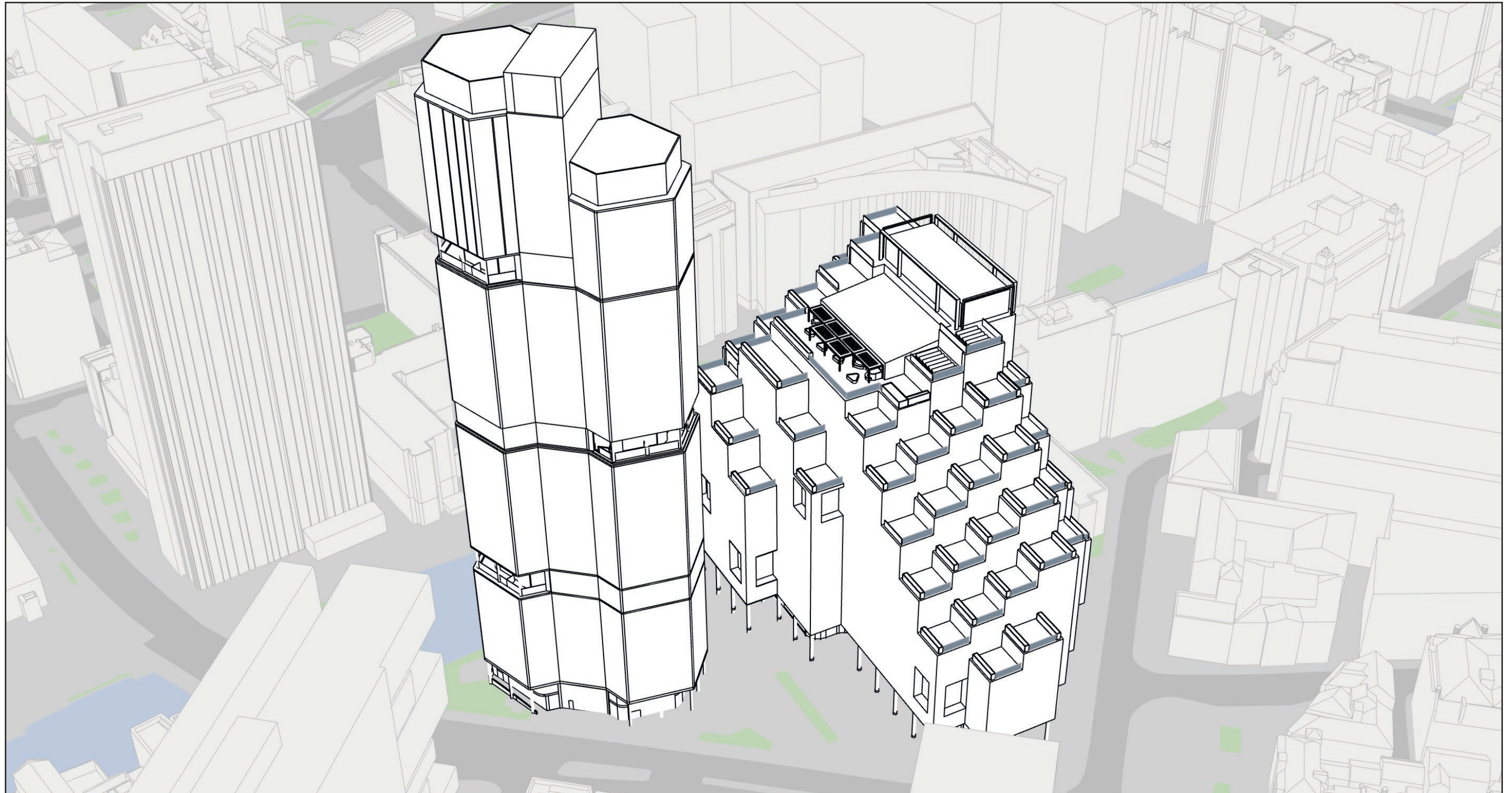


5222M
Albert Bridge House

WIND MICROCLIMATE ASSESSMENT

September 2022

akt II
Bioclimatic



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Prepared by:		Steven Daniels
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Executive Summary

AKT II has prepared this wind microclimate report on behalf of Oval Real Estate ("the applicant") in support of the application to Manchester City Council for the redevelopment of Albert Bridge House, 1 Bridge St, Manchester M60 9AF ("the Site") in Manchester City, UK.

This report details an assessment of the pedestrian wind comfort on and around the Site of the Proposed Development using Computational Fluid Dynamics (CFD). This assessment pays particular attention to the impact of the Proposed Development on its surroundings, including pedestrian access routes to the Site, building drop-off and entrances, and proposed on-and-off-Site seating areas. The wind conditions on the proposed public and private terraces are also considered. Overall, the impact of the Proposed Development on local wind conditions will be evaluated on two measures:

1. a comparison between the Existing Site ('Baseline') and the Proposed Development.
2. whether the wind conditions for identified 'receptors' for the Proposed scheme are suitable for the intended use.

Scope of work

This report details the wind assessment for the following schemes:

- 'Baseline' - Existing Site with existing surroundings;
- Proposed Development with existing surroundings;
- Proposed Development with future consented schemes in the surroundings;
- Proposed Development with proposed on-Site landscaping with existing and future consented surroundings.

Quantification of the wind conditions within and around the Site is performed using the established Lawson London Docklands Development Corporation (LDDC) criteria. For the wind 'comfort' part of this assessment, the criteria sets out pedestrian activities (Sitting, Standing, Strolling, Business Walking, Uncomfortable) that would be suitable for the local wind conditions, e.g., wind conditions in a seating area need to be calmer than for a location used as a movement corridor. If the wind conditions exceed the threshold for the intended activity, then they are unacceptable for the stated pedestrian activity and the expectation is that there may be complaints of nuisance or people will not use the area for its intended purpose. This part of this assessment performed on two contrasting seasons:

- winter (windiest season)
- summer (characterised by frequent pedestrian activity),

An annual 'distress' assessment (from the same criteria) also forms part of this assessment. If exceeded (unacceptable distress) people may find walking difficult in this area - potentially leading to stumbling or falling.

Results

Ground-level

A summary of the wind comfort and distress results for the 'Baseline' and Proposed schemes at ground-level around the Site is as follows:

- During winter, the wind conditions for the Baseline are suitable for the intended use. The Proposed scheme has a Negligible impact on the surroundings.
- During summer, the wind conditions for the Baseline are suitable for the intended use. Of particular note are the wind conditions for the off-Site public seating area - Motor Square, which experiences a Minor Beneficial impact from the Proposed scheme. For the remaining areas, the Proposed scheme has a Negligible impact.
- No areas of (annual) distress observed in both the Baseline and Proposed schemes. The Proposed scheme therefore has a Negligible impact on the surroundings.

Overall, the Proposed scheme largely has a 'Negligible' impact on the wind conditions in its surroundings, with a Minor Beneficial impact on Motor Square. The wind conditions for the Proposed scheme are therefore acceptable.

Proposed Development entrances

The wind conditions in the vicinity of the entrances to the Proposed Development experience suitable wind conditions in both summer and winter. No regions of unacceptable wind distress are observed. The significance of the wind conditions for the Proposed scheme is Negligible and therefore acceptable.

Proposed on-Site seating areas

The Proposed on-Site seating areas experience unsuitable wind conditions for summer (Moderate Adverse impact). This report shows that the Proposed on-Site landscaping mitigates the adverse wind conditions. No regions of unacceptable wind distress are observed. The significance of the wind conditions for the Proposed scheme is Negligible with the Proposed on-Site landscaping. The wind conditions for the Proposed scheme are therefore acceptable.

Proposed public passageway through the commercial Development

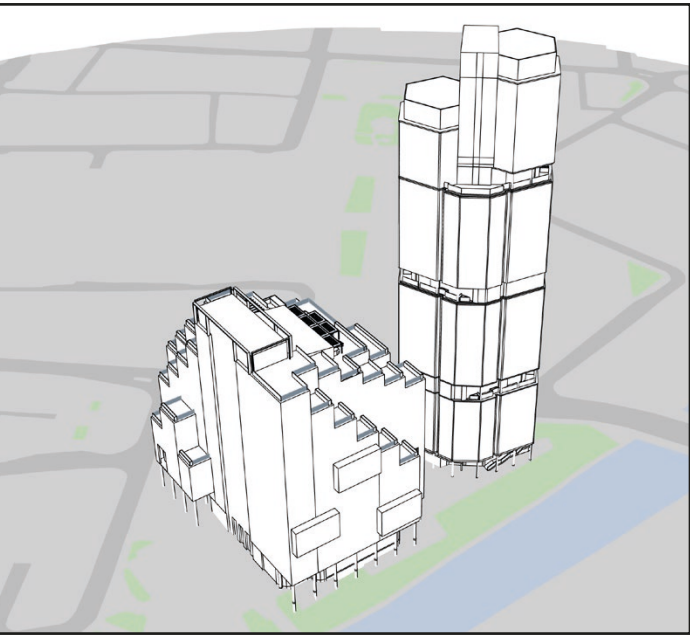
The wind conditions for the passageway through the Proposed commercial building are suitable for the intended use in both summer and winter. No regions of unacceptable wind distress are observed. The significance of the wind conditions for the Proposed scheme is Negligible and therefore acceptable.

Proposed Development commercial building terraces

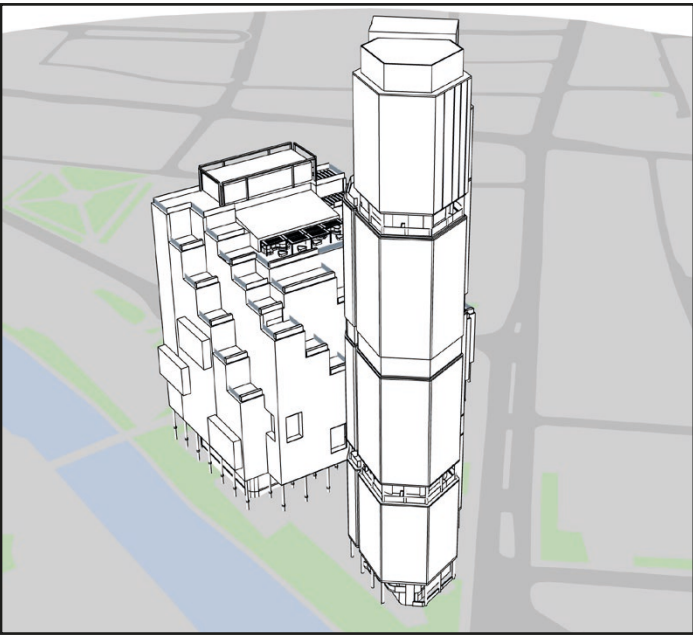
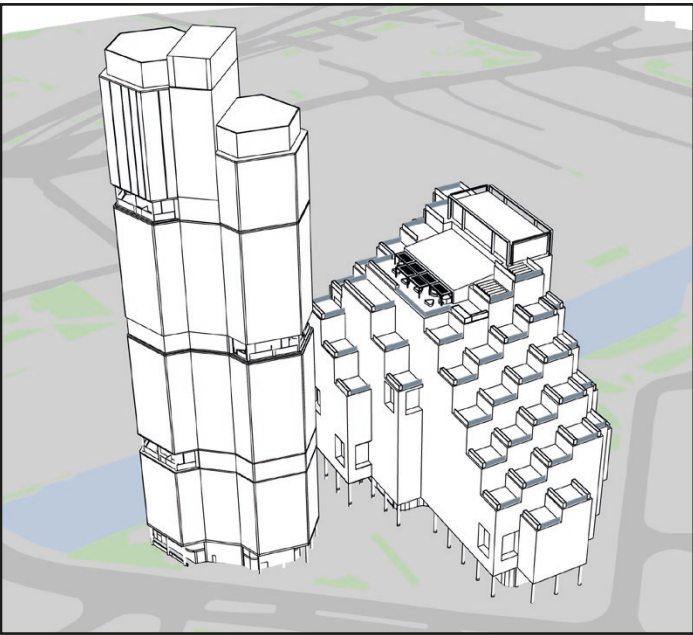
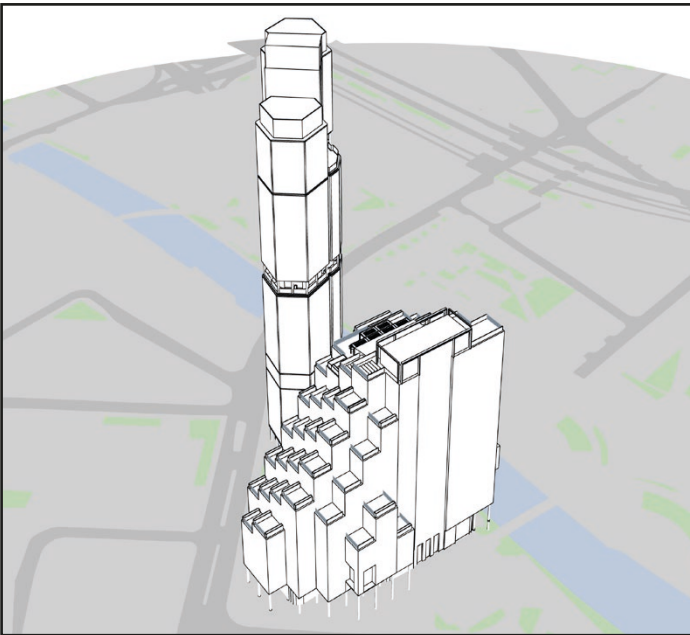
The wind conditions for the public terraces on the commercial building experience suitable wind conditions in summer. No regions of unacceptable wind distress are observed. The significance of the wind conditions for the Proposed scheme is Negligible and therefore acceptable.

Proposed Development residential building terraces

The wind conditions for the private terraces on the residential building experience unsuitable wind conditions in summer. Significant areas of unacceptable wind distress are also observed. This area therefore experiences Major Adverse (unacceptable) wind conditions, and so further measures against the adverse wind are required.



Design of the Proposed Development



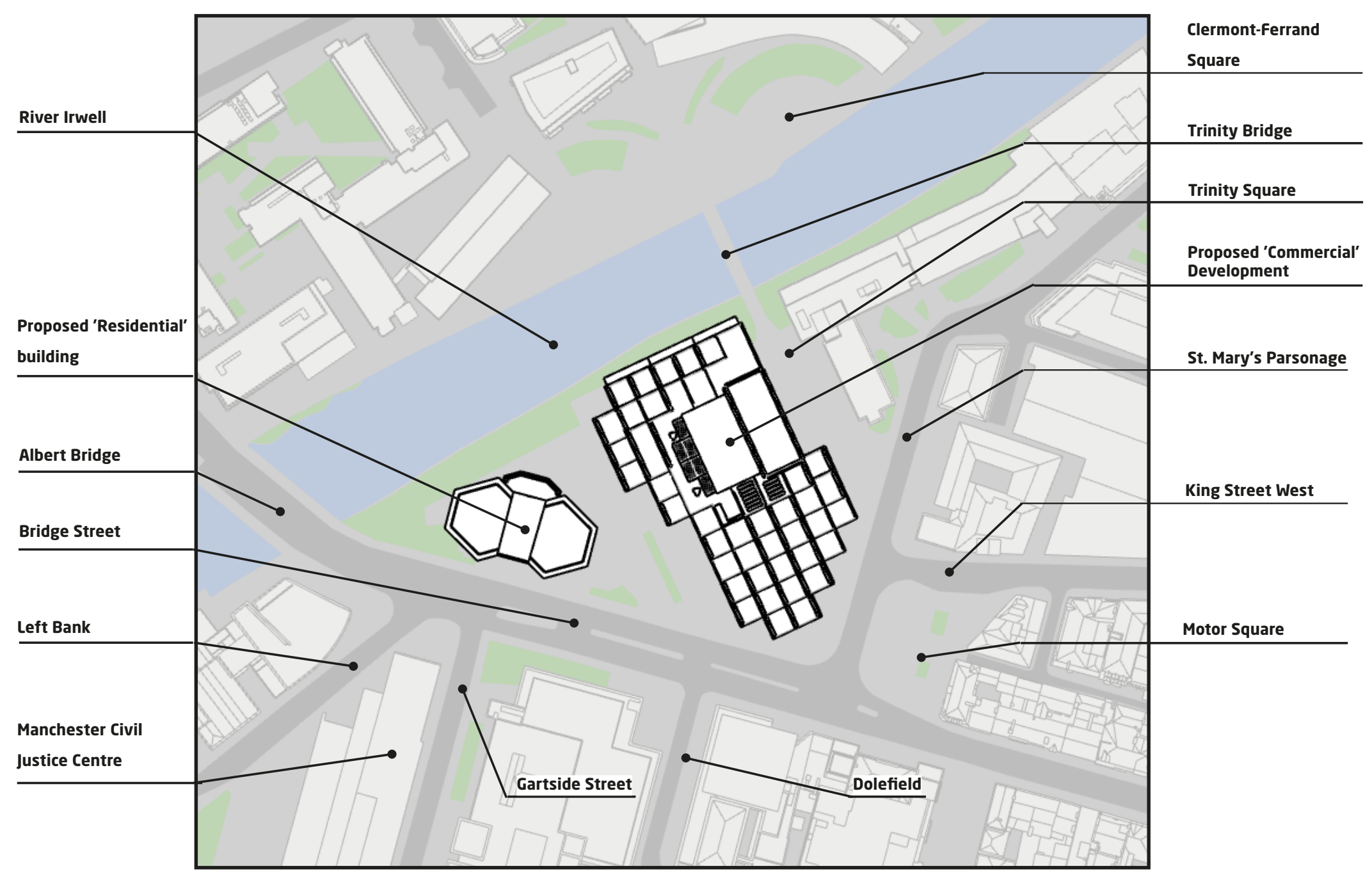
1.0

Introduction

AKT II has prepared this wind microclimate report on behalf of Oval Real Estate ("the applicant") in support of the application to Manchester City Council for the redevelopment of Albert Bridge House, 1 Bridge St, Manchester M60 9AF ("the Site") in Manchester City, UK.

This report details an assessment of the pedestrian wind comfort on and around the Site using Computational Fluid Dynamics (CFD). This assessment pays particular attention to the impact of the Proposed Development on its surroundings, including pedestrian access routes to the Site, building drop-off and entrances, and proposed on-and-off-Site seating areas. The wind conditions on the proposed public and private terraces are also considered. Overall, the impact of the Proposed Development on local wind conditions will be evaluated on two measures:

1. a comparison between the Existing Site ('Baseline') and the Proposed Development.
2. whether the wind conditions for identified 'receptors' for the Proposed scheme are suitable for the intended use.



Plan view of the Proposed Development (existing surroundings) with labelled key public regions for discussion.

1.1

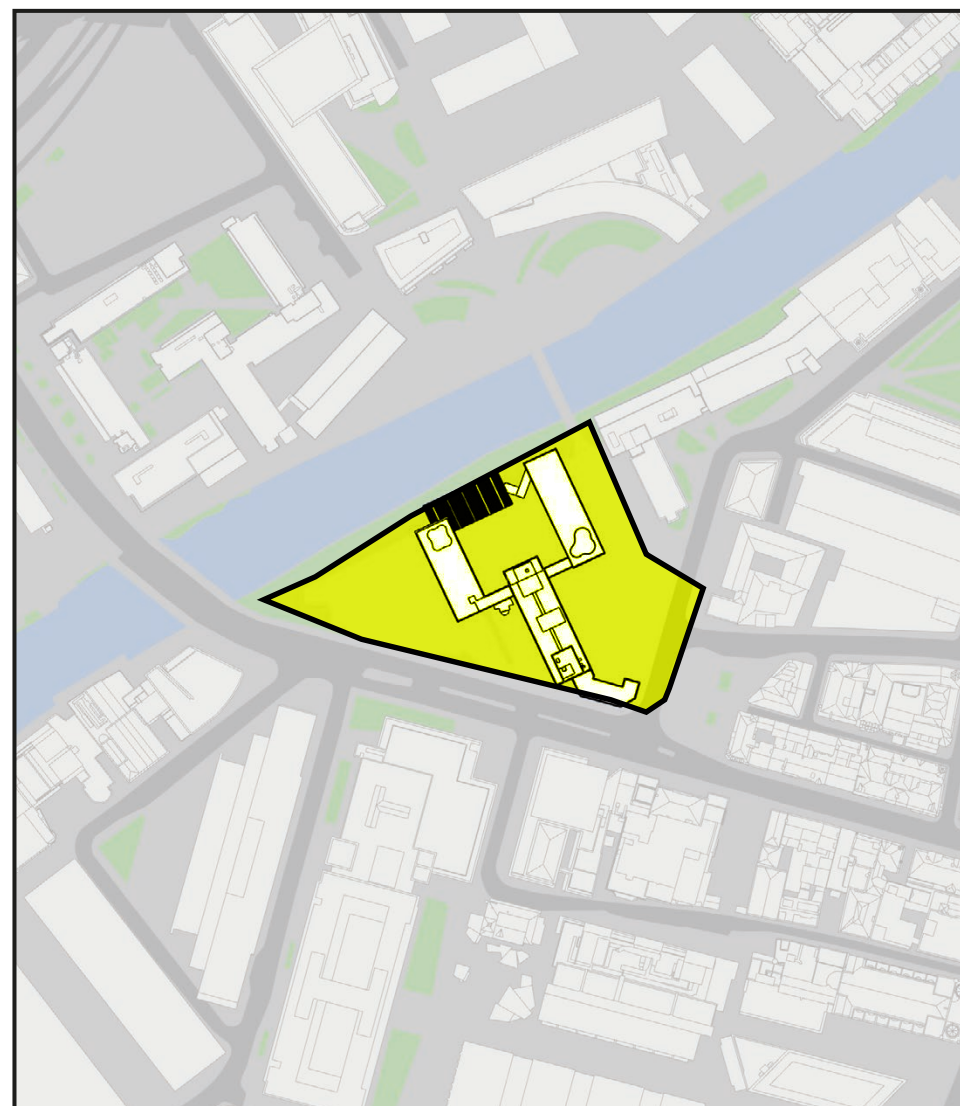
Location

The Site is located to the north of Manchester, UK. The National Grid Reference for the Site is 534819, 22508.

1.2

Site Boundary

Please refer to the image below indicating the site boundary.



Plan view of the Existing Site (existing surroundings) and its location. The Site boundary is highlighted in yellow.

1.3

Surrounding Area

The area around the Site is characterised by medium-rise (5-8 storeys) industrial, office, commercial, and residential buildings. The Site is located on the south bank of the River Irwell, with a Grade-II listed Albert (road) Bridge immediately west, and Trinity (foot) Bridge immediately east of the Site.

Immediately south-west of the Site is a public seating area 'Motor Square'. For this area, the St Marys Parsonage Strategic Regeneration Framework (SRF) seeks to reimagine and revitalise this space to "encourage adjoining businesses to expand into the square at key locations, enhancing the vibrancy and activity" which would include introducing seating/additional amenity uses as opposed to its current lack of function/predominant use as a movement corridor.

North of the Site, on the other side of the River Irwell, is another public seating area 'Clermont-Ferrand Square'.

The CAD geometry for the surrounding context was received from Studio Egret West (SEW) on the 22/02/22 and the 10/08/22 who obtained this from VU.City.

1.4

Existing Site & Proposed Development

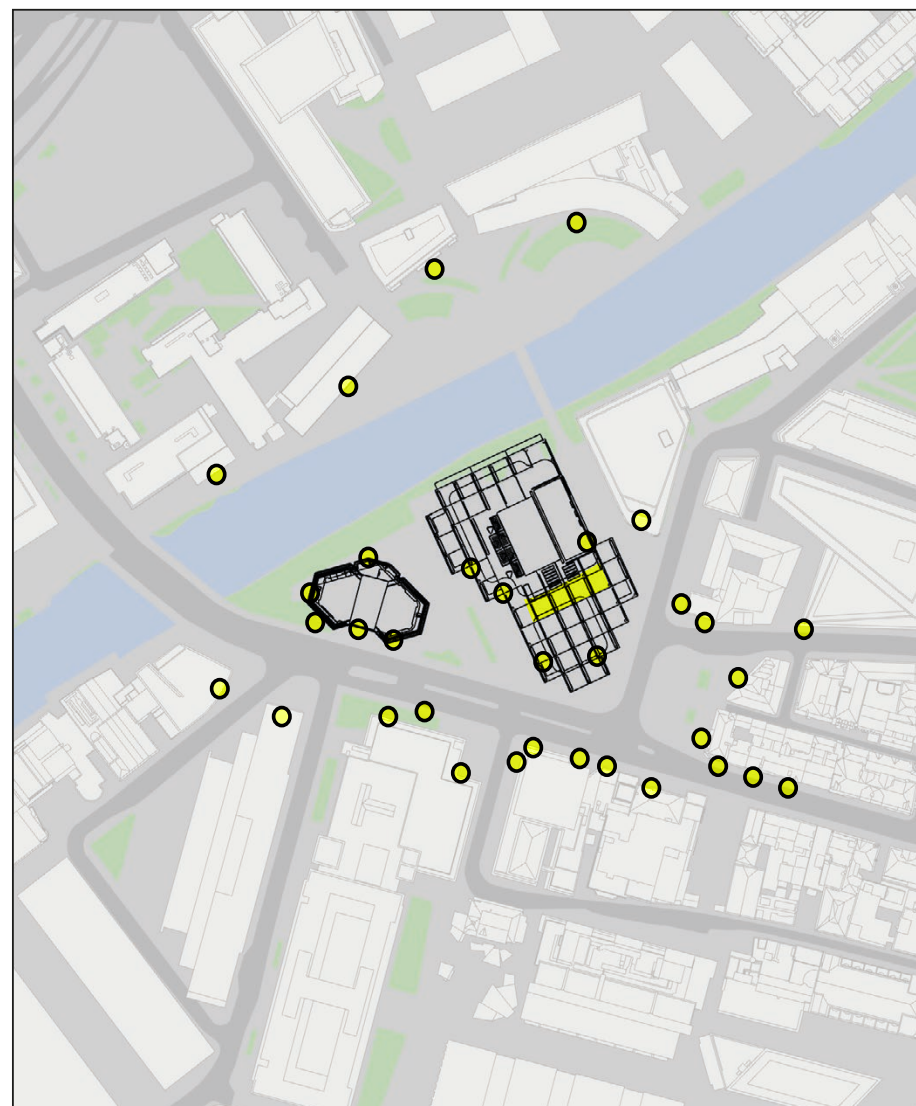
The Existing Site comprises of an 18-storey office building constructed between 1958-1959. The use of this Site is largely used for car parking and a movement corridor for pedestrians.

