



Unlocking potential for a better built environment

WIND MICROCLIMATE ASSESSMENT REPORT

Chorlton Precinct

March 2025

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1 INTRODUCTION

This report outlines the results of a wind microclimate assessment for the proposed development at Chorlton Precinct in Manchester. The proposals comprise an application for Full Planning Permission for the erection of 6 residential buildings to provide up to 262 residential dwellings (Use Class C3) with ground floor commercial uses (Use Class E(a-e)); infrastructure works including electric substation and associated utilities works, service yard, vehicular pedestrian accesses; together with public realm works and hard/soft landscaping following demolition of existing buildings and structures on site.

1.1 SUMMARY

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

No wind safety risks were identified either within the site or the surrounding area.

Wind comfort conditions would be suitable for all intended uses for all thoroughfares, roadways, proposed or existing building entrances, bus stops, existing spill out seating, existing gardens, proposed amenity at ground level and podium level and proposed balconies).

There are no adverse impacts of the proposed development on wind microclimate conditions.

The proposed development is therefore compliant with the relevant Planning Practice Guidance and adopted development plan (Manchester Core Strategy) policy on tall buildings.

1.2 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” (2024)

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.

The mean correction factors between the site and the airport are shown in Table 1.

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.

Table 01: Site Wind Correction Factors

DIRECTION (°N)	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Corr. Factor	1.53	1.53	1.50	1.36	1.34	1.38	1.39	1.33	1.35	1.37	1.35	1.40

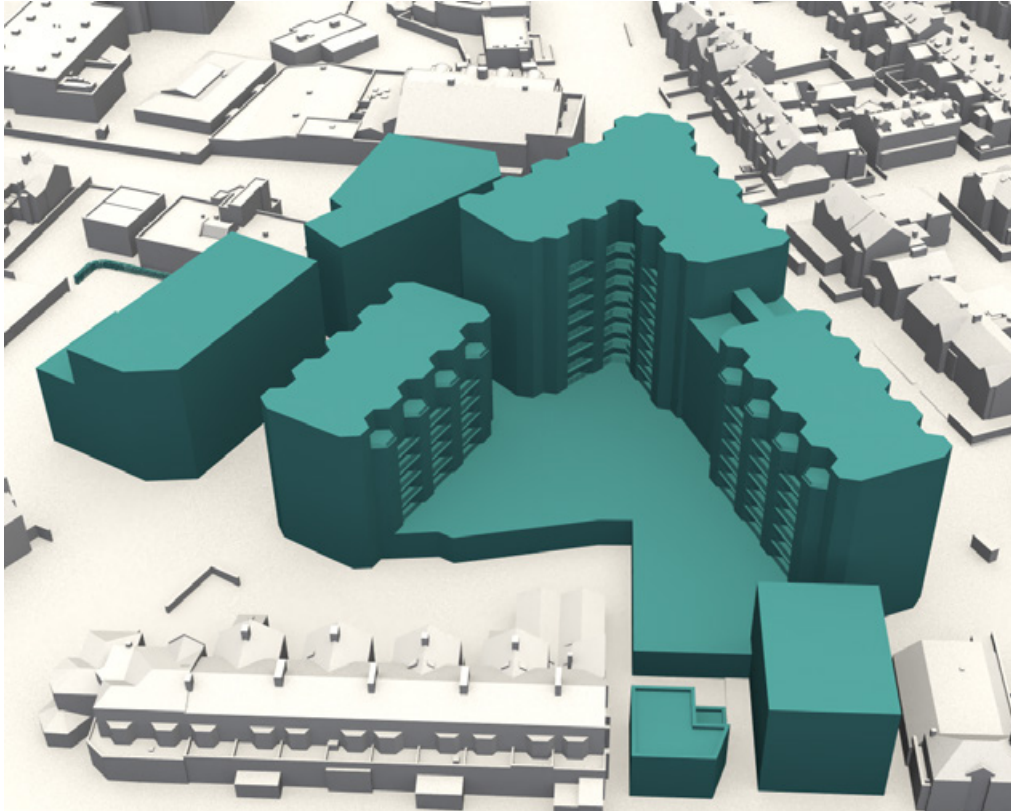


Fig. 01: 3D View of proposed Development



Fig. 02: Proposed Development with Existing Surrounds



Fig. 03: Sensitive Wind Receptors



Fig. 04: Proposed Landscape as Tested

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 02: 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 03: 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 3, and principal off-site entrances are marked “O”.

There are bus stops on Wilbraham Road to the south and Barlow Moor Road to the east (marked “B” on Figure 3). These are targeted to be suitable for standing in winter.

There is existing cafe spill out seating around the site on Wilbraham Road and Barlow Moor Road (marked “S” on Figure 3). These are targeted to be suitable for sitting in summer.

There are existing residential gardens to the east of Barlow Moor Road (marked “G” on Figure 3). These are targeted for the majority of the space to be suitable for sitting in summer.

There is space for potential ground level amenity (marked “A” in Figure 3) as well as a mixed-use amenity terrace at podium level. These are targeted for the majority of the space to be suitable for sitting in summer.

