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**5.01 ENVIRONMENTAL STATEMENT CHAPTER 12: GREENHOUSE
GASES**

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12 GREENHOUSE GASES

12.1 Introduction

- 12.1.1 This chapter presents the assessment of likely significant effects of Greenhouse Gas (GHG) emissions arising from the Proposed Development during construction and operation.
- 12.1.2 GHG emissions are used as a measure and indicator of the Proposed Development's impact on climate change. The increase in concentration of GHG emissions in the global atmosphere is causing a change in climatic conditions creating climate change impacts. Any GHG emissions arising as a result of the Proposed Development will therefore have an impact on climate change.
- 12.1.3 The assessment of Climate Change Resilience (i.e. the impact of the future climate changes on the Proposed Development) is presented in **Chapter 9** Climate Change Resilience of this Environmental Statement (ES) **[TR020001/APP/5.01]**.
- 12.1.4 The Environmental Impact Assessment (EIA) Scoping Report **Appendix 1.1 and 1.2 [TR020001/APP/5.05]** sets out the proposed scope for the assessment of GHG. Although, the Airports National Policy Statement (ANPS) does not have direct effect in relation to the Proposed Development, it sets out a number of principles for environmental impact assessment and compliance and the key emissions sources have been assessed in line with the (ANPS) and other policy statements, and are:
- a. Aviation;
 - b. Airport Operations¹;
 - c. Surface Access; and
 - d. Construction.
- 12.1.5 **Table 12.6** provides further details of the full range of activities and operations taken into account under each of these areas.
- 12.1.6 In line with the requirements of the ANPS (Ref. 12.1), two scenarios have been modelled to understand the GHG impact of the Proposed Development. These scenarios are categorised as 'Do-Minimum' (DM), where the Proposed Development does not proceed, and the airport continues to operate assuming a 'business as usual' approach and 'Do-Something' (DS) where the Proposed Development proceeds.
- 12.1.7 For the purpose of the GHG assessment the DM Scenario provides a Future Baseline against which the DS Scenario, or Core Planning Case (as defined in **Chapter 5** of this Environmental Statement (ES) **[TR020001/APP/5.01]**), is

¹ The term *Airport Operations* is used throughout this document. This is sometimes referred to within the aviation sector as *Airport Ground Operations*; the two terms refer to the same scope of operations and can be used interchangeably.

compared. The variation between the two scenarios represents the GHG impact of the Proposed Development.

Other key policy

- 12.1.8 Two important and relevant Government policies that influence GHG emissions arising from the aviation and transportation sectors in the UK help frame the approach to assessing and reporting GHG emissions in this chapter. The first is the Jet Zero Strategy (Ref. 12.2) published in 2022 which sets out Government commitments to decarbonise airport operations by 2040, and aviation by 2050. The second is the Transport Decarbonisation Plan (Ref. 12.3) which sets out Government Policy on decarbonising transportation in the UK in line with the UK's net zero by 2050 target. Further details on these policies, how they relate to other policies and mechanisms to reduce carbon emissions such as the UK Emissions Trading Scheme and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA) as well as how they impact the Proposed Development, are presented in **Section 12.2**.

Baseline (DM): Current Baseline (2019) and Future Baseline

- 12.1.9 The Baseline (DM) consists of two parts:
- a. Current Baseline; and
 - b. Future Baseline.
- 12.1.10 The Current Baseline is calculated using 2019 data for airport operations, surface access journeys and air traffic movements.
- 12.1.11 The Future Baseline assumes the airport continues to operate at the current consented capacity of 18 million passengers per annum (mppa). GHG emissions for the operation of airport buildings and infrastructure, as well as airside and landside vehicles and equipment have been calculated based on an extrapolation of 2019 through to 2043. GHG emissions for surface access journeys have been calculated from 2019 through to 2043 based on surface access journey data for passengers and staff provided by Transport Planners. GHG emissions from air traffic movements for the same period are calculated from Aircraft Movements and passenger demand (further information on demand forecasts are provided in the **Need Case [TR020001/APP/7.04]** submitted as part of the application for development consent and key data is provided in **Appendix 12.2 [TR020001/APP/5.02]**.
- 12.1.12 The Future Baseline has taken into consideration the future impact of government policy. For example, it takes into consideration the impact of the national energy grid decarbonising as well as the uptake of electric and low carbon vehicles in line with current government policy as laid out in the Transport Decarbonisation Plan. The Future Baseline also takes into consideration the Jet Zero Strategy High Ambition Scenario assumptions relating to carbon pricing via the UK Emissions Trading Scheme (ETS) and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA), the increased efficiency of aircraft, the increased take up of sustainable aviation fuels (SAFs) and the introduction of zero emission aircraft.

Greenhouse Gas Assessment Core Planning Case

- 12.1.13 The Greenhouse Gas Core Planning Case assessment presented in this chapter has a slightly different scope to assessment to that applied in the other environmental aspects such as air quality and noise reported in this ES. This difference in approach is taken due to the unique circumstances around how aviation GHG emissions are managed at an international and national level and the surrounding policy framework that has been set out for this as reported in the Jet Zero Strategy (Ref. 12.4).
- 12.1.14 The Jet Zero Strategy considers measures such as the national mandate to introduce Sustainable Aviation Fuels (SAF) into aviation fuel supply, and the introduction of next generation aircraft which are currently not available but in development. Initiatives and programmes in these areas are outside the control of the Applicant or scope of the application for development consent. However, as the Jet Zero Strategy demonstrates, they represent committed targets in government policy and legislation and can be relied upon as such.
- 12.1.15 For this reason, the Core Planning Case scenario in this chapter has included such measures taking care to ensure they are implemented at the appropriate time within the Proposed Development assessment and its study period to 2050. This approach is applied to the uptake of technology for example, next generation aircraft deployment. On other matters such as passenger forecasts the Greenhouse Gas Core Planning Case follows the same approach applied in the Core Planning Case of the other environmental aspect chapters. In outcome this means the Core Planning Case set out in this chapter includes for example, next generation aircraft, rather than examining them as part of a sensitivity test (**Table 12.23** describes this example in more detail).
- 12.1.16 This approach allows greenhouse gas emissions from the Proposed Development to be considered appropriately in the national context, and against the relevant national and/or sectorial comparator.
- 12.1.17 GHG emissions from airport operations have largely been calculated using energy demand data provided by the Energy Model, but in some cases through extrapolating the average tonnes of CO_{2e} per passenger in the Current Baseline by forecast passenger numbers or other suitable metrics.
- 12.1.18 Emissions from surface access journeys are based on a Strategic Traffic Model which accounts for increased passenger, staff and freight journeys as the airport expands. Further information of this traffic model is provided in the **Transport Assessment [TR020001/APP/7.02]**. Emissions from air traffic movements are based on the demand forecasts documented in the **Need Case [TR020001/APP/7.04]**.
- 12.1.19 The Core Planning Case includes embedded mitigation measures to reduce GHG emissions from the Proposed Development. Further details on embedded mitigations are provided in **Section 12.8**.

Overview

- 12.1.20 This chapter consists of the following sections and content:

- a. **Section 12.1** Introduction
- b. **Section 12.2** Legislation, policy and guidance – relevant to the scope and methodology of the Greenhouse Gases assessment;
- c. **Section 12.3** Scope of the GHG assessment;
- d. **Section 12.4** Stakeholder engagement and consultation – undertaken to inform the GHG assessment;
- e. **Section 12.5** Methodology – applied to the GHG assessment;
- f. **Section 12.6** Assumptions and limitations;
- g. **Section 12.7** Baseline conditions;
- h. **Section 12.8** Embedded and good practice mitigation measures;
- i. **Section 12.9** Assessment of Core Planning Case;
- j. **Section 12.10** Additional mitigation;
- k. **Section 12.11** Residual effects, and the overall significance of effect;
- l. **Section 12.12** Non-CO2 emissions;
- m. **Section 12.13** In-combination climate change effects;
- n. **Section 12.14** Monitoring;
- o. **Section 12.15** Assessment summary.

12.2 Legislation, policy and guidance

12.2.1 This section identifies the key legislation, policy and guidance relevant to the GHG assessment including its scope and methodology alongside influencing the type of mitigation measures that may be incorporated into the Proposed Development during construction and/or operation.

12.2.2 **Table 12.1 to Table 12.4** provide descriptions of the relevant legislation, policy and guidance, and identify how and where each of these have been addressed in the ES.

Legislation

Table 12.1: Greenhouse Gases legislation

Legislation	How and where addressed in ES
<p>The Paris Agreement (adopted 2015) (Ref. 12.5) is a legally binding international treaty within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with GHG emissions mitigation, adaptation and finance starting in the year 2020. It requires all signatories to declare their Nationally Determined Contributions (NDC) towards balancing anthropogenic sources and sinks of GHGs in the second half of this century with the objective of keeping global warming to well below 2°C and to pursue efforts to limit global warming to 1.5°C.</p>	<p>Since its withdrawal from the EU, the UK Government declares its own NDC setting out its climate change obligations under the Paris Agreement and the climate change target and budgets set under the Climate Change Act 2008. Section 12.7 presents an assessment to identify the impact of the Proposed Development on the UK meeting its climate change target and five-yearly carbon budgets. In support of this the embedded and additional mitigation measures of the Proposed Development are set out in the Section 12.8 and Section 12.10.</p>
<p>UK Nationally Determined Contribution (2020) (Ref. 12.6). In 2020, the UK communicated its new Nationally Determined Contribution to the UNFCCC pursuant to the Paris Agreement. Within its latest NDC, the UK has committed to reducing GHG emissions by at least 68% by 2030 compared to 1990 levels.</p>	<p>Embedded measures to mitigate the impacts of climate change from the Proposed Development are set out in the Section 12.7. An assessment of the impact of the Proposed Development against the Government’s carbon target and budgets is set out in the Section 12.9.</p>
<p>The Climate Change Act 2008 and Climate Change Act 2008 (2050 Target Amendment) Order 2019 (Ref. 12.7) The Climate Change Act 2008 (hereafter referred to as the ‘Act’) originally set a legally binding target for the UK to reduce its GHG emissions from 1990 levels by at least 80% by 2050. This</p>	<p>Embedded and good practice mitigation measures have been identified in Section 12.8. An assessment of the impact of the Proposed Development against the Government’s carbon target and budgets is set out in Section 12.11.</p>

Legislation	How and where addressed in ES
<p>target is supported by a system of legally binding five-year ‘carbon budgets’ that restrict the amount of GHG emissions the UK can legally emit. An independent body, the Climate Change Committee (CCC), was established to monitor progress.</p> <p>The Act was amended in June 2019 to revise the 80% reduction target to 100% by 2050, compared to 1990 levels (through the Climate Change Act 2008 (2050 Target Amendment) Order 2019). Section 30 of the Act addresses emissions from international aviation and international shipping.</p>	<p>Following the tables set out here in Section 12.2, a summary description is provided for how the Proposed Development GHG assessment is presented within the national context and the Climate Change Act and the Secretary of State’s legal obligations defined by it (Section 12.2.6).</p>
<p>The Carbon Budget Order 2021 (Ref. 12.8) In June 2021, the UK Government passed into law the sixth carbon budget, in line with the recommendation of the CCC. The budget for the years 2033-37 is 965 Mt CO₂e².</p> <p>For the first time the sixth carbon budgets includes international aviation and shipping emissions. Prior to this UK carbon budgets included only domestic aviation emissions, and were set excluding, but allowing for, ‘headroom’ (also known as the ‘planning assumption’) to account for international aviation (and shipping) emissions.</p> <p>The Sixth Carbon Budget includes international aviation for the first time, but does not identify a separate allowance for aviation. The CCC’s Sixth Carbon Budget Report did set out a range of different scenarios for the growth on aviation to meet the ‘net zero’ target (Ref. 12.9), but these scenarios have not been adopted as Government policy. Outturn emissions from aviation in 2050 varied widely across these scenarios³.</p>	<p>An assessment of the impact of the Proposed Development against the Government’s carbon budgets is set out in the Section 12.11.</p>

² A megatonne (Mt) is equivalent to 1,000,000 metric tonnes

³ The Jet Zero consultation also includes a range of potential emissions scenarios for aviation which represent additional modelling from UK Government, and which include potential trajectories reflecting technology improvements and SAF uptake.

Legislation	How and where addressed in ES
<p>The Greenhouse Gas Emissions Trading Scheme Order 2020 (as amended by the Greenhouse Gas Emissions Trading Scheme (Amendment) Order 2022) (Ref. 12.10) provides the legislation which implements the UK Emission Trading Scheme (UK ETS), as a replacement to the UK's participation in the EU ETS. The UK ETS is a cap-and-trade mechanism which includes aviation emissions. The aviation routes covered by the UK ETS include UK domestic flights, flights between the UK and Gibraltar, and flights departing the UK to the European Economic Area by all aircraft operators, regardless of nationality.</p> <p>Government has made it clear in the Jet Zero Strategy (para 3.46) that:</p> <p><i>This Strategy draws on UK ETS Authority proposals in the Developing the UK ETS consultation to increase the ambition of the scheme by aligning the cap with a clear net zero trajectory, and new carbon price assumptions which illustrate the potential costs faced by airline operators in future.</i></p> <p>Aircraft operators covered by the UK ETS need to surrender a greenhouse gas emission permit for each tonne of CO₂ emitted in a year and have obligations to comply with the conditions in their Environmental Management Plan and monitor their aviation emissions each year.</p> <p>In 2021, the UK Government has consulted on how the UK ETS will integrate with wider industry initiatives to reduce GHG emissions, including a proposed approach to implementing CORSIA in the UK (see following row on The Air Navigation (Carbon Offsetting and Reduction Scheme for International Aviation) Order 2021) and the detail of</p>	<p>Carbon emissions from aviation are capped at a national level by the UK ETS. Aircraft operators (i.e. airlines) in the UK have to operate within this legislative framework. Emissions calculations within this ES have been quantified in line with the Airports National Policy Statement (ANPS) and are presented in the Section 12.9 as domestic or international, and categorised as traded under UK ETS vs. non-traded carbon emissions.</p>

Legislation	How and where addressed in ES
<p>the CORSIA Monitoring, Reporting and Verification (MRV) provisions (Ref. 12.11).</p>	
<p>The Air Navigation (Carbon Offsetting and Reduction Scheme for International Aviation) Order 2021 (Ref. 12.12) came into force on 26 May 2021 and it implements the monitoring, reporting and verification (MRV) requirements of International Civil Aviation Organisation (ICAO) Carbon Offsetting Reduction Scheme for International Aviation (CORSIA) (Ref. 12.13) in the UK and contains duties for aeroplane operators, verification bodies and Regulators in the UK.</p> <p>CORSIA is a global market-based measure whereby offsetting is used to reduce sectoral emissions to agreed levels. Offsetting of CO₂ emissions will be achieved through the acquisition and cancelation of emissions units from the global carbon market by aeroplane operators.</p> <p>CORSIA imposes on aeroplane operators' requirements to:</p> <ul style="list-style-type: none"> • monitor, report and verify CO₂ emissions - operators with annual emissions over 10,000 tonnes of CO₂ are required to annually report their emissions for international flights only. • offset CO₂ emissions - at the end of each 3-year compliance period, operators must demonstrate that they have met their offsetting requirements by cancelling the appropriate number of emissions units. <p>The Air Navigation (Carbon Offsetting and Reduction Scheme for International Aviation) (Amendment) Order 2022 came into force in November 2022. It amends the Air Navigation (Carbon Offsetting and Reduction Scheme for International Aviation) Order 2021 and implements the offsetting requirements</p>	<p>Aircraft operators are responsible for carbon emissions associated with flights (presented in Section 12.7). Therefore, it is not the direct responsibility of individual airport owners (including the Applicant) to meet requirements of CORSIA. CORSIA will apply to both the Current Baseline (Do minimum) and Do Something scenarios. The UK policy and legislation regimes are under development to manage and control aviation emissions at a national and global level, within UK climate obligations and carbon budgets. This ES has not included assumptions about the offsetting of residual GHG emissions under the CORSIA regime in its reporting of emissions, but the effect of CORSIA should be taken into account.</p>

Legislation	How and where addressed in ES
<p>of CORSIA into UK law in respect of 2021 emissions only. Further secondary legislation is required to implement CORSIA's offsetting requirements for the full duration of the scheme and to clarify any interaction between CORSIA and the UK ETS.</p>	
<p>The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref. 12.14) requires a description of the factors “likely to be significantly affected by the development” including climate (for example greenhouse gas emissions and impacts relevant to adaptation) (Schedule 4 (Paragraph 4)) and a description of the likely significant effects of the development on the environment resulting from “the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change” (Schedule 4 (paragraph 5(f))).</p>	<p>This ES follows the process for assessment within the regulations. Likely significant effects of climate change with the embedded and good practice mitigation measures are presented in the Section 12.8.</p>

Policy

Table 12.2: Greenhouse Gases policy

Policy	How and where addressed in ES
<p>The National Planning Policy Framework (2021) (Ref. 12.15) (NPPF) sets out the Government’s planning policies for England. Policies of relevance to climate change and sustainability assessment include those relating to achieving sustainable development and meeting the challenge of climate change.</p> <p>Paragraph 152 of the NPPF states that: “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, minimise vulnerability and improve resilience; encourage the reuse</p>	<p>The GHG emissions methodology and assessment described in Section 12.5 and Section 12.5 respectively have been developed in line with the NPPF guidance. Mitigation measures have been incorporated into the Proposed Development design, construction and operation to minimise and mitigate the impacts of GHG emissions on climate change from the Proposed Development. These are set out in the Section 12.8 and Section 12.10.</p>

Policy	How and where addressed in ES
<p><i>of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.”</i></p> <p><i>Paragraph 154 states that:</i></p> <p><i>“New development should be planned for in ways that (...) can help to reduce greenhouse gas emissions, such as through its location, orientation and design.”</i></p> <p><i>Paragraph 155 states that:</i></p> <p><i>“To help increase the use and supply of renewable and low carbon energy and heat, plans should:</i></p> <p><i>a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts); b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and 53 In line with the objectives and provisions of the Climate Change Act 2008. 46</i></p> <p><i>c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for collocating potential heat customers and suppliers.”</i></p> <p><i>Paragraph 157 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...”.</i></p>	
<p>Jet Zero Strategy: Delivering net zero aviation by 2050 (2022) (Ref. 12.16). The strategy sets out government</p>	<p>Government commitments presented in the Jet Zero Strategy have been taken into consideration when modelling GHG</p>

Policy	How and where addressed in ES
<p>ambition to decarbonise the UK aviation sector by 2050. A number of commitments are presented in the strategy with direct relevance to the Proposed Development including:</p> <ul style="list-style-type: none"> a. A commitment to achieving a ‘High Ambition Scenario’ whereby emissions from aircraft will be decarbonised by 2050 through a series of interventions including the increased uptake of sustainable aviation fuels (SAFs), aircraft efficiencies, demand management through carbon pricing and zero emissions aircraft. b. A commitment for UK airport operations to be zero emissions by 2040 (noting that further consultation will be undertaken to define this) c. A commitment to accelerate work to understand non-CO₂ impacts from aviation. 	<p>emissions from aircraft and operations. The outputs of this modelling are presented in Section 12.10.</p> <p>The GHG assessment in Section 12.12 acknowledges the impact of non-CO₂ emissions but in line with the Jet Zero Strategy also acknowledges that there are significant uncertainties around calculating these non-CO₂ impact.</p>
<p>A Green Future: Our 25 Year Plan to Improve the Environment, (2018), updated 2019 (Ref. 12.17). The 25 Year Plan sets out government action to help the natural world regain and retain good health. It sets out commitment to <i>“take all possible action to mitigate climate change, while adopting to reduce its impact.”</i></p>	<p>Measures to minimise and mitigate the impacts of climate change from the Proposed Development are set out in the Section 12.8 and Section 12.10.</p>
<p>The UK Aviation Policy Framework (2013) (Ref. 12.18) outlines the Government’s policy for the UK aviation sector. With respect to climate change, paragraph 2.4 states that the UK Government’s objective is to: <i>“ensure that the aviation sector makes a significant and cost-effective contribution towards reducing global emissions”</i>.</p>	<p>Measures to minimise and mitigate the impacts of climate change from the Proposed Development are set out in Section 12.8 and Section 12.10.</p>
<p>Beyond the horizon: The future of UK aviation. Making best use of existing runways (2018) (Ref. 12.19)</p>	<p>This policy states that climate change issues are embedded in, and controlled by, decision-making undertaken at a national level.</p>