The Proposed scheme comprises two Developments for residential and commercial use, respectively.

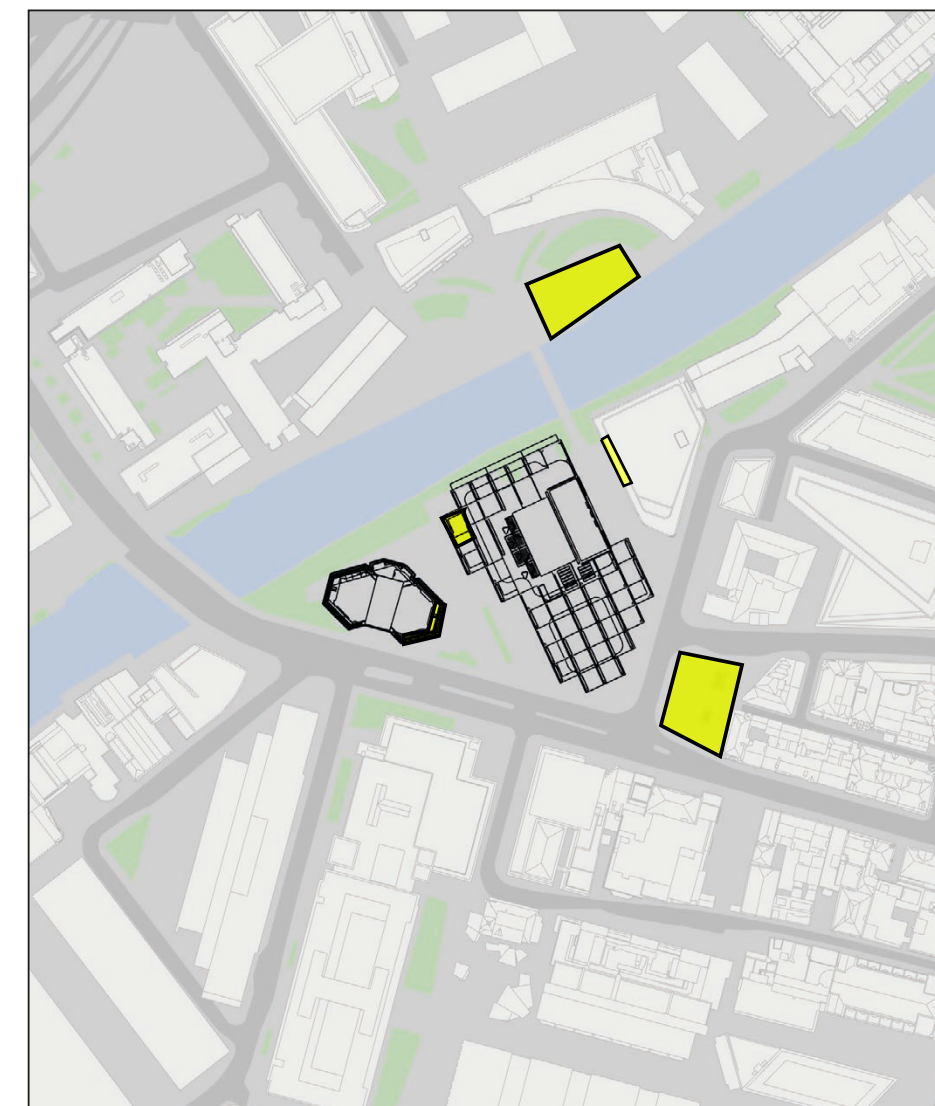
The commercial Development to the east of the Site introduces a number of areas for public use, including numerous open terraces and on-site (ground-level) seating areas. A public passageway through the ground-level of the building is to primarily act as a movement corridor from the pathway from Trinity Bridge to the centre of the Site.

The residential Development introduces a number of private terraces and a public seating area on the ground level.

The Proposed Development was modelled based on the CAD geometry received from the SEW (220803_0412-SEW-ZZ-ZZ-M3-A-00000_buildings only.dwg, 03/08/22).



Proposed Development with future consented surroundings with entrances, public passageways, and bus stops highlighted



Proposed Development with future consented surroundings with public seatings areas (on-Site and off-Site) highlighted

1.5

Consented schemes

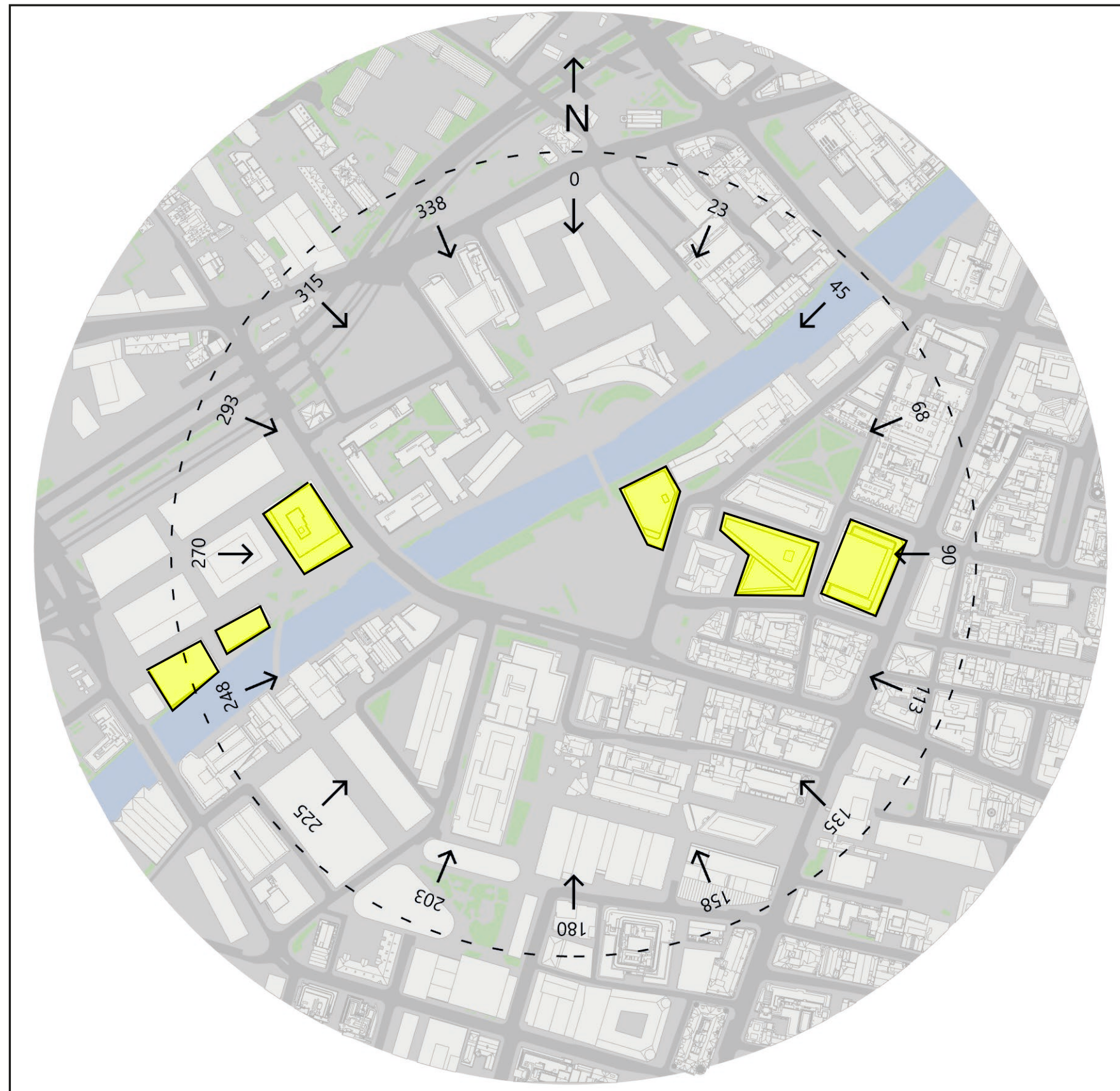
The assessment considers developments that have received planning consent within 300m of the Site. These include schemes in Manchester City and Salford:

- 134287/F0/2022 - Alberton House.
- 129251/F0/2021 - Kendel Milne Building and Fraser Building.
- 20/75571/FUL - Plot B7 Salford Central Masterplan.
- 21/78277/FUL - Rali Quays site (once HMRC)

The locations of these schemes are indicated in the figure on this page.

The cumulative effect of the approved designs of these buildings is considered in this report for the 'Proposed Development with consented schemes' scenario.

Note that as part of the Albert House future consented scheme, a seating area is to be introduced on Trinity Square (neighbouring the Site). The area for this is highlighted on the previous page.



Context surroundings with highlighted positions of consented schemes

2.0

Legislative Framework, Policy and Guidance

In support of the application for the Proposed Development, this wind microclimate assessment has been undertaken within the context of relevant planning policies, guidance documents and legislative instruments. These are summarised below.

2.1

Guidance

National Planning Practice Guidance (2021)

The NPPG was published in November 2016 to support the NPPF and was updated in August 2021. There is no guidance within the NPPG related to wind microclimate issues.

National Design Guidance (2021)

The Ministry of Housing, Communities & Local Government, paragraph 71 states that

“Proposals for tall buildings (and other buildings with a significantly larger scale or bulk than their surroundings) require special consideration. This includes their location and siting; relationship to context; impact on local character, views and sight lines; composition - how they meet the ground and the sky; and environmental impacts, such as sunlight, daylight, overshadowing and wind. These need to be resolved satisfactorily in relation to the context and local character”.

Historic England Advice Note 4, Tall Buildings (2022)

The revised Guidance on Tall Buildings updates previous guidance by English Heritage and the Commission for Architecture and Built Environment (CABE), produced in 2007. It seeks to guide people involved in planning for and designing tall buildings so that they may be delivered in a sustainable and successful way through the development plan and development management process. The relevant passages:

Page 8:

“3.3 The following factors need to be considered to determine the impacts a tall building could have upon the historic environment:

...

Environmental: *the influence on local micro-climates such as creation of wind tunnels, canyon effect, over-shadowing, glare, and air quality and effect on heritage assets in terms of the impact these micro-climatic changes could have upon their fabric, and how they are experienced; and*

Cumulative: *the combined impacts on heritage assets from existing, consented and proposed tall buildings.”*

Page 14:

“4.5 Using an understanding of the historic environment to inform the approach to tall building design can be achieved by:

...

2. The impact on the local environment: people’s experience of local character and the historic environment can be affected by factors such as wind and other microclimatic changes, overshadowing, and light pollution from the development of a tall building. In some cases, this has the potential to impact the physical fabric of heritage assets. It is important to test impacts on the local environment at design stage and present these through the application process to reduce the incidence of interventions being required to mitigate impacts post construction (which may in turn harm character and quality of a site, street or area).”

2.2

Legislative Framework

For Manchester, there is no specific national legislation or planning policy guidance dealing with wind microclimate in terms of pedestrian comfort. However, the Lawson variant of the criteria used in this assessment is recognised by many other local authorities across the UK as a suitable benchmark for wind assessments.

2.3

National Planning Policy

The National Planning Policy Framework (2019)

The National Planning Policy Framework was revised in February 2019 by the Department of Communities and Local Government (DCLG). The relevant paragraphs are as follows:

Paragraph 127 of this framework states:

“Planning policies and decisions should ensure that developments:

a) will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;

b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;

c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);

d) establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;

e) optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and

f) create places that are safe, inclusive and accessible and which promote health and wellbeing, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience.”

National Design Guidance (2021)

The Ministry of Housing, Communities & Local Government, paragraph 71 states that:

“Proposals for tall buildings (and other buildings with a significantly larger scale or bulk than their surroundings) require special consideration. This includes their location and siting; relationship to context; impact on local character, views and sight lines; composition - how they meet the ground and the sky; and environmental impacts, such as wind. These need to be resolved satisfactorily in relation to the context and local character”.

2.4

Local Planning Policy

The Greater Manchester’s Plan for Homes, Jobs and the Environment: Greater Manchester Spatial Framework Revised Draft (2019)

The revised draft enables Greater Manchester to reinforce their ambition to meet local housing need, promote new approach to town centres, achieve carbon neutral goals and supports other wider strategies around air quality, microclimate, walking and cycling etc.

Policy GM-S 4 ‘Resilience’, states that:

“The development of Greater Manchester will be managed so as to increase considerably the capacity of its citizens, communities, businesses and infrastructure to survive, adapt and grow in the face of physical, social, economic and environmental challenges. Key measures will include:

[...] 6. Designing indoor and outdoor environments to provide a reduction and respite from more extreme temperatures and winds associated with climate change and greater urbanisation;”.

Policy GM-E 1 ‘Sustainable Places’, states that:

“Greater Manchester will aim to become one of the most liveable city regions in the world, consisting of a series of beautiful, healthy and varied places, each having the following key attributes that all development, wherever appropriate, should be consistent with:

[...] 14. Comfortable and inviting, with indoor and outdoor environments:

A. Offering a high level of amenity that minimises exposure to pollution;

B. Addressing microclimate issues such as sunlight, indoor air quality, overheating, shade, wind and shelter”.

Policy GM-C 8 ‘Streets For All,’ states that:

“Greater Manchester’s streets will be designed and managed to make a significant positive contribution to the quality of place and support high levels of walking, cycling and public transport, including by:

[...] 8. Offering shelter from wind and rain, and shade from the sun;”.

3.0 Methodology

3.1 Software & Workflow

The CFD calculations have been carried out using AKT II's proprietary Bioclimatic CFD Tool, which has been developed in-house and embedded within the McNeel Rhinoceros and Grasshopper platforms, utilising OpenFOAM 7.0 as the CFD analysis engine by means of local Clusters and Cloud Computing Technology.

In order to perform the CFD simulation, three main steps are followed: pre-processing, computing and post-processing. Each phase contributes to the final outcome of the simulation:

1. pre-processing: McNeel Rhinoceros was used to model the urban geometry and Grasshopper platform to transform meshes into CFD ready file;
2. computing: OpenFOAM 7.0 was then employed to carry out the CFD analysis due to its flexibility and reliability alongside strong validation in the Industry. Local Clusters and Cloud Computing Technology was embedded within the workflow to multi-thread the analysis and increase the efficiency of the overall workflow;
3. post-processing: MATLab was used to process the raw data from OpenFOAM, processing them with the long-term wind data to be then visualised in McNeel Rhinoceros / Grasshopper.

3.2 Key Assumptions

The dimensions of the CFD domain follow the established guidelines for urban environments [1]. These are outlined below.

Input parameters	Value
Reference building height (<i>H</i>)	90 m.
Height of Domain (min. <i>6H</i>)	600 m.
Length Upstream (min. <i>6H</i>)	1200 m.
Length Downstream (min. <i>12H</i>)	1500 m.
Width Domain (min. <i>6H</i>)	2400 m.

[1] Franke, Jörg & Hellsten, A & Schlünzen, Heinke & Carissimo, Bertrand. (2007). Best Practice Guideline for the CFD Simulation of Flows in the Urban Environment. COST action. 732. 51.

3.3 CFD workflow

Approximately 24million cells were used for the CFD simulations over 16 wind directions. The simulations were performed using steady-state Reynolds-Averaged Navier-Stokes (RANS) equations with the k-w SST model for the turbulence closure. 2nd order discretisation to solve the governing equations.

Details of the wind characteristics from the meteorological and terrain data are included in Appendix A of this report.

3.4 Presentation of Results

The pedestrian wind ‘comfort’ assessment in this report focuses primarily on the seasons:

- winter (windiest season);
 - summer (characterised by frequent pedestrian activity).
- The comfort results are discussed relating the wind conditions in an region to the intended pedestrian use using the established Lawson LDDC criteria. Generally, for mixed-use terrain and developments, the target conditions are:
- Strolling during the windiest season on pedestrian thoroughfares;
 - Standing conditions at main entrances, drop off areas or taxi ranks, and bus stops throughout the year;
 - Sitting conditions at outdoor seating and amenity areas during the summer when these areas are more likely to be frequently used by pedestrians.

The ‘Business Walking’ and ‘Main Roads’ classifications are usually avoided because of their association with occasional strong winds, unless they are on a minor pedestrian route or a route where pedestrian access could be controlled in the event of strong winds.

For roof terraces, either ‘Sitting’ or ‘Standing’ conditions are acceptable.

An annual pedestrian ‘distress’ assessment is also performed to highlight any potential safety risks to vulnerable members of the public or cyclists due to strong winds.

Please refer to the tables below for the colour-coding of the comfort and distress plots. Further details on the Lawson Criteria and wind statistics are included in Appendix A of this report.

Comfort Category	Colour
Sitting	
Standing	
Strolling	
Business Walking	
Roads and Car Parks	

Table A Wind Acceptability according to Lawson LDDC Criteria

Distress Category	Colour
Unacceptable	
Acceptable	

Table B Wind Safety according to Lawson LDDC Criteria

3.5

Scenarios Analysed

The main body of this report outlines the wind comfort and distress results of the Proposed Development for the following schemes:

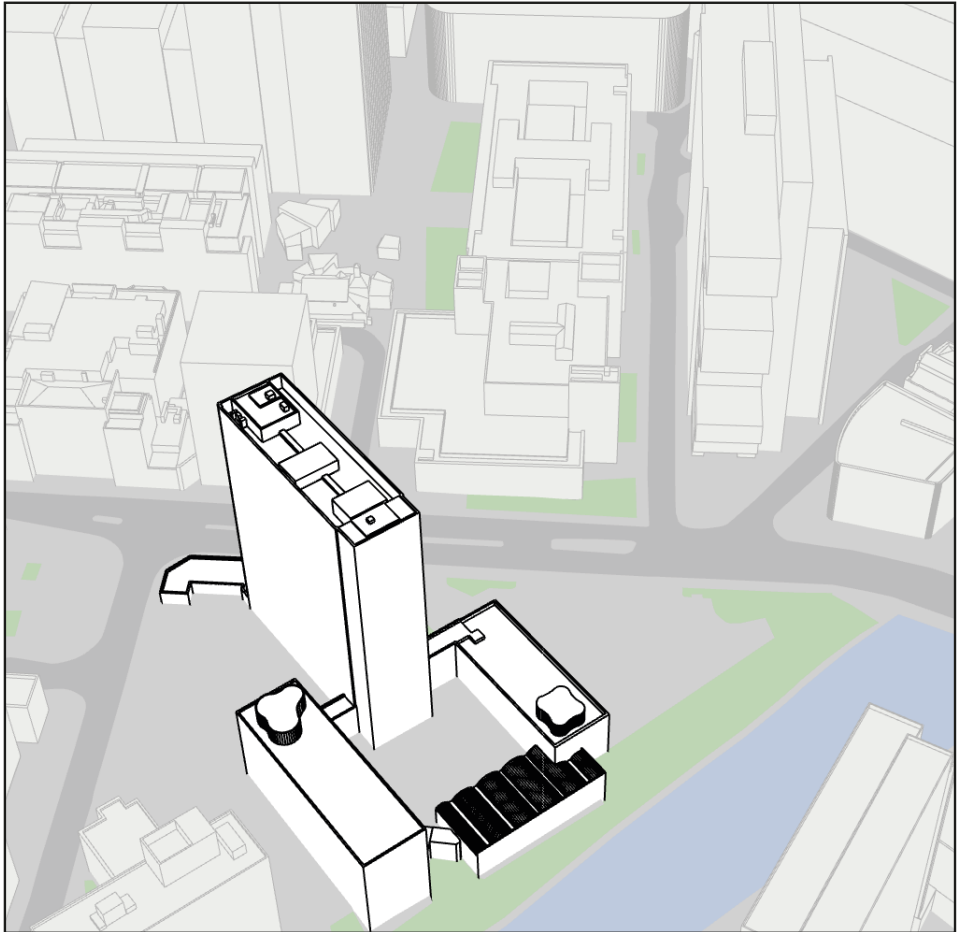
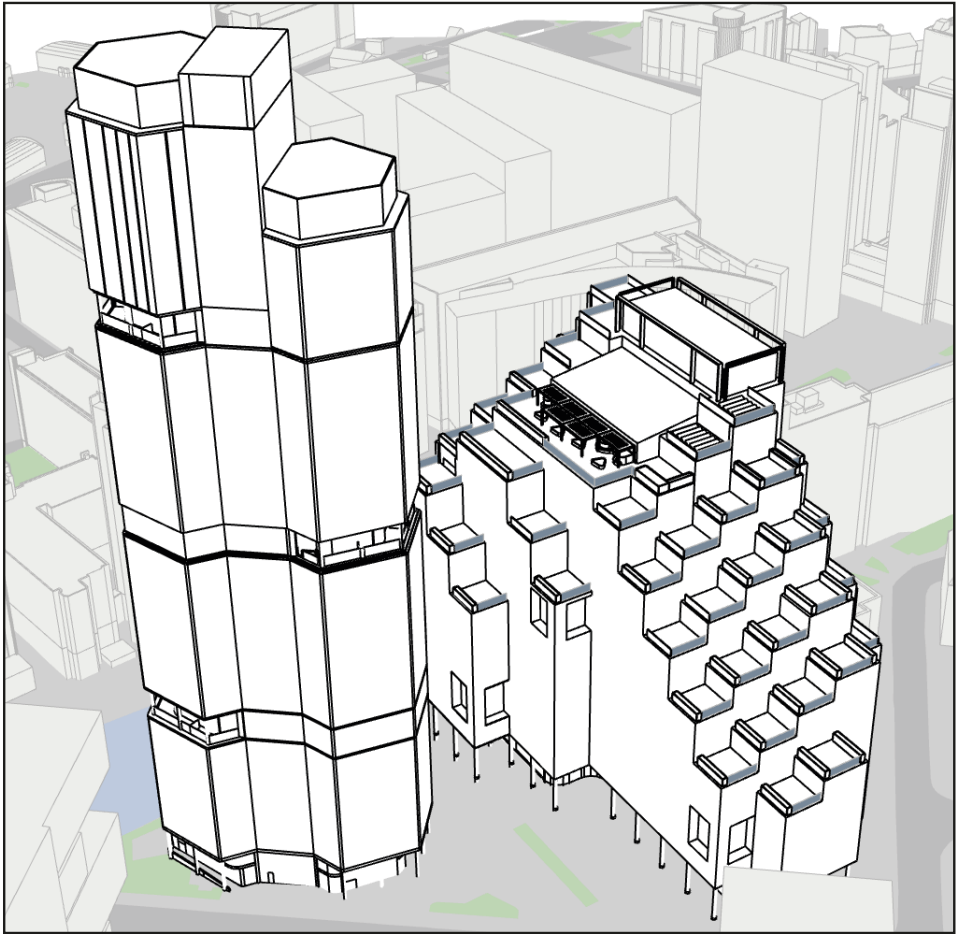
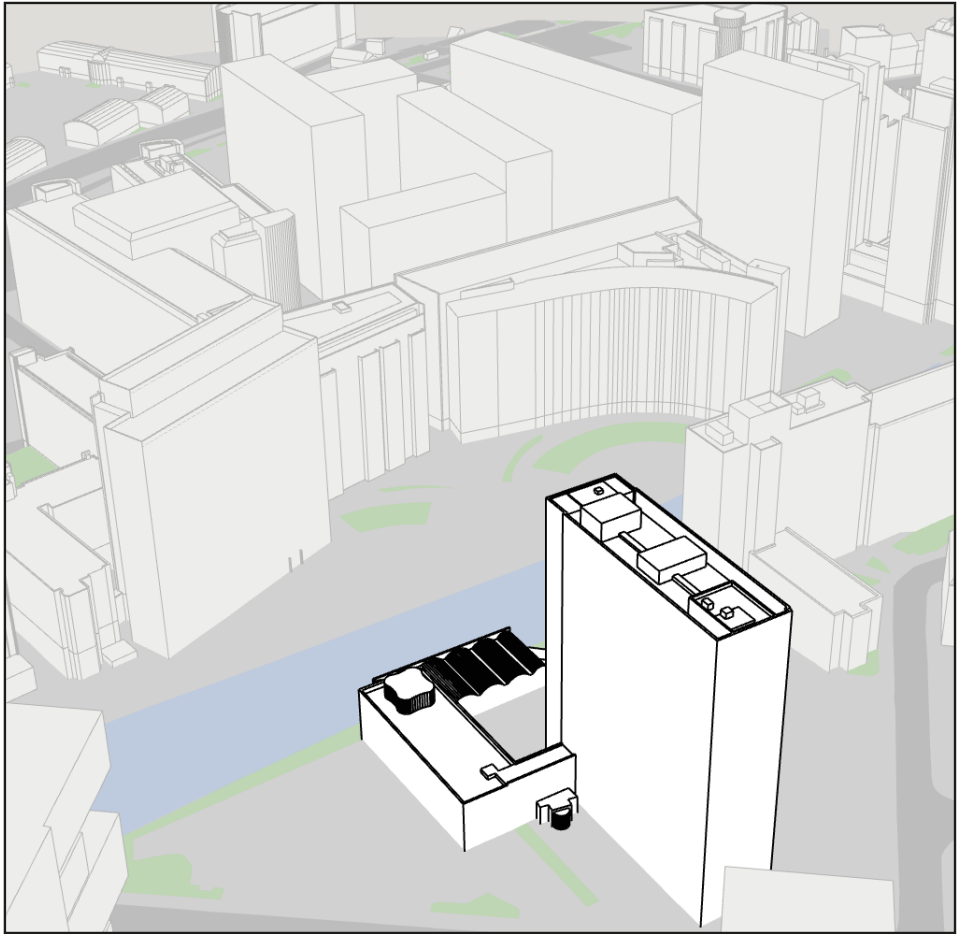
1. Baseline: Existing Site with existing surroundings;
2. Proposed Development with existing surroundings;
3. Proposed Development with future planning consented schemes in the surroundings
4. Proposed Development with existing surroundings and Proposed on-site landscaping
5. Proposed Development with future planning consented schemes in the surroundings and Proposed on-site landscaping

However, schemes 4 and 5 are only discussed for the ground-level on-Site seating area results.

