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syz

17-21 University Avenue, Canberra, ACT

Desktop Wind Impact Study

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Rev. 00	Original issue	20 Aug 2025	
Rev. 01	Updated recommendations	05 Sep 2025	SG

Executive Summary

syz commissioned Vipac Engineers and Scientists Ltd to prepare a statement of wind effects for the ground level and elevated areas of the proposed development at **17-21 University Avenue, Canberra, ACT.** This appraisal is based on Vipac's experience as a wind-engineering consultancy.

Drawings of the proposed development were provided by **Turco and Associates** in **August 2025**.

The findings of this study can be summarized as follows:

With proposed design:

- Wind conditions in the ground level footpath areas and access ways would be expected to be within the **walking** comfort criterion.
- The main entrances would be expected to be within the **standing** comfort criterion.
- The seating areas in the ground level areas would be expected to be within the **sitting** comfort criterion.
- The terraces and balconies would be expected to be within the recommended **walking** comfort criterion.
- **With recommendations,** the Common Rooftop is expected to have wind conditions within the recommended **walking** comfort criterion.
- All areas are expected to fulfil the **Safety** criterion.

Vipac recommends a wind tunnel test to be conducted to quantify the wind conditions and determine the proper wind control measures wherever necessary.

As a general statement, educating occupants about wind conditions at open terrace/balcony areas during high-wind events and fixing loose, lightweight furniture on the terrace is highly recommended.

The assessments provided in this report have been made based on experience of similar situations in Canberra and around the world. As with any opinion, it is possible that an assessment of wind effects based on experience and without experimental validation may not account for all complex flow scenarios in the vicinity.

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1 Introduction

Vipac Engineers and Scientists has been commissioned by **syz** to carry out an appraisal of the pedestrian wind effects at the ground level and elevated areas of the proposed development at **17-21 University Avenue, Canberra, ACT.**

Strong winds in pedestrian areas are frequently encountered in central business districts of cities around the world, including Canberra, Sydney, Melbourne and Brisbane. Wind characteristics such as the mean speed, turbulence and ambient temperature determine the extent of disturbance to users of pedestrian areas. These disturbances can cause both comfort and safety problems and require careful consideration to mitigate successfully.

The proposed development consists of two buildings, buildings A and B. These buildings are 14 and 16-storey mixed use buildings with a roof height of 44.75m and 50.45m, respectively. The site is bounded by Marcus Clarke Street to the north-west, University Avenue to the north-east, Darwin Place, 15 London CCT and Farrell Place to the south-east and the existing development (1 Farrell PL) to the south-west. A satellite image of the proposed development site and the north elevation of buildings A and B are shown in Figure 1, Figure 2 and Figure 3 respectively.

This report details the opinion of Vipac as an experienced wind engineering consultancy regarding the wind effects in ground level footpath and elevated areas of the development as proposed. No wind tunnel testing has been carried out for this development at this stage. Vipac has carried out wind tunnel studies on many developments of similar shape and having similar exposure to that of the proposed development. These serve as a valid reference for the prediction of wind effects. Empirical data for typical buildings in boundary layer flows has also been used to estimate the likely wind conditions on the ground level and elevated areas of the proposed development [2] & [3].

Drawings of the proposed development were supplied to Vipac by **Turco and Associates** in **August 2025.** A list of drawings supplied is provided in Appendix C of this report.

