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WIND MICROCLIMATE ASSESSMENT REPORT

48 Store Street

October 2025

GIA No: **22959**

PROJECT DATA:

Client	**M1 Developments Ltd**
Project Title	**48 Store Street**
Project Number	**22959**

REPORT DATA:

Report Title	**Wind Microclimate Assessment**
GIA Department	**Wind Microclimate**
Dated	**October 2025**
Prepared by	**JW**
Checked by	**CH**

Revisions	No:	Date:	Notes:	Signed:

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1 INTRODUCTION

This report outlines the results of a wind microclimate analysis for the proposed development at 48 Store Street in Manchester, UK.

1.1 SUMMARY

Wind microclimate conditions for the proposed development at 48 Store Street were assessed using high resolution Computational Fluid Dynamics (CFD).

There are no wind safety risks associated with the proposed development.

Wind comfort conditions are either suitable or consistent with the baseline for all proposed entrances, off-site entrances, existing and consented amenity spaces and proposed roof terraces.

When future consented schemes come forward, wind conditions will remain suitable.

1.2 BACKGROUND

This report represents an update of the 2022 wind microclimate assessment which was submitted alongside planning application ref. (132626/FO/2022).

The assessment contained herein represents a re-test of the Proposed Development in the context of an updated surrounding context to account for schemes which were consented at the time of the 2022 assessment, and also those which have achieved consent in the intervening time period.

1.3 GUIDANCE

The Planning Practice Guidance (2021) identifies the potential for tall and large buildings to affect wind microclimate. The National Design Guide (2021) states in Paragraph 71 that:

"Proposals for tall buildings (and other buildings with a significantly larger scale or bulk than their surroundings) require special consideration. This includes their [...] environmental impacts, such as [...] wind. These need to be resolved satisfactorily"

Greater Manchester Combined Authority Joint Development Plan "Places for Everyone" (2021)

Policy JP-P-1 "Sustainable Places" states that "all development [...] should be consistent with: [...] comfortable and inviting, with indoor and outdoor environments: [...] addressing microclimate issues such as sunlight, indoor air quality, overheating, shade, wind and shelter".

Manchester Core Strategy (2012 – 2027)

Policy EN2 – Tall Buildings – States that, by their very size, tall buildings can have a significant impact on the local environment and its micro-climate. It is therefore expected that this impact be modelled and that submissions for tall buildings also include appropriate measures to create an attractive, pedestrian friendly local environment.

2 METHOD

To identify the likely effect of the proposed development on the pedestrian level wind environment, a 3D CFD model of the development and surrounding site was created. This section describes the methodology for the creation of this model and the inputs used.

2.1 ASSESSMENT METHODOLOGY

The assessment was performed using GIA's high-resolution Computational Fluid Dynamics (CFD) modelling.

CFD is a digital modelling technique, which simulates the effect of wind for the built environment. The air is divided into hundreds of millions of "cells", within which the equations of motion are solved. GIA uses cloud computing from Amazon Web Services (AWS) to run the simulations, to ensure vast scalability and appropriate resource availability for any project.

A full description of the test methodology is included in Appendix 01.

2.2 ESTABLISHING MICROCLIMATE CONDITIONS

Microclimate conditions were established using a high resolution CFD model, extending 400m radius from the Site.

A model of the development was included within the CFD model and tested to determine the conditions at and around the Site. The model used is shown in Figure 1, Figure 2 and Figure 3.

The model was run at full scale from 18 wind angles, spaced using 10° or 30° increments such that no sector contributes more than 10% of the annual wind. The wind angles which were run are indicated in Appendix 01.

Wind speeds were measured at 1.5m above any surfaces expected to be used for pedestrian activity.

On-site and local wind speeds were combined with wind statistics from 30 years of data recorded at Manchester International Airport for variations in terrain between the airports and the site, to obtain annual and seasonal frequency and magnitude of wind speeds across the model. This allows the 'grading' of the pedestrian level winds according to the Lawson Comfort Criteria, which are explained later in this report.

The wind microclimate effects are assessed annually, for the winter months (December, January and February) and for the summer months (June, July, August). Winter conditions are reported as this is the season when the strongest winds are expected, summer conditions are reported as this is the season when pedestrian usage of outdoor spaces is expected to be highest.

2.3 LIMITATIONS AND ASSUMPTIONS

The accuracy of the results is dependent upon the accuracy of the CAD used to construct the model.

The assessment herein is valid to the design as supplied to GIA at the time of the assessment, and does not cover future variations in the design.

There is an inherent assumption that on-site wind speeds will scale linearly with the measured wind speeds at the airport (since all wind probabilities are based on data measured at airfield anemometers).

There is an inherent assumption that the wind speed statistics for the past 30 years will remain applicable for the foreseeable future.

