

15 Climate Change

15.1 Introduction

- 15.1.1 This chapter was prepared by the Savills Environment and Infrastructure team to assess the Development in relation to the potential effects on and due to climate change, both the construction and completed development stages of the project.
- 15.1.2 Under The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the '2017 EIA Regulations') as amended, applicants are required to include in the ES where relevant to the development *"a description of the likely significant effects of the development resulting from, inter alia: [...] the impact of the development on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the development to climate change"* (Schedule 4, paragraph 5(f)).
- 15.1.3 Climate change in the context of development projects is typically considered in three parts, as is suggested by the wording in Schedule 4:
- the impact of greenhouse gas emissions (GHGs) caused directly or indirectly by the Development, which contribute to climate change;
 - risks to the development caused by the changing climate and resilience or adaptation options; and
 - inter-related effects (such as changes in the sensitivity or resilience of receptors due to climate change) that in turn could influence the significance of other environmental effects of the development on those receptors.
- 15.1.4 Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and/or enhance likely beneficial effects. The nature and significance of the likely residual effects are then reported.
- 15.1.5 The chapter is supported by the following appendices with further information on each of these areas:
- Appendix 15.1 – Legislation, Planning Policy and Guidance;
 - Appendix 15.2 – GHG Emission Calculations;
 - Appendix 15.3 – Climate Risk Assessment; and
 - Appendix 15.4 – Inter-Related Effects of Climate Change.
- 15.1.6 GHG emissions are normally expressed as carbon dioxide equivalents, explained in the methodology section below, and are therefore often referred to as 'carbon' as a shorthand (e.g. when speaking of 'low-carbon power' or 'carbon reduction targets').

Competence

- 15.1.7 Chapter 15: Climate Change has been written by Miles Ryan-Cummings, PISEP, REnvP, a senior consultant at Savills who is a Registered Environmental Practitioner and Practitioner Member of the Institute of Sustainability and Environmental Professionals

(ISEP, formerly known as the Institute of Environmental Management and Assessment (IEMA)). Miles has three years' experience of EIA, including climate change assessments.

- 15.1.8 The chapter has been reviewed by Tom Dearing, Director at Savills, who is a Chartered Environmentalist and Full Member of ISEP. Tom has 15 years' experience undertaking climate change assessments for development projects and is co-author of the 2022 ISEP guidance used in this assessment.

15.2 Legislation, Planning Policy and Guidance

- 15.2.1 The following sections provide a summary of the legislation, planning policy and guidance that is of relevance to this assessment and the Development. For a detailed review, please refer to Appendix 15.1.

Legislation Context

- 15.2.2 The following treaties and legislation, as amended, are relevant to the Development:

- The Kyoto Protocol¹, Paris Agreement² and Glasgow Pact³;
- The Climate Change Act 2008⁴;
- The Environment Act 2021⁵; and
- The Building Regulations 2010⁶.

Planning Policy Context

National

- 15.2.3 The following national policy (including both planning policy and climate change policy) is relevant to the Development and to contextualising the significance of effects. The policy context is detailed in Appendix 15.1.

- Carbon Budget and Growth Delivery Plan⁷;
- The Net Zero Strategy (Build Back Greener)⁸;
- National Planning Policy Framework (2024)⁹;
- Heat and Buildings Strategy¹⁰;
- Powering up Britain: Net Zero Growth Plan¹¹;
- UK Infrastructure: a 10 Year Strategy¹²; and
- Third National Adaptation Programme¹³

Regional

- 15.2.4 The following regional policy is relevant to the Development:

- Strategic Action Plan (2024-2030) Net Zero Carbon Across Hertfordshire¹⁴; and
- Sustainable Hertfordshire Strategy 2022¹⁵.

Local

- 15.2.5 The following local planning policy is relevant to the Development:

- Draft St Albans District Council Local Plan – Draft Local Plan 2041 ('Emerging Local Plan')¹⁶; and
- City and District of St Albans District Local Plan Review 1994 (Adopted 30 November 1994), Saved and Deleted Policies Version (July 2020)¹⁷.

15.2.6 Additional requirements of the policies listed above are further detailed in Appendix 15.1.

Guidance

15.2.7 The following guidance is relevant to the Development:

- Planning Practice Guidance (PPG) (Live Document);
- The ISEP guide to 'Assessing Greenhouse Gas Emissions and Evaluating their Significance'¹⁸;
- The ISEP EIA Guide to Climate Change resilience and Adaptation¹⁹;
- The Greenhouse Gas Protocol suite of documents from the World Resources Institute and the World Business Council for Sustainable Development (WRI and WBCSD)²⁰;
- Valuation of Energy Use and Greenhouse Gas: Supplementary guidance to the HM Treasury Green book from the Department for Energy Security and Net Zero²¹;
- UK Government GHG Conversion Factors for Company Reporting²²; and
- The UK Green Building Council (UKGBC) Framework for Measuring and Reporting of Climate-related Physical Risks to Built Assets²³.

15.3 Assessment Methodology

Consultation

EIA Scoping Opinion

15.3.1 A request for a Scoping Opinion was submitted by the Applicant to SADC on 27th March 2025. The Scoping Report accompanied the request (Appendix 3.2). The Scoping Opinion (Appendix 3.3) was issued by SADC on 23rd May which included comments from statutory consultees. Table 15.1 summarises key comments raised by consultees of relevance to this assessment during the EIA Scoping study and how the assessment responded to them.

Table 15.1: EIA Scoping Response Summary

Consultee and Comment	Response
<i>St Albans City & District Council – Scoping Opinion (23 May 2025)</i>	
SADC agreed that the scope of the Climate Change Chapter as reported in the Scoping Report was acceptable.	In the Climate Change chapter of the EIA Scoping Report, it was proposed to scope in the effects listed in Section 15.3.4 and 15.3.5 below. Effects listed in Section 15.3.11 were proposed to be scoped out in the Scoping Report. The scope of this chapter is therefore aligned to the Scoping Report.

Pre-Application Consultation

- 15.3.2 No further consultation was undertaken over and above the EIA Scoping process.

Summary of Assessment Scope

- 15.3.3 The scope of the construction assessment within this chapter is limited to the following potential impacts and assessment of effects.

Construction

- 15.3.4 For the construction phase of the Development, the following potential effects have been assessed:

- The upfront embodied carbon in construction materials used (lifecycle stages A1-A5);
- Direct GHG emissions from construction activities (e.g. fuel consumption by construction plant) where information is available and material to the assessment; and
- Climate risks to the construction workforce.

Completed Development

- 15.3.5 For the completed Development, the following potential effects have been assessed:

- GHG emissions associated with energy consumption;
- GHG emissions associated with occupiers' travel to and from the Site; and
- Climate risks such as potential overheating and water scarcity during summer heatwave/ drought events.

- 15.3.6 One of the main risks to the Development from climate change over its operating life is expected to be flooding, which is assessed in ES Chapter 12: Water Resources, Flood Risk and Drainage.

Cumulative Assessment

- 15.3.7 All developments that emit GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a cumulative impact on climate change. Consequently, cumulative effects due to other specific local development projects will not be predicted individually, but are taken into account when considering the impact of the Development by defining the atmospheric mass of GHGs as a high sensitivity receptor.

- 15.3.8 Similarly, the cumulative effect of all other developments globally on predicted future climatic conditions, and hence the risk assessment and resilience/adaptation measures, will be taken into account through use of the RCP8.5 scenario in the probabilistic climate change projections so a separate cumulative assessment is not required.