Policy	How and where addressed in ES
<p>Published by the Department of Transport (DfT), it represents current UK Government policy on aviation and climate change. It sets out the Government's support for airports (other than Heathrow) making best use of their existing runways subject to related economic and environmental considerations being considered.</p>	<p>Aviation emissions are to be appropriately addressed at a national level.</p> <p>The inclusion of international aviation within the Sixth Carbon Budget removes the need for a 'planning assumption' from 2033-37, but does not change the pathway to carbon net zero.</p> <p>This ES calculates gross emissions in line with methodology set out in the EIA scoping opinion and the guidance in the ANPS as reported in Section 12.5 and assessed in Section 12.9 to determine whether these prejudice the UK's ability to meet the Government's carbon budgets.</p>
<p>The Airports National Policy Statement (ANPS) (2018) (Ref. 12.20) sets out the Government's policy on the need for new airport capacity in the Southeast of England.</p>	<p>While the ANPS is only directly applicable to Heathrow Airport, it has a bearing on other airports, particularly those in the south east making best use of their existing runways, and the assessment of effects. Relevant sections of the ANPS are discussed in more detail in Table 12.3.</p>
<p>Aviation 2050: the future of UK aviation (2018) (Ref. 12.21)</p> <p>In 2018 government published Aviation 2050 to consult on its long term ambitions for aviation. In 2019 a response to one area of the consultation relating to proposals for legislation for enforcing the development of airspace change was published. Due to the impact of COVID-19 on the aviation sector however, the government decided to not to publish any further responses to the Aviation 2050 consultation at that time. Flightpath to the Future (Ref. 12.22) published in 2022 built on the responses received during the Aviation 2050 consultation and set out government's 10 year commitments and ambitions for the aviation sector.</p>	<p>See comments below on Flightpath to the Future above on how commitments have been addressed.</p>
<p>Flightpath to the Future (2022) (Ref. 12.23) provides a medium-term strategic framework for the UK aviation sector. Flightpath to the Future is a strategic framework for the aviation</p>	<p>While the Flightpath to the Future strategy is not directly addressed in this chapter, the relevant commitments in the Jet Zero Strategy, referred to in Flightpath to the</p>

Policy	How and where addressed in ES
<p>sector that supports the Department for Transport’s vision for a modern, innovative and efficient sector over the next 10 years.</p> <p>This 10-point plan focuses on how government and industry can work together to deliver a successful aviation sector of the future.</p> <p>Two of the key themes in Flightpath to the Future focus on ‘Enhancing global impact for a sustainable recovery’ and ‘Embracing innovation for a sustainable future’ noting the role the Jet Zero Strategy will play.</p>	<p>Future have been addressed throughout the methodology and significance test.</p>
<p>The Transport Decarbonisation Plan, Decarbonising Transport: a better, greener Britain (2021) (Ref. 12.24)</p> <p>The plan sets out the government’s commitments and actions to further decarbonise the full transport system in the UK before 2050. The strategic priorities included are modal shift and active transport; decarbonisation of road transport; decarbonising the freight system; green transport technology and innovation; place-based solutions; and reducing carbon in the global economy. Relevant commitments to the Proposed Development are as follows:</p> <ol style="list-style-type: none"> a. To deliver a net zero railway network by 2050, with sustained carbon reductions in rail along the way, including removal of all diesel-only trains (passenger and freight) from the network by 2040. b. To improve rail journey connectivity with walking, cycling and other modes of transport. c. To deliver 4,000 new zero emission buses and the infrastructure needed to support them. d. To invest £2 billion over five years with the aim that half of all journeys in towns and cities will be cycled or walked by 2030. 	<p>The Transport Decarbonisation Plan contains high level targets for phasing out new fossil fuelled vehicles after specified dates. Accordingly, the Core Planning Case factors in the projected impacts of the Transport Decarbonisation Plan on surface access journeys through to 2050.</p> <p>The strategy has been also considered in mitigation measures described in Section 12.8 and Section 12.10 and Outline GHG Action Plan Appendix 12.1 of this ES [TR020001/APP/5.02].</p>

Policy	How and where addressed in ES
<p>The National Policy Statement for National Networks (2014) (Ref. 12.25) sets out the need for development of road, rail and strategic rail freight interchange projects on the national networks and the policy against which decisions on major road and rail projects will be made.</p> <p>Paragraph 5.16 states that: <i>“Carbon budgets and plans will include policies to reduce transport emissions, taking into account the impact of the Government’s overall programme of new infrastructure as part of that.”</i></p> <p>Paragraph 5.17 explains that any carbon impacts should be included at the option appraisal stage and as part of the EIA for the DCO application, and that applicants should provide evidence of the carbon impacts and assess them against the carbon budgets.</p> <p>Paragraph 5.18 explains how carbon increases from road development are included in the UK carbon budget and state the following:</p> <p><i>“any increase in carbon emissions is not a reason to refuse development consent, unless the increase in carbon emissions resulting from the proposed scheme are so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets.”</i></p> <p>Paragraph 5.19 states:</p> <p><i>“Evidence of appropriate mitigation measures (incorporating engineering plans on configuration and layout, and use of materials) in both design and construction should be presented. The Secretary of State will consider the effectiveness of such mitigation measures in order to ensure that, in relation to design and construction, the carbon footprint is not unnecessarily high. The Secretary of State’s view of the adequacy of the mitigation measures relating to design and</i></p>	<p>The policy has been taken into account in relation to the highway improvements proposed as part of the Proposed Development.</p> <p>The assessment of GHG emissions provides preliminary evidence of the carbon impact against the Government’s carbon obligations and quantifies the GHG effects of the Proposed Development, presented in Section 12.7.</p> <p>Mitigation measures have been incorporated into the Proposed Development design, construction and operation to minimise and mitigate the impacts of GHG emissions on climate change from the Proposed Development, these are set out in Section 12.8 and Section 12.10.</p>

Policy	How and where addressed in ES
<p><i>construction will be a material factor in the decision-making process.”</i></p>	
<p>The Clean Growth Strategy: Leading the way to a Low Carbon Future (2017) (Ref. 12.26) set out Government proposals to accelerate clean, low carbon growth. It sets out policies across a range of sectors including transportation and energy generation.</p>	<p>The impact of this policy has been taken into account through identified mitigation set out in Section 12.8 and Section 12.10.</p>
<p>The Ten Point Plan for a Green Industrial Revolution (2020) (Ref. 12.27) sets out the government’s approach to build back better, support green jobs, and accelerate the path to net zero. It sets out a number of commitments transitioning to low carbon power and transportation including zero emissions vehicles and low carbon energy. It also commits to positioning the UK at the forefront of aviation with the establishment of the Jet Zero Council to drive the uptake of sustainable aviation fuels and zero emissions aircraft.</p>	<p>Modelling of GHG emissions in line with government policy for the uptake of zero emissions aircraft, SAFs, and more efficient use of airspace is addressed in Section 12.8.</p>
<p>The Luton Local Plan 2011-2031 (adopted 2017) (Ref. 12.28) The Local Plan discusses challenges faced within transport and climate change. It sets out policies to support delivery of strategic objectives leading to reduction of carbon through waste management, increase energy and water efficiency, and promotion of renewable energy. Strategic Objective 11 aims to increase energy and water efficiency and encourage and promote the use of renewable energy sources and ensure effective waste management. Policy LLP25 - High Quality Design states: <i>“Proposals will need to demonstrate adherence to the best practice principles of urban design to help create quality places in the Borough. In particular, where the following design criteria are material to an application site, its context and development</i></p>	<p>Measures to mitigate the impacts of climate change from the Proposed Development are set out in the Section 12.8 and Section 12.10.</p>

Policy	How and where addressed in ES
<p><i>proposals, provision should be made to: (...) reduce carbon emissions, risk of flooding, and increase energy and water efficiency and quality."</i></p> <p>Policy LLP31 - Sustainable Transport Strategy states: <i>"Support for the continued economic success of London Luton Airport as a transport hub (policy LLP6) will be delivered through: a. measures to ensure there is capacity at strategically important junctions; and continued enhancement of sustainable modes of transport via the Airport Surface Access Strategy."</i></p>	
<p>Luton Borough Council (LBC) Climate Change Action Plan 'My climate action plan. Becoming a carbon neutral borough by 2040' (2021) (Ref. 12.29)</p> <p>The Action Plan sets out actions to reduce carbon emissions and increase carbon sequestration arising from the council's operations, measures include encouraging and supporting public and active transport, prioritising active travel when improving local highways, provision of Electric Vehicles (EVs) chargers.</p> <p>The Plan also states that LBC are in the process of reviewing Local Transport Plan and coming review of the Local Plan, which will address sustainable transport and environmental standards for new developments.</p>	<p>LBC's commitments set out in the Plan have been considered for mitigation measures in the Section 12.8.</p>
<p>Central Bedfordshire Council (CBC) Local Plan 2015 - 2035 (adopted July 2021) (Ref. 12.30)</p> <p>The Local Plan aims to reduce the impact of the proposed developments by at least 10%. It includes the Policy CC1: Climate Change and Sustainability to ensure that new developments contribute to the mitigation of climate change and minimise the lifetime carbon emissions resulting from the development with aim to reduce the</p>	<p>Embedded measures to minimise and mitigate the impacts of climate change from the Proposed Development are set out in Section 12.8. Additional mitigation measures are presented in Section 12.10.</p>

Policy	How and where addressed in ES
<p>impact of the proposed developments by at least 10%.</p>	
<p>North Hertfordshire District Council (NHDC) Proposed Submission Draft Local Plan for 2011-2031 (adopted 2022) (Ref. 12.31). The submission draft Plan addresses the climate change by setting out policies to mitigate effects of climate change through efficient use of natural sources, use of sustainable construction techniques, use of renewable energy technologies.</p>	<p>Measures to mitigate the impacts of climate change from the Proposed Development are set out in Section 12.8 and Section 12.10.</p>
<p>Dacorum Local Plan Core Strategy 2006-2031(adopted 2013) (Ref. 12.32) New development will comply with the highest standards of sustainable design and construction possible. The following principles should normally be satisfied: (a) Use building materials and timber from verified sustainable sources; (b) Minimise water consumption during construction; (c) Recycle and reduce construction waste which may otherwise go to landfill. (d) Provide an adequate means of water supply, surface water and foul drainage; (e) Plan to limit residential indoor water consumption to 105 litres per person per day until national statutory guidance supersedes this advice; (f) Plan to minimise carbon dioxide emissions; (g) Maximise the energy efficiency performance of the building fabric, in accordance with the energy hierarchy set out in Figure 16; (h) Incorporate at least one new tree per dwelling/per 100sqm (for non-residential developments) on-site; (i) Minimise impacts on biodiversity and incorporate positive measures to support wildlife; (j) Minimise impermeable surfaces around the curtilage of buildings and in new street design; (k) Incorporate permeable and lighter coloured surfaces within urban areas; and (l) Provide on-site recycling facilities for waste. Buildings will be designed to have a long life and</p>	<p>Measures to mitigate the impacts of climate change from the Proposed Development are set out in Section 12.8 and Section 12.10 many of which are aligned with the principles set out in the Dacorum strategy.</p>

Policy	How and where addressed in ES
<p>adaptable internal layout. Applicants will therefore need to explain how: (i) they have considered the whole life cycle of the building and how the materials could be recycled at the end of the building’s life; and (ii) their design has been ‘future proofed’ to enable retrofitting to meet tighter energy efficiency standards and connection to decentralised community heating systems. For specified types of development applicants should provide a Sustainability Statement. Where new development cannot meet on-site energy or tree planting requirements, the applicant will be expected to contribute towards sustainability offsetting if at all possible (see Policy CS30). If a scheme would be unviable or there is not a technically feasible approach, the principles in this policy may be relaxed.</p>	

- 12.2.3 The Airports National Policy Statement (ANPS) (Ref. 12.33) does not ‘have effect’ in relation to an application for development consent for an airport development not comprised of an application relating to the Heathrow Northwest Runway. Nevertheless, as set out within paragraph 1.41 of the ANPS, the Secretary of State considers that the contents of the ANPS will be both important and relevant considerations in the determination of such an application, particularly where it relates to London or the south east of England. In particular, the ANPS makes clear that, alongside the provision of a new Northwest Runway at Heathrow, the government supports other airports making best use of their existing runways as set out in Beyond the Horizon: Making best use of existing runways (MBU) (Ref. 12.34), which is the specific policy context for this application.
- 12.2.4 In addition, whilst the ANPS does not have effect in relation to the Proposed Development, it sets out a number of principles for environmental impact assessment and compliance and these will be an important and relevant consideration in the determination of the application for development consent. A summary of the relevant provisions for the GHG assessment and how and where these have been addressed in this ES is provided within **Table 12.3**.

Table 12.3: How relevant Greenhouse Gases requirements of ANPS are addressed in the ES

ANPS Section	How and where addressed in ES
<p>Paragraph 5.74 recognises that the carbon impact of airport development falls into four areas namely:</p> <p><i>“air transport movements (both international and domestic) as a result of increased demand, emissions from airport buildings and ground operations, emissions from surface transport accessing the expanded airport; and emissions caused by construction.”</i></p>	<p>The GHG assessment considers the four areas of carbon impact named in the ANPS. This is covered in Section 12.5.</p>
<p>Paragraph 5.76 sets out the considerations that will need to be taken into account for an assessment of GHG emissions, including the quantification of impacts. 5.76 requires the applicant to:</p> <ul style="list-style-type: none"> a. <i>“Provide evidence of the carbon impact of the project (including embodied carbon), both from construction and operations such that it can be assessed against the Government’s carbon obligations, including but not limited to carbon budgets.</i> p. Quantify GHG impacts before and after mitigation to show the impacts of the proposed mitigation. q. Split emissions into traded and nontraded sector.” 	<p>The construction and operational GHG impact of the Proposed Development is set out in Section 12.7 and Section 12.9 which includes GHG emissions for the Future Baseline scenario (i.e. the Proposed Development is not consented) and the Core Planning Case with embedded mitigation scenarios,. An assessment of the impact of the Proposed Development against the Government’s carbon obligations, including the Jet Zero Strategy High Ambition Scenario for Aviation emissions and national carbon budgets for non-aviation emissions, is set out in Section 12.9.</p>
<p>Paragraph 5.77 states that the applicant’s assessment should seek to quantify impacts including:</p> <ul style="list-style-type: none"> a. <i>“Emissions from surface access due to airport and construction staff;</i> b. <i>Emissions from surface access due to freight and retail operations and</i> c. <i>construction site traffic;</i> d. <i>Emissions from surface access due to airport passengers/visitors; and</i> e. <i>Emissions from airport operations including energy and fuel use.</i> 	<p>GHG emissions impacts for each of the required emissions sources are presented in Section 12.9. This includes Do-Minimum and Do-something with embedded mitigation scenarios for the year of opening, year of peak operation and the worst-case scenario.</p>

ANPS Section	How and where addressed in ES
<p><i>This should be undertaken in both a ‘Do-Minimum’ and ‘Do-Something’ scenario for the opening, peak operation and worst-case scenarios.”</i></p>	
<p>Paragraph 5.78 states that the Secretary of State needs to be satisfied that mitigation measures are acceptable and provides a list of suggested measures for inclusion. Paragraph 5.78 suggests <i>“a management /project plan may help clarify and secure mitigation at this stage”</i>.</p>	<p>Mitigation measures suggested in the policy have been considered in the embedded and additional measures to mitigate GHG emissions from the construction and operation of the Proposed Development which are presented in Section 12.8 and Section 12.10. These measures have been collated into the Outline GHG Action Plan available in Appendix 12.1 in of this ES [TR020001/APP/5.02].</p>
<p>Paragraph 5.82 specifies that: <i>“Any increase in carbon emissions alone is not a reason to refuse development consent, unless the increase in carbon emissions resulting from the project is so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, including carbon budgets.”</i></p> <p>Paragraph 5.83 set outstates that: <i>“The Secretary of State’s view of the adequacy of the mitigation measures relating to design, construction and operational phases will be a material factor in the decision-making process.</i></p>	<p>Following the tables set out here in Section 12.2, a summary description is provided (from Section 12.2.5) for how the Proposed Development GHG assessment is being carried out including the assessment of significance and for the materiality of its emissions with respect to the Government’s ability to meet its carbon reduction targets and budgets as referenced in paragraph 5.82 of the ANPS. Further description to this is also given from Section 12.11.</p>

Guidance

Table 12.4: Greenhouse Gases guidance

Guidance	How and where addressed in ES
<p>National Planning Practice Guidance on Climate Change (Ref. 12.35) This guidance sets out how to identify suitable mitigation and climate adaptation measures to incorporate into the planning process. Paragraph 001 states <i>“effective spatial planning is an important part of a successful response to climate change as</i></p>	<p>Measures to minimise and mitigate the impacts of climate change from the Proposed Development are set out in Section 12.8 and Section 12.10.</p>

Guidance	How and where addressed in ES
<p><i>it can influence the emission of greenhouse gases.”</i></p> <p><i>Paragraph 004 states “Sustainability appraisal can be used to help shape appropriate strategies in line with the statutory duty on climate change and ambition in the Climate Change Act 2008.”</i></p>	
<p>Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022) (Ref. 12.36). This provides guidance on the identification, assessment and subsequent mitigation of life cycle impacts of GHG emissions throughout the Environmental Impact Assessment (EIA) process. It further sets out the process against which the significance of GHG emissions from a project can be assessed.</p>	<p>The approach to assessing GHG emissions from construction and operation of the Proposed Development outlined in Section 12.5, and evaluating their significance carried out in Section 12.11 has been undertaken in accordance with this guidance.</p>
<p>Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (2015) (Ref. 12.37). Provides a guide for companies to use in quantifying their GHG emissions and defines three ‘scopes’ of emissions that are used for corporate reporting. It categorises emissions by the scope (scope 1, scope 2 and scope 3) based on whether emission sources are in controlled or not by the reporting company. Broadly these scopes can be summarised as follows:</p> <ol style="list-style-type: none"> a. Scope 1: direct emissions of GHGs from plant, equipment, vehicles owned by the reporting corporate entity (e.g. combustion of natural gas, vehicle fuels, and emissions of refrigerants). b. Scope 2: indirect emissions of GHGs associated with purchased electricity, steam, heating and cooling (purchased by the reporting corporate entity). c. Scope 3: other GHG emissions arising from the activities of the organisation including those associated with construction, transportation and 	<p>This ES reports GHG emissions by Scope from the perspective of the Applicant, in line with the scope breakdown in the 2019 baseline report. Emissions broken down by Scope are presented in Appendix 12.2 in of this ES [TR020001/APP/5.02]. Overall emissions are reported in Section 12.9.</p>

Guidance	How and where addressed in ES
distribution, waste, water, business travel, employee commuting, and energy use by tenants and 3 rd party organisations.	
PAS 2080 Carbon Management in Infrastructure (2016) (Ref. 12.38). Provides guidance on how to incorporate effective carbon management in infrastructure.	The approach to assessing GHG emissions from construction and operation of the Proposed Development outlined in the Section 12.5 has been undertaken in line with this guidance.
BS EN 15978 Sustainability of construction works – assessment of environmental performance of buildings – calculation method (2011) (Ref. 12.39).	Focusses on the calculation method to assess the environmental performance of a building based on life cycle assessment for both new and existing buildings and has been used to define the assessment methodology outlined in Section 12.5
European Monitoring and Evaluation Programme (EMEP)/ European Environment Agency (EEA) air pollutant emission inventory guidebook: 2019 (Ref. 12.40) (formerly known as ‘Corinair’). Provides guidance on calculating GHG emissions from aircraft and has been used to calculate emissions over the climb, cruise, descent (CCD) and (landing/ take-off (LTO) phases.	It has been used to inform the assessment methodology for calculating aircraft emissions outlined in Section 12.5 .

Assessing the GHG impacts of the Proposed Development within the national context

- 12.2.5 It is important to set out clearly the context within which the assessment of the Proposed Development’s GHG impacts, and their significance is undertaken.
- 12.2.6 The first key consideration in respect of GHG assessment for airport projects is the ANPS (Ref. 12.41), which makes clear in paragraph 5.82 that:

“Any increase in carbon emissions alone is not a reason to refuse development consent, unless the increase in carbon emissions resulting from the project is so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, including carbon budgets.”
- 12.2.7 To assess the impacts of the project it is therefore critical to understand both the scale of any increase in GHG emissions and the materiality of their impact on the government’s ability to meet its obligations. As is explained below, because the government’s targets and budgets are expressed at a national level, this is therefore the scale at which the assessment of materiality must be considered.

