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LegPro 45 Pty Ltd ATF LegPro 45 Unit Trust




253-265 Pacific Highway, North Sydney

Pedestrian Wind Comfort - Computational Wind Engineering



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Executive Summary

Vipac Engineers & Scientist Pty Ltd has carried out an assessment of the pedestrian level winds for the proposed development at **253-265 Pacific Highway, North Sydney** based on Computational Wind Engineering (CWE) simulations.

The 3D model was developed based on drawings and Revit model supplied by **Nettletontribe Architects** in **April 2025**. The proposed development and surrounding buildings covering a circular area of approximately 500m radius were modelled at a full-scale. The approaching mean wind speed and turbulent intensity of Terrain Category (TC) 2.5 and 3 Atmospheric Boundary Layer (ABL) profiles were modelled based on Australian Standard ASNZ 1170.2:2021.

Wind speeds simulated for 16 wind directions are combined with the local wind climate to determine mean wind speed exceeded **5%** of the time for the wind comfort and gust wind speed at **once per year (0.1%)** for the wind safety.

The finding of the Computational Wind Engineering (CWE) study are summarised as follows:

The proposed design of the development:

- fulfils the recommended criterion for **Safety** at all interest areas **with the recommendations**;
- fulfils the recommended criterion for **Walking** at all footpath and access areas;
- fulfils the recommended criterion for **Standing** at all building entrances;
- fulfils the recommended criterion for **Walking** at Level 11 Terrace;
- fulfils the recommended criterion for **Walking** at Rooftop Terrace; and
- fulfils the recommended criteria for **Walking** or better at all balconies.

As a general statement, common to all new developments, educating occupants about wind conditions at high level terraces/balconies during high-wind events and tying down loose furniture are highly recommended.

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1 Introduction

Vipac Engineers & Scientist Pty Ltd was commissioned by **LegPro 45 Pty Ltd ATF LegPro 45 Unit Trust** to carry out Computational Fluid Dynamics (CFD) simulation of the pedestrian wind effect for the proposed development at **253-265 Pacific Highway, North Sydney**.

The project site is bound by Pacific Highway to the west, Church Lane to the east, and existing low-rise developments to the north and south. A satellite image overlaid with the proposed development site, west elevation of the proposed development and the ground floor plan with an approximate dimensions overlaid are shown in Figure 1, Figure 2 and Figure 3, respectively. Assumed terrain categories for wind speed estimation are shown in Figure 4.

The report details the analysis and results obtained from the CFD simulations of the development in April 2025. CFD simulations solves the governing equations of fluid flow for a wide range of applications. It can provide both inside and quantitative assessments to areas such as wind flow in an urban/open environment. For the proposed development located in windy locations, having data obtained from CFD enables to predict the wind conditions at any location which reduces risks that would otherwise be persist. Vipac has carried out many winds related studies using computational and experimental approaches on developments of similar shapes, size, and exposure to that of the proposed development. These serves as a valid reference for the prediction and analysis of wind effects.

The simulations were carried out for 16 wind directions using a full-scale model of the proposed development, surroundings, and variable topography surface. Some pictures of the CFD modelling are shown in Figure 5 to Figure 9. In the analysis, only the proposed development with the existing surroundings were modelled in the CFD simulations.

Drawings of the proposed development were supplied to Vipac by **Nettletontribe Architects** in **April 2025**. A list of drawings supplied is provided in Appendix B of this report.

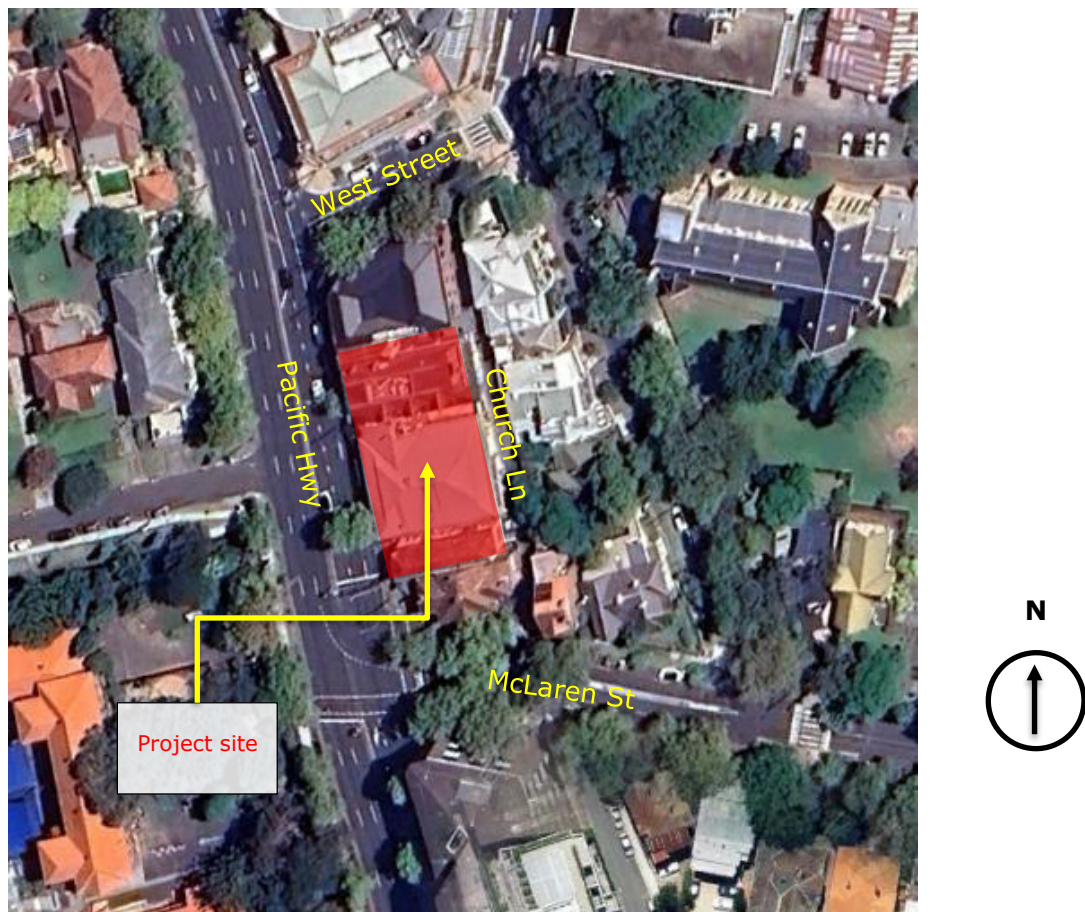


Figure 1: Aerial view of the proposed development site.



Figure 2: West elevation of the proposed development.

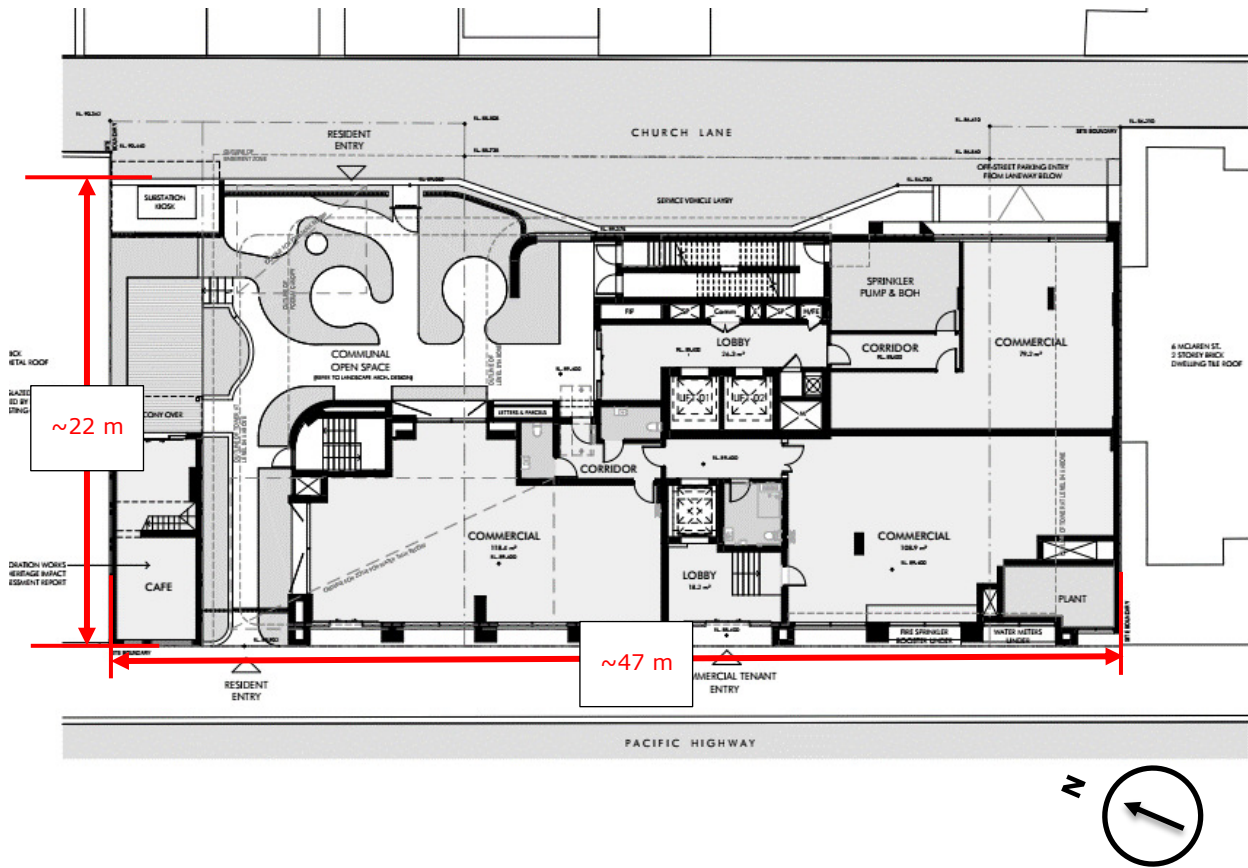


Figure 3: Ground floor plan with the overall dimensions overlaid.

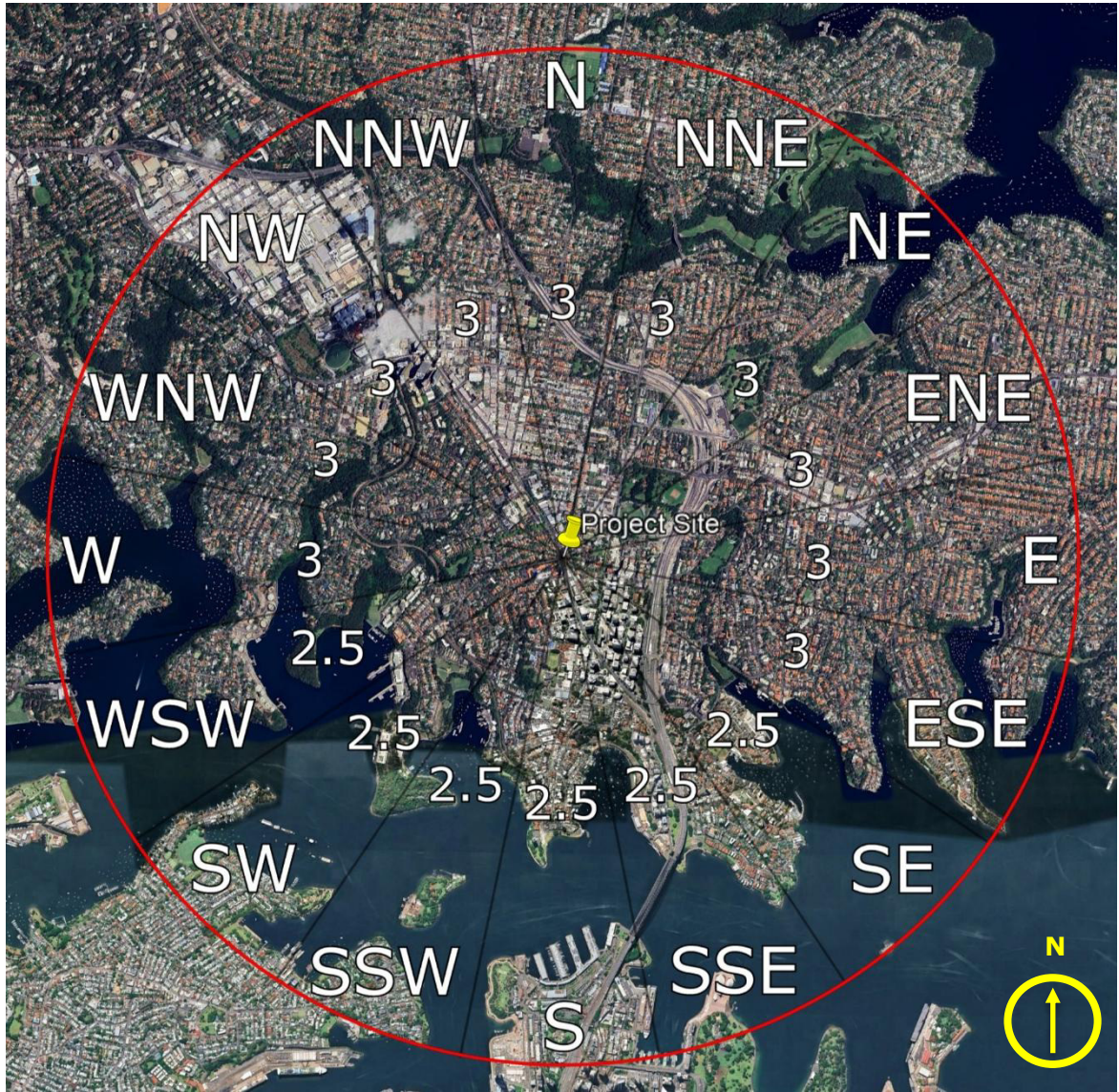


Figure 4: Assumed terrain categories for wind speed estimation.