Inter-related effects

- 15.3.9 The main applicable environmental pathways for potential inter-related effects (also known as in-combination effects) are expected to be hydrology, ecology, landscape planting, human health and noise (with respect to ventilation). These will be assessed through a climate risk assessment and inter-related effects assessment using site-specific climate projections from the UKCP18 dataset.

- 15.3.10 Consideration of inter-related effects (such a changing future baseline and sensitivity of receptors) will be also given in each respective topic chapter of the ES, where applicable, using the climate projections data.

Non-Significant Effects

- 15.3.11 All other climate change effects were scoped out of further assessment within this ES. This includes:

- GHG emissions from construction plant and management of construction waste. These are considered *de-minimis* sources and are thus scoped out of this assessment.
- Embodied carbon from maintenance and refurbishment work during the buildings operational lifetime after completion. This is dependent on resident choices, so it is difficult to estimate values at an outline planning stage. As the UK is expected to reach net-zero emissions by 2050, future maintenance and refurbishment is expected to have a significantly lower carbon intensity through decarbonisation and is therefore scoped out of the assessment.
- Supply of potable water and treatment of wastewater in operation are considered to be *de-minimis* sources, unlikely to be a material source of emissions relative to energy and transport, and are therefore scoped out.
- The generation of household waste and its management by the responsible local authority is not a factor influenced significantly by the development design or location, and so effects on this caused by the Development are also considered *de minimis* and therefore scoped out.
- Change in habitat. The existing baseline agricultural land use is not a significant carbon stock. This is because, while agricultural activity does cause direct and indirect greenhouse emissions or in some cases sequestration (for example from livestock manure, fuel and fertiliser use, and changes in soil carbon stocks from grass or crop growth), these are of a low intensity per hectare relative to industrial or other developed land uses. Nor is it a significant carbon store, as the land does not include peat deposits or extensive woodland, so soil and vegetation carbon stocks that may be subject to disturbance are relatively minor. Where possible, existing hedgerows and trees would to be retained and incorporated in landscaping for the Development, and further landscape planting is proposed. On this basis, no significant loss of carbon stocks (in soils or vegetation) is expected and further assessment of land use change is scoped out.

Study Area

- 15.3.12 As described above, Schedule 4, paragraph 5(f) of the 2017 EIA Regulations requires that climate change in EIA is assessed in the following ways:

- The impact of GHGs caused directly or indirectly by the Development;
- Risks to the Development caused by the changing climate and resilience or adaptation options; and
- Inter-related effects that in turn could influence the significance of other environmental effects of the development on those receptors.

- 15.3.13 It is appropriate to apply a different study area to each of the above ways in which climate change is required to be assessed. These are set out below.

GHG Emissions

- 15.3.14 GHG emissions have a global effect rather than directly affecting any specific local receptor. The impact of GHG emissions occurring due to the Development on the global atmospheric concentration of the relevant GHGs, expressed in CO₂e, is therefore considered within this assessment. As GHG impacts are global and cumulative with all other sources, no specific geographical study area is defined for the identification of receptors or assessment of effects.
- 15.3.15 However, GHG emissions caused by an activity are often categorised into 'scope 1', 'scope 2' or 'scope 3' emissions, following the guidance of the WRI and the WBCSD Greenhouse Gas Protocol²⁰ suite of guidance documents.
- Scope 1 emissions: released directly by the entity being assessed, e.g. from combustion of fuel at a facility;
 - Scope 2 emissions: caused indirectly by consumption of imported energy, e.g. emissions from generating electricity supplied through the national grid to a facility; and
 - Scope 3 emissions: caused indirectly in the wider supply chain, e.g. in the upstream business activities supplying goods or services or the downstream use of products.
- 15.3.16 This assessment has sought to include emissions from all three scopes, where this is material and reasonably possible from the information and emissions factors available, to capture the impacts attributable to the Development.
- 15.3.17 The majority of GHG emissions are likely to occur within the territorial boundary of the UK and hence within the scope of the UK's national carbon budgets. However, in recognition of the climate change effect of GHG emissions (wherever occurring) and the need, as identified in national policy, to avoid 'carbon leakage' overseas when reducing UK emissions, potential scope 3 GHG emissions that may physically occur outside the UK have been considered where relevant.

Climate Risks

- 15.3.18 The UKCP18 dataset provides probabilistic projections in 25 km grid squares. The primary geographical scope is the 25 km grid square in which the Development is located. However, regional and national trends from the UKCP18 overview report have also been considered as further context.

Inter-related Effects

- 15.3.19 The geographical scope for inter-related effects would be that of the individual impact pathways, as reported in the respective ES topic chapters.

Baseline Characterisation Approach

Existing Baseline

- 15.3.20 The approach to defining the baseline conditions within the study area for the assessment involved baseline data collection from desk-based research. Site surveys were not required, as set out below.

Desk Study

- 15.3.21 The baseline conditions for the study area were informed by a review of the following information sources:

- Embodied Carbon Benchmarks for European Buildings – OneClick LCA Ltd, (2021)²⁴;
- RIBA 2030: Climate Challenge – RIBA, (2021)²⁵;
- Embodied Carbon Primer – LETI, (no date)²⁶;
- UK Net Zero Carbon Buildings Standard (UKNZCBS); Pilot Version rev2 – UK NZBC, (2024)²⁷;
- National Energy Efficiency Data-Framework (NEED) – Department of Energy Security and Net Zero (DESNZ), (2025)²⁸;
- Climate Emergency Design Guide – LETI, (2021)²⁹;
- Non-domestic National Energy Efficiency Data Framework – DESNZ and the Department for Business, Energy and Industrial Strategy, (2025)³⁰;
- Census 2021: Travel to Work or Study – Office for National Statistics, (2021)³¹; and
- Greenhouse gas reporting: conversion factors 2025 – DESNZ, (2025)³².

Field Study

- 15.3.22 Surveys have not been undertaken as the desk-based study is deemed sufficient and appropriate for determining the baseline conditions on the Site and within the relevant study area.

Future Baseline

- 15.3.23 The future baseline conditions have been determined by a review of the following information sources:

- RIBA 2030: Climate Challenge – RIBA, (2021)²⁵;
- Embodied Carbon Primer – LETI, (no date)²⁶;
- UK Net Zero Carbon Buildings Standard; Pilot Version rev1 – UK NZBC, (2024)²⁷;
- Climate Emergency Design Guide – LETI, (2021)²⁹;
- Greenhouse gas reporting: conversion factors 2025 – DESNZ, (2025)³²;
- Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal – DESNZ, (2023)³³;
- UK Climate Projections User Interface - Met Office Hadley Centre (MOHC), (2025)³⁴;

- Setting Climate Commitments for St Albans – Jaise Kuriakose et al. (Tyndall Centre for Climate Change Research), (2025)ⁱ³⁵; and
- UKCP18 Science Overview Report - UKCP18 (2018)³⁶.

Assessment Method

15.3.24 A different assessment method has been used for each of the three ways in which climate change should be assessed in EIA, as defined by Schedule 4, paragraph 5(f) of the 2017 EIA Regulations. These are set out below.

GHG Emissions

15.3.25 In overview, GHG emissions have been estimated by applying published emissions factors and/or benchmark data to activities required for the Development. The emissions factors relate to a given level of activity, a physical or chemical process, or amount of fuel, energy or materials used to the mass of GHGs released as a consequence.