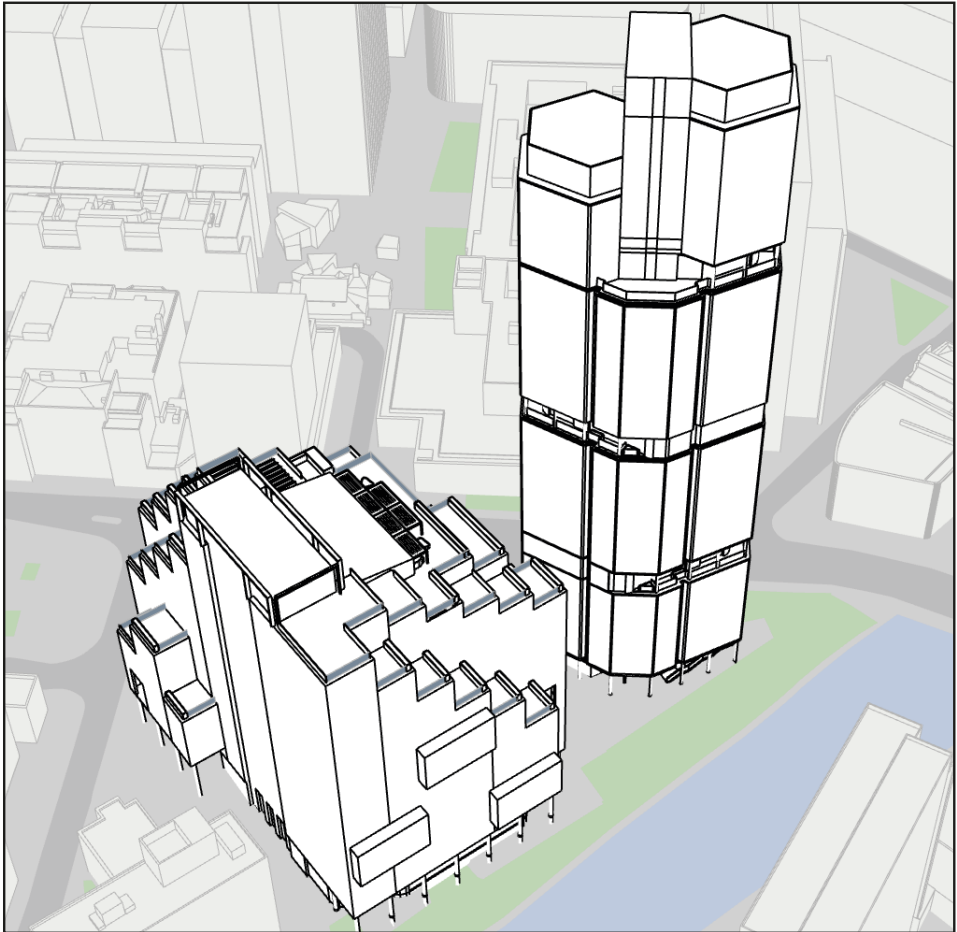
3.6

Level of Detail

Building features down to 0.5m on the Site and surrounding buildings are included in this analysis. Of particular note, the facade detail that characterises the Proposed Development have been omitted from this analysis. Therefore, this report consists of a conservative assessment of the wind conditions, especially on the ground-level.



Existing Site



Proposed Development

4.0

Results

The results of this assessment are discussed for off-Site and on-Site areas for pedestrian access/activities - denoted as ‘Receptors’. Off-site receptors focus on the ground-level wind conditions with the following assessments:

- wind comfort results on the ground-level for winter and summer seasons respectively.
- the annual wind distress results on the ground-level

For the above results, the Baseline and Proposed scheme results are shown side-by-side to represent the impact of the Proposed scheme on the surrounding terrain. The impact of the Proposed scheme on the off-site surroundings are categorised by the following significance criteria:

Off-site Receptors	
Significance	Trigger
Major Adverse	Unacceptable wind distress in the Proposed scheme that was not present in the Baseline or Conditions (in terms of comfort) that were suitable for the intended use in the Baseline become unsuitable by the Proposed scheme
Moderate Adverse	Conditions (in terms of comfort) are made windier (by one comfort grade) by the Proposed scheme but are still suitable for the intended use
Negligible	Conditions between the Baseline and Proposed scheme remain the same
Minor Beneficial	Conditions (in terms of comfort) that were unsuitable for the intended use in the Baseline are made suitable in the Proposed scheme
Major Beneficial	Unacceptable distress in the Baseline become acceptable in the Proposed scheme

This criteria was applied to off-site areas with pedestrian access:

- entrances
- bus stops
- seating areas
- thoroughfares.

It should be noted that the entrance to the (off-Site) Manchester Civil Justice Centre is off-set from the walkway, as shown in the figure on this page. additional images of the comfort results for this region are included in this chapter.

Subsequently, various on-site Receptors are discussed for the Proposed scheme:

- entrances
- seating areas
- thoroughfares
- public terraces (commercial building)
- private terraces (residential building)

The following criteria area used for these:

On-site Receptors	
Significance	Trigger
Major Adverse	Unacceptable wind distress conditions
Moderate Adverse	Wind comfort conditions are unsuitable for the intended use
Negligible	Wind comfort conditions are suitable for the intended use
Moderate Beneficial	Conditions are calmer than required for the intended pedestrian use

4.1

Ground-level comfort – winter

Baseline:

The surrounding streets generally experience wind conditions suitable for ‘Sitting’ and ‘Standing’ activities, and are therefore suitable for the intended use as thoroughfares.

All bus stops, and entrances for off-site buildings experience ‘Sitting’ and ‘Standing’ conditions, therefore are suitable for the intended use.

Proposed Development with existing surroundings:

Off-Site

The surrounding streets generally experience wind conditions suitable for ‘Sitting’ and ‘Standing’ activities, with an increase in ‘Strolling’ conditions along Left Bank. For areas used as thoroughfares this is acceptable.

All bus stops, and entrances for off-site buildings experience wind conditions suitable for ‘Sitting’ and ‘Standing’ activities, therefore are suitable for the intended use.

The Proposed Development therefore has a **Negligible impact on the surrounding (off-Site) area.**

On-Site

The Proposed public passageway through the Development experiences wind conditions suitable for ‘Standing’ with local areas of ‘Strolling’. This is generally acceptable.

On-Site entrances to the Proposed Development experience wind conditions suitable for ‘Sitting’ and ‘Standing’ activities. This is acceptable.

The significance of the wind conditions for the **on-Site area is therefore Negligible.**

Proposed Development with consented surroundings:

The significance of the wind conditions remain unchanged with the future-consented schemes in the surroundings.

4.2

Ground-level comfort – summer

Baseline:

The surrounding streets generally experience wind conditions suitable for ‘Sitting’ and ‘Standing’ activities, and are therefore suitable for the intended use as thoroughfares.

All bus stops, and entrances for off-site buildings experience ‘Sitting’ and ‘Standing’ conditions, therefore are suitable for the intended use.

Off-site seating areas, Motor Square and Clermont-Ferrand Square, experience ‘Sitting’ conditiions with a small area of ‘Standing’ for Motor Square. The wind conditions for these areas are largely suitable for the intended use.

Proposed Development with existing surroundings:

Off-Site

The surrounding streets generally experience wind conditions suitable for ‘Sitting’ and ‘Standing’ activities. For areas used as thoroughfares this is acceptable.

All bus stops, and entrances for off-site buildings experience wind conditions suitable for ‘Sitting’ and ‘Standing’ activities, and therefore are suitable for the intended use.

Off-site seating areas, Motor Square and Clermont-Ferrand Square, experience wind conditions suitable for ‘Sitting’ activities. The wind conditions for these areas are suitable for the intended use.

The Proposed Development therefore has a **Negligible to Minor Beneficial impact on the surrounding (off-Site) area.**

On-Site

The Proposed public passageway through the Development experiences wind conditions suitable for ‘Standing’ with local areas of ‘Strolling’. This is acceptable for the intended use.

On-Site entrances to the Proposed Development experience wind conditions for ‘Sitting’ and ‘Standing’ activities. This is acceptable for the intended use.

On-Site seating areas experience wind conditions suitable for ‘Sitting’ and ‘Standing’ activities. The wind conditions for these areas are unsuitable for intended use.

The significance of the wind conditions for the **on-Site area is therefore Negligible to Moderate Adverse.** However, section - of this report demonstrates that the wind conditions for the on-Site seating areas are mitigated through the Proposed on-site landscaping.

Proposed Development with consented surroundings:

The significance of the wind conditions remain unchanged with the future-consented schemes in the surroundings. However, it is observed that the wind conditions appear slightly calmer along the passageway through the Proposed Development. As part of the Alberton House future consented scheme, the off-site seating area located on Trinity Square experiences wind conditions suitable for ‘Sitting’ activities. The wind conditions for this area are suitable for the intended use.

4.3

Ground-level distress – annual

Baseline:

No unacceptable distress areas observed on-or-off-Site.

Proposed Development with existing surroundings:

No unacceptable distress areas observed on-or-off-Site. The Proposed scheme has a Negligible impact on this region.

Proposed Development with consented surroundings:

No unacceptable distress areas observed on-or-off-Site. The Proposed scheme has a Negligible impact on this region.

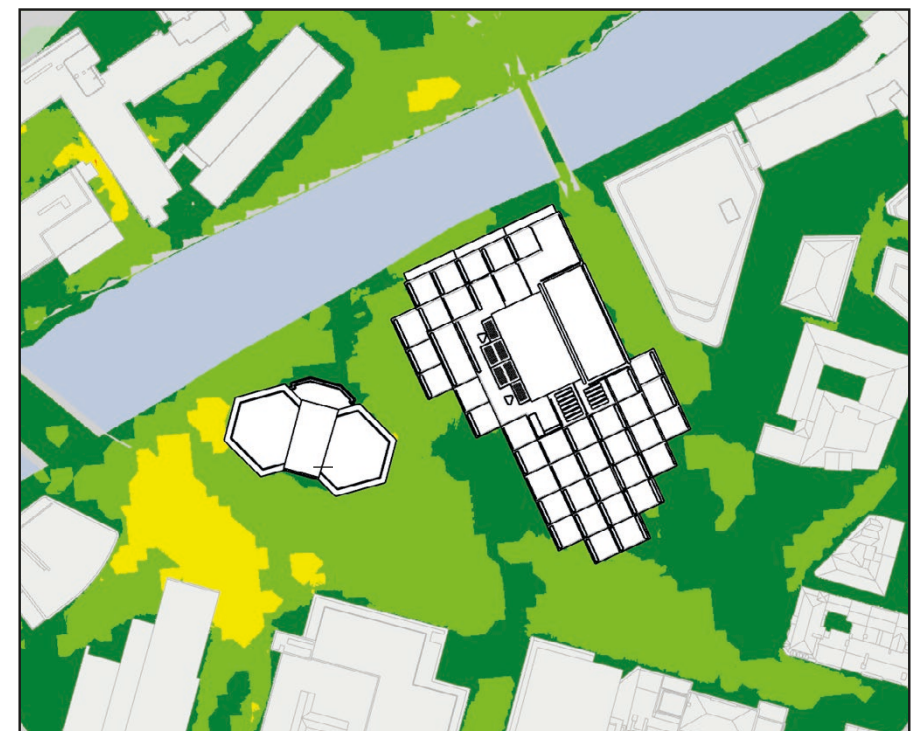
Please refer to the following pages for the Ground-level comfort and distress results desribed above.



Entrance for the Manchester Civil Justice Centre

Comfort Category	Colour
Sitting	
Standing	
Strolling	
Business Walking	
Roads and Car Parks	

Ground-level comfort - winter season



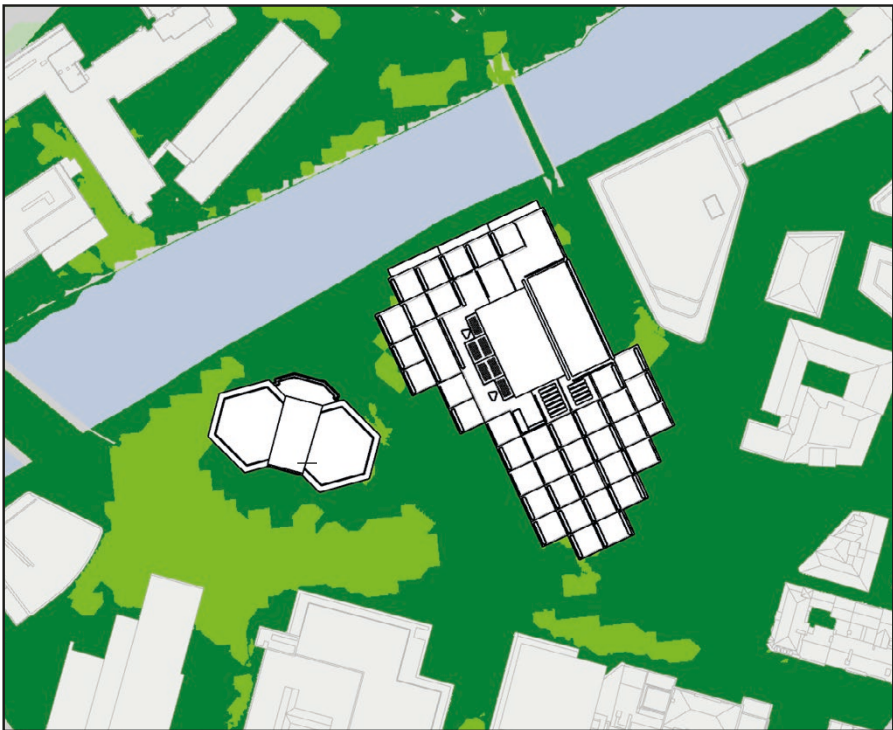
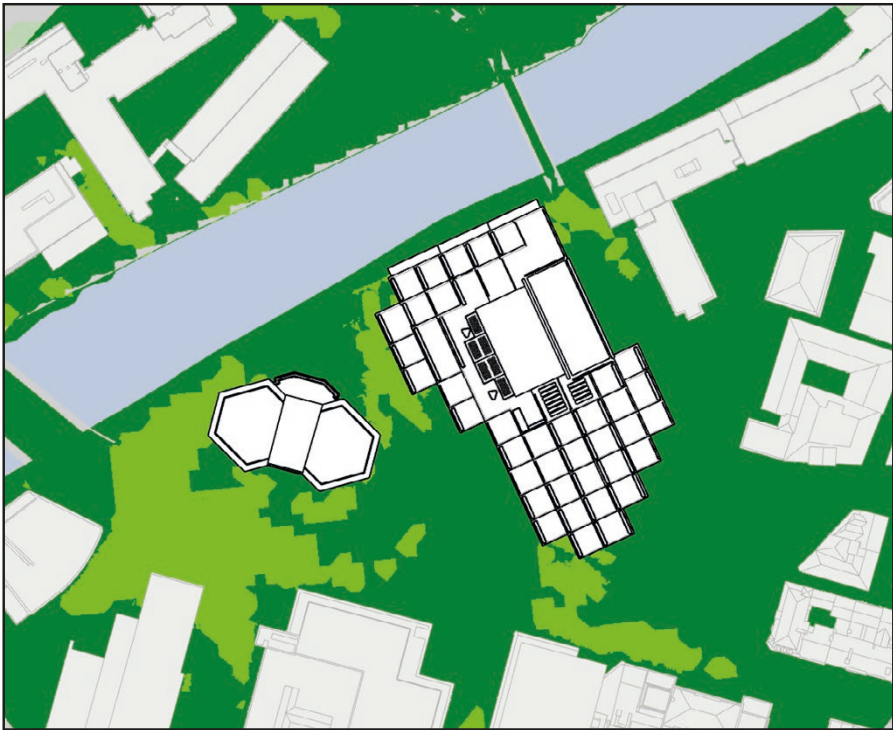
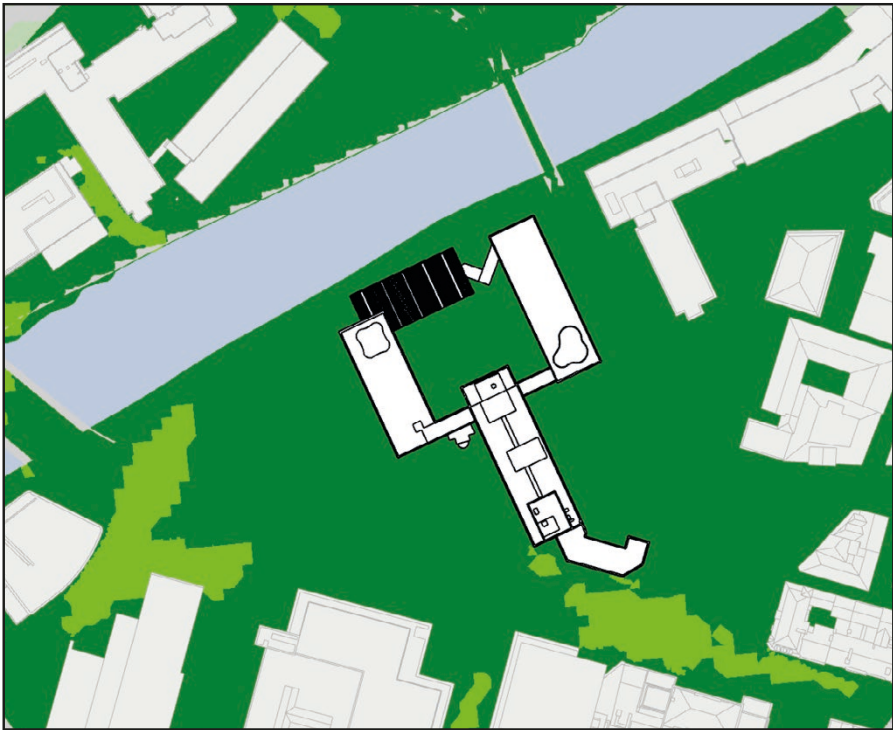
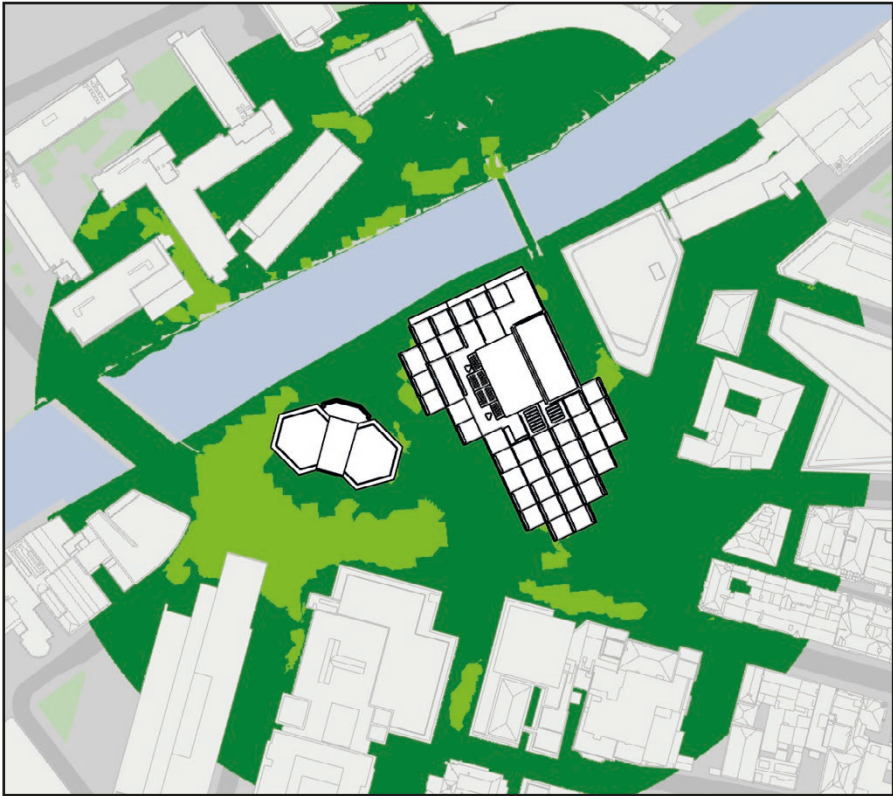
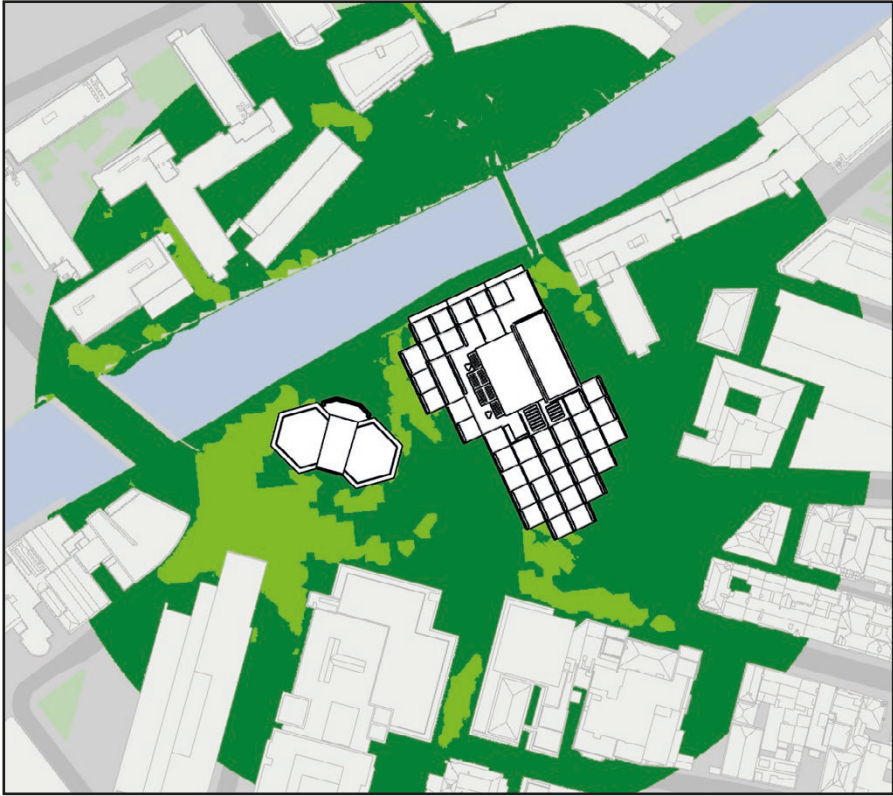
Existing site with existing surroundings

Proposed Development with existing surroundings

Proposed Development with consented surrounding

Comfort Category	Colour
Sitting	
Standing	
Strolling	
Business Walking	
Roads and Car Parks	

