APPENDIX 6.11.1: CLIMATE CHANGE RESILIENCE RISK ASSESSMENT

1.1 INTRODUCTION

1.1.1 Schedule 4, Clause 5(f) of the Town and Country Planning (EIA) Regulations 2017 notes information should be included in the ES on the likely significant effects of the development on the environment resulting from the vulnerability of the project to climate change.

1.1.2 In line with the IEMA EIA Guide to Climate Change Resilience and Adaptation (IEMA, 2020) (hereafter referred to as the IEMA guidance), there are two key strands to assessing climate change resilience and adaptation issues within EIA, as outlined below:

- The risks of changes in the climate to the project (i.e. the resilience or conversely the vulnerability of a project to future climate changes). The IEMA guidance states that this is generally best reported in the analysis of alternatives and it is better suited to a risk assessment type process than traditional EIA '*determination of significance'*. This climate change resilience risk assessment (CCRA) has therefore been completed for the Proposed Development and appended to the Environmental Statement; and
- The extent to which climate exacerbates or ameliorates the effects of the project on the environment (i.e. *'in-combination'* effects). The IEMA guidance states that this is best analysed in the existing chapters of the ES and is suited to using traditional significance criteria from the respective chapters. Therefore, this has been included throughout each of the technical chapters and has been completed by each technical specialist.

1.2 METHODOLOGY AND ASSESSMENT CRITERIA

Risk assessment

1.2.1 This CCRA has been undertaken in line with the IEMA guidance. The methodology has also been informed by other guidance documents referenced in the IEMA guidance, including the C40 Cities Climate Change Risk Assessment Guidance (2018), the Public Infrastructure Engineering Vulnerability Committee (PIEVC) Climate Risk Assessment Methodology (2015), and the Highways England Design Manual for Roads and Bridges Sustainability & Environmental Appraisal. Risks have been assessed based on both the probability of the event occurring and the severity of the consequences of the event, should it occur. The assessment is based on climate change projection data from UKCP18, as well as information provided in other submitted reports, including the Flood Risk Assessment (FRA). The list of climate hazards that has been considered has been adapted from the C40 Cities Climate Change Risk Assessment Guidance (2018).

Probability

1.2.2 Table 1 summarises the criteria that have been used to determine the likelihood rating for an effect, adapted from Appendix 1 of the IEMA guidance. The project lifetime includes both the construction and operational stages. In line with the principles set out in BS EN 15978, a Reference Study Period (RSP) of 60 years after opening (the opening year) has been used.

Table 1 Criteria used to determine likelihood

Score	Description (probability and frequency of occurrence)
1	The event occurs very rarely during the lifetime of the projects (60 years). For example, once every 60 years (1 event).
2	The event occurs limited number of times during the lifetime of the project (60 years). For example, once every 25 years (2-3 events).
3	The event occurs regularly during the lifetime of the project (60 years) For example, once every 2-5 years (12-30 events).
4	The event occurs frequently during lifetime of the project (60 years). For example, once per year (60 events).
5	The event occurs very frequently during the lifetime of the project (60 years). For example, multiple times per year (more than 60 events).

Consequence

1.2.3 Table 2 summarises the criteria used to determine the consequence rating for effects relating to a climate risk. Consequence has been determined based on the extent to which the climate risk may impact on the amenity value and function of the Proposed Development. The amenity value is the positive element or elements that contribute to the overall character or enjoyment of the Proposed Development. The function is the extent to which the Proposed Development meets the purpose or purposes that it is designed to fulfil (i.e. a place for residents to live).

Table 2 Criteria used to determine consequence

Score	Description
1	Very low but measurable effect on site users and the Proposed Development itself. Slight negative change in amenity value of the Proposed Development and slight negative change in function.
2	Low but measurable effect on site users and the Proposed Development itself. Low negative change in amenity value of the Proposed Development and slight negative change in function.
3	Moderate effect on site users and the Proposed Development itself. Moderate negative change in amenity value of the Proposed Development and slight negative change in function.
4	Moderate effect on site users and the Proposed Development itself. Major negative change in amenity value of the Proposed Development and low negative change in function.
5	Moderate effect on site users and the Proposed Development itself. Major negative change in amenity value of the Proposed Development and moderate negative change in function.
6	Major effect on site users and the Proposed Development itself. Major negative change in amenity value of the Proposed Development and major negative change in function.
7	Extreme effect on site users and the Proposed Development itself. Loss of asset.

Risk Rating

1.2.4 Table 3 summarises the matrix used to determine the risk rating, based on probability of the event occurring and the consequences as a result of the event occurring.

Table 3 Risk rating determined based on the likelihood and consequence scores

	Probability					
Consequence		**1**	**2**	**3**	**4**	**5**
	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	18
	5	5	10	15	20	25
	6	6	12	18	24	30
	7	7	14	21	28	35

	Low risk
	Medium risk
	High risk

Limitations and assumptions

1.3 The main uncertainty regarding the CCRA surrounds the climate change projections that the scheme is assessed against. Climate change projections (e.g., UKCP18) are presented using a set of scenarios that capture the relationships between human choices, emissions, concentrations and temperature change. The UKCP18 climate change projections have been selected, as they are UK specific, and relatively conservative. Some scenarios are consistent with continued dependence on fossil fuels, while others are associated with deliberate actions to reduce GHG emissions. Therefore, these climate change projections contain inherent uncertainty, reflecting the uncertainty associated with quantifying human activities (including technological change) and their influence on climate.

1.4 LEGISLATION AND POLICY

1.4.1 A review of UK legislation, planning policy and guidance relevant to the proposals has been previously undertaken as part of the 2022 ES. The 2025 addendum is informed by additional documents, outlined below. Details on the documents that have been updated since the 2022 ES are also outlined below.