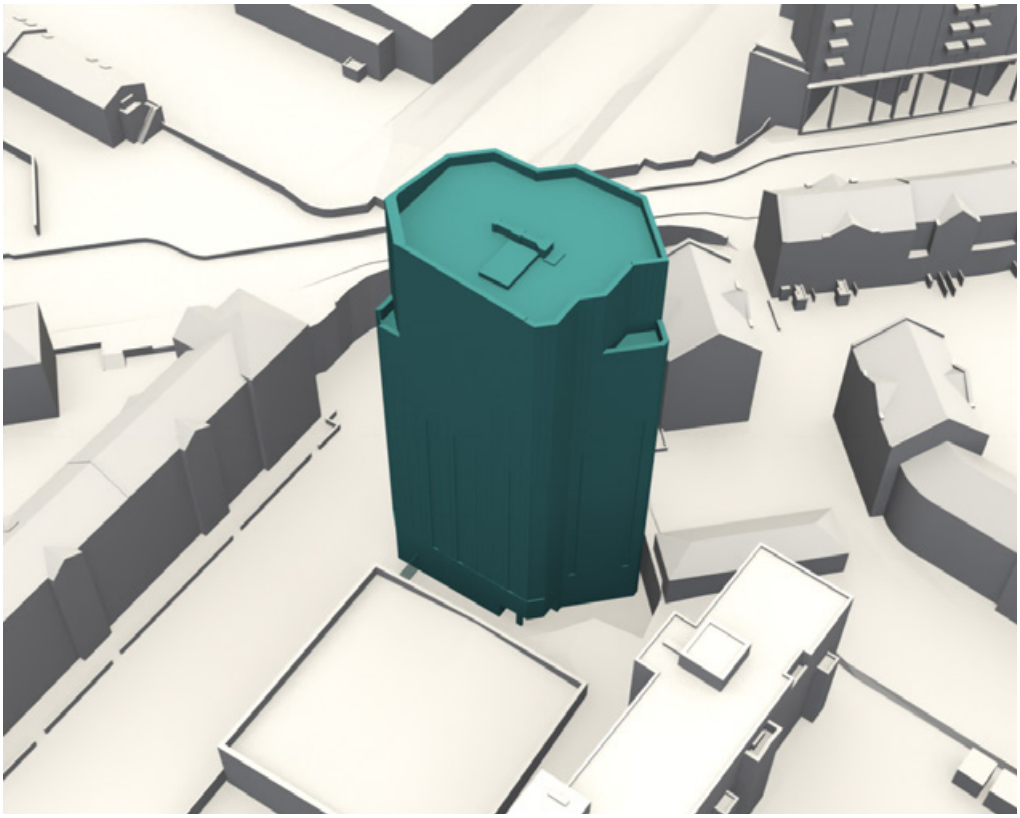


Fig. 01: 3D View of proposed Development

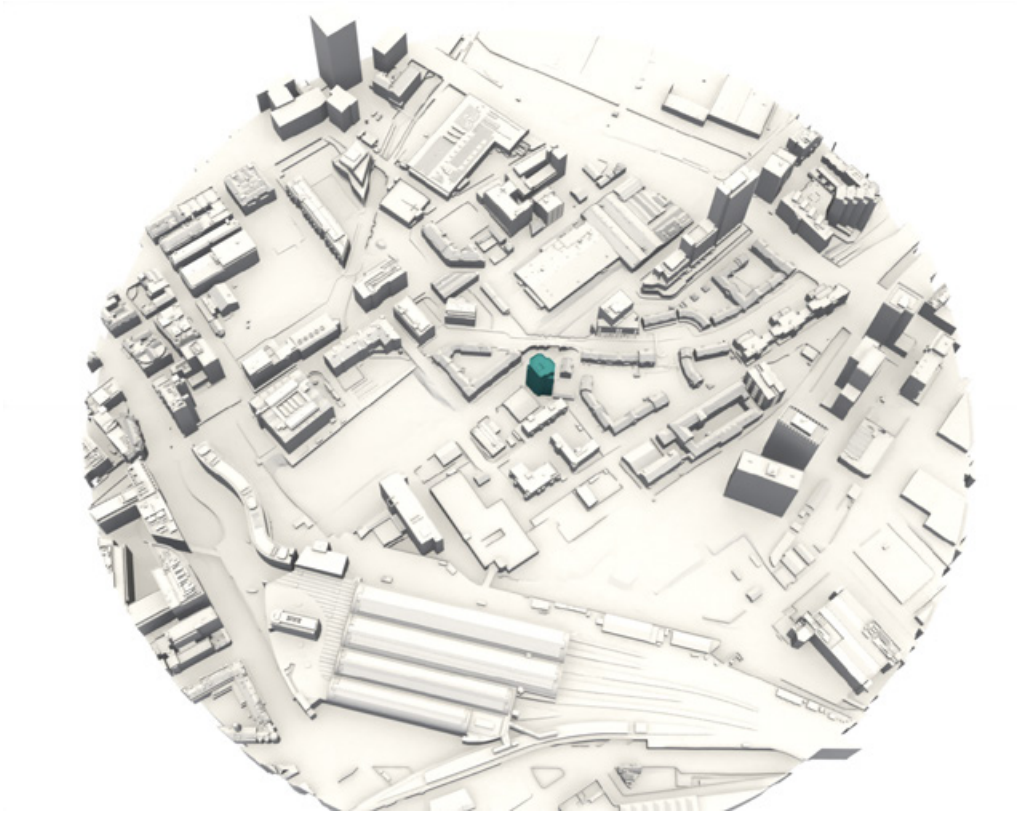


Fig. 02: Proposed Development with Existing Surrounds

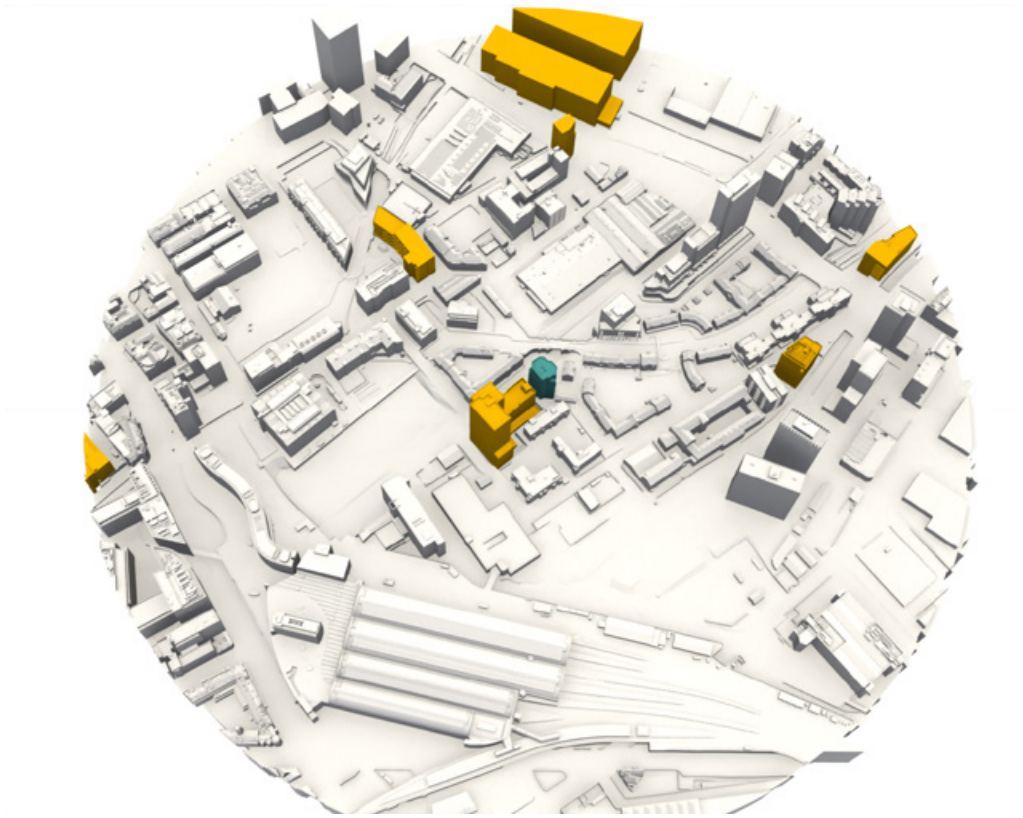


Fig. 03: Proposed Development with Cumulative Surrounds

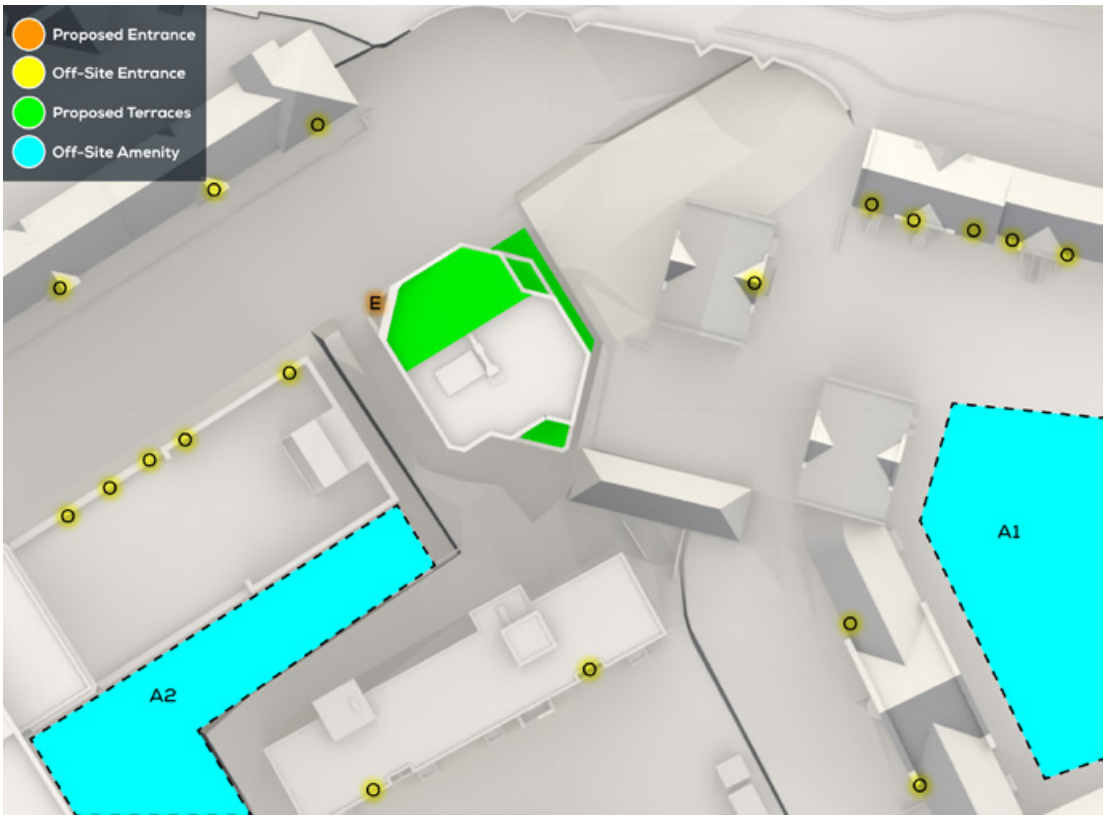


Fig. 04: Sensitive Wind Receptors

2.4 LAWSON COMFORT AND SAFETY CRITERIA

The assessment was graded against the Lawson Comfort and Safety Criteria.

Table 1 and Table 2 show the banding of the various categories within the Lawson Comfort and Safety criteria.

Comfort categories are based on the level of wind speed exceedance for 5% of each season, and safety categories are based on the level of wind speed exceedance for~2 hours per year.

The assessment was performed using the London Docklands Development Corporation (LDDC) variant of the Lawson Comfort Criteria. The Lawson Criteria are well-established in the UK for quantifying wind conditions in relation to build developments and, although not a UK 'standard', the criteria are recognised by local authorities as a suitable benchmark for wind assessments. The Lawson Criteria have been adopted for this assessment.

Table 01: Lawson Comfort Criteria (LDDC variant)

KEY	COMFORT CATEGORY	MEAN WIND SPEED (5% EXCEEDANCE)	DESCRIPTION
	Sitting	4 m/s	Acceptable for outdoor sitting use (e.g. cafés, benches, balconies and terraces)
	Standing	6 m/s	Acceptable for main building entrances, pick-up / drop-off points and bus stops
	Walking (leisure)	8 m/s	Acceptable for strolling
	Walking (business)	10 m/s	Acceptable for external pavements, walking purposefully without lingering
	Uncomfortable	>10 m/s	Not comfortable for regular pedestrian access

Table 02: Lawson Safety Criteria (LDDC variant)

KEY	SAFETY CATEGORY	MEAN WIND SPEED (0.025% EXCEEDANCE)	DESCRIPTION
	No Safety Exceedance	<15 m/s	
	S15 (Distress)	>15 m/s	Unsafe for frail individuals, or cyclists
	S20 (Safety)	>20m/s	Wind conditions considered unsafe for all users

2.5 TARGET CONDITIONS

For a mixed-use urban area within which the site is located, the desired wind microclimate would typically need to have areas acceptable for sitting, standing (including at entrances of buildings) and walking use. A description of the comfort categories to classify wind conditions in accordance with is given below.

Any areas which show up as either unsafe (annually) or uncomfortable (for winter) will require mitigation, unless they are in locations where pedestrian access can be controlled in the event of strong winds. This applies to all thoroughfares (for pedestrians) and roads (for cyclists) around the proposed development.

