

7 CLIMATE CHANGE

Introduction

7.1 This Chapter focuses on both the impact of the Proposed Development (as defined in Chapter 2) on climate change (i.e. Greenhouse Gas (“GHG”) emissions associated with the Proposed Development) and the effects of climate change on the Proposed Development itself (i.e., climate change resilience and adaptation). As these are two separate but linked issues, this ES Chapter is split into two parts:

- Part A: Greenhouse Gas Emissions. This part of the ES Chapter reports an assessment of the likely significant effects of the proposed development on the global atmosphere through the emission of GHGs. It describes the assessment methodology; the baseline conditions; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. This section follows a traditional EIA approach whereby the significance of the effects is assessed. This assessment has been undertaken in line with the Institute of Sustainability and Environmental Professionals (“ISEP”¹) Guide to Assessing GHG Emissions and Evaluating their Significance 2nd Edition (2022); and,
- Part B: Climate Change Resilience Risk Assessment. This section sets out an assessment of the proposed development’s resilience and adaptation to climate change. This assessment follows a risk assessment approach, rather than a traditional assessment of effect significance. This assessment has been undertaken in line with the methodology advocated in the ISEP Guide to Climate Change Resilience and Adaptation 2nd Edition (2020).

7.2 GHGs include carbon dioxide, methane, ozone, nitrous oxide, Chlorofluorocarbons (CFCs) and water vapour. As GHGs vary in terms of their impact on climate change, a measure known as carbon dioxide equivalent (CO₂eq) is used to standardise the climate impact of different greenhouse gases. Throughout this Chapter, CO₂eq is used as a standard metric to enable us to compare the emissions from various GHGs.

7.3 This Chapter of the ES has been prepared by Ridge.

7.4 This Chapter is supported by the following figures and appendices:

¹ The ISEP is formerly known as the Institute of Environmental Management and Assessment (IEMA)

- Appendix 7.1: Ridge and Partners Embodied Carbon Concept Stage Summary Report

Legislative and Planning Policy Context

Legislation

- 7.5 The Climate Change Act 2008 committed the UK to an 80% reduction in carbon emissions relative to the levels in 1990, to be achieved by 2050. The UK Government set carbon budgets 1 to 5 to meet the 80% emission reduction target.
- 7.6 In June 2019, secondary legislation amended that target to require that the UK reduce all greenhouse gas emissions to net zero by 2050 relative to 1990 levels. In April 2021, the Government confirmed its intention to ratify 'The Sixth Carbon Budget' which effectively requires a 78% reduction in UK territorial emissions between 1990 and 2035.
- 7.7 Following the 21st United Nations Climate Change Conference (COP21) in 2015, the Paris Agreement was adopted. It is a legally binding international agreement on climate change. As part of the agreement, countries are required to submit a Nationally Determined Contribution (NDC) to set out the actions they will take to meet the goals of the agreement. In its NDC, the UK committed to reducing economy-wide greenhouse gas emissions by at least 68% by 2030, compared with 1990 levels. The UK's NDC is on the pathway to the 2050 net zero target.

National Planning Policy

National Planning Policy Framework

- 7.8 Section 14 of the National Planning Policy Framework (NPPF) specifically addresses the challenge of climate change. It states that '*...New development should be planned for in ways that:*
- a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and*
 - b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the government's policy for national technical standard Local Plan and supplementary guidance...'*

Local Planning Policy

Places for Everyone Joint Development Plan

- 7.9 The Places for Everyone Joint Development Plan (2024) contains the strategic planning policies for Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan. With respect to climate change and sustainability considerations, the following policies are included within the Places for Everyone Joint Development Plan are of relevance to the assessment.

Policy JP-S2: Carbon and Energy

- 7.10 This policy states that *'the aim of delivering a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures including:*

- Promoting the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy, heating and cooling;*
- Promoting the use of life cycle cost and carbon assessment tools to ensure the long-term impacts from development can be captured; and*
- Taking a positive approach to renewable and low carbon energy schemes, particularly schemes that are led by, or meet the needs of local communities;*
- Increasing the range of nature-based solutions including carbon sequestration through the restoration of peat-based habitats, woodland management, tree planting and natural flood management techniques'*

- 7.11 There is *'an expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable;*

Be net zero carbon which applies:

- From adoption – to regulated operational carbon emissions;*
- From 2028 – to all emissions 'in construction'.*

- 7.12 From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions. Development proposals should set out how this has achieved in an energy statement in accordance with the energy hierarchy, which in order of importance seeks to:

- a. *Minimise energy demand;*
- b. *Maximise energy efficiency;*
- c. *Use renewable energy;*
- d. *Use low carbon energy; and*
- e. *Utilise other energy sources.*

7.13 *From 2025 any residual carbon emissions that cannot be fully mitigated on-site should be offset, in agreement with the relevant local planning authority through a financial contribution to a carbon offset fund. As an interim measure, development should be consistent with the 2022 Part L Building Regulations unless superseded by changes to building regulations and/or national or local planning policies....'*

7.14 *Development will be expected to 'incorporate adequate electric vehicle charging points, in line with Part S of the Building Regulations, unless superseded by relevant Local Plan policies, to future proof for the likely long-term demand, taking account of the potential maximum energy demand for the site.'*

7.15 *Where practicable, development will be expected to 'prioritise connection to a renewable energy/heating/cooling network in the first instance or a low carbon energy/heating/cooling network that is adaptable to non-fossil fuels at a later date'.*

7.16 *Residential developments will be expected to 'achieve energy demand reductions in terms of space heat demand; hot water energy demand and the delivery of on-site renewable energy generation...'*

'For renewable energy generation priority should be given to PV installation where technically feasible, alternative technologies will be appropriate where the equivalent generation is evidenced. '

7.17 *Applications should 'include a detailed energy statement to demonstrate via site relevant evidence how the development has sought to maximise reductions in carbon emissions in line with relevant policy targets, including the minimisation of overheating risks and appropriate measures for post occupancy evaluation.*

Whole life cycle emissions should be considered where possible. Districts may set out specific carbon emission reduction and energy demand targets within Local Plans'.

Policy JP-S4: Flood Risk and the Water Environment

- 7.18 This policy states that *'Greater Manchester is located within a complex hydrological network that extends into surrounding districts and beyond. This means that individual areas cannot be viewed in isolation, as rainfall and activities in one place can have significant impacts on the water environment in other locations'.*

'Climate change is expected to significantly increase peak river flows and surface water run-off as a result of more intense rain events, potentially placing many more properties at risk in the future unless flood defences, drainage and run-off management are improved. A coordinated catchment-wide approach to all types of flood risk will be required to address these challenges and minimise potential harm to people and property, including actions upstream of Greater Manchester.'

'Sustainable Drainage System ("SuDS") schemes can provide appropriate solutions to addressing both flood risk and water quality issues and are mandatory for major development unless clear evidence indicates that they would be inappropriate. Development proposals should achieve greenfield run-off rates where possible, depending on site conditions. Alternative surface water discharge rates can be set out in district local plans to reflect local circumstances and evidence.'

'In addition to the general need to improve water quality, the Environment Agency has defined source protection zones for groundwater sources such as wells, boreholes and springs used for public drinking water supply. The control of potentially contaminating activities is particularly important in these locations.'

'It is important that water is conserved and efficiently used as much as possible to help build resilience to periods of drought; avoid over abstraction; reduce carbon emissions from water treatment and disposal; and protect river and wetland habitats from degradation. All new homes have to meet mandatory national standard set out in Building Regulations (of 125 litres/person/day). Where there is a clear local need, the government's Housing Optional Technical Standards paragraph 013 and 014 set out that local authorities may also consider tighter water efficiency requirements for new homes (110 litres a day) to help manage water demand.'

Policy JP-P1: Sustainable Places

- 7.19 This policy sets out *'key attributes that all developments wherever appropriate, should be consistent with'*. The list of key attributes includes:

- *'Resilient, capable of dealing with major environmental events';*
- *'Adaptable, able to respond easily to varied and changing needs and technologies';*
- *'Durable, being built to last and using robust materials that reflect local character, weather well and are easily maintained'; and*
- *'Resource efficient with:*
- *Low carbon Footprint*
- *Efficient use of land;*
- *Minimised use of new materials;*
- *High levels of recycling'*

Manchester Core Strategy

7.20 The Manchester Core Strategy (2012) is the Adopted Development Plan for Manchester City Council. With respect to climate change and sustainability considerations, the following policies are included within the Manchester Core Strategy (2012) although some elements of these have been superseded by the Places for Everyone Plan. Relevant extracts which are still valid are provided below.

Policy EN4: Reducing CO2 Emissions by Enabling Low & Zero Carbon Development

7.21 This policy sets out the following actions:

- *"Wherever possible new development and retrofit projects, including energy generation plant, must be located, and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.*
- *Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.*
- *Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/ or to incorporate provision to enable future connection to any existing/ potential decentralised energy schemes.*

- *The use of building material with low embodied carbon in new development and refurbishment schemes”.*

Policy EN5: Strategic Area for Low and Zero Carbon Decentralised Energy Infrastructure

- 7.22 This policy sets a requirement for key developments to consider being part of or providing an anchor to a new local energy network.

“Within specific strategic areas (including the Oxford Street corridor) new development, regeneration and retrofit projects, will be expected to take place in the context of more detailed proposals for decentralised low and zero carbon energy infrastructure in the form of energy proposals plans. The Council will work with all relevant stakeholders, which may include developers, landowners, residents, community groups, private sector partners, utilities companies, neighbouring authorities, and other public sector bodies, as appropriate, to bring forward such plans.

Where investment or development is being undertaken into or adjacent to a public building/asset or district heating network, full consideration shall be given to the potential role that these can have in providing an anchor load within a decentralised energy network or in creating opportunities for CO₂ reduction funded by contributions”.

Policy EN6: Target Framework for CO₂ Reductions from Low or Zero Carbon Energy Supplies

- 7.23 This policy did set a requirement for non-residential developments of over 1000m² to achieve a minimum performance target; however, this is now superseded by Policy JP-S2 in the Places for Everyone Plan.