15.3.26 Further detail of the approach, data inputs, assumptions and boundaries of the calculations is given in Appendix 15.2: GHG Emission Calculations.

15.3.27 The GHGs considered in this assessment are those in the 'Kyoto basket'ⁱⁱ of global warming gases expressed as their CO₂-equivalent (CO₂e) global warming potential (GWP). GWPs used are typically the 100-year factors in the Intergovernmental Panel on Climate Change Sixth Assessment Report³⁷ or as otherwise defined in emissions factors and for national reporting under the United Nations Framework Convention on Climate Change (UNFCCC).

15.3.28 The main emissions sources within the boundary of the assessment comprise:

- The upfront 'embodied carbon' of materials used in construction;
- transport of materials to site and use of construction plant;
- operational energy consumption; and
- operational transport.

Climate Risks

15.3.29 A risk assessment matrix approach has been used to evaluate the potential impact of climatic hazards, consequence, likelihood and resulting risk profile to the Development. This has been informed by the UKGBC guidance 'A Framework for Measuring and Reporting of Climate-related Physical Risks to Built Assets'.

ⁱ The local carbon budget setting tool has been taken offline by Tyndall Centre for Climate Change Research, with the latest update dated June 2025, although its status page explains that the previously published data is still suitable for use. The Wayback Machine (<http://search.archive.org/>), has therefore been used to access an archived version of the local carbon budget setting tool, captured in June 2025. This is reflected in the URL noted in the reference list.

ⁱⁱ The 'Kyoto Basket' encompasses the following greenhouse gases: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), nitrogen trifluoride (NF₃), hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (SF₆).

- 15.3.30 The risk assessment is provided in Appendix 15.3, which defines the qualitative scales used to describe the probability and consequence of each hazard, and how the resulting risk score is determined.

Inter-Related Effects

- 15.3.31 The assessment has considered how impacts of the Development, in combination with the effects of climate change, may affect receptors throughout the construction phase and occupational lifetime.
- 15.3.32 There are two ways in which climate change could exacerbate or ameliorate the effects of the Development on sensitive receptors. Firstly, climate change could alter the sensitivity of receptors or the baseline environment, thereby increasing the significance of effects; and secondly, climate change could modify an impact pathway, i.e. by changing the magnitude or spatial extent and introducing new receptors.
- 15.3.33 The assessment is qualitative only and does not aim to be determinative of significance levels, which have been assessed in the applicable ES topic chapters; but identifies where there is the potential for inter-related effects to increase or decrease the significance of effects reported alone.
- 15.3.34 The potential avenues for inter-related effects are presented in Appendix 15.4.

Assessment Criteria

Sensitivity of Receptor

GHG Emissions

- 15.3.35 GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in tCO₂e, has therefore been treated as a single receptor of high sensitivity. It is considered to be of high sensitivity given the importance of the global climate as a receptor, the limited and decreasing capacity to absorb further GHG emissions without severe climate change resulting, and the cumulative contribution of GHG emission sources.

Climate Risks

- 15.3.36 Receptor sensitivity is not directly defined, but rather a range of risk consequences from 'minor' to 'severe' is used, the definitions of which are formulated with regard to the sensitivity of buildings, businesses and residents or workers to hazards. More detail is provided in Appendix 15.3.

Inter-Related Effects

- 15.3.37 As described above, climate change could alter the sensitivity of receptors or the baseline environment. Hence, receptor sensitivity is described qualitatively in Appendix 15.4.

Magnitude of Impact

GHG Emissions

- 15.3.38 As GHG emissions can be quantified directly and expressed based on their GWP, the magnitude of impact is reported numerically as tCO₂e rather than requiring a descriptive scale.

Climate Risks

15.3.39 The scale of risk is from 'very low' to 'very high'.

Inter-Related Effects

15.3.40 As described above, climate change could modify an impact pathway, i.e. by changing the magnitude or spatial extent and introducing new receptors. Hence, impact magnitude is described qualitatively in Appendix 15.4.

Assessing Significance

GHG Emissions

15.3.41 The ISEP assessment guidance for GHG emissions describes five levels of significance for emissions resulting from a development, each based on whether the GHG emission impact of the development will support or undermine a science-based 1.5°C compatible trajectory towards net zero.

15.3.42 To aid in considering whether effects are significant, the guidance recommends that GHG emissions should be contextualised against pre-determined carbon budgets, or applicable existing and emerging policy and performance standards where a budget is not available or not meaningfully applicable at the scale of development assessed. It is a matter of professional judgement to integrate these sources of evidence and evaluate them to determine significance.

15.3.43 Taking the guidance into account, the following have been considered in contextualising the Development's GHG emissions:

- the magnitude of net GHG emissions in construction and operation as a percentage of national and local carbon budgets;
- the GHG emissions intensity of the Development at lifecycle stages A1-A5 (materials and products manufacturing, transport to site, and installation) relative to business-as-usual and good-practice performance benchmarks;
- the GHG emissions intensity of the Development's operational energy use relative to business-as-usual and good-practice performance benchmarks; and
- whether the Development contributes to, and is in line with, the applicable UK policy for GHG emissions reductions, where this policy is consistent with science-based commitments to limit global climate change to an internationally-agreed level (as determined by the UK's current Nationally Determined Contribution under the UNFCCC).

15.3.44 Effects from GHG emissions are described in this chapter as adverse, negligible or beneficial based on the following definitions, which closely follow the examples in Box 3 of the ISEP guidance.

- **Major Adverse:** the Development's GHG impacts would not be compatible with the UK's net zero trajectory. Its GHG impacts would not be mitigated, or may be compliant only with do-minimum standards set through regulation. The development would not provide further emissions reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.

- **Moderate Adverse:** the development's GHG impacts would not be fully compatible with the UK's net zero trajectory. Its GHG impacts would be partially mitigated and may partially meet the applicable existing and emerging policy requirements, but it would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.
- **Minor Adverse:** the proposed development's GHG impacts would be compatible with the UK's 1.5°C-aligned trajectory and would be fully consistent with up-to-date policy and good practice emissions reduction measures. The proposed development may have residual emissions, but these are substantially reduced. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.
- **Negligible:** the proposed development would achieve emissions mitigation that goes well beyond existing and emerging policy compatible with the 1.5°C-aligned trajectory, 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 residual emissions.
- **Beneficial:** the proposed development would result in emissions reductions from the atmosphere, whether directly or indirectly, compared to the without-project baseline. As such, the net GHG emissions would be below zero. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

15.3.45 Major and moderate adverse effects and beneficial effects are considered to be significant.

15.3.46 Minor adverse and negligible effects are considered to be not significant.

Climate Risks

15.3.47 Risk ratings greater than 'moderate' have been considered to be significant.

Inter-Related Effects

15.3.48 As described above, the assessment of inter-related effects is qualitative only and does not aim to be determinative of significance levels.

Assumptions and Limitations

15.3.49 There are two main limitations to the assessment. Firstly, the Development is subject to an outline planning application with all matters except for access reserved, and hence is at an early parameters-based stage of design. The assessment has therefore used broad and conservative assumptions for a 'business-as-usual' case to estimate the magnitude of GHG emission impacts prior to further mitigation that could be specified at the detailed design stage. At this outline stage, it is not possible for the Applicant to confirm specific additional mitigation measures and accordingly the recommendations are presented as general principles.