There are balconies within the proposed development. These are targeted to be suitable for sitting or standing in summer.

The locations of the sensitive receptors are shown in Figure 3.

2.6 SCENARIOS

The purpose of these tests was to assess the impact of the proposed development on wind conditions on and around the site.

The following scenarios were tested:

- 1 Baseline: The existing building on site, with the existing surrounds; and
- 2 Proposed Development with Existing Surrounds: The completed and operational development with the existing surrounds.

A review of recent planning consents within the surrounding area did not find any which are of sufficient scale or proximity to the site to impact wind conditions on the site. As such, a separate cumulative scenario was not tested.

Existing trees were modelled as part of the baseline scenario, retained existing trees and proposed trees were modelled as part of the proposed scenario.

The proposed landscape is shown in Figure 4.

2.7 DESIGN UPDATES

Since the testing for the wind assessment was undertaken in December 2024, minor changes have been made to the design of the proposed development. These consist of changes to the elevations (but not to the massing) and also include minor amendments to the landscaping layout on Manchester Road as well as at the north west corner of the site.

None of the changes are of sufficient magnitude that they would change the level of wind conditions, and the results reported herein are therefore representative of the final submitted design.

3 RESULTS

3.1 CONDITIONS FOR EXISTING SITE WITH EXISTING SURROUNDS (BASELINE)

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

There are no wind safety risks within the site or surrounding area.

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

Conditions for 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 bus stops on Wilbraham Road and Barlow Moor Road (marked "B" in results figures) are suitable for either sitting or standing in all seasons. This is suitable for the intended use.

Conditions for the cafe spill-out seating on Wilbraham Road and Barlow Moor Road (marked "S" on results figures) are suitable for sitting or standing in winter and for sitting in summer. This is suitable for the intended use.

Conditions for existing off-site residential gardens (marked "G" in results figures) are suitable for sitting in all seasons. This is suitable for the intended use.



Fig. 05: Annual Safety, Existing Site with Existing Surrounds (Baseline)

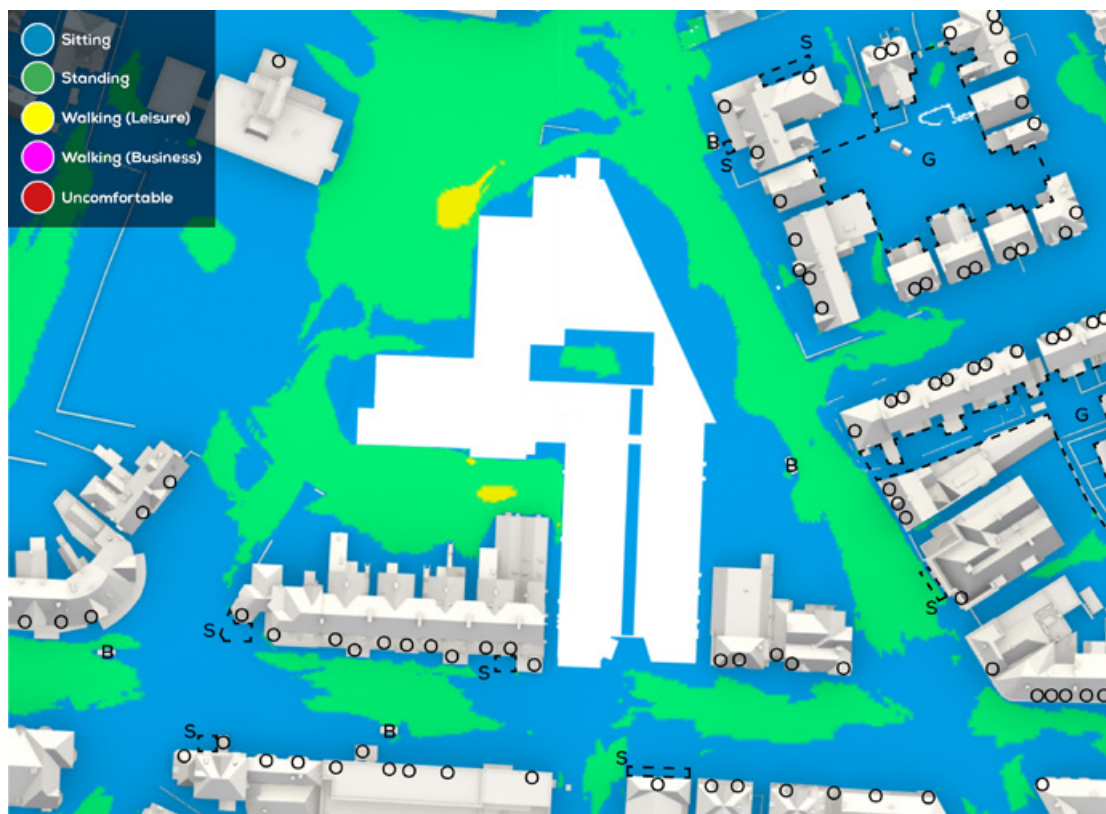


Fig. 06: Winter Comfort, Existing Site with Existing Surrounds (Baseline)



Fig. 07: Summer Comfort, Existing Site with Existing Surrounds (Baseline)

3.2 CONDITIONS FOR PROPOSED DEVELOPMENT WITH EXISTING SURROUNDS

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

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

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

There are no wind safety risks within the site or surrounding area.

