AtkinsRéalis

Volume 2, Chapter 9 – Climate Vulnerability

Manchester City Council

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FORMER CENTRAL RETAIL PARK – THE PARK

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9. Climate Vulnerability

9.1 Executive summary

Climate change and climate variability present both challenges and opportunities for the successful construction and operation of the Proposed Development. This Environmental Statement (ES) assesses these factors in two separate chapters:

- Chapter 9, Vulnerability of the Proposed Development to climate change (this chapter); and
- Chapter 10, Effects of the Proposed Development on climate.

The Climate Vulnerability chapter provides an assessment of the vulnerability of the Proposed Development to climate change, including:

- An examination of the current climate baseline using the Met Offices latest regional dataset of 30-year averages and data from nearby long running meteorological stations;
- A consideration of the projected future climate baseline for the study area using UKCP18 data;
- An assessment of how during its construction and operation climate change and extreme weather could affect the Proposed Development's assets, as well as how they could affect the potential environmental impacts identified in the other chapters of this ES, i.e. how it could impact environmental receptors;
- Identification of specific mitigation to adapt the design and operational processes to reduce the Proposed Development's potential adverse climate vulnerabilities; and
- An assessment of the residual climate change vulnerability of the Proposed Development that considers both adverse and beneficial vulnerability affects.

A key outcome of the assessment is to ensure that climate change, and impacts associated with extreme weather, are considered during planning so that they can be avoided and, if that is not possible, mitigated during the construction and operation of the Proposed Development.

The baseline examination of climate projections has confirmed that the study areas climate is expected to change in the future:

- Hotter and drier summers;
- More intense storms (high winds); and
- Wetter winters and more intense rainfall.

The assessment of potential impacts finds that the Proposed Development could be vulnerable to impacts linked to these changes in the climate, for example creating new impacts or worsening existing impacts assessed in other Chapters of this ES. Mitigation measures, that are typically built into the design (i.e. embedded mitigation), that either avoids these impacts, minimises them or reduces their consequences to an acceptable level are presented. After consideration of this mitigation none of the potential climate vulnerability impacts are found to be significant.

9.2 Introduction

Vulnerability to climate change refers to an aspect of infrastructure, operations or a project which is susceptible to impacts arising from climate change. It encompasses a variety of concepts and elements including susceptibility to harm and capacity to adapt.

The Scoping Report identified that the Proposed Development has the potential to give rise to three potentially significant climate vulnerability impacts during construction and nine during operation (see Section 9.7).

The Environmental Scoping Report determined that the following were not considered likely to result in significant effects and have therefore not been considered further in this assessment:

- The Site's inland position (>20 km from the coast) means that sea level changes are not expected to affect the Proposed Development during its operation and this impact is therefore scoped out of further assessment.
- Climate change could generate increasingly severe soil moisture deficits and altered groundwater levels that could affect the stability of embankments. Construction of the embankments in the Site is not part of the scope of this Proposed Development, they are considered as part of the baseline, see Volume 2, Chapter 3 - Construction. The stability of the embankments on the project site is therefore not scoped in for further assessment in this projects ES.

The Scoping Report identified one potentially beneficial impact of climate change:

- Warmer average temperatures will increase the appeal of the park, providing more opportunity for users to access its recreational facilities.

The Scoping Report and the subsequent Scoping Opinion has informed the approach to the assessment reported in this ES. It was concluded in the Scoping Report that construction impacts would be scoped out of this assessment. Potential climate vulnerability related impacts on environmental receptors are assessed within the relevant topic Chapters of this ES, they therefore do not need to be considered further in this assessment.

9.3 Competent expert evidence

This chapter has been prepared by the following individuals who have used their knowledge and professional judgement to undertake this assessment:

- A Chartered Water and Environmental Manager who is also a Chartered Environmentalist and holds professional memberships including Member of the Chartered Institution of Water and Environmental Management (M.CIWEM) and Fellowship of the Royal Geographical Society (F-RGS). They have 17 years of experience in environmental impact assessment.
- This chapter was reviewed by a Chartered Environmentalist who holds professional memberships including Membership of Institute of Environment Management and Assessment and Engineer's Australia.