15.3.50 Secondly, both the GHG impacts and the climatic risks to the Development over its life could change depending on the global warming trajectory that eventuates and on adaptation or mitigation at a national level, e.g. decarbonisation of energy supplies and transport. The assessment has used climate projections based on present-day knowledge. The climate projections used provide a probabilistic range of data which allows for known uncertainties. With regard to GHG emissions, present-day emission factors in Defra and DESNZ guidance

have been used, which represents a conservative position given the expected decarbonisation over time, but future projections have also been considered where available.

15.4 Baseline Conditions

Existing Baseline

- 15.4.1 With regard to GHG emissions, the Site's existing use is agricultural fields, a low intensity source of direct and indirect GHG emissions and sequestration per hectare, compared to other industrial land uses. The Site is not a significant carbon store, with no peat deposits or large woodlands, and thus disturbance through the Development is expected to be minimal.
- 15.4.2 With regard to current climate, the baseline is the local and regional climate and resulting weather patterns recorded in Met Office data. This is in the context, however, of trends in global climate changes affecting the UK climate, which at their present rates may be considered part of the known baseline. The change in baseline over time with climate change is set out in Appendix 15.3.

Future Baseline

- 15.4.3 The future baseline for GHG emissions in the absence of the Development, is assumed to be the continuation of agricultural land use, which would remain both a minor source of GHG emissions and a small stock of soil and vegetation carbon in the future baseline if the Development did not take place. Carbon intensities within the UK are expected to decrease over time, through UK decarbonisation efforts e.g. decarbonisation of fuel for machinery.
- 15.4.4 The potential future baseline for climatic conditions is shown in the probabilistic climate change projections set out in Appendix 15.3. This changing baseline will also affect the future baseline for other receptors, particularly the water environment, ecological receptors and landscape receptors, which is an inter-related effect of climate change. The future baseline with consideration of a changing climate is set out in the respective topic chapters of the ES and the potential avenues of inter-related effects are considered in Appendix 15.4.

Summary of Receptors and Sensitivity

- 15.4.5 As described above, with respect to the assessment of GHG emissions, the global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in tCO₂e, has therefore been treated as a single receptor of high sensitivity. In the assessment of climate risks and inter-related effects, the sensitivity of receptor is described qualitatively in Appendices 15.3 and 15.4, respectively.

15.5 Embedded Mitigation (Scheme Design and Management)

- 15.5.1 Table 15.2 summarises the embedded mitigation measures that have been accounted for within this assessment. As set out in Chapter 3: EIA Methodology, and in line with ISEP guidance, this includes both primary and tertiary mitigation measures.

Table 15.2: Summary of Embedded Mitigation

Embedded Mitigation Measure	Description	How Secured
<i>Construction Stage</i>		
CEMP	The Construction Environmental Management Plan (CEMP) will include measures that will help to reduce the GHG impacts of construction activity on-site, through use of well-maintained plant, optimisation of construction methods and material use, retaining excavated material within the development area, and implementing best practice waste management.	Planning Condition
CEMP	For construction workers' welfare, the following good-practice measures drawn from HSE guidance³⁸, will be incorporated into the detailed CEMP. Cold Environments • Ensure the personal protective equipment issued is appropriate • Provide mobile facilities for warming up, and soup or hot drinks • Introduce more frequent rest breaks • Consider delaying the work until warmer times of the year without compromising on safety • Make sure workers can recognise the early symptoms of cold stress, such as a cough or body aches Hot Environments • Reschedule work to cooler times of the day where needed • Provide more frequent rest breaks and introduce shading to rest areas • Provide free access to cool drinking water • Introduce shading in areas where people are working • Encourage workers to remove personal protective equipment when resting to help encourage heat loss • Make sure workers can recognise the early symptoms of heat stress.	Planning Condition
<i>Completed Development</i>		
Energy Strategy	As noted in the Energy and Sustainability Statement, the energy strategy for the Development expects to adopt the Future Homes Standard (FHS) under forthcoming Building	Planning condition / Building Regulations

Embedded Mitigation Measure	Description	How Secured
	Regulations updates. The FHS is the future national requirement for 'net zero-ready' buildings, focusing on integrating low-carbon heating systems, enhancing energy efficiency, and improving building fabric performance.	
Embedded transport mitigation	The Development will deliver a number of embedded measures which will reduce operational transport emissions, as set out in Chapter 9: Transport and Access. These comprise: • Delivery of a Sustainable Transport Corridor which extends between Leighton Buzzard Road to the west and Breakspear Way (and beyond) to the south. Through the Site, the STC alignment crosses in a north-south direction, continuing south towards East Hemel crossing Hemel Hempstead Road. • A wider bus strategy is being developed for the HGC and will be supported by the Site. This will include a new Orbital bus route through the HGC as well as improvements to existing bus services. • It is proposed to close the existing junctions to Holtsmere End Lane and Cherry Tree Lane to motorised traffic, which will become part of the Green Loop. The Green Loop will be an active travel route that allows continuous access through the wider HGC. • Retention and integration of existing PRowS crossing the Site, and appropriate connections. The Development would also deliver walking routes as part of the SANG / Community Park. • An integrated Mobility Hub with facilities to encourage and facilitate modes of transport other than the private car will be delivered close to the local centre. • Details of active travel interventions are to be agreed but will focus on improved connections along B487 Redbourn Road towards Hemel Hempstead town centre.	Included within the Site and extension beyond to be safeguarded / S106 contributions

Embedded Mitigation Measure	Description	How Secured
	The above measures will connect the Development with proposed local employment uses and supporting infrastructure which could reduce private car journeys from the Development.	

15.6 Assessment of Effects – Construction

GHG Emissions

Impact Magnitude

- 15.6.1 The construction phase will involve earthworks to prepare the Site levels, other civils work, construction of buildings, roads and utilities, and planting of landscaping. Construction of the Development will cause direct and indirect GHG emissions from the fuel and energy used by construction plant and in the ‘embodied carbon’ of materials used. The embodied carbon refers to the indirect emissions in the supply chain for those materials: extracting and transporting the raw materials, manufacturing them into products, and delivery of those products to Site.
- 15.6.2 Landscaping is likely to involve a mixture of habitat creation, including grassland and scrub and some areas of tree planting. While the tree planting in particular has the potential to provide some carbon sequestration over the lifetime of the Development, the area of planting is not such that this would be material to the overall carbon balance, so it has not been assessed further.
- 15.6.3 At this early stage of masterplan design for the Site, with an outline application being made on a parameters basis, no detailed bill of quantities of materials is established. Construction-stage GHG emissions have therefore been estimated conservatively from published benchmarks for development of this type. Where the benchmarks reflect ‘business as usual’ (BAU) construction practice, the potential for further mitigation has also been considered in the Additional Mitigation, Monitoring and Residual Effects section. Details of the benchmark values and GHG emission calculations are given in Appendix 15.2: GHG Emission Calculations.
- 15.6.4 An indicative schedule of some construction materials has been provided in Chapter 6: Construction. As a cross-check, embodied carbon also has been estimated based on these material quantities using factors from the ICE Database³⁹ and compared to the floorspace benchmark-based construction stage GHG emissions estimates used in the assessment. This cross-check showed that the embodied carbon of the materials listed in Chapter 6 falls within the total estimated using the benchmarks-based approach.
- 15.6.5 Construction traffic has not been separately assessed. The phased nature of the Development means that there would be a mixture of construction and operational traffic generation in each year until full completion. The construction traffic predicted by the transport specialists is much lower than the operational traffic. Given the overlapping phases of construction and occupation, the construction traffic has been added to the

operational traffic (assessed in the next section) to provide a simple, combined maximum case for traffic-related GHG emissions.