National legislation and policy

National Planning Policy Framework (NPPF) Ministry of Housing, Communities & Local Government (MHCLG (formerly DLUHC), 2024)

1.4.2 Section 14 of the NPPF 2024 focuses on meeting the challenge of climate change, flooding and coastal change. Paragraph 160 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 incorporating green infrastructure and sustainable drainage systems'

UK Climate Change Risk Assessment (HM Government, 2022)

1.4.3 The third and most recent UK-wide CCRA was published in 2022. The assessment outlines risks in the eight priority risk areas relating to the following topics:

- *'Risks to the viability and diversity of terrestrial and freshwater habitats and species from multiple hazards (Priority Risk Area 1)';*
- *'Risks to soil health from increased flooding and drought (Priority Risk Area 2)';*
- *'Risks to natural carbon stores and sequestration from multiple hazards, leading to increased emissions (Priority Risk Area 3)';*
- *'Risks to crops, livestock and commercial trees from multiple climate hazards (Priority Risk Area 4)';*
- *'Risks to supply of food, goods and vital services due to climate-related collapse of supply chains and distribution networks (Priority Risk Area 5)i;*
- *'Risks to people and the economy from climate-related failure of the power system (Priority Risk Area 6)';*
- *'Risks to human health, wellbeing and productivity form increased exposure to heat in homes and other buildings (Priority Risk Area 7)';*
- *'Multiple risks to the UK from climate change overseas (Priority Risk Area 8)'; and*
- *'Additional More Action Needed Risks'.*

The Third National Adaptation Programme and the Fourth Strategy for Climate Adaptation Reporting (Defra, 2023)

1.4.4 The third and most recent National Adaptation Programme sets out the UK government's response to the third CCRA, showing the actions it is, and will be, taking to address the risks and opportunities posed by a changing climate. This breaks down the likely risks associated with climate change in terms of the following themes:

- 'Infrastructure';
- 'Natural environment';
- 'Health, communities, and the built environment';
- 'Business and industry';
- 'International dimensions'; and
- 'Working together'.

Regional and local policy

The London Plan (Greater London Authority, 2021)

1.4.5 In addition to the policies outlined in the 2022 ES, the following policies in the London Plan are of relevance to GHG emissions:

- GG6 Increasing efficiency and resilience:
  - 'ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, while mitigating and avoiding contributing to the urban heat island effect'.

Draft New Camden Local Plan (CC, 2024)

1.4.6 Camden's next Local Plan covering the period 2026-2041 was drafted in 2024, set to be updated for further consultation in Spring 2025.

1.4.7 It states that, following the Council's declaration of a Climate and Ecological Emergency in 2019, a key challenge for the plan is *'to ensure that development in Camden seeks to mitigate and adapt to climate change by using less energy; minimise the use of resources; follow the principles of a circular economy, where re-use and recycling are prioritised, and ensure that buildings and spaces are designed to cope with more extreme weather'*

1.4.8 The following policies and site guidance are of relevance to climate resilience:

- Policy DS1: Delivering Healthy and Sustainable Development:
  - 'The Council will require development to support the creation of healthy and sustainable places in Camden by:'
- 'ii. Delivering buildings that achieve net zero carbon emissions, optimise resource efficiency and are designed to be resilient to climate change'
- Policy W1 - West Camden:

- 'To support the delivery of development in this area the Council will seek the provision of, and contributions to, the delivery of infrastructure, from appropriate development. The Council will work with relevant providers to secure the infrastructure needed to support development and provide the facilities needed for the area's communities', including:

- 'vi. The delivery of flood mitigation measures and sustainable drainage schemes;'
- Allocation W2 (WHI2) – O2 Centre, car park, car showrooms and 14 Blackburn Road
  - 'A Flood Risk Assessment will be required in accordance with Policy CC11 (flood risk), as the site is within an area identified by the Council as being at risk of flooding, and parts of the site have experienced problems with flooding in the past.'; and
  - 'Sustainable Urban Drainage Systems will be required on this site in accordance with Policy CC12 (sustainable drainage). Recommendations in the Flood Risk Assessment will be secured by planning condition'
- Policy CC1 – Responding to the climate emergency:
  - 'The Council will prioritise the provision of measures to mitigate and adapt to climate change and require all development in Camden to respond to the climate emergency by:'
- 'vii. Being designed to be resilient to climate change and meet the highest standards of sustainable design and construction;
- viii. Minimising the risk of overheating through design and avoiding reliance on air conditioning;
- ix. Improving water efficiency;
- x. Minimising and avoiding the risk of flooding from all sources, and incorporating multifunctional Sustainable Urban Drainage Systems (SuDS) to reduce surface water run-off'.
- Policy CC8 – Overheating and cooling:
  - 'The Council will ensure that development is designed to minimise overheating and promote cooling. The Council will:
- i. Support proposals which seek to adapt and improve existing buildings, to improve ventilation, and address overheating and promote cooling, where they are in accordance with the other policies in this Plan.
- ii. Require all development to minimise the adverse impacts of overheating through the application of the London Plan cooling hierarchy. Applicants should include information demonstrating that the risk of overheating has been mitigated through the incorporation of design measures in the Sustainability Statement.
- iii. Resist applications that include active cooling (air conditioning) and non-essential mechanical plant. Applications for new build development that include active cooling will only be permitted where dynamic thermal modelling demonstrates there is a clear need for it and other passive measures have been integrated into the development. Applications for existing non-residential buildings will need to demonstrate there is a clear need for additional, or replacement, active cooling equipment and that other passive measures have been integrated. Where need is demonstrated to the Council's satisfaction, the Council will also require the carbon used to operate the system to be offset through the installation of solar photovoltaics.
- iv. Require applicants to incorporate measures to cool buildings through the use of materials and finishes. The Council will expect materials and finishes to have the ability to reflect sunlight.
- v. Require applicants to incorporate measures to cool the spaces around and between buildings using appropriate materials, finishes, and greening. Trees should provide adequate canopy cover for greater cooling effect'.
- Policy CC10 – Sustainable design and construction certification:
  - 'The Council will ensure that development achieves the highest possible standards of sustainable design and construction. The Council will:
- i. Require residential development resulting in the conversion or extension of 500sqm or more, or delivering 5 or more dwellings, to achieve a minimum of 'excellent' in BREEAM domestic refurbishment.
- ii. Require non-residential development resulting in the conversion or extension of 500sqm or more floorspace to achieve a minimum of 'excellent' in BREEAM non-domestic refurbishment.
- iii. Require non-residential development (new build) of 500sqm or more floorspace to achieve a minimum of 'Excellent' BREEAM Non-domestic new construction.'
- Policy CC11 – Flood risk:
  - 'The Council will seek to ensure that development addresses and reduces flood risk to mitigate the impact of flooding on Camden's communities, both now and in the future'
- Policy CC12 – Sustainable drainage:
  - 'The Council will seek to control surface water run-off from development to reduce the risk of flooding. The Council will:
    - i. Require all development to include permeable surfaces, incorporate green and blue roofs, and seek to replace non-permeable surfaces where feasible. This should be documented within the Sustainability Statement, or Drainage report if required.
    - ii. Resist proposals including impermeable surfacing unless it can be demonstrated to the Council's satisfaction that this is unavoidable.
    - iii. Require all major development to reduce surface water run off rates to greenfield run-off rates, through the application of Sustainable Drainage Systems, following the drainage hierarchy in the London Plan.
    - iv. Require Sustainable Drainage Systems to be designed to provide multi-functional benefits and be integrated into the development.
    - v. Expect sustainable drainage system proposals to meet national and local guidance to ensure they are adequately designed, built and maintained for the lifetime of development'

Camden Climate Action Plan 2020-2025 (CC, 2020)

1.4.9 CC's Climate Action Plan sets out CC's commitments to tackling climate change from 2020-2025, with the aim of achieving net-zero by 2030.

1.4.10 The plan uses four themes for its various '*immediate actions*' and '*programme development*' activities:

- 'People – Everyone who lives, works, studies and visits the borough will be well informed and actively contribute to tackling the climate crisis in all aspects of their lives';

- 'Places - Camden's public spaces will encourage and enable healthy and sustainable travel choices and promote biodiversity';
- 'Buildings - Camden's buildings will be energy efficient, comfortable and fit-for-purpose for a zero carbon future'; and
- 'Organisations - All organisations in Camden will operate responsibly and embed tackling the climate crisis throughout their operations'.

Camden Climate Adaptation and Resilience Plan 2023-2025 (CC, 2020)

1.4.11 The Climate Adaptation and Resilience Plan is designed to build CC's 'understanding of how climate hazards, such as flooding, and heat risk will affect Camden, while devising a set of activities to improve the borough's resilience to them'.

1.4.12 The plan is designed in a two-year period so that current understanding of Camden's climate risks can be integrated into subsequent Climate Action Plans from 2025 onwards.

1.4.13 The key climate hazards for Camden are identified as:

- Primary hazards with a higher likelihood of occurrence and impact:
  - Heatwaves;
  - Flooding; and
  - Air pollution
- Secondary Hazards with lower likelihood of occurrence and potential impact:
  - Extreme storms;
  - Water scarcity; and
  - Fires.

1.4.14 The five key receptors affected by climate hazards are identified as:

- People and communities;
- Infrastructure and physical assets;
- Council services;
- Businesses, organisations, and local economy; and
- Nature and environment.

1.4.15 The 14 outcomes outlined to build climate resilience include:

- 'Outcome 4: Camden's public realm and estates are adapted to provide protection to people from climate risks';
- 'Outcome 6: New buildings and infrastructure are designed to be resilient to future climate risks' and;
- 'Outcome 13: Camden's Green spaces and other green infrastructure are resilient to a changing climate'.

Climate Emergency Declaration

Camden Citizens' Assembly on the Climate Crisis (CC, 2019)

1.4.16 Camden Council declared a Climate Emergency in July 2019, where three discussion sessions were held with residents to develop an approach for the climate crisis. The 17 agreed actions under the categories of '*The Home*', '*The Neighbourhood*' and '*The Council*' include:

- 'Make all new homes carbon zero';
- 'Create more green space on residential streets';
- 'Fit solar panels on as many homes as possible';
- 'Plant more trees and create more allotments;'
- 'Enable electric transport with infrastructure and incentives'; and
- 'Developers to fund energy efficient retrofits of old buildings'.

Guidance documents

ISO 14090:2019 Adaptation to Climate Change – Principles, Requirements and Guidelines (BSI, 2019)

1.4.17 The main purpose of this standard is to provide organisations and projects with a consistent, structured and pragmatic approach to prevent or minimise the harm that climate change could cause and also to take advantage of opportunities.

C40 Cities Climate Change Risk Assessment Guidance (C40 Cities, 2017)

1.4.18 This document aims to provide a concise, easy-to-read guidance, to help cities to develop a climate risk assessment report. It provides the methodology and components of the assessment, as well as providing a comprehensive list of possible effects relating to climate change.