Ground-level comfort - summer season



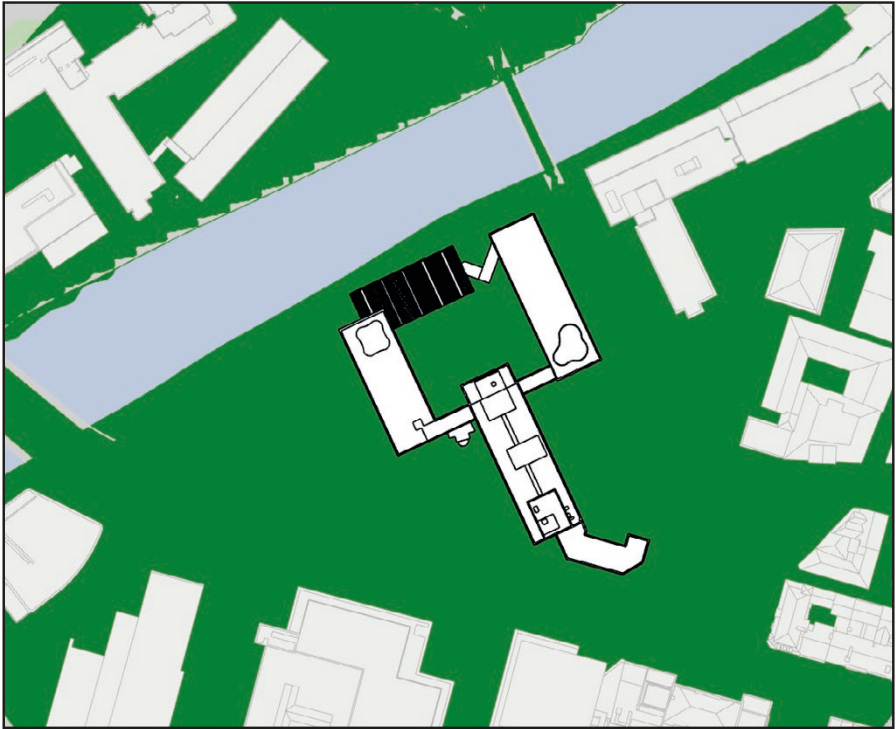
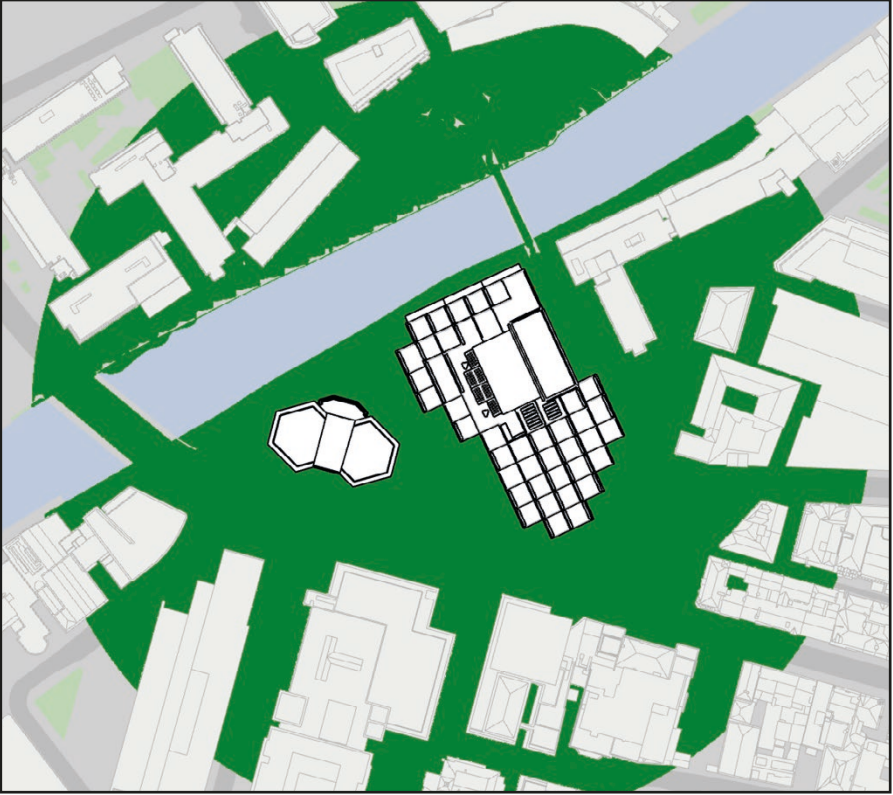
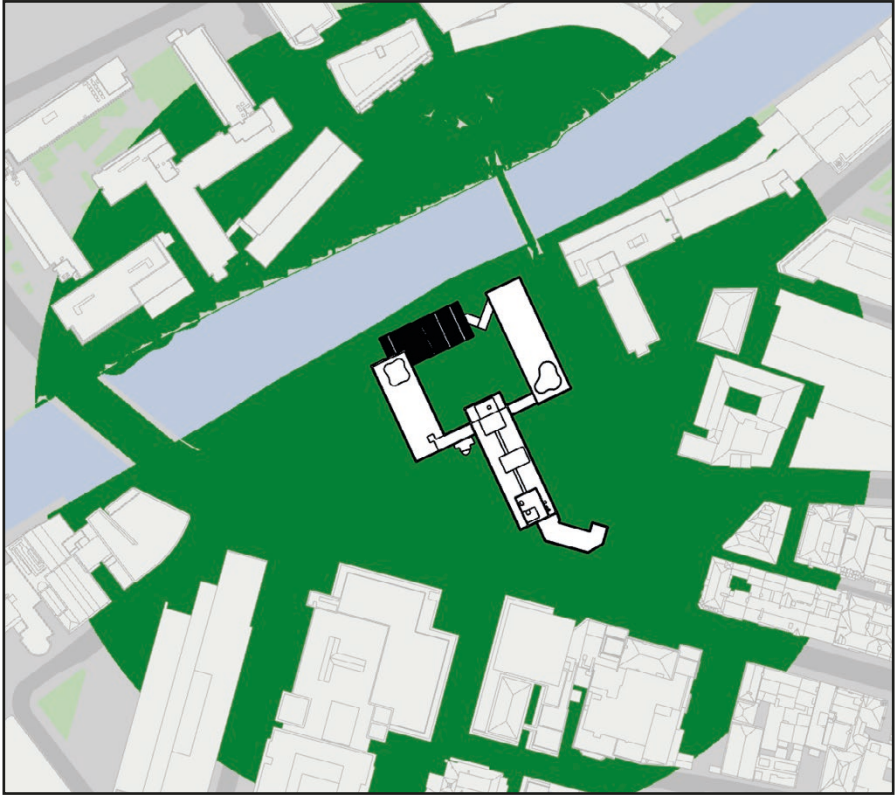
Existing site with existing surroundings

Proposed Development with existing surroundings

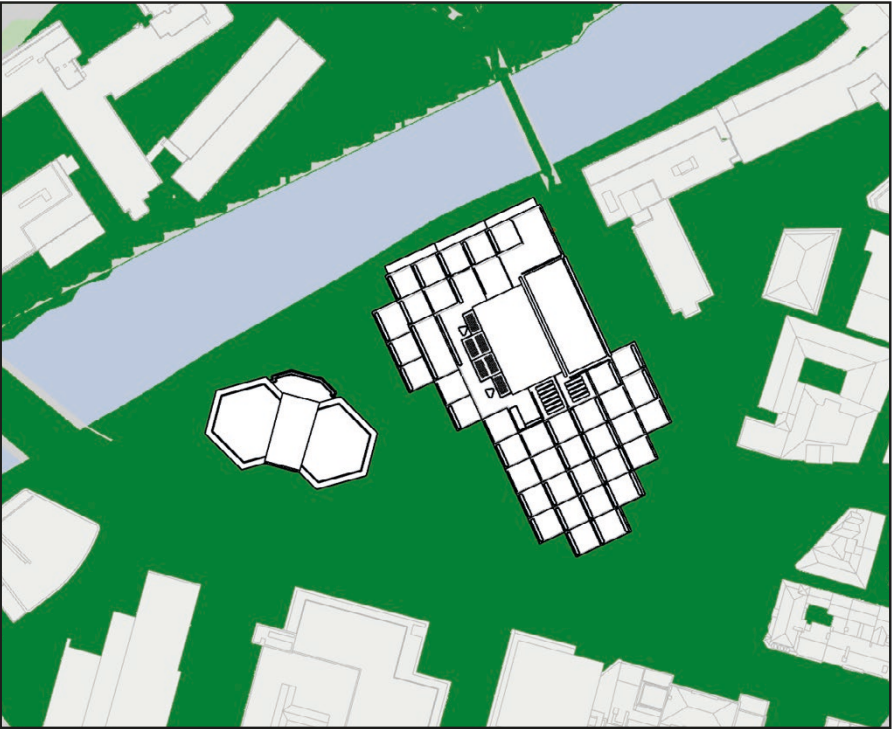
Proposed Development with consented surrounding

Distress Category	Colour
Unacceptable	Red
Acceptable	Green

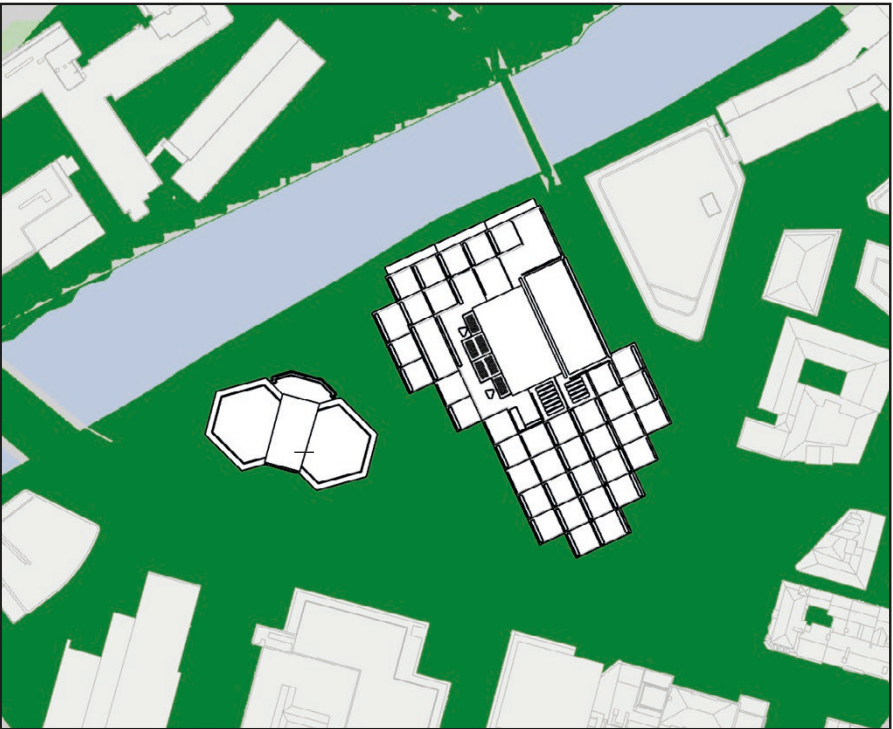
Ground-level distress - annual



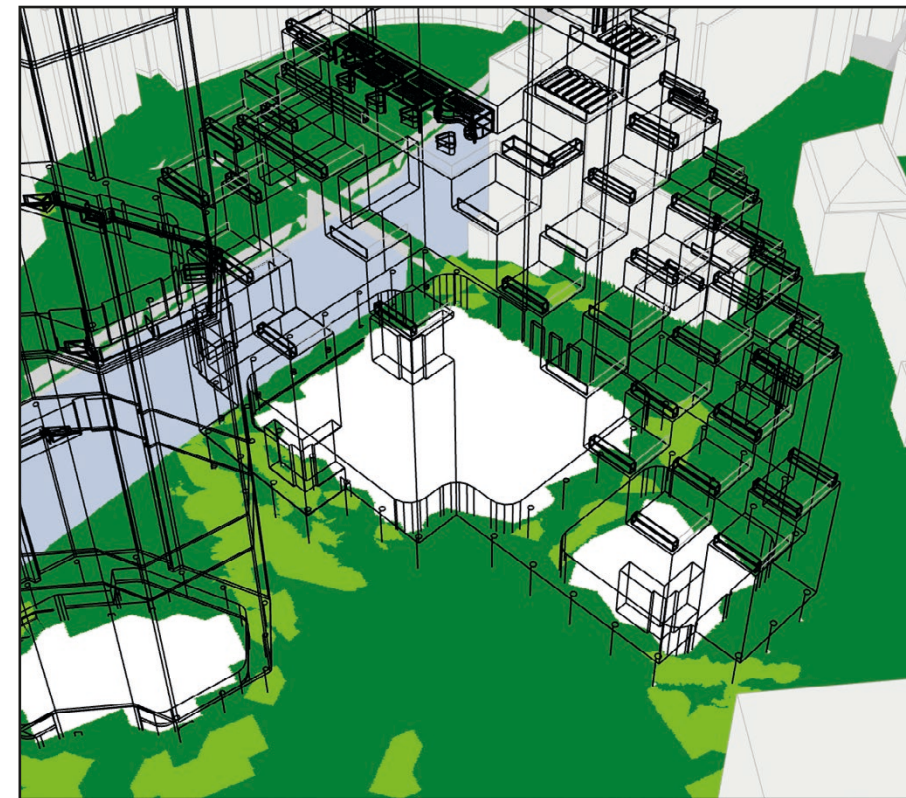
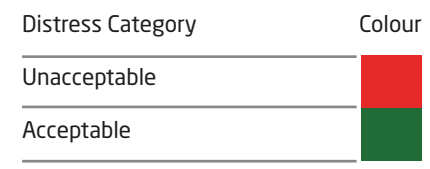
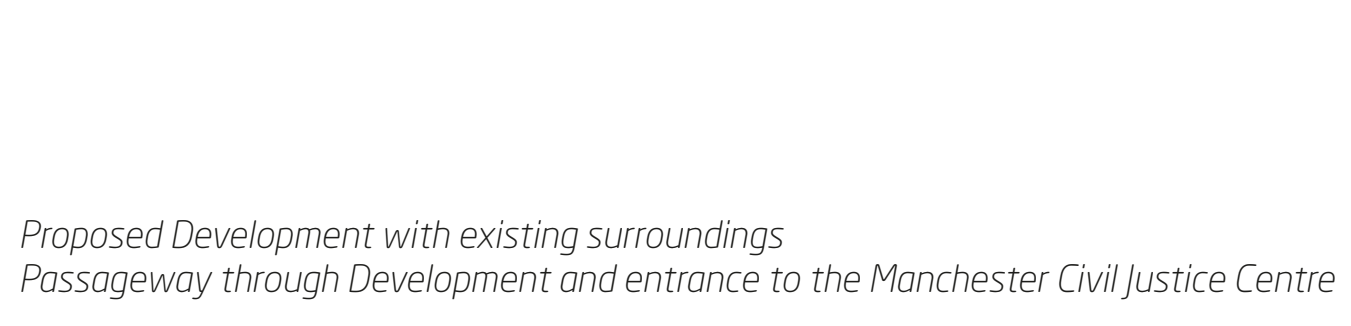
Existing site with existing surroundings



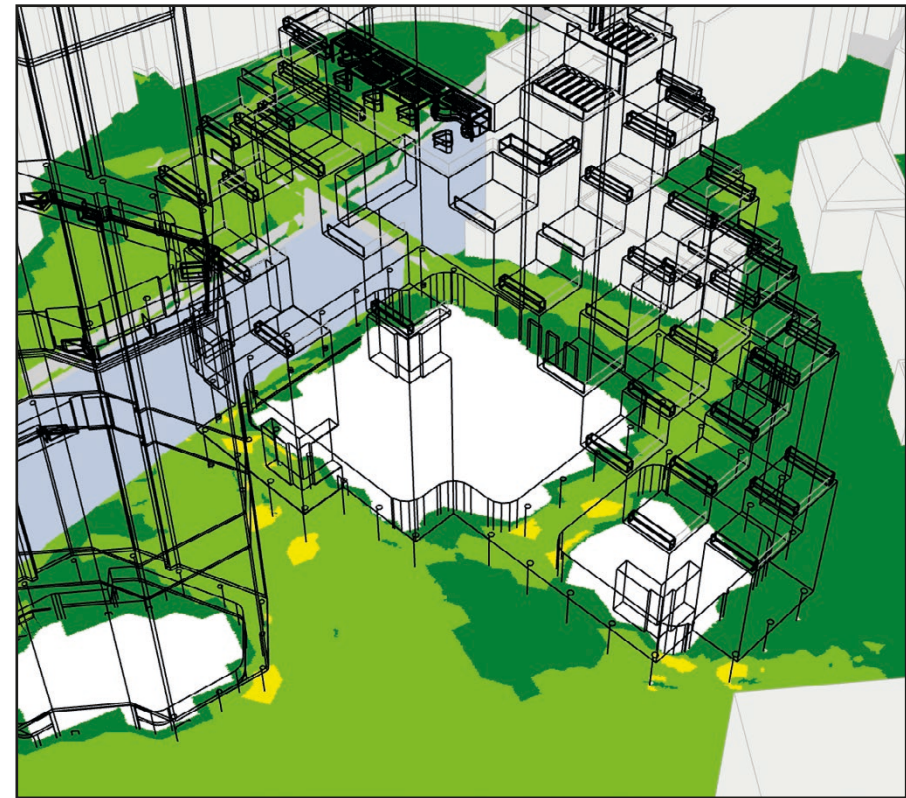
Proposed Development with existing surroundings



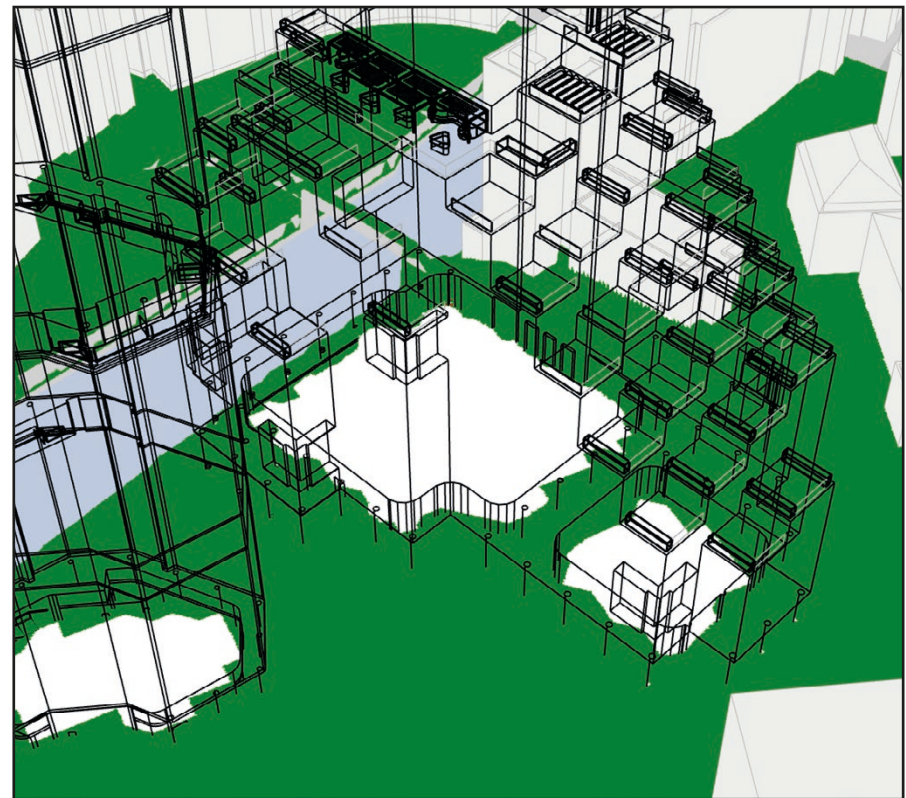
Proposed Development with consented surrounding



Passageway through the Development - summer comfort



Passageway through the Development - winter comfort



Passageway through the Development - annual distress



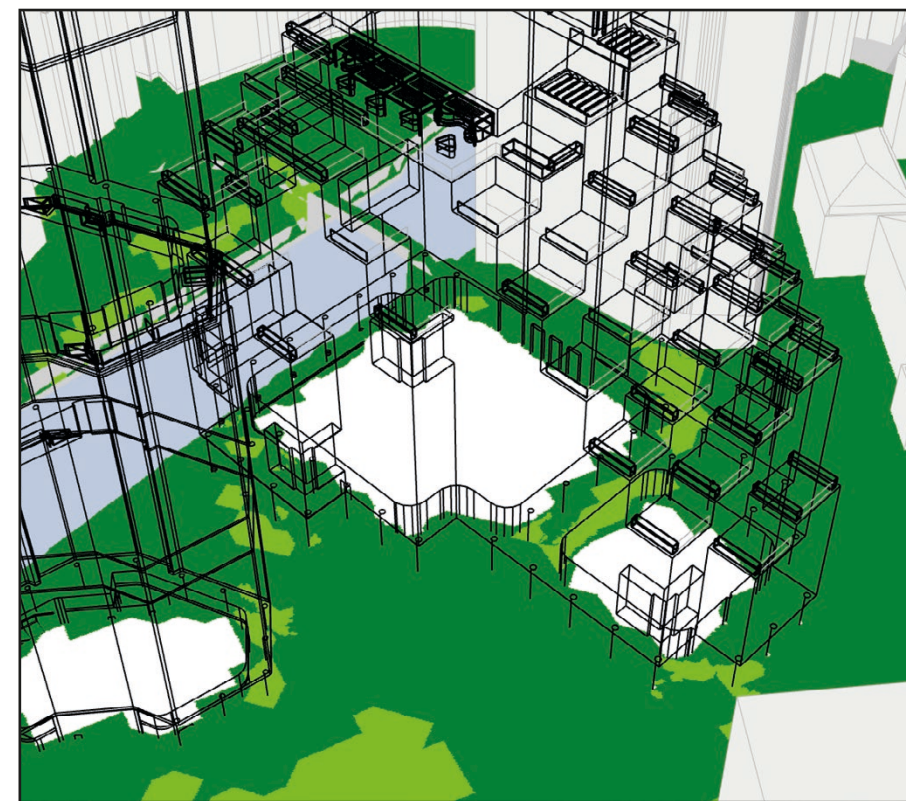
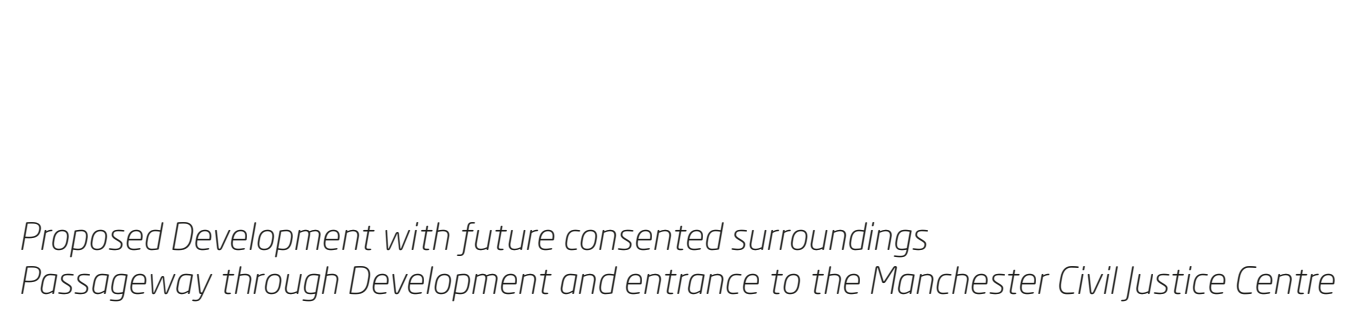
Manchester Civil Justice Centre - Summer comfort



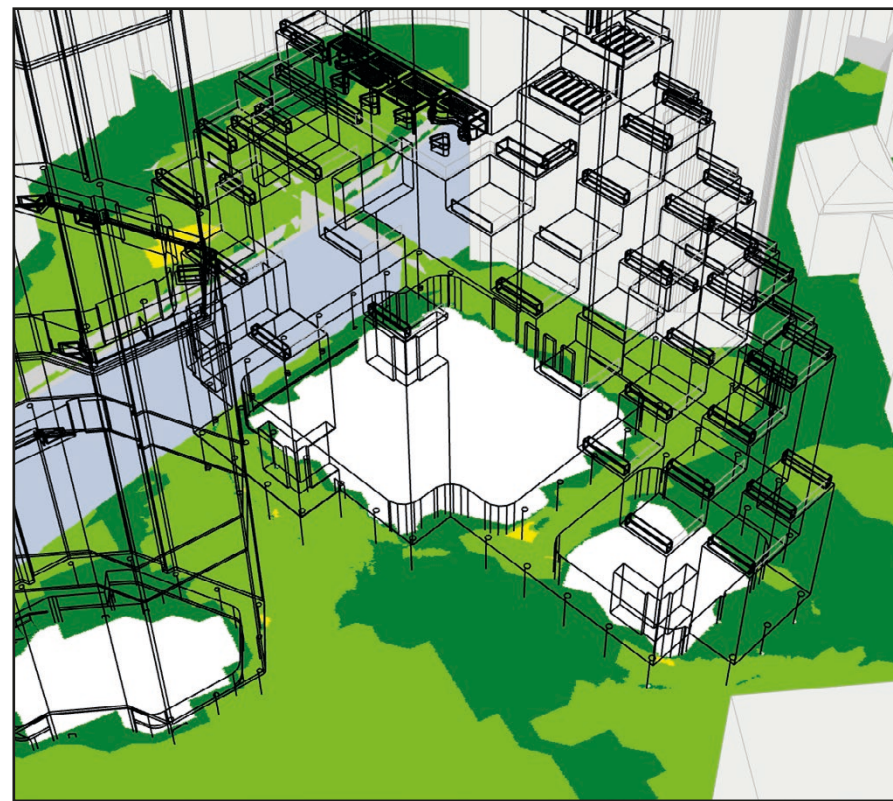
Manchester Civil Justice Centre - winter comfort