9.4 Relevant legislation and guidance

The following legislation and policies govern the assessment of vulnerability to climate change and have been consulted in preparing this chapter.

9.4.1 National policy

Climate Change Act, 2008[1]

The UK passed legislation that introduced the world's first long term legally binding framework to tackle the risks posed by climate change. The Climate Change Act (2008) created a new approach to managing and responding to climate change in the UK, by:

- Setting ambitious, legally binding reduction targets;
- Taking powers to help meet those targets;
- Strengthening the institutional framework;
- Enhancing the UK's ability to adapt to the impacts of climate change; and
- Establishing clear and regular accountability to the UK Parliament and to the developed legislatures.

Key provisions of the Act in respect of climate change adaptation include a requirement for Government to report, at least every five years, on the risks to the UK of climate change, and to publish a programme setting out how these will be addressed. This Act also introduces powers for Government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address those risks. The Adaptation Sub-Committee of the Committee on Climate Change will provide advice to, and scrutiny of, the Government's adaptation work.

9.4.2 Local policy

Places for Everyone Joint Development Plan[2]

The Places for Everyone (PfE) plan provides objectives and guidance policies to help create inclusive and sustainable economic growth across nine boroughs. It reinforces the ambition to bring forward development on brownfield land and provide greater protection of environmental assets whilst also supporting wider strategies around clean air, walking and cycling and underpins the ambition to be a carbon neutral city region by 2038. Specifically, the Sustainable Development policy (JP-S1) addresses the importance of action on climate change and outlines a focus on both adaptation and mitigation strategies.

Manchester City Council Climate Change Action Plan 2022 refresh[3]

The action plan “supports city wide adaptation to climate change”. This includes a commitment under workstream 4 that supports the installation of green infrastructure and nature-based solutions.

[1] http://www.legislation.gov.uk/ukpga/2008/27/contents
[2] https://www.greatermanchester-ca.gov.uk/media/9578/places-for-everyone-joint-development-plan-document.pdf
[3] https://www.manchester.gov.uk/downloads/download/7523/climate_change_action_plan_2022_refresh
[4] Institute of Environmental Management and Assessment, 2020, IEMA Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation: https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guide-to-climate-change-resilience-and-adaptation-2020

9.5 Assessment methodology

9.5.1 Guidance documents

The climate vulnerability assessment follows the framework set out in the IEMA guidance[4]. The In-Combination Climate Change Impacts (ICCI) assessment method is multi staged and is summarised in the following sections.

9.5.2 Establishing the baseline

9.5.2.1 Study area

The area for assessing the Proposed Development’s vulnerability to climate change includes the Site (see Chapter 2 [Description of the Site and Proposed Development]) plus the environmental receptors considered by the other assessment chapters where associated impacts could be intensified by climate change (see study area section within each environmental topic chapter).

The climate vulnerability assessment covers the design life of the developments assets with consideration of how the Proposed Development’s life span could exceed this with ongoing management and maintenance. It is noted that it is not unusual for a development’s design life to be exceeded by its life span as many developments remain in situ long after they have fulfilled their original objectives. With this in mind the climate vulnerability baseline uses long term climate projections for the period 2071 to 2089 which is the most appropriate period for which data is available.

9.5.2.2 Desk study

The climate projections presented in this chapter are from United Kingdom Climate Projections 2018 (UKCP18). These projections have been developed by the Meteorological Office (Met Office) Hadley Centre Climate Programme which is supported by BEIS and the Defra[5]. They provide the most up-to-date assessment of how the climate of the UK may change over the 21st century.

The baseline and impact assessment sections from the other assessment chapters also informs the climate vulnerability assessment.

9.5.2.3 Surveys

No surveys are required to inform the climate vulnerability baseline.

9.5.2.4 Determining sensitivity

Receptors have been identified using information gathered in the initial scoping exercise from the other assessment chapters of this ES.