- 12.2.8 In setting out the scale of any increase associated with the Proposed Development, as with any similar assessment, the GHG assessment has been developed on the basis of known plans and robustly foreseeable trends across the scope of assessment as described in **Section 12.3**. A description of these can be found in **Section 12.6** on Assumptions and Limitations, including both the level of aviation demand and the carbon intensity of flights; further detail is provided in **Section 2.3.6** of **Appendix 12.2** of this ES [TR020001/APP/5.02].
- 12.2.9 A second key consideration is the Jet Zero Strategy, published in 2022, setting out government strategy on how net zero will be achieved in the aviation sector, aligning with the UK's wider net zero target. Following consultation in 2021, government has committed to achieving the 'High Ambition Scenario' presented in the Jet Zero Strategy. On the High Ambition Scenario the Jet Zero Strategy concludes that there will be 19.3 MtCO_{2e} of residual emissions in 2050 to be offset or removed (see **Inset 12.6**).
- 12.2.10 Fundamental to the UK aviation sector meeting the High Ambition Emissions Scenario in the Jet Zero Strategy, and in turn the UK achieving its net zero target by 2050, is the UK Emissions Trading Scheme (ETS) (Ref. 12.42) and the Carbon Reduction Offsetting Scheme for International Aviation (CORSA) (Ref. 12.43). A large majority of aviation GHG emissions from the airport will fall under the UK ETS, while the remainder will be managed under CORSA. CORSA requires aircraft operators in participating member states to offset any emissions above a specified baseline.
- 12.2.11 On these matters Paragraph 3.46 in the Jet Zero Strategy states:
"The UK Emissions Trading Scheme (UK ETS) covers all domestic flights in the UK as well as flights from the UK to the EEA, and to and from Gibraltar. This Strategy draws on UK ETS Authority proposals in the Developing the UK ETS consultation to increase the ambition of the scheme by aligning the cap with a clear net zero trajectory, and new carbon price assumptions which illustrate the potential costs faced by airline operators in future. This Strategy also reflects the need to expand the reach and impact of carbon markets by facilitating interaction between UK ETS and other international schemes such as CORSA."
- 12.2.12 As such the UK ETS sets an overall cap on the amount of carbon which may be emitted by participating airlines. Participants receive free carbon emissions allowances and/or buy emission allowances (at auction or on the secondary market) which they can trade with other participants as needed to cover the carbon emissions associated with operating their business, or to derive a commercial benefit from their own lower carbon emissions. The available allowances place a cap on the total amount of GHG emissions that can be emitted by sectors, including aviation, covered by the UK ETS. This cap will be reduced over time stimulating innovation by participants to increase the carbon efficiency of their operation, or indeed to take steps which would reduce the overall scale of their operations. This effectively puts a binding cap on the amount of GHG emissions the aviation sector can emit.
- 12.2.13 Participants in the Scheme are required to monitor their aviation emissions and then have these verified on an annual basis by an independent third party.

Participants must report their verified emissions by the 31st of March each year and then surrender allowances equal to the verified emissions by 30 April in the following Scheme year.

- 12.2.14 The cost to airline operators of purchasing carbon allowances will ultimately flow through to the cost of airline ticket prices to passengers. This has been factored into the aviation demand forecasts underlying the Proposed Development. This is explained in the **Need Case [TR020001/APP/7.04]**.
- 12.2.15 The Government's control of aviation's GHG emissions, and the assessment against the policy text in para 5.82 of the ANPS, must also be seen within the context of the Secretary of State's legal duty under section 1 of the Climate Change Act 2008, to achieve a UK net carbon account at least 100% below 1990 levels (i.e. net zero GHG emissions) by 2050 and its legal duty under section 4 to meet the five-yearly carbon budgets (including the Sixth Carbon Budget). The UK ETS and CORSIA, adopted by Government, mean that the Secretary of State will have both the controls and the legal obligation to ensure that the 2050 'net zero' target and future carbon budgets are met.
- 12.2.16 The UK ETS operates to cap aircraft emissions within its scope regardless of the total airport *capacity* in the UK, or indeed the capacity of the country's individual airports, since it bears directly on the operators of aircraft from wherever they fly in the UK. Like the UK's carbon targets themselves, the UK ETS operates at the national level and targets the activity responsible for emitting GHGs rather than the ground-based infrastructure from which they take off and land. This also avoids the risk of simply moving the source of carbon emissions (within the total UK ETS cap) from one airport to another which would be the likely outcome if emissions were capped on an airport-by-airport basis either through capacity constraint or direct emissions controls.
- 12.2.17 A third key consideration for the assessment of GHG emissions from the Proposed Development is the Transport Decarbonisation Plan (TDP) setting out government's commitment to decarbonise transportation in the UK by 2050 in line with the UK's 2050 net zero target. Surface access journeys modelled for the Proposed Development are anticipated to be net zero by 2050 in line with the TDP.
- 12.2.18 Modelling of aviation emissions for the Proposed Development has been undertaken to reflect the Jet Zero Strategy High Ambition Scenario which takes into consideration an increased uptake of SAFs, aircraft fuel efficiencies, demand management through carbon pricing and the uptake of zero emissions electric and hydrogen aircraft. Further detail is provided in **Section 12.5**.

12.3 Scope of the assessment

12.3.1 This section describes the scope of the GHG assessment, including how the assessment has responded to the Scoping Opinion. The temporal and spatial scope, the relevant receptors, and matters scoped in and out are identified. A description of engagement undertaken with relevant technical stakeholders to develop and agree this scope is provided in **Section 12.4**.

Scoping Opinion

12.3.2 The EIA Scoping Report, which was submitted to the Planning Inspectorate on 29 March 2019 set out the proposed scope and assessment methodologies to be employed in the EIA and is provided in **Appendix 1.1** to this ES **[TR020001/APP/5.05]**.

12.3.3 In response to that Scoping Report, a Scoping Opinion was received from the Planning Inspectorate on 9 May 2019 and is provided in **Appendix 1.3** of this ES **[TR020001/APP/5.05]**.

12.3.4 **Table 12.5** describes the main matters highlighted by the Planning Inspectorate in the Scoping Opinion and how these have been addressed in this ES. Responses to all comments received during Scoping are provided in **Appendix 1.4** of this ES **[TR020001/APP/5.02]**.

Table 12.5: GHG Scoping Opinion comments

Scoping Opinion ID	Planning Inspectorate Scoping Opinion comment	How this is addressed
3.2.14	<p>The Scoping Report proposes that decommissioning impacts are to be scoped out of the ES for two specific aspect chapters: Chapter 8 Climate Change and Chapter 9 Greenhouse Gas. Paragraph 5.2.5 also states that the assessment of potentially significant effects arising from the decommissioning of the Proposed Development is proposed to be scoped out of the ES. The Inspectorate therefore infers that the Applicant intends to scope out decommissioning impacts from the ES entirely. Having regard to the nature and characteristics of the Proposed Development the Inspectorate agrees that decommissioning can be scoped out of the ES. The Inspectorate does however, advise that the ES</p>	<p>Decommissioning of the Proposed Development was scoped out of the assessment.</p>

Scoping Opinion ID	Planning Inspectorate Scoping Opinion comment	How this is addressed
	includes details of any infrastructure elements predicted to be decommissioned over a shorter time period and give consideration to the potential for likely significant effects to arise in relation to these elements.	
3.2.17	Include a description and assessment (where relevant) of the likely significant effects the Proposed development has on climate (for example having regard to the nature and magnitude of greenhouse gas emissions).	An assessment of the likely significant effects the Proposed Development has on climate is included in Section 12.11 .
3.2.19	Detail and justify the conclusion that the Proposed Development is not likely to have significant effects on another European Economic Area (EEA) State and that transboundary effects do not need to be considered within the ES.	The Inspectorate has undertaken, and published, a transboundary screening exercise stating that “Under Regulation 32 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 2017 EIA Regulations) and on the basis of the current information available from the Applicant, the Inspectorate is of the view that the Proposed Development is not likely to have a significant effect on the environment in another EEA State.” (Ref. 12.44)
4.4.1	The Inspectorate agrees that decommissioning can be scoped out of the impact assessment (see also comments at Paragraph 3.2.14 of this opinion).	Decommissioning of the Proposed Development was scoped out of the assessment.
4.4.2	Identify and consider cumulative effects of the Proposed Development and other relevant projects or plans.	<p>GHG emissions and their assessment are inherently cumulative for the following reasons:</p> <ul style="list-style-type: none"> a. the environmental impact arising from GHGs is the aggregation and increased concentration of GHGs within the atmosphere; b. the location of the emissions source is not relevant to the impact arising from it; any development leading to GHG

Scoping Opinion ID	Planning Inspectorate Scoping Opinion comment	How this is addressed
		<p>emissions has the same impact whether it is located near to the Proposed Development or in another region/country; and</p> <p>c. impacts on a given location arise from the aggregated GHG levels in the atmosphere, not from the magnitude of GHG emissions in the local area.</p> <p>Any attempt to compile a cumulative assessment of GHG emissions would have to include all development projects in the UK (as the impact of GHG is not related to their emission location) and for this reason the approach for managing the cumulative GHG emissions across the UK is through the adoption of national carbon budgets.</p> <p>This GHG assessment has considered whether the carbon emissions from the Proposed Development will have a material impact on the UK’s ability to meet its carbon reduction target, including its carbon budgets, and this is presented in Section 12.11.</p>
4.4.3	Assess the impact on arriving flights to the extent that the airspace change process affects the arriving traffic consistent with the CAP1616 requirements.	CAP1616 relates to airspace redesign. The Proposed Development does include airspace redesign however there is broad compatibility between the EIA and CAP1616 methods of assessment.
4.4.4 and 4.4.5	Include an assessment of the increased emissions from additional GHG emissions from construction staff and increased passengers to and from the airport.	Modelling of GHG emissions presented in this ES includes emissions from construction staff travelling to/from the site and emissions from surface access journeys made by passengers to/from the airport. See Table 12.21 for construction emissions and Table 12.22 for surface access journeys during operation.
4.4.6	Provide justification for the choice of peak construction and operation years selected for the	A justification for the choice of peak years for overall emissions has been presented in this ES assessment. The

Scoping Opinion ID	Planning Inspectorate Scoping Opinion comment	How this is addressed
	assessment.	output of the GHG modelling has been used to identify the year with the highest overall GHG impact, as shown in Section 12.9 .
4.4.7	The future baseline will account for decarbonisation of the national grid and other technological improvements such as lower emission vehicles. The assumptions and uncertainties regarding future improvements scenarios, including any sensitivity analysis, should be clearly set out in the ES, in order to understand the reliance placed on such measures in assessing likely significant effects.	The assumptions and uncertainties regarding future improvements and the reliance placed on these measures when calculating the future scenarios are set out in Table 12.8 and Section 12.7 .

Study area

12.3.5 The study area for the GHG emissions assessment considers all GHG emissions arising over the lifecycle of the Proposed Development during construction and operation including direct emissions arising from activities within the Order Limits (as shown in **Figure 2.1** of this ES [TR020001/APP/5.03]) and indirect emissions from activities outside the Order Limits (e.g. transport of materials to site, embedded carbon in construction materials, treatment and disposal of waste and surface access journey’s from passengers, employees and freight).

Zone of influence

12.3.6 A Zone of Influence is not identified for the GHG emissions assessment as gases are not geographically bound, but rather globally distributed.

Temporal Scope

12.3.7 The Proposed Development is assessed over three assessment phases, during which construction and operation may take place simultaneously. Assessment years for each phase are described in **Chapter 5** Approach to the Assessment of this ES [TR020001/APP/5.01].

12.3.8 The temporal scope for the GHG assessment covers the periods of construction, operation and maintenance of the Proposed Development from 2025 to 2050 inclusive.

12.3.9 GHG emissions are reported for the Current Baseline / Future Baseline (Do-Minimum) and Core Planning Case (Do-Something), for the following years:

- a. the current consented capacity (18 million passengers per annum (mppa)) (2019);
- b. worst case scenario – this is the year of predicted maximum environmental impact (i.e. the year with the highest estimated GHG emissions, including from Aviation, Airport Operations, Surface Access and Construction. (2025);
- c. the year the forecast passenger throughput of the existing terminal for assessment Phase 1 is first reached (21.5 mppa) (2027);
- d. the year the forecast passenger throughput of the existing terminal for assessment Phase 2a is first reached (27 mppa) (2039);
- e. year of maximum forecast passenger throughput (i.e. peak operation) is first reached (32 mppa) (2043); and
- f. the target year for the UK Government’s carbon reduction target (to reduce emissions to net zero) (2050).

12.3.10 The annual GHG emissions were estimated for every year between 2025 and 2050 in order to determine the year of predicted maximum environmental impact for the worst-case scenario in accordance with the methodology described in the ANPS.

Receptors

12.3.11 The global atmosphere is the receptor for the effects on the climate of GHG emissions arising from the Proposed Development.

Matters scoped in

12.3.12 In line with requirements from the ANPS (Ref. 12.45), the GHG emissions assessment considers emissions from four key activities:

- a. aviation (air traffic movements including landing take-off (LTO) and climb, cruise, descent (CCD) emissions).
- b. airport operations (including emissions from airport buildings, assets and infrastructure and airside/landside vehicles);
- c. surface access journeys; and
- d. construction activities;

12.3.13 The GHG emissions sources within each activity are outlined in **Table 12.6** along with the source of data used for the assessment.

Table 12.6: GHG emissions sources arising from the Proposed Development

Activity	GHG emission sources	Data source
Aviation (Aircraft Movements)	<ul style="list-style-type: none"> • Emissions from aircraft fuel consumption during the landing take-off (LTO) cycle (including descent/ascent up to 3000ft) for aircraft arriving at and leaving from 	<p>Need Case [TR020001/APP/7.04]</p>

Activity	GHG emission sources	Data source
	the Airport, and during the climb – cruise – descend (CCD) phase for aircraft departing from the airport.	
Airport Operations	<ul style="list-style-type: none"> • Emissions from fuel/electricity use for buildings, assets and other infrastructure; 	Energy Statement, Appendix 4.3 of the ES [TR020001/APP/5.02]; 2019 Carbon Footprint Report
Surface Access	<ul style="list-style-type: none"> • Emissions from fuel/electricity use for the transportation of passengers to/from the airport; 	Transport Assessment [TR020001/APP/7.02]
Construction	<ul style="list-style-type: none"> • Emissions from fuel/electricity used by vehicles, plant, facilities and equipment during construction works; • Embedded carbon in materials used for the construction of the Proposed Development; • Emissions from fuel used for the transportation of materials and construction workers; • emissions from fuel used for the transportation and treatment of construction related waste (including demolition, excavation and land clearance); • emissions from the provision of water and treatment of wastewater; and • emissions associated with land use change e.g. removal of carbon stock within soil and vegetation for the Proposed Development or addition of greenspace transformation from greenfield site to development. 	Applicant data

Matters scoped out

12.3.14 Due to the length of the lifetime of the Proposed Development decommissioning of the airport was scoped out of the assessment, as agreed with the Planning Inspectorate in the EIA Scoping Opinion, and therefore is not considered further in this assessment.

12.4 Stakeholder engagement and consultation

12.4.1 Engagement in relation to GHG emissions has been undertaken with a number of prescribed and non-prescribed stakeholders. Consultation on the greenhouse gas assessment has been completed through the following:

- a. the EIA Scoping process (**Appendices 1.1 to 1.4** of this ES **[TR020001/APP/5.02]**);
- b. non-statutory and statutory consultation, where comments relevant to the GHG assessment were received as part of the joint response issued by WSP on behalf of Luton Borough Council, Central Bedfordshire Council, North Hertfordshire District Council and Hertfordshire County Council; and
- c. meetings with the Climate Change and Greenhouse Gases stakeholder working group comprising representatives from:
 - i. Buckinghamshire Council;
 - ii. Central Bedfordshire Council;
 - iii. Dacorum Borough Council;
 - iv. East Hertfordshire Council;
 - v. Stevenage Council;
 - vi. Luton Borough Council;
 - vii. Milton Keynes Council;
 - viii. North Herts District Council;
 - ix. Welwyn Hatfield Borough Council; and
 - x. London Luton Airport Operations Limited.

12.4.2 The **Consultation Report** submitted as part of the application for development consent **[TR020001/APP/6.01]** and **[TR020001/APP/6.02]** contains a full account of the statutory consultation process and issues raised in feedback. Matters raised regarding the scope, method, and mitigation being considered as part of the GHG assessment were then subject to further discussions directly with stakeholders during working group meetings. The main matters/themes raised during consultation considered relevant to the GHG assessment were:

- a. identification of additional and more ambitious mitigation measures during construction and operation;
- b. concerns about efficiency of the proposed mitigation measures to minimise increase in GHG emissions;
- c. mitigation measures considered for the Proposed Development to be implemented for the airport regardless of the Proposed Development;
- d. compatibility of the emissions arising from the Proposed Development with the government climate targets and national carbon budgets; and

- e. the impact of non-CO₂ emissions and flight arrivals, not only departures as presented in the 2022 PEIR, should be considered in the assessment of significant effects.

12.4.3 **Table 12.7** provides a summary of engagement with relevant stakeholders, undertaken to inform this ES and EIA to date, including the date and time of meetings and a summary of discussions to resolve matters raised.

Table 12.7: Stakeholder engagement relating to GHG

Meeting name and date	Attendees (organisation)	Summary of discussion
Greenhouse Gas and Climate change working group – meeting no 1. (18 th March 2021)	Buckinghamshire Council Central Bedfordshire Council Dacorum Borough Council East Herts and Stevenage Council Luton Borough Council North Herts District Council	Main focus of the discussion was on the GHG assessment on topics of the methodology, assessing the significance of the effects and potential mitigation. Net Zero Strategy and Green Controlled Growth were also discussed. No matters raised regarding the GHG assessment to be addressed.
Climate change and greenhouse gas working group – meeting no 2. (4 th November 2021)	Luton Borough Council North Herts District Council Milton Keynes Council Central Beds Council East Herts District Council Buckinghamshire Council	Preliminary findings of 2022 PEIR presented and update on Green Controlled Growth was provided and discussed. No matters raised regarding the GHG assessment to be addressed.
Climate change and greenhouse gas working group – meeting no 3. (12 th October 2022)	North Herts District Council Central Beds Council Luton borough Council London Luton Airport Operations Limited	Update approach to GHG assessment presented along with proposed GHG mitigation measures. No matters raised regarding the GHG assessment to be addressed
Statutory Consultation Response discussion (6 th October 2022)	Civil Aviation Authority (CAA)	Meeting to close out responses received on the GHG assessment received from CAA during the Statutory Consultations covering cumulative GHG emissions, mitigating future GHG uncertainty and the impact of the Scheme on the UK achieving net zero emissions by 2050.

12.5 Methodology

Overview

- 12.5.1 This section outlines the methodology employed for assessing the GHG emissions likely to result from the construction and operation of the Proposed Development. The approach outlined below for GHG assessment is in line with the ANPS. Full details of the methodology, including relevant assumptions and limitations, can be found in **Appendix 12.2** of this ES [TR020001/APP/5.02].
- 12.5.2 To meet the requirements of the ANPS, and in line with the EIA Regulations, two assessment scenarios are assessed and reported:
- a. Future Baseline (or Do-Minimum): the Proposed Development is not built, and the airport continues to operate within its current consented 18 mppa capacity. Expected impacts are based on current policy including the Jet Zero Strategy and the Transport Decarbonisation Plan which align with the UK net zero targets. These policy impacts include, for example, the phasing out of vehicles with internal combustion engines, the decarbonisation of the national electricity grid, the uptake of sustainable aviation fuels (SAFs) and the rollout of Zero Emission (electric and hydrogen) aircraft.
 - b. A Core Planning Case (or Do-Something): the Proposed Development proceeds. This includes embedded mitigation agreed and committed to as part of the EIA and planning process. It takes account of the same policy impacts as the Future baseline.

Quantifying GHG emissions

- 12.5.3 The approach to assessing GHG emissions from construction and operation of the Proposed Development has been undertaken in line with available GHG guidance listed in **Table 12.4**.
- 12.5.4 Estimated GHG emissions have been calculated as per the equation below:
- $$\text{Activity data} \times \text{GHG emissions factor} = \text{GHG emissions value}$$
- 12.5.5 All emissions are reported as tCO₂e (tonnes of carbon dioxide equivalent⁴) accounting for the seven GHGs included in the UNFCCC/Kyoto Protocol namely carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and nitrogen trifluoride (NF₃).
- 12.5.6 When calculating GHG emissions from the Proposed Development the influence of Policy and Guidance on reducing future GHG emissions has been considered. Further detail on the various policies and guidance are provided in **Table 12.2** and **Table 12.4**.

⁴ Carbon dioxide equivalent (CO₂e) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP). CO₂e is calculated by converting amounts of other gases to the equivalent amount of carbon dioxide with the same GWP. GWP is the relative potency on a molecule for molecule basis, of a greenhouse gas, taking account of how long it remains active in the atmosphere.

Baseline methodology

Aviation (Aircraft movements)

- 12.5.7 Baseline GHG emissions for aviation are based on data provided which detail aircraft movements by destination, distance travelled and aircraft type for forecast aircraft movements from 2019 through to 2043 assuming airport capacity remains at 18 mppa. Baseline emissions were further modelled through to 2050 assuming passenger numbers remain constant at 18 mppa and the fleet mix remains the same as projected for 2043. This is an inherently conservative assumption, as it is very likely that increased numbers of zero emissions aircraft will replace conventionally-fuelled aircraft during the period between 2043 and 2050. GHG emissions from aircraft movements are calculated separately for the LTO and cruise phases of flight.
- 12.5.8 LTO is defined as aircraft movements below an altitude of 3000 feet i.e. during the approach, taxiing, take-off and climb. The EMEP/EEA Aviation Emissions Calculator (Ref. 12.46) was used to estimate the fuel consumption and carbon dioxide (CO₂) emissions for each model of aircraft and world region distance during the landing take-off cycle. Emissions were then converted to CO₂e using the appropriate ratio for aviation fuel taken from the Department for Business, Energy and Industrial Strategy (BEIS) conversion factors (Ref. 12.47).
- 12.5.9 CCD emissions are defined as all activities that take place at altitudes above 3000 feet. CCD includes climb to cruise altitude, cruise, and descent from cruise altitudes to 3000ft at the destination. CCD emissions are only calculated for flights departing from the airport to avoid double counting with other airport inventories. This is in line with approach defined in the UNFCCC. GHG emissions from the CCD phase have been calculated using the EMEP/EEA Air Pollutant Emissions Inventory guidebook aviation calculator (Ref. 12.48) based on aircraft type and distance travelled (in nautical miles) for aircraft departures from the airport.
- 12.5.10 Aircraft movement forecasts are limited to a breakdown of data at a regional level, namely Central and Eastern Europe, Domestic (UK), Middle East, North America, Turkey, Near East and North Africa, and Western Europe. Given the uncertainty around forecasting future flight destinations in detail, the forecast data provides an average distance travelled per journey to each region, rather than distances to specific destination airports.
- 12.5.11 The fleet mix used for the aircraft movement data is based primarily on types of aircraft that exist now and will replace the existing fleet over time. The fleet mix modelled reflects a shift from current aircraft models to newer aircraft such as the Airbus A320 and A321neo (new engine option) models, as well as the introduction of a number of Zero Emission Aircraft (ZEA) models from 2040 onwards in line with Jet Zero Strategy High Ambition scenario assumptions.
- 12.5.12 Alongside the aviation mitigation measures mentioned above, the Jet Zero Strategy includes a number of specific targets, including for domestic flights to be net zero by 2040, and for airport operations in England to be zero emission by the same date. These are target outcomes, rather than mitigation measures that can be incorporated into the GHG assessment. For this reason, neither the

Future Baseline nor the Core Planning Case includes these 2040 targets as assumptions.