- 7.24 The policy continues to require submission of *“an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the project regulated energy demand and associated CO₂ emissions for all phases of the development”.*

Policy EN8: Adaptation to Climate Change

- 7.25 This policy requires all new development *“to be adaptable to climate change in terms of the design, layout, sitting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, this is not an exhaustive list:*

- *Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways*

- *The need to control overheating of buildings through passive design*

Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO₂ mitigation under Policy EN6, subject to sufficient evidence to quantify their contribution to compliance".

Policy EN14: Flood Risk

7.26 This policy states that:

- *"In line with the risk-based sequential approach contained within PPS25, development should be directed away from sites at the greatest risk of flooding, and towards sites with little or no risk of flooding; this should take account of all sources of flooding identified in the Manchester-Salford-Trafford Strategic Flood Risk Assessment (SFRA).*
- *In addition to the requirements for site specific Flood Risk Assessments ("FRAs") set out in the PPS25, an appropriate FRA will also be required for all development proposals including changes of use, on sites greater than 0.5ha within Critical Drainage Areas (CDAs) and Canal Hazard Zones identified in the SFRA. .*
- *The City of Manchester contains many sections of rivers which are culverted or 'hidden'; where these are indicated in the SFRA beneath the proposed development site, further investigation will be required and the development proposal should take this into account; where feasible and appropriate development should seek to open up culverted/hidden rivers to reduce the associated flood risk and danger of collapse, taking advantage of opportunities to enhance biodiversity and Green Infrastructure."*

Relevant Guidance

ISEP (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance (2nd Edition)

7.27 This document is the key guidance for assessing the impact of a project on climate change. It reflects the 2019 amendment to the UK's legally binding Climate Change Act 2008 in response to the Paris Agreement, setting a new and challenging target to reduce UK GHG emissions to net zero by 2050, accounting for residual emissions which are offset. The guidance confirms that all emissions contribute to climate change, however specifically in the EIA context it provides relative significance descriptions to assist assessments. It sets out levels of significance which are not solely based on whether a project emits GHG emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero.

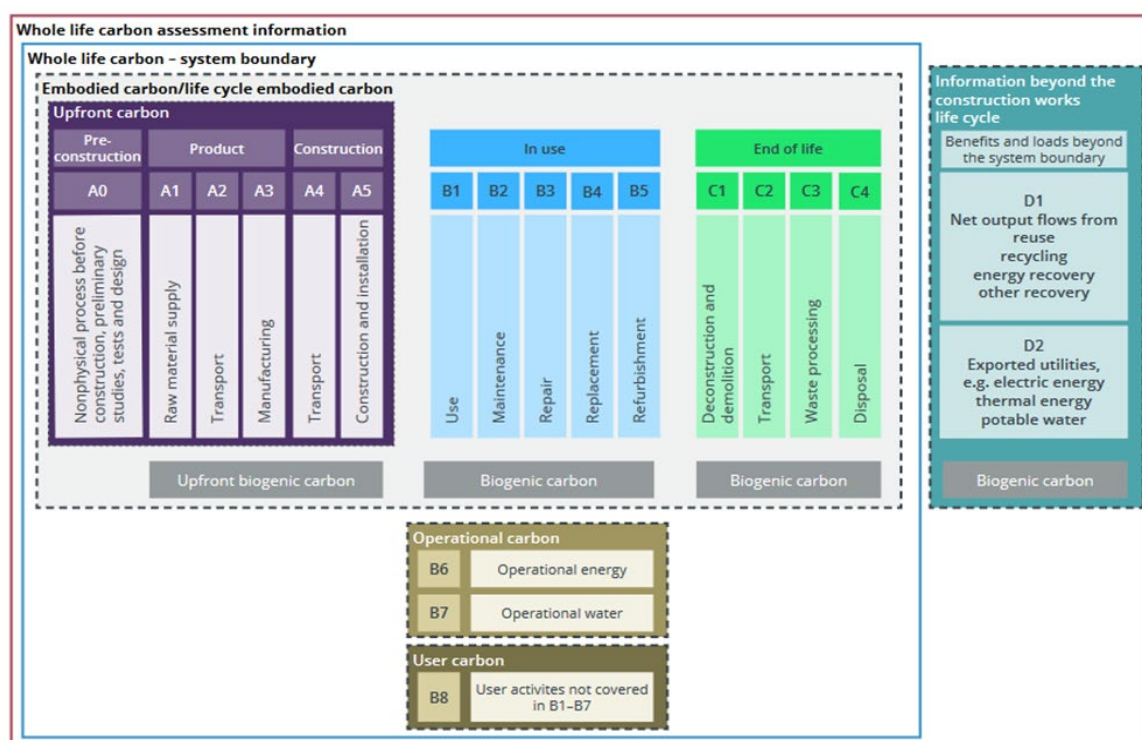
ISEP (2020) EIA Guide to: Climate Change Resilience & Adaptation

- 7.28 This document provides guidance for considering the vulnerability of a project to climate change (climate change resilience). It provides a framework for the effective consideration of climate change resilience and adaptation in the EIA process.

RICS (2024) Whole Life Carbon Assessment 2nd Edition, Version 3

- 7.29 The Royal Institute of Chartered Surveyors (RICS) have developed an approved technical methodology for 'assessing the carbon impacts from buildings and related infrastructure assets/civil engineering works throughout their life cycle', known as a Whole Life Carbon Assessment (WLCA). This standard sets out this methodology, which is recognised as a clear and consistent approach to WLCA.
- 7.30 The RICS standard requires WLCAs to follow a modular structure for carbon reporting, which breaks down the built asset's life cycle into stages and modules. Some modules are broken down further into submodules; these are explained in more detail in the relevant life cycle stage in section 5.
- 7.31 **Figure 7.1** sets out the stages and modular structure for WLCAs.

Figure 7.1 Taken from RICS (2024) - Building and infrastructure life cycle stages and information modules (adapted from EN 15978, EN 17472 and EN 15643, with additions to illustrate biogenic carbon)



RIBA (2021) RIBA 2030 Climate Challenge v2

- 7.32 The Royal Institute of British Architects (RIBA) have developed the RIBA 2030 Climate Challenge which sets out voluntary performance targets which set out a challenging path to achieve the reductions needed so that the UK building stock can achieve net zero carbon by 2050. The voluntary operational energy and water use and embodied carbon performance targets that are set out in the 2030 Climate Challenge have been developed by the RIBA consultation with experts across the industry. The targets consider the latest recommendations from the Green Construction Board and are aligned with other built environment professional bodies.
- 7.33 The RIBA 2030 Climate Challenge targets for residential buildings are shown in Table 7.1.

Table 7.1 RIBA 2030 Climate Challenge CO₂eq targets for residential buildings

RIBA Sustainable Outcomes Metrics	Business as Usual	2025 Targets	2030 Targets
Operational Energy kWh/m ² /y	120kWh/m ² /y	<60kWh/m ² /y	<35kWh/m ² /y
Embodied Carbon kgCO ₂ e/m ² (A1-A5, B1-B5, C1-C4)	1200kgCO ₂ e/m ²	<800kgCO ₂ e/m ²	<625 kgCO ₂ e/m ²

LETI (2020) Climate Emergency Design Guide

- 7.34 The Low Energy Transformation Initiative (LETI) is a voluntary network of built environment professionals, working together to put the UK and the planet on the path to a zero-carbon future. The LETI Climate Emergency Design Guide outlines how new buildings should be designed to ensure the UK's climate change targets are met. It covers five key areas: operational energy, embodied carbon, the future of heat, demand response and data disclosure. The Guide sets out requirements for four key building archetypes (small scale residential, medium/large scale residential, commercial offices, and schools).
- 7.35 The LETI targets for operational energy and embodied carbon, for small / medium / large scale housing are shown in Table 7.2 below.

Table 7.2 LETI Climate Emergency Design Guide Targets for Small / Medium & Large-Scale Housing

Metric	Target
Operational Energy kWh/m ² /y	35kWh/m ² /y
Embodied Carbon kgCO ₂ e/m ² (A1-A5, B1-B5, C1-C4)	<500kgCO ₂ e/m ²

UK Net Zero Carbon Building Standard Pilot Version

- 7.36 The pilot version of a new UK Net Zero Carbon Building Standard (UKNZCBS) was published in September 2024. This includes *"technical details on how a building should meet the Standard, including what limits and targets it needs to meet, the technical evidence needed to demonstrate this and how it should be reported. In the future, projects will be able to verify that a project conforms to the Standard"*.
- 7.37 The UKNCZBS includes specific limits for each year from 2025-2050 for upfront carbon and operational energy. The UKNZCBS also uses energy use intensity as a metric for operational energy (kWh/m²GIA/yr) and CO₂eq for upfront carbon.

Part A Greenhouse Gas Emissions**Assessment Methodology and Significance Criteria**

- 7.38 In accordance with EIA regulations Part A of this chapter addresses the impacts of the project on climate change, in line with ISEP (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance.

Identification of the Study Area

- 7.39 The study area for the assessment of the impact on climate change is the boundary of the Proposed Development (as defined in Chapter 2) but also encompasses relevant emissions arising outside of this boundary, including the embodied emissions associated with construction materials, and the emissions associated with the transportation of materials and workers to site and removal of waste from site.

Desk-based Data

- 7.40 The following information has been used to inform the assessment of GHG emissions:

- Cradle to Grave Embodied Carbon Calculations completed by Ridge and Partners (Sustainability Consultants) for the proposed buildings. These cover RICS stages A1-5, B1-5, C1-C4, as shown in Figure 7.1. As these relate to the carbon associated with the building materials which are fixed at construction stage, these have been used as the basis for determining the Enabling and Construction Phase effects.
- Operational Energy Calculations for the proposed buildings, completed by Civic (Building Services Engineers) for Alpha House and TACE (Building Services Engineers) for Brotherton House and C2 The Birtles. These form part of the basis for determining Operational Phase effects.
- Transport Assessments for Brotherton House and C2 The Birtles and a Transport Statement for Alpha House, completed by Curtins (Transport Engineers), considering movements to and from the proposed buildings once operational. These also form part of the basis for determining Operational Phase effects.