In accordance with IEMA guidance, receptors considered include:

[5] Met Office, UK Climate Projections (UKCP). Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index

- Human health receptors (e.g., occupants, and site users);
- Environmental receptors; and
- Climatic systems.

Sensitivity, in relation to climate change vulnerability, for each receptor has been determined using quantifiable data such as the level of designation as well as professional judgement. In accordance with IEMA guidance in ascribing sensitivity the following have been considered:

- Susceptibility – ability for the receptor to be affected by climate change;
- Vulnerability – potential exposure of receptor to climate change; and
- Value – importance of receptor.

Susceptibility and vulnerability have been determined based on the criteria set out in the IEMA guidance and shown in Table 9-1 and Table 9-2. Criteria for defining a receptors value are set out in Table 9-3.

Table 9-1 – Guidance for determining susceptibility

Susceptibility	Criteria
High (Score: 4)	Receptor has no ability to withstand / not be substantially altered by the projected changes to the existing / prevailing climatic factors (e.g., lose much of its original function and form).
Medium (Score: 3)	Receptor has some limited ability to withstand / not be altered by the projected changes to the existing / prevailing climatic conditions (e.g., retain elements of its original function and form).
Low (Score: 2)	Receptor has the ability to withstand / not be altered much by the projected changes to the existing / prevailing climatic factors (e.g., retain much of its original function and form).
Negligible (Score: 1)	Receptor can withstand / not be altered by the projected changes to the existing / prevailing climatic factors (e.g., it will retain all of its original function and form).

Table 9-2 – Guidance for determining vulnerability

Vulnerability	Criteria
High (Score: 4)	Receptor is directly dependent on existing / prevailing climatic factors and reliant on these specific existing climate conditions continuing in the future (e.g., river flows and groundwater level) or only able to tolerate a very limited variation in climate conditions.
Medium (Score: 3)	Receptor is dependent on some climatic factors but is able to tolerate a range of conditions e.g., a species which has a wide geographic range across the entire UK but is not found in southern Spain.
Low (Score: 2)	Climatic factors have little influence on the receptor.
Negligible (Score: 1)	Climatic factors have no influence on the receptor.

Table 9-3 – Guidance for determining value

Value	Criteria
High (Score: 4)	High importance with regard to rarity (for example red list category species), diversity (internationally important), scientific value, educational value, or experience (e.g., untouched by encroachment or important within landscape or for recreation).
Medium (Score: 3)	Medium importance with regard to rarity (for example nationally designated), diversity (nationally important), scientific value, educational value, or experience (e.g., only slightly impacted by encroachment or important within nationally important landscape or for recreation).
Low (Score: 2)	Low importance with regard to rarity (for example locally or regionally designated), diversity (nationally important), scientific value, educational value, or experience (e.g., only slightly impacted by encroachment or important within nationally important landscape or for recreation).
Negligible (Score: 1)	Negligible importance with regard to rarity (e.g., not designated), diversity (not important), scientific value, educational value, or experience (e.g., site already heavily impacted by encroachment or not important within landscape or for recreation).

The receptor's sensitivity is a combination of its vulnerability, susceptibility, and value score. It is determined by the sum of these scores and then categorising as follows:

- Score 0-4 Negligible
- Score 5-7 Low
- Score 8-9 Medium
- Score 10-12 High

9.5.3 Impact assessment

9.5.3.1 Determining impact magnitude

Due to the inherent uncertainty of future climate change predictions, a risk-based approach has been used to identify impact magnitude which considers a combination of the consequence of a climate change impact occurring and the probability of occurrence, both after mitigation.

The probability of a specific climate variable changing is determined using available data and professional judgement. The categories range from negligible through low and medium to high. When defining probability, consideration has been given to the projected return periods of future events (where known), and the confidence in the direction of projected changes.

The consequence of climate change impacts has been defined as shown in Table 9-4.