The areas immediately outside any building entrances should be suitable for standing use during winter to provide a "buffer" between the still conditions in interior spaces and the general thoroughfare. The principal entrances to the proposed development are marked "E" on Figure 5, and principal off-site entrances are marked "O".

There are no bus stops or railway platforms within the study area,

There is existing amenity in Thomas Telford Basin to the south east (marked "A1" on results figures) and also within the cumulative Sparkle Street scheme to the west (marked "A2"). There are also proposed amenity terraces at elevated levels within the Proposed Development These are targeted to be suitable for a mix of sitting and standing in summer.

The locations of the sensitive receptors are shown in Figure 5.

2.6 SCENARIOS

The purpose of these tests was assess conditions when the proposed development is operational.

The following scenarios were tested:

1 Proposed Development with Existing Surrounds: The completed and operational development with the existing surrounds; and

2 Proposed Development with Cumulative Surrounds: The completed and operational development with the existing surrounds plus all local planning consented schemes within 400m.

The following local schemes were considered sufficiently advanced to be included in the baseline surrounds:

- Burlington House (106021/FO/2014/CS)
- Ducie Street (120149/FO/2018)
- Store Street (126608/FO/2020)
- Oxygen Tower (115545/FO/2017)
- Islington Wharf Phase 4 (126669/FO/2020)
- Crusader Works (113363/FO/2016)
- Portugal Street East Phase 1 (121099/FO/2018)
- Piccadilly East (127317/FO/2020)
- Victoria House (122000/FO/2018)
- Leonardo House (122599/FO/2019)

The following local consented schemes were not considered sufficiently advanced to be included in the baseline, so were only included as part of the cumulative surrounds:

- Laystall Street (135662/FO/2022)
- Chapeltown Street (132214/FO/2021)
- Pollard Street (128191/FO/2020)
- Manchester Digital Campus (141607/FO/2024)
- Eider House (115178/FO/2017)
- Hometel Piccadilly (137794/FO/2023)
- Holiday Inn Express (103945/FO/2013/C2)
- Sparkle Street (126608/FO/2020)

All scenarios were tested in the absence of trees or soft landscaping, to ensure conservative results.

3 RESULTS

3.1 CONDITIONS FOR PROPOSED DEVELOPMENT WITH EXISTING SURROUNDS

Ground Level Conditions

Annual safety at ground level for the proposed development with existing surrounds is shown in Figure 5. Winter comfort at ground level for the proposed development with existing surrounds is shown in Figure 6. Summer comfort at ground level for the proposed development with existing surrounds is shown in Figure 7.

There are no exceedances of the wind safety criteria within the site or the surrounding area.

Conditions range between suitable for sitting, standing and leisure walking in winter and between sitting and standing in summer.

Conditions for the proposed entrance to the development (marked "E" in results figures) are suitable for sitting in all seasons. This one category calmer than required for the intended use.

All principal off-site entrances (marked "O" in results figures) are suitable for either sitting or standing in all seasons. This is suitable for the intended use.

Conditions for the Thomas Telford Basin amenity (marked "A1" in results figures) are suitable for a mix of sitting and standing in winter and for sitting in summer. This is suitable for the intended use.

Elevated Level Conditions

Annual safety at elevated level for the proposed development with existing surrounds is shown in Figure 8. Winter comfort at elevated level for the proposed development with existing surrounds is shown in Figure 9. Summer comfort at elevated level for the proposed development with existing surrounds is shown in Figure 10.

There are no safety exceedances at any terrace level, and conditions would be suitable for a mix of sitting and standing in summer. This is suitable for the intended use.

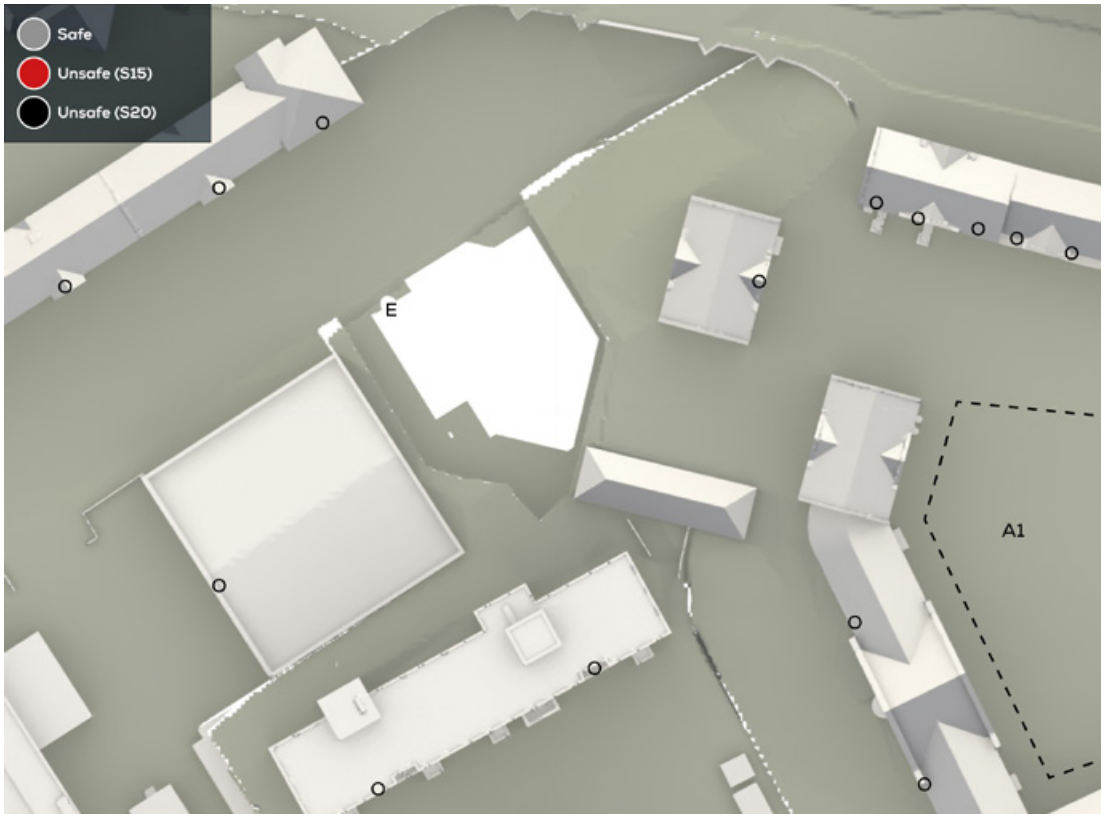


Fig. 05: Annual Safety at Ground Level, Proposed Development with Existing Surrounds

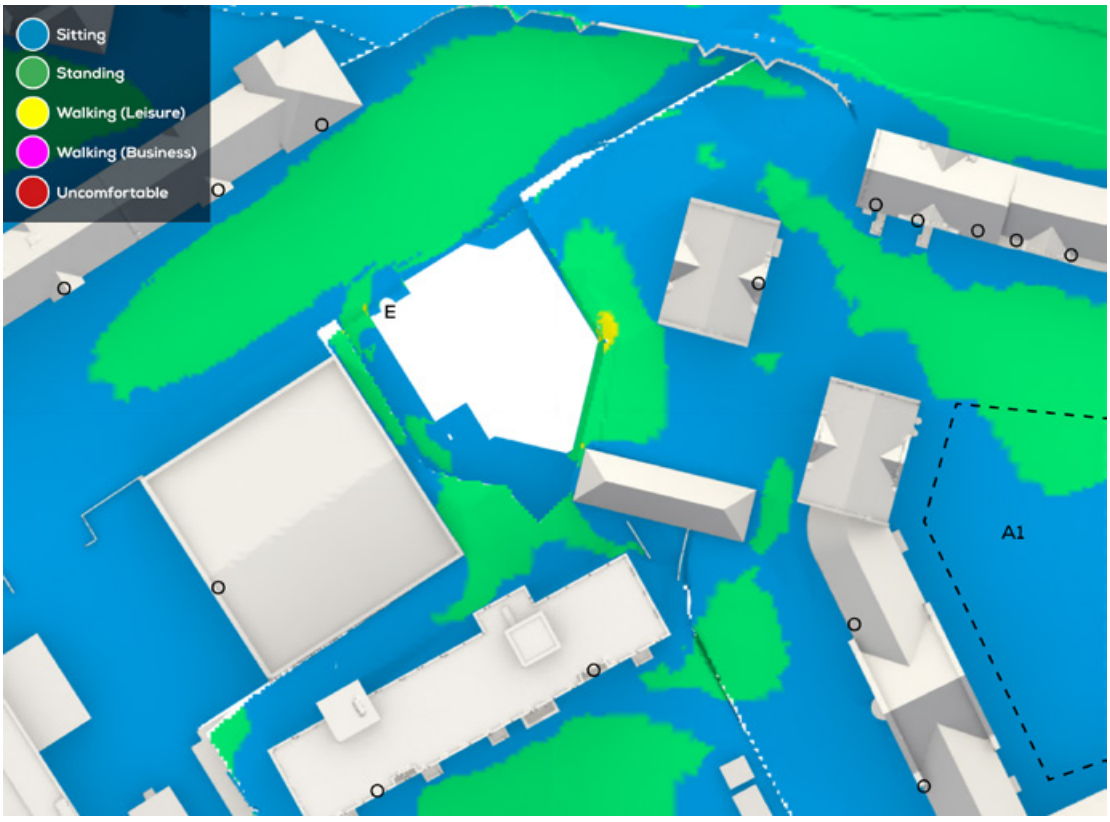


Fig. 06: Winter Comfort at Ground Level, Proposed Development with Existing Surrounds