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

Conditions for the principal proposed entrances 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.

Conditions for 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 bus stops on Wilbraham Road and Barlow Moor Road (marked "B" in results figures) are suitable for either sitting

or standing in all seasons. This is suitable for the intended use.

Conditions for the cafe spill-out seating on Wilbraham Road and Barlow Moor Road (marked "S" on results figures) are suitable for sitting or standing in winter and for sitting in summer. This is suitable for the intended use.

Conditions for existing off-site residential gardens (marked "G" in results figures) are suitable for sitting in all seasons. This is suitable for the intended use.

Conditions for the proposed ground level amenity (marked "A" 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 proposed podium level amenity are suitable for a mix of sitting, standing and leisure walking in winter and for a mix of sitting and standing (with the vast majority of the space suitable for sitting) in summer. This is suitable for the intended use.

Conditions for the proposed balconies are suitable for either sitting or standing in summer. This is suitable for the intended use.



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

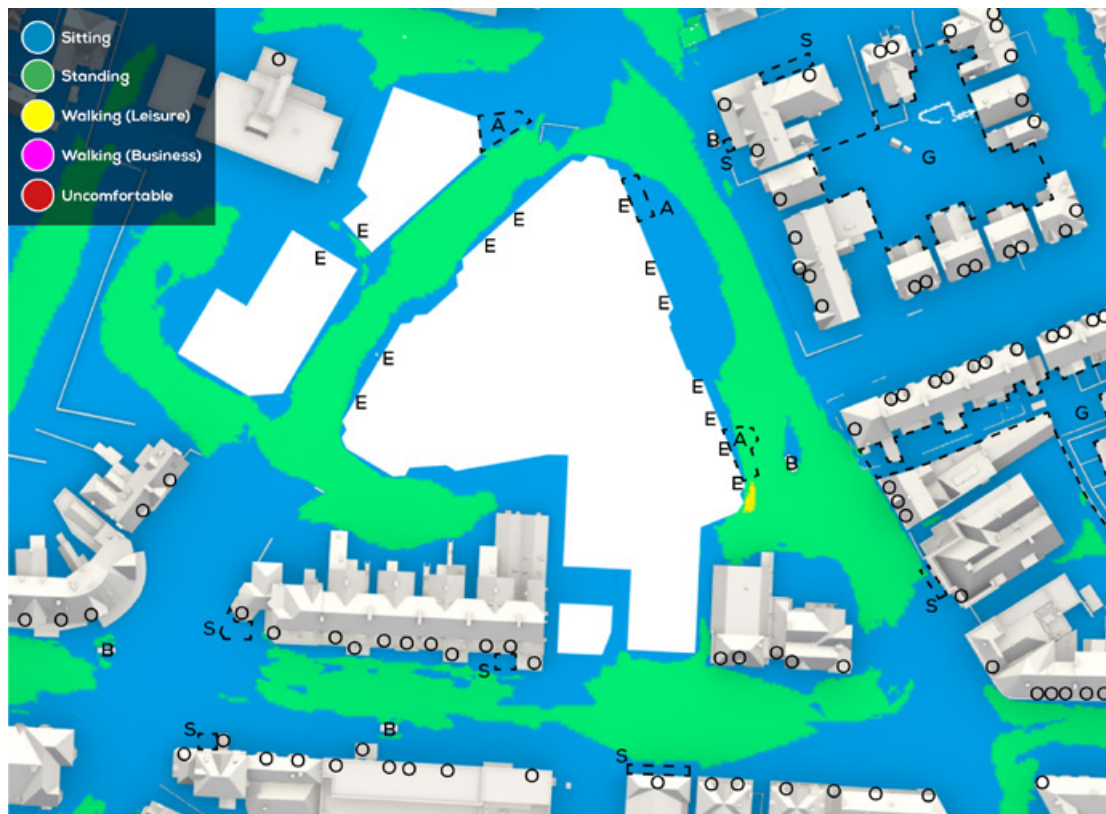


Fig. 09: Winter Comfort, Proposed Development with Existing Surrounds



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

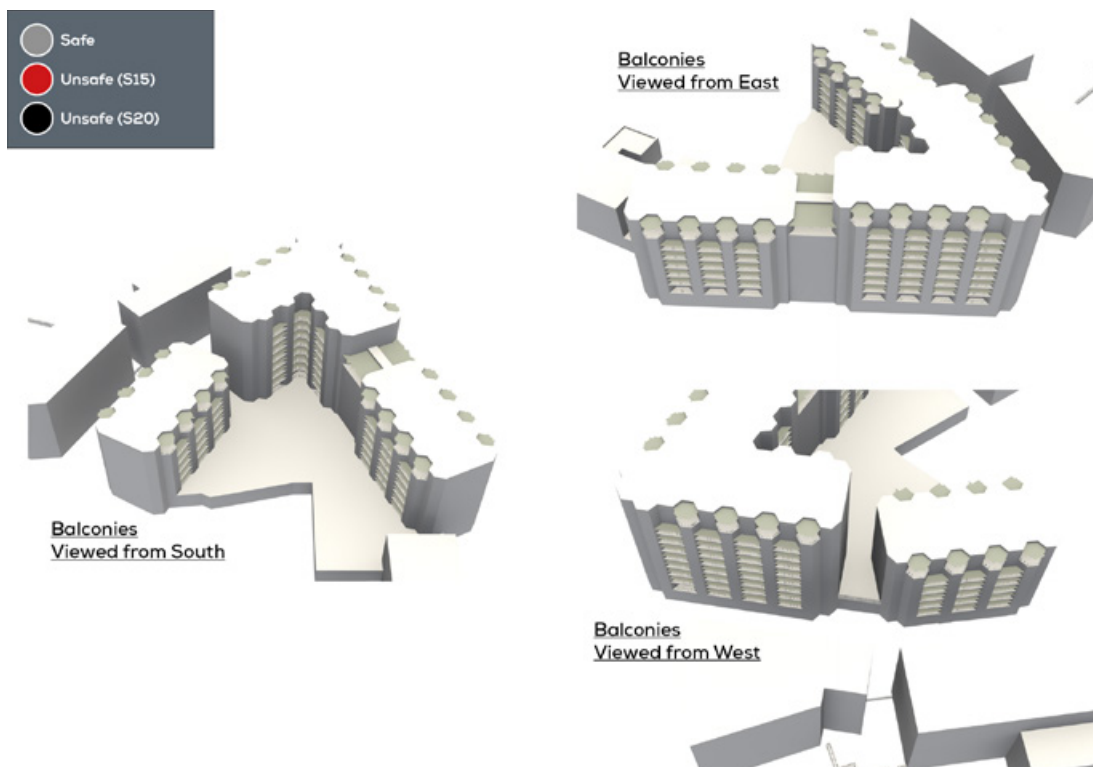