7.41 As set out in **Chapter 2: Assessment Scope and Methodology**, the Proposed Development consists of three full planning applications. However, there are still detailed elements of the design to be confirmed (as would typically be undertaken during RIBA Stages 3-4 and as part of construction stage design), and therefore there is insufficient detail to undertake a fully accurate Whole Life Carbon (WLC) assessment at this stage. However, in line with ISEP Guidance (2022) a reasonable worst-case approach has been taken.

Identification of Sensitive Receptors

7.42 As GHG emissions are not geographically limited and have a global effect rather than directly affecting any specific local receptor, the receptor for assessment of the impact of the project on climate change is the global atmosphere. The receptor is of high sensitivity, given the severe consequences of global climate change and the cumulative contributions of all GHG sources.

Characterisation of Effect

7.43 Magnitude will be determined in accordance with the below table which is based on the ISEP 2022 Guide and references the RIBA Climate Challenge v2 (2021).

7.44 Table 7.3 identifies how the magnitude of effect is determined for Greenhouse Gas Emissions.

Table 7.3 Impact on Climate Change Greenhouse Gas Emissions – Determining Magnitude

Magnitude of Impact	Criteria for assessing impact
Major Adverse	The 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 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 project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but 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 project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards 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 residual emissions.

Significance Criteria

- 7.45 The significance of an environmental impact is determined by the interaction of magnitude and sensitivity, whereby the impacts can be positive or negative. In addition, inherent design mitigation measures which are already being incorporated within the Proposed Development will be taken into account when determining significance.
- 7.46 Table 7.4 demonstrates how significance is determined, based on the receptor being of high sensitivity (i.e. the global climate) and is defined against magnitude of impact. Effects which are moderate or major magnitude are considered significant.

Table 7.4 Impact on Climate Change Greenhouse Gas Emissions – Significance Matrix

Magnitude	Significance
Major Beneficial	Significant
Moderate Beneficial	Significant
Minor Beneficial	Not Significant
Negligible	Not Significant
Minor Adverse	Not Significant
Moderate Adverse	Significant
Major Adverse	Significant

Assumptions/Limitations

7.47 The assessment is based on the information available for Brotherton House, C2 The Birtles and Alpha House. The data used to inform the assessment has come from various parties, including:

- TACE (Building Services Engineers for Brotherton House and C2 The Birtles)
- Civic (Building Services Engineers for Alpha House, and Civil & Structural Engineers for Brotherton House and C2 The Birtles)
- AJP (Civil & Structural Engineers for Alpha House)
- Feilden Clegg Bradley Studios (Architects for Brotherton House and C2 The Birtles)
- Levitt Bernstein (Architects for Alpha House)

7.48 The assessment is based on professional experience and undertaken using conservative assumptions.

Embodied Carbon Assessment

- 7.49 The assessment of embodied CO₂eq emissions is based on a 60-year life span for the Proposed Development in accordance with RICS Whole Life Carbon guidance.
- 7.50 The assessment of construction stage CO₂eq emissions has been based on assumptions to give a best estimate of the scheme's impact at this stage. The actual quantity of CO₂eq emissions is likely to be different to this as will vary depending on the final construction materials, construction methods etc., however the conclusions drawn in this report are likely to remain the same.
- 7.51 Assumptions were made to further supplement the information provided by the design team. These are based on reasonable industry standards and on our experience with similar building projects.
- 7.52 Transport impacts (Module A4) have been included in line with the RICS 'Whole Life Carbon' guidance.
- 7.53 Construction impacts (Module A5) have been included in line with assumed fuel usage and waste production values across the full construction period of the Proposed Development as follows:
- Site Waste: 6.5t per 100m² gross internal area based on BRE good practice site waste guidance (BREEAM New Construction v6, credit Wst 01).
 - Site Energy Use: 23.58kWh; 1.12l diesel and 0.05l petrol all per m² gross floor area (based on research conducted on construction site operations in temperate climatic regions, provided by One Click LCA software).
- 7.54 For concrete specifications, information provided by AJP and Civic for the likely strength, reinforcement and cement replacement rates have been used.
- 7.55 At this stage, high level allowances for mechanical and electrical installations have been made based on information provided by the design team, using 'typical' apartment building services package as reference to extrapolate across the whole design.
- 7.56 Information provided by the design team has been used to account for finishes, sanitaryware, fittings and furnishings across the Proposed Development. Non-fixed fittings, furnishings and equipment have been excluded from the assessment scope.

- 7.57 Where no Environmental Product Declaration (EPD) information or specific product references have been provided, generic UK EPDs have been selected matching the closest description to the materials detailed on the documents provided, with assumed recycled contents aligning with RICS 'Whole Life Carbon' Guidance.
- 7.58 Module B1 (Emissions in Use) has been accounted for using values for refrigerant charge provided by the design team. R32 and R1234ze have been included as the operational refrigerant types and annual / end-of life have been assumed as 2% and 1% respectively for package systems, and 6% and 3% respectively for VRF systems, in line with TM65 guidance.
- 7.59 Modules B2 (Maintenance) and B3 (Repair) have been assumed at 10kgCO₂eq/m² GIFA and 2.5kgCO₂eq/m² GIFA respectively, in accordance with GLA Whole Life carbon assessment methodology (London Plan Guidance: Whole Life Carbon Assessments).
- 7.60 Module B4 (Replacement) has been incorporated in the form of default product service lives for each material, based on RICS Whole Life Carbon guidance. For example, unitised curtain walling systems and internal finishes have an assumed expected lifespan of 35 years and 10 years respectively.
- 7.61 Module C1 (Deconstruction/ Demolition) has been assumed based on UK average demolition impacts relative to gross floor area, as provided by RICS / One Click LCA software.
- 7.62 Modules C2-C4 (Waste Transportation, Waste Processing & Waste Disposal) are assumed based on end-of-life processing chains relative to each material, as provided by One Click LCA software.

Operational Energy Assessment

- 7.63 Operational energy use intensity has been calculated for each plot using SAP calculations. Actual emissions are likely to be different to the estimations provided, depending on both detailed design and operational use of the buildings. It is not possible to fully understand, at this time, how energy use and emissions will vary, but it has been assumed that energy use will remain the same, year on year, throughout the assessment period.
- 7.64 Energy use has been estimated based on a number of assumptions, as follows:
- Cooking energy use- the calculations have allowed for 1 hour of electric cooking for every day in fan-forced convection oven: 0.61 kWh

- Occupancy - Living/Kitchen 08:00 until 23:00 (1 person in 1 bed apartments, 2 people in 2 bed apartments), Bedrooms 23:00 until 08:00 (2 people in 1 bed apartments, 2 people in bed 1 and 1 person in bed 2 for 2 bed apartments)
- Heating – panel heaters (21°C set point)
- Infiltration 0.05 based on an air permeability of 1
- Ventilation – Mechanical Ventilation with Heat Recovery (MVHR)
- Hot water- Dimplex Edel Hot Water Heat Pump (3.36 SCOP), 33 litres per person per day

7.65 Unregulated energy use has been calculated using the assumptions above, but could vary substantially when the Proposed Development is operational as this is based on actual use. It is therefore not possible to accurately predict this energy use at this stage in design.

Climate Resilience Assessment

7.66 The assessment of the impacts of climate change on the Proposed Development are based on a number of assumptions about the future effects of climate change. The climate change predictions used within the climate resilience assessment are based on the most recent UK Climate Projections published in 2018 (UKCP18) developed by the UK Climate Impacts Programme (UKCIP). These are based on the assumption of a high emissions scenario (worst case).

Assessment of Wider Development Project

7.67 Assessment of the wider development project has been scoped out as it is not possible to undertake a meaningful assessment at this stage. An assessment will be undertaken as the individual applications are made. It is assumed that the wider Development Project (i.e. within the wider Development Framework) will apply the same energy and carbon principles as individual applications come forward.

Baseline Conditions

7.68 In relation to Part A, the impact of the project on climate change, i.e. Greenhouse Gas (GHG) emissions, the baseline is a scenario whereby the Proposed Development does not proceed, and the site remains in its current condition. The combined area of the Proposed Development site and the wider DF area extends to 22.97 hectares (ha), which is bound by three key roads, Simonsway to the south, Poundswick Lane to the north and Brownley Road to the east. Manchester Enterprise Academy is located to the west, beyond which is

residential housing and the M56. Rowlands Way creates an additional north-south route through the eastern portion of the wider Development Project area, connecting Poundswick Lane and Simonsway.

- 7.69 The wider Wythenshawe development framework site currently accommodates a mix of low-rise buildings and associated infrastructure, some of which is proposed for demolition as part of this Proposed Development. The existing structures within the Proposed Development site are assumed to have limited energy efficiency and no significant low-carbon or renewable energy systems in place. As such, they form the baseline condition against which the GHG emissions of the Proposed Development are assessed.
- 7.70 In relation to the impact of the Proposed Development on climate change (i.e. CO₂eq emissions), the baseline scenario assumes the development does not proceed and the site remains in its current condition. The Proposed Development site comprises three plots: Brotherton House, a vacant office building with associated car parking and landscaping; C2 The Birtles, a disused mixed-use building with occasional market activity; and Alpha House, a former office building currently under demolition. While the buildings are largely inactive, there may be residual GHG emissions associated with infrastructure, demolition activity, and embodied carbon in existing structures. In the absence of detailed data on current emissions, it is assumed that baseline GHG emissions are negligible, representing a worst-case scenario for comparative assessment of the Proposed Development's impact.
- 7.71 The Proposed Development site is clearly accessible by sustainable modes of transport, which are also useable by those with limited mobility and are wheelchair accessible. The surrounding area exhibits very good levels of pedestrian and cycling infrastructure, and there are a number of public transport opportunities within acceptable walking distance of the site. The Proposed Development site is well served by existing public transport routes (buses and the Metrolink), connecting the site to amenities and centres of employment in the City Centre and Wythenshawe. The closest Metrolink tram stop is Wythenshawe Town Centre. The Metrolink tram services provide frequent services to Manchester Victoria (City Centre) via Exchange Square and Manchester Airport. Additionally, Metrolink users can change at St Werburgh's Road, St Peters Square, Cornbrook and Piccadilly to access the entire Metrolink network. The nearest bus route corridor to the site is Wythenshawe Interchange. The interchange is served by several bus routes, providing connections to Manchester Piccadilly Gardens, Manchester Airport, Altrincham, Stockport, Eccles and Macclesfield. Details of the bus services stopping at

the nearest bus stops are provided within the Transport Assessment reports, that support each application.