Figure 1: Aerial view of the proposed development site

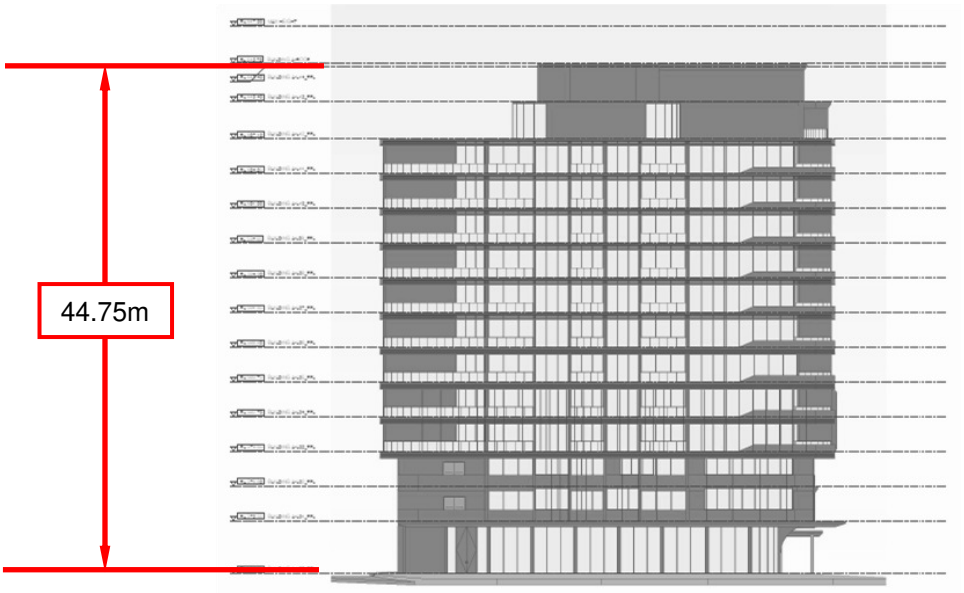


Figure 2: North Elevation of Building A of the proposed development.

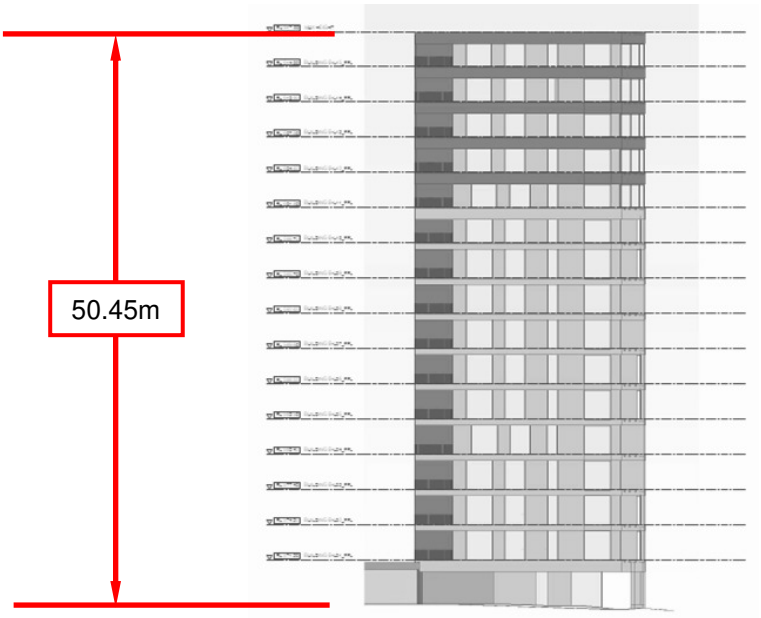


Figure 3: North Elevation of Building B of the proposed development.

2 Analysis Approach

In assessing whether a proposed development is likely to generate adverse wind conditions in ground level footpath areas, Vipac has considered the following five main points:

- The exposure of the proposed development to wind.
- The regional wind climate.
- The geometry and orientation of the proposed development.
- The interaction of flows with adjacent developments.
- The assessment criteria determined by the intended use of the areas affected by wind flows generated or augmented by the proposed development.

The pedestrian wind comfort at specific locations of ground level footpath areas may be assessed by predicting the gust and mean wind speeds with a probability of once per year and 5% of the time expected at that location. The location may be deemed generally acceptable for its intended use while gust and mean wind speeds are within the threshold values noted in Section 2.5. Where Vipac predicts that a location would not meet its appropriate comfort criterion, the use of wind control devices and/or local building geometry modifications to achieve the desired comfort rating may be recommended. For complex flow scenarios or where predicted flow conditions are well more than the recommended criteria, Vipac recommends scale model wind tunnel testing to determine the type and scope of the wind control measures required to achieve acceptable wind conditions.