Fig. 11: Balcony Annual Safety, Proposed Development with Existing Surrounds

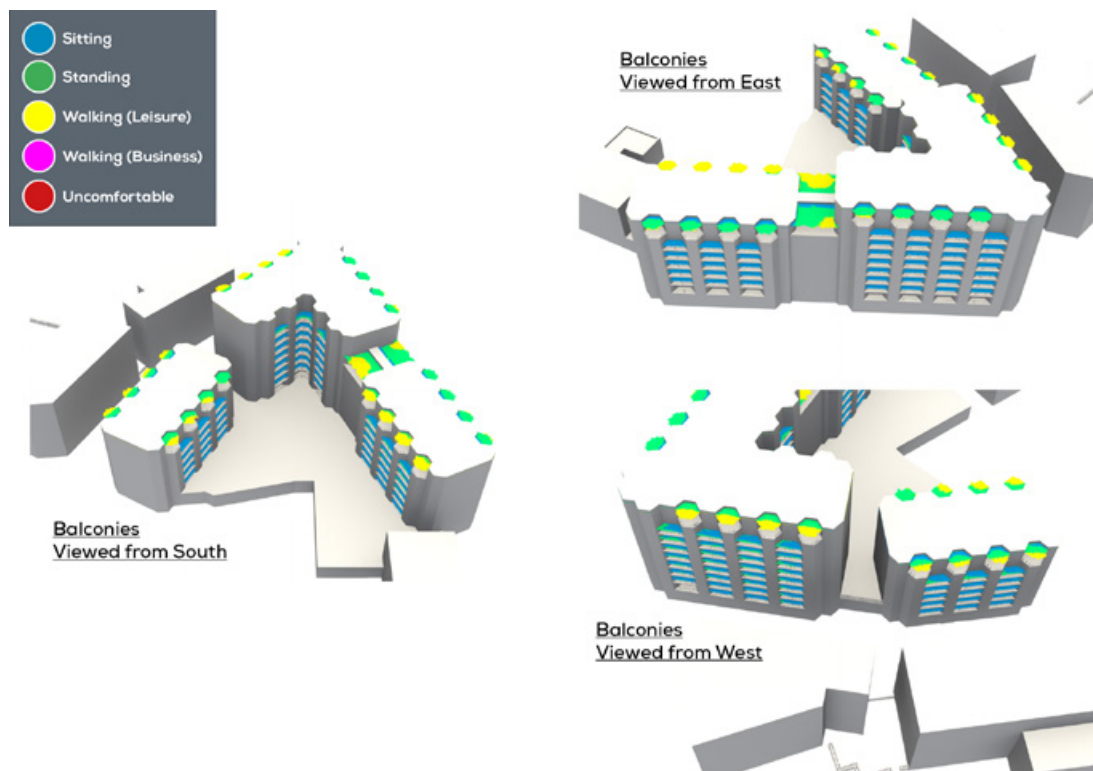


Fig. 12: Balcony Winter Comfort, Proposed Development with Existing Surrounds

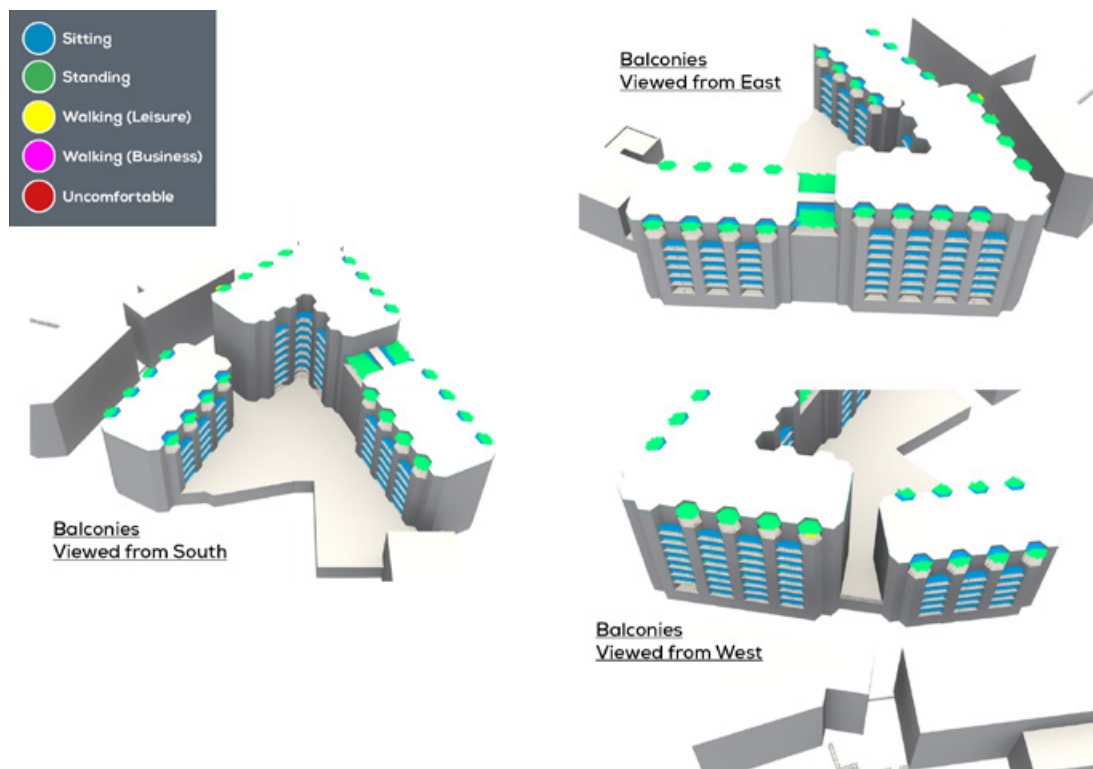


Fig. 13: Balcony Summer Comfort, Proposed Development with Existing Surrounds



Fig. 14: Podium Annual Safety, Proposed Development with Existing Surrounds

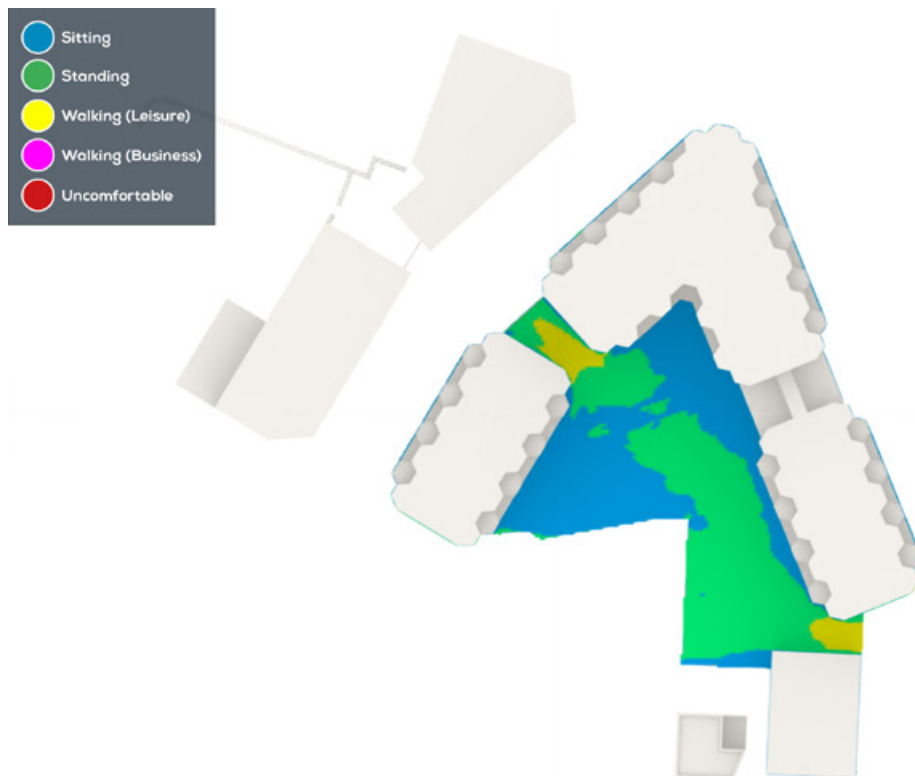


Fig. 15: Podium Winter Comfort, Proposed Development with Existing Surrounds



Fig. 16: Podium Summer Comfort, Proposed Development with Existing Surrounds

4 CONCLUSIONS

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

No wind safety risks were identified either within the site or the surrounding area.