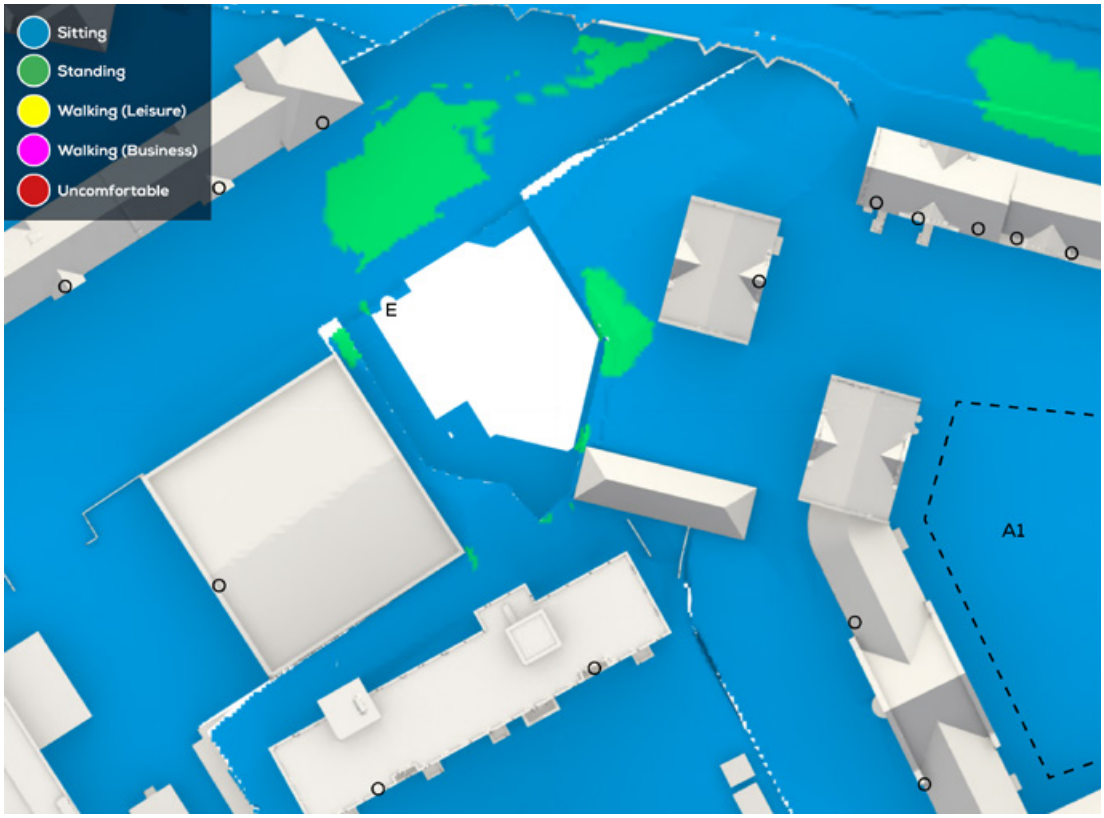


Fig. 07: Summer Comfort at Ground Level, Proposed Development with Existing Surrounds

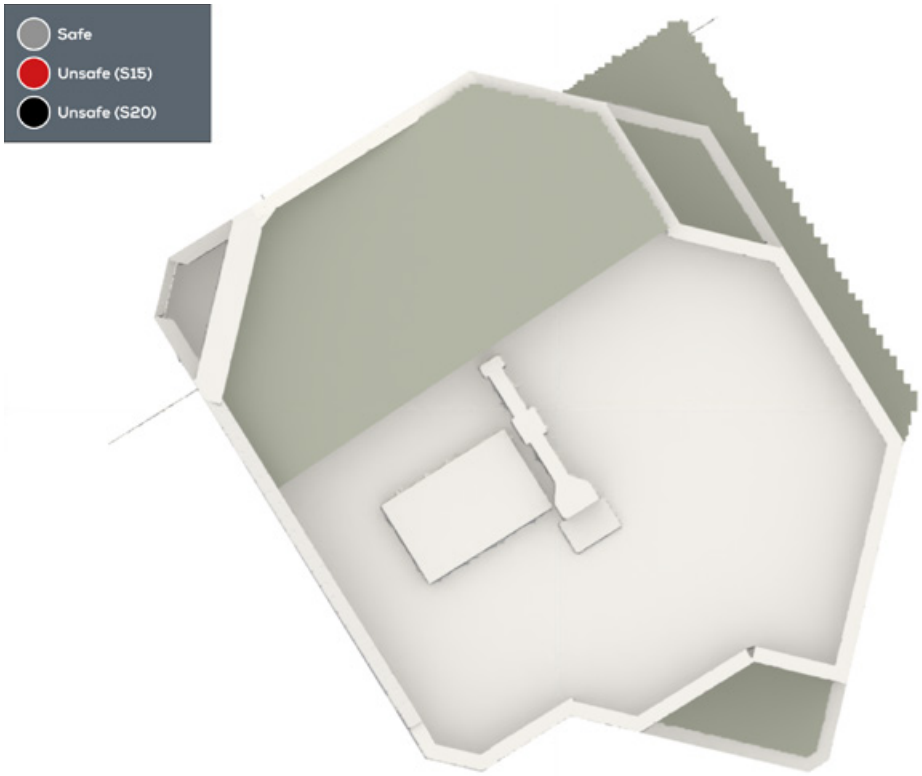


Fig. 08: Annual Safety at Elevated Level, Proposed Development with Existing Surrounds

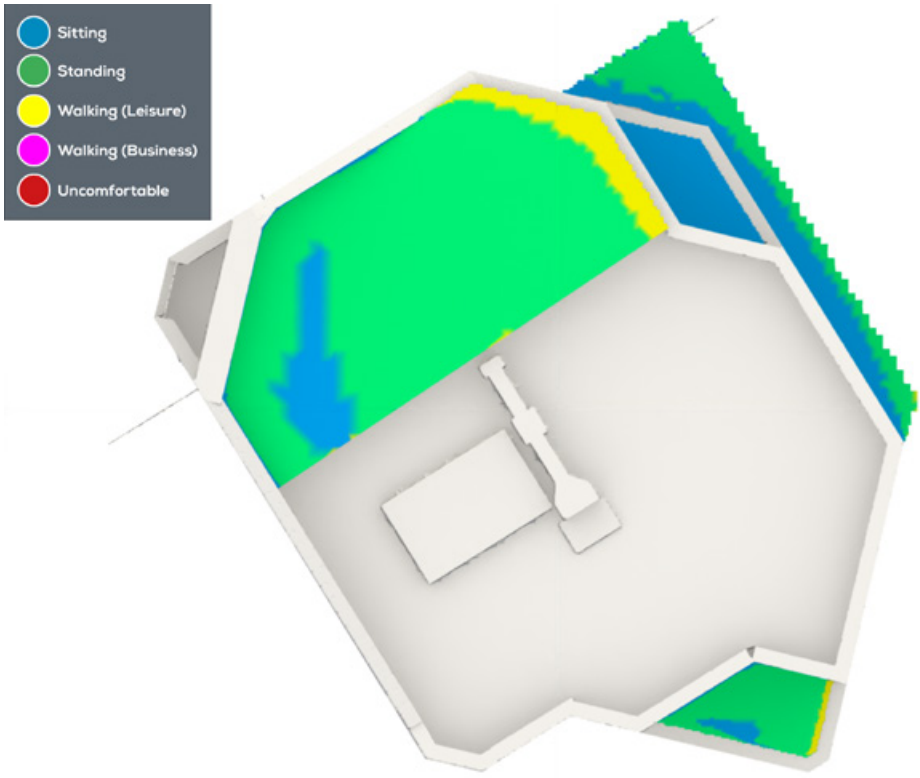


Fig. 09: Winter Comfort at Elevated Level, Proposed Development with Existing Surrounds