Table 9-4 – Criteria for determining impact consequence

Consequence	Criteria
High	• Consequences have very large economic cost or affect assets that are integral to critically important systems • Consequences cause very large safety risks (long term injury/illness or risk of fatality) or very poor performance (e.g., outage or quality problems lasting >48 hours) • Consequences cause prolonged negative national reporting • Consequences cause very large environmental pollution or harm resulting in a major breach in compliance and prosecution or adversely affect internationally important species or habitat

Consequence	Criteria
	• Consequences occur many times during the life of the Proposed Development, e.g., could occur seasonally or last for many months/years
Medium	• Consequences have a large economic cost or affect important systems • Consequences cause large safety risks (short term injury or illness) or poor performance (e.g., moderate outage or quality problems lasting <48 hours) • Consequences cause negative regional media or social media • Consequences cause large environmental pollution or harm resulting in a regulatory non-compliance or affect nationally important species or habitat • Consequences occur more than once or lasting several months
Low	• Consequences have a moderate economic cost or affect systems or assets that can be replaced • Consequences cause safety risks (minor harm or near miss) or slightly reduce performance (e.g., outage or quality problems lasting <1 hour) • Consequences cause negative local media or adverse local stakeholder reaction • Consequences cause moderate environmental pollution or harm that may cause non-compliance of regional or local policy or affecting locally important species or habitat • Consequences occur once or last several weeks
Negligible	• Consequences have little economic cost or affect individual assets and can be easily repaired or replaced • Consequences cause very small or no safety risks or reduced performance • Consequences have little or no public interest • Consequences have no statutory controls or cause negligible environmental pollution or harm to receptors of little or no importance • Consequences unlikely to occur during projects design life or lasts for only a few days

The probability of potential climate changes and events occurring are determined using available data (extreme weather event recurrence intervals) and professional judgement, based on knowledge and experience of other similar developments.

Table 9-5 – Determining impact probability

Probability	Criteria
High	• The event occurs multiple times during the project lifetime (60 years) • e.g., approximately annually, typically 60 events.
Medium	• The event occurs limited times during the project lifetime (60 years) • e.g., approximately once every 15 years, typically 4 events.
Low	• The event occurs during the project lifetime (60 years) • e.g., approximately once in 60 years.
Negligible	• The event is unlikely to occur during the project lifetime (60 years).

The impact magnitude is determined by considering the impact's consequence and probability in combination as shown in Table 9-6.

Table 9-6 – Determining impact magnitude

		Probability			
		High	**Medium**	**Low**	**Negligible**
Consequence	**High**	High	High	Medium	Low
	Medium	High	Medium	Low	Negligible
	Low	Medium	Low	Negligible	Negligible
	Negligible	Low	Negligible	Negligible	Negligible

9.5.4 Determination of significance

The significance of effect is determined by considering the relationship between the sensitivity of the receptor and the impact magnitude as shown in Table 9-7. Major or Moderate effects are deemed to be significant. Minor and Negligible effects are deemed to be not significant. Table 9-7 acts as a guide and professional judgement is used at each step to make a reasoned judgement on whether an effect is significant or not.

Table 9-7 – Determining effect significance

		Impact magnitude			
		High	**Medium**	**Low**	**Negligible**
Receptor sensitivity	**High**	Major	Major / Moderate	Moderate / Minor	Minor / Negligible
	Medium	Major / Moderate	Moderate	Minor	Negligible
	Low	Moderate / Minor	Minor	Minor	Negligible
	Negligible	Minor / Negligible	Negligible	Negligible	Negligible

Where Table 9-8 identifies more than one level of significance, (e.g., Major or Moderate), professional judgement has been used to determine the most suitable significance of effect based on professional judgement and knowledge of the type of impact and the receiving receptor.

9.5.5 Assessment assumptions and limitations

The climate vulnerability assessment identifies potential impacts of climate change on the Proposed Development based on professional judgement.

The climate projections used are from UKCP18. The UKCP18 projections do not provide a single precise prediction of how weather and climate will change years into the future. Instead UKCP18 provides ranges that aim to capture a spread of possible climate responses. This better represents the uncertainty of climate prediction science.