2 Computational Wind Engineering

The assessment was undertaken through Computational Wind Engineering (CWE) which used Computational Fluid Dynamics (CFD) techniques to model a 'virtual wind tunnel' and simulate wind conditions around the project site.

The main objective of the CWE simulations was to reproduce the macro level wind flow around the proposed development. The wind approaching the modelled area were simulated for 16 wind directions (starting 0°, at 22.5° increments around the compass), accounting for the effects of the Atmospheric Boundary Layer (ABL) and terrain influence. Simulated wind data were obtained in the form of ratios of wind speeds at approximately 1.5m above the concerned levels, to the mean wind speed at the building height (**Zref = 50m**). The data was then combined with meteorological records obtained from Sydney International Airport to determine the wind speeds and frequencies in the simulated areas.

2.1 Assumptions and Limitations

Gust wind speeds are infrequent but deserve special attention due their potential impact on pedestrian wind safety concerns. The computational modelling method used in the current assessment does not quantify the transient behaviour of the winds, including wind gusts. Instead, to calculate the gust wind speeds from the steady state simulations, we used the following equations to convert the mean wind speeds into gust wind speeds [6,7]:

$$\sigma = \sqrt{\frac{2}{3} \times \text{Turbulent Kinetic Energy}_{CFD}} \quad (\text{eqn. 1})$$

$$U_{Gust} = U_{CFD,mag} + g\sigma \quad [g = \text{Peak factor}] \quad (\text{eqn. 2})$$

$$TI_{\text{Turbulent Intensity}} = \frac{\sigma}{U_{CFD,mag}} \quad (\text{eqn. 3})$$

Trees, natural vegetation, and planter boxes were not included in this analysis as their effectiveness is dependent on wind speeds and may not be accepted as wind control measures by authorities in general. Thus, results presented in this CWE report represent a worst-case scenario. Furthermore, the results presented in this report are valid only under the modelling conditions stated in the document. Any variations to the current design will render the conclusions of the report invalid.

3 Computational Fluid Dynamics Methodology

3.1 Modelling the geometry

To determine the expected wind conditions around the proposed development, a full-scale 3D model was developed based on the drawings supplied by **Nettletontribe architects** in **April 2025**, as well as the data on the surrounding buildings and variable topography surface.

The wind flow around the proposed development was modelled using commercial CFD software package. Figure 5 to Figure 7 show the computational fluid enclosure and coordinate system used for this study. The proposed development and surroundings were modelled at a full-scale. The computational enclosure was 3.0km in X direction, 3.0km in Y direction, and 1km in Z direction. The large computational domain ensured that the blockage ratio of the CFD model was less than 5%. It could also ensure that the fluid enclosure boundaries sufficiently far away from the project site and surrounding buildings to have negligible effects on the wind flow in the area of interest. To simplify the analysis and computational simulation efficiency, only balconies on several of the lower, mid, and upper level of the tower were modelled. This simplification does not affect the wind speeds in the areas of interest, and allows higher resolution where required.

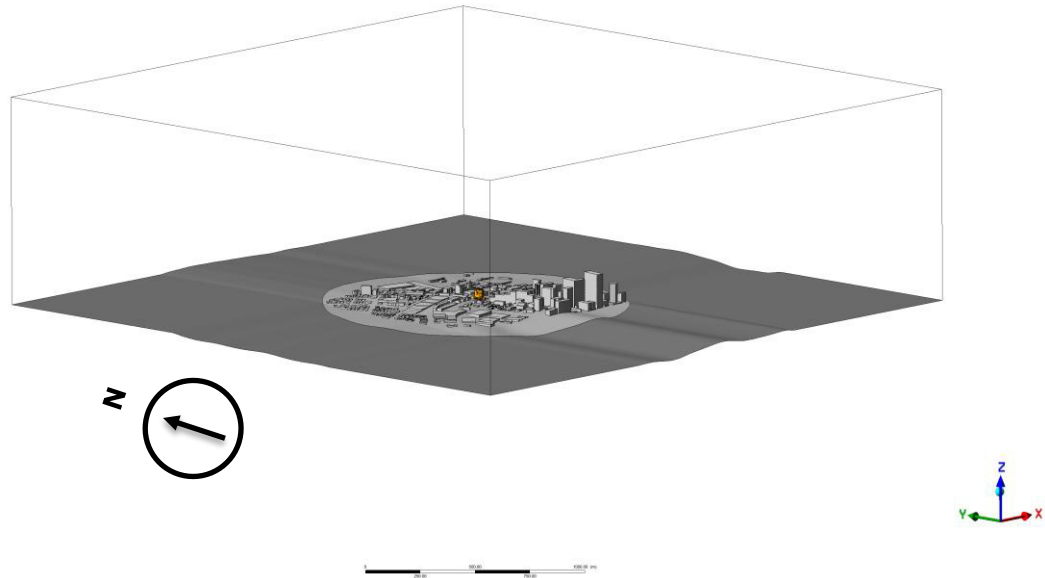


Figure 5: CFD model geometry - full computational enclosure.

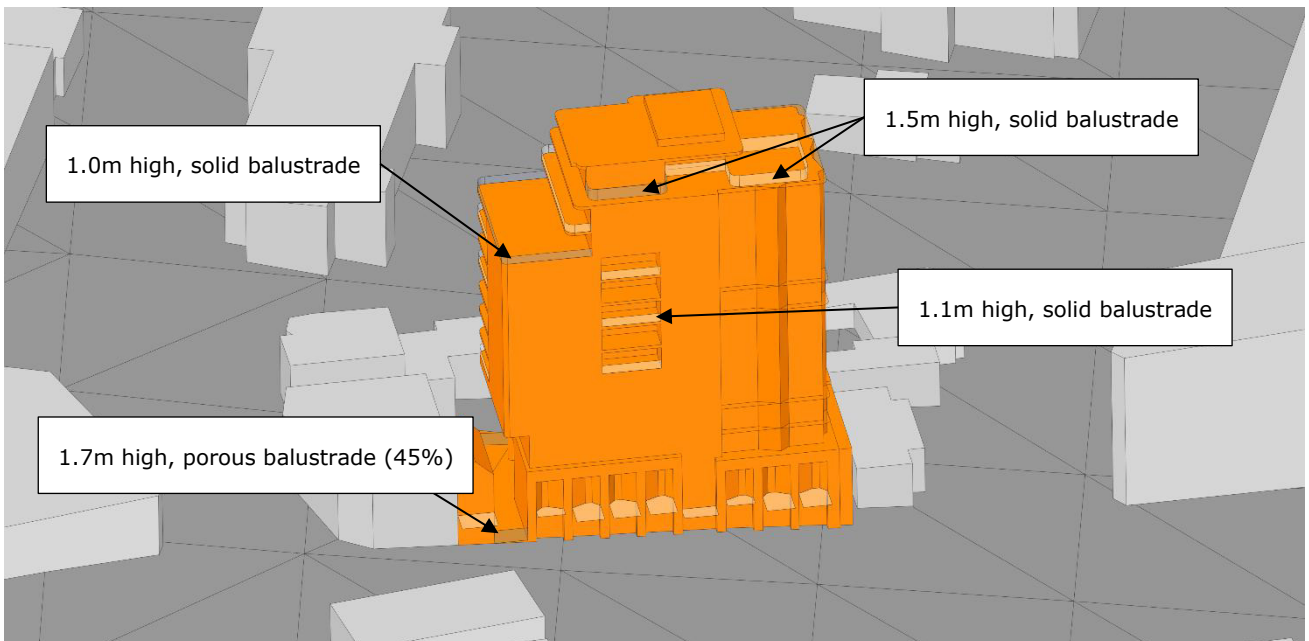


Figure 6: CFD model geometry - west close-up view of the proposed development.

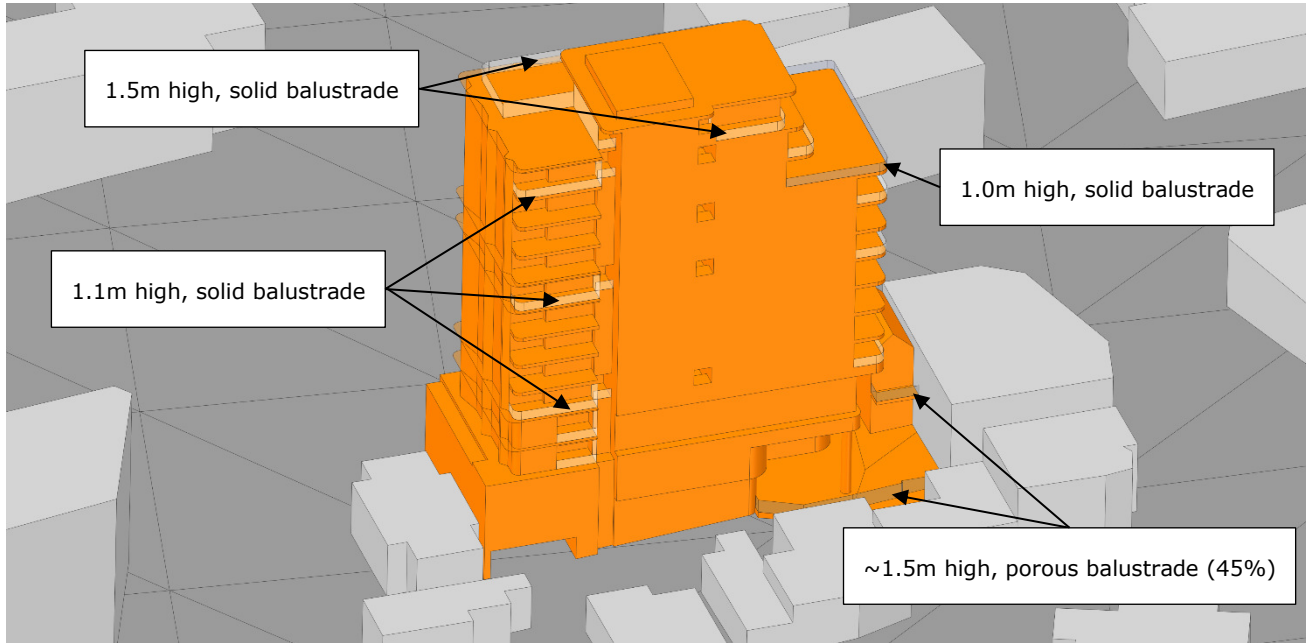


Figure 7: CFD model geometry - east close-up view of the proposed development.

3.2 Computational Grid

The computational enclosure needs to be discretised into computational control volumes (or mesh) to solve the discretised governing equation of fluid flows. Creating a high-quality mesh allows governing equations to be solved on predictable shaped and mathematically defined volumes with a high-level of accuracy. Meshing the buildings in urban areas balances the accuracy versus computational cost; finer meshes with smaller element size provide accurate results but take longer time to solve.