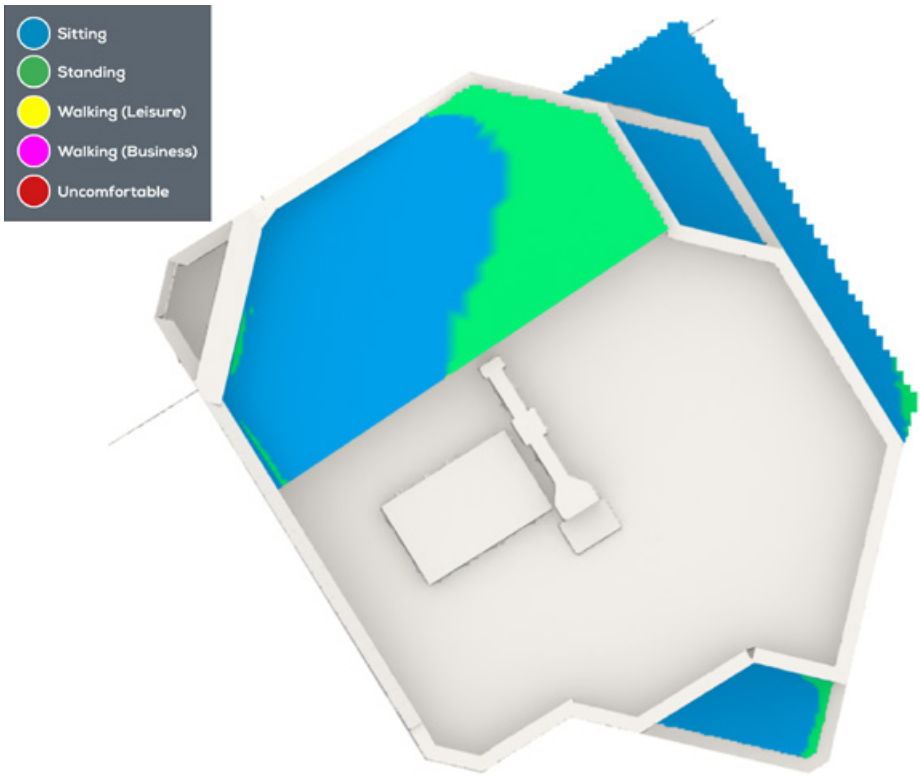


Fig. 10: Summer Comfort at Elevated Level, Proposed Development with Existing Surrounds

3.2 CONDITIONS FOR PROPOSED DEVELOPMENT WITH CUMULATIVE SURROUNDS

Annual safety at ground level for the proposed development with cumulative surrounds is shown in Figure 11. Winter comfort at ground level for the proposed development with cumulative surrounds is shown in Figure 12. Summer comfort at ground level for the proposed development with cumulative surrounds is shown in Figure 13.

There are no exceedances of the wind safety criteria within the site or the surrounding area.

Conditions range between suitable for sitting, standing and leisure walking in winter and between sitting and standing in summer.

Conditions for the proposed entrance to the development (marked "E" in results figures) are suitable for sitting in all seasons. This one category calmer than required for the intended use.

All principal off-site entrances (marked "O" in results figures) are suitable for either sitting or standing in all seasons. This is suitable for the intended use.

Conditions for the Thomas Telford Basin amenity (marked "A1" in results figures) are suitable for a mix of sitting and standing in winter and for sitting in summer. This is suitable for the intended use.

Conditions for the cumulative Sparkle Street amenity (marked "A2" in results figures) are suitable for a mix of sitting and standing in all seasons. This is suitable for the intended use.

Elevated Level Conditions

Annual safety at elevated level for the proposed development with existing surrounds is shown in Figure 14. Winter comfort at elevated level for the proposed development with existing surrounds is shown in Figure 15. Summer comfort at elevated level for the proposed development with existing surrounds is shown in Figure 16.

There are no safety exceedances at any terrace level, and conditions would be suitable for a mix of sitting and standing in summer. This is suitable for the intended use.

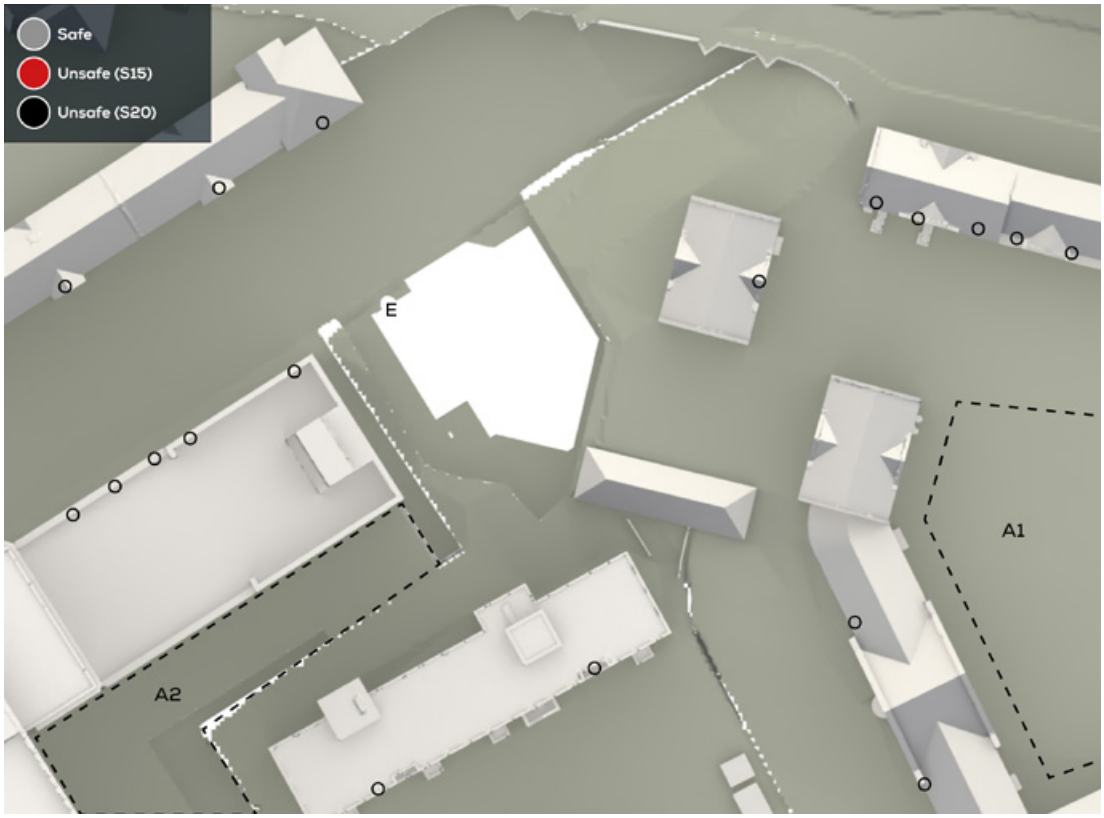


Fig. 11: Annual Safety at Ground Level, Proposed Development with Cumulative Surrounds

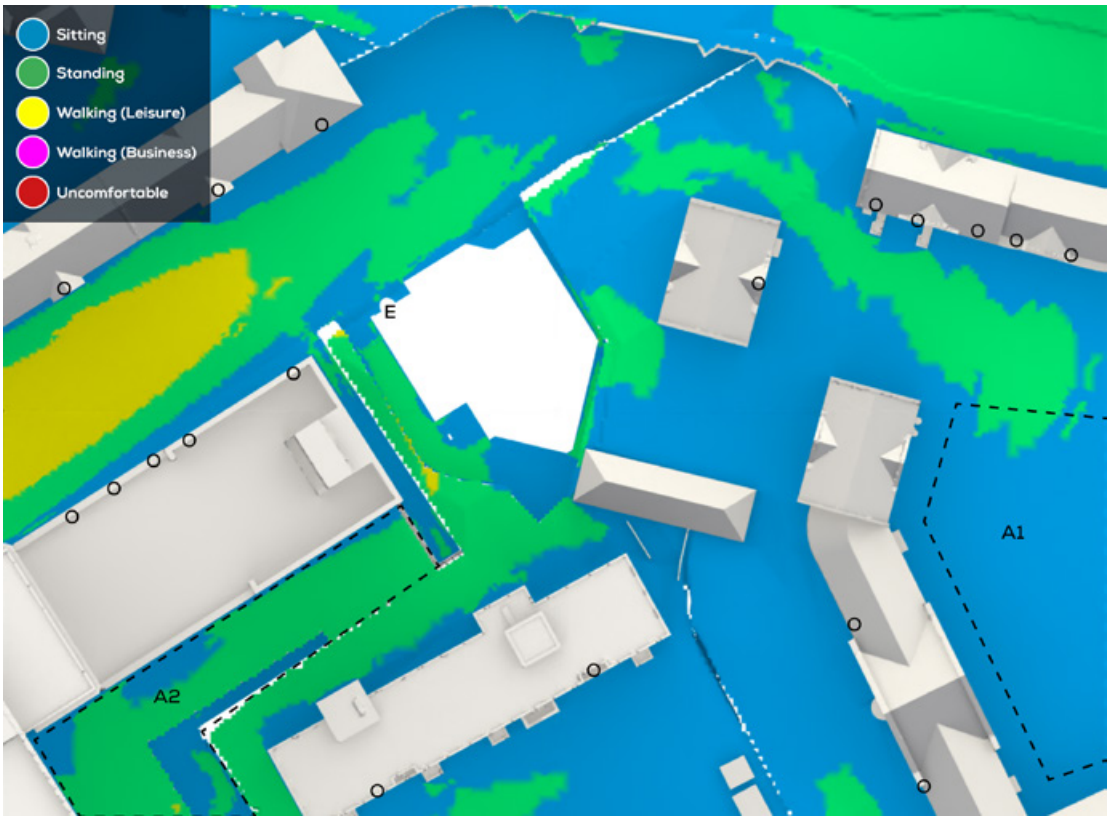


Fig. 12: Winter Comfort at Ground Level, Proposed Development with Cumulative Surrounds