- 7.72 The Proposed Development site achieves a Greater Manchester Accessibility Level (GMAL) score of 6. The GMAL score is calculated using an interactive tool managed and maintained by Transport for Greater Manchester (TfGM). The tool measures accessibility by public transport of a point of interest and provides a score between 1 and 8, where 1 is a low level of accessibility and 8 is the highest level of accessibility. As such, the Proposed Development site is considered appropriately situated to take advantage of existing public transport infrastructure.
- 7.73 The Proposed Development site is considered to be well connected to a number of amenities. The pedestrian infrastructure which connects the Proposed Development site to the amenities is generally excellent and there are well lit, wide footways with a number of controlled crossing points across key roads. Nearby to the Proposed Development site connected by a pedestrianised zone are Asda Wythenshawe (inc. Pharmacy and Post Office), Peel Hall Medical Centre and Wythenshawe Town Centre.

Embedded Mitigation

- 7.74 This section describes the measures which have been 'embedded' into the development.

Enabling and Construction Phase

- 7.75 Mitigation for reducing the embodied carbon emissions have already been incorporated into the design of the Proposed Development, through adopting the most efficient design with minimum material usage as this typically results in the most cost effective and lowest embodied carbon solution.

Operational Energy

- 7.76 Operational energy related GHG emissions have been minimised through the application of the Energy Hierarchy and Passivhaus standards as set out within the Energy Strategy Reports produced for Alpha House (Civic, 2025), Brotherton House and C2 The Birtles (TACE, 2025). These are summarised below.

Alpha House

- 7.77 Throughout the design process, measures have been applied to reduce the energy demand associated with the development. In the first instance, the Mechanical and

Electrical Consultants (Civic) produced an energy strategy to advise on incorporating sustainable design and resource efficiency in line with the energy hierarchy.

7.78 U-values and air permeability targets will be delivered which far exceed Building Regulations Part L performance. The building fabric achieves high insulation levels and air tightness, with optimised glazing to balance daylight and heat gains.

7.79 The proposed development will include implementation of passive design measures and optimise the building envelope in terms of orientation, air tightness, and insulation. Good performing fabric elements with natural ventilation systems are proposed at this stage providing dwellings with healthy internal environments. Mechanical ventilation with heat recovery (MVHR) is included to minimise heat loss while ensuring good indoor air quality. Passivhaus design standards are aspired to for all fabric U-values and air permeability targets, whilst consideration is given to building orientations, solar shading devices and natural means of ventilation.

7.80 The following efficiency measures and services are proposed as set out within the Energy Strategy Report:

- External light fittings will be controlled through a time switch, or daylight sensor, to prevent operation during daylight hours to limit the impact of artificial lighting for the development's residents and surrounding environment.
- Heating and hot water will be provided through efficient, low-carbon systems supporting the transition away from traditional gas-based solutions. Although photovoltaic panels are not currently proposed, the design allows flexibility for future integration if required.
- The all-electric, high efficiency system is compatible with local energy markets and future smart grid/ storage integration. The schemes measures reduce operation carbon by 74.6% lowering local network demand and improving suitability for Local Energy Market (LEM) participation.

7.81 An appraisal of low and zero carbon technologies has been undertaken as detailed within the Energy Strategy Report. The following two technologies are identified as appropriate and feasible for the site:

- Air source heat pump hot water systems (ASHPHWs) – these will be specified for all flats.

- Photovoltaic (PV) panels – these will be specified across roof spaces to help meet energy demands to meet planning policy conditions.

Brotherton House and C2 The Birtles

7.82 Throughout the design process, measures have been applied to reduce the energy demand associated with the development. In the first instance, the Mechanical and Electrical Consultants (TACE) produced an energy strategy to advise on incorporating sustainable design and resource efficiency in line with the energy hierarchy for Brotherton House and C2 The Birtles.

7.83 U-values and air permeability targets will be delivered in accordance with Building Regulations Part L performance. Glazing with a G-value of 0.4² is also specified to limit the amount of unwanted solar gain to avoid habitable rooms from overheating. Passive measures are to be implemented within the design of the development to reduce energy use and the associated CO₂ emissions. These include windows with high thermal insulation, maximisation of daylight to reduce reliance on artificial lighting, and optimisation of glazing solar energy transmittance, balancing daylight access with solar control to reduce cooling loads.

7.84 The following efficiency measures and services are proposed as set out within the Energy Strategy Report:

- Control of heating and cooling plant will be optimised, and weather compensated to ensure plant operates as close to demand as possible and not at full capacity.
- Variable speed drives shall be installed on circulation pumps and ventilation fans to allow the speed of the respective motors to be amended by the automatic controls to suit changing load of the building. This will ensure energy usage matches demand requirements.
- Internal lighting within the areas covered by Part L2 analysis will incorporate energy-efficient LED lighting where practicable. Additionally, lighting controls will be provided to limit energy use, alongside automatic presence detection in appropriate areas. This form of control will ensure lights are automatically switched off during periods of non-occupancy. External lighting will be designed to incorporate energy efficient

² G-value, also known as total solar energy transmittance, is a coefficient used to measure the transmittance of solar gain through glazing

luminaires and an automatic lighting control system utilising daylight sensors and time clock control to ensure energy efficient operation of the lighting.

- All non-residential zones, where required, are modelled with mechanical ventilation with heat recovery (MVHR) units. The installed systems incorporate heat recovery to preheat the incoming fresh air, thereby reducing overall energy consumption. The heat recovery units will have low specific fan power to minimise the energy used by the fans.

7.85 An appraisal of low and zero carbon technologies has been undertaken as detailed within the Energy Strategy Report. The following two technologies are identified as appropriate and feasible for the site:

- Photovoltaic (PV) panels.
- Air source heat pump (ASHP) – electric panel heaters have been considered for the majority of zones within the building, however areas that will utilise comfort cooling shall be fitted with a high efficiency air source heat pump.

Operational Transport

7.86 The design of the Proposed Development includes a number of features to encourage the use of sustainable transport opportunities, including walking, cycling, and public transport use. Localised improvements to pedestrian routes through the provision of inter-connecting footway links across the sites to surrounding public transport services have been proposed. In addition, cycle routes around the Proposed Development are largely routed to the perimeter, however, these connect to crossing facilities, and there are traffic free cycle routes along the entirety of Simonsway and large sections of Poundswick Lane. Cycle parking will be provided as part of the development proposals alongside a series of measures to encourage residents to adopt cycling.

Assessment of Likely Significant Effects

Enabling and Construction Phase

7.87 Construction of the Proposed Development will result in CO₂eq emissions associated with construction transport (i.e. Heavy Goods Vehicle (HGV) movement and the transportation of the workforce) and emissions associated with the use of energy on site for construction activities.

- 7.88 Construction works will also result in carbon emissions associated with the embodied carbon within construction materials. Embodied carbon is the total greenhouse gas emissions generated to produce a built asset. This includes emissions caused by extraction, manufacture/ processing, transportation and assembly of every product and element in an asset. It also includes the maintenance, replacement, deconstruction, disposal and end-of-life aspects of the materials and systems that make up the asset (UK Green Building Council, 2017).
- 7.89 Ridge and Partners have undertaken an Embodied Carbon study for the Proposed Development (see Appendix 7.1). For Brotherton House, the site wide average embodied carbon total (including RICS stages A1-A5, B1-B5 & C1-C4) is 802kgCO₂/m².
- 7.90 For C2 The Birtles, the site wide average embodied carbon total (including RICS stages A1-A5, B1-B5 & C1-C4) is 811kgCO₂/m².
- 7.91 For Alpha House, the site wide average embodied carbon total (including RICS stages A1-A5, B1-B5 & C1-C4) is 817kgCO₂/m².
- 7.92 The average embodied carbon totals for each building are within 3% of the RIBA Climate Change Challenge target for 2025. It is therefore considered that they partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with policy goals (i.e. consistent with the UK trajectory to achieve net zero by 2050). In line with Table 7.4 this equates to a **Moderate Adverse** effect and is therefore **significant**.

Operational Energy

- 7.93 The operation of the Proposed Development will result in CO₂eq emissions associated with energy usage for heating, cooling, ventilation, lighting, and electrical equipment, which will therefore result in an increase in emissions compared to the baseline scenario. There will also be carbon emissions associated with unregulated energy, e.g. plug-in equipment such as white goods and small power.
- 7.94 Energy Use Intensity (EUI) is the benchmark for operational energy used within the RIBA 2030 Climate Challenge. For Brotherton House and C2 The Birtles, TACE have undertaken calculations of the EUI for 1 and 2 bed apartments using the SAP methodology. The average EUI for 2 bed apartments is 33kWh/m²/annum. This is approximately 5.71% below the RIBA 2030 Climate Challenge residential target for 2030 (35kWh/m²/annum). The average EUI for 1 bed apartments is 31kWh/m²/annum. This is approximately 11.43% below the RIBA 2030 Climate Challenge residential target for 2030 (35kWh/m²/annum).

- 7.95 For Alpha House, Civic have undertaken calculations of the EUI also using the SAP methodology. The average EUI for apartments is 35kWh/m²/annum. This is in line with the RIBA 2030 Climate Challenge residential target for 2030 (35kWh/m²/annum).
- 7.96 The EUI figures for all buildings achieve the 2030 target for domestic buildings as set out within the RIBA 2030 Challenge (35kWh/m²/yr). This therefore equates to a **Minor Adverse** Effect, which is **not significant**.