1.5 CURRENT & FUTURE BASELINE CONDITIONS

Current Baseline Conditions

1.6 Table 4 provides a summary of the current baseline climatic conditions, taken from the closest weather station, Hampstead (London) weather station, to the north of the Proposed Development. The data provides historic average climatic conditions for 1991-2020, which is assumed to be representative of the baseline year of the assessment (i.e. 2025). The monthly mean minimum/maximum temperatures are calculated from the average of the daily maximum and daily minimum temperatures for each month. The warmest month on average was July and the coolest month on average was January. The wettest month on average was November and the driest month on average was March. The sunniest month on average was July and the least sunny month on average was December.

Table 4 Summary of historic average climatic conditions for 1981-2010 taken from the Hampstead Met Office monitoring station.

Month	Mean daily maximum temperature (degrees C)	Mean daily minimum temperature (degrees C)	Days of air frost (days)	Sunshine (hours)	Rainfall (mm)
January	7.83	1.94	9.67	60.00	84.37

Month	Mean daily maximum temperature (degrees C)	Mean daily minimum temperature (degrees C)	Days of air frost (days)	Sunshine (hours)	Rainfall (mm)
February	8.30	1.79	9.17	79.80	60.89
March	10.86	3.14	5.66	123.66	51.67
April	13.92	4.66	2.78	177.16	53.22
May	17.15	7.51	0.34	209.82	52.42
June	20.03	10.30	0.00	208.72	53.68
July	22.28	12.38	0.00	218.55	53.66
August	22.03	12.35	0.00	201.36	63.06
September	19.20	10.14	0.01	154.77	60.63
October	15.11	7.62	1.10	113.12	89.73
November	10.97	4.50	4.47	69.66	93.53
December	8.31	2.30	9.75	54.16	89.11

Climate Change Projections

1.6.1 The UK Climate Projections 2018 (UKCP18) (Met Office, 2018) provide the most up-to-date assessment of how the climate of the UK may change over the 21st century. UKCP18 uses Representative Concentration Pathways (RCPs). These are named according to the concentration of greenhouse gas modelled to occur in the atmosphere in 2100. There are four RCPs available in the UKCP18 climate projections: RCP 2.6, RCP 4.5, RCP 6.0 and RCP 8.5. In line with the IEMA (2020) guidance, RCP 8.5 has been used, which represents the most conservative, highest-impact scenario. Table 5 summarises the projected summer and winter mean temperature and precipitation changes up to the 2090s for RCP 8.5.

Table 5 UKCP18 data for London under RCP 8.5

Season	Variable	Time Period	Projected Change At		
			10th percentile	50th percentile	90th percentile
Winter	Mean temperature (ºC)	2020 - 2039	0 to 1	0 to 1	1 to 2
		2040 - 2059	0 to 1	1 to 2	2 to 3
		2060 - 2079	0 to 1	2 to 3	4 to 5
		2080 – 2099	1 to 2	3 to 4	5 to 6
	Mean precipitation change (%)	2020 - 2039	-10 to 0	0 to 10	20 to 30
		2040 - 2059	-10 to 0	10 to 20	20 to 30
		2060 - 2079	-10 to 0	10 to 20	40 to 50
		2080 – 2099	-10 to 0	20 to 30	50 to 60
	Mean daily maximum temp change compared to 1981-2000	2020 - 2039	0 to 1	0 to 1	1 to 2
		2040 - 2059	0 to 1	1 to 2	3 to 4
		2060 - 2079	0 to 1	2 to 3	4 to 5
		2080 – 2099	1 to 2	3 to 4	6 to 7
	Mean daily minimum temp change compared to 1981-2000	2020 - 2039	-1 to 0	0 to 1	1 to 2
		2040 - 2059	0 to 1	1 to 2	2 to 3
		2060 - 2079	0 to 1	2 to 3	4 to 5
		2080 – 2099	1 to 2	3 to 4	5 to 6
Summer	Mean temperature (ºC)	2020 - 2039	1 to 2	2 to 3	3 to 4
		2040 - 2059	1 to 2	2 to 3	3 to 4
		2060 - 2079	1 to 2	3 to 4	5 to 6
		2080 – 2099	2 to 3	5 to 6	8+
	Mean precipitation change (%)	2020 - 2039	-30 to -20	-10 to 0	10 to 20
		2040 - 2059	-50 to -40	-20 to -10	10 to 20
		2060 - 2079	-60 to -50	-30 to -20	0 to 10
		2080 – 2099	-80 to -70	-50 to -40	0 to 10
	Mean daily maximum temp change compared to 1981-2000	2020 - 2039	0 to 1	1 to 2	2 to 3
		2040 - 2059	0 to 1	1 to 2	3 to 4
		2060 - 2079	1 to 2	4 to 5	6 to 7
		2080 – 2099	2 to 3	5 to 6	8+
	Mean daily minimum temp change compared to 1981-2000	2020 - 2039	0 to 1	1 to 2	1 to 2
		2040 - 2059	1 to 2	2 to 3	3 to 4
		2060 - 2079	1 to 2	3 to 4	5 to 6
		2080 – 2099	2 to 3	5 to 6	7 to 8

1.6.2 According to UKCP18 data, over land the projected general trends of climate changes in the 21st century are similar to UKCP09, with a move towards warmer, wetter winters and hotter, drier summers. However, natural variations mean that some cold winters, some dry winters, some cool summers and some wet summers will still occur.

Temperature

1.6.3 UKCP18 projections show that there is more warming in the summer than in the winter.

Precipitation

1.6.4 Rainfall patterns across the UK are not uniform and vary on seasonal and regional scales and will continue to vary in the future. While UKCP18 projections show a clear shift to higher probability levels of dry summers, they also suggest that the likelihood of individual wet summers reduces only slightly. The risk of heavy rainfall events is likely to increase.