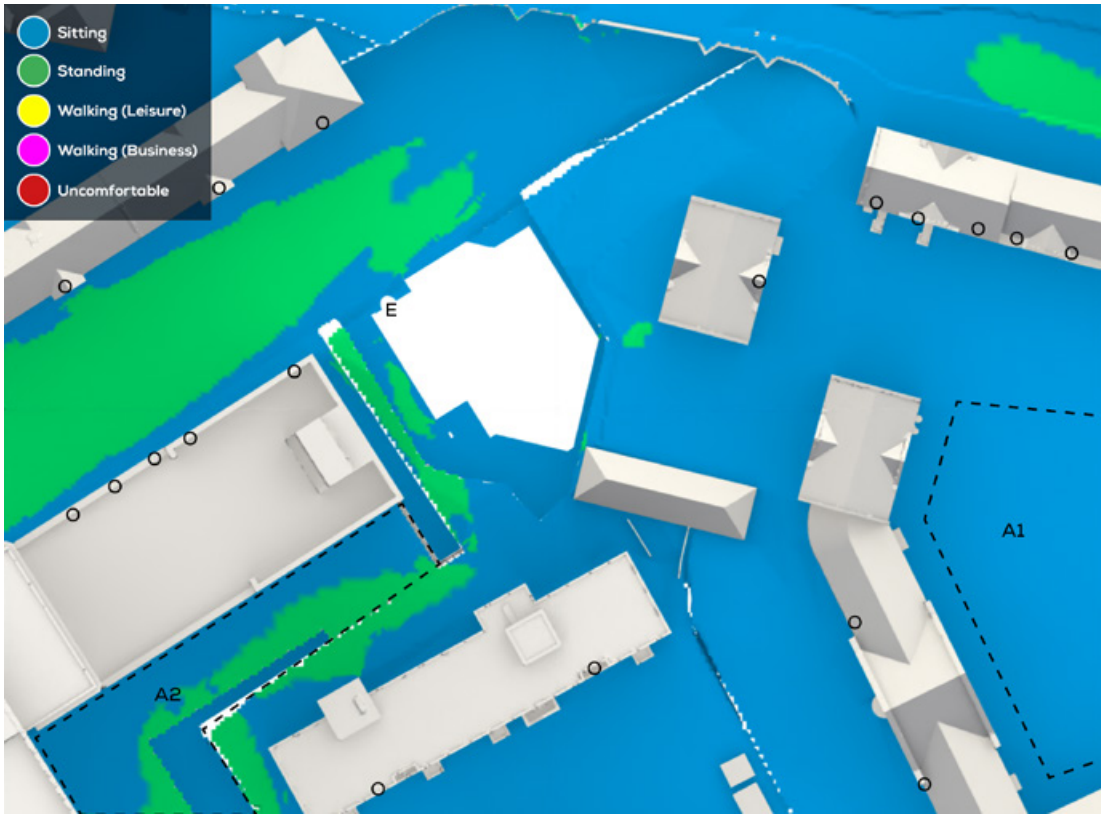


Fig. 13: Summer Comfort at Ground Level, Proposed Development with Cumulative Surrounds

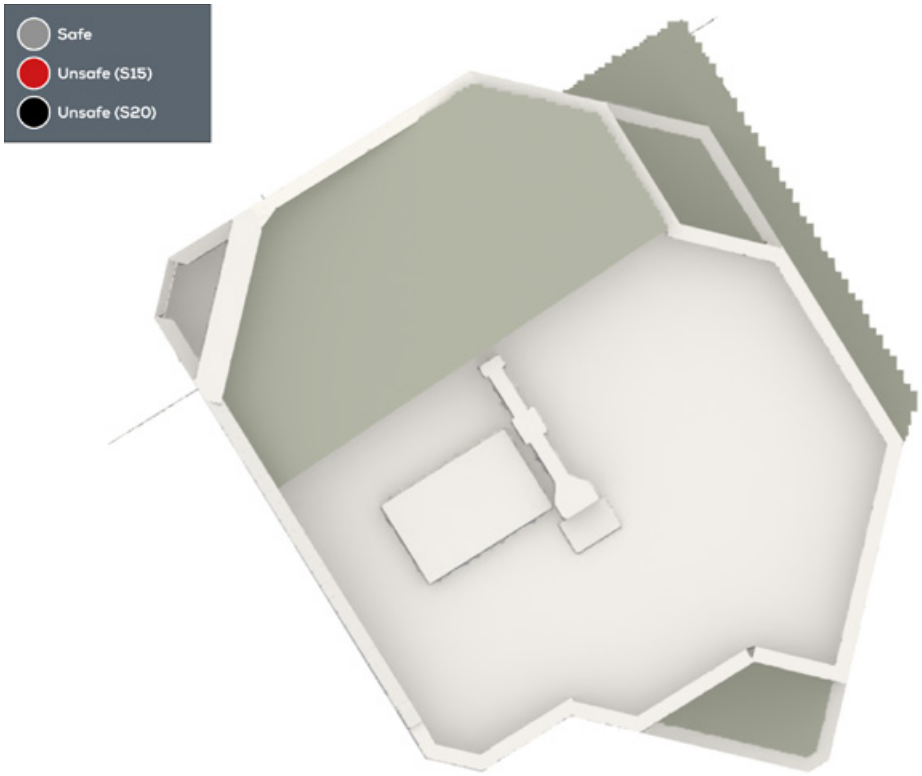


Fig. 14: Annual Safety at Elevated Level, Proposed Development with Cumulative Surrounds

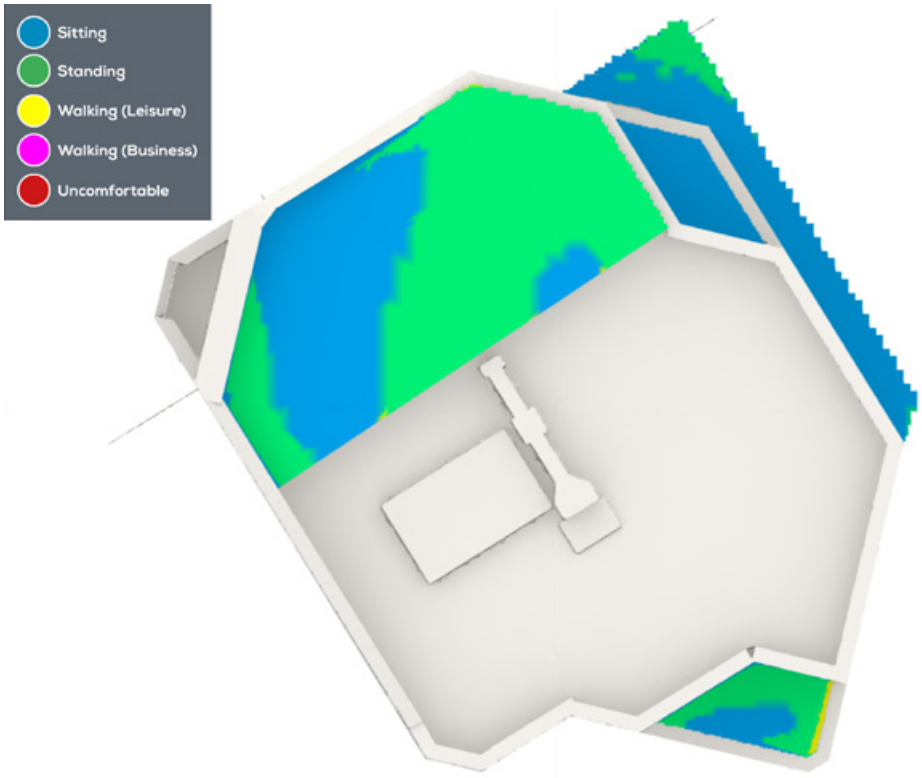


Fig. 15: Winter Comfort at Elevated Level, Proposed Development with Cumulative Surrounds

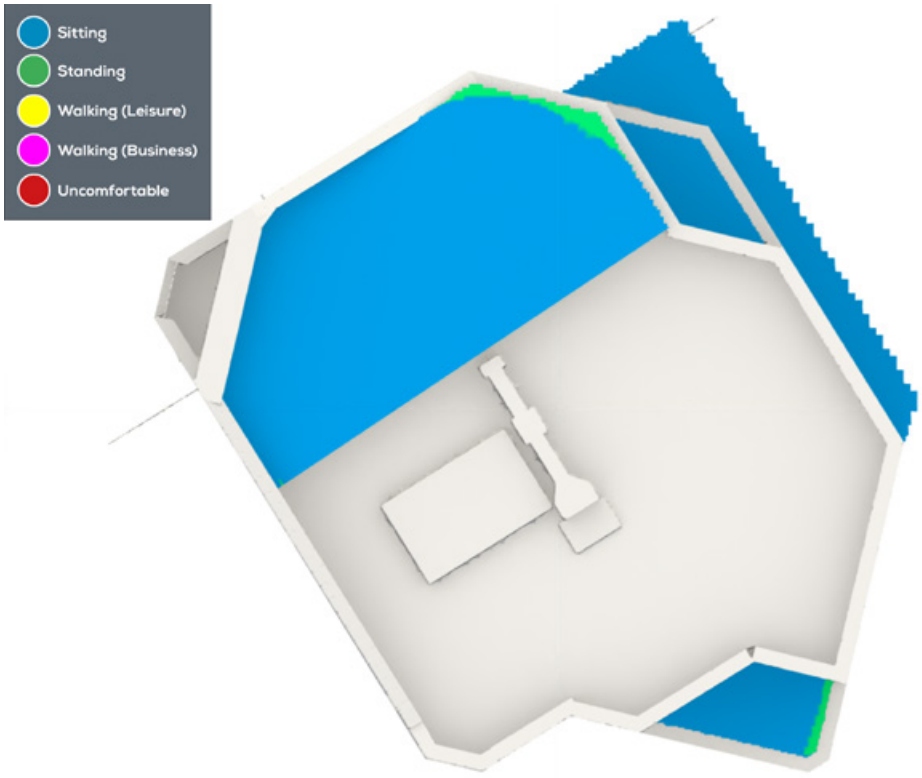


Fig. 16: Summer Comfort at Elevated Level, Proposed Development with Cumulative Surrounds

4 CONCLUSIONS

Wind microclimate conditions for the proposed development at 48 Store Street were assessed using high resolution Computational Fluid Dynamics (CFD).