Computational grid generated is shown in Figure 8. The computational enclosure was discretised into an approximately 10 million cells comprising poly-hexahedral cell types. Furthermore, the mesh was refined around the project site and boundary later inflation layer meshed were included on all solid walls. These inflation layers would help to capture the wind flow mechanism in the areas of interest and resolve near wall velocities and pressure gradients (Figure 9).

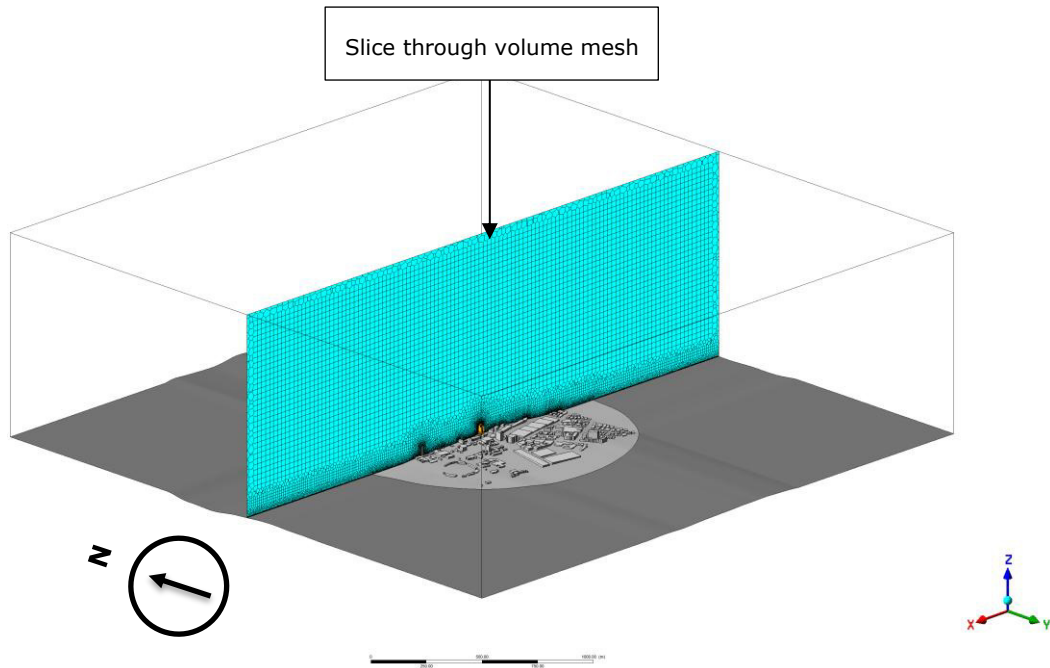


Figure 8: Computational Grid.

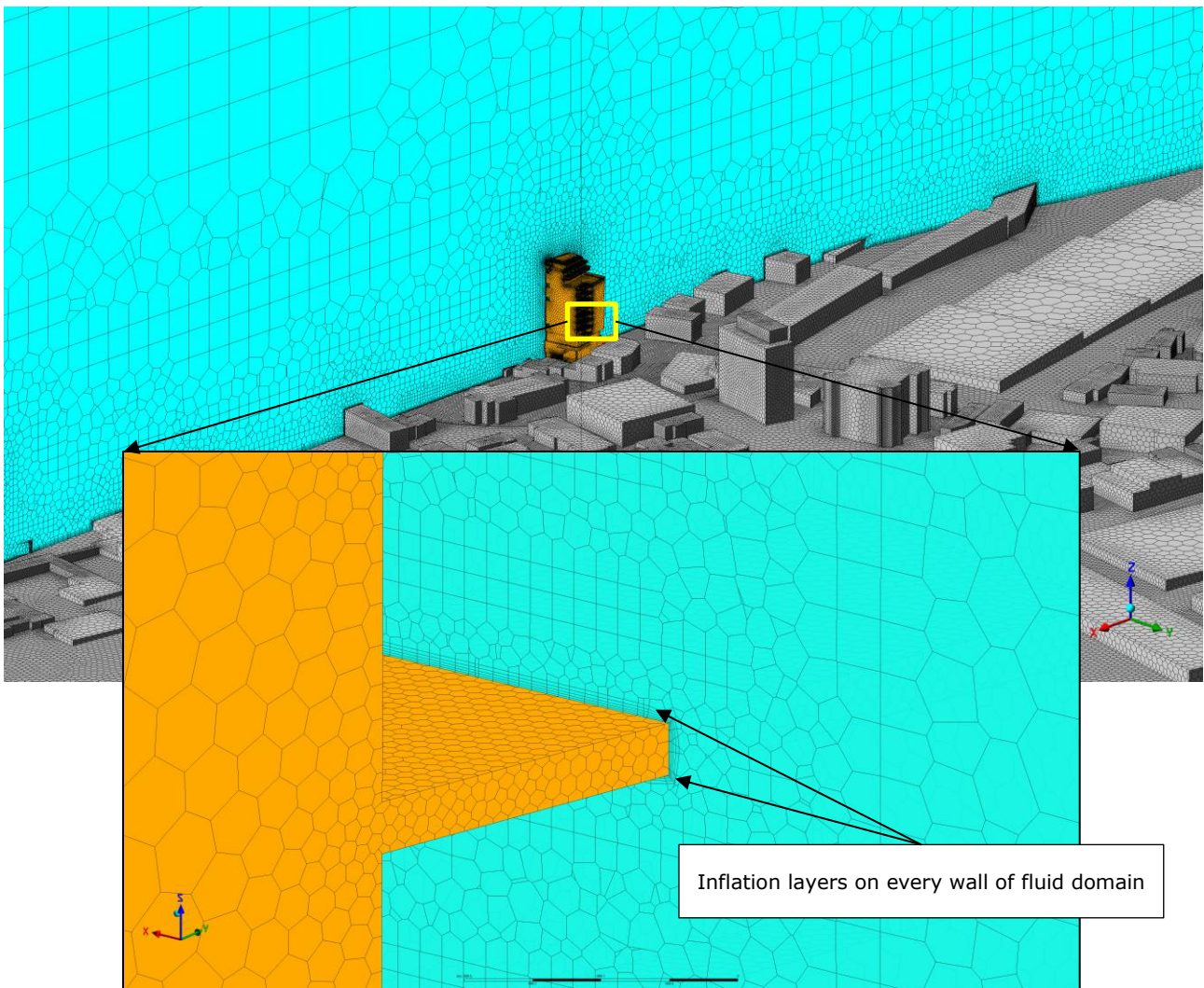


Figure 9: Southwest close-up view of the proposed development.

3.3 Turbulence Modelling

The fluid (wind) flow was solved using 3D steady state Reynolds Average Navier Stokes (RANS) k-omega turbulence model. Commercial CFD package used the Finite Volume Method (FVM) to discretise the governing equations, which are then solved using SIMPLE algorithms. Second-order discretization schemes were used for all variables (pressure and momentum equations), except for k and omega terms where a first order discretization was used. The equations for momentum were discretised to second order accuracy to reduce the effect of numerical diffusion.

Many academic publications support that the RANS K-omega Shear Stress Transport (SST) is more robust in solving Computational Wind Engineering simulations [3,4]. Therefore, k-omega SST turbulence model was used in this study. Sixteen wind directions were simulated for this study to assess the wind flow characteristics around the proposed development.

The CFD setup followed the best practices and guidelines for simulating flow in urban environments and consistent with AWES-QAM-3-2024 (Computational Wind Engineering Quality Assurance Manual). Point monitors at different locations around the site were used to monitor the convergence of the results and ensure the CFD solution reached a steady state solution.

3.4 Approaching Wind Inlet Profile

An estimate of the upstream terrain category properties for the project site has been made and reproduced in the CFD simulation. The approaching mean and turbulent flows of Terrain Category (TC) 2.5 and 3 Atmospheric Boundary Layers (ABL) for different exposures were modelled based on AS/NZS 1170.2:2021.

The CFD inlet mean velocity (normalised at the building height) and turbulence intensity profile for TC 2.5 and 3 are shown in Figure 10 and Figure 11. These ABL profiles represent the mean wind speed and turbulence intensity profiles approaching the model of the development as described in Deaves and Harris (1978) [7]. Ensuring the propagation of the Atmospheric Boundary Layer (ABL) profile into the fluid domain is a key requirement of conducting reliable Computational Wind Engineering (CWE) simulations.

Sand grain roughness techniques were used to ensure that this requirement was achieved for all 16-wind directions. Closer to the ground the wind moves more slowly but with increased turbulence. Some conversion techniques were implanted in the analysis to ensure propagation of the ABL profile to the edge of the CFD modelled turntable geometry.

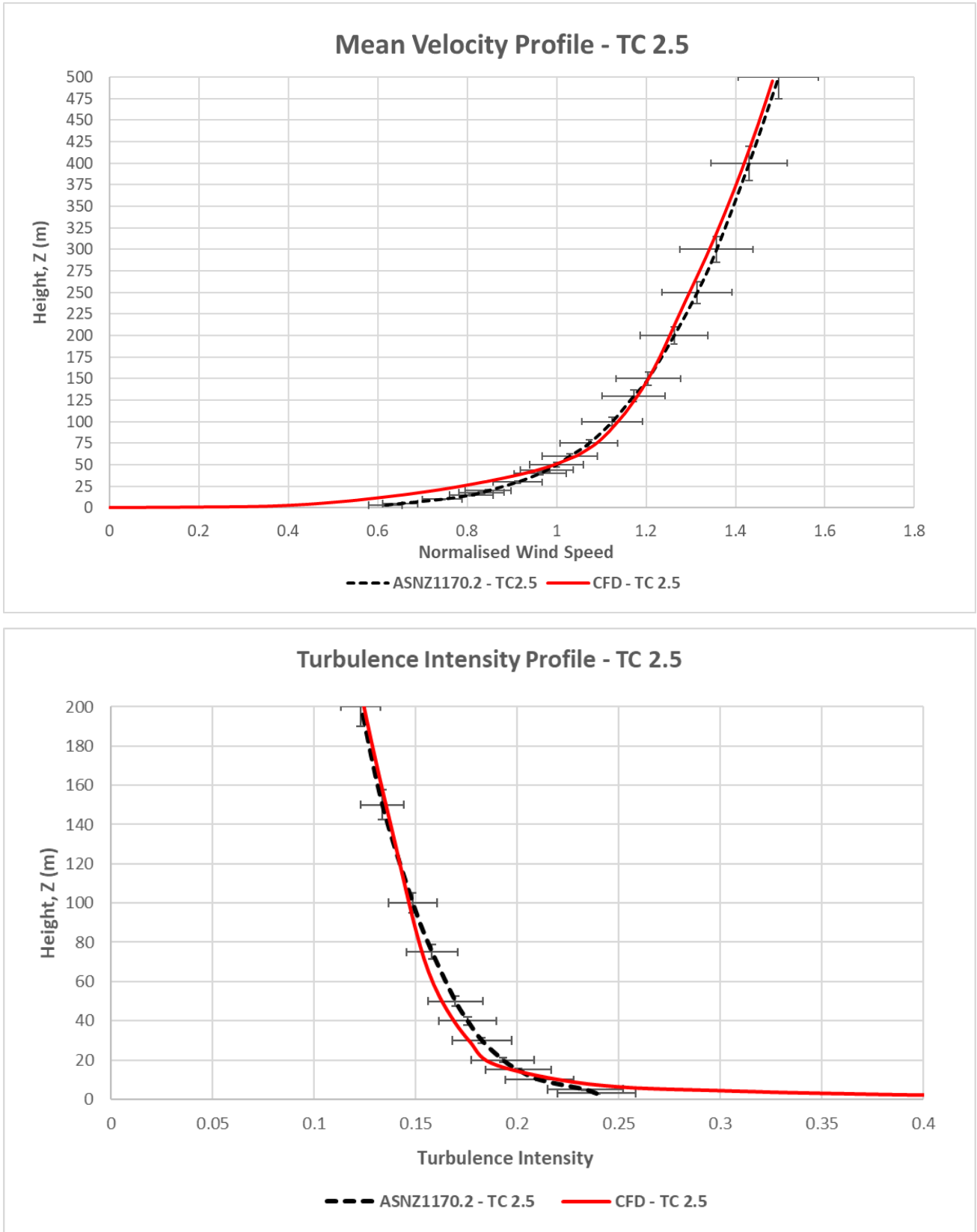


Figure 10: Mean Velocity and Turbulence Intensity Profiles for Terrain Category (TC) 2.5.