- 12.5.13 The approach to defining future baseline is described in **Section 5.4 of Chapter 5** of the ES [TR020001/APP/5.01]. The future baseline considered for GHG assessment is described in **Section 12.7** of this chapter. Further information on the Proposed Development's aircraft movements and passenger demand forecasts is provided in the **Need Case [TR020001/APP/7.04]** submitted as part of the application for development consent.

Airport Operations

- 12.5.14 Baseline GHG emissions for the operation of airport buildings and infrastructure (including for example the provision of power for passenger and staff EV charging), as well as airside and landside vehicles and equipment have largely been calculated based on activity data provided by the Applicant and included in the Energy Statement, **Appendix 4.3** to this ES [TR020001/APP/5.02] that accompanies this application for development consent.
- 12.5.15 Exceptions to this include fire training, which is assumed to remain constant throughout the design life, and aircraft engine testing, which have been extrapolated from 2019 baseline data proportional to overall aircraft movement numbers. Business travel⁵ is also extrapolated from 2019 data, but is proportional to staff numbers. Emissions from the use of de-icer for aprons and runways was not included in the 2019 footprint report, but are included in the Future Baseline and Core Planning Case.
- 12.5.16 Emissions factors are assumed to remain constant at 2022 levels with the exception of grid electricity. Future grid carbon intensity values are taken from projections published by the UK Government (Ref. 12.49) and can be found in **Appendix 12.2** of this ES [TR020001/APP/5.02].

Surface Access journeys

- 12.5.17 Baseline GHG emissions for surface access journeys have been calculated from 2019 through to 2050 based on surface access journey data for passengers, staff and freight included in the **Transport Assessment [TR020001/APP/7.02]**.
- 12.5.18 Passenger surface access journey data set out in the **Transport Assessment [TR020001/APP/7.02]** was derived from demand forecasts. These considered the 2016 Passenger Survey (Ref. 12.50) conducted by the Civil Aviation Authority (CAA) and provided information on the origin and destination of passengers within the United Kingdom and their mode of travel.
- 12.5.19 It should be highlighted that this approach to assessment, and the methodology it applies, does not quantify the potential GHG savings the Proposed Development will deliver from passenger surface access journeys when considered against the case of the airport not expanding. This potential benefit exists because the Proposed Development will afford shorter distances to be

⁵ *Business Travel* describes travel done by staff at the airport for business purposes. It is not to be confused with business aviation, which is a subset of aircraft movements and reported under Aviation.

travelled by passengers who would otherwise travel to other airports if the Proposed Development were not realised. The demand forecast illustrates the potential for this saving as described in Section 9 of the **Need Case** submitted as part of the application for development consent **[TR020001/APP/7.04]**.

- 12.5.20 Airport staff surface access journey data included within the **Transport Assessment [TR020001/APP/7.02]** was derived from demand forecasts based on data from the airport operator's 2016 and 2017 Annual Monitoring Reports (AMRs) updated for 2019 data and taking account of the change in mode share as reported in London Luton Airport's Annual Monitoring Report (Ref. 12.51).
- 12.5.21 For passenger and staff travel by car, the split between petrol, diesel and electric cars⁶ has been taken from the DfT's TAG Databook (Ref. 12.52) until 2030. After this date, new petrol and diesel cars cannot be sold, and the proportion of these vehicles on the road is assumed to decline in a linear fashion to reach 0% by 2050. The proportion of EVs increases alongside this decline.
- 12.5.22 For freight transportation⁷, data has been provided by the Transport Planners, divided between Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs) in terms of vehicle km per year. For LGVs, it is assumed that the DfT TAG Databook projections apply to 2035, after which petrol and diesel LGV numbers decline to 0% by 2050 with electric LGVs making up the remainder. For HGVs, it is assumed that the emissions factor in kg CO_{2e}/veh.km remains flat at 2022 levels until 2035, then falls in a straight line from 2036 to reach zero in 2050. It should be noted that freight transportation included in the assessment is principally for deliveries of goods associated with the operation of the airport rather than the movement of air freight through the airport.
- 12.5.23 The emissions factor for rail and bus travel fall in a straight line from 2024 onwards, reaching zero by 2050. These declines are consistent with the trend in emissions reductions over the period 2016 – 2022.

Accounting for GHG policy

- 12.5.24 Government policy and strategy is expected to influence GHG emissions from airport activities and has been accounted for when modelling the DM scenario. Those allowed for in the study are presented in **Table 12.8** Table 12.8.

⁶ Emissions from passenger and staff travel in EVs are reported under Surface Access, but emissions from EV charging at the airport are reported under Airport Operations. Because of this there will be some overlap and twin reporting of these emissions. However, because of the nature of available data it is not possible to quantify the extent of this double counting with any confidence. For this reason, all emissions from EV travel are reported under Surface Access and all emissions from EV charging at the airport are reported under Airport Operations; this represents a conservative, worst case approach.

⁷ Freight Transport here refers to transportation of goods to the airport by land, and is included in the Surface Access emissions data. It is separate from air freight, which is included in Aviation emissions.

Table 12.8: Policy and strategy influencing future GHG emissions

Policy/Strategy	Potential impact on emissions
Department for Business, Energy and Industrial Strategy (BEIS)	Decarbonisation of electricity generation (grid) will influence future emissions from the airport operations. The source of information used for this is the UK Government Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions (Ref.12.53) for appraisal which provides forecasts for the carbon intensity of grid electricity in the future. Projected grid carbon intensities are presented in Appendix 12.2 of this ES [TR020001/APP/5.02].
Jet Zero Strategy: Delivering net zero aviation by 2050 (Ref. 12.54)	Decarbonisation of the aviation sector in line with the UK 2050 net zero emissions target. Government has committed to achieving the High Ambition Scenario presented in the Jet Zero Strategy which is based on an increased uptake of sustainable aviation fuels (SAFs), increased aircraft efficiency, airspace management, demand management through carbon pricing and zero emissions aircraft. The Core Planning Case has accounted for mitigation measures within the High Ambition Scenario for Aviation, including the use of Sustainable Aviation Fuels, (SAFs), improvements to efficiency of aircraft and airspace management, and the future rollout of zero emission aircraft. The Jet Zero Strategy also includes specific targets, including for all domestic flights to be net zero emissions by 2040, and for airport operations in England to be zero emissions by the same date. As these are targets, rather than mitigation measures, they are not assumptions that can be applied to the GHG assessment. It should be noted that a commitment is made in the Jet Zero Strategy (paragraph 3.6) for additional consultation to further develop definitions and development plans for zero emissions airport operations.
Transport Decarbonisation Plan (TDP) (Ref. 12.55)	The Transport Decarbonisation Plan sets targets for the phase out of fossil fuelled cars, vans and trains by given dates. The Core Planning Case discussed in Section 12.13 applies the assumptions for the decarbonisation of surface access transport aligned with the Transport Decarbonisation Plan.
UK Emission Trading Scheme (UK ETS) (Ref. 12.56)	Emissions trading schemes work on the 'cap and trade' principle, where a cap is set on the total amount of certain greenhouse gases that can be emitted by sectors covered by the scheme. The aviation routes covered by the UK ETS include UK domestic flights, flights between the UK and Gibraltar, and flights departing the UK to European Economic Area states conducted by all included aircraft operators, regardless of nationality.

Policy/Strategy	Potential impact on emissions
	<p>The UK ETS sets an overall cap on the amount of carbon which may be emitted by scheme participants including airlines. Participants receive free carbon emissions allowances and/or buy emission allowances (at auction or on the secondary market) which they can trade with other participants as needed to cover the carbon emissions associated with operating their business, or to derive a commercial benefit from their own lower carbon emissions. The available allowances place a cap on the total amount of GHG emissions that can be emitted by sectors covered by the UK ETS. This cap will be reduced over time, in line with the government’s national carbon reduction obligations, stimulating innovation by participants to increase the carbon efficiency of their operation, or indeed to take steps which would reduce the overall scale of their operations. This effectively puts a binding cap on the amount of GHG emissions the aviation sector can emit.</p> <p>Participants in the Scheme are required to monitor their aviation and then have these verified on an annual basis by an independent third party. Participants must report their verified emissions by the 31st of March each year and then surrender allowances equal to the verified emissions by the 30 April in the following Scheme year.</p> <p>The UK Government has committed to aligning the UK ETS cap with the UK’s trajectory to net zero in 2050; they will do this via legislation during 2024. (Ref. 12.57)</p>

12.5.25 The policies and strategies identified, if implemented as expected, will impact future carbon emissions from energy used in airport operations, surface access journeys and aviation. As far as reliable data permits, these policies and strategies are accounted for in this ES.

Core Planning Case Assessment methodology

Aviation

12.5.26 Estimates for future GHG emissions from air traffic movements are based on air traffic forecast included within the **Need Case [TR020001/APP/7.04]**.

12.5.27 Granularity of aircraft movement forecasts for current and forecast journeys is limited to the data being available by region. CO₂e emissions are calculated as an average distance travelled per journey for each region, on the basis of the existing nature of the route network from the airport. This approach is adopted as it is not possible to forecast exact destinations with certainty.

12.5.28 Aircraft movement and passenger forecasts within the **Need Case [TR020001/APP/7.04]** assume an aircraft fleet mix based on known aircraft types as described in the Core Planning Case. Aviation mitigation measures assumed within the Jet Zero Strategy High Ambition scenario, including the

uptake of Sustainable Aviation Fuels, improvements in aircraft and airspace efficiency, and the future rollout of zero emission aircraft from the late 2030s onwards, are also included in 'GHG assessment Core Planning Case'.

- 12.5.29 Further information on the demand forecasts can be found in the **Need Case [TR020001/APP/7.04]** submitted as part of the application for development consent.

Airport Operations

- 12.5.30 Estimated emissions from Airport Operations for the Core Planning Case are derived in part from the 2019 carbon footprint, with emissions for aircraft engine tests, water consumption, waste disposal and airport employee business travel being extrapolated on the basis of projected aircraft movements, passenger and staff numbers as appropriate.
- 12.5.31 Energy demand figures for power, heating and transport are taken directly from the Energy Statement, **Appendix 4.3** of this ES **[TR020001/APP/5.02]**. Emissions factors for natural gas and other fuels are assumed to remain constant at 2021 levels, while the carbon intensity of grid electricity is assumed to fall as projected by the UK Government.
- 12.5.32 Full details of the methodology, including relevant assumptions and limitations, can be found in **Appendix 12.2** of this ES **[TR020001/APP/5.02]**.

Surface Access journeys

- 12.5.33 Estimates for future GHG emissions from passenger Surface Access journeys, journeys to and from the airport by public and private transport, are based on data provided in the **Transport Assessment [TR020001/APP/7.02]**. Demand forecast data, as presented in the **Need Case [TR020001/APP/7.04]** were input into the strategic traffic model to provide traffic data. Predictions of the distribution of future year trips on the transport networks are provided by an updated version of the Central Bedfordshire and Luton Traffic Model (CBLTM) which has been amended to provide more detail on the networks around the airport and to extend the area over which the performance of the highway network can be assessed. The modified version of that model is referred to as the CBLTM-LTN.
- 12.5.34 Further information on surface access can be found in the **Transport Assessment [TR020001/APP/7.02]** and **Framework Travel Plan [TR020001/APP/7.13]** submitted as part of the application for development consent.

Construction

- 12.5.35 Construction GHG emissions calculated for the Core Planning Case presented in the ES are based on data for estimated energy use, types and quantities of construction materials, waste generated during construction, water use and land use change leading to a loss of carbon stock. Data sources are listed in **Table 12.6**, data used included:
- a. construction materials and their transportation to site;

- b. construction plant/equipment use estimates;
- c. estimated energy demand for equipment and facilities used during the construction;
- d. waste disposal and transportation estimates;
- e. land use change data;
- f. estimated water consumption; and
- g. estimated worker transport data.

12.5.36 GHG emissions from construction have been calculated by applying GHG emissions conversion factors for 2022 published by BEIS (Ref. 12.58) to the estimated quantities of energy, water used, and waste generated during construction provided by the Design Team. Embodied carbon in construction materials has been calculated by applying embodied carbon conversion factors from the Inventory of Carbon and Energy (Ref. 12.59) to quantities of key materials provided by the Design Team. Full details of the methodology, including relevant assumptions and limitations, can be found in **Appendix 12.2** of this ES [TR020001/APP/5.02].

Assessing the Significance of Effects

- 12.5.37 The conventional approach to determining the likely significant effects of a development is challenging to apply where the receptor is the global climate and no one development is capable of having a likely significant effect. In this context it is appropriate that significance is measured against appropriate benchmarks and milestones for progress towards net zero.
- 12.5.38 As such, different approaches to testing significance have been applied to the four sources of GHG emissions assessed in this chapter. Each of these is consistent with the updated guidance published by IEMA on assessing greenhouse gas emissions and assessing their significance.
- 12.5.39 **Table 12.9** below sets out the key factors that inform the evaluation of significance for the four emissions sources within the Proposed Development.

Table 12.9: Trajectories to net zero, policies, and control measures considered when assessing significance of different GHG emissions sources

Emissions source	Applicable trajectory to net zero	Relevant policies	Control measures
Aviation	Jet Zero Strategy High Ambition scenario; CCC Planning Assumption for aviation; 6 th national carbon budget	Jet Zero Strategy; ANPS	UK Emissions Trading Scheme; CORSA

Emissions source	Applicable trajectory to net zero	Relevant policies	Control measures
Airport Operations	4 th , 5 th and 6 th national carbon budgets	Jet Zero Strategy	Green Controlled Growth
Surface Access	4 th , 5 th and 6 th national carbon budgets	Transport Decarbonisation Plan	Green Controlled Growth
Construction	4 th , 5 th and 6 th national carbon budgets	National and local planning policies	National and local building standards

Aviation

- 12.5.40 Aviation emissions as a result of the Proposed Development are considered in the context of the emissions trajectory provided for the Jet Zero Strategy High Ambition Scenario, and are also benchmarked against other relevant emissions trajectories.
- 12.5.41 The assessment of significance also considers the extent to which the Aviation element of the Proposed Development will be aligned with existing policy and best practice, including policy as described within the Jet Zero Strategy and alignment with the High Ambition scenario in particular.
- 12.5.42 The role of market-based mechanisms including UK ETS and CORSIA as control measures for aviation emission is also considered.

Airport Operations

- 12.5.43 Emissions from Airport Operations are considered against the trajectory to net zero provided by the UK’s national carbon budgets.
- 12.5.44 The assessment of significance also considers the extent to which the Proposed Development is consistent with existing policy and best practice designed to drive decarbonisation and achieve net zero.
- 12.5.45 While the government has an ambition for airport operations to be zero emission by 2040 in the Jet Zero Strategy, the government acknowledges that further work is required to develop the requirements to meet this target and the Jet Zero Strategy includes a commitment to publish a Call for Evidence to gather further information on the best approach to implementing the target. Given this uncertainty, emissions from Airport Operations are considered against the trajectory to net zero provided by the UK’s national carbon budgets.
- 12.5.46 The Proposed Development includes a range of measures to support decarbonisation. To ensure that the development of the airport is consistent with the 2040 target, the **Green Controlled Growth (GCG) Framework [TR020001/APP/7.08]** submitted as part of this application for development consent, requires the GHG Thresholds and Limits to be reviewed “*within three*

months of the government publishing updated policy or guidance that clarifies the scope and pathway to achieving zero emissions airport operations by 2040.” Where required the Applicant will bring forward other measures to ensure airport operations are consistent with government policy once it has been further defined.

Surface Access

- 12.5.47 Emissions from Surface Access are considered against the trajectory to net zero provided by the UK’s national carbon budgets.
- 12.5.48 The assessment of significance also considers the extent to which the Proposed Development is consistent with existing policy and best practice designed to drive decarbonisation and achieve net zero, with particular reference to the UK Government’s Transport Decarbonisation Plan (Ref. 12.60).
- 12.5.49 The role of the **GCG Framework** of this ES [TR020001/APP/7.08] as a mechanism to control emissions from Surface Access is also considered.

Construction

- 12.5.50 Emissions from Construction are considered against the trajectory to net zero provided by the UK’s national carbon budgets.
- 12.5.51 The assessment of significance also considers the extent to which construction activities within the Proposed Development are consistent with existing local and national policy and best practice designed to drive decarbonisation and achieve net zero.

Proposed Development as a whole

- 12.5.52 Having considered the significance of each of the four specific emissions sources, the significance of the Proposed Development as a whole is considered and evaluated, with this evaluation carried out in line with the updated guidance as published by IEMA. The significance criteria as provided by IEMA, and laid out in full in **Table 12.10**.

Table 12.10: IEMA Significance Impact Criteria

Significance Rating	Criteria
Significant Adverse	A project’s GHG impacts are not mitigated or are only compliant with do minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for a project’s type. A project with major adverse effects is not doing enough to make a meaningful contribution to the UK’s trajectory to net zero.

Significance Rating	Criteria
Moderate Adverse	A project’s GHG impacts are partially mitigated or are only compliant with do minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for a projects type. A project with moderate adverse effects is not doing enough to make a meaningful contribution to the UK’s trajectory to net zero.
Minor adverse	The project’s GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for a project of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK’s trajectory to net zero.
Negligible	The project’s GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well ahead of the curve for the trajectory towards net zero and has minimal emissions.
Beneficial.	The project’s net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without project Do-Minimum) scenario. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

12.5.53 In addition to the overall evaluation of significance, in line with the updated IEMA guidance, a further I of significance is carried out to assess the Proposed Development in the light of paragraph 5.82 of the ANPS:

‘Any increase in carbon emissions alone is not a reason to refuse development consent, unless the increase in carbon emissions resulting from the project is so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, including carbon budgets.’

12.5.54 This assessment determines to what extent the Proposed Development complies with this statement.

12.6 Assumptions and limitations

- 12.6.1 This section provides a description of the assumptions and limitations to the GHG assessment of the Core Planning Case.
- 12.6.2 The assessment undertaken for the ES has been based on the collation and appraisal of available construction and current and future operational data provided by LLAOL, and the Applicant’s advisors on construction, aviation and surface access, with data from environmental specialists undertaking assessment of the Proposed Development.
- 12.6.3 The temporal scope of this assessment extends to 2050, and this means that assumptions have been made for activities occurring over the period from baseline (2019) to 2050. These assumptions include emissions factors for the range of GHG emitting activities.
- 12.6.4 Most future emission factors will be dependent on factors outside of the Applicant’s control, for example those affected through UK Government policy and legislation (as set out in **Section 12.2**). This means that there are inherent uncertainties in the quantification of future GHG emissions.
- 12.6.5 **Table 12.11** sets out the main assumptions that have informed the GHG assessment of the Core Planning Case. Additional details on assumptions within the modelling process are set out in **Appendix 12.2** in of this ES [TR020001/APP/5.02].