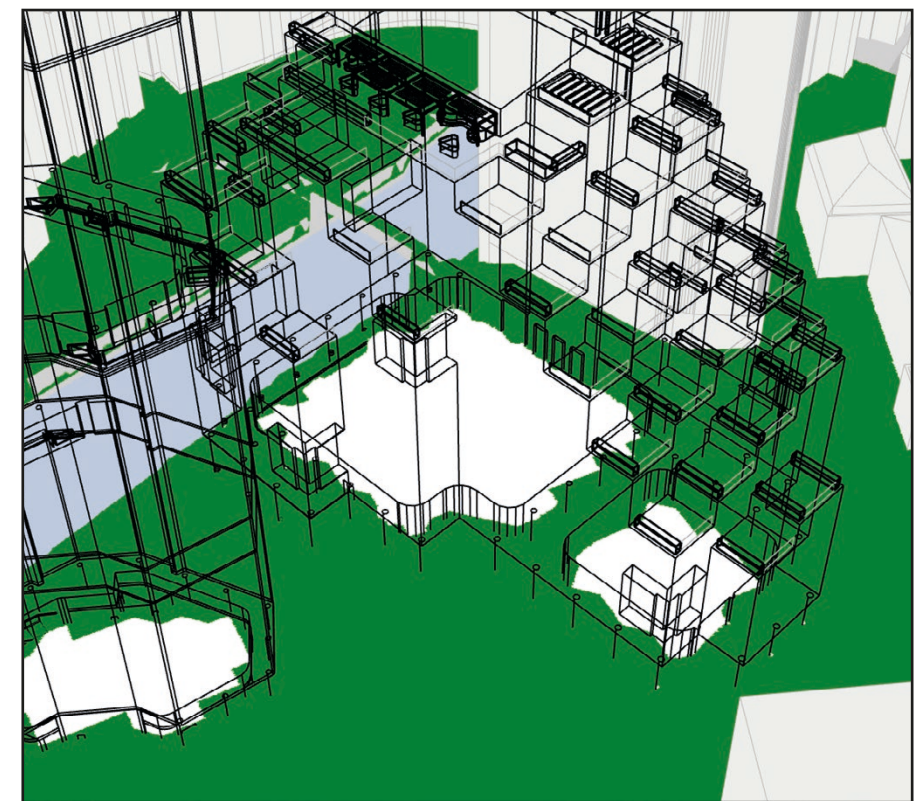
Manchester Civil Justice Centre - annual distress



Passageway through the Development - summer comfort



Passageway through the Development - winter comfort



Passageway through the Development - annual distress



Manchester Civil Justice Centre - Summer comfort



Manchester Civil Justice Centre - winter comfort



Manchester Civil Justice Centre - annual distress

4.4

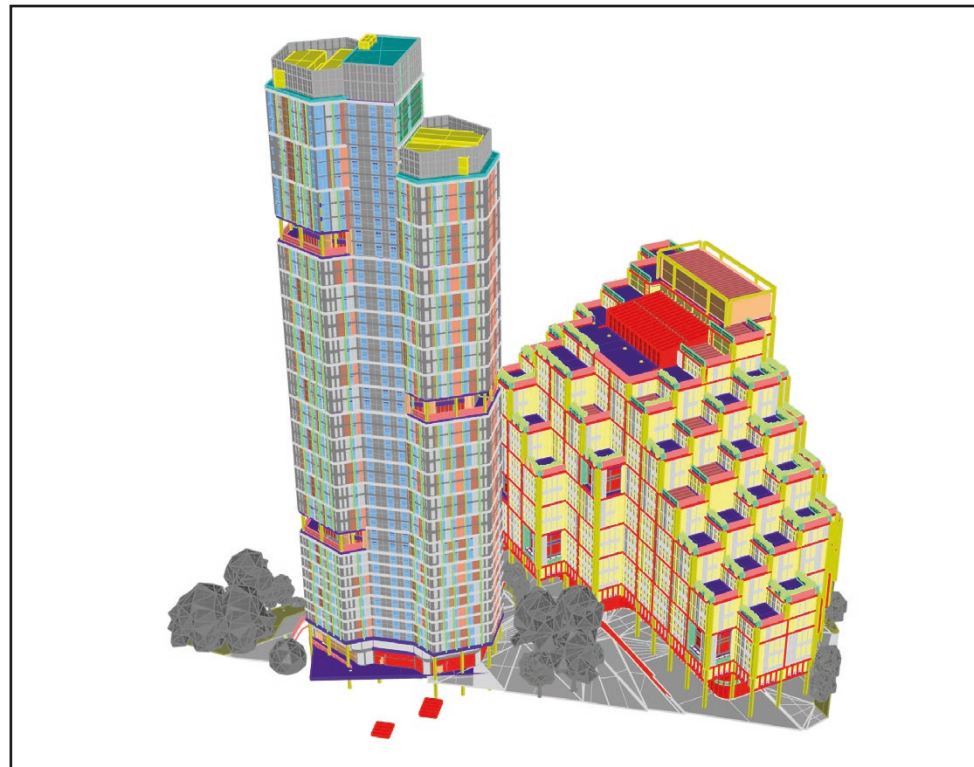
Proposed on-Site Landscaping

To mitigate the wind conditions around the on-Site seating areas, the additional scenarios of the Proposed Development with Proposed on-Site landscaping is considered.

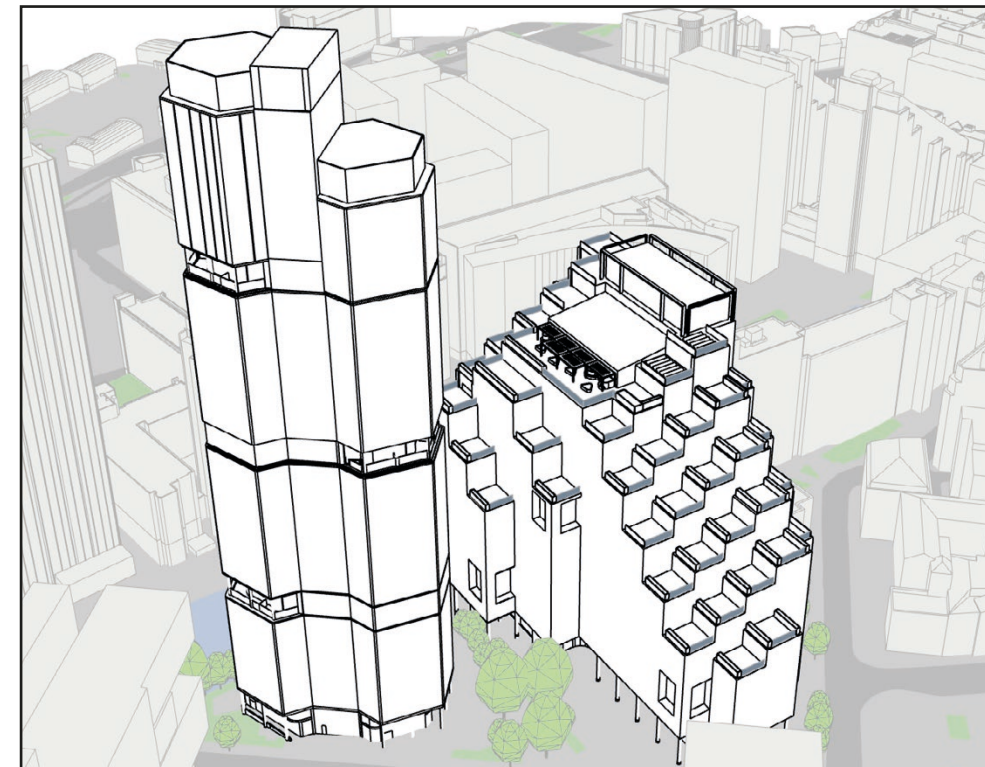
The vegetation included within the study models is based on the Proposed landscaping as part of the detailed design received 03/08/22 from Studio Egret West (SEW). Images of the received and modelled landscaping are shown on this page.

The trees are modelled with a representative size based on the architect's model. The crown of the trees are modelled as a 'porous' volume, representing deciduous trees with a sparse crown for the branch structure without any leaves, often referred to as '*winter trees*' in the industry.

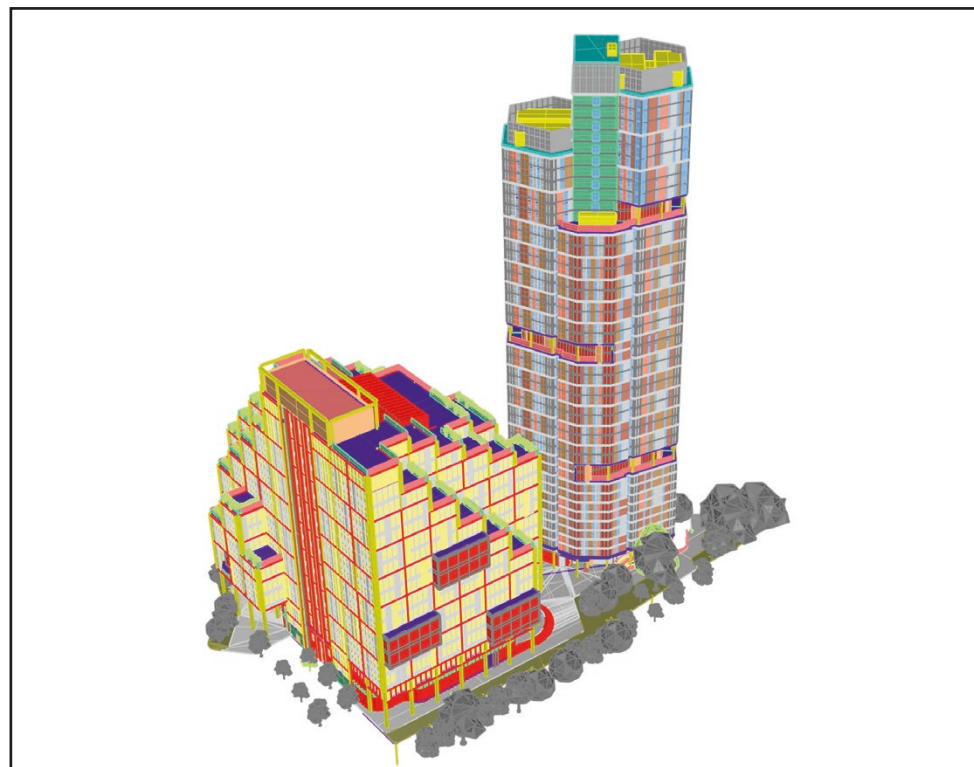
The proceeding pages show the summer wind comfort for the Proposed Development with existing and future-consented surroundings respectively. It can be seen that the wind conditions around the Proposed on-Site seating areas are suitable for 'Sitting' activities in summer. The significance of the wind conditions for the **on-Site area is therefore Negligible with the Proposed on-Site landscaping.**



Model received from SEW (03/08/22) for the Proposed landscape design



Proposed Development with consented surroundings with modelled landscaping



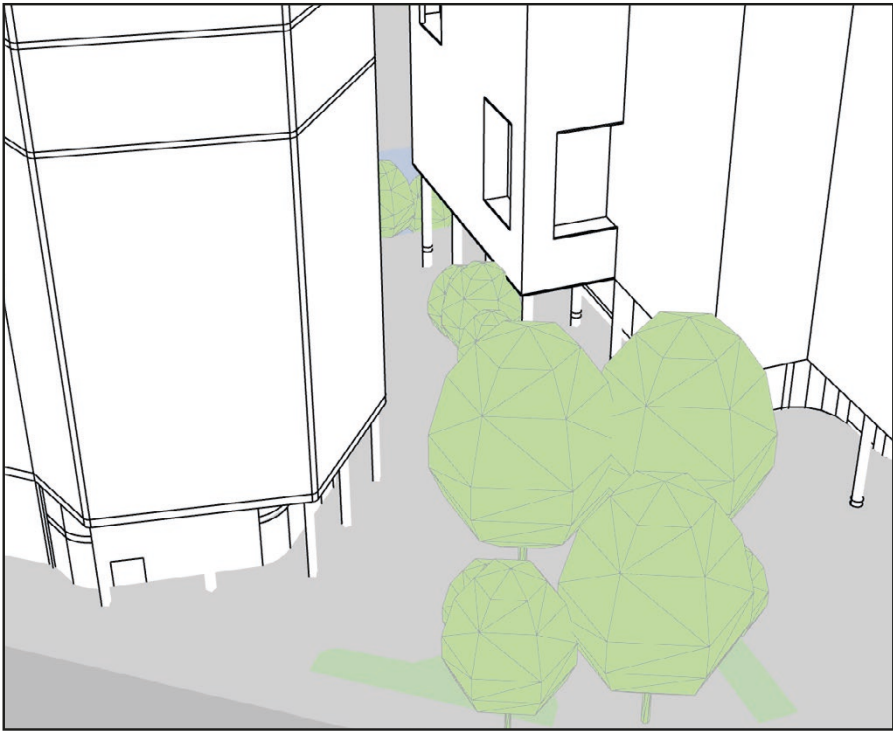
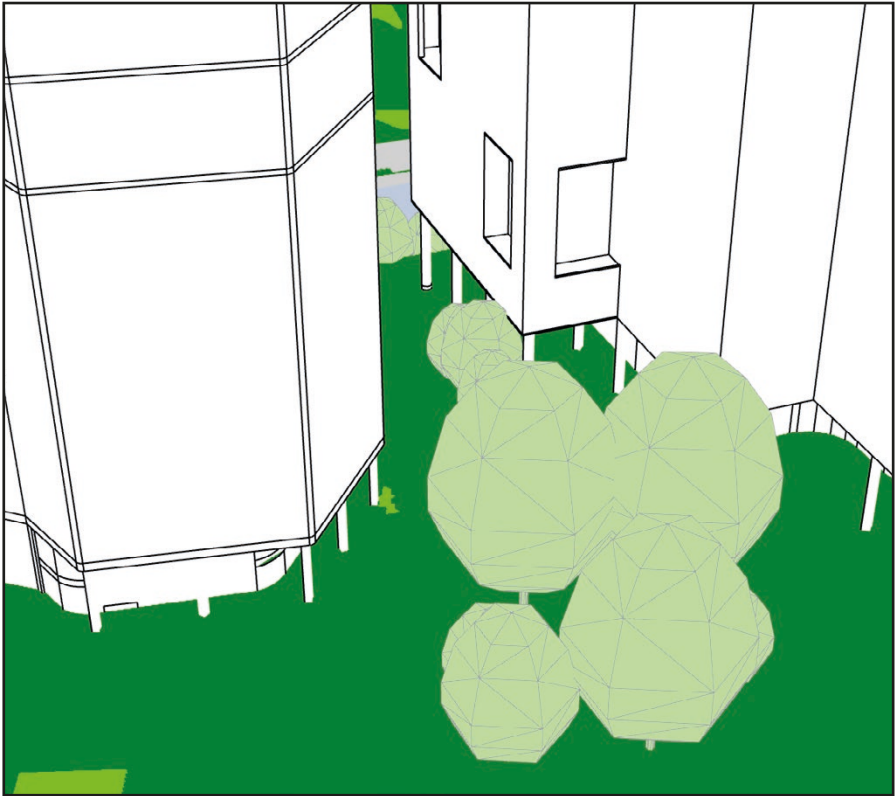
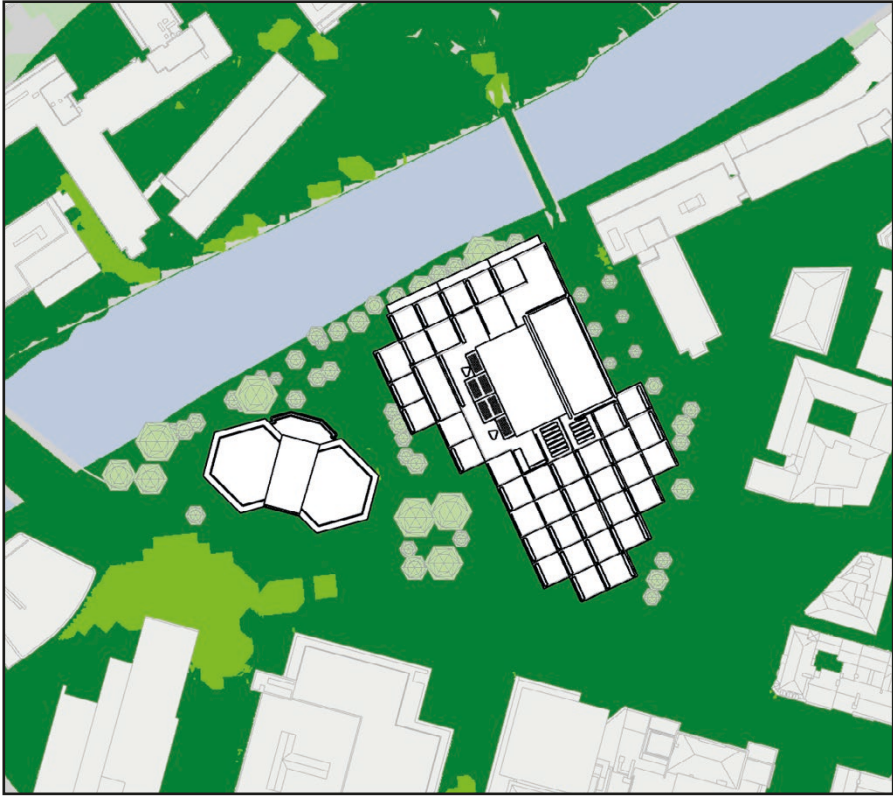
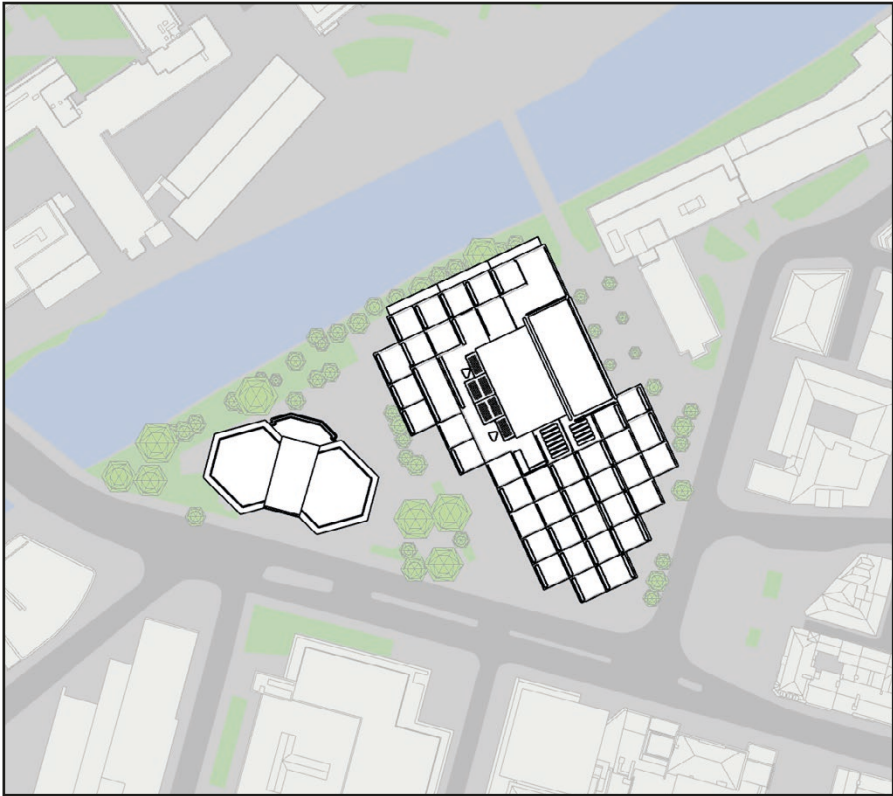
Model received from SEW (03/08/22) for the Proposed landscape design



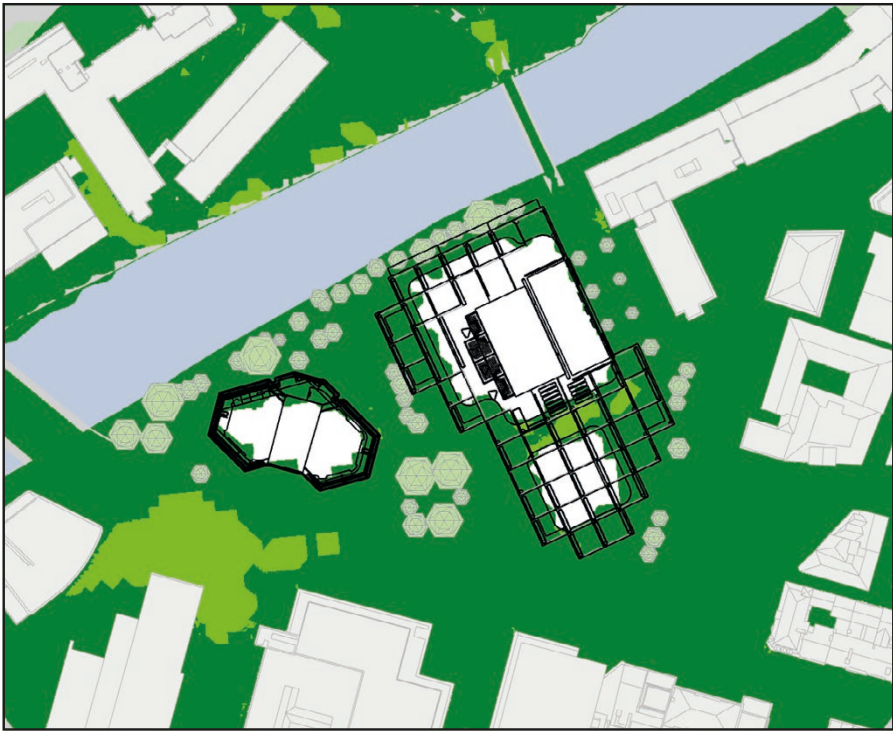
Proposed Development with consented surroundings with modelled landscaping

Comfort Category	Colour
Sitting	
Standing	
Strolling	
Business Walking	
Roads and Car Parks	

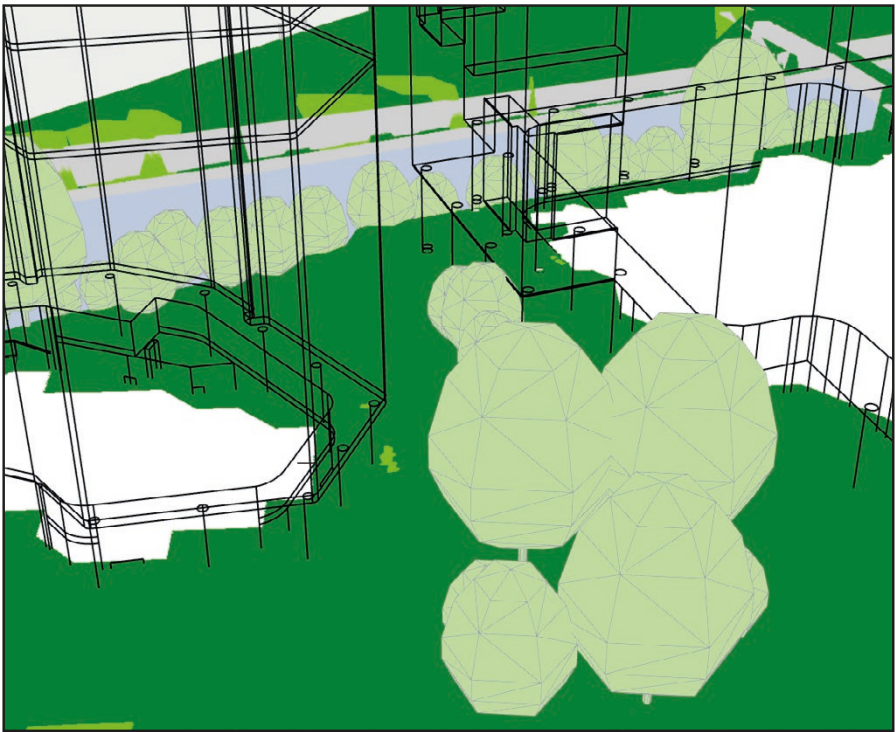
Proposed Development with on-site landscaping and existing surroundings - Ground-level comfort - summer season



Model of the Proposed Development with existing surroundings and Proposed landscaping