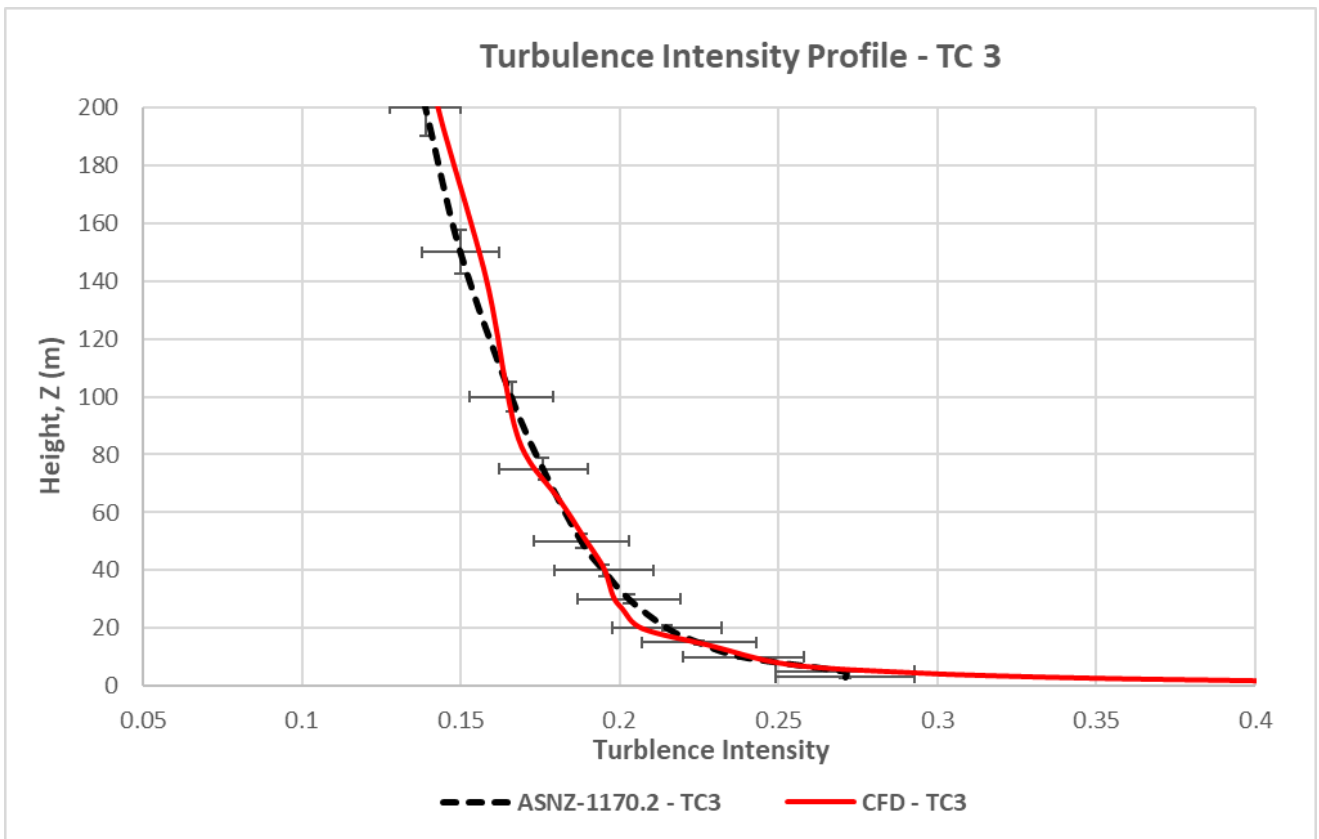
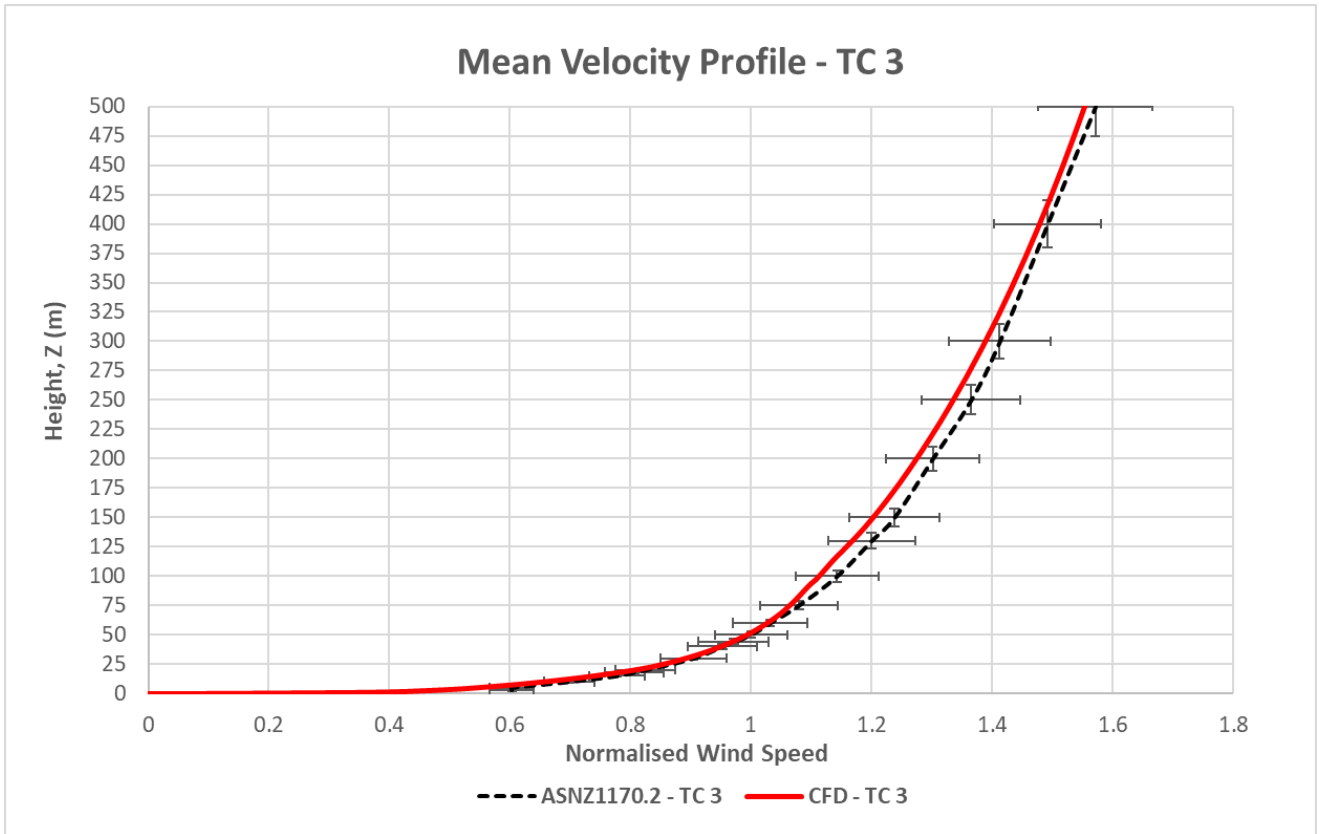


Figure 11: Mean Velocity and Turbulence Intensity Profiles for Terrain Category (TC) 3.

4 Regional Wind Climate

The mean and gust wind speeds have been recorded in the Sydney area for over 30 years. This data has been analysed and directional probability distribution of wind speeds has been determined. The directional distribution of hourly mean wind speed at the gradient height, with a probability of occurring once per year (i.e. 1-year return period) and 5% of time exceeded are shown in Figure 12. The wind data at this free stream height is common to all Sydney city sites and may be used as reference to assess ground level wind conditions at the project site. Figure 12 indicates that the stronger winds are primarily distributed around the northeast, south, and west quadrants, and winds from the east are less frequent and generally calmer.

Hourly Mean Wind Speeds (m/s), once per year and 0.5% of the time, at 500 m height, Cat 2, Sydney

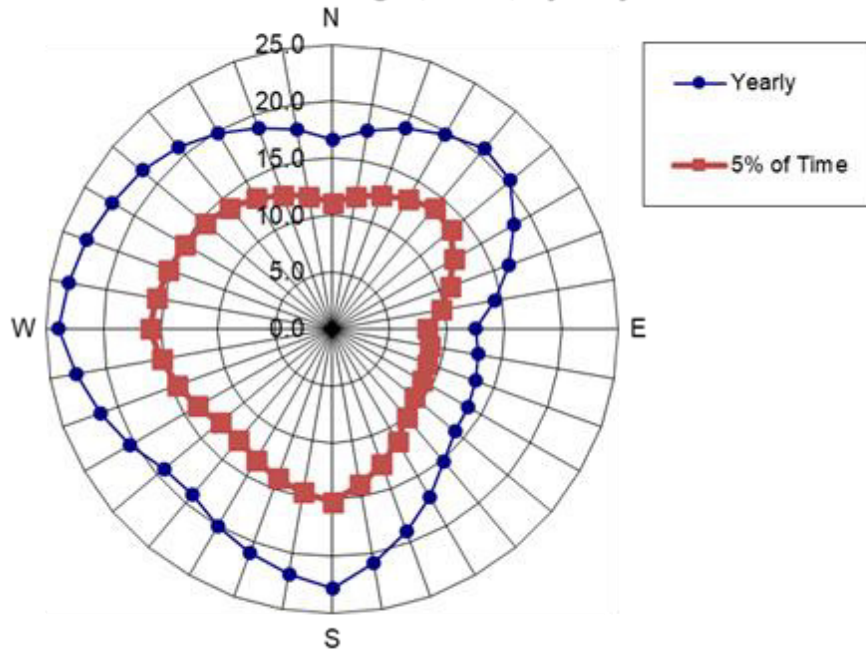


Figure 12: Directional Distribution of Annual Return Period of Mean Hourly Wind Speeds (m/s) and 5% exceeded at Gradient Height for Sydney.

5 Wind Assessment Criteria

It is generally accepted that wind speed and the rate of change of wind velocities are the key parameters that should be used in the wind assessment of how wind affects pedestrians in the area of interests. Local wind effects can be evaluated with respect to a number of environmental wind speed criteria established by various academic researchers. Despite the apparent differences in numerical values and assumptions made in their development, it has been found that when these are compared on a probabilistic basis, there is remarkably good agreement.

Lawson (1990) wind criteria were used to assess the pedestrian level wind speeds in this study. The wind assessment criteria are based upon the research of Lawson (1990), described in Table 1 for both pedestrian comfort and safety. The benefit of these criteria is that they use both a mean and gust equivalent mean (GEM) wind speed to assess the suitability of specific locations. The criteria based on the mean wind speeds define when the steady wind component of the wind causes discomfort, whereas the gust equivalent mean wind speeds define when the wind gusts cause discomfort. The level and severity of these comfort categories can vary based on individual preference, so calibration to the local wind environment for all wind directions is recommended when evaluating with Lawson ratings. **Another benefit of these from a comfort perspective is that the 5% of the time event is appropriate for a precinct to develop a reputation from the general public** – the rating is based on the wind speeds that occur for 95% of the time. Please also refer to the Figure 13 for the comparison between the different wind comfort criteria.

Table 1: Lawson (1990) wind comfort criteria.

Measurements	Description
Gust wind speed (max. wind speed exceeded once per year of the time) ≤20m/sec , for combined all directions	Accepted international criterion for human safety to avoid a healthy pedestrian losing balance
Hourly mean/GEM wind speed*, 5% of the time exceedance, ≥10m/sec , for combined all directions.	Uncomfortable (People will purposefully avoid the space for any activities)
Hourly mean/GEM wind speed*, 5% of the time exceedance, ≤10m/sec , for combined all directions.	Acceptable for fast/business walking (Any activities where the person intends to transit through the space where comfort and leisure is not a requirement, such as crossing a road)
Hourly mean/GEM wind speed*, 5% of the time exceedance, ≤8m/sec , for combined all directions.	Acceptable for walking (steady steps for most pedestrians)
Hourly mean/GEM wind speed, 5% of the time exceedance, ≤6m/sec , for combined all directions.	Acceptable for standing (Short-term standing activities: Building entrance, queueing, wind shopping, vehicle drop off or waiting for a bus)
Hourly mean/GEM wind speed, 5% of the time exceedance. ≤4m/sec , for combined all directions.	Acceptable for sitting (gardens, park benches, eating fast food, reading a magazine on a bench, and quick coffee)

*Note: Hourly Mean wind speeds is the maximum of mathematical mean or Gust Equivalent Mean (Gust divided by 1.85).