Operational Transport

- 7.97 The Proposed Development consists of 423 homes in total, across each of the plots. Brotherton house will provide a total of 108 (including 14 disabled bays) car parking spaces, whilst C2 The Birtles will provide 5 disabled parking bays with no additional regular car parking spaces. The Transport Assessment produced for Brotherton House and C2 The Birtles anticipate that the existing level of car ownership demonstrates that 41% of households within the Proposed Development would own one car or van in the household. For Alpha House, the proposals include a parking area consisting of 16 disabled parking bays. The Transport Statement produced for Alpha House anticipate that the existing level of car ownership demonstrates that 44% of households within the Proposed Development would own one car or van within the household. While there will clearly be car movements to and from the Proposed Development with associated CO₂ emissions it is not possible to calculate the overall impact, as it is not known whether the future occupants are likely to have cars and whether the occupiers' driving habits will change as a result of moving to the Proposed Development site. In addition, there are no recognised net zero carbon targets set out for benchmarking transport emissions from the residential development.
- 7.98 Each of the plots within the Proposed Development occupies a sustainable location, accessible by a range of sustainable travel modes. Each plot is well located for access by active and sustainable travel modes to local amenities at the district centre, including various shops, banking facilities, food outlets and community and health facilities. Furthermore, there are a series of initiatives discussed in the Travel Plans to encourage walking, cycling, public transport and car sharing.
- 7.99 Therefore, it is considered that in terms of operational transport, the Proposed Development's impacts across each plot are fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. Subsequently, in line with the ISEP guidance and Tables 7.3 and 7.4, the effect of the

scheme in relation to operational transport is considered to be **Minor Adverse** which is **not significant**.

Additional Mitigation / Enhancement Measures

7.100 This section describes the measures which are required to mitigate any significant environmental effects with regards to climate change. This should detail mitigation measures which are not designed into the proposals, and which requires a commitment from the applicants to carry out further actions.

Enabling and Construction Phase

7.101 As the predicted effect is Moderate Adverse for the Enabling and Construction Phase, additional mitigation or enhancement measures have been considered.

7.102 More detailed and accurate Whole Life Carbon Assessments will be undertaken as the designs for the buildings are developed as part of the construction stage design, with a commitment of aligning with the RIBA 2030 Climate Challenge target for construction.

7.103 Options will be considered at this next stage of design to reduce the embodied carbon totals down as much as feasibly possible, through the development of a Construction Embodied Carbon Management Strategy. Additional measures to be considered include:

- Consideration of alternatives for the structural frame, such as Light Gauge Steel Frames (LGSF) for apartment blocks and timber frames for town houses.
- Inclusion of cement replacement (GGBS) within the concrete mix for the substructure, the superstructure and ground floor. This would significantly reduce the embodied carbon associated with these elements. The application of the recommended rates of cement replacement will be subject to review at a later stage by the structural engineers for the scheme.
- Reducing site reliance upon high carbon diesel fuel during the construction stage (through the acquisition of a grid electricity connection, or the use of diesel alternatives / on-site renewables to minimise diesel requirements). This would significantly reduce the embodied carbon associated with the construction site impacts. In addition, targeting low effective construction waste totals, and a high degree of waste segregation and diversion from landfill, to maximise lower carbon will also assist in reducing the impact of the site construction phase.

- Utilising materials containing a recycled content reduces the need for raw material extraction and processing, consequently lowering carbon emissions. Further steps to specify reused or higher recycled content products or materials could be made for the external walls and internal blockwork walls, through exploring initiatives such as using reclaimed bricks and blocks containing cement replacement. The use of unfired bricks for the external and non-bearing internal walls could also be investigated as these contain significantly less embodied carbon than standard clay bricks.
- Review of specific finish products to explore increasing the duration of the service life of the finishes specified. This emphasises the importance of optimising the finishes specification by modelling and comparing products, verified using EPDs, to ensure long lasting and durable products are selected.
- The significant contribution of Mechanical, Electrical and Public Health (MEP) systems carbon emissions to Embodied Carbon for the Proposed Development is influenced by several factors. The MEP equipment is often replaced multiple times over the building's lifespan, and therefore maintenance, replacement, and other emissions such as refrigerant leakage, can massively increase the contribution of services equipment to a building's embodied carbon footprint. Prioritising passive design solutions, such as natural ventilation and the optimisation of building orientation alongside effective shading strategies can minimise the reliance on mechanical and electrical components. Identifying and selecting durable equipment which provides a greater service life, to reduce through-life maintenance requirements should also be considered as the design progresses. Additionally, any further rationalisation of wiring, pipework, ducting extent would help to reduce the total impact of this element.
- Without exact information default assumptions have been applied to the MEP elements at this time, during the remaining design and construction stages, where the service design is further progressed and manufacturers can provide documentation showing their products are guaranteed for a longer period than specified, these assumptions can be amended to reduce the emissions associated with replacement. This will provide a much more accurate overview of the emissions associated of their systems, and their service life.

The Completed and Operational Development

- 7.104 The predicted effect is not significant for operational energy, and there are no additional mitigation or enhancement measures required.

7.105 For operational transport, the predicted effect is not significant, and additional mitigation is proposed through the further development and implementation of a Travel Plan for the scheme.

7.106 A framework travel plan has been produced by Curtins for each plot to encourage sustainable transport practices and reduce transport emissions associated with the development. As confirmed in the report, the objectives of the Travel Plan include:

- To increase the level of walking to and from the site;
- To increase the level of cycling to and from the site;
- To increase the level of public transport use to and from the site;
- To encourage car sharing and shared transport to and from the site;
- To encourage uptake of Ultra Low and Zero Emission vehicles.

7.107 The plan proposed several further measures, this includes appointment of a Travel Plan Coordinator, provision of Welcome Packs to all residents which will comprise communications to promote active and sustainable travel, provision of a car club and monitoring over the five-year life of the plan.

Summary of Residual Effects and Mitigation Measures

7.108 In line with best practice guidance, mitigation measures for reducing CO₂eq emissions during the Enabling and Construction Phase have already been incorporated into the design of the scheme, therefore residual effects are per those previously identified.

Table 7.5: Residual Effects Summary

Description of Effect	Embedded Mitigation	Potential Effect (inc. Significance)	Additional Mitigation / Enhancement Measures	How are Additional Mitigation / Embedded Mitigation / Enhancement Measures secured?	Residual Effect (inc. Significance)
Construction – Brotherton House					
Embodied CO ₂ eq emissions	Adoption of efficient design with minimum material usage	Moderate Adverse (Significant)	More detailed appraisal of options and reduction of embodied carbon through a Construction Embodied Carbon Management Strategy	Construction Embodied Carbon Management Strategy secured by Condition	Minor Adverse (Not Significant)
Construction –C2 The Birtles					
Embodied CO ₂ eq emissions	As above				
Construction – Alpha House					
Embodied CO ₂ eq emissions	As above				
Completed and Operational – Brotherton House					
Energy & Transport CO ₂ eq emissions	Application of the Energy Hierarchy. Installation of ASHP & PV panels. Provision of EV charging stations. Installation of sufficient cycle infrastructure and facilities.	Minor Adverse (Not Significant)	Development and Implementation of the Travel Plan	By design (within Energy Strategy) Appointment of the Travel Plan Coordinator Monitoring over the first 5 years.	Minor Adverse (Not Significant)
Completed and Operational - C2 The Birtles					
Energy & Transport	As above				

Description of Effect	Embedded Mitigation	Potential Effect (inc. Significance)	Additional Mitigation / Enhancement Measures	How are Additional Mitigation / Embedded Mitigation / Enhancement Measures secured?	Residual Effect (inc. Significance)
CO ₂ eq emissions					
Completed and Operational – Alpha House					
Energy & Transport CO ₂ eq emissions	As above				

Summary of Residual Effects and Mitigation Measures

- 7.109 Best practice guidance recommends that the Proposed Development is assessed against whether its greenhouse gas emissions align with the UK's path towards net zero carbon by 2050. RIBA have developed the RIBA 2030 Climate Challenge which sets out voluntary performance targets which set out a challenging path to achieve the reductions needed so that the UK building stock can achieve net zero carbon by 2050.
- 7.110 Initial modelling of embodied carbon emissions has been undertaken which shows a Moderate Adverse effect on climate change, which is significant. However, through a commitment to achieving the RIBA 2030 Climate Challenge target as part of a Construction Embodied Carbon Management Strategy prepared during the construction stage design, the effect is reduced to Minor Adverse, **not significant**.
- 7.111 Initial calculations of operational energy across the site indicates a Minor Adverse effect on climate change, which is **not significant**.
- 7.112 Operational transport emissions predominantly through resident's car trips, are predicted to have a Minor Adverse effect on climate change, which is **not significant**.

Assessment of Cumulative Effects

Inter-Cumulative Effects

- 7.113 Cumulative climate change effects from other developments have not been assessed. In line with ISEP (2022) guidance³ an inter-development cumulative effects assessment has not been undertaken on a specific cumulative scheme basis; however, the Proposed Development's GHG emissions have been considered in the context of national net zero targets, in accordance with the methodology and best practice guidance. As such, the cumulative contributions of other GHG sources that make up the national and local contexts have been considered within the assessment.

³ ISEP (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance (2nd Edition)

Part B Climate Change Resilience Risk Assessment

Assessment Methodology and Significance Criteria

7.114 In accordance with the 2017 EIA regulations, Part B of this chapter addresses the vulnerability of the project to climate change (climate change resilience) in line with ISEP (2020) EIA Guide to: Climate Change Resilience & Adaptation.

Identification of the Study Area

7.115 The study area for the climate change resilience assessment is the Proposed Development itself. Assessment of the wider development project has been scoped out as it is not possible to undertake a meaningful assessment at this stage. Assessment will be undertaken as the individual applications are made. It is assumed that the wider Development Project (i.e. within the wider Development Framework) will apply the same climate adaptation principles as individual applications come forward.