Table 12.11: Assumptions within the Core Planning Case GHG Assessment

Assessment Issue	Assumptions
Aviation	
Traded and non-traded emissions	<p>Traded sector emissions are those which fall under the UK ETS and include domestic and non-domestic intra-EEA aviation emissions.</p> <p>Aircraft movement forecasts are limited to a breakdown of data at a regional basis, namely Central and Eastern Europe, Domestic (UK), Middle East, North America, Turkey, Near East and North Africa, and Western Europe. Therefore, for the purpose of this assessment traded emissions include emissions arising from domestic, Western Europe and Central and Eastern Europe flight destinations; while non-traded includes Middle East, North America, Turkey, Near East and North Africa flight destinations.</p> <p>EEA countries comprise EU member states plus Iceland, Liechtenstein and Norway. There are some countries in Central and Eastern Europe (such as Switzerland, Albania and parts of the former Yugoslavia) that are not in the EEA, therefore emissions from flights to these destinations do not fall under the UK ETS but will be included in the traded sector emissions for the purposes of this ES. This discrepancy is small and not considered to be material to the overall assessment.</p>

Assessment Issue	Assumptions
Sustainable Aviation Fuels (SAF)	<p>An uptake of SAFs has been applied to the Future Baseline and Core Planning Case, consistent with the assumptions for the Jet Zero Strategy High Ambition Scenario. (Ref. 12.61). This assumes that SAFs accounts for 10% of aviation fuel supply in 2030, 22% by 2040 and 50% by 2050, with a linear increase in the uptake of SAFs between these milestones.</p> <p>Furthermore, an emissions reduction of 67% from the use of SAFs relative to the use of conventional aviation fuel has been assumed; this is at the conservative end of the range provided for in the Jet Zero Strategy High Ambition scenario.</p>
Zero Emissions aircraft	<p>The Jet Zero Strategy High Ambition scenario includes assumptions for the adoption of Zero Emission aircraft; these are described in the Jet Zero Strategy Illustrative Scenarios and Sensitivities document (Ref. 12.62) that accompanies the Jet Zero Strategy. The High Ambition scenario assumes no Zero Emission aircraft in 2030, 5% of aircraft movements are Zero Emission by 2040 and 27% by 2050.</p> <p>These assumptions have been translated by the Applicant’s aviation consultants into aircraft movement numbers for specific aircraft makes and models (Airbus A320Neo and A321Neo; Boeing 737 Max8, Max9 & Max10; DHC-8 Q400; and Embraer E190-E2).</p> <p>For the purposes of the GHG model, these flights are assumed to be zero emission at the tailpipe due to the decarbonisation of the power required.</p> <p>There is uncertainty around the future infrastructure that may be needed to support the operation of zero emission aircraft, particularly around the storage of hydrogen aircraft fuel and the charging requirements of electric aircraft. This issue is discussed in more detail in the Design and Access Statement of the ES [TR020001/APP/7.03].</p> <p>It is important to note that the inclusion of Zero Emission Aircraft in the fleet mix, to reflect the assumptions within the Jet Zero Strategy, means that the GHG assessment for the Core Planning Case addresses the Next Generation Aircraft sensitivity scenario discussed in Table 12.23 below.</p>
Aircraft movement	<p>Aircraft movement emissions data are based on an aircraft fleet mix for different regional destinations. It is assumed that overall efficiency (from aircraft and from airspace management) improves by 2% per year from 2017 through to 2050, in line with the assumptions applied to the Jet Zero Strategy High Ambition scenario (Ref. 12.63).</p> <p>An efficiency factor has been combined with a factor for emissions reductions from the use of SAFs (see above) and a</p>

Assessment Issue	Assumptions
	composite emissions reductions factor applied to all Aviation emissions.
Non-CO ₂ emissions	<p>Emissions from aviation have both direct (CO₂, CH₄ and N₂O) and indirect (non-CO₂ emissions e.g. water vapour, contrails and NO_x) climate change effects.</p> <p>These additional emissions are mainly short-lived and reversible, and their warming impact is dependent on atmospheric conditions. Quantifying their impact is subject to considerable scientific uncertainty, and they are not factored into either the Future Baseline or the Core Planning Case. Non-CO₂ emissions are discussed in more detail in Section 12.12 below.</p>
Airport operations	
Future decarbonisation of the UK national grid	<p>The grid is forecast to reduce in carbon intensity over the period of the Proposed Development, meaning that the GHG impact from electricity use will reduce in terms of kg CO₂e per kilowatt hour (kWh). The extent and rate at which this will happen is inevitably subject to some uncertainty. The assessment has used UK Government forecasts for grid decarbonisation set out in the Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal (Ref. 12.64). This decarbonisation trajectory is set out in Appendix 12.2 of this ES [TR020001/APP/5.02].</p>
Surface Access	
Surface access for passengers, staff and freight	<p>The assessment assumes that cars transition from conventional to EV in line with DfT TAG Databook projections until 2030, then the proportion of petrol and diesel cars on the road decline in a linear fashion, reaching 0% by 2050. The proportion of EV cars increases alongside this decline.</p> <p>For LGVs, it is assumed that the DfT TAG Databook projections apply to 2035, after which petrol and diesel LGV numbers decline to 0% by 2050 with electric LGVs making up the remainder.</p> <p>For HGVs, it is assumed that the emissions factor in kg CO₂e/veh.km remains flat at 2022 levels until 2035, then falls in a straight line from 2036 to reach zero by 2050.</p> <p>The emissions factor for rail and bus travel fall in a straight line from 2024 onwards, reaching zero by 2050. These declines are consistent with the trend in emissions reductions over the period 2016 – 2022.</p>
Construction	
Construction activities	<p>GHG emissions from construction activities are based on estimated activities provided in Appendix 4.1 of the ES [TR020001/APP/5.02]. Embodied carbon in construction materials is based on initial material quantity estimates provided by the design teams. The assessment of construction activities</p>

Assessment Issue	Assumptions
	and embodied carbon emissions in materials may be revised for the ES as the design for the Proposed Development and construction programme for the Proposed Development further evolves.

12.7 Baseline conditions

- 12.7.1 This section provides a description of the existing GHG emissions from the airport operating at the currently consented limit of 18 mppa. This is described as the Current Baseline (as set out in **Section 12.1.9**).
- 12.7.2 In addition, the GHG assessment considers a Future Baseline with airport capacity maintained at 18 mppa, over the period 2025 to 2050, against which the GHG emissions of the Proposed Development will be assessed.

Current Baseline

- 12.7.3 The Current Baseline refers to the airport's GHG emissions in the calendar year 2019. It draws together information from a range of documents, analyses and sources. A full breakdown of emissions is included in **Appendix 12.2** of this ES **[TR020001/APP/5.02]** to provide estimates of GHG emissions, these are summarised in **Table 12.12**.

Table 12.12: 2019 GHG emissions from the airport for each emissions source (tCO_{2e})

Emissions source	Emissions (tCO _{2e})	Data source
Aviation	1,123,074	Need Case [TR020001/APP/7.04]
Airport Operations	17,149	LLAOL 2019 Carbon Footprint report (minor adjustment)
Surface Access	201,012	Transport Assessment [TR020001/APP/7.02]
Construction	0	None required
Total	1,341,235	

Future baseline

- 12.7.4 The DM scenario provides a Future Baseline against which the GHG emissions impact within the Core Planning Case can be assessed. This Future Baseline runs from the first year of construction (2025) through to the year of the UK's legally binding net zero emissions reduction target (2050). This is in line with the guidance contained within the ANPS.
- 12.7.5 In the absence of the Proposed Development, there is likely to be a change to the Future Baseline conditions as a result of other factors and developments in proximity to the airport. These are the conditions that will prevail 'Without Development' in place. The Future Baseline assumes that there will be no construction activity.
- 12.7.6 This Future Baseline scenario makes a number of assumptions around the implementation of emissions reduction measures included in the Jet Zero Strategy High Ambition scenario, including carbon pricing via ETS/CORSIA⁸,

⁸ Assumptions applied to the Future Baseline and the Core Planning Case include the carbon pricing element of CORSIA, but do not take account of any offsetting itself.

efficiency improvements from aircraft and airspace management, the ongoing uptake of SAFs, and the future rollout of zero emission aircraft

- 12.7.7 This Future Baseline scenario is used as a comparator for the assessed Core Planning Case, to show the effect of the Proposed Development against an appropriate reference point. The approach to defining future baseline and the developments identified for consideration are described in **Section 5.4 of Chapter 5** of the ES [TR020001/APP/5.01].

Future Baseline Emissions

- 12.7.8 GHG emissions for the Future Baseline are presented in **Table 12.13** for a worst-case scenario for the Future Baseline (2025) and for years: 2027, 2039, 2043 and 2050 which are in line with reporting years for the Core Planning Case.

Table 12.13: Future Baseline: GHG emissions from the airport (by source of emissions) (tCO_{2e})

Reporting Category	2025 (Worst case scenario)	2027	2039	2043	2050
Aviation	956,738	885,838	610,027	460,150	293,989
Airport Operations	12,669	11,560	2,689*	2,478*	2,197*
Surface Access	183,145	174,264	91,992	59,106	1,522
TOTAL	1,152,552	1,071,661	704,708	521,733	297,708

* See **Section 12.5.45** and **12.5.46** for how the Applicant will bring forward measures to ensure airport operations are consistent with government policy for achieving Net Zero by 2040 once definition for this target has been established.

- 12.7.9 A full description of the methodology and assumptions for the GHG assessment are set out in **Appendix 12.2** of this ES [TR020001/APP/5.02].

12.8 Embedded mitigation

- 12.8.1 This section describes the embedded mitigation for GHG that has been incorporated into the Proposed Development design or assumed to be in place before undertaking the assessment. A definition of these classifications of mitigation and how they are considered in the EIA is provided in **Chapter 5** of the ES [TR020001/APP/5.01].
- 12.8.2 A summary of measures that have been incorporated into the design of the Proposed Development and that have been accounted for in the Core Planning Case presented in the ES are presented in **Table 12.14** to **Table 12.17**. GHG mitigation measures relating to Construction are included in **Section 10** of the Code of Construction Practice (CoCP) (provided as **Appendix 4.2** of the ES [TR020001/APP/5.02]).

Embedded mitigation	Impact avoided	How secured
No new fossil fuel heating or generator equipment to be purchased after 2025, where permissible and where practicable alternatives are available, excluding emergency repairs.	GHG emissions from electricity use	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
The New T2 will be designed to deliver net zero within the new building over its lifecycle.	GHG emissions from energy use	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
Mitigation measures have been integrated (embedded) into the design for the purpose of minimising effects related to waste and resources. These general measures comprise the following, which focus on designing out waste and implementing the waste hierarchy: a. Designing the development in a manner that facilitates the reuse of acceptable material arisings, for example those associated with earthworks cuttings and other excavations. b. The inclusion of land within the development for the temporary on-site storage of soils, excavated materials and other materials. c. The appropriate sizing of construction compounds to	Waste production and contribution to waste management facility capacity, specifically landfill	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])

Embedded mitigation	Impact avoided	How secured
<p>enable the segregation and storage of waste, and to facilitate offsite recovery.</p> <p>d. The retention of existing infrastructure within the development design where feasible, to minimise the need for the demolition of components and infrastructure and the associated generation of waste material.</p> <p>e. Design of adequate provision for internal and external waste storage to allow waste segregation during operation.</p>		
<p>The new terminal building will utilise efficient building design:</p> <p>a. electric reverse heat pumps for heating and cooling supported with ground source heat pump technology; and</p> <p>a. storage of heat using water storage facilities.</p>	<p>Reduction in operational GHG emissions.</p>	<p>Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])</p>
<p>The new T2 will include equator-facing glazing to minimise heat gain.</p>	<p>GHG emissions from energy use</p>	<p>Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])</p>
<p>The new T2 design will maximise daylighting.</p>	<p>GHG emissions from energy use</p>	<p>Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])</p>
<p>The design has the flexibility to allow for battery storage for electricity to be accommodated in the future.</p>	<p>GHG emissions from energy use</p>	<p>Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])</p>
<p>The new T2 will have increased airtightness and reduced thermal bridges.</p>	<p>GHG emissions from energy use</p>	<p>Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])</p>
<p>The contractor will set targets to minimise potable water use during construction.</p>	<p>GHG emissions from the provision of potable water</p>	<p>Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])</p>

Embedded mitigation	Impact avoided	How secured
	and treatment of wastewater	
<p>Measures incorporated into the design to reduce waste include:</p> <ul style="list-style-type: none"> a. design of adequate provision for internal and external waste storage; and b. setting of municipal waste recycling targets as per the ANPS and development of a waste and resources plan. 	Reduction in operational GHG emissions from waste.	Design Outline Operational Waste Management Plan (Appendix 19.2 of this ES [TR020001/APP/5.02])
<p>Measures to reduce waste generated and resource use during construction including:</p> <ul style="list-style-type: none"> a. designing out waste workshops to identify opportunities to reduce waste and resources and to identify opportunities to achieve a cut/fill balance during construction; b. recycling of demolition waste on site; c. recycling and use on site of existing landfill material; d. balancing the cut (excavation) and fill (material placement) – Earthworks excluding landfill material; and e. setting waste targets in line with the ANPS. 	<p>GHG emissions from waste sent to landfill and over use of resources.</p> <p>GHG emissions from the delivery of materials and disposal of waste.</p>	Design Outline Operational Waste Management Plan (Appendix 19.2 of this ES [TR020001/APP/5.02])
The design incorporates stormwater capture and treatment.	Reduction in operational GHG emissions from water.	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
T2 will incorporate greywater recovery and re-use.	GHG emissions from water use/wastewater treatment	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])

12.8.3 An Outline Greenhouse Gas Action Plan, available as **Appendix 12.1** of this ES [TR020001/APP/5.02], supports the delivery of the commitments and mitigation in the DCO.

Table 12.14: Embedded mitigations – Aviation

Embedded mitigation	Impact avoided	How secured
Steps to reduce emissions from aircraft during the landing and take-off (LTO) cycle will be considered as part of the airport’s operational approach. For example, single/reduced engine taxiing, electric towing, review/minimise use of auxiliary power units (APU), reduce emissions due to aircraft idling and hold.	Reduction in GHG emissions from aircraft during the landing take-off cycle.	Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
LLAOL to encourage the take up of more efficient aircraft through operating policy/strategy. LLAOL to encourage the take up of SAFs through operating policy/strategy.	Reduction in GHG emissions from aircraft during the landing take-off cycle and from cruise emissions.	Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])

Table 12.15: Embedded mitigation: Airport Operations

Embedded mitigation	Impact avoided	How secured
No new fossil fuel heating or generator equipment to be purchased after 2025, where permissible and where practicable alternatives are available, excluding emergency repairs.	GHG emissions from electricity use	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
The New T2 will be designed to deliver net zero within the new building over its lifecycle.	GHG emissions from energy use	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
Mitigation measures have been integrated (embedded) into the design for the purpose of minimising effects related to waste and resources. These general measures comprise the following, which focus on designing out waste and implementing the waste hierarchy: f. Designing the development in a manner that facilitates the reuse of acceptable material arisings, for example those associated	Waste production and contribution to waste management facility capacity, specifically landfill	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])

Embedded mitigation	Impact avoided	How secured
<p>with earthworks cuttings and other excavations.</p> <p>g. The inclusion of land within the development for the temporary on-site storage of soils, excavated materials and other materials.</p> <p>h. The appropriate sizing of construction compounds to enable the segregation and storage of waste, and to facilitate offsite recovery.</p> <p>i. The retention of existing infrastructure within the development design where feasible, to minimise the need for the demolition of components and infrastructure and the associated generation of waste material.</p> <p>j. Design of adequate provision for internal and external waste storage to allow waste segregation during operation.</p>		
<p>The new terminal building will utilise efficient building design:</p> <p>b. electric reverse heat pumps for heating and cooling supported with ground source heat pump technology; and</p> <p>c. storage of heat using water storage facilities.</p>	<p>Reduction in operational GHG emissions.</p>	<p>Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])</p>
<p>The new T2 will include equator-facing glazing to minimise heat gain.</p>	<p>GHG emissions from energy use</p>	<p>Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])</p>
<p>The new T2 design will maximise daylighting.</p>	<p>GHG emissions from energy use</p>	<p>Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])</p>

Embedded mitigation	Impact avoided	How secured
The design has the flexibility to allow for battery storage for electricity to be accommodated in the future.	GHG emissions from energy use	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
The new T2 will have increased airtightness and reduced thermal bridges.	GHG emissions from energy use	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
The contractor will set targets to minimise potable water use during construction.	GHG emissions from the provision of potable water and treatment of wastewater	Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
Measures incorporated into the design to reduce waste include: <ul style="list-style-type: none"> c. design of adequate provision for internal and external waste storage; and d. setting of municipal waste recycling targets as per the ANPS and development of a waste and resources plan. 	Reduction in operational GHG emissions from waste.	Design Outline Operational Waste Management Plan (Appendix 19.2 of this ES [TR020001/APP/5.02])
Measures to reduce waste generated and resource use during construction including: <ul style="list-style-type: none"> f. designing out waste workshops to identify opportunities to reduce waste and resources and to identify opportunities to achieve a cut/fill balance during construction; g. recycling of demolition waste on site; h. recycling and use on site of existing landfill material; i. balancing the cut (excavation) and fill (material placement) – Earthworks excluding landfill material; and j. setting waste targets in line with the ANPS. 	GHG emissions from waste sent to landfill and over use of resources. GHG emissions from the delivery of materials and disposal of waste.	Design Outline Operational Waste Management Plan (Appendix 19.2 of this ES [TR020001/APP/5.02])

Embedded mitigation	Impact avoided	How secured
The design incorporates stormwater capture and treatment.	Reduction in operational GHG emissions from water.	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])
T2 will incorporate greywater recovery and re-use.	GHG emissions from water use/wastewater treatment	Design, Outline GHG Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])

Table 12.16: Embedded mitigation: Surface Access

Embedded mitigation	Impact avoided	How secured
<p>The LLAL surface access strategy provides the medium to long term direction for a shift away from private car use to public transport. Where private cars are used it will incentivise low/zero carbon private transport options e.g. electric vehicles.</p>	<p>GHG emissions from surface access journeys (passengers/staff)</p>	<p>Framework Travel Plan [TR020001/APP/7.14]</p>
<p>Options for low carbon renewable energy generation/or procurement, and options to incentivise the future uptake of low and zero carbon fuels for both vehicles using the airport and aircraft e.g. inclusion of infrastructure for sustainable aviation fuels will be implemented where feasible.</p>	<p>GHG emissions from the use of energy.</p>	<p>Framework Travel Plan [TR020001/APP/7.14]</p>
<p>Car parks will include EV charging points to incentivise the future uptake of ZEVs</p>	<p>GHG emissions from surface access (transition to zero emissions vehicles)</p>	<p>Framework Travel Plan [TR020001/APP/7.14]</p>

Table 12.17: Embedded mitigation: Construction

Embedded mitigation	Impact avoided	How secured
<p>Achieve a minimum of 25% recycled or secondary content in key construction materials (e.g. concrete and steel).</p>	<p>Reduction in GHG emissions from construction materials</p>	<p>CoCP provided as Appendix 4.2 of this ES [TR020001/APP/5.02]</p>
<p>Setting of waste recovery targets as per the ANPS. The following targets are set in the Proposed Development CoCP and OSWMP and will be secured in the DCO application:</p> <ul style="list-style-type: none"> a. achieve at least 90% (by weight) material recovery of non-hazardous construction and demolition waste. Uncontaminated excavated soil and stones (European Waste Catalogue/List of Wastes code 	<p>Reduction in GHG emissions from waste sent to landfill and over use of resources. Reduction in GHG emissions from the delivery of materials and disposal of waste.</p>	<p>CoCP provided as Appendix 4.2 of this ES [TR020001/APP/5.02]</p>

Embedded mitigation	Impact avoided	How secured
<p>17 05 04) are specifically excluded from this target. Recovery is deemed to include reuse, recycling and recovery (e.g. energy recovery).</p>		
<p>The lead contractor will develop and implement a Carbon Efficiency Plan to manage carbon emissions and promote good practice including:</p> <ul style="list-style-type: none"> a. monitoring of fuel use/compressed air leaks; b. driver/plant use training; c. avoidance of oversizing of generators for plant and temporary buildings; d. nominated individuals with responsibility for site energy management; e. use of renewable/zero or low carbon fuels for construction vehicles, plant and machinery where reasonably practicable; f. early connection to grid electricity to reduce use of mobile diesel energy generation; and g. promotion of modes of sustainable transport in line with the Construction Workforce Travel Plan. 	<p>Reduction in GHG emissions from construction activities.</p>	<p>CoCP (provided as Appendix 4.2 of this ES [TR020001/APP/5.02])</p>

12.9 Assessment of Core Planning Case

Introduction

- 12.9.1 This section presents the results of the assessment of likely significant effects taking into account the embedded and good practice mitigation measures and the assumptions listed in **Section 12.6 and Section 12.8**. A summary of the assessment of effects is provided in **Table 12.31** in **Section 12.15**.
- 12.9.2 For each of the four main emissions sources, the assessment compares the Core Planning Case with the Future Baseline to establish the emissions impact of the Proposed Development of each one.
- 12.9.3 For emissions sources that will continue over the operational life of the project (i.e. Aviation, Airport Operations and Surface Access), emissions are shown for each of the reference years as specified in paragraph 5.77 of the ANPS:
- a. 2019 (Baseline year)
 - b. 2025 (year of peak operations, i.e. the year with the maximum overall emissions)
 - c. 2027 (Year of maximum passenger throughput for assessment Phase 1)
 - d. 2039 (Year of maximum passenger throughput for assessment for assessment Phase 2a)
 - e. 2043 (Year of maximum passenger throughput for assessment for assessment Phase 2b)
 - f. 2050
- 12.9.4 Emissions from construction occur intermittently over the period from 2025 to 2040, with no construction emissions between 2028 and 2032 inclusive. Emissions from this source are broken down by activity.
- 12.9.5 Emissions from Aviation are compared against the Jet Zero Strategy High Ambition scenario emissions trajectory, as this provides a valuable sector-specific dataset that can be used as a comparator.
- 12.9.6 Emissions from Airport Operations, Surface Access and Construction are each compared with the UK's national carbon budgets for the period to 2037. After this date, no carbon budgets have been set and a qualitative assessment is carried out.
- 12.9.7 The overall significance of the Proposed Development's GHG impact is evaluated in **Section 12.11**, along with consideration of how the Proposed Development meets the test set in Paragraph 5.82 of the ANPS.