- 15.6.6 The total estimated construction-stage GHG emissions with a BAU design would be: **112,280 tCO₂e** for the residential component of the Development, including the residential and specialist accommodation for older people, **965 tCO₂e** for the local centre and **2,363 tCO₂e** for the primary school. Together, these components give a combined total of **115,608 tCO₂e** for the construction-stage GHG emissions.

Significance of Effect

- 15.6.7 Paragraph 15.3.43 defined three ways in which GHG impact magnitude could be contextualised to aid in determining significance of effects: as a percentage of local carbon budgets; by comparison to benchmarked emissions intensity; and with reference to whether the impact is in line with national net zero- and Paris Agreement-compatible policy goals for carbon reduction.
- 15.6.8 The existing total GHG emissions baseline in SADC in 2023 (the latest year available) was 826,144 tCO₂e, or 454,410 tCO₂e if excluding sources considered to be outside the local authority's influence (see Appendix 15.2 for further details). The construction-stage GHG emissions (divided over 13 years from 2028/29 to 2041) would be equivalent to 1.1% of the present-day baseline annual emissions in the local authority area, or 2% of the present-day total baseline annual emissions under SADC's influence.
- 15.6.9 The Tyndall Centre for Climate Change Researchⁱ has recommended national and local authority-specific carbon budgets up to 2100 that, in its research, are considered to be an equitable distribution and compatible with a 1.5°C-aligned trajectory for the UK. The Tyndall Centre carbon budgets are more stringent than the UK national budgets (as advised by the Climate Change Committee): the budget for St Albans would result in achieving near zero carbonⁱⁱⁱ no later than 2040.
- 15.6.10 The recommended future carbon budget for SADC is approximately 1,280,000 tCO₂ in total for the construction period 2028/29-2041. The total construction-stage GHG emissions would be equivalent to 9% of this budget.
- 15.6.11 While the UK national carbon budgets do not provide a useful scale of context for individual development emissions, the trajectory of GHG reductions towards the UK's net zero goal that they define is relevant: the Fourth Carbon Budget (2023-27) and Fifth Carbon Budget (2028-32) require a 23% and 32% national reduction respectively compared to the baseline period of the Third Carbon Budget (2018-22). On the assumption of a business-as-usual approach, the Development may not include measures to reduce its construction-stage impacts in line with this trajectory.
- 15.6.12 Embodied carbon is not included and hence not controlled by the expected forthcoming Future Homes Standard of the Building Regulations. National and local policy and expert guidance, referenced at the start of this chapter (and within Appendix 15.1), requires "*radical reductions in GHG emissions*" in the UK economy and built environment. Advice from the

ⁱⁱⁱ The Tyndall Centre defines zero or near zero carbon as achieving CO₂ levels >96% lower than in the Paris Agreement reference year of 2015, excluding non-CO₂ GHGs and aviation and shipping emissions. The carbon budgets are for energy-related CO₂ emissions only.

Climate Change Committee is that that buildings remain the UK's second-highest emitting sector and there is a need for a significant increase in the pace of emission reductions and on-the-ground delivery of policy measures to achieve the UK's net zero emissions. With an assumed business-as-usual approach, absent further mitigation, this would not be achieved by the Development during its construction phase.

- 15.6.13 Taking these contextual factors into consideration, and in line with the significance of effect definitions set out in paragraph 15.3.44 and the high sensitivity of the receptor, it is judged that the embodied carbon of the Development could have a **major adverse** effect that is **significant**, prior to additional mitigation.
- 15.6.14 This reflects the outline planning application stage, by the nature of which, committed mitigation is not yet secured in detail. Evidence-based performance targets that could be adopted for mitigating construction-stage GHG impacts have been developed and are emerging from bodies such as RIBA, LETI and the UKGBC. These are discussed in the Additional Mitigation, Monitoring and Residual Effects section below.

Climate Risks

- 15.6.15 The construction phase is expected to be from 2028/29 to 2041, i.e. extending for a little over a decade. Climate change in the UK is ongoing but conditions in the near future, during the early construction period, are not likely to differ substantially to those encountered at present. Greater change may become apparent towards the end of the construction period and risks have been considered on that basis.
- 15.6.16 As discussed in the assessment approach section, and detailed in Appendix 15.3, the climate risk assessment uses a matrix of the probability of hazard occurrence and the severity of consequence to estimate risk, with risk ratings of moderate or greater considered to be significant. Magnitude of impact and sensitivity of receptor are therefore not separately defined in this section.
- 15.6.17 Potential climatic risks during the construction period are to the workforce, for example in summer 'heatwave' conditions with high peak temperatures, to the public from increased risk of construction dust in drought conditions, and also the risk of programme disruption, for example where snow / ice, high wind or flooding and waterlogged ground can prevent certain construction works. These risks are also typical of the existing climate, and it is considered that construction contractors are routinely adapted to them, including by managing construction workforce safety as required under the Health and Safety at Work Act 1974. Committed mitigation measures, based on HSE guidance, will be controlled through the CEMP.
- 15.6.18 Climate risks during the construction phase are therefore judged to be **low** and **not significant**.

Additional Mitigation, Monitoring and Residual Effects

- 15.6.19 A significant adverse effect from construction GHG emissions has been predicted prior to further mitigation. The following sections give a broad overview of principles and good-practice mitigation measures which potentially could be adopted to reduce the impact.
- 15.6.20 These measures identify sources of good practice from industry guidance and are also intended to indicate, at a high level, how the Development could align with Policy CE1 –

Promoting Sustainable Design, Construction and Building of the Draft St Albans District Council Local Plan 2041. Policy CE1 is discussed fully in Appendix 15.1 but in summary includes requirements for new buildings to be designed and constructed to ensure efficient use of energy, water and materials and provide evidence of sustainable design and a high degree of resource efficiency, including the use of low-carbon materials.

- 15.6.21 However, at this outline stage, it is not possible for the Applicant to confirm specific additional mitigation measures. Examples of mitigation measures which could be explored at a later reserved matters and detailed design stage are set out below.

Construction Carbon Targets

- 15.6.22 To mitigate embodied carbon impacts, a recognised framework could be used to set an appropriate emissions intensity target, to guide design, procurement and construction decisions accordingly, and to monitor and report on its achievement. Performance targets and management / monitoring frameworks to achieve these could be reviewed during detailed design to establish the appropriate good practice target to meet (see Appendix 15.2 for further details)

Construction Carbon Mitigation Measures

- 15.6.23 Embodied carbon emissions could be reduced by using the following good practice principles and examples. Appropriate and feasible measures would need to be determined during detailed design, and not all examples suggested at this stage may be feasible or the optimum solution.

Specify materials with low embodied carbon intensities

- Use verified Environmental Product Declarations and engage with or require the design and construction contractor to engage with tier one suppliers for the main materials and major engineered components to procure lower-carbon products.
- Identify 'big-ticket' items, in terms of embodied carbon (e.g. foundations and superstructure) and evaluate the use of alternative materials (e.g. using concrete with a high cement replacement content or substituting the use of carbon intensive concrete and steel with a timber-framed structure).
- For concrete, consider substitution of a lower-carbon material in place of the carbon-intensive ordinary Portland cement, with cement substitution by low-carbon waste materials such as ground granulated blast-furnace slag or pulverised fuel ash (GGBS or PFA).
- For steel, specify 'green steel' where possible. Green steel can be defined as that which is made from 100% recycled steel, made in an electric arc furnace powered via 100% renewable energy.
- Consider the whole life carbon implications of material substitutes. In certain cases, materials with an initial higher embodied carbon content may be an optimal solution when considering the implications of durability, adaptability and operational energy use.