Desk-based Data

7.116 The following information has been used to inform the Climate Change Resilience Risk Assessment:

- Flood Risk Assessment and Drainage Strategy;
- Ecological Assessment;
- Concept architectural, structural, drainage and landscape drawings;
- Phase II Geo-Environmental Site Assessment;
- Design and Access Statement.

7.117 Workshops with the design teams for the Proposed Development were held to run through the climate resilience assessment and to identify inherent and additional mitigation measures.

Identification of Sensitive Receptors

7.118 For the Climate Change Resilience Risk Assessment, receptor groups are identified, and their sensitivity is determined based on the susceptibility of the receptor (e.g. ability to be

affected by a change – low, medium or high) and the vulnerability of the receptor (i.e. potential exposure to a change – low, medium or high).

- Low susceptibility: receptor has the ability to withstand/not be altered much by the projected changes to the existing/prevaling climatic factors (e.g. retain much of its original function and form).
- Moderate susceptibility: receptor has some limited ability to withstand/not be altered by the projected changes to the existing/prevaling climatic conditions.
- High susceptibility: receptor has no ability to withstand/not be substantially altered by the projected changes to the existing/prevaling climatic factors.
- Low vulnerability: Climatic factors have little influence on the receptors.
- Moderate vulnerability: receptor is dependent on some climatic factors but able to tolerate a range of conditions.
- High vulnerability: receptor is directly dependent on existing/prevaling climatic factors and reliant on these specific existing climate conditions continuing in future or only able to tolerate a very limited variation in climate conditions.

7.119 Table 7.6 identifies how the sensitivity of receptors is determined.

Table 7.6 Climate Resilience – Sensitivity of Receptors

	1 (Low vulnerability)	2 (Moderate vulnerability)	3 (High vulnerability)
1 (Low susceptibility)	1 (Low sensitivity)	2 (Low sensitivity)	3 (Moderate sensitivity)
2 (Medium susceptibility)	2 (Low sensitivity)	4 (Moderate sensitivity)	6 (High sensitivity)
3 (High susceptibility)	3 (Moderate sensitivity)	6 (High sensitivity)	9 (High sensitivity)

Characterisation of Effect

7.120 Magnitude has been determined based on a combination of likelihood (the chance of the effect occurring over the lifespan of the project if the risk is not mitigated) and consequence (which will reflect the geographical extent of the effect or the number of receptors affected, the complexity of the effect, degree of harm to those affected and the duration, frequency and reversibility of effect).

- Very Low likelihood: The event may occur once during the lifetime of the project
- Low likelihood: The event may occur once or on limited occasions during the lifetime of the development.
- Moderate likelihood: The event may occur limited times during the lifetime of the development.
- High likelihood: The event will occur on several occasions during the lifetime of the development.
- Very high likelihood: The event occurs multiple times during the lifetime of the development e.g. approximately annually.
- Low consequence: Minor disruption to business operations / no risk to building occupants / no damage to buildings / infrastructure.
- Moderate consequence: Some disruption to building operations / slight risk to building occupants / slight damage to buildings / infrastructure.
- High consequence: Major disruption to business operations / risk to building occupants / significant damage to buildings / infrastructure.

7.121 Table 7.7 identifies how the magnitude of effects is determined.

Table 7.7 Climate Resilience – Determining Magnitude

	1 (Low consequence)	2 (Moderate consequence)	3 (High consequence)
1 (Very low likelihood)	Negligible	Negligible	Negligible
2 (Low likelihood)	Minor magnitude	Minor magnitude	Moderate magnitude
3 (Moderate likelihood)	Minor magnitude	Moderate magnitude	Major magnitude
4 (High likelihood)	Moderate magnitude	Major magnitude	Major magnitude
5 (Very High likelihood)	Moderate magnitude	Major magnitude	Major magnitude

Significance Criteria

7.122 The significance of an environmental impact is determined by the interaction of magnitude and sensitivity, whereby the impacts can be positive or negative. The Impact Significance Matrix is set out in Table 7.8.

Table 7.8 Climate Resilience – Determining Significance

Magnitude	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Major	Significant	Significant	Significant
Moderate	Significant	Significant	Not significant
Minor	Significant	Not significant	Not significant
Negligible	Not significant	Not significant	Not significant

Assumptions/Limitations

- 7.123 The assessment of the impacts of climate change on the Proposed Development is based on assumptions about the future effects of climate change. The climate change predictions used within the climate resilience assessment are based on the most recent UK Climate Projections published in 2018 (UKCP18) developed by the UK Climate Impacts Programme (UKCIP). These assume a high emissions scenario (worst case).

Baseline Conditions

- 7.124 The existing baseline for the climate change resilience assessment is the current climate in the location of the Proposed Development. Historic climate data obtained from the Met Office website (accessed September 2025) recorded by the closest meteorological station to the Proposed Development with comparable data (Rochdale Station) for the 30-year climate periods of 1961-1990 and 1991-2020 is summarised in Table 7.9 below and shows an increase in the average annual maximum daily temperature.

- 7.125 **Table 7.9 Historic Climate data recorded by the closest meteorological station (Rochdale)**

Climate Period	1961-1990		1991-2020	
Climatic factor	Month	Figure	Month	Figure
Average annual maximum temperature (°C)	-	12.3°C	-	13.13°C
Warmest month by maximum temperature (°C)	July	19.26°C	July	20.01°C
Coldest month by maximum temperature (°C)	January / February	5.97°C	January	6.93°C
Mean annual rainfall levels (mm)	-	1135.75mm	-	1197.22mm
Wettest month on average (mm)	December	120.37mm	December	138.88mm
Driest month on average (mm)	April	68.25mm	May	65.68mm

7.126 The Met Office website (accessed September 2025) confirms that past severe weather events in the last 5 years have included heatwaves, severe flooding, severe winter weather with significant snowfalls, and storm and high wind events.

7.127 UK Climate Projections published in 2018 (UKCP18) have been developed by the UK Climate Impacts Programme (UKCIP) to provide projections for future climatic scenarios and trends. The Table below provides a summary of predictions for summer and winter changes by the 2070s (Met Office, 2018).

Table 7.10 Future climate estimates under a high emission scenario (England)

Summer rainfall change	Winter precipitation change	Summer temperature change	Winter temperature change
57% drier to 3% wetter	2% drier to 33% wetter	1.1 °C warmer to 5.8 °C warmer	0.7 °C warmer to 4.2 °C warmer

Embedded Mitigation

7.128 A number of measures for reducing the potential impact of climate change on the Proposed Developments have been 'embedded' into the development to ensure it is climate change resilient.

7.129 The embedded mitigation measures are as follows:

- The post development surface water discharge rates will be designed for an increase in the rainfall intensity of 45% for the 1 in 30-year and 1 in 100-year storm events respectively to allow for climate change;
- SUDS suitable for implementation for Alpha House include:
 - Green Roof (in the form of a landscaped roof top garden)
 - Tanked/ Piped systems
- SUDS suitable for implementation for Brotherton House include:
 - Permeable Paving
 - Attenuation Tanks
 - 450mm UU Sewer

- SUDS suitable for implementation for C2 The Birtles include:
 - Raingardens
 - Permeable Paving
 - Attenuation Tanks
 - Local Combined Sewer
- Building and roofs for the Proposed Developments have been designed against the risk of high winds and for snow loads (in line with Eurocodes);
- Weather rated louvres will provide protection from high winds;
- For each of the plots there will be tree planting to deflect and divert wind from pedestrian areas and provide shelter;
- Access control within Alpha House will be present on apartment doors with safety features; all apartment front doors will have closers;
- For Brotherton House and C2 The Birtles most external doors will include door closure and stops;
- Overheating analysis has been completed for the Proposed Developments, demonstrating compliance with Part O and future weather files;
- Mechanical Ventilation with Heat Recovery (MVHR) units have been specified for the Proposed Developments with the ability to boost, further increasing the rate of ventilation;
- Street tree planting will help to cool the area down and provide shading throughout the Proposed Developments;
- The proposed landscaping scheme includes areas of habitat creation with native hedgerow around the perimeter of plots;
- External fabric is to be designed as a weathertight structure, mostly clad in brick with limited areas of metal rainscreen cladding across each plot;

- The use of sound detailing and specification of robust materials which weather with time will minimise the risk of damage to building fabric and services across the plots;
- Air intake and exhaust positions will be designed to protect from water ingress where possible with weatherproof louvres. Across each plot, the louvres are recessed from facing brickwork.
- Low water use sanitary fittings and appliances, shared facilities specified where appropriate to minimise water demand;
- Pulsed output water meters to be installed for overall building across each plot, whilst every apartment unit will have a water meter;
- Foundations will be piled into mudstone to mitigate against ground swell and changes to volume for each plot;
- For Brotherton House and C2 The Birtles, the ground make-up is clay above mudstone.
- Design life of the building is 60 years. Roof and external wall materials will have a service life minimum of 40 years;
- Materials have been chosen to maximise durability.

Assessment of Likely Significant Effects

Enabling and Construction Phase

7.130 Given the short timescale for the construction phase (100-115 weeks) and its temporary nature, it is not considered that there will be any significant effects associated with the construction phase in relation to the climate change resilience assessment. Therefore, this assessment considers the operation of the completed development only.

The Completed and Operational Development

7.131 Table 7.11 for the Proposed Development identifies the potential impacts associated with climate change, the receptors affected (and the sensitivity of those receptors), the magnitude of the impact (likelihood and consequence of impact) and the overall significance (based on mitigation already incorporated).