Aviation

- 12.9.8 Aviation emissions are presented in **Table 12.18** for each of the reference years required by the ANPS. A full breakdown is provided in **Appendix 12.2** of this ES [TR020001/APP/5.02].

Table 12.18: Aviation Emissions (tonnes CO_{2e})

	2019 (Baseline)	2025 (Peak Operatio n)	2027 (Year of capacity for assessme nt Phase 1)	2039 (Year of capacity for assessment Phase 2a)	2043	2050
Future Baseline	1,123,074	956,738	885,838	610,027	460,150	293,989
Core Planning Case	1,123,074	1,014,704	1,010,984	930,022	881,398	574,926
Net impact	0	57,966	125,146	319,995	421,248	280,937

Airport Operations

12.9.9 Emissions from Airport Operations are presented in **Table 12.19** for each of the reference years required by the ANPS. A full breakdown is provided in **Appendix 12.2** of this ES [TR020001/APP/5.02].

Table 12.19: Airport Operation Emissions (tonnes CO_{2e})

	2019 (Baseline)	2025 (Peak Operatio n)	2027 (Year of capacity for assessm ent Phase 1)	2039* (Year of capacity for assessm ent Phase 2a)	2043*	2050*
Future Baseline	17,149	12,669	11,560	2,689	2,478	2,197
Core Planning Case	17,149	12,982	12,169	3,119	2,978	2,438
Net impact	0	313	609	430	500	241

* See **Section 12.5.45 and 12.5.46** for how the Applicant will bring forward measures to ensure airport operations are consistent with government policy for achieving Net Zero by 2040 once definition for this target has been established.

Surface Access

12.9.10 Emissions from Surface Access are presented in **Table 12.20** below for each of the reference years required by the ANPS. A full breakdown is provided in **Appendix 12.2** of this ES [TR020001/APP/5.02].

Table 12.20: Surface Access emissions (tonnes CO₂e)

	2019 (Baseline)	2025 (Peak Operation)	2027 (Year of capacity for assessment Phase 1)	2039 (Year of capacity for assessment Phase 2a)	2043	2050
Future Baseline	201,012	183,145	174,264	91,992	59,106	1,522
Core Planning Case	201,012	201,870	206,787	131,330	99,514	2,588
Net impact	0	18,725	32,523	39,338	40,408	1,066

12.9.11 It can be seen GHG emissions reduce in both scenarios (Future Baseline and Core Planning Case) due to external factors delivered as part of the UK Government's Transport Decarbonisation Plan (TDP). It should be noted that these emission estimates also take no account of the emission savings potentially realised by passengers being able to use the Proposed Development (expanded airport), rather than having to use more distant alternative airports; as referred to in **Section 12.5.19**.

Construction

12.9.12 Emissions from the construction of the Proposed Development are broken down by activity and shown in **Table 12.21**Table 12.21. A full breakdown of emissions is presented in **Appendix 12.2** of this ES [TR020001/APP/5.02].

12.9.13 In contrast with the emissions from Aviation, Airport Operations and Surface Access, there are no Construction emissions within the Future Baseline scenario, so no net GHG impacts are shown for this emissions source.

Table 12.21: Construction emissions (tonnes CO₂e)

Category	Emissions	Percentage of total
Plant Usage	536,943	61%
Construction materials	234,569	27%

Category	Emissions	Percentage of total
Transport of construction materials	65,107	7%
Worker Transport	17,875	2%
Land use change	17,692	2%
Transport of waste materials	8,138	0.9%
Waste	1,233	0.1%
Energy	1,071	0.1%
Water	11	0.01%
Total	882,640	100%

Overall emissions for Core Planning Case

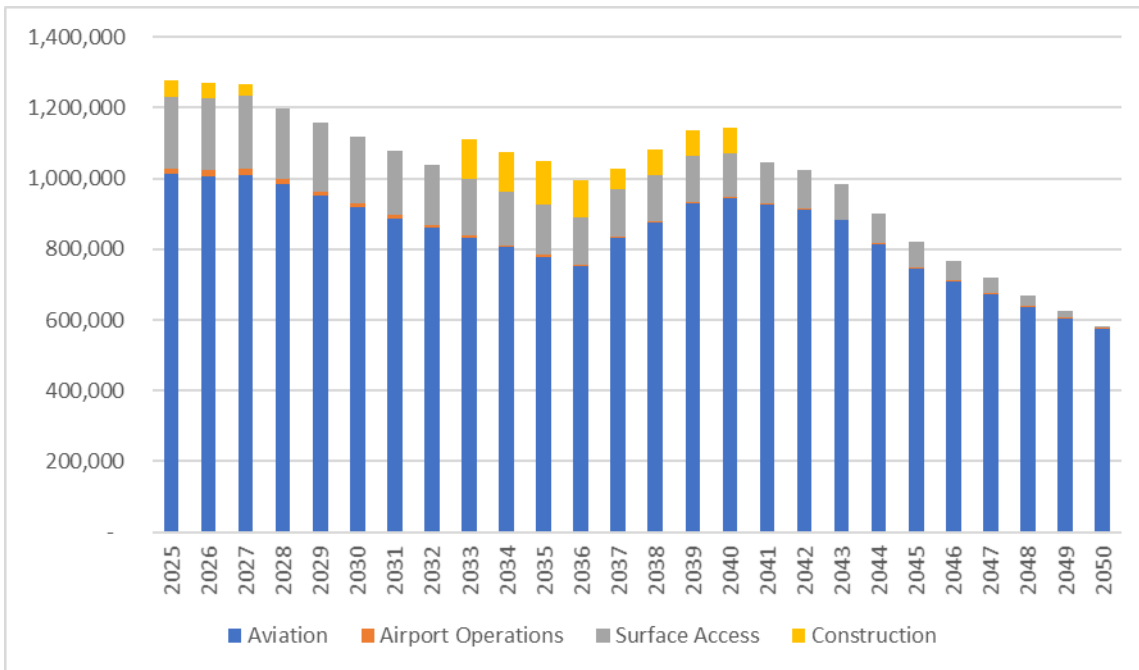
12.9.14 The overall GHG emissions, including construction and all operational impacts, for the GHG Core Planning Case (as defined in **Section 12.1.7**) are presented in **Table 12.22** for each of the reference years required by the ANPS. A full breakdown is provided in **Appendix 12.2** of this ES [TR020001/APP/5.02].

Table 12.22: Core Planning Case Emissions: (tonnes CO_{2e})

	2019 (Baseline)	2025 (Peak Operatio n)	2027 (Year of capacity for assessm ent Phase 1)	2039 (Year of capacity for assessm ent Phase 2a)	2043	2050
Future Baseline	1,341,235	1,152,552	1,071,661	704,708	521,733	297,708
Core Planning Case	1,341,235	1,278,825	1,262,716	1,137,202	983,890	579,952
Net Impact	0	126,273	191,055	432,494	462,157	282,244

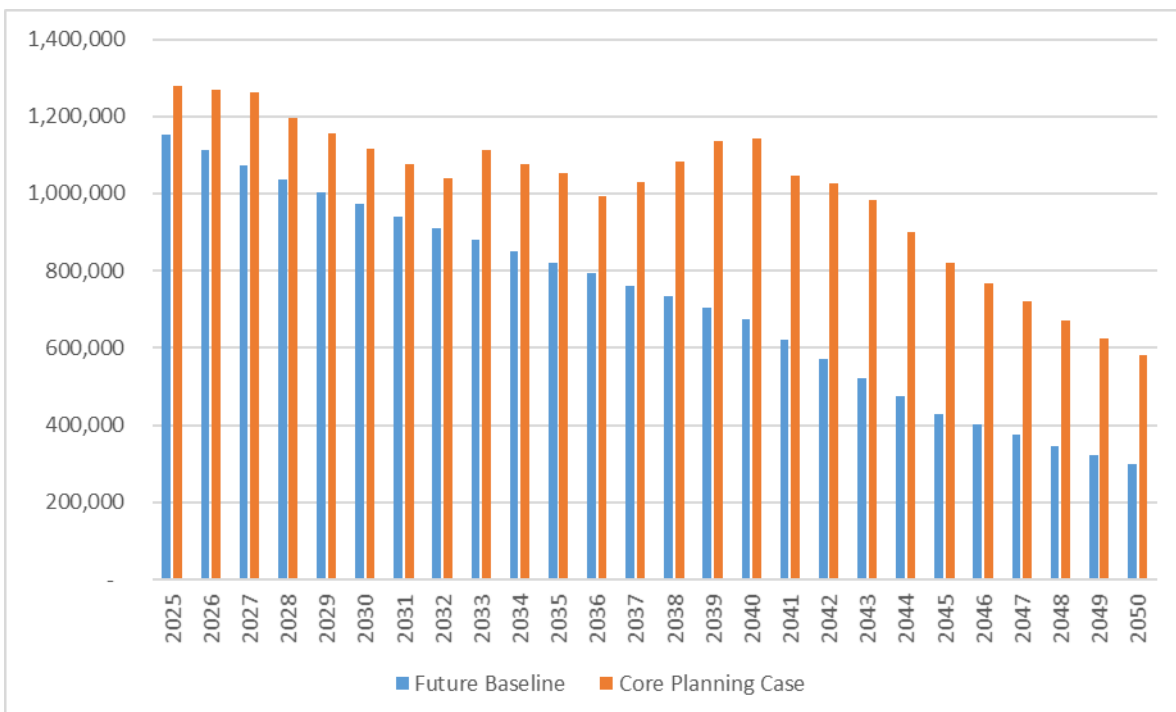
12.9.15 Overall emissions from all sources for each year from 2025 to 2050 are shown graphically in **Inset 12.1** below.

Inset 12.1: Core Planning Case Emissions (tonnes CO₂e)



12.9.16 A comparison of overall emissions in the Core Planning Case with those in the Future Baseline for each year from 2025 to 2050 is shown in **Inset 12.2** below.

Inset 12.2: Overall Emissions – Future Baseline and Core Planning Case (tonnes CO₂e)



Sensitivity Analysis

12.9.17 There are certain known scenarios or risks that may occur that could influence the conclusions of the core assessment. These scenarios and the general

approach to considering them in this assessment are described in **Section 5.4** of **Chapter 5** of the ES [TR020001/APP/5.01].

12.9.18 Documented below is a sensitivity analysis of the assessment to these potential scenarios and risks. This is reported **Table 12.23** with a qualitative assessment of any likely changes to the conclusions of the assessment reported in this chapter.

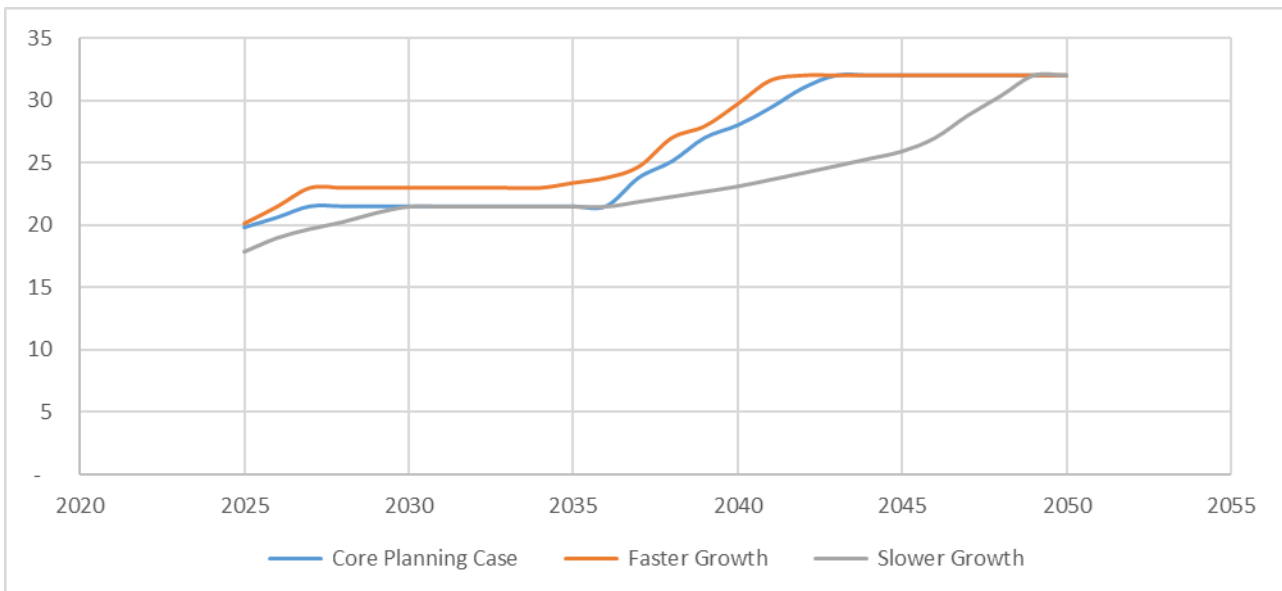
Table 12.23: Qualitative Sensitivity Analysis

Sensitivity scenario	Potential impact and change	Likely effect
1. 19 mppa application	Should the current operator’s planning application (Ref. 12.65) to increase the current passenger limit from 18 mppa to 19 mppa be granted, this would lead to a change in the baseline capacity, therefore the total emissions attributable to the Proposed Development would be reduced by a proportion associated with 1 mppa passengers.	In the Future Baseline scenario this would result in a marginal increase of emissions. In the Core Planning Case there would be no change to emissions profile; and the relative increase would be smaller.
2. Faster Growth	Within the Faster Growth scenario, passenger numbers increase earlier, including reaching 23 mppa through T1 in 2027 to compared to the Core Planning Case forecast, but remain capped at 32 mppa. Inset 12.3 below shows the expansion in passengers in each scenario. Within the Faster Growth scenario, operational emissions could also be expected to increase in line with passenger numbers. Overall construction emissions would be expected to remain unchanged.	There would be an increase in overall emissions relative to the Core Planning Case, but the overall impact would be small, relative to the Jet Zero Strategy trajectory and national carbon budgets. All development takes place in line with government policy and best practice.
3: Slower Growth	Within the Slower Growth scenario, passenger numbers increase to 21.5 mppa later when compared to the Core Planning Case forecast. They also remain lower than the 23 mppa seen in the Faster	There would be a reduction in overall emissions relative to the Core Planning Case, but the overall impact would be relatively small, relative to the Jet Zero Strategy trajectory and national carbon budgets.

Sensitivity scenario	Potential impact and change	Likely effect
	<p>Growth forecast until 2039. They remain capped at 32 mppa as per the other scenarios. Inset 12.3 shows the expansion in passengers in each scenario.</p> <p>Within the Slower Growth scenario, operational emissions could also be expected to increase in line with passenger numbers.</p> <p>Overall construction emissions would be expected to remain unchanged.</p>	<p>All development takes place in line with government policy and best practice.</p>
<p>4: Next generation aircraft</p>	<p>In other technical aspect assessments the adoption of next generation aircraft (including Zero Emission Aircraft) is included as a sensitivity test. However, for this GHG assessment the future rollout of these aircraft has been assumed within the GHG Core Planning Case due to their explicit inclusion as an assumption within the Jet Zero Strategy High Ambition scenario that represents current UK Government policy on aviation.</p>	<p>There is no change to the emissions modelled for the Core Planning Case. The GHG assessment for this case takes account of Zero Emission Aircraft to more fully reflect the assumptions within the Jet Zero Strategy.</p>
<p>5: J10 without National Highways Smart Motorway upgrade</p>	<p>Surface Access emissions are based on projections of passenger, staff and freight transport as included in the Transport Assessment. The data does not vary depending on the inclusion or exclusion of Smart Motorway upgrade at J10.</p>	<p>The change in modelled capacity on the M1 would result in some minor changes to the assignment of airport traffic, some of which would utilise different routes to/from the airport other than the M1 due to the increased journey times on the M1, as set out within the Transport Assessment [TR020001/APP/7.02]. However, the overall distance travelled, which is the primary variable in the calculation of GHG emissions for this sensitivity test, would not materially change from that in the Core Planning Case, and therefore the associated surface</p>

Sensitivity scenario	Potential impact and change	Likely effect
		access GHG emissions would not materially increase or decrease.
6: Changes to airspace	The GHG assessment is not affected by any changes to airspace, beyond the assumptions already explicitly applied to the Jet Zero Strategy High Ambition scenario and included within the assessment.	There is no change to the emissions modelled for the Core Planning Case.

Inset 12.3: Passenger numbers for the Core Planning Case, Faster Growth and Slower Growth scenarios from 2025 to 2050 (mppa)



12.9.19 The impact on the evaluation of significance of the sensitivity tests is discussed in **Section 12.11** below.

12.10 Additional mitigation

- 12.10.1 In addition to the embedded mitigations the Proposed Development will implement (as described in **Section 12.8** Embedded mitigation measures), a series of further additional mitigation measures have been identified as a result of the assessment process. These are proposed to reduce or mitigate the effects of GHG emissions as a result of the construction and operation of the Proposed Development.
- 12.10.2 Additional mitigations relating to Aviation, Airport Operations and Surface Access are described in the Outline Greenhouse Gas Action Plan, provided as **Appendix 12.1** of this ES [TR020001/APP/5.02]. The development of a further detailed Action Plan, that is substantially in accordance with the Outline Plan, is secured by a Requirement of the DCO [TR020001/APP/2.01].
- 12.10.3 Additional mitigation measures relating to Construction are described in **Section 10** of the CoCP (**Appendix 4.2** of the ES [TR020001/APP/5.02]).

Emissions reductions from additional mitigation measures

- 12.10.4 The GHG impact from the implementation of the additional mitigation measures referenced above cannot be quantified, either because of a lack of quantifiable detail in the measures themselves, or because the available baseline data is not presented in a sufficiently granular form to allow specific savings to be quantified. However, since they are not included in the GHG assessment for the Core Planning Case, the emissions figures presented in this analysis are greater than expected and represent a worst case.

12.11 Residual effects and overall significance of effect

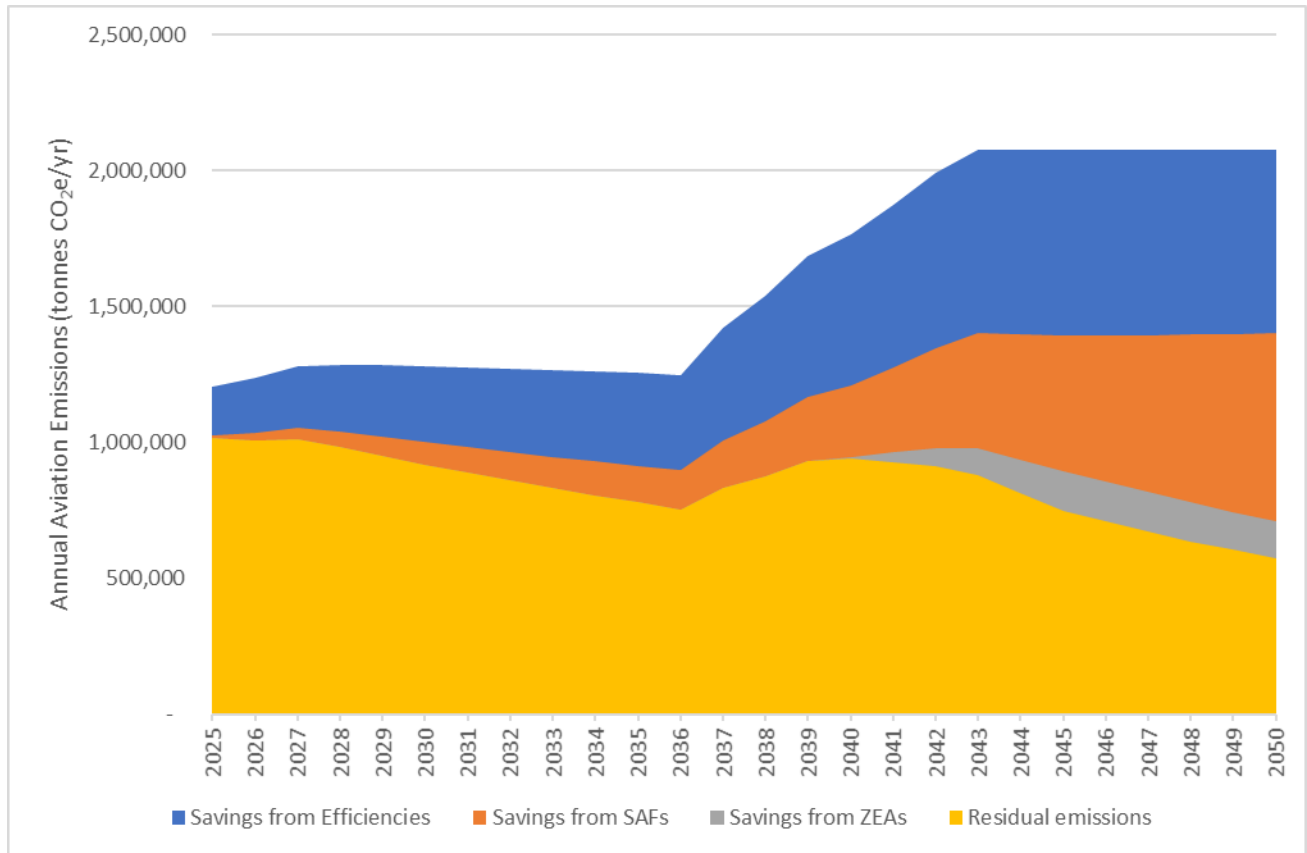
- 12.11.1 The quantification of emissions reductions from the additional mitigation measures listed in **Section 12.10** above has not been carried out. This reflects the available detail on the Proposed Development (as defined by design detail), as well as understanding of future aviation policy, and how such information might support a more detailed quantitative analysis. Therefore, the residual effect remains as reported in **Section 12.11**.