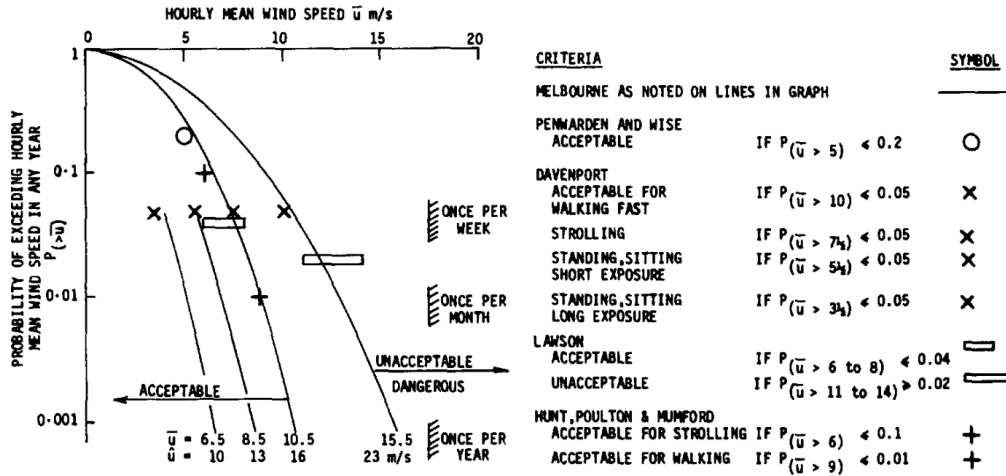


Figure 13: Comparison of various wind criteria for environmental wind conditions for daylight hours.

5.1 CWE Assessment – Colour Contours

Table 2: CWE Wind Comfort Colour Contours used in the assessment.

Mean/GEM wind speed that exceeded $\leq 5\%$ of the time	Colour code	Comfort Rating
≤ 4 m/s		Sitting
≥ 4 m/s – 6 m/s		Standing
≥ 6 m/s – 8 m/s		Walking
≥ 8 m/s – 10 m/s		Business (or Fast) Walking
≥ 10 m/s		Uncomfortable

Table 3: CWE Wind Safety Colour Contours used in the assessment.

Peak wind speed that exceeded once per year of the time	Colour code	Comfort Rating
< 20 m/s		Pass
≥ 20 m/s		Fail (Unsafe)

5.2 Use of Adjacent Pedestrian Occupied Areas & Recommended Wind Comfort Criteria

The following table lists the specific areas adjacent to the proposed development and the corresponding recommended criteria.

Table 4: Recommended application of criteria.

Area	Specific location	Target Criteria
Public Footpaths and Access ways	Along the footpaths on Pacific Hwy, Church Lane, (Figure 14)	Walking
Building Entrances	Various locations at ground level (Figure 14)	Standing
Communal Terrace Areas	Level 11 and Rooftop (Figure 15 & Figure 16)	Walking (See discussion below)

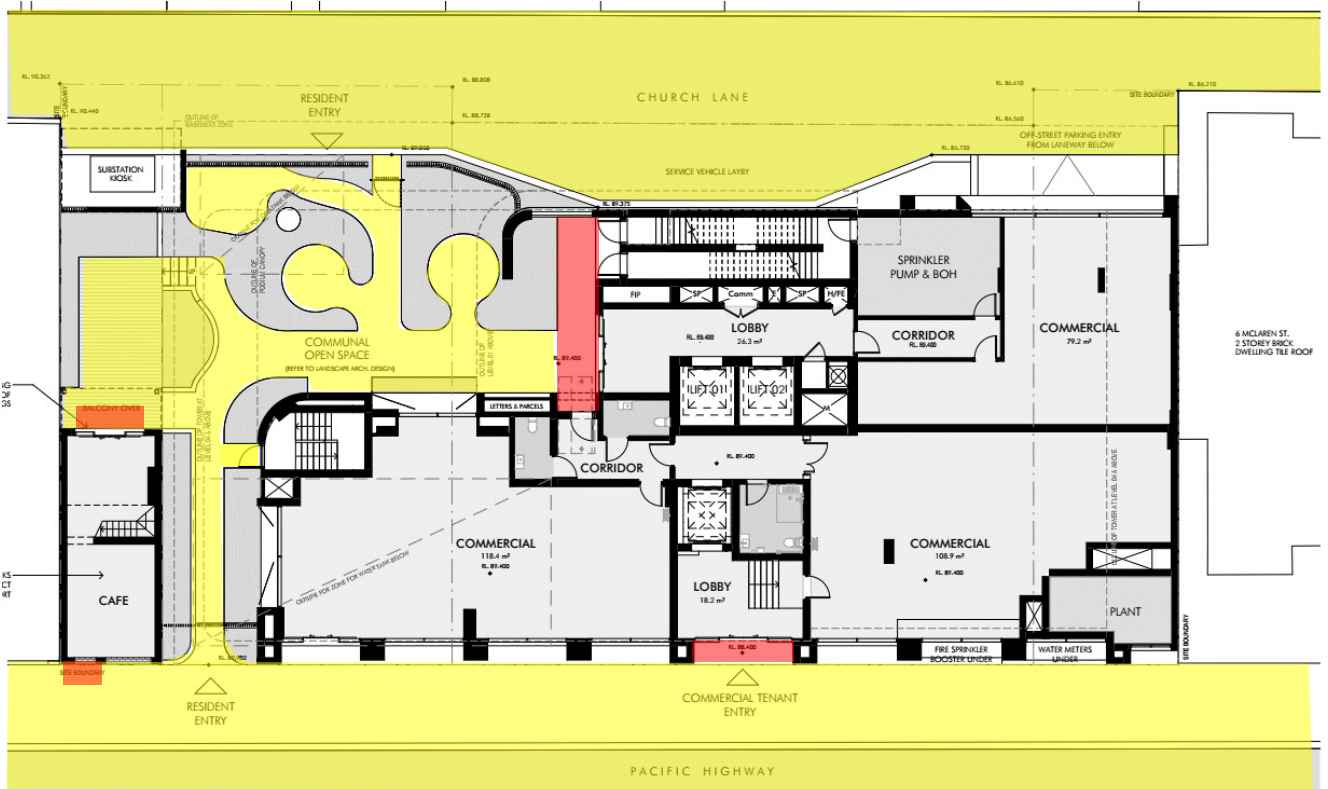
5.3 Terrace / Balcony Recommended Criterion Discussion

There are private balconies and terraces located up the height of the development. Vipac recommends as a minimum that balcony/terrace areas meet the criterion for **walking** since:

Vipac recommends as a minimum that outdoor terrace areas meet the criterion for walking since:

- the use areas is optional, and only intended to be used on fair weather conditions with calm winds;
- a key experience of these terrace areas is to be reasonably open to the environmental conditions;
- these areas are not public spaces;
- residents at private open spaces can choose to retreat indoors during uncomfortable wind conditions, while a pedestrian or person using a public area may not have this option; and
- many similar developments in Sydney and other Australian capital cities experience wind conditions on balconies and elevated deck areas in the vicinity of the criterion for walking.

However, it should be noted that meeting the walking criterion on elevated recreation areas will be no guarantee that occupants will find wind conditions in these areas acceptable at all times.



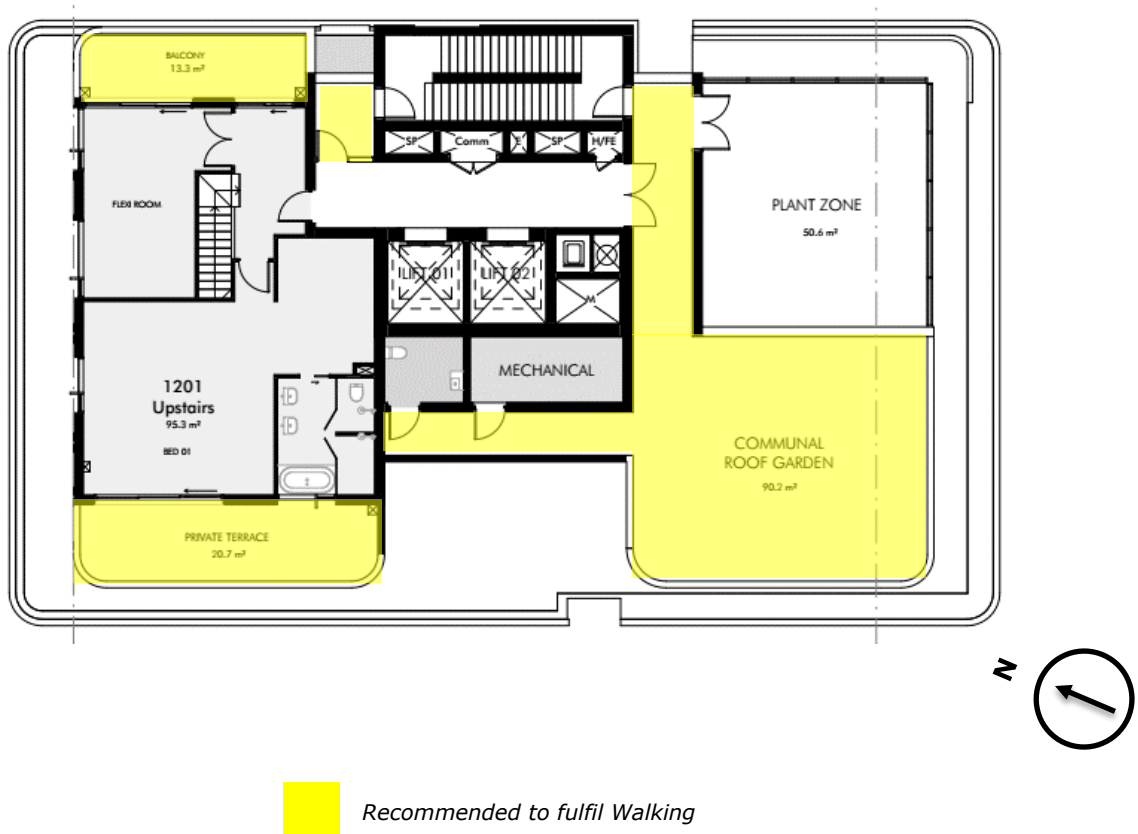
Recommended to fulfil Walking Recommended to fulfil Standing

Figure 14: Ground floor plan with the recommended wind criteria overlaid.



 Recommended to fulfil Walking

Figure 15: Level 11 floor plan with the recommended wind criteria overlaid.



 Recommended to fulfil Walking

Figure 16: Roof terrace plan with the recommended wind criteria overlaid.

6 Results and Discussion

6.1 Footpaths and Accessway

Wind comfort conditions around the project site is dominated by prevailing north-northeasterly and westerly winds. Locations at the street level around the project site are classified between standing and walking wind comfort ratings (Figure 17). The velocity ratio contours for all 16 wind directions can be found in Appendix C.

Overall, the wind conditions at the street level around the project site are within the recommended waking comfort ratings. As such, no recommendations for wind amelioration were recommended around the project site.

The wind safety rating is used to indicate potential areas where wind conditions may pose an occasional risk to the safety of pedestrians. The northern side of the proposed development were measured with gust wind speed exceeded the recommended the wind safety criterion (Figure 18).