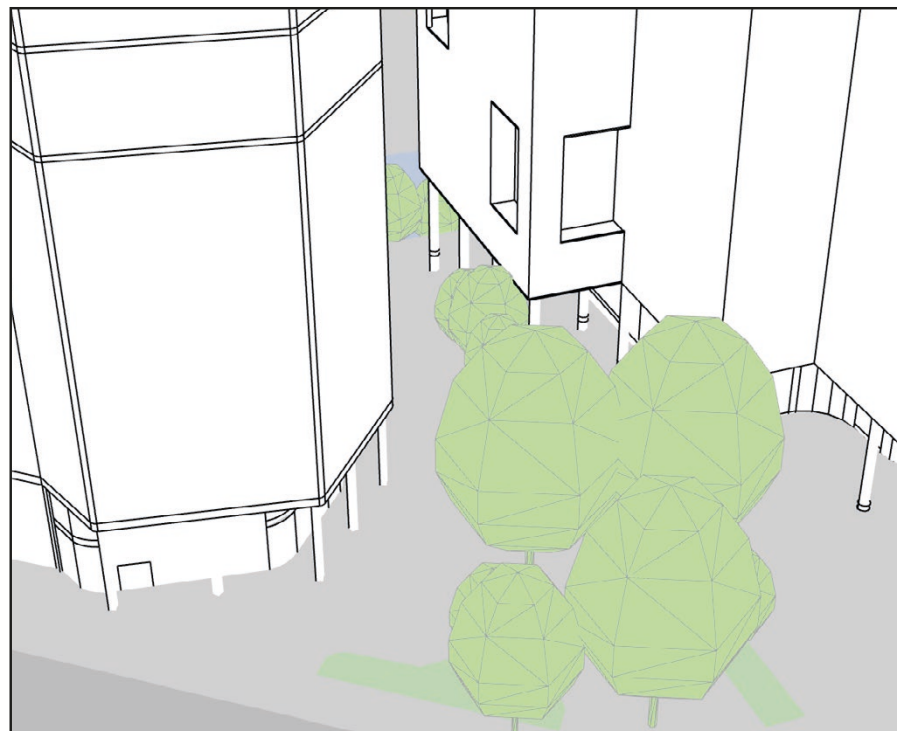
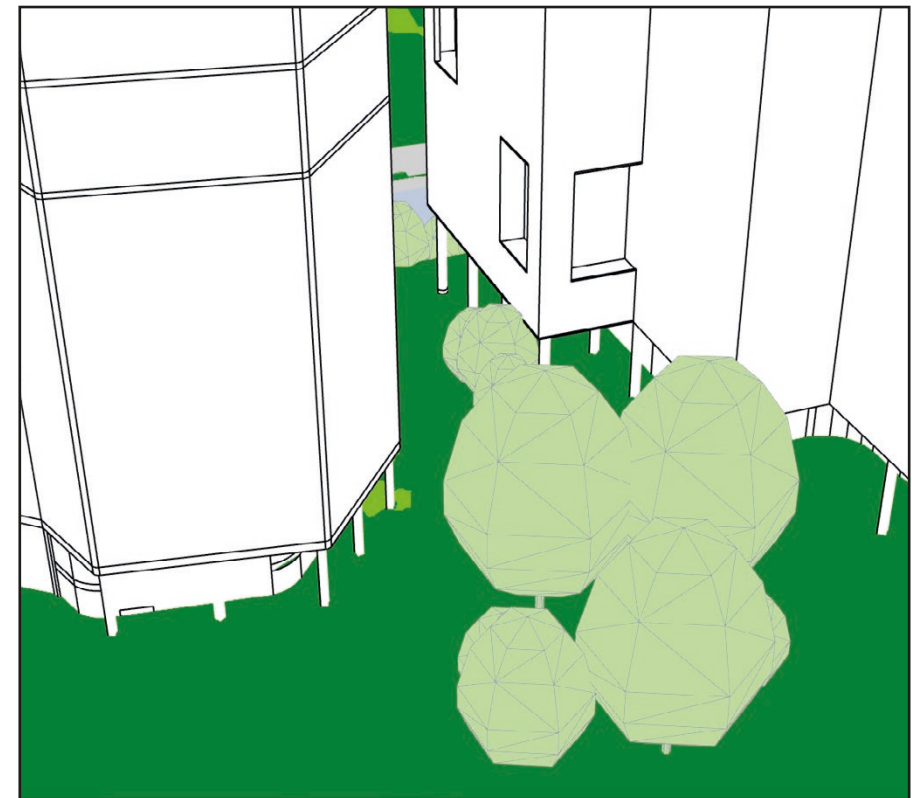
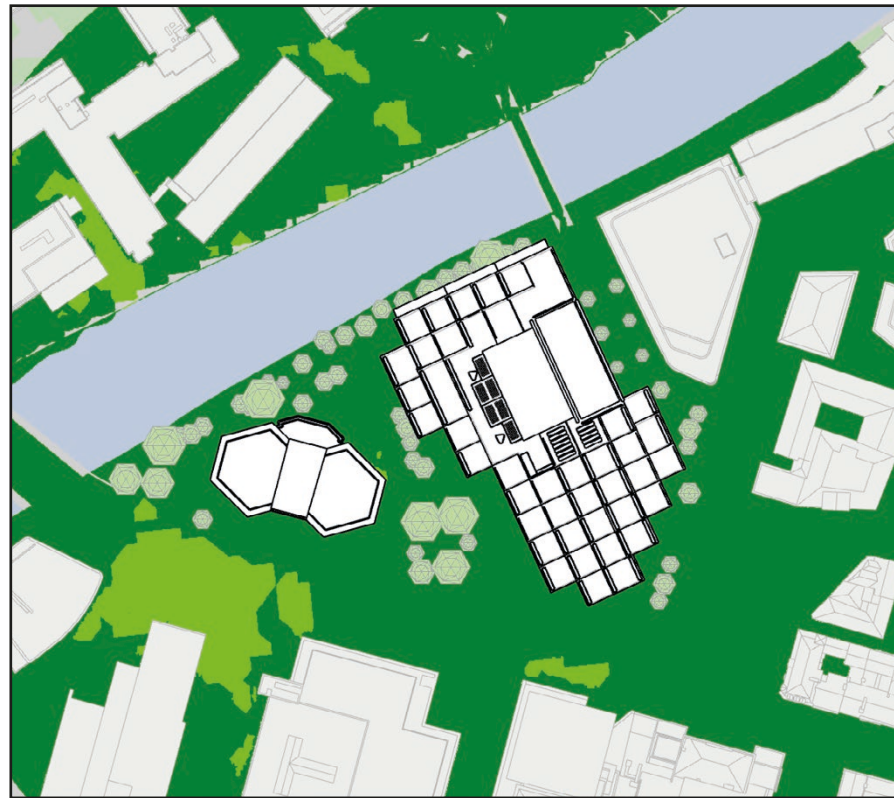
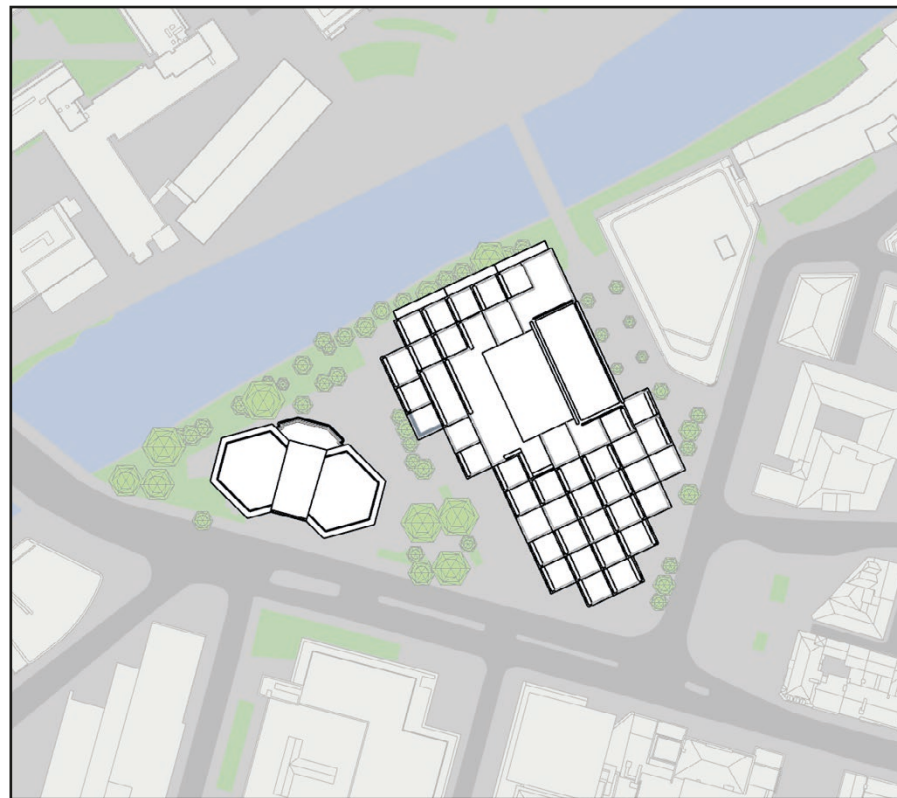
Ground-level wind comfort in summer with Proposed Development with landscaping. Plan view of the Site



Ground-level wind comfort in summer with Proposed Development with landscaping - closeup of the on-Site seating areas

Comfort Category	Colour
Sitting	
Standing	
Strolling	
Business Walking	
Roads and Car Parks	

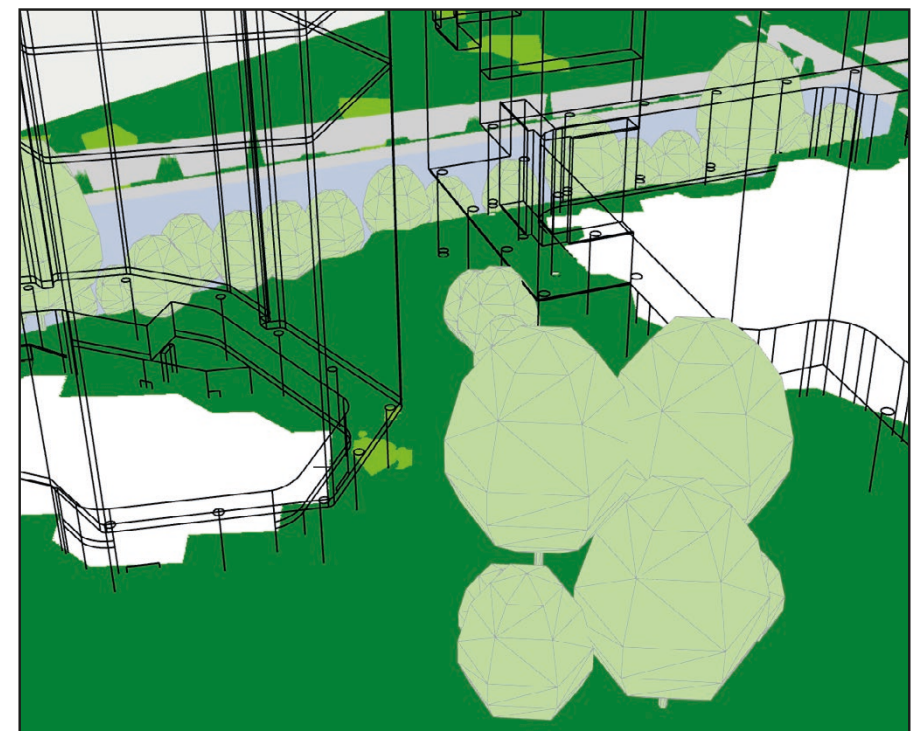
Proposed Development with on-site landscaping and future consented surroundings - Ground-level comfort - summer season



Model of the Proposed Development with existing surroundings and Proposed landscaping



Ground-level wind comfort in summer with Proposed Development with landscaping. Plan view of the Site



Ground-level wind comfort in summer with Proposed Development with landscaping - closeup of the on-Site seating areas

4.5
Proposed Development design - Public and Private
terraces

Public terraces (commerical building)

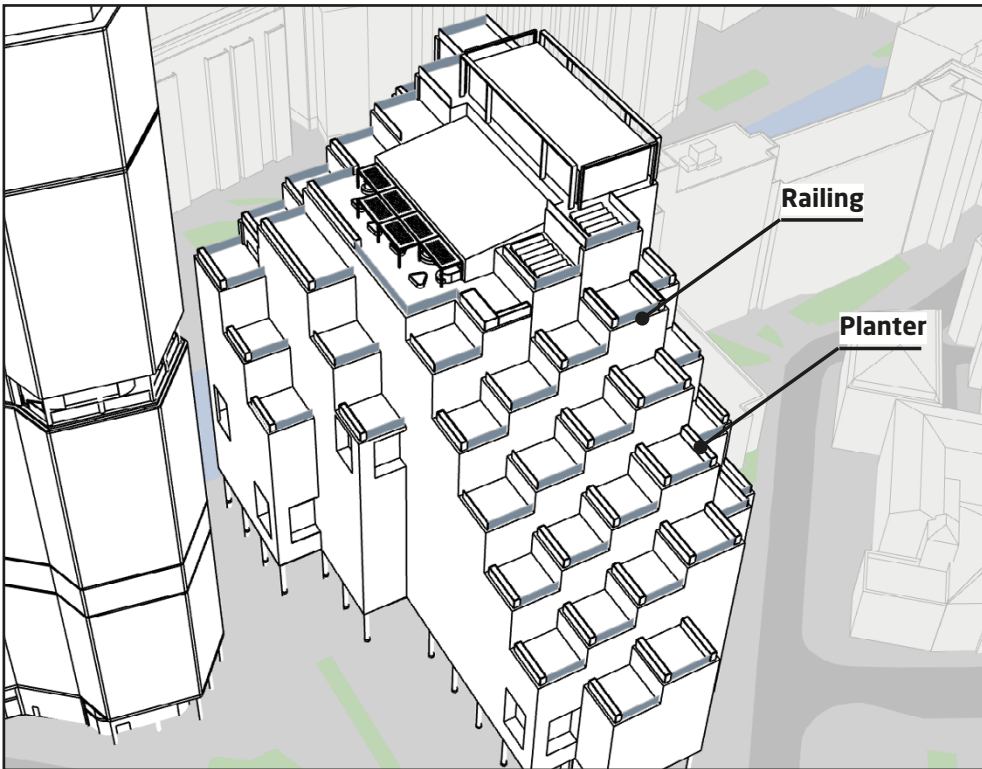
The public terraces on the Proposed Development are circumvented by a mixture of 1.6m high solid planters and 75% open railings. Without a detailed design available, the railings were modelled as an explicit porous medium using the established *power-law*. Planters and a pergola are also introduced to the roof (atrium) terrace to improve the wind conditions.

A number of the terraces are intended to be areas for photovoltaic panels. For these the wind results are not shown.

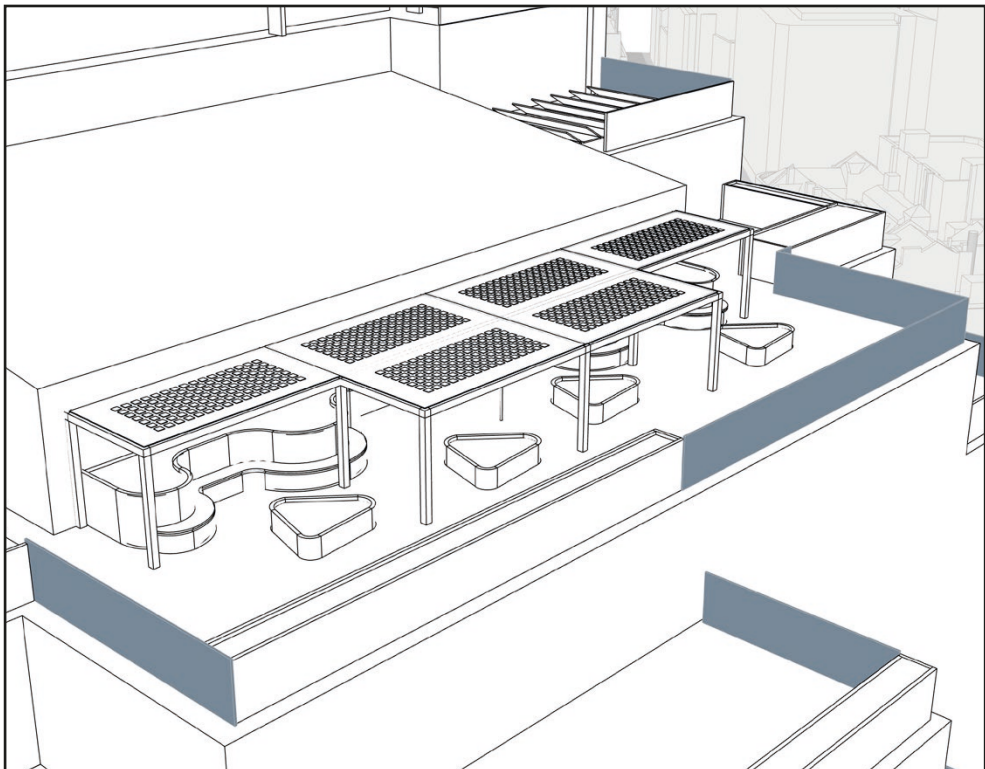
The design of the commercial building terraces are shown on this page.

Private terraces (residential building)

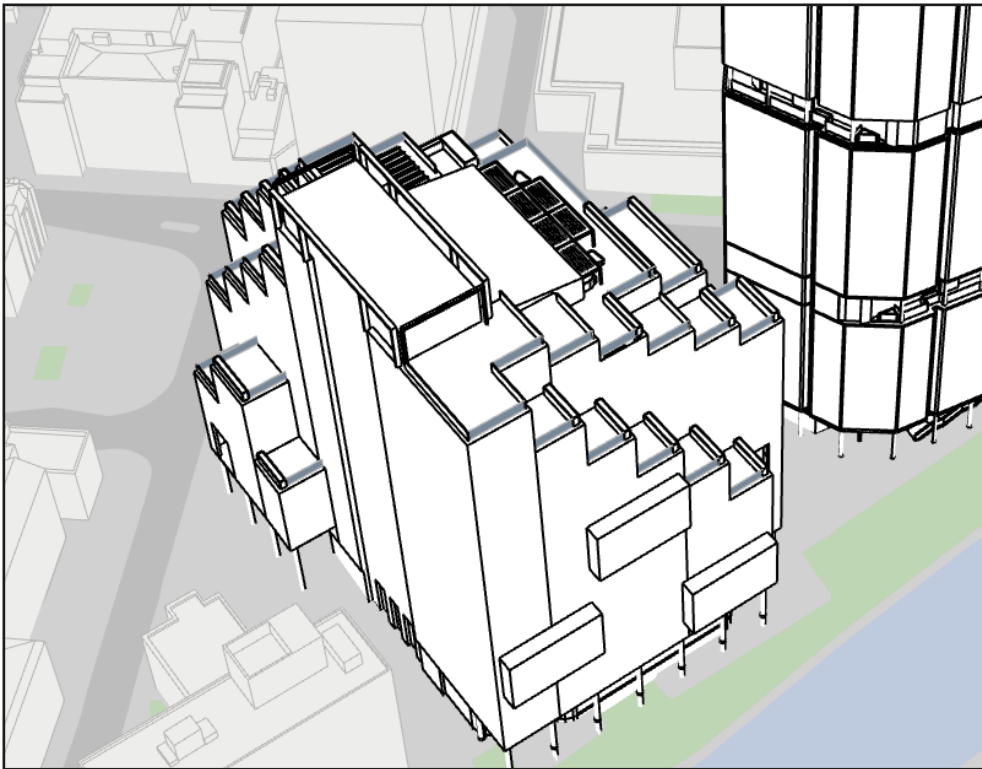
The private terraces on the Proposed Development are circumvented by 1.8m solid balustrades with (1.8m) solid screens and (1.5m) planters at various locations to divide the terraces; the following page (20) shows the location of these measures.



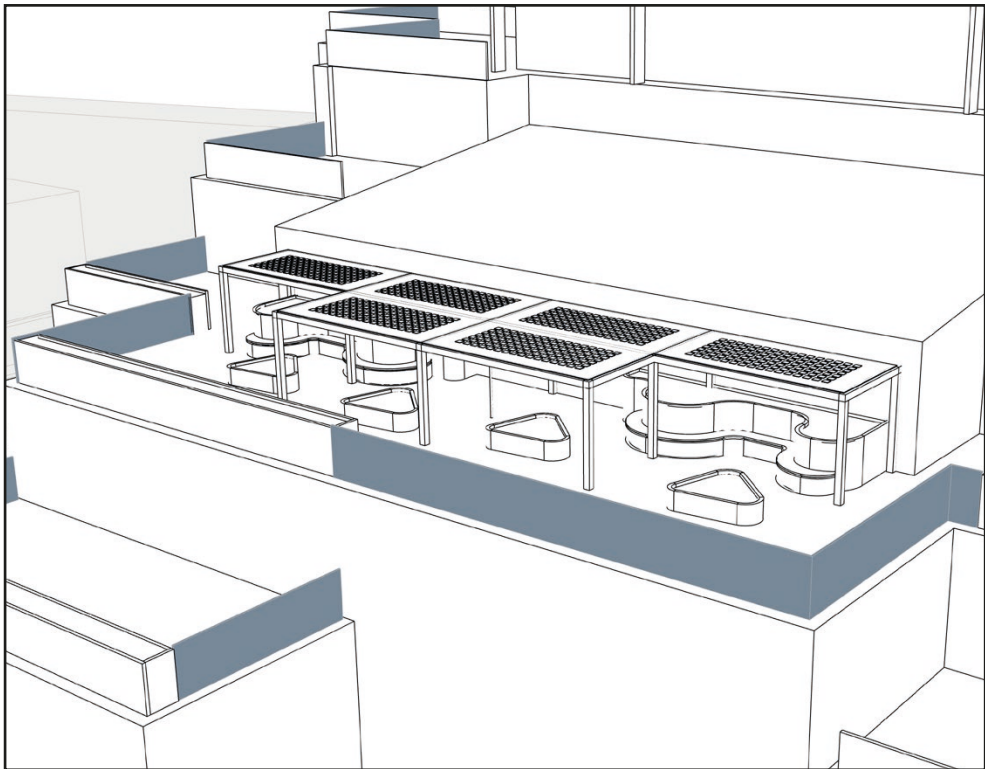
Proposed commercial development design - Planter and Railing layout



Proposed commercial development - pergola and planter design for the roof terrace