Sea level rise

1.6.5 According to UKCP18 projections, global sea level has risen over the 20th century and will continue to rise over the coming centuries. The amount of sea level rise depends on the location around the UK and increases with higher emissions scenarios. Sea level rise over the coming centuries may affect tidal characteristics substantially (including tidal range).

Snow

1.6.6 According to UKCP18 projections, for the period 2061-2080, under a high emissions scenario (RCP8.5), the regional (12km) and local (2.2km) projections show a decrease in both falling and lying snow across the UK relative to the 1981-2000 baseline.

Wind

1.6.7 There are no compelling trends in storminess, as determined by maximum gust speeds, from the UK wind network over the last four decades. UKCP18 projections over the UK show an increase in near surface wind speeds over the UK for the second half of the 21st century for the winter season when more significant effects of wind are experienced. This is accompanied by an increase in frequency of winter storms over the UK. However, the increase in wind speeds is modest compared to interannual variability.

1.6.8 Winds associated with major storm events can be some of the most damaging and disruptive events for the UK with implications for property, power networks, road and rail transport and aviation.

1.7 IDENTIFICATION AND EVALUATION OF RISKS WITH CLIMATE CHANGE

1.7.1 Table 6 provides a List of potential risks, as adapted from the C40 Cities Climate Change Risk Assessment Guidance (C40 Cities, 2017). A summary is provided of how the identified climate risks are likely to change in the future as a result of climate change. Probability and consequence ratings have been given to these risks, thereby generating a risk rating based on Table 3. The probability and consequence ratings have been considered prior to the implantation of mitigation measures.

Table 6 Climate change risks

Climate Hazard	Description	Is it relevant to the Proposed Development	Likely consequences of climate risk occurring	Change in probability as a result of climate change	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Rainstorm	Strong wind and heavy rain	Yes – rainstorms happen frequently in the UK and are likely to impact the Proposed Development	Damage and degradation of building materials through wetting and impact from rainfall. Discomfort for users of the Proposed Development.	The frequency of precipitation is likely to decrease, particularly in the summer. However, the risk of heavy rainfall events is likely to increase.	5 Rainstorms will occur very frequently during the lifetime of the Proposed Development	1 Very low but measurable effect on site users and the Proposed Development. Damage and degradation of building materials through rainfall impacts.	5	No
Monsoon	*'A persistent seasonal wind, often responsible for seasonal precipitation regime.'* (National Weather Service, 2023)	No – Monsoons do not occur in the UK, and therefore do not present a climatic risk to the Proposed Development.	N/A	N/A	N/A	N/A	N/A	N/A
Heavy snow	*'Large snowflakes that greatly reduce the visibility and falls at a rate exceeding 4cm per hour.'* (Wild, 2023)	Yes – Heavy snow can occur during winters in the UK and therefore has the potential to impact the Proposed Development.	Damage to building materials (e.g. roofs). Discomfort and potential injury to users of the Proposed Development.	The frequency of heavy snow events is likely to decrease.	2 Heavy snow is likely to occur a limited number of times during the lifetime of the Proposed Development	2 Low but measurable effect on site users and the Proposed Development. Damage to building materials and potential injury to users.	4	No
Fog	*'Water droplets which are suspended in the air near the Earth's surface and causing reduced visibilities.'* (National Weather Service, 2023)	Yes – Fog occurs under certain climatic conditions in the UK, and therefore has the potential to impact the Proposed Development.	Increased risk of accidents as a result of impaired vision.	It is unknown how climate change will affect the frequency of fog.	5 Fog will occur very frequently during the lifetime of the Proposed Development	1 Very low but measurable effect on site users and the Proposed Development. Increased risk of accidents around the Proposed Development.	5	No
Hail	*'Precipitation of small balls or other pieces of ice (hailstones) falling separately or frozen together in irregular lumps. (Typically associated with thunderstorms and surface temperatures above freezing).'* (National Weather Service, 2023)	Yes – Hail occurs in the UK and therefore has the potential to impact the Proposed Development	Discomfort for users of the Proposed Development.	The frequency of hailstorms is likely to increase.	5 Hail will occur very frequently during the lifetime of the Proposed Development	1 Very low but measurable effect on site users and the Proposed Development. Discomfort for users of the Proposed Development.	5	No
Severe wind	Mean wind speed exceeding 23 m/s (Met Office, 2024a).	Yes – Severe wind occurs in the UK and therefore has the potential to impact the Proposed Development	Damage to building materials. Discomfort and potential injury to users of the Proposed Development, and immediate surroundings	The frequency of severe wind and storms is likely to remain similar.	4 Severe wind is likely to occur frequently during the lifetime of the Proposed Development.	2 Low but measurable effect on site users and the Proposed Development. Damage to building materials and potential injury to users.	8	Yes
Tornado	*'A violent rotating column of air, usually forming a pendant from a cumulonimbus cloud with the circulation reaching the ground. It nearly always starts as a funnel cloud and may be accompanied by a loud roaring noise. On a local scale, it is the most destructive of all atmospheric phenomena'* (National Weather Service, 2023)	No – Tornados are very rare in the UK. It is therefore very unlikely that they pose a climatic risk to the Proposed Development	N/A	N/A	N/A	N/A	N/A	N/A