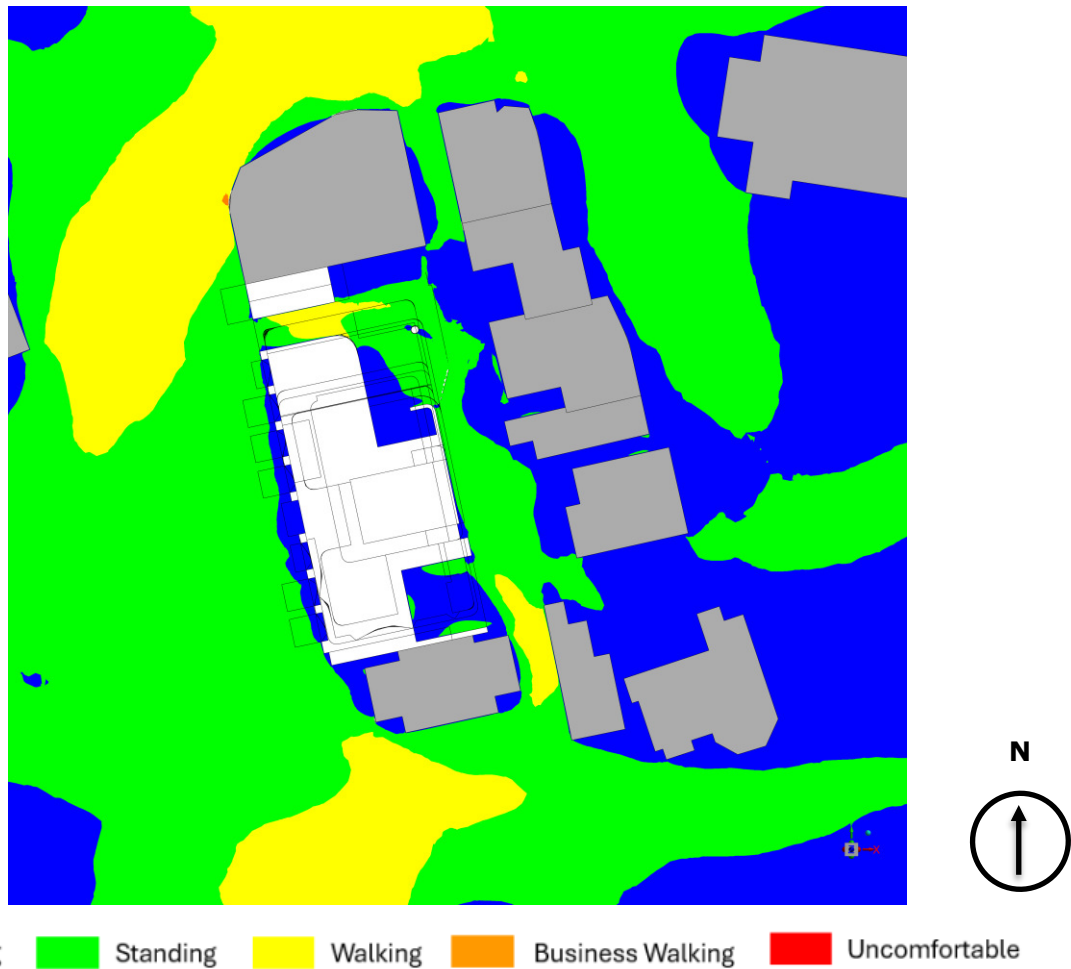


Figure 17: Wind comfort result (combined all wind directions) - footpath areas and around the project site.



Figure 18: Wind safety result (combined all wind directions) - footpath areas and around the project site.

The west façade of the proposed development is exposed to unimpeded winds due to lower suburban structures west of the project site, causing downwash, corner acceleration, and channelled between adjacent building (café) and proposed development (Figure 19).

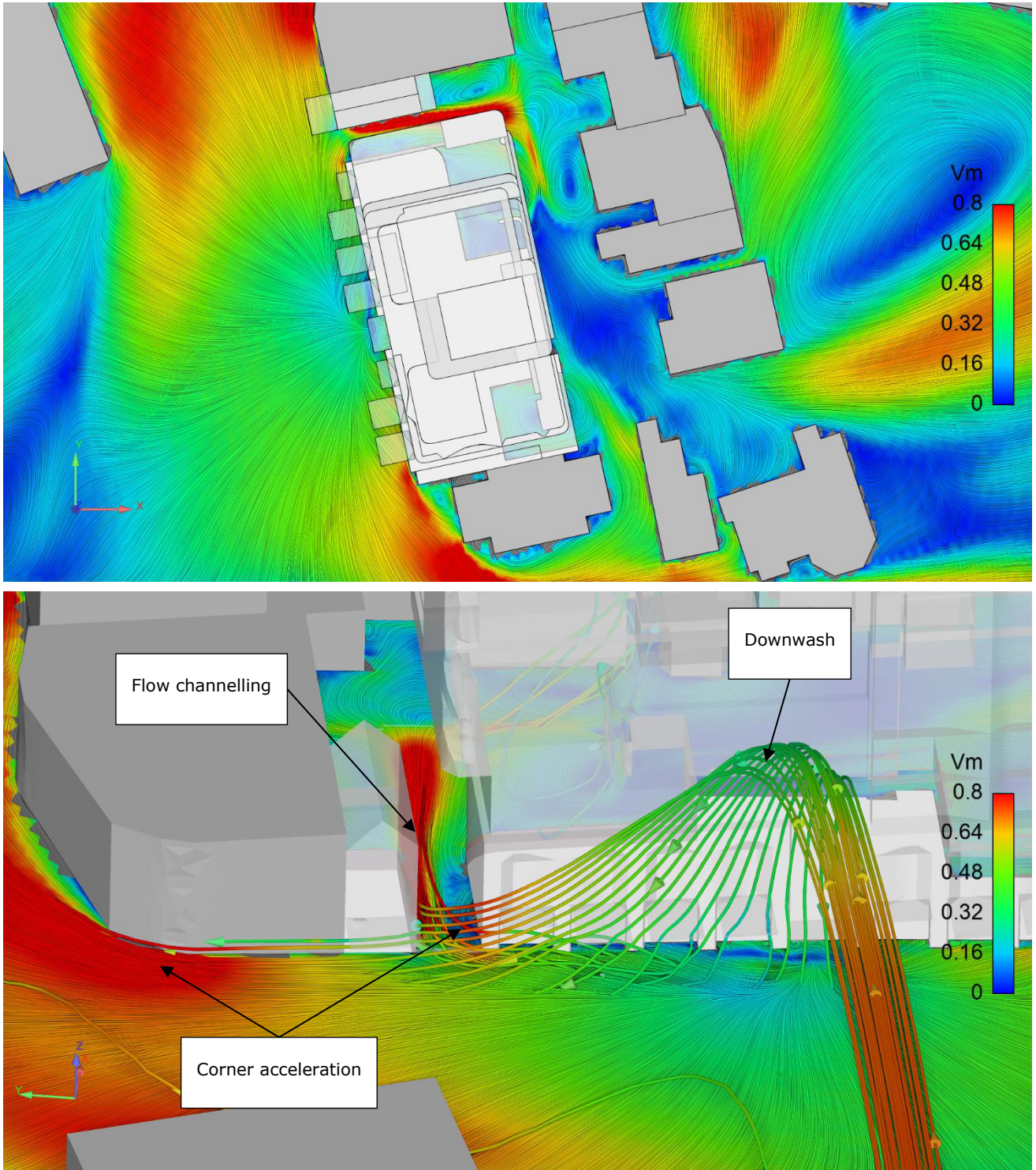


Figure 19: Streamline flow pattern – Westerly winds.

From Figure 18 and Figure 19, the prevailing westerly winds increase the wind speed level on the western resident entry planter area. As such the wind conditions exceeded the recommended safety criterion. These conditions are not suitable for pedestrian access. As such, the following wind amelioration features is recommended to mitigate the wind safety conditions for this area:

- Introduce a wind shelter airlock entrance at the strategic location is recommended (Figure 20). This airlock entrance would be expected to mitigate the wind safety issue caused by channelling effects.

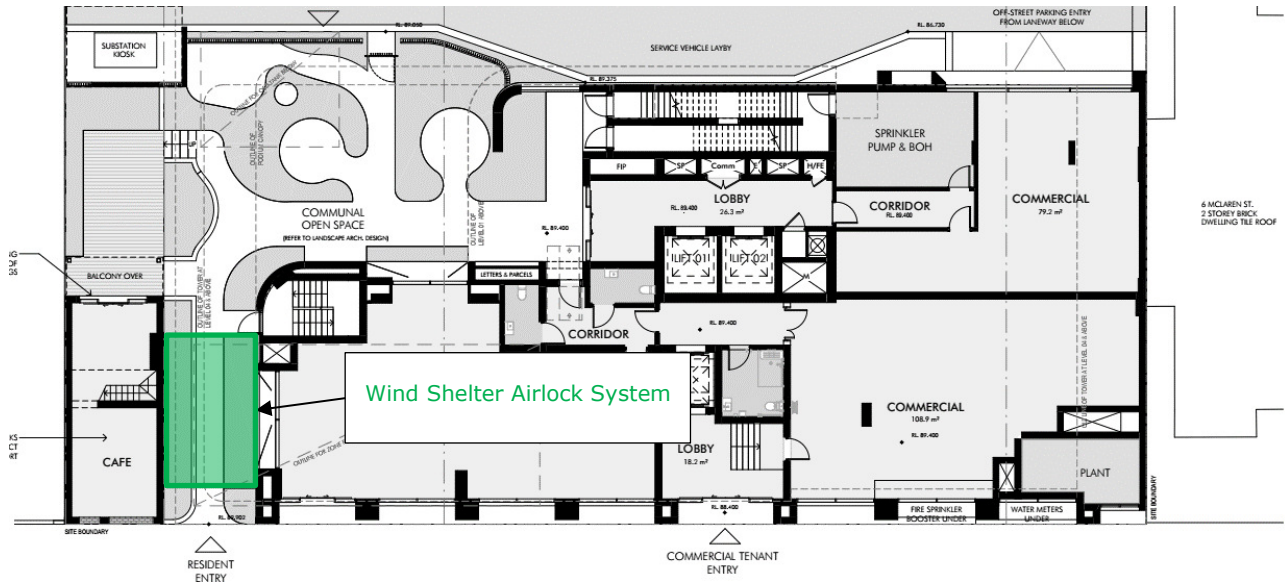


Figure 20: Ground floor plan with the recommended wind control measures overlaid.

6.1.1 Proposed Wind Shelter Airlock System

Following further consultation and design collaboration with **Nettletontribe architects**, a wind shelter airlock system has been developed and incorporated into the revised scheme. This mitigation strategy specifically targets the wind safety concerns identified in the earlier assessment, which were primarily driven by channelling effects through the ground-level accessway.

The proposed airlock structure introduces a buffered entry zone that is expected to significantly reduce the impact of high wind gusts on pedestrians transitioning between the street entrance and the communal open space. By disrupting the direct wind path and diffusing localised wind flows, the airlock system is expected to improve wind safety and pedestrian comfort at this critical location.



Figure 21: Proposed Wind Shelter Airlock System.

It should be noted that the wind amelioration methods discussed are in-principle recommendations and have not been simulated in the study.

6.2 Building Entrances

All building entrances are well protected from the prevailing winds and windspeeds are predicted within the recommended standing comfort criterion or better (Figure 22).