Table 7.11 Climate Resilience Assessment

Hazard	Impact	Embedded Mitigation	Receptor	Likelihood	Consequence	Magnitude	Significance
Increased flooding	Rising flood levels can cause inundation of buildings. Infrastructure could also be affected. The development site falls wholly within Flood Zone 1 (Low Risk). Areas of high surface water flooding are located predominantly in the centre of the site and associated with existing buildings, however the majority of the site is classified as low risk. There is a medium to low risk of flooding from groundwater. The site is not at risk of flooding from any other source (see the FRA produced by AJP for Alpha House). For Brotherton House /C2 The Birtles there are some areas of medium to high risk of surface water flooding (see the FRA produced by CIVIC for Brotherton House and C2 The Birtles).	The post development discharge rates will be designed for an increase in the rainfall intensity of 45% for the 1 in 30-year and 1 in 100-year storm events respectively to allow for climate change. SUDS included across the site (Alpha House); -Green roof - Tanked/ Pipe systems SUDS included across the site (Brotherton House and C2 The Birtles); - Permeable Paving - Attenuation Tank - 450mm UU sewer	Buildings and infrastructure (Moderate sensitivity)	1	3	Negligible	Not Significant

Hazard	Impact	Embedded Mitigation	Receptor	Likelihood	Consequence	Magnitude	Significance
Increased likelihood of storms (high winds)	High winds can result in a risk of structural damage to buildings and reduction of mechanical ventilation capacity.	Buildings and roofs designed to account for the risk of high winds (in line with Eurocodes). Weather rated louvres will provide protection.	Buildings and infrastructure (Moderate sensitivity)	1	2	Negligible	Not Significant
	High winds may cause a risk to occupants' safety in public realm	Entrance is set back and covered Mews planting is set back Provision of new trees to deflect / divert wind from pedestrian areas and provide shelter across all plots.	Public realm users (Moderate sensitivity)	1	2	Negligible	Not Significant
	Risk to the safety of building occupants from doors slamming.	Access controls on apartment doors with safety features All apartment front doors will have closers within Alpha House. Most external doors within Brotherton House and C2 The Birtles will include door closure and stops.	Building occupants (Moderate sensitivity)	1	2	Negligible	Not Significant
More extreme heat and cold events, and greater temperature variation	Extremes of temperature may result in building services being unable to maintain thermal comfort levels and could affect people living in the homes.	Overheating analysis completed, the project complies with Part O. Design includes deep reveals to limit solar gains. The Mechanical Ventilation with Heat Recover (MVHR) system has the ability to boost further to increase rate of ventilation. The overheating study for Brotherton House and C2 The Birtles included assessment against future weather files. It demonstrated that 3 flats need additional fans and comfort cooling for compliance.	Building occupants (Moderate sensitivity)	3	2	Moderate	Significant
	Extreme external temperatures could affect users of public realm.	Street tree planting will help to cool the area down and provide shading.	Users of public realm (Moderate sensitivity)	2	2	Minor	Not Significant

Hazard	Impact	Embedded Mitigation	Receptor	Likelihood	Consequence	Magnitude	Significance
	Extreme cold events may lead to plant failure due to freezing or defrost cycles	There is localised plant which reduces risk of plan failure. The building fabric will exceed Part L, which will help to reduce heating loads as far as possible. Designed in line with CIBSE guidance (-40C)	Buildings and infrastructure (Moderate sensitivity)	1	2	Negligible	Not Significant
	Landscape planting and existing habitats and species may be affected by extreme temperatures. drought and precipitation.	Proposed landscape planting designed to account for extremes of temperature and precipitation events (native or climate resilient). The proposed landscaping scheme includes areas of habitat creation-native hedgerow around perimeter for all plots.	Planting, Habitats & Species (Moderate sensitivity)	2	2	Minor	Not Significant
Wetter winters (including increased moisture and driving rain)	Increased moisture and rain may cause damage to building fabric and services.	For Alpha House, the external fabric will be designed as a weathertight structure, completely clad in brick. For Brotherton House and C2 The Birtles, the external fabric will be designed as a weathertight structure, mostly clad in brick with limited areas of metal rainscreen cladding. Roof and external wall materials will have a design life of a minimum of 40 years. The use of sound detailing and specification of robust materials which weather with time will minimize the risk of damage to building fabric and services. Air intake and exhaust positions will be designed to protect from water ingress where possible, weatherproof louvres will be recessed back from facing brickwork.	Buildings and infrastructure (Moderate sensitivity)	1	2	Negligible	Not Significant

Hazard	Impact	Embedded Mitigation	Receptor	Likelihood	Consequence	Magnitude	Significance
	Increased rate of run-off risks of system inundation leading to localised flooding, as above.	See above For Alpha House, discussions have taken place with United Utilities regarding designed in flexibility for stub connection for future surface water drainage system outside site boundary.					
More drought events (including reduced summer rainfall)	Reduced rainfall may decrease the amount of water available for development.	Low water use sanitary fittings and appliances, shared facilities specified where appropriate to minimise water demand. The Muse minimum standard for water consumption is 95l/person/day. A supply meter will be provided with pulsed outputs. In addition, every unit will have a water meter.	Building occupants (Moderate sensitivity)	2	2	Minor	Not Significant
	Drying soils could result in structural damage to buildings. Ground make up is mostly mudstone as detailed within the Geo-Environmental Site Assessment.	Structural engineers will ensure design of foundations is mitigated against the risk of ground shrinkage. Foundations will be piled into mudstone to mitigate against ground swell / changes to volume Suspended ground floor slab.	Buildings and infrastructure (Moderate sensitivity)	1	3	Negligible	Not Significant
	Landscape planting, species and habitats may be affected by drought, as detailed above.	See above					
Warmer summers and increased solar radiation	Increased temperatures within buildings may result in building services being unable to maintain thermal comfort levels as above.	See above					

Hazard	Impact	Embedded Mitigation	Receptor	Likelihood	Consequence	Magnitude	Significance
	Extreme external temperatures could affect users of public realm as above.	See above					
	Solar radiation may reduce the durability of roof and external wall materials.	Materials have been chosen to maximise durability. Design life of building is 60 years. Roof and external wall materials will have a service life of a minimum of 40years.	Buildings and infrastructure (Moderate sensitivity)	1	2	Negligible	Not Significant
	Drying soils could result in structural damage to buildings, as above.	See above					
	Landscape planting, species and habitats may be affected by heat, as detailed above.	See above					
More precipitation e.g. rain and snow	Increased rate of run-off risks of system inundation leading to localised flooding, as detailed above.	See above					
	Damage to building fabric and services resulting from water ingress and heavy snow	Roofs fully designed for snow loads (in line with Eurocodes). Intake and exhaust positions will be designed to protect from water ingress where possible.	Buildings and infrastructure (Moderate sensitivity)	2	2	Minor	Not Significant

Additional Mitigation/ Enhancement Measures

7.132 This section describes the measures which are required to mitigate any significant environmental effects with regards to Climate Resilience. This details mitigation measures which are not designed into the proposals, and which requires a commitment from the applicants to carry out further actions.

Completed and Operational Development

7.133 Additional mitigation to be included is as follows:

- Dynamic thermal modelling has been completed at design stage for Brotherton House and C2 The Birtles to assess the development's performance under a projected climate change environment, using predicted future weather files. This modelling was carried out for each plot of the Proposed Development in accordance with the Chartered Institution of Building Services Engineers (CIBSE) TM59⁴ methodology, demonstrating compliance with Part O of Building Regulations. The results have informed that to meet compliance with future weather files (2050 and 2080), comfort cooling may be necessary for the apartments which fail to meet the overheating criteria. Flexibility will be included so that cooling could be added to the MVHR units when they need replacement..
- For Alpha House, additional dynamic thermal modelling is to be undertaken at the detailed design stage to assess the design for a projected climate change environment using predicted future weather files. This will be undertaken as part of CIBSE TM59 calculations, required to comply with Part O of the Building Regulations. Ventilation and heating plant selection will be adaptable based on projected future temperatures.

Summary of Residual Effects and Mitigation Measures

7.134 In line with best practice guidance, several mitigation measures for minimising hazards that may impact upon the Proposed Development as a result of climate change have already been incorporated into the design. The additional mitigation measures proposed above will reduce the risk of building services being unable to maintain thermal comfort levels, thus reducing this effect to Minor Adverse which is **not significant**.

⁴ CIBSE Technical Memorandum 59: Design methodology for the assessment of overheating risk in homes (2017)

Table 7.12: Residual Effects Summary Alpha House, Brotherton House & C2 The Birtles

Description of Effect	Embedded Mitigation	Potential Effect (inc. Significance)	Additional Mitigation / Enhancement Measures	How are Additional Mitigation / Embedded Mitigation / Enhancement Measures secured?	Residual Effect (inc. Significance)
	Completed and Operational				
Risk of rising Flood Levels/ increased rate of run-off causing inundation	Post development discharge rates designed for an increase in the rainfall intensity of 45% for the 1 in 30-year and 1 in 100-year storm events respectively SudS included across Alpha House through green roof and tanked/piped systems. SudS included for Brotherton House through permeable paving, attenuation tank and 450mm UU sewer. SudS included across C2 The Birtles through raingardens, permeable paving, attenuation tanks and a local combined sewer.	Negligible Not Significant	N/A	Building and Site Design in accordance with the Drainage Design drawings, which will be secured via condition	Negligible Not Significant
High winds resulting in a risk of structural damage and reduction in mechanical ventilation capacity	Design of buildings and roofs mitigated against the risk of high winds (in line with Eurocodes) Weather rated louvres to provide protection against the risk of high winds.	Negligible Not Significant	N/A	Building design in accordance with the Structural, Architectural and Mechanical Design drawings, which will be secured via condition	Negligible Not Significant
Risk to occupants' safety in public realm	Entrance to plots is set back and covered. The designs of each plot include the provision of new trees to deflect and divert wind from pedestrian areas to provide shelter.	Negligible Not Significant	N/A	Site Design	Negligible Not Significant