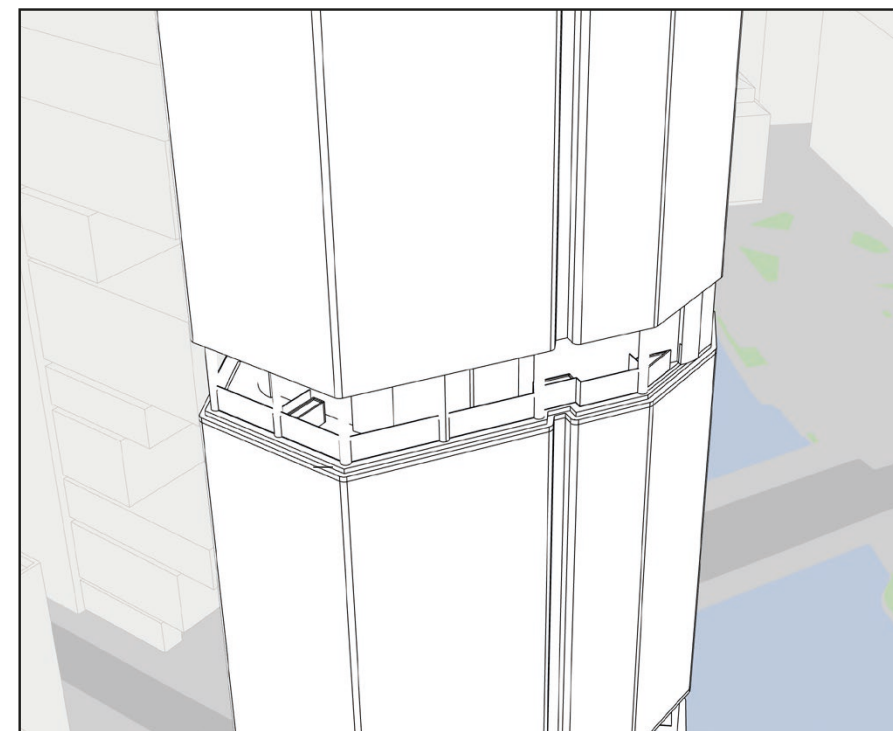
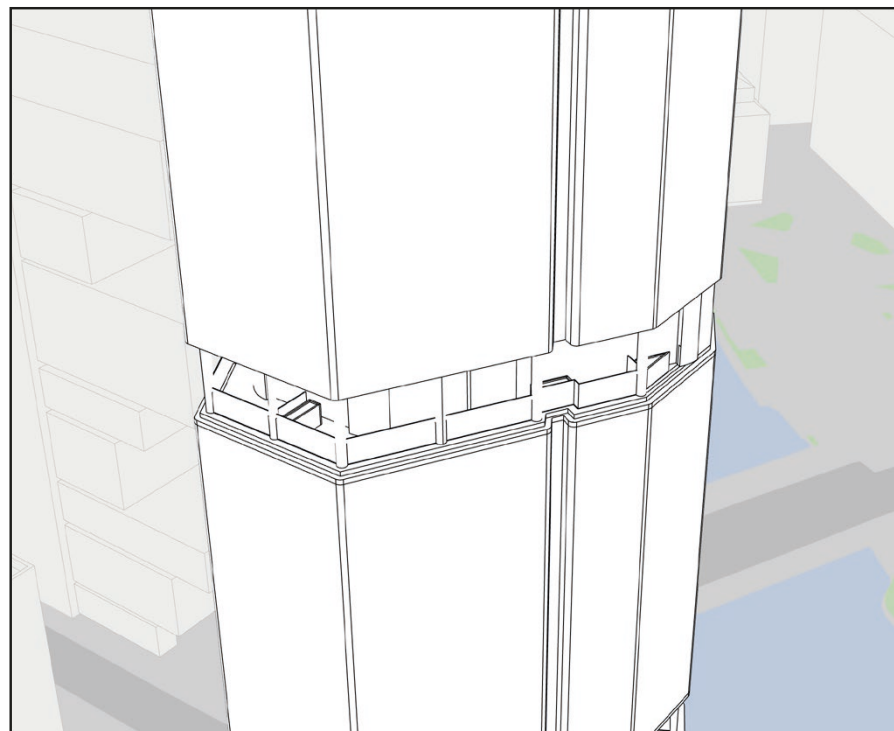
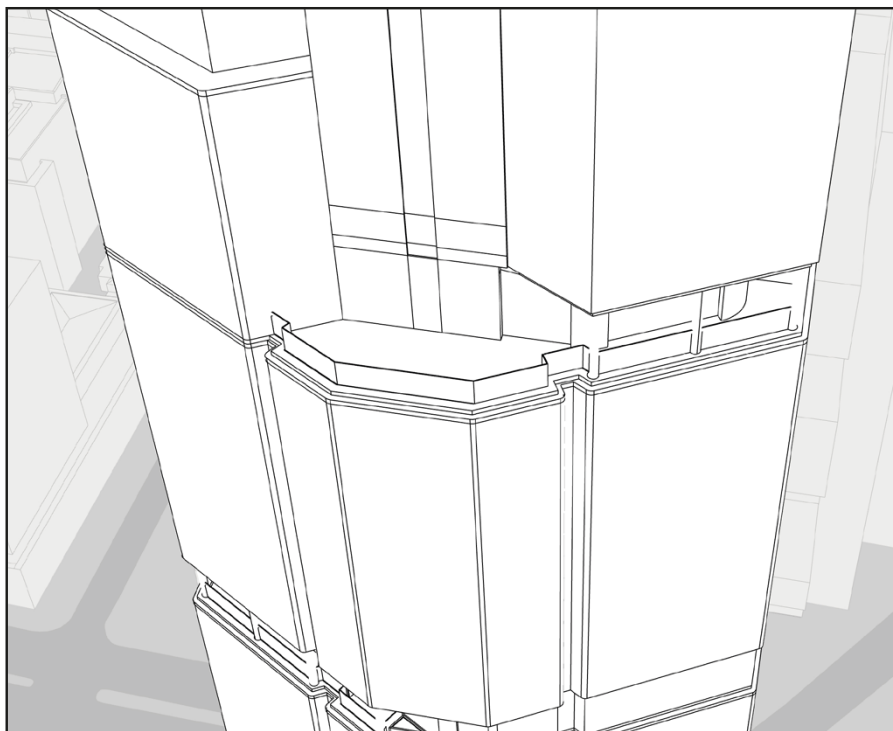
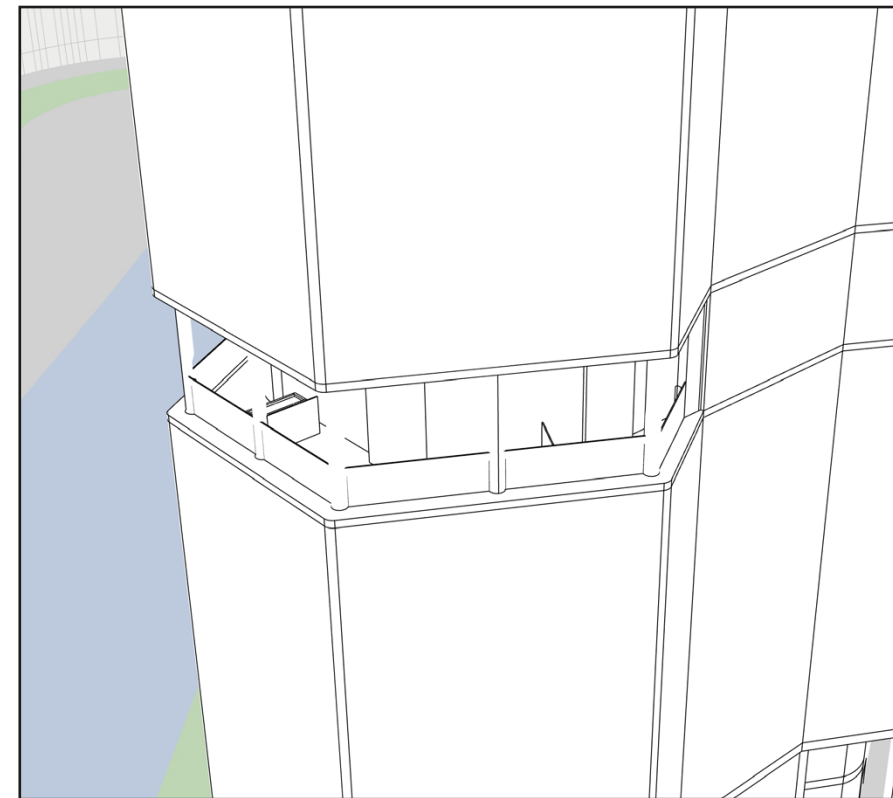
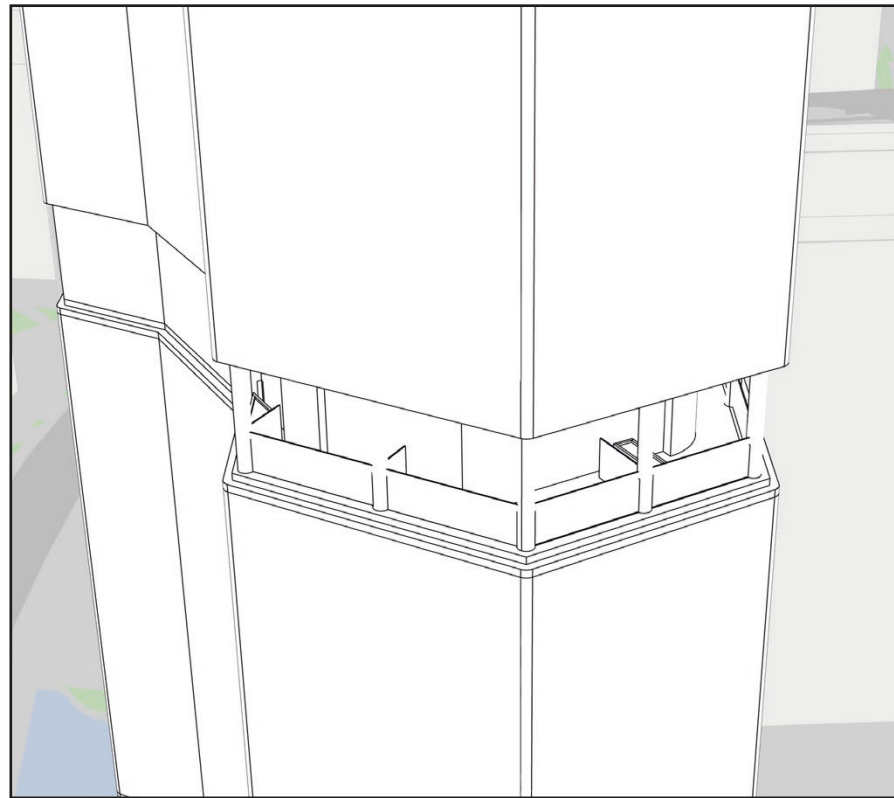
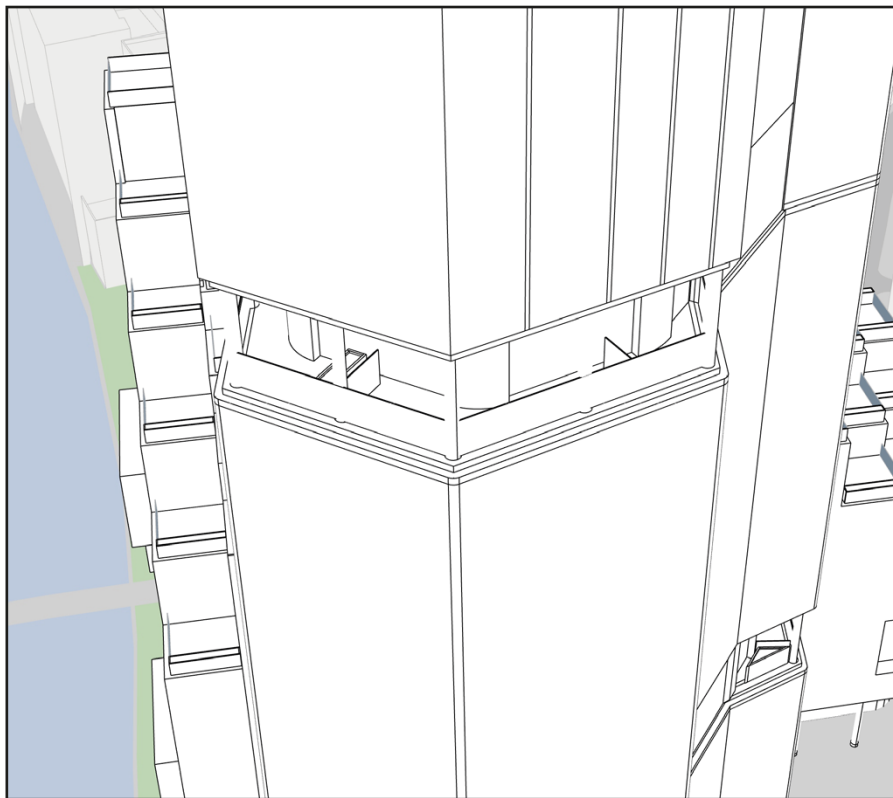


Proposed commercial development design - Planter and Railing layout



Proposed commercial development - pergola and planter design for the roof terrace

Proposed residential development - terrace design



Proposed residential development design - top-level terrace

Proposed residential development design - mid-level terrace

Proposed residential development design - lower-level terrace

Proposed Development with existing surroundings -
Public and Private terraces

Public terraces (commerical building)

Summer (comfort):

The wind conditions on the terraces are largely suitable for ‘Sitting’ and ‘Standing’ activities. The wind conditions for these terraces are therefore acceptable for the intended use.

Annual (distress):

No areas of unacceptable distress areas are observed.

The significance of the wind conditions for the **public terraces is therefore Negligable.**

Private terraces (residential building)

Summer (comfort):

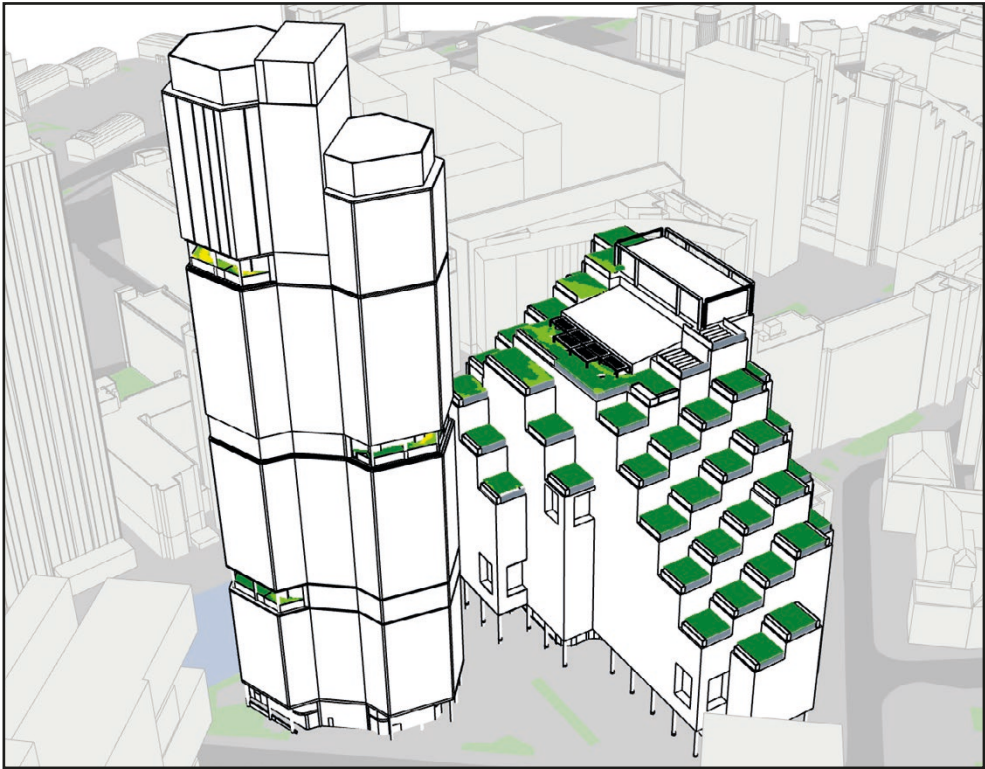
The wind conditions on the terraces show a range of comfort grades, suitable for ‘Standing’, ‘Strolling’, and ‘Business Walking’ activities. The wind conditions for these terraces are therefore unsuitable for the intended use.

Annual (distress):

Unacceptable wind distress can be observed on the terraces.

The significance of the wind conditions for the **private terraces is therefore Major Adverse** and so further measures against adverse wind are required. Despite this, as a private terrace, the impact can be more controllable than one for public use, for example, implementing a building management strategy to limit the pedestrian access to these locations during windy days. Landscaping strategy can also be used to block specific wind distress regions from pedestrian access.

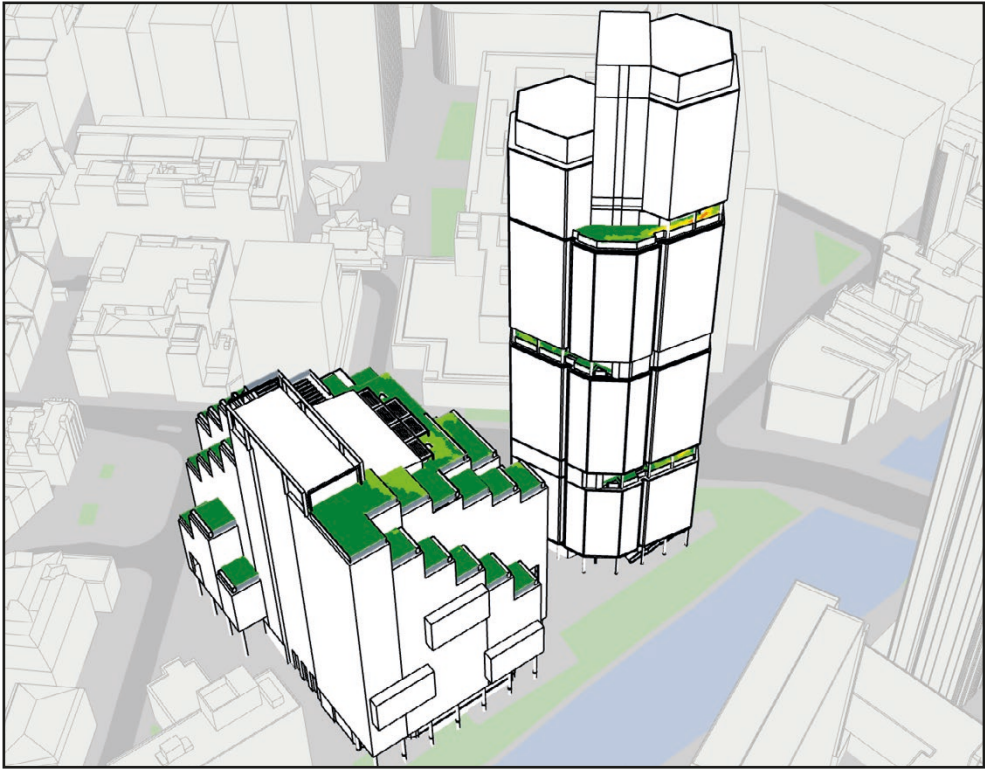
Comfort Category	Colour	Distress Category	Colour
Sitting		Unacceptable	
Standing		Acceptable	
Strolling			
Business Walking			
Roads and Car Parks			



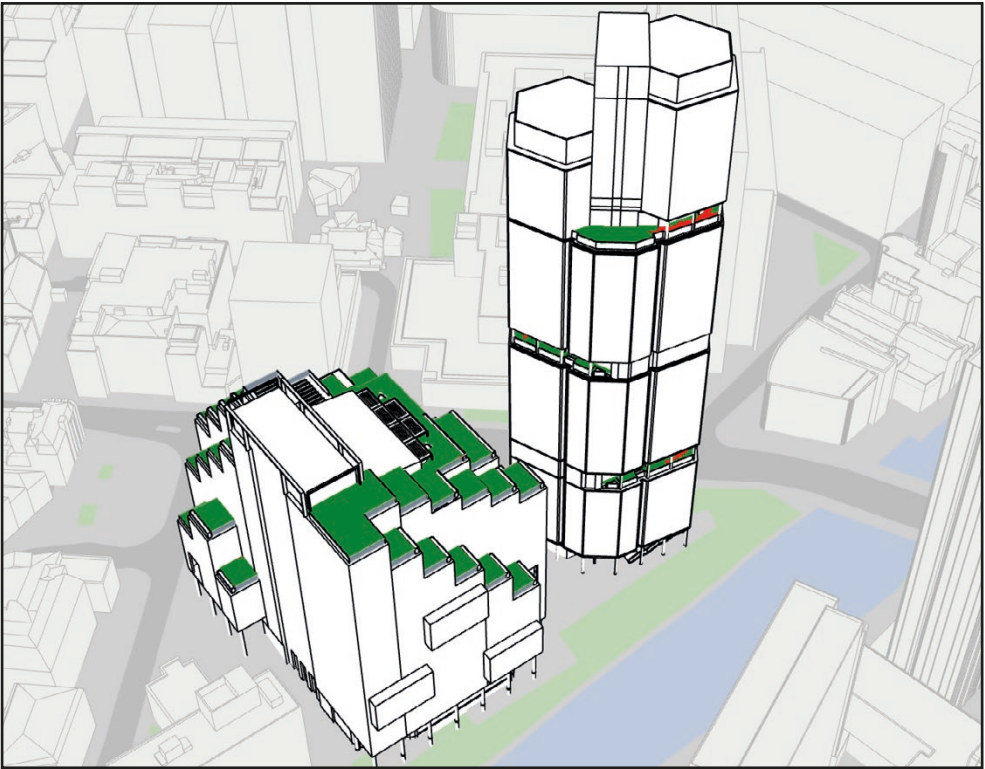
Proposed Development with existing surroundings - terrace-level comfort - summer season



Proposed Development with existing surroundings - terrace-level distress - annual



Proposed Development with existing surroundings - terrace-level comfort - summer season



Proposed Development with existing surroundings - terrace-level distress - annual

Proposed Development with future consented surroundings - Public and Private terraces

Public terraces (commerical building)

Summer (comfort):

The wind conditions on the terraces are largely suitable for ‘Sitting’ and ‘Standing’ activities. The wind conditions for these terraces are therefore acceptable for the intended use.

Annual (distress):

No areas of unacceptable distress areas are observed.

The significance of the wind conditions for the **public terraces is therefore Negligable.**

Private terraces (residential building)

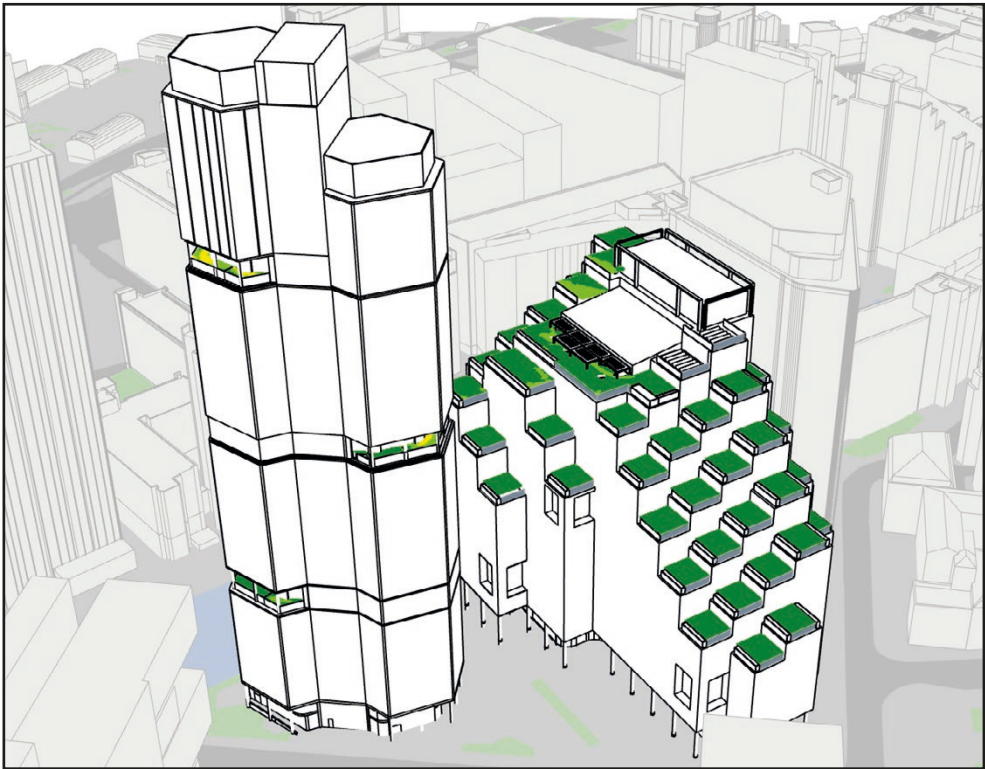
Summer (comfort):

The wind conditions on the terraces show a range of comfort grades, suitable for ‘Standing’, ‘Strolling’, and ‘Business Walking’ activities. The wind conditions for these terraces are therefore unsuitable for the intended use.

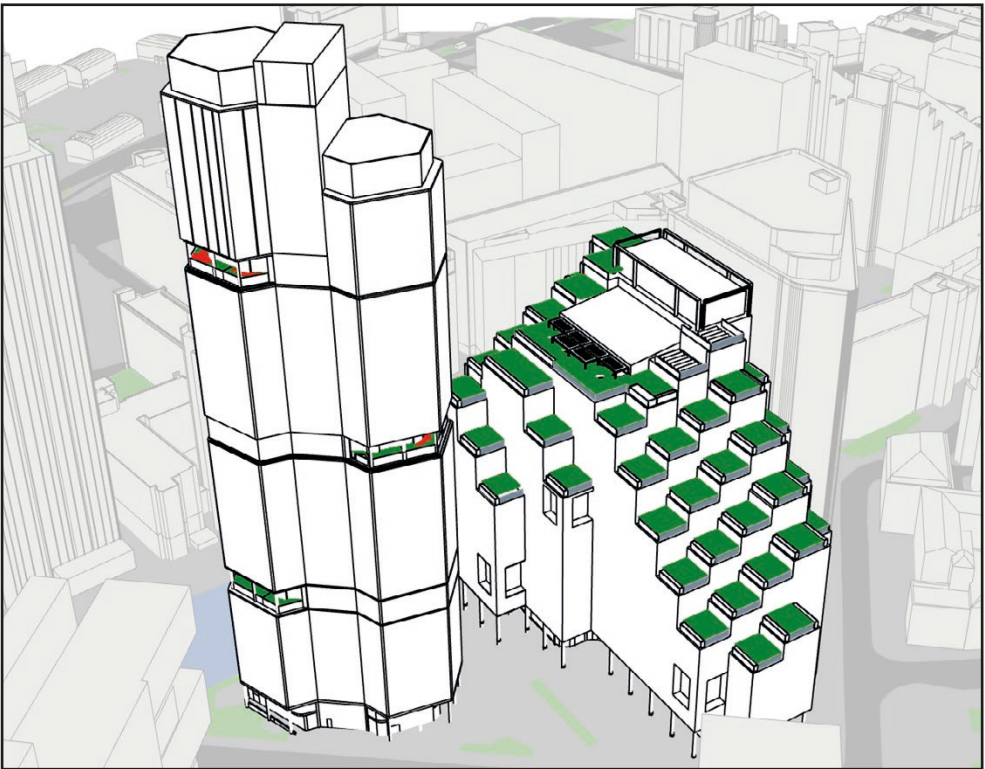
Annual (distress):

Unacceptable wind distress can be observed on the terraces.