The climate vulnerability assessment uses data from Relative Concentration Pathway (RCP) 8.5. This is a greenhouse gas concentration trajectory under which it is assumed that emissions continue to rise throughout the 21st century.

There is considerable uncertainty regarding if, how far and how quickly emissions will be reduced in the future. Using RCP 8.5 represents a conservative position.

It should also be noted that the level of uncertainty of the projections is dependent on the climate variable, for example, there is greater confidence around changes in temperature than there is in wind.

Other limitations of UKCP18 data are presented on the Met Office website[6].

9.6 Baseline conditions

The baseline for climate change vulnerability is presented in the following two parts:

- Current climatic conditions - an examination of the current climate
- Climate projections – a consideration of the forecast future climate

The full climate vulnerability baseline for both parts is included in Volume 3, Appendix 9.1 and summarised in the following sections.

9.6.1 Current climate

Data from the Met Office has been examined in order to summarise the current climate in the North West England River Basin. This stretches up the west coast from Stoke on Trent to Carlisle. The Met Office's standard average data tables are used to inform the current climate, these show the latest set of 30-year averages covering the period 1981-2010[7]. Context to this is provided within Volume 3, Appendix 9.1 by including comparison to the equivalent national dataset (UK minimum, average, and maximum).

In summary the current climate in the study area is one of relatively mild winters and warm summers. Monthly average temperatures in the North West are just above the mean for the UK whilst monthly mean maximum temperatures are close to the average. Long-term average monthly rainfall is close to average for the UK as is the number of heavy rainfall days in the study area.

With regards to storminess, across the UK there are no compelling trends over the last five decades, as determined by maximum gust speeds from the UK wind network[8].

Periods of prolonged rainfall can lead to widespread flooding, especially in winter and early spring when soils are usually near saturation. The autumn of 2000 was particularly wet, with over twice the normal rainfall in much of the Pennines, Greater Manchester and Cheshire. Widespread and severe flooding affected Cumbria in January 2005 and November 2009. The January 2005 floods in Carlisle were considered to be the worst to affect the city since 1822. On 19 November 2009, Seathwaite (Cumbria) reported 253 mm in 24 hours.

9.6.2 Projected future climate

Future projections are presented as averages for the 2080s based on climate projections running from 2071 to 2089 which is the most appropriate period for which data is available. For temperature and precipitation seasonal averages are provided for summer and winter, which represent the most extreme changes in response to climate change. The projections are probabilistic, those plotted are for the central estimate (i.e., 50th percentile) and use the emissions scenario RCP8.5. This is the most extreme emissions scenario representing a future where greenhouse gas emissions continue to rise, and the nations of the world choose not to switch to a low carbon future. This is considered appropriate as it provides a precautionary view of possible future climate responses.

In summary NW England is likely to experience hotter and drier summers and warmer and wetter winters. Alongside these changes in average conditions, it is possible, but less certain, that climate change will also increase the frequency and severity of extreme weather events such as: heavy rainfall, storms, and heatwaves.

9.6.3 Receptors

Table 9-8 shows the receptors that have been considered in the climate vulnerability assessment and shows how their sensitivity has been derived.

Table 9-8 – Receptors considered in the climate vulnerability impact assessment

Receptor	Susceptibility	Vulnerability	Value	Sensitivity
Landscape assets – all planted vegetation and anything retained from the baseline	Receptor has some limited ability to withstand / not be altered by the projected changes to the existing / prevailing climatic conditions Medium (3)	Receptor is dependent on some climatic factors but is able to tolerate a range of conditions Medium (3)	Medium importance with regard to rarity Medium (3)	Medium (9)
Water resources	Receptor has no ability to withstand / not be substantially altered by the projected changes to the existing / prevailing climatic factors High (4)	Receptor is directly dependent on existing / prevailing climatic factors High (4)	High importance with regard to rarity High (4)	High (12)
Air quality	Receptor has some limited ability to withstand / not be altered by the projected changes to the existing / prevailing climatic conditions Medium (3)	Receptor is dependent on some climatic factors but is able to tolerate a range of conditions Medium (3)	Medium importance with regard to rarity Medium (3)	Medium (9)

[6] Defra, BEIS, Met Office, Environment Agency, 2018, UKCP18 Guidance: Caveats and limitations. Available at: www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-guidance---caveats-and-limitations.pdf

[7] Met Office [online]. UK climate averages. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages

[8] Royal Meteorological Society (2020). State of the UK Climate 2019, July 2020. Available at: https://rmets.onlinelibrary.wiley.com/doi/full/10.1002/joc.6726 Last accessed: December 2020.