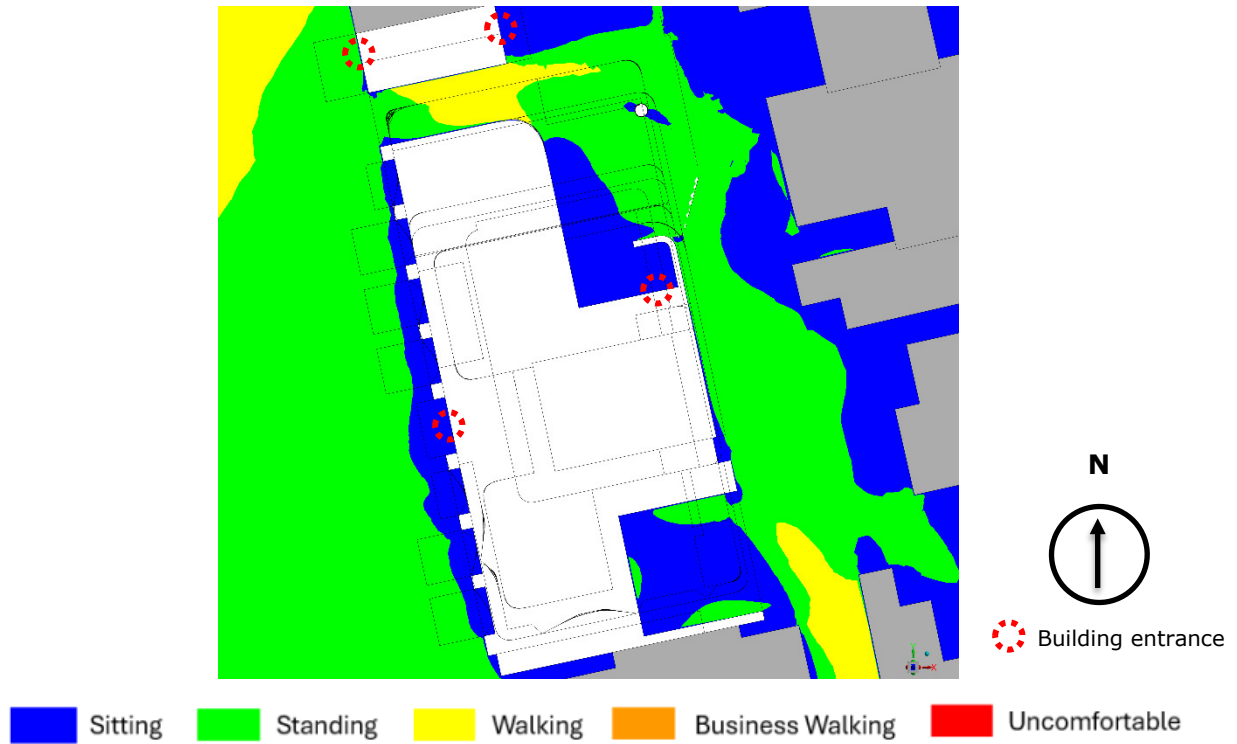


Figure 22: Wind comfort result (combined all wind directions) building entrances.

6.3 Level 11 Terrace

The simulations were performed with 1m high solid balustrade along the northern perimeter, as proposed.

The Level 11 terrace is achieved the recommended walking comfort criterion or better (Figure 23). As such, no wind control measures have been provided.



Figure 23: Wind comfort result (combined all wind directions) – level 11 terrace.

The predicted gust windspeeds were within the recommended wind safety criterion (Figure 24).

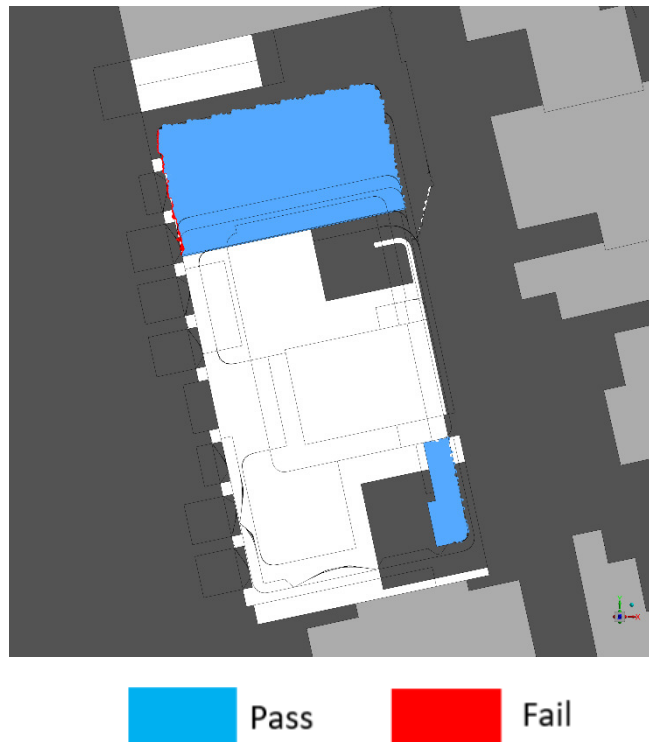


Figure 24: Wind safety result (combined all wind directions) – level 11 terrace.

6.4 Rooftop Terrace

The simulations were performed with 1.5m high solid balustrade, as proposed.

The rooftop terrace is achieved the recommended walking comfort criterion or better (Figure 25) and wind safety criterion (Figure 26). As such, no wind control measures have been provided.

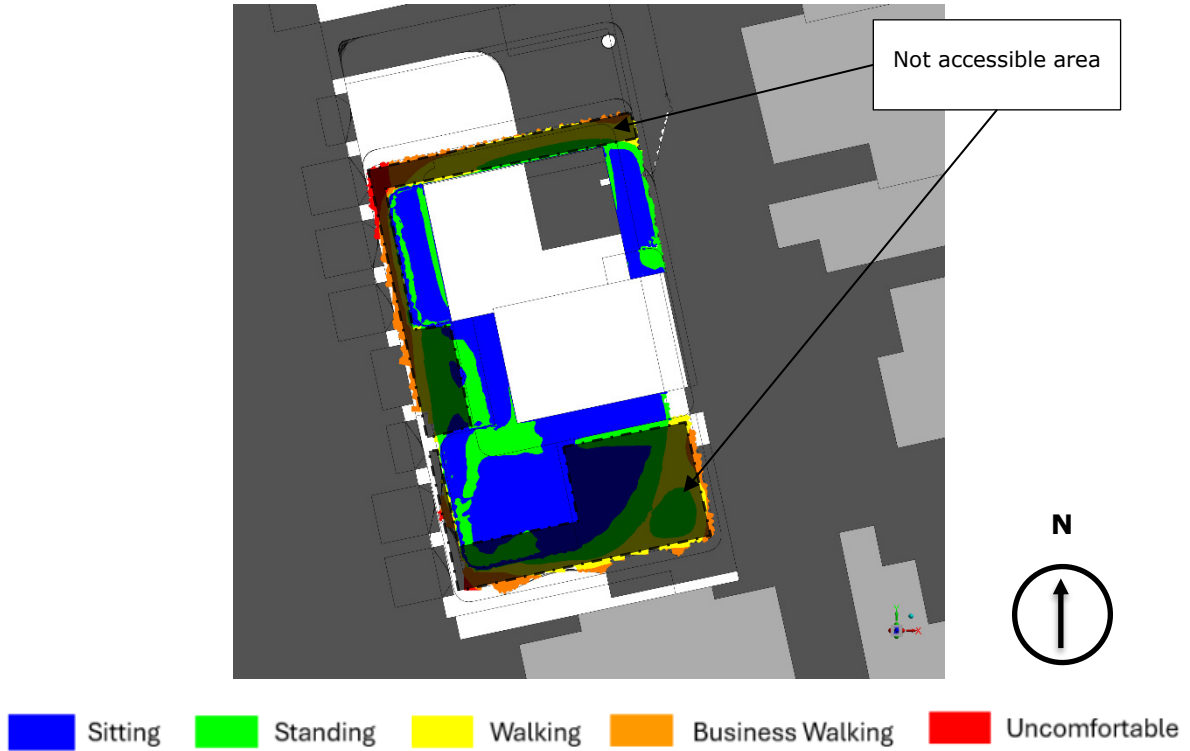


Figure 25: Wind comfort result (combined all wind directions) – rooftop terrace.

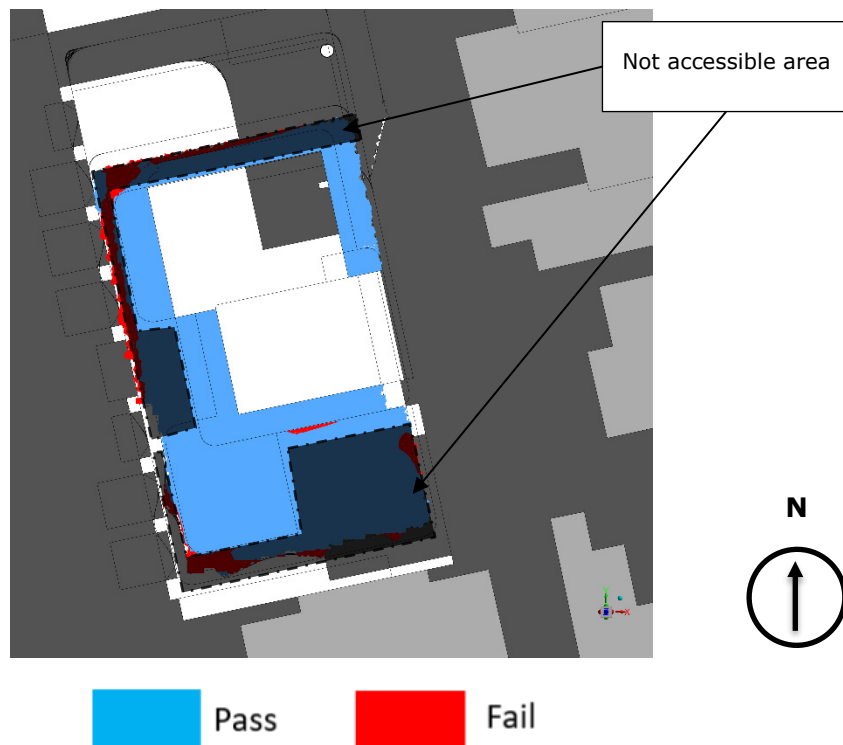


Figure 26: Wind safety result (combined all wind directions) – rooftop terrace.

6.5 Balconies

The simulations were performed with 1.1m high solid balustrade, as proposed.

All balconies are achieved the recommended walking comfort criterion or better (Figure 27) and wind safety criterion (Figure 28). A gradient of comfort ratings can be seen for the southwest corner balconies, with sheltered zones and highest winds concentrated along the outward facing corners (Figure 27). As such, no recommendations for wind amelioration were provided.

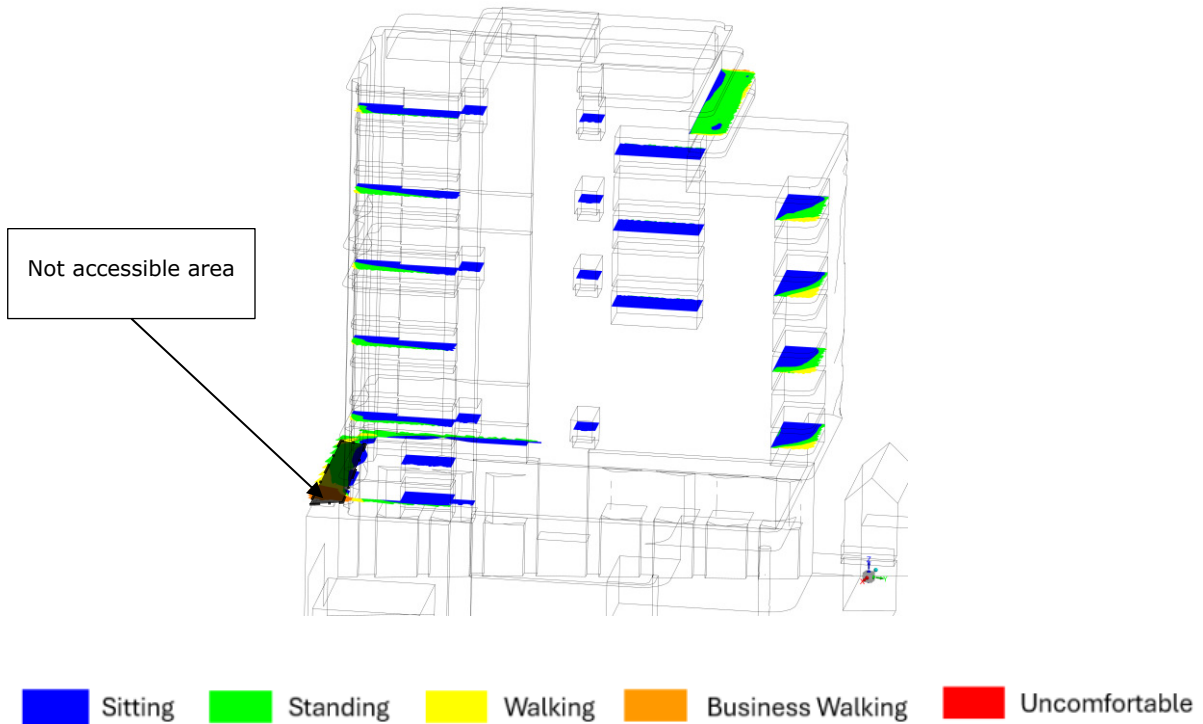


Figure 27: Wind comfort result (combined all wind directions) – balconies.