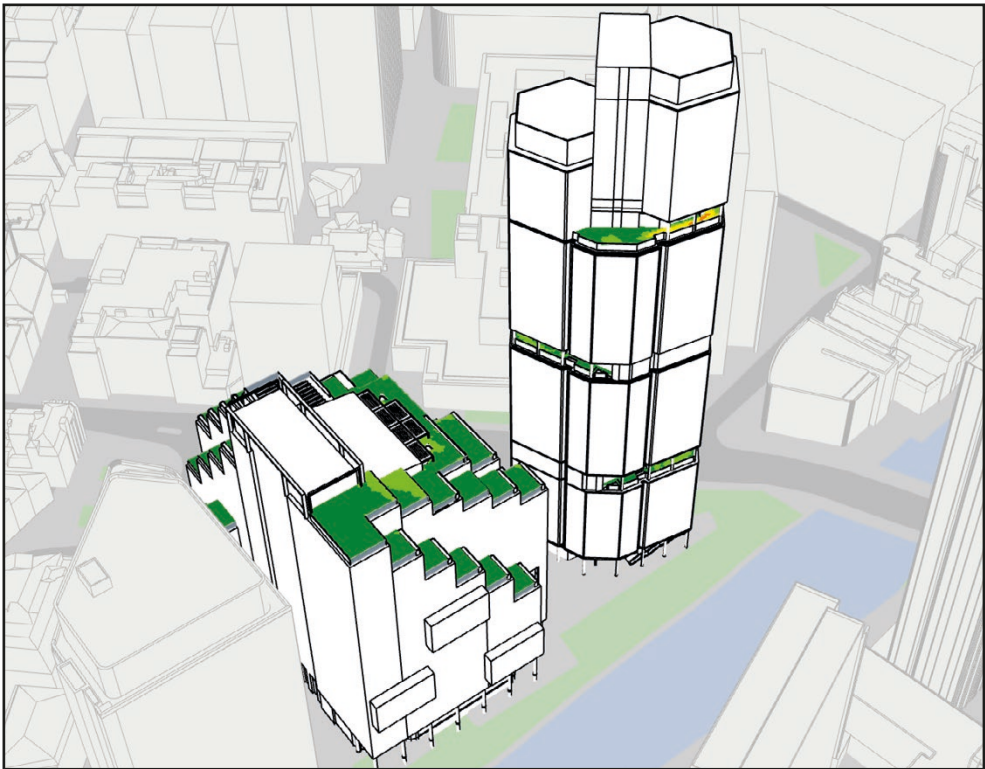
The significance of the wind conditions for the **private terraces is therefore Major Adverse** and so further measures against adverse wind are required. Despite this, as a private terrace, the impact can be more controllable than one for public use, for example, implementing a building management strategy to limit the pedestrian access to these locations during windy days. Landscaping strategy can also be used to block specific wind distress regions from pedestrian access.



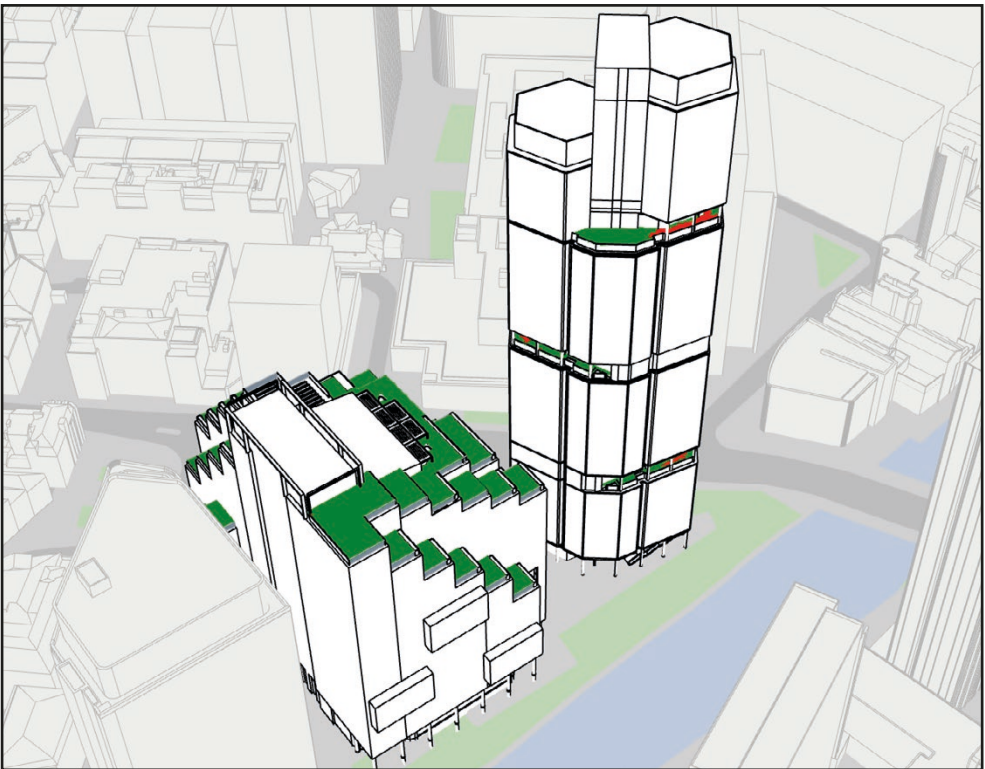
Proposed Development with consented surroundings - terrace-level comfort - summer season



Proposed Development with consented surroundings - terrace-level distress - annual



Proposed Development with consented surroundings - terrace-level comfort - summer season



Proposed Development with consented surroundings - terrace-level distress - annual

Comfort Category	Colour	Distress Category	Colour
Sitting	Dark Green	Unacceptable	Red
Standing	Light Green	Acceptable	Dark Green
Strolling	Yellow		
Business Walking	Orange		
Roads and Car Parks	Red		

5.0

Conclusions

AKT II has prepared this wind microclimate report on behalf of Oval Real Estate (“the applicant”) in support of the application to Manchester City Council for the redevelopment of Albert Bridge House, 1 Bridge St, Manchester M6o 9AF (“the Site”) in Manchester City, UK.

This report details an assessment of the pedestrian wind comfort on and around the Site of the Proposed Development using Computational Fluid Dynamics (CFD).

This report details the following scenarios for the Site:

- ‘Baseline’ - Existing Site with existing surroundings;
- Proposed Development with existing surroundings;
- Proposed Development with future consented schemes in the surroundings;
- Proposed Development with proposed on-Site landscaping with existing and future consented surroundings.

The pedestrian wind ‘comfort’ assessment in this report focuses primarily on the seasons:

- winter (windiest season);
- summer (characterised by frequent pedestrian activity).

The comfort results are discussed relating the wind conditions in a region to the intended pedestrian use using the established Lawson LDDC criteria.

An annual pedestrian ‘distress’ assessment is also performed to highlight any potential safety risks to vulnerable members of the public or cyclists due to strong winds.

The results of these assessments are summarised as follows:

Ground-level

A summary of the wind comfort and distress results for the Baseline and Proposed schemes at ground-level around the Site is as follows:

- During winter, the wind conditions for the Baseline are suitable for ‘Sitting’ and ‘Standing’ activities, with regions around Left Bank showing conditions suitable for ‘Strolling’. These results are considered acceptable for the intended uses of the surrounding areas. The Proposed scheme has a Negligible impact on the surroundings and are therefore acceptable.
- During summer, the wind conditions for the Baseline are suitable for ‘Sitting’ and ‘Standing’ activities’. Of particular note are the wind conditions for off-Site public seating area - Motor Square, which experiences a Minor Beneficial (acceptable) impact from the Proposed scheme. For the remaining areas, the Proposed scheme has a Negligible impact and are therefore acceptable.
- No areas of (annual) distress observed in both the Baseline and Proposed schemes. The Proposed scheme therefore has a Negligible impact on the surroundings. The wind conditions for the Proposed scheme are therefore acceptable.

Overall, the Proposed scheme largely has a ‘Negligible’ impact on the wind conditions in its surroundings, with a Minor Beneficial impact to Motor Square. The wind conditions for the Proposed scheme are therefore acceptable.

Proposed Development entrances

In the vicinity of the entrances to the Proposed Development, wind conditions are suitable for ‘Sitting’ and ‘Standing’ activities in both summer and winter.

No regions of unacceptable wind distress are observed.

For these areas, the significance of the wind conditions for the Proposed scheme is Negligible. The wind conditions for the Proposed scheme are therefore acceptable.

Proposed on-Site seating areas

The wind conditions for the Proposed on-Site seating areas are suitable for ‘Sitting’ and ‘Standing’ activities in summer. This would be considered unsuitable for the intended use (Moderate Adverse impact). However, this report shows that the Proposed on-Site landscaping mitigates the adverse wind conditions. Finally, the seating area on Trinity Square, to be introduced as part of the Alberton House future consented scheme (neighbouring the Site), is suitable for ‘Sitting’ conditions in summer (without landscaping).

No regions of unacceptable wind distress are observed.

For these areas, the significance of the wind conditions for the Proposed scheme is Negligible with the Proposed on-Site landscaping. The wind conditions for the Proposed scheme are therefore acceptable.

Proposed public passageway through the commercial Development

The wind conditions for the passageway through the Proposed commercial building are suitable for ‘Standing’ activities in both summer and winter.

No regions of unacceptable wind distress are observed.

For this area, the significance of the wind conditions for the Proposed scheme is Negligible. The wind conditions for the Proposed scheme are therefore acceptable.

Proposed Development commercial building terraces

The wind conditions for the public terraces on the commercial building experience wind conditions suitable for ‘Sitting’ and ‘Standing’ activities in summer.

No regions of unacceptable wind distress are observed.

For these areas, the significance of the wind conditions for the Proposed scheme is Negligible.

Proposed Development residential building terraces

The wind conditions for the private terraces on the residential building experience wind conditions suitable for ‘Standing’, ‘Strolling’, and ‘Business Walking’ activities in summer. Significant areas of unacceptable wind distress are observed. The significance of the wind conditions for the Proposed scheme is Major Adverse, and so further measures against adverse wind are required. Despite this, as a private terrace, the impact can be more controllable than one for public use, for example, implementing a building management strategy to limit the pedestrian access to these locations during windy days. Landscaping strategy can also be used to block specific wind distress regions from pedestrian access.

The analysis and results presented in this report are of analytical and comparative nature.

5.1

Summary

The table on this page summarises whether the wind conditions for a studied areas acceptable for its intended use, and the significance of the wind conditions between the Baseline and the Proposed schemes.

	Location	Season	Conclusion	Interpretation
1	Surrounding off-Site context area - thoroughfares and entrances	Summer	✓	Wind conditions suitable for intended mixed use area. Conditions are largely suitable for 'Sitting' and 'Standing' activities. The Proposed scheme has a Negligible impact on this region.
		Winter	✓	Wind conditions suitable for intended mixed use area. Conditions are largely suitable for 'Sitting' and 'Standing' activities with some 'Strolling' conditions around junction at Left Bank. The Proposed scheme has a Negligible impact on this region.
		Annual (distress)	✓	No unacceptable distress areas observed on-or-off-Site. The Proposed scheme has a Negligible impact on this region.
2	Surrounding off-Site context area - Motor Square seating/amenity space	Summer	✓	Wind conditions suitable for the intended use of 'Sitting' activities. The Proposed scheme has a Minor Beneficial impact on this region.
		Winter	✓	Wind conditions suitable for the intended use of 'Sitting' activities. The Proposed scheme has a Negligible impact on this region.
		Annual (distress)	✓	No unacceptable distress areas observed.. The Proposed scheme has a Negligible impact on this region.
3	Surrounding off-Site context area - Clermont-Ferrand seating area	Summer	✓	Wind conditions suitable for the intended use of 'Sitting' activities. The Proposed scheme has a Negligible impact on this region.
		Annual (distress)	✓	No unacceptable distress areas observed.. The Proposed scheme has a Negligible impact on this region.
4	Surrounding off-Site context area - Trinity Square seating area (as part of the future consented scheme for Alberton House)	Summer	✓	Wind conditions suitable for the intended use of 'Sitting' activities. The Proposed scheme has a Negligible impact on this region.
		Annual (distress)	✓	No unacceptable distress areas observed.. The Proposed scheme has a Negligible impact on this region.
5	Proposed on-Site seating areas	Summer	✓	Wind conditions suitable for 'Sitting' and 'Standing' activities. Proposed on-Site landscaping mitigates this to 'Sitting' conditions. The significance of the wind conditions for this area is therefore Negligible with the Proposed landscaping and Moderate Adverse without..
		Annual (distress)	✓	No unacceptable distress areas observed.. The significance of the wind conditions for this area is therefore Negligible.
6	Proposed on-Site entrances	Summer	✓	Wind conditions are suitable for 'Sitting' and 'Standing' activities and therefore suitable for the intended use. The significance of the wind conditions for this area is therefore Negligible.
		Winter	✓	Wind conditions are suitable for 'Sitting' and 'Standing' activities and therefore suitable for the intended use. The significance of the wind conditions for this area is therefore Negligible.
		Annual (distress)	✓	No unacceptable distress areas observed.. The significance of the wind conditions for this area is therefore Negligible.
7	Proposed on-Site public passageway through the commercial building	Summer	✓	Wind conditions are suitable for 'Sitting' and 'Standing' activities and therefore suitable for the intended use. The significance of the wind conditions for this area is therefore Negligible.
		Winter	✓	Wind conditions are suitable for 'Standing' activities and therefore suitable for the intended use. The significance of the wind conditions for this area is therefore Negligible.
		Annual (distress)	✓	No unacceptable distress areas observed.. The significance of the wind conditions for this area is therefore Negligible.
8	Proposed Development private terraces (residential building)	Summer	✗	Wind conditions are suitable for 'Standing', 'Strolling', and 'Business Walking' activities and therefore unsuitable for the intended use. The significance of the wind conditions for this area is therefore Major Adverse. As a private terrace, the impact can be more controllable than one for public use, for example, implementing a building management strategy to limit the pedestrian access to these locations during windy days. Landscaping strategy can also be used to block specific wind distress regions from pedestrian access.
		Annual (distress)	✗	Unacceptable distress areas observed on all terraces.. The significance of the wind conditions for this area is therefore Major Adverse. As a private terrace, the impact can be more controllable than one for public use, for example, implementing a building management strategy to limit the pedestrian access to these locations during windy days. Landscaping strategy can also be used to block specific wind distress regions from pedestrian access.
9	Proposed Development public terraces (commercial building)	Summer	✓	Wind conditions are suitable for 'Sitting' and 'Standing' activities and therefore suitable for the intended use. The significance of the wind conditions for this area is therefore Negligible.
		Annual (distress)	✓	No unacceptable distress areas observed.. The significance of the wind conditions for this area is therefore Negligible.

Appendix A

Lawson Criteria

This chapter specifies the wind comfort and distress criteria used in this assessment.

The established Lawson London Docklands Development Corporation (LDDC) criterion was adopted. Developed by Tom Lawson, this criterion is considered best practice guidance and is widely used in the established field of wind research within the United Kingdom. Lawson devised a scale for assessing the suitability of wind conditions in the urban environment based upon threshold values of wind speed and frequency of occurrence.

This criterion¹ defines a range of pedestrian activities from sitting through to more transient activities such as crossing the road, and for each activity defines a wind speed and frequency of occurrence. If the wind conditions exceed the threshold, then the conditions are considered unacceptable for the stated activity. If the wind conditions are below the threshold, they are described as tolerable (or suitable) for the stated activity.

¹ *Building Aerodynamics, Lawson, T., 2001, London, Imperial College Press*

Table A.1 describes these criteria, which can be visualised easily using a colour gradient from green to red representing the different grades from 1 to 5 and in turn, their associated activities.

In addition, the criterion stipulates two strong wind thresholds (15 and 20m/s) to represent the levels of *distress* where someone could find walking difficult - potentially leading to stumbling or falling. In this report, the more conservative (and inclusive) threshold of 15 m/s was used to design for vulnerable and young people. The methodology is similar to assessing pedestrian wind comfort, but this time with much stricter criterion.

However, even if we design to ensure that high wind speeds will not exceed a period over the year of 0.025% (i.e., 2 hours), we cannot quantify the frequency of this high wind speed because 2 hours (or more) can represent a sum of a 2-hour storm or 2400 gust-events of 3 seconds each. We quantify these 2-hours based on probability and statistics over a long period (30-years), but we can't predict these events' frequency to sum up to the 2 hours.

Grade	Criteria for acceptability wind speed exceeded for x% of the time	Activity				
		Roads and Car Parks	Business Walking	Strolling	Standing and Entrance	Sitting
1	5% and < 4 m/s	✓	✓	✓	✓	✓
2	5% and > 4m/s	✓	✓	✓	✓	
3	5% and > 6m/s	✓	✓	✓		
4	5% and > 8m/s	✓	✓			
5	5% and > 10m/s	✓				

Table A.1 Criteria for wind acceptability according to Lawson criteria'

Criteria for distress, wind speed exceeded for 0.025% of the year		
Unacceptable	> 15m/s	
Acceptable	< 15m/s	

Table A.2 Criteria for wind distress according to Lawson criteria'

Interpreting Comfort Results

The Lawson LDDC comfort criteria results are the principle method established for understanding pedestrian wind comfort around a development, and is the first visualisation presented and analysed in the following results section.

Each Grade within the Lawson Criteria is suitable for particular spatial programmes or 'uses' - such as sitting, slow walking (strolling), walking, and so forth. For a more detailed description of the Lawson LDDC comfort criteria, please see Appendix Section A.

Figure on this page demonstrates specific examples of spatial programmes for a notional building that is suitable for each of these different Grades.

Table A shows an abbreviated table that is used throughout the rest of this document, which pairs each of these spatial programmes with their relevant Grades.

Grade	Activity				
	Main Roads	Business Walking	Strolling	Standing and Entrances	Sitting
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	
3	✓	✓	✓		
4	✓	✓			
5	✓				

Table A Grades of wind acceptability according to Lawson Criteria'

External Terraces + Balconies and Ground-level seating - such as restaurants and plazas
Assumed spatial use: Longer duration sitting during Summer, and shorter duration standing during Winter.

Preferred Comfort Grades :
Summer 1 Winter 2

Active Building Frontages and Plazas and Parks etc
Assumed spatial use: slow walking and strolling.

Preferred Comfort Grades :
Summer 3 Winter

Inactive Building Frontages and Streets
Assumed spatial use: Faster walking in order to reach another destination.

Preferred Comfort Grades :
Summer 4 Winter

Building Entrances
Assumed spatial use: Entering and exiting buildings.

Preferred Comfort Grades :
Summer 2 Winter

Main Roads
Assumed spatial use: Busier roads and other exposed spaces unsuitable for most activities.

Preferred Comfort Grades :
Summer 5 Winter

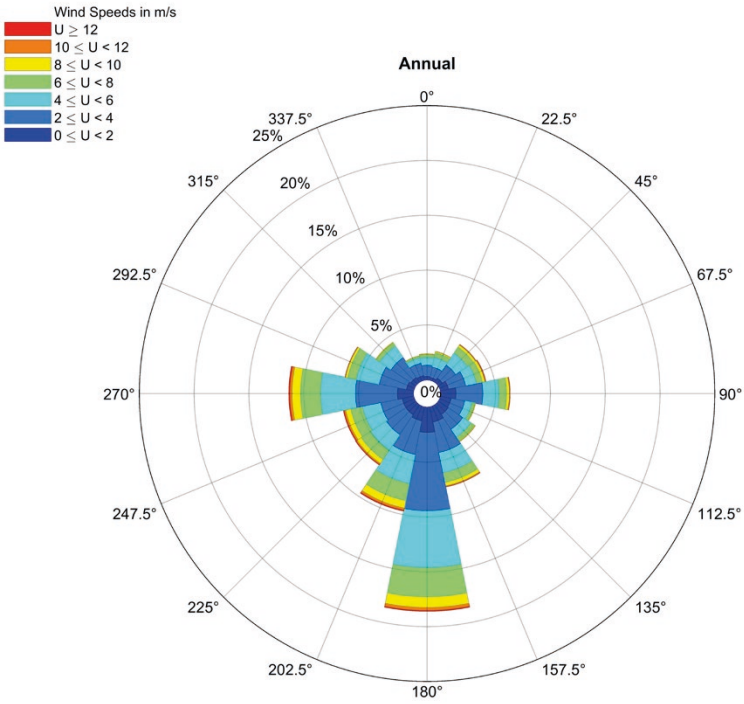
Lawson Criterion interpretation

Wind Statistics

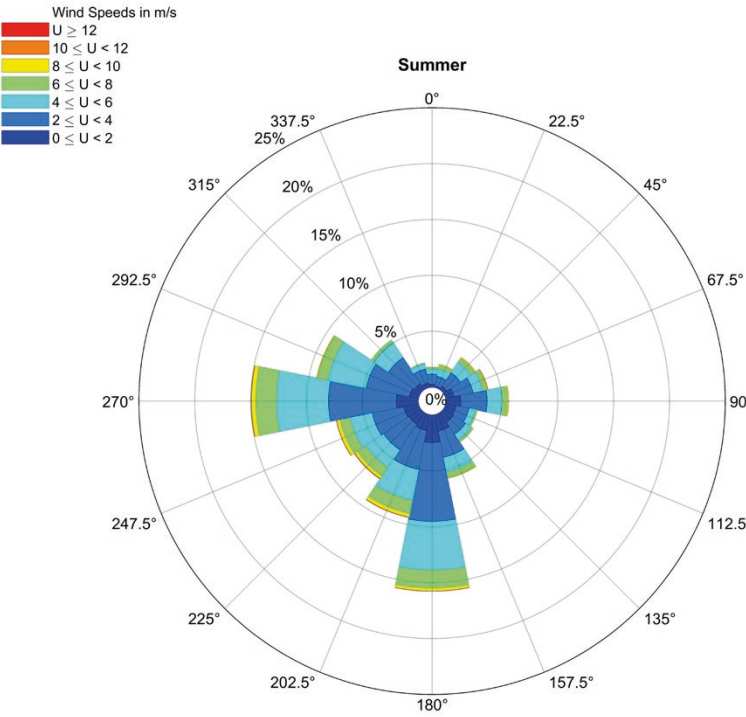
For this assessment, the wind statistics were derived from historical data from Manchester City Airport (1991-2021). Additionally, scaling factors to account for the surrounding terrain roughness are dervied using ESDU 01008:

Wind direction	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
Mean factor at 120m	1.38	1.36	1.36	1.37	1.36	1.36	1.345	1.34	1.36	1.36	1.365	1.37	1.38	1.37	1.38	1.4

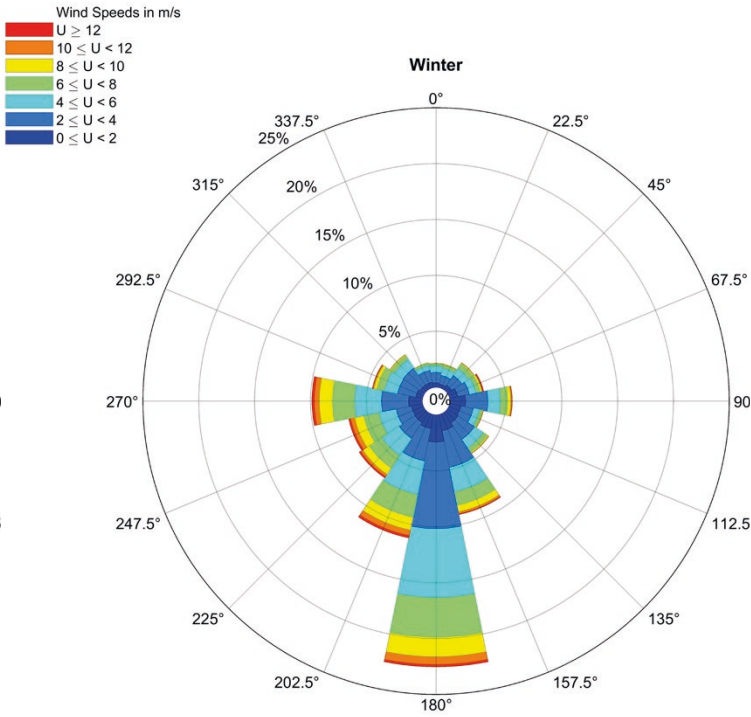
The wind roses indicate that throughout the year the prevailing winds are from the southern direction to the site - as is typical for this region of the UK.



Annual wind rose



Summer season



Winter season

Appendix B

Surrounding views

B.1 Existing site with existing surroundings

Far-field view of the entire model: Top View



B.1 Existing site with existing surroundings

Far-field view of the entire model: West



B.1 Existing site with existing surroundings

Far-field view of the entire model: South



B.1 Existing site with existing surroundings

Far-field view of the entire model: East



B.1 Existing site with existing surroundings

Far-field view of the entire model: North



B.2 Proposed Development with existing surroundings

Far-field view of the entire model: Top View



B.2 Proposed Development with existing surroundings

Far-field view of the entire model: West



B.2 Proposed Development with existing surroundings

Far-field view of the entire model: South



B.2 Proposed Development with existing surroundings

Far-field view of the entire model: East



B.2 Proposed Development with existing surroundings

Far-field view of the entire model: North



B.3 Proposed Development with consented surroundings

Far-field view of the entire model: Top View



B.3 Proposed Development with consented surroundings

Far-field view of the entire model: West



B.3 Proposed Development with consented surroundings

Far-field view of the entire model: South



B.3 Proposed Development with consented surroundings

Far-field view of the entire model: East



B.3 Proposed Development with consented surroundings

Far-field view of the entire model: North