2.1 Site Exposure

The proposed development is located on a relatively flat terrain. The site is surrounded within an approximately 3.0km radius predominately by low to mid-rise developments; with parklands, forest and rivers located further out. A satellite image showing these site surroundings is shown in Figure 4.

Considering the immediate surroundings and terrain, for the purposes of this study, the site of the proposed development is assumed to be within Terrain Category 2 and 3 as shown Figure 4.

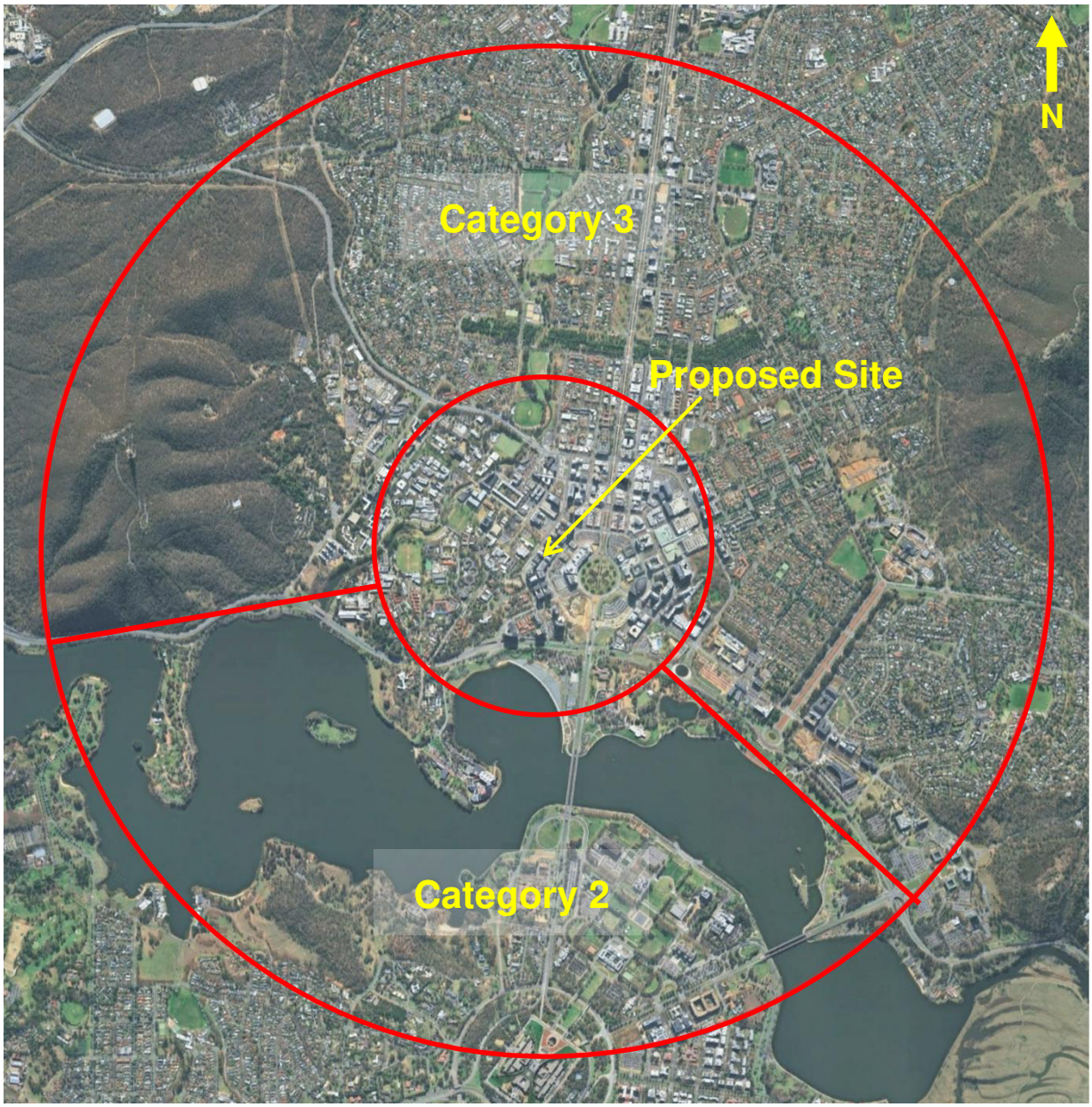


Figure 4: Assumed terrain categories for wind speed estimation.