Climate Hazard	Description	Is it relevant to the Proposed Development	Likely consequences of climate risk occurring	Change in probability as a result of climate change	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Hurricane	'*A severe tropical cyclone with wind speeds in excess of 74 mph (64 knots).*' (National Weather Service, 2023)	No – Hurricanes cannot form at the latitudes of the UK, and therefore do not pose a climatic risk to the Proposed Development.	N/A	N/A	N/A	N/A	N/A	N/A
Extra tropical storm	'*Deep depressions that were originally hurricanes which have moved to higher latitudes.*' (Met Office, 2024b)	Yes – Extra tropical storms (such as ex-Hurricanes) can reach the UK, and therefore have the potential to impact on the Proposed Development.	Damage to building materials. Discomfort and potential injury to users of the Proposed Development and immediate surroundings	The frequency of severe wind and storms is likely to remain similar.	3 Extra tropical storms are likely to happen regularly during the lifetime of the Proposed Development	4 Moderate effect on site users and the Proposed Development. Damage to building materials and potential injury to users.	12	Yes
Tropical storm	*'An organised cyclone in the tropics with wind speed between 35 and 64 knots.'* (National Weather Service, 2023)	No – Tropical storms do not occur in the UK and therefore do not pose a climatic risk to the Proposed Development	N/A	N/A	N/A	N/A	N/A	N/A
Storm surge	'*A change in sea level that is caused by a storm.*' (Met Office, 2024c).	No – the Proposed Development is not located close to the coast, and is therefore not at risk of storm surge	N/A	N/A	N/A	N/A	N/A	N/A
Lightning	*'Electrical discharge cause by imbalances between storm clouds and the ground, or within clouds themselves.*' (National Geographic, 2024)	Yes – Lightening occurs during storms, and therefore has the potential to impact the Proposed Development	Potential damage to building materials. Injury to users of the Proposed Development unlikely but possible.	The frequency of lightning storms is likely to remain similar.	4 Lightening is likely to occur frequently during the lifetime of the Proposed Development.	1 Very low but measurable effect on site users and the Proposed Development Potential damage to building materials and injury to users.	4	No
Extreme winter conditions	*'A combination of heavy snow, blowing snow and/or dangerous wind chills'* (NOAA, 2024c)	Yes – Extreme winter conditions sometimes occur in the UK, and therefore have the potential to impact the Proposed Development	Damage to building materials (e.g. pipes bursting). Discomfort and potential injury to users of the Proposed Development.	The frequency of extreme winter conditions is likely to decrease.	4 Extreme winter conditions are likely to occur frequently during the lifetime of the Proposed Development.	3 Moderate effect on site users and the Proposed Development. This could include thermal discomfort, damage to building materials and potential injury to users.	12	Yes
Cold wave	*'Average temperatures below 2°C for 5 days' or 'average temperatures below 0°C for 48hrs or more.'* (Met Office, 2023)	Yes – Cold waves happen during winter months, and therefore have the potential to impact the Proposed Development	Damage to building materials (e.g. pipes bursting). Discomfort and potential injury to users of the Proposed Development.	The frequency of cold waves is likely to decrease.	4 Cold waves are likely to occur frequently during the lifetime of the Proposed Development.	3 Moderate effect on site users and the Proposed Development. This could include thermal discomfort, damage to building materials and potential injury to users.	12	Yes
Extreme cold days	Average temperatures below 0°C (Met Office, 2023)	Yes – Extreme cold days occur during winter months, and therefore have the potential to impact the Proposed Development	Damage to building materials (e.g. pipes bursting). Discomfort and potential injury to users of the Proposed Development.	The frequency of extreme cold days is likely to decrease.	4 Extreme cold days are likely to occur frequently during the lifetime of the Proposed Development.	3 Moderate effect on site users and the Proposed Development. This could include thermal discomfort, damage to building materials and potential injury to users.	12	Yes