Regenerative design

- Specify building materials that have the capacity to remove CO₂ from the atmosphere (e.g. specify concrete with high carbonation potential or use of structural timber,

thereby sequestering carbon within the structure over the course of the development's lifetime).

- Where appropriate (depending on structural requirements), make use of framing in engineered timber (cross laminated timber (CLT), glulam and laminated veneer lumber (LVL)) or lightweight timber stud walls that are sustainably sourced, as verified by means of a Forest Stewardship Council or Programme for the Endorsement of Forest certification, for example.
- Where appropriate, make use of wall panels with a timber carcass, oriented strand board (OSB) sheathing and hempcrete or and natural fibre insulation.

Source local building materials

- Sourcing bulk materials locally where possible to reduce transport GHG emissions.

15.6.24 It is important that the embodied carbon implications of the design are considered in parallel with the operational energy use related emissions and with a view to maintenance requirements, in order to optimise GHG emissions across the duration of the Development's expected lifetime. For example, whilst designing more lightweight buildings (e.g. by using timber frames in place of masonry) may reduce the embodied carbon associated with construction, the reduced thermal mass of the buildings may have negative implications for operational energy use.

Roles and responsibilities

15.6.25 PAS2080 and associated guidance from the ICE⁴⁰ and the CLC⁴¹ provide a helpful structure for roles and responsibilities at each project stage. While these standards and guidance are applicable to infrastructure developments, the structure of roles and responsibilities is considered to be useful and relevant to major developments of any type. These standards and guidance cover responsibilities of the developer and designers to:

- Take account of whole-life carbon in decision-making and procurement; apply the carbon reduction hierarchy (avoid/switch/improve);
- Set a clear carbon vision, leadership and initial carbon reduction target for the works; and
- Not over-constrain the design specification too early, which may limit carbon reduction and innovation opportunities.

15.6.26 When appointing a design and construction contractor, or an internal delivery team, their carbon management policies could also be considered a factor within the decision-making process of appointment.

15.7 Residual Effects

15.7.1 With implementation of additional mitigation during detailed design, the Development's GHG effects could be reduced. However, given the outline nature of the scheme and the

principles-based approach to additional mitigation, the residual effects conclusion remains **major adverse and significant**^{iv}.

- 15.7.2 No additional mitigation is considered to be required to mitigate construction-stage climate risks (managed under existing HSE guidance), so the residual effect would remain **low** and **not significant**.

15.8 Assessment of Effects – Completed Development

GHG Emissions

Impact Magnitude

- 15.8.1 Operation of the Development will cause direct and indirect GHG emissions due to the use of electricity within the buildings and combustion of fuel from the additional road traffic generated by the Development. These will largely occur outside the Site boundary, and although a number of key aspects of development design can strongly influence these emissions, it is also acknowledged that demand for residential developments means these emissions may also occur at an alternative site without the Development. Nevertheless, being a consequence of operational use of the Development, these are included in the assessment.
- 15.8.2 There could also be embodied carbon from maintenance and refurbishment work during the buildings' lifetime. This would be dependent on resident choices and is difficult to estimate at an outline planning stage. Given the expected UK trajectory of decarbonisation to 2050, future maintenance and refurbishment is likely to have substantially lower carbon intensity than the initial construction stage (assessed above), so has not been separately estimated in this assessment.
- 15.8.3 Details of the GHG emission calculations are given in Appendix 15.2: GHG Emission Calculations.
- 15.8.4 The operational emissions from grid-supplied energy consumption would equate to **3,254–864 tCO₂e/annum** using present-day or projected first year of full operation (2041) emission factors, respectively. This can be broken down into the different proposed use classes, shown in Table 15.3 below.

^{iv} At this outline application stage, it is not possible to commit to the exact mitigation measures for the Proposed Development as the detailed design work has not been undertaken. The Outline Energy and Sustainability Statement sets out principles on how the Proposed Development will seek to incorporate sustainable design and mitigate the impact of climate change in accordance with emerging local plan policies CE1, CE2 and SP2 in the Draft St Albans District Council Local Plan 2041^{Error! Bookmark not defined.}. These policies remain in draft and only form one part of the policy and evidential context that has been used in judging the significance of effects. The Statement explains that the details on the exact proposed mitigation measures will be provided as part of subsequent RMAs. If the Development were to be considered against the current adopted development plan, City and District of St Albans District Local Plan Review 1994 (Adopted 30 November 1994), Saved and Deleted Policies Version (July 2020)¹⁷, which makes no reference to climate change, then climate change effects (including embodied carbon) would not be regarded as a matter of significance in policy terms. Where appropriate, the effects would be reconsidered against the Draft SADC Local Plan if adopted during the outline determination period.

Table 15.3: Operational-stage GHG emissions

Use	Present day tCO ₂ e	Projected first full year of operation tCO ₂ e
Residential dwellings	3,006	798
Residential and specialist accommodation for older people	142	38
Local centre	32	8
Primary school	74	20
Total	3,254	864

15.8.5 Chapter 9: Transport and Access provides annual average daily trip (AADT) generation figures for the Development. These have been multiplied up to an annual total on a conservative (maximum-case) basis assuming 365 days of annual vehicle trips and construction traffic, based on a 5.5 day working week, has also been added to account for the overlap in phases.

15.8.6 The assessment of GHG emissions from transport has focused on commuting emissions from private car trips, and does not further assess emissions associated with modal shift to bus use. It therefore presents a conservative scenario. A commuting distance of 15.5 km (based on census data⁴²) has been used for private car commuting and a 50 km haul distance has been assumed for HGV journeys, given the Site's proximity to urban centres. Total transport emissions are estimated to be **5,191 tCO₂e/annum**. This is based conservatively on present-day emissions factors, and may become lower over the Development's lifetime, particularly with the expected phase out of new petrol and diesel light vehicle sales in the 2030s.

Significance of Effect

15.8.7 Paragraph 15.3.43 defined three ways in which GHG impact magnitude could be contextualised to aid in determining significance of effects: as a percentage of local carbon budgets; by comparison to benchmarked emissions intensity; and with reference to whether the impact is in line with national net zero- and Paris Agreement-compatible policy goals for carbon reduction

15.8.8 The existing total GHG emissions baseline in 2023 in SADC (see Appendix 15.2) for the domestic sector is estimated to be 190,336 tCO₂e/annum, for the commercial sector is 51,169 tCO₂e/annum, for the public sector is 16,264 tCO₂e/annum and for the transport sector is 493,356 tCO₂e/annum. The total local authority area emissions are greater at 826,144 tCO₂e/annum, or 454,410 tCO₂/annum if excluding sources considered to be outside of the authority's influence.

15.8.9 As discussed above, the estimated GHG emissions from energy use in operation are 3,254 – 864 tCO₂e/annum, using present-day and opening-year emissions factors, respectively. This is equivalent to 0.8% – 0.2% of the total present-day baseline annual SADC's emissions, or 1.4% – 0.4% of the total emissions under SADC's influence.

15.8.10 The Tyndall Centre for Climate Change Research recommended future carbon budget for SADC is approximately 40,000 tCO₂e/annum during the period 2038-2042. The GHG

emissions impact of operational energy use would be equivalent to 16.0% of this budget using present-day emission factors, or 4.2% of this budget if using future-year emissions factors.