2.2 Regional Wind Climate

The mean and gust wind speeds have been recorded in the Canberra area (Canberra Airport, Wind Station 070014) for over 30 years. This data has been analysed and the 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 5. The wind data at this free stream height is common to all Canberra city sites and may be used as a reference to assess the wind conditions at the proposed development.

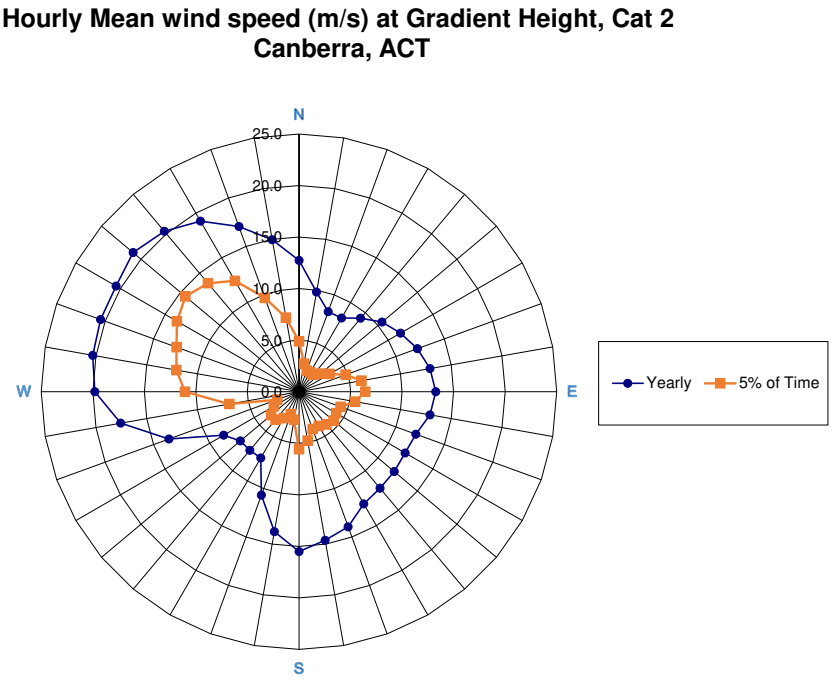


Figure 5: Directional Distribution of Annual Return period of Mean Hourly Wind Velocities (m/s) and 5% exceeded at Gradient Height for Canberra.

2.3 Building Geometry and Orientation

The proposed development consists of two buildings, buildings A and B. These buildings are 14 and 16 storey high commercial and residential buildings. The overall dimensions are shown in Figure 6. The main entrances are located on Marcus Clarke Street. The two buildings have consistent plan form throughout each level with minor setbacks at higher levels.