Receptor	Susceptibility	Vulnerability	Value	Sensitivity
Electrical equipment	Receptor has the ability to withstand / not be altered much by the projected changes to the existing / prevailing climatic factors. Low (2)	Climatic factors have little influence on the receptor Low (2)	Low importance with regard to rarity Low (2)	Low (6)
End users – visitors and maintenance staff	Receptor has some limited ability to withstand / not be altered by the projected changes to the existing / prevailing climatic conditions Medium (3)	Climatic factors have little influence on the receptor Low (2)	Medium importance with regard to rarity Medium (3)	Medium (8)

9.7 Potential impacts

The potential operational phase impacts that have been assessed for climate vulnerability are set out below.

9.7.1 Operation phase

Climate change gives rise to the following potential adverse impacts to the Proposed Development:

- Hotter and drier summers could damage landscaping
- Hotter and drier summers could increase risks from fire
- Hotter drier summers could increase irrigation demands, putting pressure on regional water resources
- More intense storms (high winds) could uproot trees
- Wetter winters and more intense rainfall could change the Sites flood risk
- More regular and intense storms in the future could increase the regularity of lightning strikes on infrastructure which could damage electrical equipment, e.g. lighting in the park
- Hotter and drier summers could change requirements for shading (user comfort)
- Hotter and drier summers could change demand for facilities, e.g. drinking water fountains
- Climate change could intensify some of the adverse impacts on environmental receptors that are assessed by the other topics in this report.

9.8 Assessment of effects

Table 9-9 sets out the assessment of climate vulnerability effects during the Schemes operation.

Table 9-9 – Operational phase impact assessment

Baseline		**Impact assessment**				
Receptor	**Sensitivity**	**Impact**	**Magnitude**	**Mitigation**	**Residual effect**	**Significance**
Newly planted vegetation	Medium	Hotter summers with longer warm spells and drier conditions.	Probability = Medium Consequence = Low Magnitude = Low	Operation management to reduce fire risk	The landscaping will have natural resilience to climate change and the majority of the planted landscape will recover after a drought. Therefore the warmer climate conditions will not significantly affect the landscaping. Hotter summers and longer warm spells will also increase the risk of fire. However, with appropriate mitigation, any fires likely to be contained.	Minor adverse effect Not significant
Newly planted tall trees and evergreens	Medium	High winds in more regular and intense storms	Probability = Medium Consequence = Low Magnitude = Low	Operational management to improve resilience of landscaping to impacts from high winds	High winds in more regular and intense storms could uproot trees and cause wind scorch on evergreen trees, shrubs, and perennials. This is only anticipated to cause minor damage that landscaping will recover from.	Minor adverse effect Not significant
Water resources	High	Hotter summers with longer warm spells and drier conditions.	Probability = Medium Consequence = Negligible Magnitude = Negligible	None required	Climate change will result in drier summers which could increase irrigation demands affecting water resources. However, no additional irrigation will be required during drought and therefore there will be no significant effect.	Minor / Negligible adverse effect Not significant
Air quality receptors	Medium	Hotter summers with longer warm spells and drier conditions.	Probability = Low Consequence = Negligible Magnitude = Negligible	None required	In the future air quality impacts for some pollutants (e.g., ozone) will be intensified as hotter summers are brought on by climate change. However, no emissions to air will arise as a result of the Proposed Development and no significant air quality effects will arise. Climate change will not change the sensitivity of receiving air quality receptors.	Negligible adverse effect Not significant
Newly installed electrical equipment	Low	Hotter summers with longer warm spells and drier conditions.	Probability = Low Consequence = Low Magnitude = Negligible	None required	Extreme weather has the potential to damage or interfere with electrical equipment. Type 2 surge protection which protect equipment against overvoltage and indirect lighting strikes (i.e. nearby structures/ grid infrastructure) and therefore there will be no significant effects.	Negligible adverse effect Not significant
End user usage patterns and dwell times	Medium	Hotter summers with longer warm spells and drier conditions.	Probability = High Consequence = Negligible Magnitude = Low	None required	Hotter and drier summers could change requirements for shading (user comfort). However, sufficient tree planting planned within the design will provide shading and therefore no significant residual effects are anticipated.	Minor adverse effect Not significant