- 15.8.11 With regard to comparison to performance benchmarks, at this outline planning stage prior to detailed design and energy strategy, conservative benchmark values have been used for the assessment. As such, the evidence available at this stage does not indicate that the Development would achieve better performance than business-as-usual benchmarks.
- 15.8.12 With regard to policy measures for emissions reduction, it is understood that the Development would seek to adopt the Future Homes Standard as expected to be required by forthcoming Building Regulations changes and be 'net zero ready', through passive design measures and energy efficient fabric performance, as noted in the Energy and Sustainability Statement. Also with reference to the Energy and Sustainability Statement, it is also understood that the Development will seek to use electricity for regulated and unregulated energy demand, heat pumps or communal heating systems for heating and hot water systems, as well as roof-mounted solar photovoltaic renewable energy systems.
- 15.8.13 These measures would offer GHG emissions reductions compared to gas-fired heating and enable the Development to benefit from expected future reductions in the carbon intensity of electricity supply. The incorporation of renewable energy sources will also reduce carbon emissions, meaning there is potential for buildings to achieve net-zero operational energy emissions as the national grid decarbonises.
- 15.8.14 With the above being said, as noted within the Energy and Sustainability Statement, the final measures to reduce energy use in line with local and national policy will be detailed as part of future subsequent reserved matters planning submissions. At this outline stage of design, the extent of measures to reduce energy use in line with local and national policy is not yet fixed.
- 15.8.15 Taking these contextual factors into consideration, and in line with the significance of effect definitions set out in paragraph 15.3.44 and the high sensitivity of the receptor, it is judged that the Development could have a **moderate adverse** effect from operational energy use that is **significant**.
- 15.8.16 The transport GHG emissions would be equivalent to 1.1% of the present-day baseline annual local authority area emissions in the transport sector, or 13.0% of the recommended total future carbon budget for St Albans in the opening year according to the Tyndall Centre budget, albeit this is a conservative position without making an assumption about potential transport decarbonisation.
- 15.8.17 The Development Site is located to form an extension to the urban area of Hemel Hempstead and incorporates local services for amenities (and education should the need for a primary school be progressed). This reduces the need for longer trips to access services and improves the feasibility of active transport options for residents. However, at this outline stage of design, typical road transport for commuting and other trips has been assumed for the assessment.
- 15.8.18 Taking these contextual factors into consideration, and in line with the significance of effect definitions set out in paragraph 15.3.44 and the high sensitivity of the receptor, it is judged

that the Development could have a **moderate adverse** effect from transport emissions that is **significant**, prior to further mitigation.

Climate Risks

15.8.19 Potential climatic risks to the buildings and residents of the Development have been assessed for the periods of 2030-59 and 2070-99 for a high global emissions scenario, for a maximum-case assessment.

15.8.20 The climate projections data show increased intensity in seasonal precipitation trends: precipitation is projected to increase during the wettest season and wettest month and decrease during the driest season. Precipitation is projected to increase during the driest month, however. Temperatures are anticipated to increase annually relative to the 1981-2010 baseline, both during the coldest and hottest seasons and months. Finally, humidity is also expected to increase during both the summer and winter, and hence the annual average will increase.

15.8.21 The main hazards considered potentially applicable are as follows:

- Pluvial flooding of Site or access;
- Overheating of buildings due to high temperatures;
- Decline in water resource supply or quality caused by drought;
- Structural damage caused by extreme storm and wind events, or heat stress leading to expansion and buckling;
- Disruption or storm damage to road network surrounding Site;
- Shrinking and swelling of soils due to excessive rainfall and drought cycles, leading to subsidence;
- Building fabric damage due to condensation/mould from increased humidity;
- Poorer indoor air quality from open windows/doors for ventilation during high temperatures;
- Increase in fuel poverty from increase in cooling demand; and
- Landscaping/habitat failure or increased watering or maintenance requirements.

15.8.22 Appendix 15.3 sets out the risk assessment matrix for these hazards, considering probability, consequence and the embedded mitigation.

15.8.23 The flood risk and adaptation of the Site in order to mitigate it is detailed in Chapter 12 of this ES. Of the remaining identified hazards, overheating of buildings affecting residents, pupils and employees in high temperature events, building damage in storm events and high temperatures, air quality degradation from dust, pollution, or wildfires, damp and water ingress issues associated with increased rainfall intensity, and (depending on soil type) soil shrinkage leading to subsidence were judged to potentially have a '**moderate**' risk, which is considered to be **significant** prior to further mitigation.

Additional Mitigation, Monitoring and Residual Effects

GHG Emissions from Energy Use

- 15.8.24 A potentially significant adverse effect from energy consumption has been predicted prior to additional mitigation. The following sections give a broad overview of principles and good-practice mitigation measures which could potentially be adopted to reduce this impact.
- 15.8.25 These measures identify sources of good practice from industry guidance and also indicate how the Development could align with Policy CE2 – Renewable and Low Carbon Energy of the Draft St Albans District Council Local Plan 2041. Policy CE2 is discussed fully in Appendix 15.1 but in summary includes a requirement for development proposals to demonstrate that the use of renewable or low carbon energy has been maximised.
- 15.8.26 The principles for this and technology options that could be feasible have been set out in the Energy and Sustainability Statement. At this outline stage, it is not possible for the Applicant to confirm specific additional mitigation measures and accordingly the recommendations are kept only to general principles which could be explored at reserved matters and detailed design stages.
- 15.8.27 Managing energy consumption and the source of supply is a fundamental element of reducing GHG emissions for a development of this nature. The Energy Strategy would be further detailed at reserved matters, to evaluate options that would be feasible to meet the on-site heat and power demand and energy use intensity (EUI) and GHG emissions reduction target for energy compared to a business-as-usual scenario. The energy hierarchy should be followed, i.e. 'Be Lean', 'Be Clean', 'Be Green'.
- 15.8.28 The following measures could strengthen operational energy performance and therefore should be explored at detailed design stages:
- Use of passive design strategies, including high-performance insulation, airtightness, solar shading, and natural ventilation to reduce heating and cooling loads;
 - Smart building systems to monitor and optimise energy use, including submetering, occupancy sensors, and automated controls;
 - Low-carbon heating systems such as air source or ground source heat pumps, with consideration for district heating viability;
 - Use of on-site renewable electricity generation, for example using solar PV panels;
 - Potential for battery storage systems to complement on-site renewable generation and improve energy resilience; and
 - Provision of guidance and engagement tools to support low-carbon behaviours and efficient energy use.

Transport

- 15.8.29 A potentially significant adverse effect due to GHG emissions from traffic generation has been predicted prior to further mitigation. It is recognised that residents' and visitors' travel and deliveries are not fully within the Applicant's direct control. Solutions through national measures around tightening vehicle emission standards and future bans on fossil-fuelled private car sales, as laid out under current policy, can be expected; however, this also relies

on provision of suitable supporting infrastructure such as EV charging at public and private sites such as the Development.

15.8.30 The Applicant has already made relevant commitments to minimise transport emissions which would be followed through at reserved matters and detailed design stage:

- Implementation of a Framework Travel Plan to achieve modal shift away from private cars.
- Provision of electric vehicle charging points for parking.
- Walking and cycling routes which are integrated into the site layout which connects with existing networks and public transport modes, with wayfinding signage and safe crossings to support uptake.
- Provision of secure and accessible cycle parking to encourage active travel.
- Engagement with local transport providers to explore opportunities for improved public transport access and service frequency to and from the site.