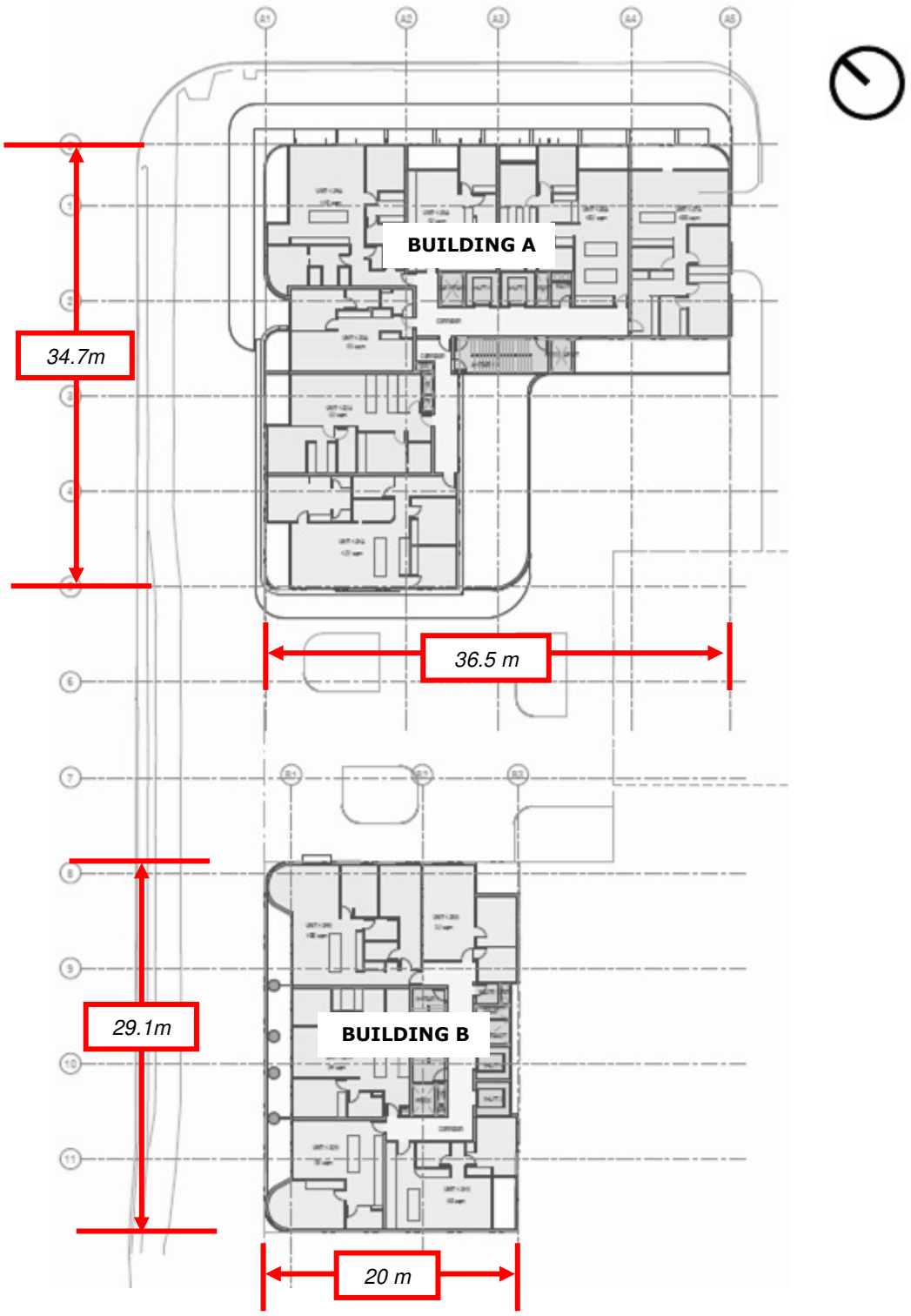


Figure 6: Level 1 plans with the overall dimensions overlaid.

2.4 Flow interactions with Adjacent Developments

The immediately adjacent developments are shown in Figure 7. At ground level, the site is exposed to direct winds from the north-westerly directions. The building is oriented such that adverse impacts from corner acceleration and downwash of north-westerly winds is expected at ground level. The development is taller than the surrounding buildings and so is exposed to winds from all directions at the upper levels.

Figure 7: Immediately adjacent surroundings and their approximate number of floors (F)

2.5 Assessment Criteria

The Commercial Zones Development Code in the Territory Plan (2008) stated a Mandatory requirement for the wind conditions and shown in Table 1 below:

Table 1: Wind requirement in Commercial Zones Development Code in the Territory Plan (2008).