9.9 Additional mitigation and enhancement measures

9.9.1 Operation management to reduce fire risk

The following measures have been identified to minimise the risk of fires:

- Regular maintenance to avoid overgrowth;
- Restricting useof BBQs
- Use composted mulch rather than bark on beds (holds moisture and is less prone to ignition);
- Avoid planting next to structures;
- Use non-flammable materials where practical;
- Provide rubbish facilities to reduce items that can reflect light (which are a fire ignition risk); and
- Provision of cigarette bins

9.9.2 Operational management to improve resilience of landscaping to impacts from high winds

The following measures have been identified to support resilience in the landscaping:

- Regular condition surveys;
- Maintenance of damaged trees;
- Preventative actions e.g. thin the tree canopy and/or reduce the size of the tree crowns (removing lower branches and/or shortening upright branches);
- No tall trees to be planted (with an unestablished root system these would be particularly vulnerable);
- The design does not include large open spaces and so reduces exposure of landscaping to wind; and
- Long term maintenance will involve the replacement of plant species that don't thrive to maintain and enhance biodiversity on Site.

9.10 Cumulative effects

This planning application has sight of the prospective Phase 2 development adjacent to the east of the Proposed Development as disclosed within the SRF 2023. It is understood that this will comprise a commercial development with opportunities for ancillary ground floors to provide active frontages. The buildings will be of heights between 6-16 storeys and vehicular access will be available via Old Mill Street. It is assumed the Proposed Development will have been constructed prior to the construction of the Phase 2 development and therefore no cumulative effects are anticipated during the construction phases as these will not overlap. In relation to the operational phase, this assessment looks at the impact of climate on the Proposed Development. Therefore, the presence of the Phase 2 development is not anticipated to change the impacts of climate change and therefore no significant adverse cumulative effects are anticipated.

There are no other anticipated future developments to consider within this assessment of inter-cumulative effects as all applications within the planning portal as the time of assessment are expected to already be constructed prior to the Proposed Development. However, it is advised that should concurrent construction projects occur that regular liaison is carried out between the environment manager/engineer or the site manager ensure mitigation measures remain appropriate.

Intra-cumulative effects of the Proposed Development are considered in Volume 2, Chapter 20 of this ES

9.11 Summary and conclusions

Climate projections for the study area show that it is likely climate will change in the future. However, the assessment has found that climate change will neither worsen the effects of the Proposed Development to result in significant adverse effects or cause new significant effects.

9.12 Glossary and acronyms

Table 9-10 Glossary of terms

Term	Definition
BEIS	Department for Business, Energy & Industrial Strategy
Climate Risk Assessment	Climate Risk Assessment
ES	Environmental Statement
FRA	Flood Risk Assessment
F-RGS	Fellowship of the Royal Geographical Society
GHG	Green House Gas
ICCI	In-Combination Climate Change Impact
IEMA	Institute of Environmental Management and Assessment
IES	Institute of Environmental Sciences
M.CIWEM	Member of the Chartered Institution of Water and Environmental Management
RCP	Relative Concentration Pathway (future scenarios for GHG emissions)
RFFP	Reasonably Foreseeable Future Projects
UKCP18	United Kingdom Climate Projections 2018 - the most up-to-date assessment of how the climate of the UK may change over the 21st century.
UK	United Kingdom

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