Wind comfort conditions would be suitable for all intended uses for all thoroughfares, roadways, proposed or existing building entrances, bus stops, existing spill out seating, existing gardens, proposed amenity at ground level and podium level and proposed balconies).

There are no adverse impacts of the proposed development on wind microclimate conditions.

The proposed development is therefore compliant with the relevant Planning Practice Guidance and adopted development plan (Manchester Core Strategy) policy on tall buildings.

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 119 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 from 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 Item 01008 ‘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.

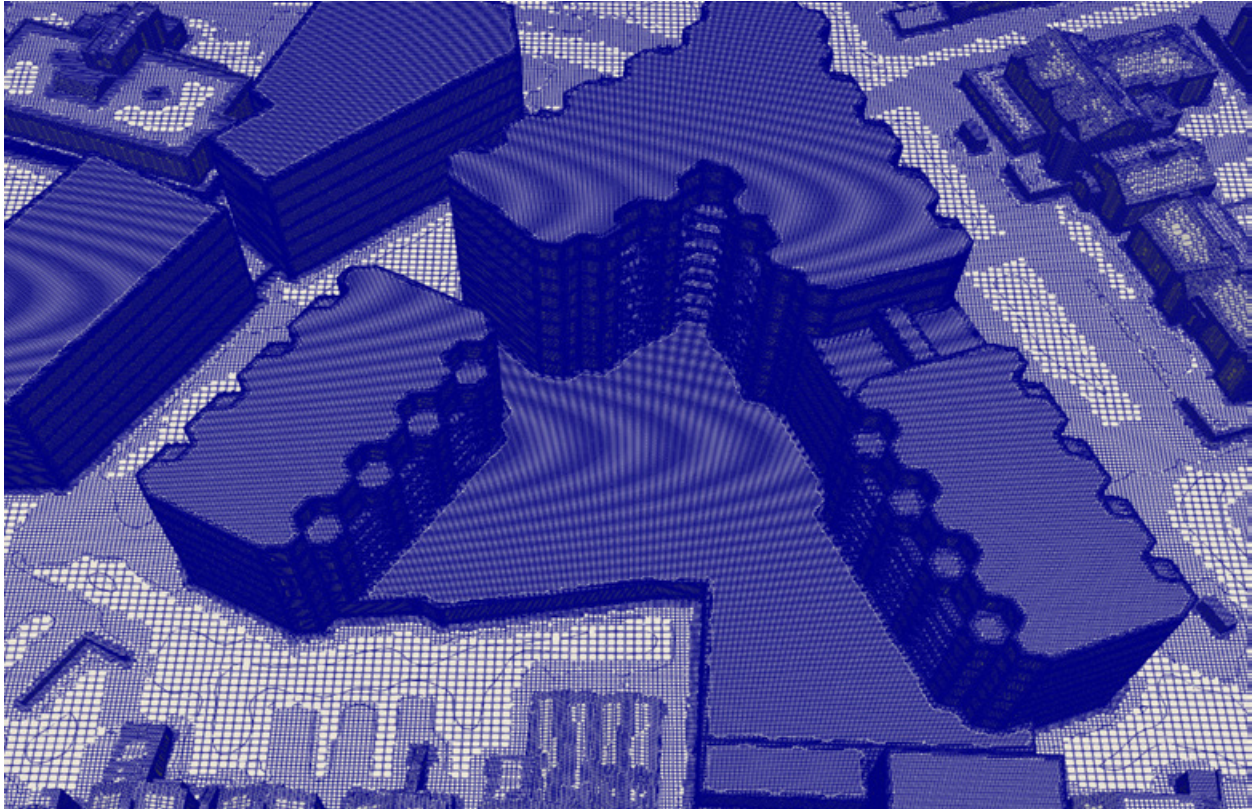


Fig. 17: Mesh Detail on Site Buildings