Climate Hazard	Description	Is it relevant to the Proposed Development	Likely consequences of climate risk occurring	Change in probability as a result of climate change	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Heat waves	Three days *'of hot weather relative to the expected conditions of the area at that time of year, which may be accompanied by high humidity.'* (Met Office, 2024d)	Yes – Heat waves occur increasingly frequently in the UK, and therefore have the potential to impact the Proposed Development	Damage and degradation to building materials. Extended period of overheating in building affects comfort and health of occupants.	The frequency of heat waves is likely to increase.	4 Heat waves are likely to occur frequently during the lifetime of the Proposed Development.	5 Moderate effect on site users and the Proposed Development. This could include health impacts, particularly for children and elderly visitors. Damage to buildings and overheating causing discomfort to occupants.	20	Yes
Extreme hot days	A day where temperatures exceed 30°C (Met Office, 2023)	Yes – Extreme hot days occur increasingly frequently in the UK, and therefore have the potential to impact the Proposed Development	Damage and degradation to building materials. Intense overheating in building affects comfort and health of occupants.	The frequency of extreme hot days is likely to increase.	4 Extreme hot days are likely to occur frequently during the lifetime of the Proposed Development.	4 Moderate effect on site users and the Proposed Development. This could include health impacts, particularly for children and elderly visitors. Damage to buildings and overheating causing discomfort to occupants.	16	Yes
Drought	'*When rainfall in an area is below average for the region*' or '*when water supplies such as streams and reservoirs are low, which is caused by low rainfall, lack of snowmelt, or other reasons*' (Met Office, 2024e)	Yes – Drought occurs in the UK and therefore has the potential to impact the Proposed Development	Health of flora and fauna on the site affected.	The frequency of drought is likely to increase.	4 Drought is likely to occur frequently during the lifetime of the Proposed Development.	2 Low effect on site users and the Proposed Development. This is an inner-city development with little exposure to drought-impacted vegetation or topography.	8	Yes
Wild fire	*'Any uncontrolled vegetation fire which requires a decision, or action, regarding suppression'* (Scottish Government, 2013)	Yes – Wild fires do occur in the UK, and therefore have the potential to impact the Proposed Development	Damage to buildings and contents. Potential injury to users of the Proposed Development.	The frequency of land fire is likely to remain similar.	1 Wild fires are likely to occur very rarely during the lifetime of the Proposed Development as it is in an urban setting. The Proposed Development includes the implementation of a park, however, and therefore a wild fire cannot be ruled out.	6 Major effect on site users and the Proposed Development. Damage to buildings and contents. Potential injury to users.	6	No
Flash/surface flood	'*A flood that occurs within a few hours (usually less than six) of heavy or excessive rainfall, dam or levee failure.*' (National Weather Service, 2023)	Yes – flash/surface floods occur during periods of intense rainfall, there is the potential this could impact the Proposed Development	Damage to buildings and contents. Potential injury to users of the Proposed Development.	The frequency of flash/surface flooding is likely to increase.	1 Flooding on site is not anticipated, as a SUDS strategy has been proposed. Flash/surface floods are likely to occur very rarely during the lifetime of the Proposed Development	6 Major effect on site users and the Proposed Development. Damage to buildings and contents. Potential injury to users.	6	No
River/tidal flood	'*Where a rivers flow will exceed the bank sides and cause damage or obstruction to a nearby area.*' (Flood Guidance, 2024)	Yes – river flooding can occur during intense periods of rainfall, and therefore has the potential to impact the Proposed Development	Damage to buildings and contents. Potential injury to users of the Proposed Development.	The frequency of river/tidal flooding is likely to increase.	1 As stated in the FRA, the Site is located in Flood Zone 1. River floods are likely to occur a limited number of times during the lifetime of the Proposed Development	6 Major effect on site users and the Proposed Development. Damage to buildings and contents. Potential injury to users.	6	No
Groundwater flood	The level of groundwater rises above the ground level as a result of increased rain, causing flooding on the surface (Flood Guidance, 2024)	Yes – groundwater flooding does occur in the UK, and therefore has the potential to impact the Proposed Development	Damage to buildings and contents. Potential injury to users of the Proposed Development.	The frequency of groundwater flooding is likely to remain at a similar level.	1	6 Major effect on site users and the Proposed Development. Damage to buildings and contents. Potential injury to users.	6	No

Climate Hazard	Description	Is it relevant to the Proposed Development	Likely consequences of climate risk occurring	Change in probability as a result of climate change	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
					A SUDS strategy has been proposed. Groundwater floods are likely to occur very rarely during the lifetime of the Proposed Development			
Permanent inundation	The increase of sea level over time to where an area is continuously covered by water (DELWP, 2021)	No – The Proposed Development is not close to the sea, and therefore salt permanent inundation is unlikely to impact the Proposed Development	N/A	N/A	N/A	N/A	N/A	N/A
Salt water intrusion	When salt water (from the ocean) gets into fresh water coastal aquifers (USGS, 2024)	No – The Proposed Development is not close to the sea, and therefore salt water intrusion is unlikely to impact the Proposed Development	N/A	N/A	N/A	N/A	N/A	N/A
Ocean acidification	*'A reduction in the pH of the ocean over an extended period of time, caused primarily by uptake of carbon dioxide (CO^2) from the atmosphere*'. (NOAA, 2024)	No – the Proposed Development is not located close to the ocean and is therefore unlikely to be impacted by ocean acidification	N/A	N/A	N/A	N/A	N/A	N/A
Landslide	'*The movement of a mass of rock, debris, or earth down a slope'* (USGS, 2024b)	No – the Proposed Development is located in a relatively flat location, and is therefore unlikely to be impacted by landslides	N/A	N/A	N/A	N/A	N/A	N/A
Avalanche	*'A mass of snow, rock, ice, soil, and other material slides swiftly down a mountainside*.' (National Geographic, 2024b)	No – the Proposed Development is not located in a location that is steep enough or receives enough snow for avalanches to be a risk	N/A	N/A	N/A	N/A	N/A	N/A
Rock fall	A '*type of fast-moving landslide that happens when rock or earth falls, bounces, or rolls from a cliff or down a very steep slope*.' (Colorado Geological Survey, 2024)	No – the Proposed Development is located in a relatively flat location, and is therefore unlikely to be impacted by rock fall	N/A	N/A	N/A	N/A	N/A	N/A
Subsidence	'*Sinking of the ground because of underground material movement'* (NOAA, 2024b)	Yes – subsidence does occur in the UK, and therefore has the potential to impact the Proposed Development	Damage to building materials. Potential injury to users of the Proposed Development.	The frequency of subsidence is likely to remain low.	1 Subsidence is likely to occur very rarely during the lifetime of the Proposed Development	6 Major effect on site users and the Proposed Development. Damage to building materials. Potential injury to users.	6	No
Water-borne disease	'*Illnesses caused by microscopic organisms, like viruses and bacteria, that are ingested through contaminated water or by coming in contact with feces.*' (Lifewater, 2024)	Yes – water-borne diseases do occur in the UK, and therefore have the potential to impact the Proposed Development	Potential illness to users of the Proposed Development.	The frequency of water-borne disease is likely to increase but remain low.	2 Water-borne diseases are likely to occur a limited number of times during the lifetime of the Proposed Development	3 Moderate effect on site users and the Proposed Development. Potential illness to users.	6	No