There are no wind safety risks associated with the proposed development.

Wind comfort conditions are either suitable or consistent with the baseline for all proposed entrances, off-site entrances, existing and consented amenity spaces and proposed roof terraces.

When future consented schemes come forward, wind conditions will remain suitable.

APPENDIX 01
DETAILED METHODOLOGY

CFD METHODOLOGY

The CFD was performed using OpenFOAM.

Meshed using a hybrid mesh of hexahedral, polyhedral, tetrahedral and prismatic elements:

- On site building edge length: 0.05m - 0.25m
- Surrounding context edge length: 0.25m - 1m

Prismatic cells were used in the boundary layer region, with 4 layers of cells growing with an expansion ratio of 1.15 and aspect ratios between 0.1 and 0.4.

The total mesh size was between 102 and 107 million cells. Mesh detail is shown in Figure 17 and Figure 18.

Buildings within 400m of the site were included.

The domain was 5000mx5000m, with a blockage ratio of 0.5%

The blockage ratio uses a "test section" of 600mx200m (within which detail is captured).

Run using the SST turbulence model with high Re wall functions to ensure mesh suitability.

The simulations were steady state and isothermal.

2nd order discretisation schemes were used.

Convergence was measured as the residuals of the continuity, x-velocity, y-velocity, z-velocity, k and omega equations all falling by at least 2 orders of magnitude, and by measured static pressure on the site buildings varying by less than 1% over the final 100 iterations.

The wind speed is corrected into a "gust-equivalent" mean. The gust-equivalent mean is calculated using an empirical relationship between the gust and mean ratios recorded at over 13,000 data points from wind tunnel tests. This method is found to give a significant correlation improvement over the more traditional methods based on the CFD turbulent kinetic energy field.

WIND CLIMATE METHODOLOGY

The simulations were performed form 18 wind directions, spaced such that no single direction contributed more than 10% of the annual winds.

The directions tested were 0°,30°,60°,90°,120°,150°,170°,180°,190°,200°,210°,220°, 240°, 260°, 270°, 280°, 300°, 330°.

Seasonal wind roses for Manchester International Airport are shown in Figure 19.

Target wind profiles for the site, from each wind direction, were generated using sectoral analysis of the terrain surrounding the site and the local weather stations with ESDU 2010 Item01008 'Computer program for wind speeds and turbulent properties: flat or hilly sites in terrain with roughness changes'. The target wind profiles, compared to the wind speeds measured from the CFD model are shown in Figure 20.