Evaluation of significance

Aviation

- 12.11.2 The significance of Aviation emissions can be evaluated by assessing the extent to which they are aligned with policy and best practice, and through a comparison of these emissions with a comparable trajectory to net zero.
- 12.11.3 Regarding policy and best practice, assessment of Aviation emissions takes into account the Aviation mitigation measures described in the Jet Zero Strategy, carbon pricing via UK ETS and CORSIA, use of SAFs, improved efficiency of aircraft and airspace management, and the rollout of Zero Emission Aircraft as explained in **Section 12.1.13**.
- 12.11.4 The impact of carbon pricing via UK ETS and CORSIA have already been factored into the forecast aircraft movement and passenger numbers as set out in the **Need Case [TR020001/APP/7.04]**. For this reason, the impact of these mechanisms cannot be reported separately and is implicit in reported emissions data of the GHG assessment. The impact on Aviation emissions of the three remaining Jet Zero Strategy measures can be quantified and are shown in **Inset 12.4** below. The measures are shown in the order in which they are implemented, with improvements in aircraft and airspace efficiencies being implemented first and the rollout of zero emission aircraft last. Thus, what is shown is the incremental effect of each additional measure.

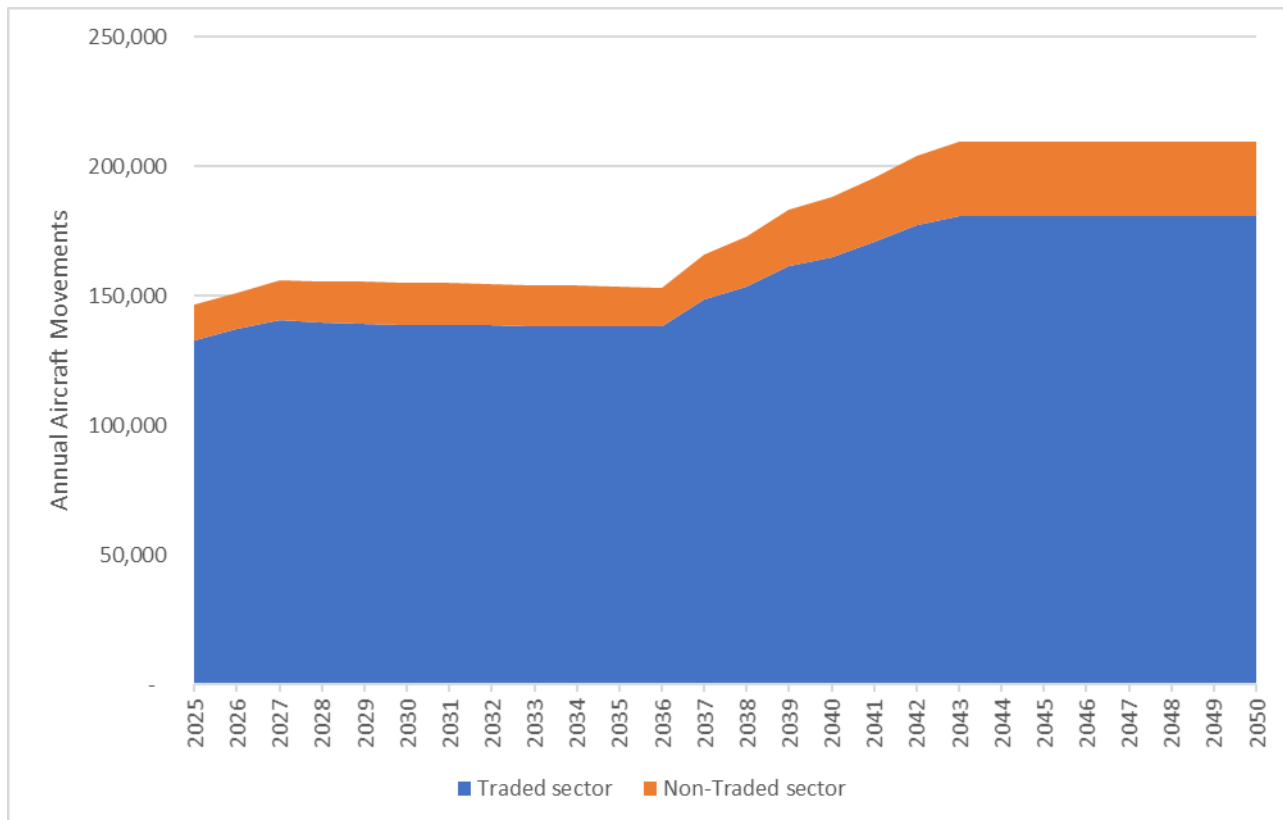
Inset 12.4: The incremental effect of Jet Zero Strategy mitigation policies on Aviation emissions



- 12.11.5 Collectively, the three mitigation measures described in the Jet Zero Strategy reduce Aviation emissions by over 72% in 2050. Improvements in aircraft and airspace efficiency and the use of SAFs account for the bulk of the savings, with the use of Zero Emission Aircraft delivering a relatively small additional incremental reduction in the High Ambition scenario.
- 12.11.6 These core mitigation measures will be delivered by aircraft operators (i.e. airlines), rather than the Applicant or the Airport Operator. These measures, however, represent UK Government policy as it applies to aviation, and the GHG Assessment assumes that they will be delivered in line with Government policy to help meet the UK’s legally-binding emissions reductions targets.
- 12.11.7 Should any or all of the mitigation measures assumed within the Jet Zero Strategy High Ambition scenario not be fully implemented, it is important to note that market-based systems including the UK Emissions Trading Scheme (UK ETS) and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) will continue to provide controlling mechanisms to prevent aviation emissions from exceeding carbon budgets or, where appropriate, ‘in sector’ targets.
- 12.11.8 The UK Emissions Trading Scheme (UK ETS) is a key market-based cap and trade scheme introduced to limit the emissions of large emitters. The scheme sets a cap on emissions that will fall over time, consistent with the UK’s net zero 2050 target.

- 12.11.9 As discussed above, the UK ETS applies to all domestic flights, flights between the UK and Gibraltar, and flights departing the UK to European Economic Area states.
- 12.11.10 The UK ETS applies to a large majority of aircraft movements over the lifetime of the Proposed Development. **Inset 12.5** below shows the numbers of aircraft movements captured by the UK ETS. The proportion of flights outside the UK ETS increases slightly as the airport expands as the number of long haul flights to destinations outside the EU or EEA, but the number of aircraft movements within the traded sector never falls below 86% of the total.

Inset 12.5: Total Aircraft Movements covered by the Traded and non-Traded sectors

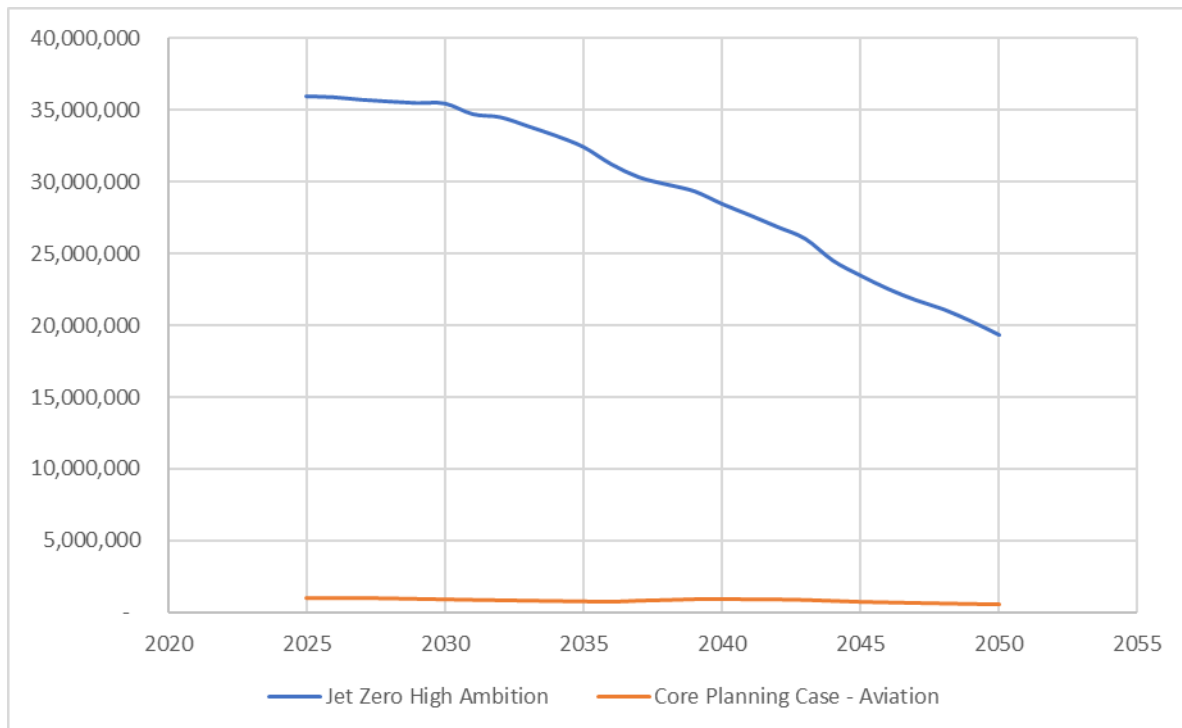


- 12.11.11 All flights covered by the UK ETS are limited by the emissions cap imposed by that scheme, and as the cap reduces consistent with the UK achieving net zero by 2050, the emissions of all emitters regulated by the UK ETS must also fall in line with the cap.
- 12.11.12 In addition to the UK ETS is CORSIA, the Carbon Offsetting and Reduction Scheme for International Aviation. Within CORSIA, aircraft operators are compelled to purchase carbon credits to offset any emissions that exceed a specified baseline.
- 12.11.13 The combination of UK ETS and CORSIA provide controls to manage the Aviation emissions from the Proposed Development at a national level in line with UK Government policy, and consistent with the UK’s legally binding emissions reduction targets.

12.11.14 The Aviation emissions from the Proposed Development can be assessed relative to an appropriate UK aviation trajectory in support of net zero; this trajectory is provided by the Jet Zero Strategy High Ambition scenario as published by the UK Government.

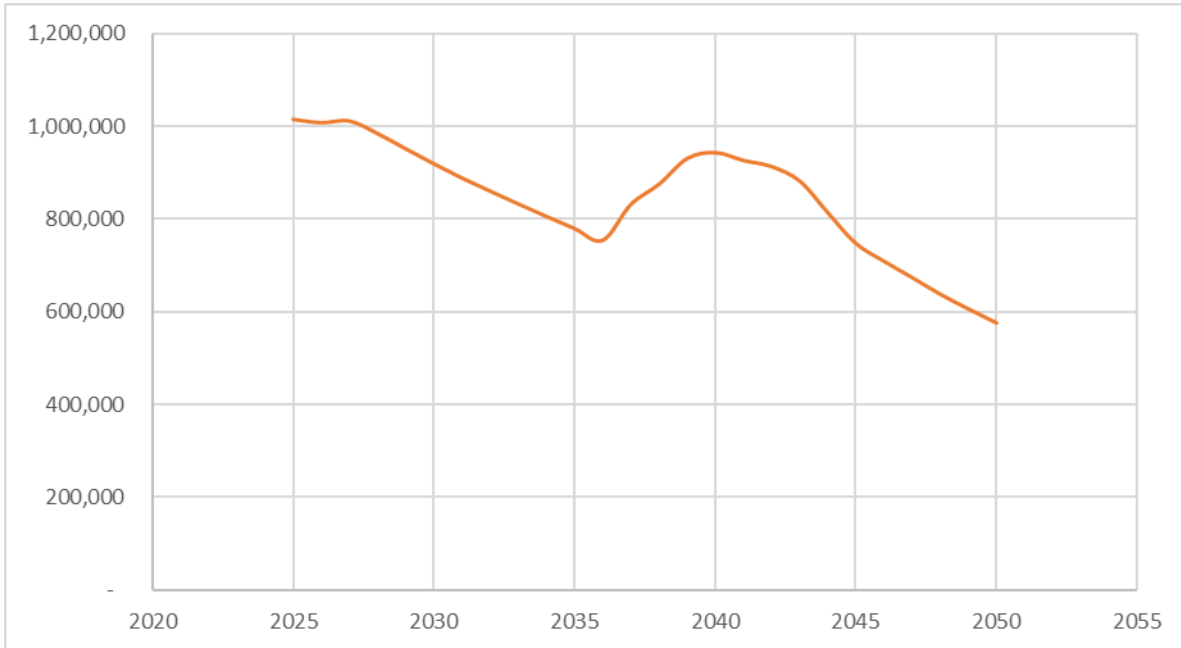
12.11.15 Aviation emissions from the Proposed Development account for only a small proportion of emissions within the Jet Zero Strategy High Ambition scenario, as shown in **Inset 12.6**.

Inset 12.6: Comparison between annual Aviation emissions within the Proposed Development and overall UK aviation emissions as set out for the Jet Zero Strategy High Ambition scenario for the period 2025 to 2050 (tonnes CO_{2e})



12.11.16 The y-axis of **Inset 12.6** makes it difficult to identify the overall trajectory of the Aviation emissions in the GHG Core Planning Case. **Inset 12.7** shows this trajectory in more detail.

Inset 12.7: Annual Aviation emissions for the Proposed Development for the period 2025 to 2050 (tonnes CO_{2e})



12.11.17 The comparison with the Jet Zero Strategy trajectory can also be shown in tabular format and is presented in **Table 12.24**. It shows how Aviation emissions from the Proposed Development never account for more than 3.24% of aviation emissions within the Jet Zero Strategy High Ambition scenario. The variation in the percentage of Jet Zero Strategy emissions over time is due to the projected expansion of the airport, with the share increasing as passenger numbers grow relative to UK aviation generally from 2036 to 2042, and then reducing again as passenger numbers remain constant thereafter. This is further described in the **Need Case [TR020001/APP/7.04]**.

Table 12.24: Core Planning Case Aviation emissions as a percentage of Jet Zero Strategy High Ambition scenario over carbon budget periods

Budget Period	Years	Jet Zero Strategy High Ambition	Aviation – Core Planning Case	Percentage of Jet Zero Strategy High Ambition
4	2025-2027	107,494,018	3,033,148	2.82%
5	2028-2035	175,639,775	4,601,317	2.62%
6	2033-2037	160,936,469	4,000,259	2.49%
7	2038-2042	142,011,812	4,585,842	3.23%

Budget Period	Years	Jet Zero Strategy High Ambition	Aviation – Core Planning Case	Percentage of Jet Zero Strategy High Ambition
8	2043-2047	118,117,711	3,822,268	3.24%
9	2048-2050	60,597,447	1,817,103	3.00%

12.11.18 Analysis of the data presented in **Table 12.25** shows that Aviation emissions from the Proposed Development fall by a proportionally equivalent amount to the fall in the Jet Zero Strategy High Ambition scenario between the baseline year of 2019 and 2050.

Table 12.25: Percentage reductions in emissions, Jet Zero Strategy High Ambition and Aviation – Proposed Development

	2019 (Baseline Year)	2050	Percentage reduction
Jet Zero Strategy High Ambition	38,088,207	19,291,001	49.35%
Aviation – Proposed Development	1,123,074	574,926	48.81%

12.11.19 **Table 12.25** compares Proposed Development Aviation emissions with the Jet Zero Strategy High Ambition trajectory. It is also possible to compare these emissions with National Carbon Budgets and the planning assumption for aviation, as set by the Committee on Climate Change, depending on the budget period in question.

12.11.20 Emissions from aviation, along with those from shipping, are only included in the UK’s National Carbon Budgets from the 6th period onwards. This is also the latest period for which a formal carbon budget has been set.

12.11.21 For comparisons outside the 6th budget period, the Committee on Climate Change recommends using a planning assumption of 37.5 MtCO_{2e} per year. **Table 12.26** below compares Aviation emissions with this planning assumption for the 4th and 5th budget periods, and the UK’s National Carbon Budget for the 6th period. Note that the Proposed Development is set to commence operations in 2025, so only the last three years of the 4th budget period are included, with the planning assumption figure reduced to 60% of the five yearly total.

Table 12.26: Aviation emissions as a percentage of planning assumption for aviation and 6th Carbon Budget

Budget Period	Years	CCC Planning Assumption for aviation	National Carbon Budget	Aviation – Core Planning Case	Percentage of comparator
4	2025-2027	112,500,000 ⁹	n/a	3,033,148	2.69%
5	2028-2035	187,500,000	n/a	4,601,317	2.45%
6	2033-2037	n/a	965,000,000	4,000,259	0.41%

- 12.11.22 **Table 12.26** shows that Aviation emissions contribute a small and falling share of the CCC’s planning assumption figure for the aviation sector in the 4th and 5th budget periods, and a much smaller percentage of the UK’s national carbon budget for the 6th period.
- 12.11.23 It is important to note that the percentage figures in **Table 12.26** are not directly comparable with each other; the planning assumption used in the 4th and 5th budget periods applies only to the aviation sector, while the total for the 6th carbon budget applies to the UK as a whole.
- 12.11.24 The Jet Zero Strategy High Ambition scenario provides an aviation-specific comparator data series that covers the entire design life of the Proposed Development. This comparison is shown in **Table 12.24** and **Table 12.25** above.
- 12.11.25 It can be seen that Aviation emissions from the Proposed Development are:
- Aligned with existing and emerging best practice, as described in the UK Government’s Jet Zero Strategy;
 - Controlled via a combination of the UK ETS and CORSIA, meaning that they cannot exceed the limits set by these market-based mechanisms;
 - Account for only a very small proportion of emissions within the Jet Zero Strategy High Ambition scenario; and
 - Fall at the same rate as Jet Zero Strategy High Ambition scenario between the baseline year of 2019 and 2050.

⁹ The Committee on Climate Change has set a planning assumption for aviation of 37.5 Mt CO₂e/yr in 2050. For the three years (2025-27) that the Proposed Development will operate during the 4th carbon budget period, this planning assumption is multiplied by 3 for a total of 112,500,000 tCO₂e. For the 5th carbon budget period it is multiplied by 5 for a total of 187,500,000 tCO₂e.

12.11.26 The combination of these factors allows the significance of Aviation emissions to be evaluated as **Minor Adverse** and **Not Significant**.

Airport Operations

12.11.27 Airport Operation emissions can be assessed relative to the UK’s national carbon budgets for the period to 2037; beyond this date only a qualitative comparison can be made.

12.11.28 **Table 12.27** compares emissions from Airport Operations with the 4th, 5th and 6th UK national carbon budgets. The figure for the 4th carbon budget has been adjusted to cover only the three years from 2025 to 2027 inclusive.

Table 12.27: Airport Operation emissions relative to UK national carbon budgets

Budget Period	Years	UK Carbon Budget	Airport Operations emissions	Percentage
4	2025-2027	1,170,000,000	38,013	0.003%
5	2028-2032	1,725,000,000	45,112	0.003%
6	2033-2037	965,000,000	24,962	0.003%

12.11.29 Relative to the UK’s national carbon budgets, Airport Operations contribute a very small proportion.

12.11.30 The mitigation measures agreed between the Applicant and the Airport Operator, combined with projected decarbonisation of the UK electricity grid, result in very substantial emissions reductions between the baseline year of 2019 and 2050.

12.11.31 This is achieved through the steady transition away from the combustion of fossil fuels for heating and transport, replacing these energy sources with grid electricity. This results in a steep increase in the consumption of grid electricity, although this is partially offset by the development of on-site renewables situated on roofs and car parking areas.

12.11.32 Overall emissions from Airport Operations fall rapidly, due to this electrification and the projected decarbonisation of the UK electricity grid. But in spite of ongoing grid decarbonisation, Government projections show a residual carbon intensity for grid electricity of 16 grammes CO₂e per kWh in 2040 and 7 grammes per kWh in 2050.

12.11.33 There are other minor emissions sources such as use of de-icer, fire training, aircraft engine tests, fugitive emissions of refrigerants, water consumption, business travel and waste disposal that prevent Airport Operations from reaching absolute zero emissions by 2040 or 2050. But the bulk of residual emissions result from the consumption of grid electricity.