Rules	Criteria
3.6 Wind	
There is no applicable rule.	C9 This criterion applies to buildings with a *height of building* greater than 19m but less than 28m. The wind patterns associated with the proposed building will not unreasonably reduce the safety and comfort of people in the public realm or other open spaces associated with the development, compared with a similar building on the site with a *height of building* of 19m. Compliance with this criterion will be demonstrated by a wind assessment report prepared by a suitably qualified person.
R10 This rule applies to buildings with a *height of building* greater than 28m. As a consequence of the proposed development wind speeds do not exceed the following: a) adjacent main pedestrian areas and routes (as defined in the relevant precinct code) - 10m/s b) all other adjacent streets and public places - 16 m/s. Compliance with this rule is demonstrated by a wind assessment report prepared by a suitably qualified person.	This is a mandatory requirement. There is no applicable criterion.

The above requirements have no rules for the high-level balconies/terraces.

Along with the above Mandatory requirement, in this study, a combination of Lawson (1990) and Central Sydney Planning Strategy wind criteria were used to assess the pedestrian level wind speeds. The document recommends the following wind safety and comfort criteria (Table 2).

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 cause discomfort, whereas the gust equivalent mean wind speeds defined when the wind gusts cause discomfort. Another benefit of these from a wind 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 occurs for 95% of the time. Please also refer to the Figure 8 for the comparison between the different wind comfort criteria.

Table 2: Wind criteria summarized from Lawson (1990) and Central Sydney Planning Strategy.

Measurements	**Result on Perceived Pedestrian Comfort**
Peak wind speed (0.5 second gust) once per year, **≤24m/sec** for any direction*.	Accepted international criterion for human safety to avoid a healthy pedestrian losing balance
Hourly ***mean*** wind speed, 5% of the time, **≤8m/sec**, for combined all directions.	Acceptable for **walking** (steady steps for most pedestrians)
Hourly ***mean*** wind speed, 5% of the time, **≤6m/sec,** for combined all directions.	Acceptable for **standing** (wind shopping, vehicle drop off)
Hourly ***mean*** wind speed, 5% of the time. **≤4m/sec,** for combined all directions.	Acceptable for **sitting** (outdoor cafes, gardens, park benches)

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

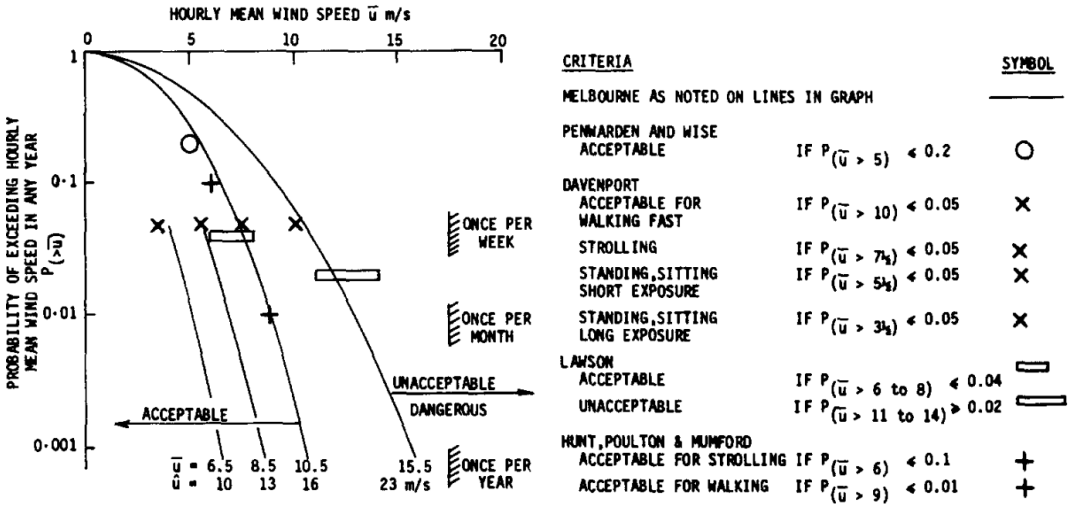


Figure 8: Comparison of various criteria for environmental wind conditions for daylight hours.