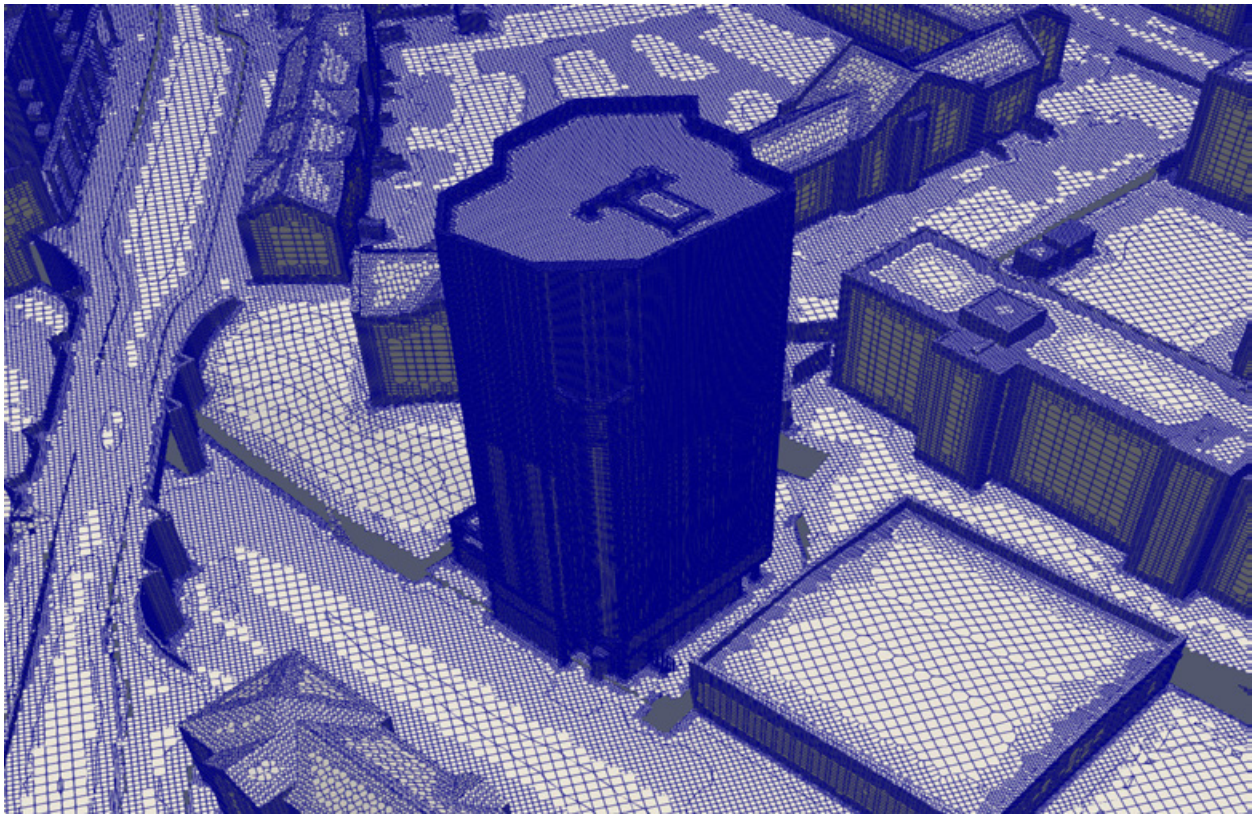


Fig. 17: Mesh Detail on Site Buildings

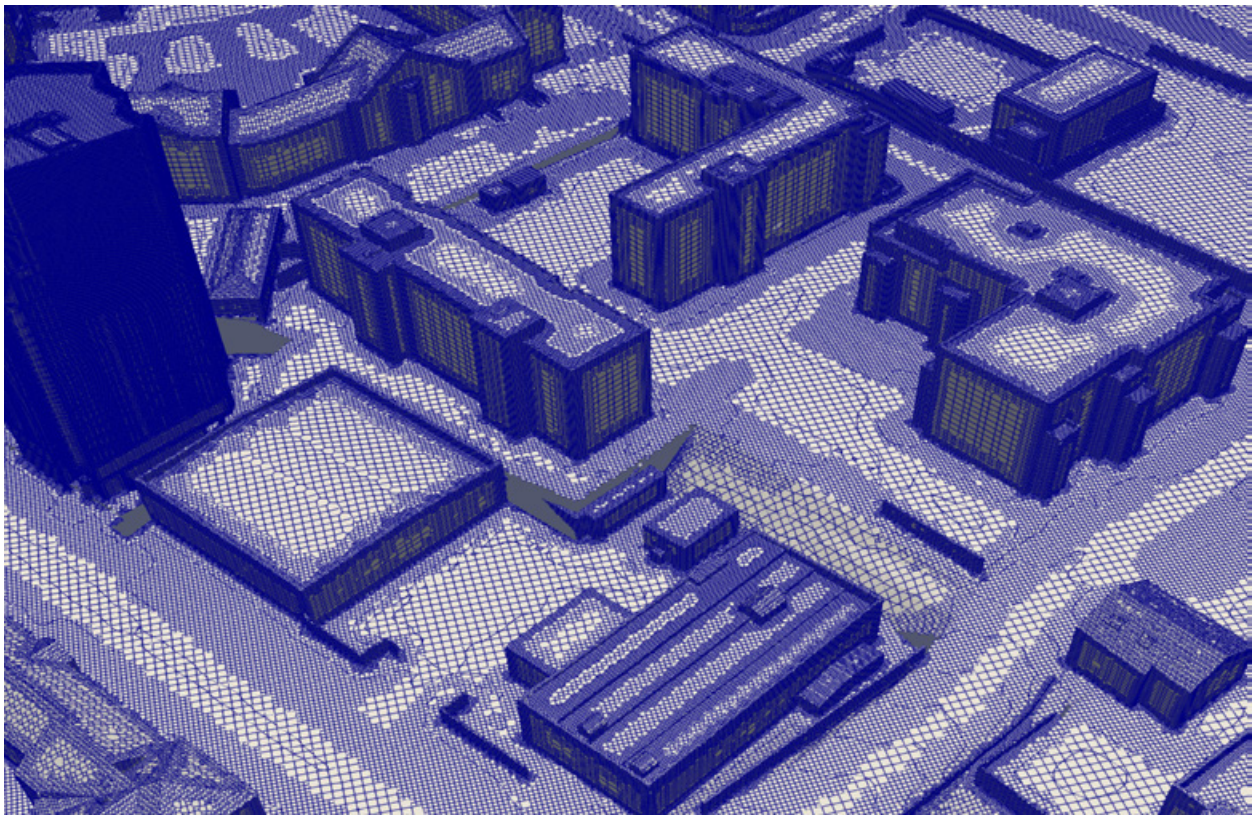


Fig. 18: Mesh Detail on Surrounds

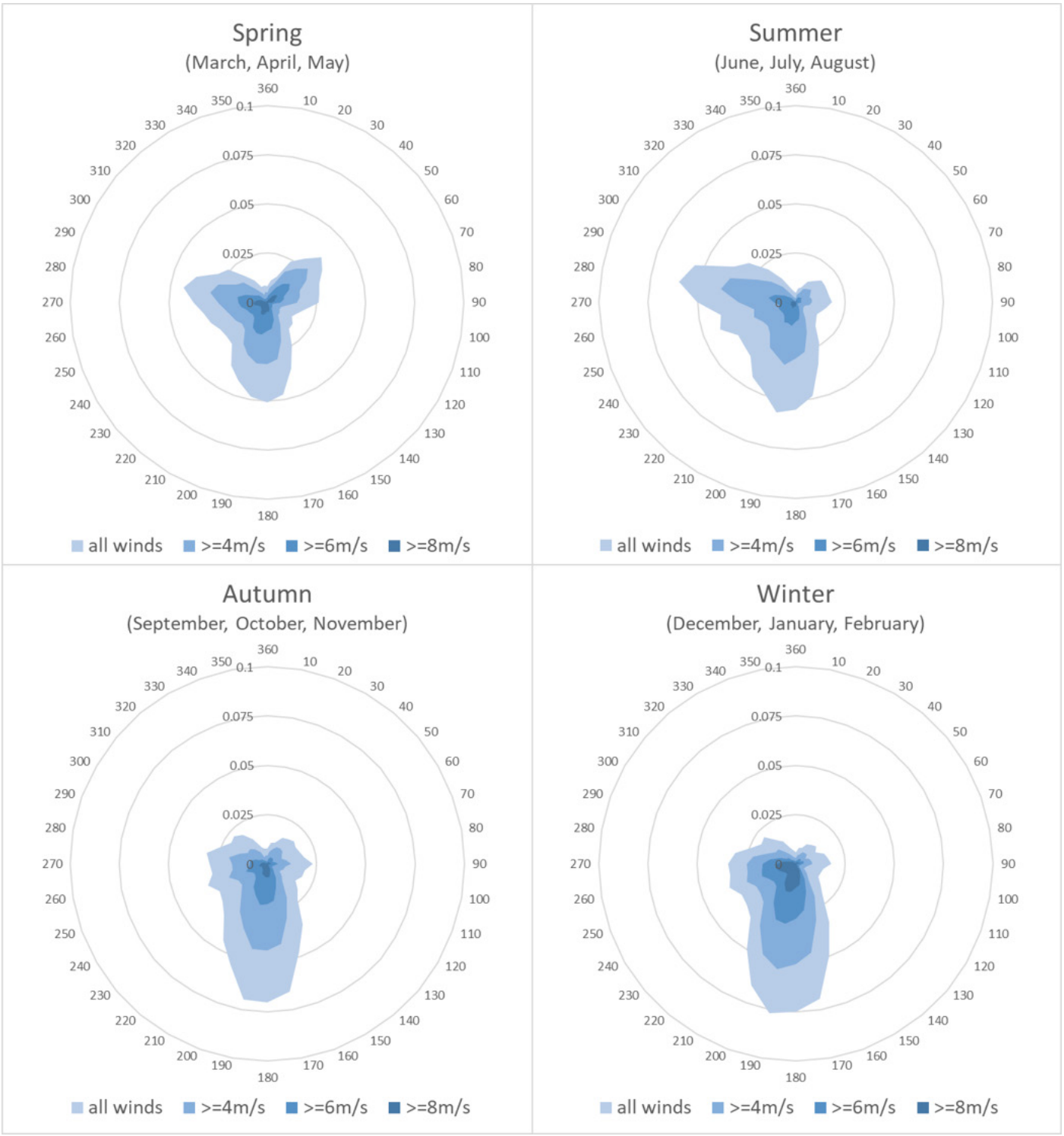


Fig. 19: Seasonal Wind Roses for Manchester International Airport

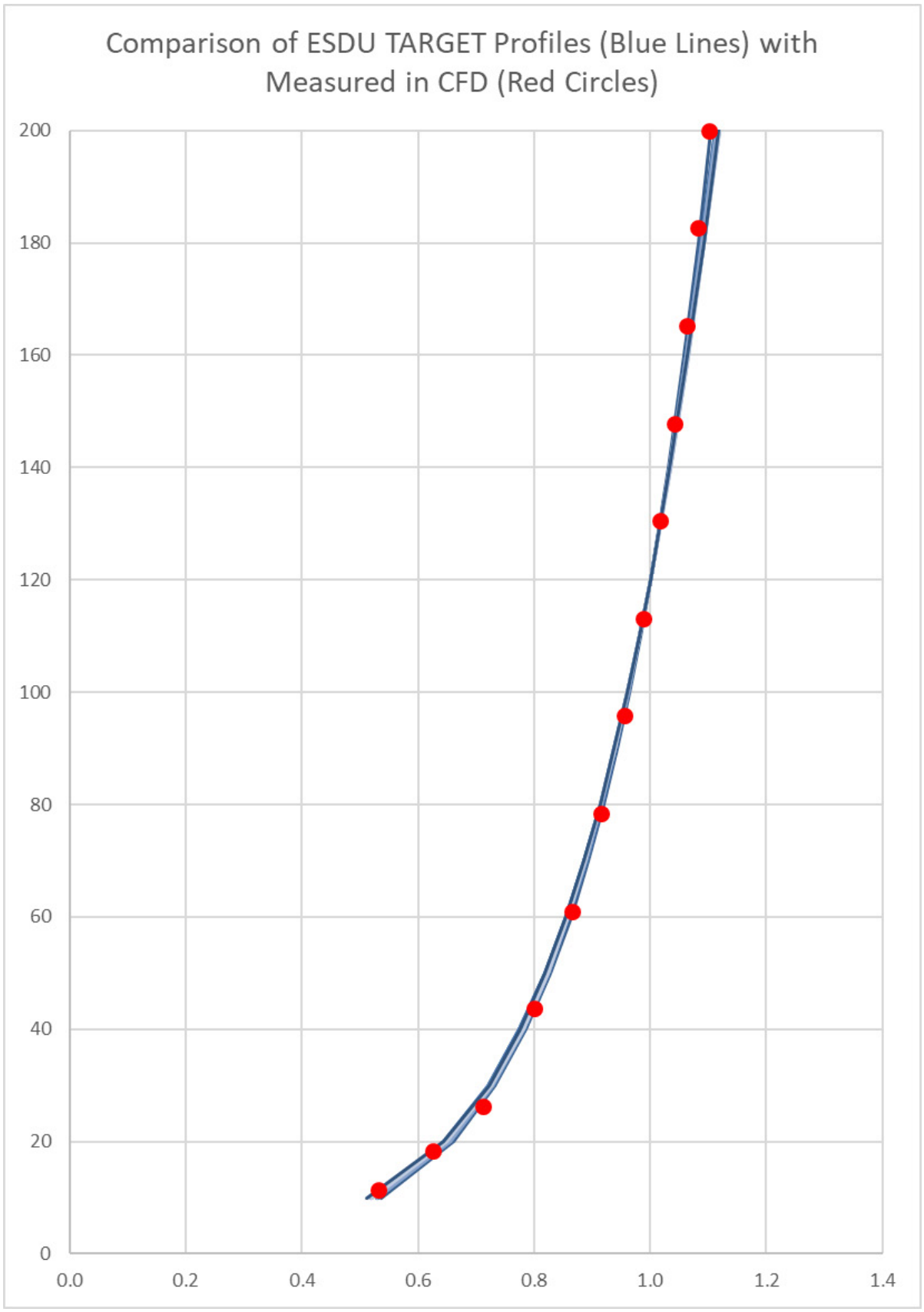


Fig. 20: Wind Profile for Central Manchester

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What we do:

Building Surveying
Daylight & Sunlight
Light Obstruction Notices
Measured Surveys
Party Wall & Neighbourly Matters
Rights of Light
Solar PV
Wind Analysis

Where we are:

Belfast
Birmingham
Bristol
Dublin
London
Manchester

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