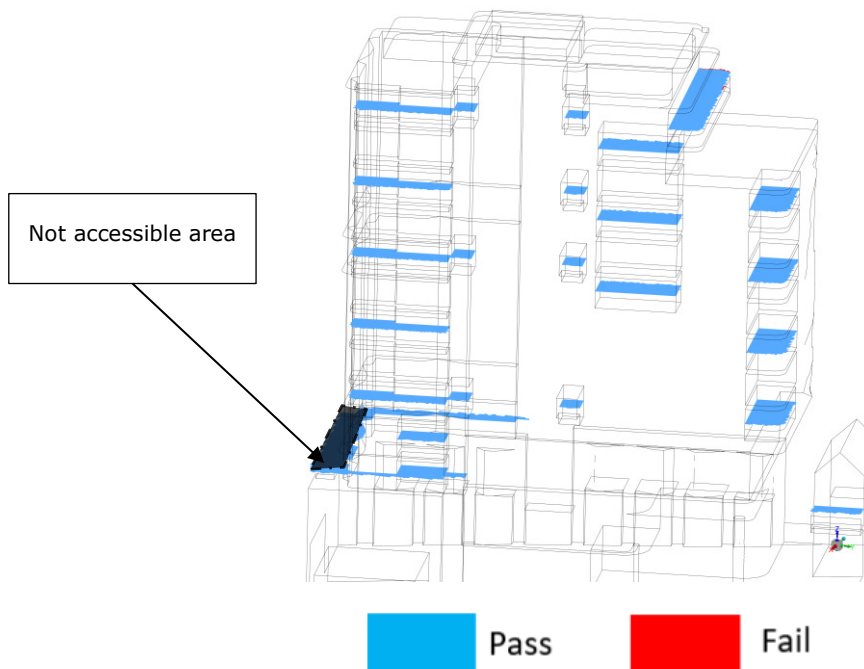


Figure 28: Wind safety result (combined all wind directions) – balconies.

7 Conclusion

Vipac Engineers & Scientist Pty Ltd has carried out an assessment of the pedestrian level winds for the proposed development at **253-265 Pacific Highway, North Sydney** based on Computational Wind Engineering (CWE) simulations.

The 3D model was developed based on drawings supplied by **Nettletontribe architects** in **April 2025**. The proposed development and surrounding buildings covering a circular area of approximately 500m radius were modelled at a full-scale model. The approaching mean wind speed and turbulent intensity of Terrain Category (TC) 2.5 and 3 Atmospheric Boundary Layer (ABL) profiles were modelled based on Australian Standard ASNZ 1170.2:2021.

Wind speeds simulated for 16 wind directions are combined with the local wind climate to determine mean wind speed exceeded **5%** of the time for the wind comfort and gust wind speed at **once per year (0.1%)** for the wind safety.

The finding of the Computational Wind Engineering (CWE) study are summarised as follows:

The proposed design of the development:

- fulfils the recommended criterion for **Safety** at all interest areas **with the recommendations**;
- fulfils the recommended criterion for **Walking** at all footpath and access areas;
- fulfils the recommended criterion for **Standing** at all building entrances;
- fulfils the recommended criterion for **Walking** at Level 11 Terrace;
- fulfils the recommended criterion for **Walking** at Rooftop Terrace; and
- fulfils the recommended criteria for **Walking** or better at all balconies

As a general statement, common to all new developments, educating occupants about wind conditions at high level terraces/balconies during high-wind events and tying down loose furniture are highly recommended.

Appendix A Environmental Wind Effects

Atmospheric Boundary Layer

As wind flows over the earth, it encounters various roughness elements and terrain such as water, forests, houses, and buildings. To varying degrees, these elements reduce the mean wind speed at low elevations and increase air turbulence. The wind above these obstructions travels with unattenuated velocity, driven by atmospheric pressure gradients. The resultant increase in wind speed with height above ground is known as a wind velocity profile. When this wind profile encounters a tall building, some of the fast-moving wind at upper elevations is diverted down to ground level resulting in local adverse wind effects.

The terminology used to describe the wind flow patterns around the proposed development is based on the aerodynamic mechanism, direction, and nature of the wind flow.

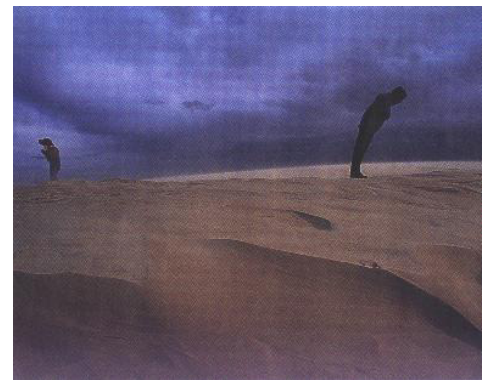
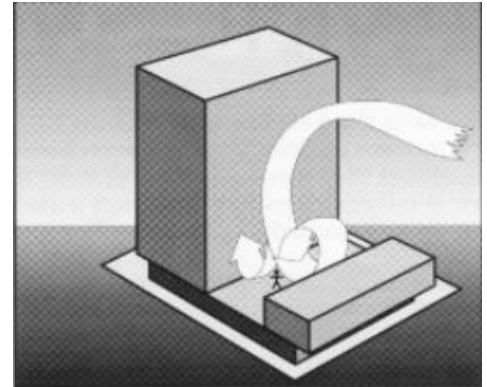
Downwash – refers to a flow of air down the exposed face of a tower. A tall tower can deflect a fast-moving wind at higher elevations downwards.

Corner Accelerations – when wind flows around the corner of a building it tends to accelerate in a similar manner to airflow over the top of an aeroplane wing.

Flow separation – when wind flowing along a surface suddenly detaches from that surface and the resultant energy dissipation produces increased turbulence in the flow. Flow separation at a building corner or at a solid screen can result in gusty conditions.

Flow channelling – the well-known “street canyon” effect occurs when a large volume of air is funnelled through a constricted pathway. To maintain flow continuity the wind must speed up as it passes through the constriction. Examples of this might occur between two towers, in a narrowing street or under a bridge.

Direct Exposure – a location with little upstream shielding for a wind direction of interest. The location will be exposed to the unabated mean wind and gust velocity. Piers and open water frontage may have such exposure.



Appendix B Drawing List

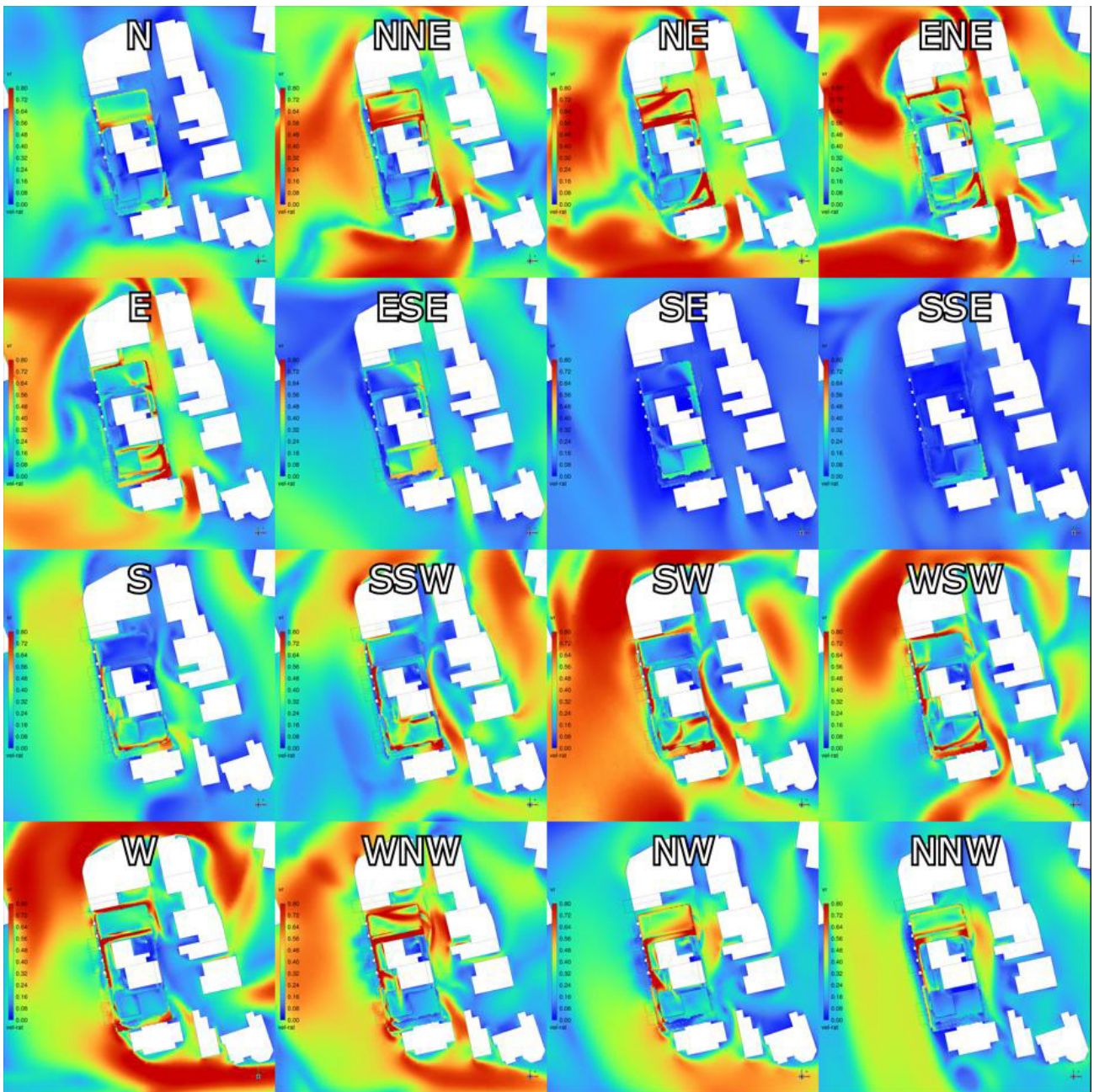
Floor Plans, Elevation Drawings and CAD Received: **March 2025**

- 14344_NT_Legacy Church Lane WIP Arch Drawings [P6].pdf
- 14344_NT_Legacy Church Lane WIP Arch Drawings [P6] CAD.zip

Updated Floor Plans, Elevation Drawings and CAD Received: **April 2025**

- 14344_LEGACY_AR_ARCH_040425.ifc
- 14344_NT_Church Lane Development Summary [040425-B].pdf
- 14344_NT_Church Lane Scoping Meeting Arch. Drawings [040425-B] reduced.pdf
- DA201 - ELEVATION - WEST [P6].pdf
- DA202 - ELEVATION - EAST [P6].pdf
- DA203 - ELEVATION - NORTH & SOUTH [P6].pdf

Appendix C Velocity Ratio for all 16 wind directions – 1.5m above the concerned areas



Appendix D References

- [1] Structural Design Actions, Part 0: General Principles, Australian/New Zealand Standard 1170.0:2011.
- [2] Structural Design Actions, Part 2: Wind Actions, Australian/New Zealand Standard 1170.2:2021.
- [3] Blocken, B. (2014) '50 years of Computational Wind Engineering: Past, present and future', *Journal of Wind Engineering and Industrial Aerodynamics*, 129, pp. 69–102. doi:10.1016/j.jweia.2014.03.008.
- [4] Blocken a et al. (2011) CFD simulation for pedestrian wind comfort and wind safety in urban areas: General Decision Framework and Case Study for the Eindhoven University Campus, *Environmental Modelling & Software*.
- [5] City of Moonee Valley (2021), *Moonee Ponds Activity Centre – Wind Guidelines for Planning Applicants*.
- [6] Holmes, J.D. and Bekele, S. (2022) *Wind loading of structures*. Boca Raton: CRC Press.
- [7] Selvam, R.P. (2022) *Computational Fluid Dynamics for Wind Engineering*. Hoboken, NJ: Wiley Blackwell.
- [8] Deaves, D.M. and Harris, R.I (1978). A Mathematical model of the structure of strong winds. CIRIA Report 76, England.
- [9] Lawson T. V. (1978). 'The wind content of the built environment' *Journal of Wind Engineering and Industrial Aerodynamics*, 3(2-3), 93-105.
- [10] Minimum design loads on structures (knowns as the SAA Loading Code), Part 2: Wind Loads, AS 1170.2-1989.