Description of Effect	Embedded Mitigation	Potential Effect (inc. Significance)	Additional Mitigation / Enhancement Measures	How are Additional Mitigation / Embedded Mitigation / Enhancement Measures secured?	Residual Effect (inc. Significance)
Risk to the safety of building occupants from doors slamming	Access controls on apartment doors with safety features and closers for Alpha House. For Plots Brotherton House and C2 The Birtles, most external doors will include door closure and stops.	Negligible Not Significant	N/A	Building Design	Negligible Not Significant
Extremes of temperature may result in building services being unable to maintain thermal comfort levels.	On all plots MVHR units are present in each apartment with the ability to boost to increase the rate of ventilation to each apartment. Initial overheating analysis completed, for Alpha House. Overheating analysis has also been completed for Brotherton House and C2 The Birtles including future weather files. Street tree planting will help to cool the area down.	Moderate Adverse Permanent Significant	For Alpha House, additional dynamic thermal modelling will be undertaken at the detailed design stage to assess the design for a projected climate change environment using predicted future weather files in line with TM59 requirements. Ventilation & heating plant selection will be based on projected future temperatures. For Brotherton House and C2 The Birtles, 3 apartments may need additional fans/ comfort cooling for compliance. Flexibility to be built in so this could be added to the MVHR units when they need replacement.	Secured by Building Design and to comply with Part O (Building Regulations)	Minor Adverse Permanent Not Significant
Extreme external temperatures could affect users of public realm.	Street tree planting will help to cool the area down and provide shading.	Minor Adverse Permanent Not Significant	N/A	Site design	Minor Adverse Permanent Not Significant
Extreme cold events may lead to plant failure due to freezing or defrost cycles.	Building Fabric exceeds Part L to reduce heating loads as far as possible. Designed in line with CIBSE guidance (-40C)	Negligible Not Significant	N/A	Building Design and to comply with Part L (Building Regulations)	Negligible Not Significant

Description of Effect	Embedded Mitigation	Potential Effect (inc. Significance)	Additional Mitigation / Enhancement Measures	How are Additional Mitigation / Embedded Mitigation / Enhancement Measures secured?	Residual Effect (inc. Significance)
Landscape planting and existing habitats and species may be affected by extreme temperatures, drought and precipitation.	Native hedgerows have been specified as a recommendation and are included within the planting specification for climate resilience.	Minor Adverse Permanent Not Significant	N/A	Site Design	Minor Adverse Permanent Not Significant
Increased moisture and rain may cause damage to building fabric and services.	External fabric is designed as a weather tight structure. Roof and external wall materials with design life of a minimum of 40 years. The use of sound detailing and specification of robust materials which weather with time will minimise the risk of damage to building fabric and services. Air intake and exhaust positions will be designed to protect from water ingress where possible with weatherproof louvres. The louvres are recessed back from facing brickwork.	Negligible Not Significant	N/A	Building Design	Negligible Not Significant
Reduced rainfall may decrease the amount of water available for development	Low water use sanitary fittings in line with Muse minimum standard of 95l/person/day will be specified. Across each plot, a supply meter will be provided with pulsed outputs. In addition, every unit will have a water meter.	Minor Adverse Permanent Not Significant	N/A	Building Design	Minor Adverse Permanent Not Significant

Description of Effect	Embedded Mitigation	Potential Effect (inc. Significance)	Additional Mitigation / Enhancement Measures	How are Additional Mitigation / Embedded Mitigation / Enhancement Measures secured?	Residual Effect (inc. Significance)
Drying soils / subsidence / ground movement could result in structural damage to buildings. Ground make up mostly mudstone and clay.	Structural engineers will ensure design of foundations is mitigated against the risk of ground shrinkage. Foundations will be piled into mudstone to mitigate against ground swell / changes to volume Suspended ground floor slab.	Negligible Permanent Not Significant	N/A	Site & building design	Negligible Not Significant
Solar radiation may reduce the durability of roof and external wall materials.	Materials will be chosen to maximise durability across each plot. Design life of building is 60 years. Roof and external wall materials, with the recommended service life of a minimum of 40 years.	Negligible Permanent Not Significant	N/A	Building Design	Negligible Not Significant

- 7.135 A number of possible effects of climate change have been identified which may have an impact on the Proposed Development. These include possible impacts on building occupants, users of the public realm and the public realm and buildings themselves. Measures have been and will be incorporated into the design of the Proposed Development to minimise these effects. As a result of these embedded mitigation measures, most of the possible effects identified are either negligible or Minor in magnitude.
- 7.136 The only potential significant effect in relation to the effects of climate change on the Proposed Development (before the provision of additional mitigation measures) is the possibility for extreme temperature events to cause overheating within the homes, and the potential effect on residents.

Summary of Residual Effects and Mitigation Measures

- 7.137 The residual effects are either negligible or Minor Adverse. The following additional measures are proposed (to comply with Building Regulations):
- Additional dynamic thermal modelling to be undertaken at the detailed design stage for Alpha House to assess the design for a projected climate change environment using predicted future weather files in line with TM59 requirements. Ventilation and heating plant selection will be based on projected future temperatures.
 - Future proofing the apartments within Brotherton House and C2 The Birtles, which may need additional fans/ comfort cooling for compliance. This would be added to the MVHR units when they need replacement.

Assessment of Cumulative Effects

Inter-Cumulative Effects

- 7.138 In relation to climate change resilience, no inter- project cumulative effects are anticipated on the basis that climate change impacts are specific to the development and will not result in impacts to any neighbouring development.

Intra-Cumulative Effects

- 7.139 There are a number of potential interactions between the future effects of climate change and other topics. For example, the effect of climate change on habitats and species. These have been identified within Table 7.11-7.12 where reference has been made to the

relevant supporting documentation. Based on the climate resilience assessment as detailed within Table 7.13, is not considered that there will be any significant intra-cumulative effects on climate change with regards to the proposed development and any in-combination effects arising from the combined effects for environmental themes.

Conclusions

7.140 Climate Change is a global environmental issue caused by greenhouse gases (GHG) emitted because of human activities. Greenhouse gases include carbon dioxide. Methane, ozone, nitrous oxide, Chlorofluorocarbons (CFCs) and water vapour. As greenhouse gases vary in terms of their impact on climate change, we use a measure known as carbon dioxide equivalent to standardise the climate impact of different greenhouse gases.

7.141 The UK Government has committed the UK to achieve net zero carbon emissions by 2050.

7.142 This chapter looks at greenhouse gas emissions which are likely to be emitted because of the development. This includes:

- embodied emissions from the construction process and materials used throughout the lifespan of the Proposed Development;
- operational emissions from energy consumption during the operation of the Proposed Development (heating, cooling, lighting and other electricity used within the buildings); and;
- operational transport emissions from transport of people who live in the Proposed Development once it is operational.

7.143 This chapter also looks at the impact that the future effects of climate change could have on the Proposed Development.

Summary of Baseline Conditions

7.144 In relation to Part A the impact of the project on climate change, i.e. greenhouse gas emissions, the baseline is a scenario whereby the Proposed Development does not proceed, and the site remains in its current condition. The Proposed Development site is situated within an existing urban setting in Wythenshawe Town Centre and currently accommodates a mix of low-rise buildings and associated infrastructure, much of which is proposed for demolition as part of the development. The existing structures are assumed to have limited energy efficiency and no significant low-carbon or renewable

energy systems in place. As such, they form the baseline condition against which the GHG emissions of the Proposed Development as assessed.

- 7.145 In relation to Part B, the existing baseline for the climate change resilience assessment is the current climate in the location of the Proposed Development. Historic climate data obtained from the Met Office website recorded by the closest meteorological station to the Proposed Development (Rochdale Station) with comparable data, for the 30-year climate periods of 1961-1990 and 1991-2020, shows an increase in the average annual maximum daily temperature.
- 7.146 The Met Office baseline climate averages for the Northwest England and North Wales District identify gradual warming between 1961 and 2010. Average annual rainfall (mm) has also increased over this period.
- 7.147 The Met Office website confirms that past severe weather events in the last 5 years have included record breaking heatwaves, severe flooding, severe winter weather with significant snowfalls, and storm and high wind events.
- 7.148 UK Climate Projections published in 2018 (UKCP18) have been developed by the UK Climate Impacts Programme (UKCIP) to provide projections for future climatic scenarios and trends. The predictions for summer and winter changes by the 2070s, include potentially drier, warmer summers, and warmer, wetter winters.

Summary of Likely Significant Effects

Construction Phase

- 7.149 Best practice guidance recommends that the Proposed Development is assessed against whether its greenhouse gas emissions align with the UK's path towards net zero carbon by 2050. The Royal Institute of British Architects (RIBA) have developed the RIBA 2030 Climate Challenge which sets out voluntary performance targets which set out a challenging path to achieve the reductions needed so that the UK building stock can achieve net zero carbon by 2050.
- 7.150 Initial modelling of embodied carbon emissions has been undertaken which shows a moderate adverse effect on climate change, which is significant. This means that the embodied carbon emissions are in line with the RIBA 2030 Climate Challenge target for 2025, but exceed the target for 2030. However, through a commitment to achieving the RIBA 2030 Climate Challenge target as part of a Construction Embodied Carbon

Management Strategy prepared during the construction stage design, the effect is reduced to Minor Adverse, not significant.

Operational Phase

- 7.151 Initial calculations of operational energy emissions show a Minor Adverse effect on climate change, which is not significant. This means that the predicted operational energy performance is in line with the target set by RIBA for 2030, and therefore the Proposed Development is in line with measures necessary to achieve the UK's trajectory towards net zero.
- 7.152 Operational transport emissions predominantly through residents' car trips, are predicted to have a Minor Adverse effect on climate change, which is not significant.
- 7.153 A number of possible effects of climate change have been identified which may have an effect on the Proposed Development during the Operational Phase. These include possible effects on building occupants, users of the public realm and the public realm and buildings themselves.

Summary of Mitigation and Enhancement Measures

Construction Phase

- 7.154 Mitigation for reducing the embodied carbon emissions have already been incorporated into the design of the Proposed Development, through adopting the most efficient structural design with minimum material usage as this typically results in the most cost effective and lowest embodied carbon solution.
- 7.155 The residual effects in relation to embodied carbon emissions are Minor Adverse and not significant.

Operational Phase

- 7.156 Embedded and additional measures have been and will be incorporated into the design of the Proposed Development to minimise the effects during the operational phase.
- 7.157 The residual effects in relation to operational energy and operational transport are Minor Adverse and not significant.

Conclusion

- 7.158 The assessment identifies significant effects in relation to climate change in relation to the embodied carbon emissions. However, no significant effects have been identified in relation to climate change in relation to operational energy or transport.

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