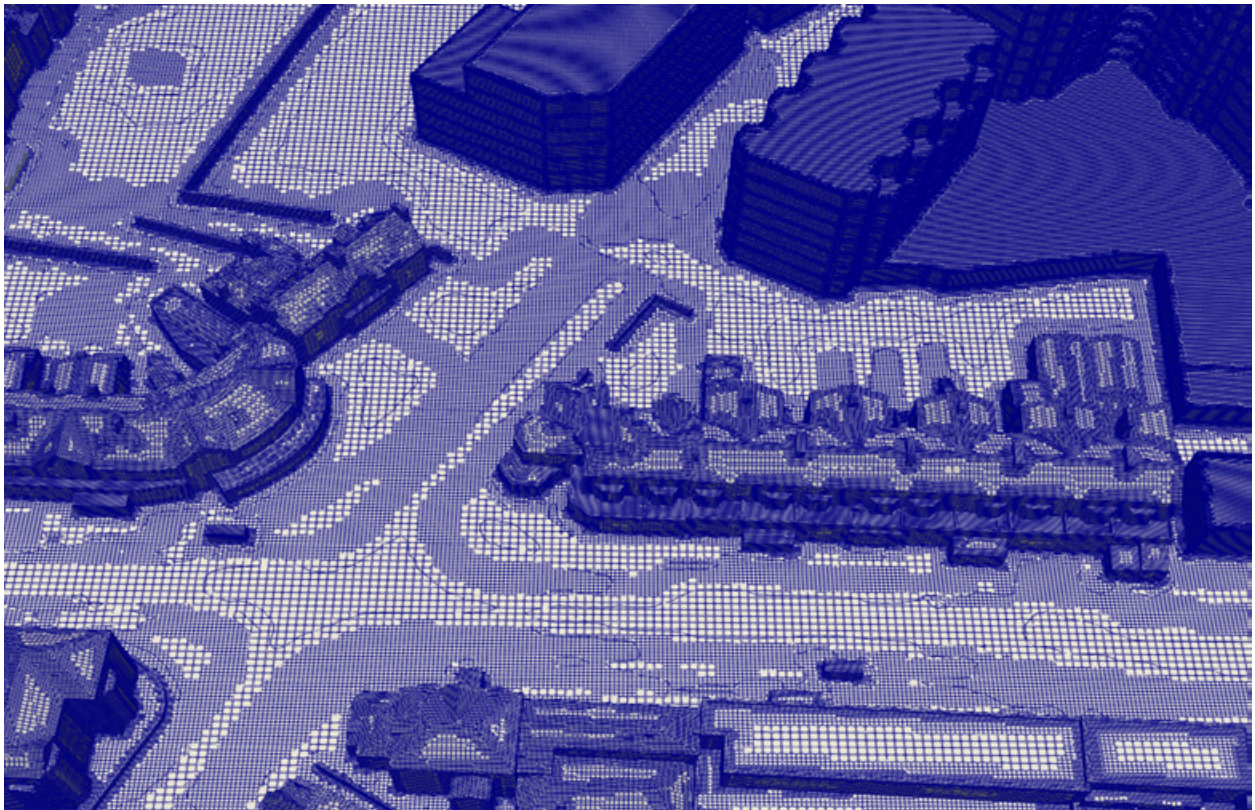


Fig. 18: Mesh Detail on Surrounds

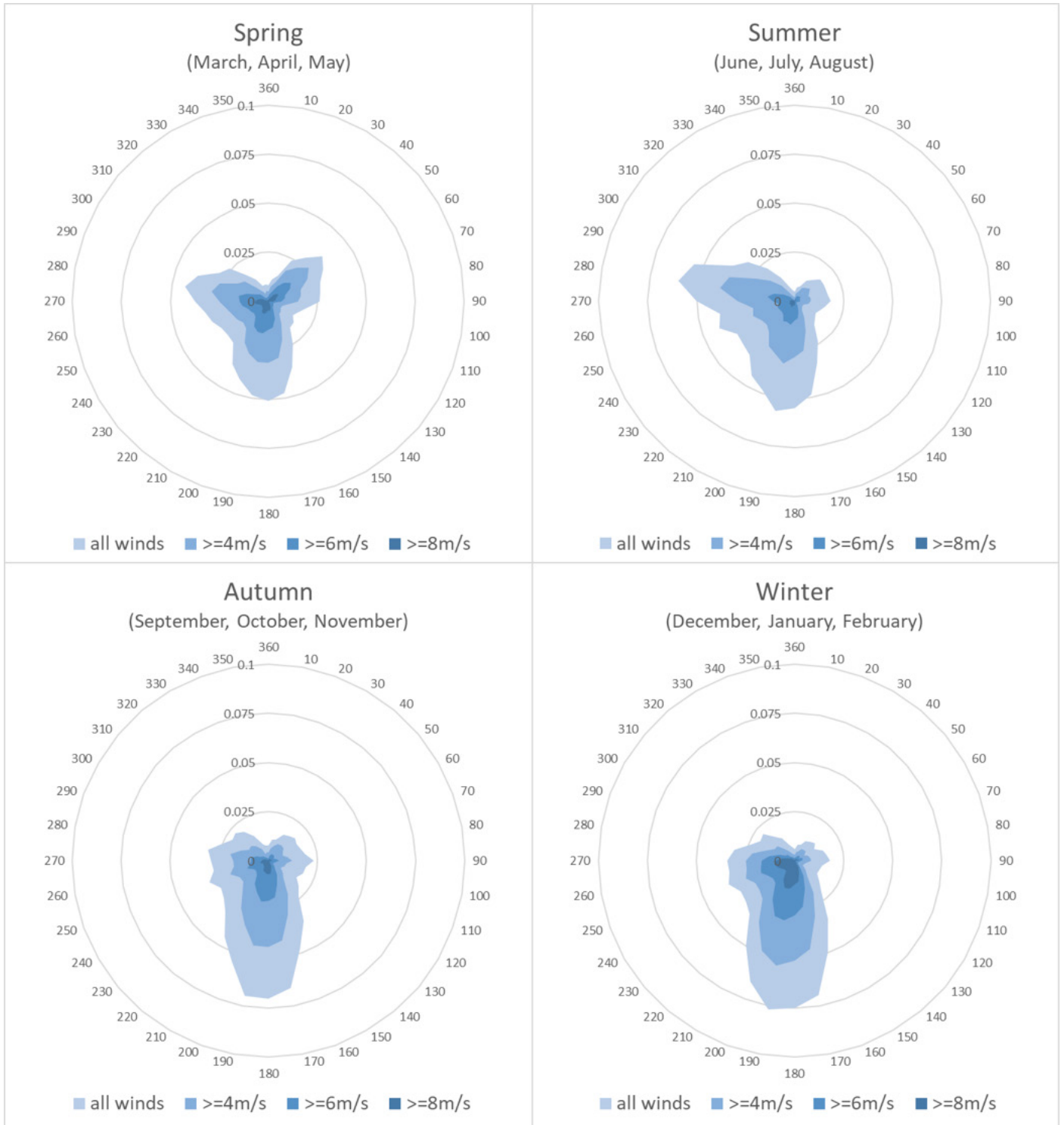


Fig. 19: Seasonal Wind Roses for Manchester International Airport

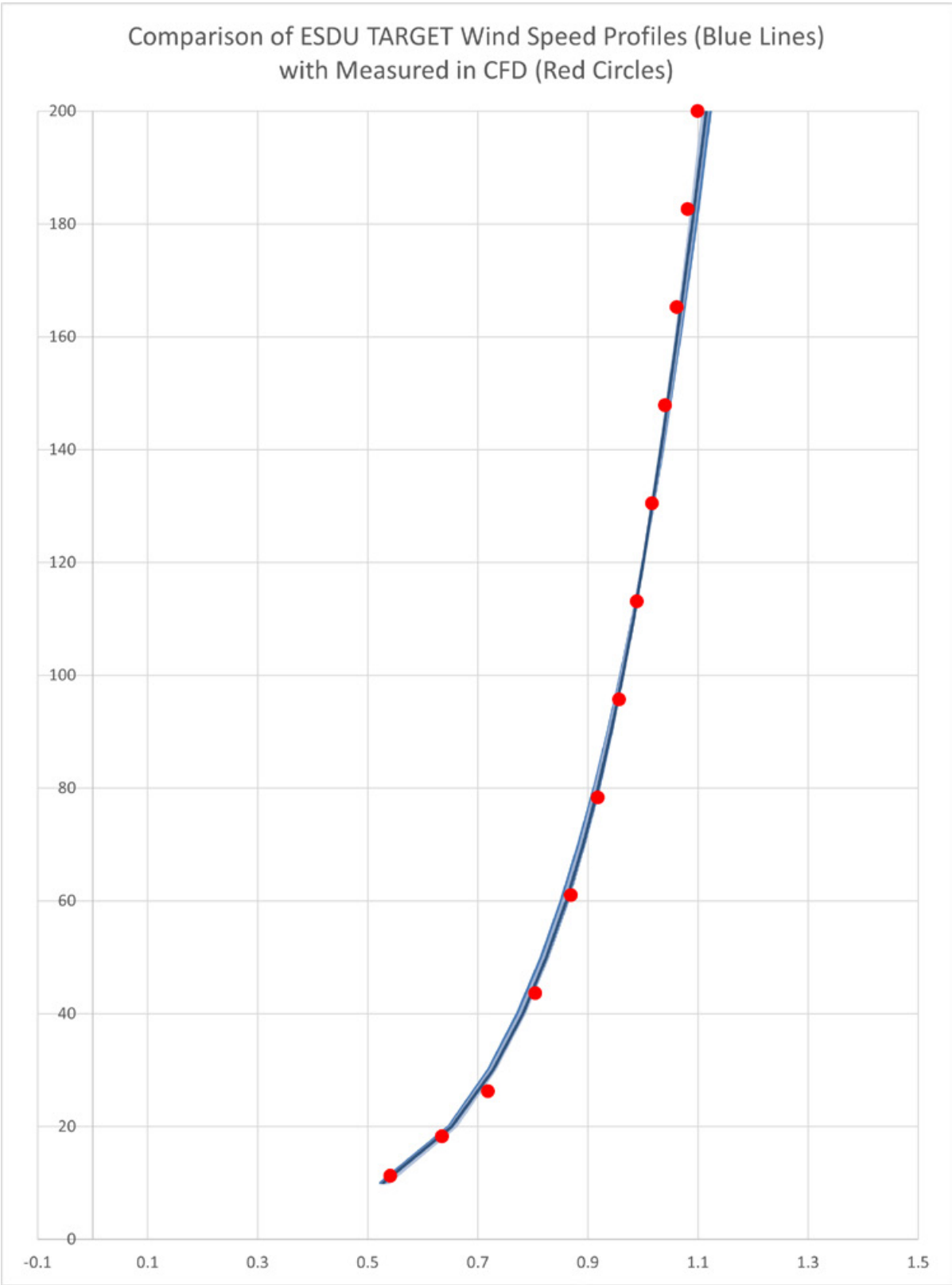


Fig. 20: Wind Profile for Chorlton



What we do:

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

Where we are:

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