15.8.31 The 'Cumulative Test Dev Case' scenario in the transport modelling has shown that other local development providing employment uses and supporting infrastructure could further reduce private car journeys from the Development. This infrastructure could reduce two-way private car movements by around 380 per day as access to employment and services by non-car modes becomes more feasible and attractive, demonstrating some of the benefit that modal shift in a location well-related to such services could provide.

Climate Risks, Resilience and Adaptation

15.8.32 Flood risk and appropriate mitigation, with allowance for climate change, are detailed in Chapter 12 of this ES.

15.8.33 Of the remaining identified hazards that were assessed, overheating of buildings affecting residents, pupils and employees in high temperature events, building damage in storm events and high temperatures, air quality degradation from dust, pollution, or wildfires, damp and water ingress issues associated with increased rainfall intensity, and (depending on soil type) soil shrinkage leading to subsidence were judged to potentially have a 'moderate' risk, which is considered to be significant.

15.8.34 The primary mitigation for building structural risks is compliance with the Building Regulations, following appropriate geotechnical ground investigation, and with an appropriate engineering allowance as safety margin in designs. Specific additional mitigation cannot be determined at this outline planning stage, but it is recommended that future climatic conditions using up-to-date UKCP18 projections data (or equivalent at the time) are specifically considered during detailed civil engineering and architectural design.

15.8.35 Overheating of buildings and the subsequent impact to residents should be managed through passive design measures (i.e. consideration of building fabric, glazing and solar gain) and where necessary by a mechanical ventilation system. It is recommended that during detailed design, future temperature conditions are considered in specifying the above factors using up-to-date UKCP18 projections data (or equivalent at the time).

15.8.36 Dynamic thermal modelling in line with CIBSE TM52 and TM59 should be employed to predict thermal comfort, overheating risk, and guide the specification of building fabric, glazing and ventilation to manage this. Further good practice mitigation includes:

- Dynamic thermal modelling to assess overheating risk under future climate scenarios;
- Orientation and shading strategies to reduce solar gain;
- Natural ventilation design that balances indoor air quality and thermal comfort;
- Use of reflective or permeable external materials to reduce urban heat island effects; and
- Landscape design that incorporates tree planting and green infrastructure to provide cooling and shading.

Residual Effects

15.8.37 With implementation of additional mitigation, the residual effect of operational energy use could be reduced. However, given the outline nature of the scheme and the principles-based approach to additional mitigation, the residual effects conclusion remains **moderate adverse** and **significant**.

15.8.38 GHG emission effects from traffic generation are only partially within the scope of what the developer can control or influence via additional mitigation. With full implementation of the additional mitigation on-site in combination with expected national transport decarbonisation trends (which the additional mitigation supports), the residual effect could be reduced to **minor adverse** and **not significant**.

15.8.39 With full implementation of the additional mitigation during detailed design, the Development's climate risk could be reduced to **low** and **not significant**.

15.9 Implications of Climate Change

15.9.1 Climate change could cause inter-related effects, in which it exacerbates or ameliorates the effects of the Development on sensitive receptors (i.e. the inter-related effects of climate change with other environmental impact pathways).

15.9.2 Inter-related effects are effects that interact spatially and/or temporally, resulting in multiple effects, or effects of a greater significance, upon a single receptor. The inter-related effects of climate change can be considered in two categories:

- Climate change altering the sensitivity of receptors or the baseline environment, thereby increasing the significance of effects; and
- Climate change modifying an impact pathway, i.e. by changing the magnitude or spatial extent or introducing new receptors.

15.9.3 These have been assessed within each technical chapter of the ES as applicable. Each author has considered the impact of climate change on the Development and adaptations to climate change, utilising the UKCP18 climate change projections, concluding as to whether potential climate change may alter the predicted effects, and if so, in what way.

15.9.4 The main areas where there is a potential for inter-related effects are considered to be:

- Landscape planting: increased temperatures and drought conditions, or increased soil erosion from extreme weather events, could cause landscape planting to fail;
- Ecology: changing weather patterns could affect the distribution of habitat and resources for a variety of species, increasing their sensitivity to impact;
- Air pollution and health: increased temperatures could lead to a greater sensitivity to episodes of poor air quality, e.g. for people with long-term respiratory or cardiovascular health conditions;
- Noise conditions: increased temperatures could lead to a greater sensitivity to noise due to open windows/doors for ventilation;
- Potable water supply: increased temperatures and drought conditions could reduce the resilience of potable water supply; and
- Transport network resilience: extreme weather events could reduce the resilience of the transport network to additional traffic generation.

15.9.5 The future climatic conditions and the potential nature of inter-related effects are discussed further in Appendix 15.4. Any increased significance of effects is identified in the respective topic chapters.

15.10 Cumulative Effects

15.10.1 All developments that emit GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a cumulative impact on climate change. Consequently, cumulative effects due to other specific local development projects are not predicted individually but are taken into account when considering the impact of the Development by defining the atmospheric mass of GHGs as a high sensitivity receptor.

15.10.2 Similarly, the cumulative effect of all other developments globally on predicted future climatic conditions, and hence the risk assessment and resilience/adaptation measures, has been taken into account through use of the RCP8.5 scenario in the probabilistic climate change projections (see Appendix 15.3), so a separate cumulative assessment is not required.

15.11 Summary

15.11.1 A summary of the residual effects is provided in Table 15.4.

Table 15.4: Summary of Residual Effects

Impact pathway	Receptor sensitivity	Description of potential impact	Additional mitigation and monitoring	Residual effect
<i>Construction Phase</i>				
Atmospheric concentration of GHGs (global climate)	High	Indirect GHG emissions from construction material use ('embodied carbon') and delivery, and direct emissions from on-site construction activity and land-use change with major adverse (significant) effect	Potential to consider use of embodied carbon performance targets and management / monitoring frameworks at reserved matters and detailed design stages.	Conservatively, remains major adverse (significant) at this stage prior to specific mitigation being confirmed at Reserved Matters
Construction programme and workforce	Up to high	Risks to the construction workforce health and safety, and to the construction programme, with some low (not significant) risks	Good-practice measures for workforce health and safety, drawn from HSE guidance, incorporated in the detailed CEMP.	Remains low (not significant)
<i>Completed Development</i>				
Atmospheric concentration of GHGs (global climate)	High	Indirect GHG emissions from energy consumption with moderate adverse (significant) effect	Potential to consider use of EUI and renewable energy targets together with management / monitoring frameworks at reserved matters and detailed design stages.	Conservatively, remains moderate adverse (significant) at this stage prior to specific mitigation being confirmed at Reserved Matters
	High	Indirect GHG emissions from traffic generation with moderate adverse (significant) effect	Provision of EV charging for all parking spaces (which may be above the current Part S minimum requirement) as future-proofing to enable higher EV uptake. Travel Plan with measures to encourage modal shift.	Could be reduced to minor adverse (not significant)

Impact pathway	Receptor sensitivity	Description of potential impact	Additional mitigation and monitoring	Residual effect
Development buildings and users (climate risks)	Up to high	Risks to the physical integrity of buildings and to health and wellbeing of residents with some moderate (significant) risks	Flood risk and drainage management (see FRA); consideration of orientation, glazing, shading and ventilation in design; water demand reduction (see as set out in the Energy and Sustainability Statement); geotechnical investigation, civil and architectural design in line with Building Regulations.	Could be reduced to low (not significant)

References

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