- 12.11.34 It must be noted that while the government has a target for airport operations to be zero emission by 2040 as set out in the Jet Zero Strategy, the government acknowledges that further work is required to develop the requirements to meet this target. As such the Jet Zero Strategy includes a commitment to publish a Call for Evidence to gather further information on the best approach to implementing this target.
- 12.11.35 Given the uncertainty as to the scope of the 2040 target, and in order to ensure that the development of the airport is consistent with achieving it, the **GCG Framework [TR020001/APP/7.08]** commits the GHG Thresholds and Limits“ to be reviewed "*within three months of the government publishing updated policy or guidance that clarifies the scope and pathway to achieving zero emissions airport operations by 2040.*" Where required, the Applicant will bring forward other measures to ensure airport operations are consistent with government policy on this aspect once it has been further defined.
- 12.11.36 As noted above, this is partially offset through the use of on-site renewables. But this is insufficient to meet more than a relatively small proportion of electricity demand.
- 12.11.37 Should the airport be able to connect to an off-site supply of renewable electricity via a private wire arrangement, this could further offset the consumption of grid electricity. But such an arrangement is beyond the scope of this DCO application, and has not been taken into account in the GHG assessment.
- 12.11.38 Overall emissions from Airport Operations fall within the scope of the **GCG Framework [TR020001/APP/7.08]**. This framework sets limits on emissions from specified sources, and controls the growth in passenger numbers should these limits be breached. The GCG framework means that qualifying emissions cannot increase beyond these strict limits.
- 12.11.39 The overall combination of the steep reduction in emissions from Airport Operations and their very small contribution to national carbon budgets, together with the potential for further reductions through the use of off-site renewables, and the role of GCG in controlling these emissions, means that the significance of these emissions can be evaluated as **Minor Adverse and Not Significant**.

Surface Access

- 12.11.40 The significance of the GHG impact of Surface Access can be evaluated via a comparison with the UK's national carbon budgets. **Table 12.28** shows the contribution of Surface Access emissions to the UK's carbon budgets for the period to 2037.

Table 12.28: Surface Access emissions relative to UK national carbon budgets

Budget Period	Years	UK Carbon Budget	Surface Access emissions	Percentage
4	2025-2027	1,170,000,000	612,693	0.052%
5	2028-2032	1,725,000,000	935,533	0.054%
6	2033-2037	965,000,000	729,309	0.076%

- 12.11.41 During these budget periods, the percentage share of the Proposed Development to the UK's carbon budgets increases, but remains extremely small.
- 12.11.42 It should be noted that these emission estimates do not take account of the emission savings potentially realised by passengers being able to use the Proposed Development (expanded airport), rather than having to use more distant /alternative airports; as described in **Section 12.5.19**.
- 12.11.43 Transport decarbonisation assumptions consistent with the TDP have been applied to passenger, staff and freight transport activity data, and the combination of these assumptions means that overall Surface Access emissions within the Core Planning Case are estimated to fall by 99% between the baseline year of 2019 and 2050.
- 12.11.44 Surface Access emissions do not reach absolute zero by 2050, largely due to residual emissions in the UK electricity grid which come through in Surface Access emissions because of the electrification of transport modes. It should be noted that emissions associated with the charging of EVs at the airport is accounted for under airport operations.
- 12.11.45 Transport decarbonisation measures are addressed by UK Government policy as described in the Transport Decarbonisation Plan. Furthermore, Surface Access emissions are controlled via the **GCG Framework [TR020001/APP/7.09]** described in **paragraph 12.11.38** above.
- 12.11.46 The steep reduction in emissions, the alignment of the emission source category with UK Government policy, and a control mechanism available to the Applicant via GCG mean that emissions from Surface Access can be evaluated as **Minor Adverse** and **Not Significant**.

Construction

- 12.11.47 As for Airport Operations and Surface Access above, the significance of the emissions from Construction can be evaluated via a quantitative comparison with to UK national carbon budgets for the period to 2037. **Table 12.29** shows the contribution of emissions from Construction to the UK's national carbon budgets.

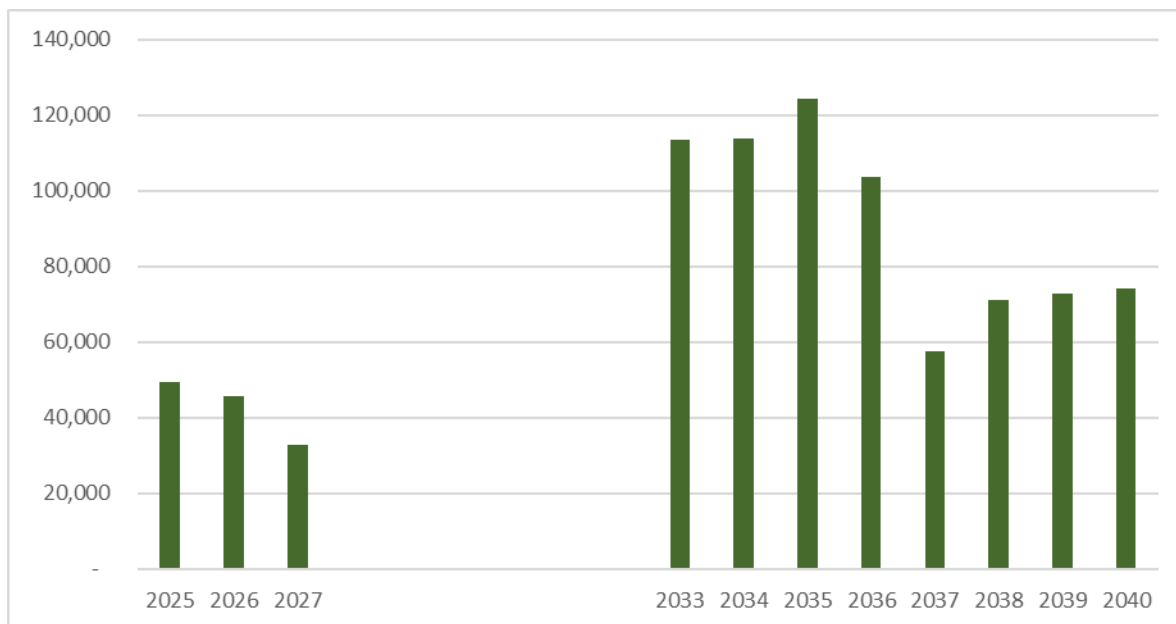
Table 12.29: Construction emissions relative to UK national carbon budgets

Budget Period	Years	UK Carbon Budget	Construction emissions	Percentage
4	2025-2027	1,170,000,000	126,913	0.011%
5	2028-2032	1,725,000,000	0	0%
6	2033-2037	965,000,000	537,699	0.053%

12.11.48 The construction of assessment Phase 1 contributes a very small proportion of the UK’s 4th national carbon budget, with the construction of assessment Phase 2 accounting for a larger but still very small share of the 6th carbon budget.

12.11.49 **Inset 12.8** presents a breakdown of GHG emissions from construction during the construction period of the Proposed Development. There is no construction occurring during the period from 2028-2032 and there are no emissions to report.

Inset 12.8: Construction emissions for applicable years (tonnes CO_{2e})



12.11.50 Construction emissions are dominated by the embodied carbon in materials and by the use of plant and machinery. Collectively, these two sources account for 88% of total Construction emissions.

12.11.51 There is likely to be substantial decarbonisation of materials (Ref. 12.66) within supply chains, and the use of electric and hybrid plant and machinery also represents the potential for decarbonisation in this sector (Ref. 12.67). But it is challenging to quantify these future impacts with confidence, so the figures for construction presented here represent a conservative, worst case assessment.

- 12.11.52 But as material manufacturing technologies improve, and government policy relating to emissions from construction continues to evolve, all future construction activities will be required to comply with this. Furthermore, Construction emissions are by definition time limited and are not projected to extend beyond 2040 so cannot materially impact on the UK's net zero target for 2050.
- 12.11.53 For these reasons, the significance of Construction Emissions can be evaluated as **Minor Adverse** and **Not Significant**.

Overall Proposed Development

- 12.11.54 The significance of effect of GHG impacts resulting from the Proposed Development has been evaluated via a combination of quantitative comparison with relevant trajectories to net zero, and a qualitative assessment against known policy and best practice. This approach is consistent with the updated guidance published by IEMA.
- 12.11.55 Furthermore, key emissions sources are controlled by either external or internal mechanisms that will prevent them from exceeding strict specified limits; Aviation emissions are controlled via the UK ETS and CORSIA, while emissions from Airport Operations and Surface Access are subject to the limits set via the **GCG Framework [TR020001/APP/7.08]** developed for the Proposed Development.
- 12.11.56 The significance of each of the four emissions sources was evaluated to be **Minor Adverse** and **Not Significant**, with the same significance being applied to the Proposed Development as a whole.
- 12.11.57 When this overall evaluation of significance is seen in the light of paragraph 5.82 of the ANPS, it is clear that the additional emissions resulting from the Proposed Development are not so significant that they have a material impact the Government's ability to meet its carbon reduction targets, including carbon budgets.

Significance of sensitivity tests

- 12.11.58 A number of sensitivity tests are examined for their likely effect on the overall GHG emissions of the Proposed Development. These are described in **Table 12.23** above. This qualitative analysis indicates that the GHG emissions from the six sensitivity tests examined would not have a material impact on the overall evaluation of significance arrived at for the Core Planning Case. In each case, the GHG impact of the Proposed Development remains as **Minor Adverse** and **Not Significant**.

12.12 Non-CO₂ impacts

- 12.12.1 In addition to the direct climate effects from the combustion of fossil fuels, aviation is known to result in a range of pollutants that can affect the climate in other ways; these include nitrogen oxides and water vapour that can, for example, result in contrails leading to the formation of cirrus clouds.
- 12.12.2 These non-CO₂ impacts are generally short-lived and reversible, meaning that they will dissipate after aircraft have passed. This is in contrast to emissions of CO₂, which remain in the atmosphere causing warming for long time periods.
- 12.12.3 There remains significant scientific uncertainty around the overall warming effect of non-CO₂ impacts. The Committee on Climate Change, in its Sixth Carbon Budget Report (Ref. 12.68), points out that:
- “It remains extremely challenging to accurately aggregate the effects of these non-CO₂ impacts into a CO₂-equivalence ‘multiplier’ for use within climate policy mechanisms. These effects still have significant uncertainties associated with them and their size can depend on the conditions under which the activity occurs, unlike for well-mixed greenhouse gases which affect the climate similarly independently of where they occur.”*
- 12.12.4 Furthermore, there is no recognised benchmark against which to compare the emissions of non-CO₂ impacts. They are not within the Nationally Determined Contributions declared pursuant to the 2015 Paris Agreement or the carbon budgets set pursuant to the UK Climate Change Act, and are not included in the Aviation emissions trajectory for the Jet Zero Strategy High Ambition scenario that this assessment uses as a comparator for Aviation emissions.
- 12.12.5 For all these reasons, while it is important to acknowledge the presence and warming effect of these non-CO₂ impacts, this assessment has not sought to quantify non-CO₂ impacts, consistent with current Government and Committee on Climate Change advice. Ongoing GHG reporting by the Airport will follow all government policy as it evolves on this issue.

12.13 In-combination climate change effects

- 12.13.1 This section provides a preliminary assessment of potential changes to the findings of the GHG assessment, taking into account the predicted future conditions as a result of climate change, known as In-combination Climate Change Impacts (ICCI).
- 12.13.2 This assessment has been undertaken using the methodology and climate change predictions described in **Chapter 9** of the ES [TR020001/APP/5.01]. The results are provided in **Table 12.30** and no additional mitigation is required.

Table 12.30: GHG in-combination climate change impacts

Climate hazard	Likelihood of climate hazard occurring	Likely ICCIs identified	Description of ICCI considering embedded environmental measures/good practice	Likelihood of ICCI occurring	Consequence	Significance of ICCI effects
Increased Summer air temperatures	Frequent	Increased energy required for cooling in buildings. Increased ambient temperatures with lowers air density and requires higher fuel consumption to increase thrust.	Possible increases of GHG emissions would be mitigated through measures within the Outline Greenhouse Gas Action Plan (Appendix 12.1 of this ES [TR020001/APP/5.02])	Remote	Very low	Negligible (Not significant)
Extreme weather events (including high winds)	Frequent	Stronger winds and changing wind patterns might lead to modifications of flight lengths and routings, resulting in increase in the	Possible increases of GHG emissions will be mitigated through measures within the Outline Greenhouse Gas Action Plan	Remote	Very low	Negligible (Not significant)

Climate hazard	Likelihood of climate hazard occurring	Likely ICIs identified	Description of ICI considering embedded environmental measures/good practice	Likelihood of ICI occurring	Consequence	Significance of ICI effects
		fuel consumption.	(Appendix 12.1 of this ES [TR020001/APP/5.02]).			

12.14 Monitoring

Construction monitoring

- 12.14.1 As outlined in the CoCP provided as **Appendix 4.2** of this ES **[TR020001/APP/5.02]**, the lead contractor's Environmental Management System (EMS) will consider the approach to:
- monitor and report energy use from construction activities; and
 - monitoring type, quantities and disposal route of waste generated during construction operations.
- 12.14.2 The monitoring process will evaluate the effectiveness of mitigation measures and the potential impact of construction operations associated with the Proposed Development. Consideration will also be given to those additional actions that may be necessary to ensure compliance.

Operational monitoring

- 12.14.3 The airport will continue to carry out annual monitoring and reporting of operational GHG emissions in line with the carbon accounting principles as defined in the GHG Protocol (Ref. 12.69) and to reflect increasing requirements of the Airport Carbon Accreditation scheme as the airport gains further levels of accreditation.
- 12.14.4 The **GCG Framework [TR020001/APP/7.08]** document has been developed to set limits on the emissions from specified activities associated with airport operations and surface access transport, as submitted with the application for development consent of this ES.
- 12.14.5 The GCG Framework requires the airport operator to monitor and report these emissions, and a Greenhouse Gases Monitoring Plan, included as **Appendix E** of the **GCG Framework [TR020001/APP/7.08]**, sets out the emissions to be covered and a detailed methodology describing how they will be monitored and reported.
- 12.14.6 In line with existing legislation, aeroplane operators are required to monitor and report on aviation emissions, this is regulated by CORSIA for international flights, and UK ETS for domestic and EEA flights.

12.15 Assessment summary

12.15.1 **Table 12.31** provides a summary of the identified impacts, mitigation and likely effects of the Proposed Development in relation to GHG.

Table 12.31: GHG Assessment summary

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Sensitivity	Description of effect and significance	Additional Mitigation	Residual Effect	Overall significance of effect
Construction							
Emissions of GHGs	Measures to reduce waste generated and resource use during construction. Site Waste Management Plan	High	N/A	Direct High Risk Long term duration, continual frequency High Probability Temporary, irreversible Construction: International spatial extent, High magnitude Minor Adverse and Not Significant	Construction materials with lower embodied carbon will be used where feasible. Specification of materials with lower embodied GHG emissions within contractor contracts (where practical, materials with a higher recycled content, and locally sourced materials etc) will be used. Where feasible design for end of component reuse and use offsite manufacture of design elements.	No quantifiable change Minor Adverse	Not significant
	The lead contractors will develop and implement a Carbon Efficiency Plan, will be developed and implemented to manage/reduce carbon emissions and promote good practice. CoCP		N/A				
	The contractor will set targets to minimise potable water use during construction.		N/A				

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Sensitivity	Description of effect and significance	Additional Mitigation	Residual Effect	Overall significance of effect
	CoCP						
	A landscaping strategy to offset any loss of vegetation. Landscape and Biodiversity Management Plan		N/A		The contractor will be required to demonstrate to the Applicant that materials with lower embodied carbon emissions have been specified where feasible.		
Operation							
Emissions of GHGs	The new terminal building will utilise efficient building design. Contracts, GHG Action Plan	High	N/A	Direct High Risk Long term duration, continual frequency	Terminal 2 buildings will be designed to at least BREEAM 'Excellent' standard, or equivalent at the time o' detailed design, to be energy efficient with appropriate installations and equipment together with thermally efficient materials and shading. Other new buildings will	No quantifiable change Minor Adverse	Not Significant.
	Measures incorporated into the design to reduce waste. Design, Site Waste Management Plan		N/A	High Risk Permanent, irreversible International spatial extent, High magnitude			
	The New T2 will: a. be designed with Passivhaus principles,		N/A	Minor Adverse and Not Significant			

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Sensitivity	Description of effect and significance	Additional Mitigation	Residual Effect	Overall significance of effect
	<p>where practicable;</p> <ul style="list-style-type: none"> b. include equator-facing glazing to minimise heat gain; c. maximises daylighting; d. incorporate greywater recovery and re-use incorporated; e. increase airtightness and reduce thermal bridges. <p>Design</p>				<p>be designed to BREEAM ‘Excellent’ standard except where the building typology dictates that it is not practical.</p> <p>All diesel generators to be removed by 2040 where regulations allow.</p> <p>All new contracts with Ground Handling Agencies to require electric vehicles, or other zero carbon energy options.</p> <p>All new and replacement Luton fleet light and medium duty vehicles to be zero carbon (electric /hydrogen).</p>		
	<p>The design has the flexibility to allow for battery storage for electricity to be accommodated in the future.</p> <p>Design</p>		N/A				

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Sensitivity	Description of effect and significance	Additional Mitigation	Residual Effect	Overall significance of effect
	<p>The design incorporates stormwater capture and treatment. Design</p>		N/A				
	<p>Options for low carbon renewable energy generation/or procurement, and options to incentivise the future uptake of low and zero carbon fuels for both vehicles using the airport and aircraft. Design</p>		N/A				
	<p>Energy use will from the national grid, supplemented by solar photovoltaic cells built where practical over car parking and on roofs during</p>		N/A				

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Sensitivity	Description of effect and significance	Additional Mitigation	Residual Effect	Overall significance of effect
	<p>construction up to 2037; ground source heat pumps; and battery storage for back-up power rather than relying on diesel generators. Contracts, GHG Action Plan</p>						
	<p>Surface Access Strategy provides the medium to long term direction for a shift away from private car use to public transport. Where private cars are used it will incentivise low/zero carbon private transport options. Traffic Assessment and Travel Plan</p>		N/A		<p>Provision of electric vehicle (cars, taxis, buses and coaches) charging infrastructure for both staff and passengers. Investigate participating in a car sharing service, including for electric cars, and having a number of dedicated bays at the airport for the</p>		

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Sensitivity	Description of effect and significance	Additional Mitigation	Residual Effect	Overall significance of effect
					<p>car sharing service.</p> <p>Measures to reduce emissions from surface access will include the incentivisation of uptake of low emission transportation for freight entering/leaving the airport for example HGV using low carbon technologies.</p>		
	<p>Steps to reduce emissions from aircraft during the landing and take-off (LTO) cycle will be considered as part of the developing operational strategy.</p> <p>GHG Action Plan</p>		N/A		<p>Provide infrastructure to facilitate the use of low emission airside equipment, such as electric vehicles; including for example, the provision of</p>		

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Sensitivity	Description of effect and significance	Additional Mitigation	Residual Effect	Overall significance of effect
	LLAOL to encourage take up of sustainable aviation fuels/newer aircraft through operating policy/strategy. GHG Action Plan		N/A		charging points within GSE compounds; hydrogen fuelling etc subject to low carbon vehicle strategy established.		

COMPETENT EXPERTS

Topic	Role	Company	Qualifications/competencies/experience of author
Climate Change	Author	AECOM	BSc Environmental Management and Technology; 20+ years' experience working in sustainability sector, MIEMA, CEnv
Climate Change	Technical reviewer	AECOM	BA (Hons) Environmental and Social Values. 20 years' experience working in the sustainability sector. MIEMA, CEnv
Climate Change	Technical reviewer	Arup	MEng Civil Engineering, Eng. Doctorate in Environmental Technologies, MIEMA, Chartered Environmentalist (CEnv) more than 20 years of professional experience in the field of climate change

GLOSSARY AND ABBREVIATIONS

Term	Definition
T2	Terminal 2
ANPS	Airports National Policy Statement
AoS	Appraisal of Sustainability
BEIS	Department for Business, Energy & Industrial Strategy
CAA	Civil Aviation Authority
CBC	Central Bedfordshire Council
CCC	Climate Change Committee
CCD	Climb, Cruise, Descent
CoCP	Code of Construction Practice
CORSIA	Carbon Offsetting Reduction Scheme for International Aviation
DCO	Development Consent Order
DfT	Department of Transport
DM	Do-Minimum scenario
DS DCO-embedded	Do-Something DCO scenario with embedded mitigation
EASA	European Union Aviation Safety Agency
ES	Environmental Statement
EEA	European Economic Area
EIA	Environmental Impact Assessment
EMEP/EEA	European Monitoring and Evaluation Programme/European Environment Agency
EV	Electric Vehicle
GHG	Greenhouse Gas
Ground Support Equipment	GSE
HCC	Hertfordshire County Council
ICAO	International Civil Aviation Organisation
IEMA	Institute of Environmental Management and Assessment
LBC	Luton Borough Council
LLAOL	London Luton Airport Operations Limited
LTO	Landing Take-Off
MPPA	Million Passengers Per Annum
NHDC	North Hertfordshire District Council

Term	Definition
NPPF	National Planning Policy Framework
PEIR	Preliminary Environmental Information Report
RICS	Royal Institution of Chartered Surveyors
SAF	Sustainable Aviation Fuels
UK ETS	UK Emission Trading Scheme
UNFCCC	United Nations Framework Convention on Climate Change

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