Climate Hazard	Description	Is it relevant to the Proposed Development	Likely consequences of climate risk occurring	Change in probability as a result of climate change	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Vector borne disease	*'Human illnesses caused by parasites, viruses and bacteria that are transmitted by vectors'* (living organisms) (WHO, 2024)	Yes – Vector borne diseases do occur in the UK, and therefore have the potential to impact the Proposed Development	Potential illness to users of the Proposed Development.	The frequency of vector-borne disease is likely to increase but remain low.	2 Given the nature of the Proposed Development and the Site, vector borne diseases, such as those transmitted through ticks, are unlikely to occur. The Proposed Development is in the inner city with little exposure to vectors.	2 Low effect on site users and the Proposed Development. Potential illness to users.	4	No
Airborne disease	'*Disease that is caused by a microorganism that is transmitted through the air.'* (Ather et al, 2013)	Yes – airborne diseases do occur in the UK, and therefore have the potential to impact the Proposed Development	Potential illness to users of the Proposed Development.	The frequency of air-borne disease is likely to increase but remain low.	2 Airborne diseases are likely to occur a limited number of times during the lifetime of the Proposed Development	3 Moderate effect on site users and the Proposed Development. Potential illness to users.	6	No
Insect infestation	*'Recently detected insect pest population, including an incursion, or a sudden significant increase of an established insect, disease agents or weed population in an area leading to damage to plants in production fields, forests or natural habitats and causing substantial damage to productivity, biodiversity or natural resources'* (UNDRR, 2024)	Yes – Insect infestations do occur in the UK, and therefore have the potential to impact the Proposed Development	Potential illness to users of the Proposed Development.	The frequency of insect infestation is likely to increase but remain low.	2 Insect infestations are likely to occur a limited number of times during the lifetime of the Proposed Development	2 Low but measurable effect on site users and the Proposed Development. Potential illness to users.	4	No

1.8 INCREASING THE RESILIENCE OF THE PROPOSED DEVELOPMENT TO CLIMATE CHANGE

1.8.1 Table 7 summarises the mitigation measures that have been put in place for the Proposed Development that will increase resilience to the likely effects resulting from climate change. The mitigation measures included in this table are already included in the design, and do not require further implementation. These particularly focus on the effects that scored highly in the risk assessment in Table 6.

Table 7 Climate change resilience measures

Risk	Mitigation measure
Severe winds	The Proposed Development will be built in line with current building regulations, and is therefore expected to be capable of withstanding severe wind and storm conditions. Balustrades will be used alongside suitable planting to increase user comfort and safety across the Proposed Development.
Extreme tropical storm	
Extreme winter conditions	The Proposed Development will be built in line with current building regulations and will therefore have appropriate insulation and heating in place to withstand extreme winter and cold conditions. 5,700 m^2 of green roofs are proposed across the site, this acts as insulation for buildings, and reduces the energy needed for heating during cold periods. Heating systems will be sized to ensure occupant thermal comfort is maintained during extreme cold weather events, accounting for an increase in frequency and intensity of these events due to climate change.
Cold wave	
Extreme cold days	
Heat waves	Overheating risk assessments have been undertaken, anticipating that 86% of the assessed spaces will meet the adaptive thermal comfort criteria for naturally ventilated places. 5,700 m^2 of green roofs are proposed across the site, this acts as insulation for buildings, and reduces the energy needed for cooling during heat waves and extreme hot days. Cooling systems will be sized to ensure occupant thermal comfort is maintained during extreme hot weather events, accounting for an increase in frequency and intensity of these events due to climate change. The results of the updated overheating assessment has demonstrated that 96% of dwellings will meet the CIBSE TM59 comfort criteria using natural ventilation. Additionally, the noise from of nearby train lines imposes constraints on window opening for natural ventilation so dwellings have been provided with active cooling systems to ensure occupant thermal comfort in extreme hot weather events.
Extreme hot days	
Drought	The planting strategy includes native, evergreen and drought resistant planting. In accordance with London Plan Policy SI 5, the development will be designed to limit mains water consumption to 105 l/person/day. Water demand for irrigation has been reduced through selection of native species in the landscape planting
All risks	Since the effects of climate change are dynamic and constantly changing, an adaptive management approach is recommended. The climate change resilience risk assessment should be periodically revisited by the design team during construction in order re-assess likely effects.

1.9 RESIDUAL EFFECTS

Table 88 provides a summary of the residual effects of climate change on the Proposed Development. Mitigation measures outlined in Table 8 have been taken into account.

Table 8 Summary of residual risks ratings based on probability and consequence taking into account mitigation measures

Risk	Risk rating pre-mitigation	Probability rating (1-5)	Consequence rating (1-7)	Risk rating
Rainstorm	5	5	1	5
Heavy snow	4	2	2	4
Fog	5	5	1	5
Hail	5	5	1	5
Severe wind	8	4	1	4
Extreme tropical storm	12	3	3	9
Lightning	4	4	1	4
Extreme winter conditions	12	4	2	8
Cold wave	12	4	2	8
Extreme cold days	12	4	2	8
Heat waves	20	4	3	12
Extreme hot days	16	4	3	12
Drought	8	4	1	4
Wildfire	6	1	6	6
Flash/surface flood	6	1	6	6
River flood	6	1	6	6
Groundwater flood	6	1	6	6
Subsidence	6	1	6	6
Water-borne disease	6	2	3	6
Vector borne disease	4	2	2	4
Air-borne disease	6	2	3	6
Insect infestation	4	2	2	4

1.10 CONCLUSION

1.10.1 A set of climate change risks to the Proposed Development were identified using the C40 Cities Climate Change Risk Assessment Guidance. These risks were assessed based on the probability of an event occurring and the consequence if it occurred. Mitigation measures have been identified for risks where required, and with the appropriate mitigation measures in place, the risk rating for all climate change hazards relating to the Proposed Development have been reduced. It is considered that the residual risks are in line with typical expectations for urban developments of this nature in the UK. Nevertheless, due to the nature and scale of many climate hazards, some level of residual risk remains in some instances.

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