2.5.1 Use of Adjacent Pedestrian Occupied Areas & Recommended Comfort Criteria

The consideration of the (intended) function of the environment heavily influences the appropriateness of the recommended wind comfort criteria. For example, people frequenting locations such as parks are will likely tolerate a windier environment when compared to people dining at an outdoor café. This is partly due to the pedestrian's judgement in clothing and predetermined expectation of the wind environment and partly due to the sensitivity of their activities to wind. For example, patrons at outdoor dining areas are highly sensitivity to wind due to the stationary nature of the activity; whereas pedestrians on the public footpaths may maintain a level of comfort under otherwise uncomfortable conditions by partaking in general activities performed on the footpath such as walking.

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

Table 3: Recommended application of criteria

Area	**Specific location**	**Recommended Criteria**
Public Footpaths, Access ways	Along Marcus Clarke Street, University Avenue, Darwin Place, Farrell Place and within the proposed development on ground level (Figure 9)	Walking
Building Entrances	Building Entrances Along Marcus Clarke Street and University Avenue (Figure 9)	Standing
Seating	Along Marcus Clarke Street and within the proposed development on ground level (Figure 9)	Sitting
Common Spaces on Rooftop	Located on level 12 (Figure 10)	Walking (See discussion below)
Balcony/Terraces	Up the height of the building	Walking (See discussion below)

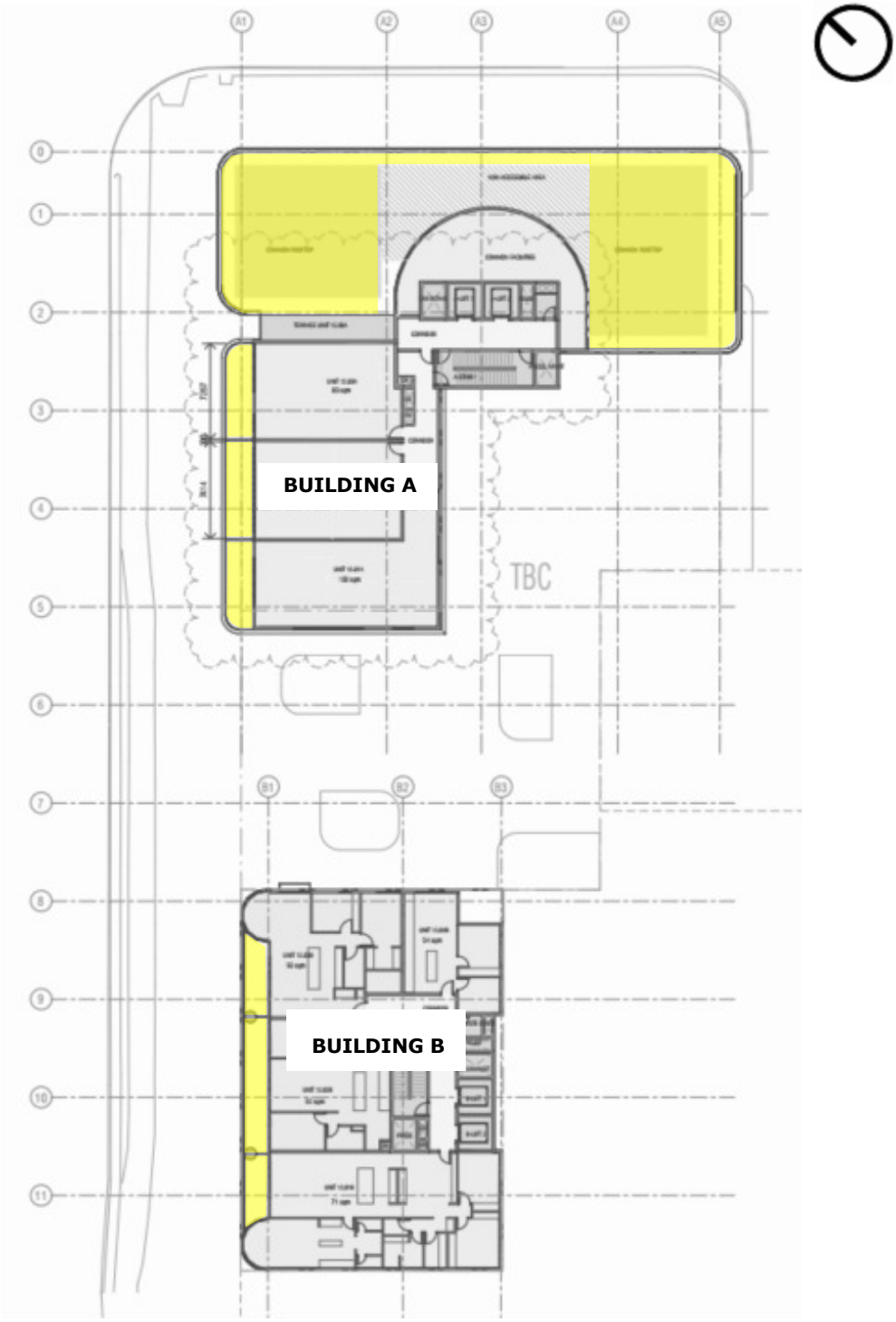
2.5.2 Terrace / Balcony Recommended Criterion Discussion

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:

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

Recommended to fulfil Walking *Recommended to fulfil Standing* *Recommended to fulfil Sitting*

Figure 9: Ground floor with recommended wind criteria overlaid



Recommended to fulfil Walking

Figure 10: Level 12 with recommended wind criteria overlaid

3 Pedestrian Level Wind Effects

3.1 Discussion & Recommendations

3.1.1 Ground level areas

The ground level areas and footpaths of the proposed development are exposed to the prevailing north-westerly winds. These areas are heavily shielded from the prevailing southerly and easterly winds due to the neighbouring mid-rise buildings. The north-westerly winds are expected to impact the upper levels of Building A and downwash onto the ground level areas. This adverse wind effect is considered to have minor impacts on the ground level areas with the proposed awning included (shown in Figure 11). Additionally, the north-westerly winds are expected to impact the ground level areas and footpath in the form of direct flow. Corner accelerated flow is expected from this direct flow on the north-western facade corners of buildings A and B and channelled flow is expected in between buildings A and B and flow towards Darwin Place. These adverse wind effects are expected to be mitigated with the proposed landscaping (recommended to be 1-1.5m high), proposed Kiosk, proposed 2-5m high densely foliating evergreen tree and existing tree as shown in Figure 11. With the current design, the wind conditions on the ground level areas, footpath and building entrances are expected to be suitable for their intended use.

3.1.2 Elevated areas of buildings A and B

The elevated areas of buildings A and B are exposed to the prevailing north-westerly winds. The elevated areas receive major shielding from the prevailing easterly and southerly winds, though it is expected that the easterly winds will have a minor impact on the level 12 Common Rooftop. The north-westerly winds are expected to corner accelerate on the northern and western corners of Building A. From levels 08 to 12 these balconies are expected to be vulnerable to uncomfortable winds. However, with the proposed standard height impermeable balustrade, these adverse wind conditions are expected to be mitigated, and these balconies are expected to be suitable for their intended use. The Common Rooftop on level 12 is impacted by the prevailing north-westerly winds in the form of direct flow. Furthermore, the shielded flow from the easterly winds is expected to have minor impacts on this Common Rooftop and are in the form of direct flow. With the recommended 1.5-2m high densely foliating landscaping around the perimeter and the communal terrace as shown in Figure 12, the wind conditions on the Common Rooftop are expected to be suitable for their intended use. Additionally, Vipac recommends standard height impermeable balustrades in all other balconies.

With the proposed features and recommendations mentioned above for the ground level and elevated areas of buildings A and B, the safety criterion is expected to be fulfilled. It should be noted that this study is based on experience only and has not utilised any CFD simulation or experimental data for the analysis.

Vipac recommends a wind tunnel test or CFD simulation to be conducted in the detailed stage to quantify the wind conditons and determine proper wind control measures whenever possible.

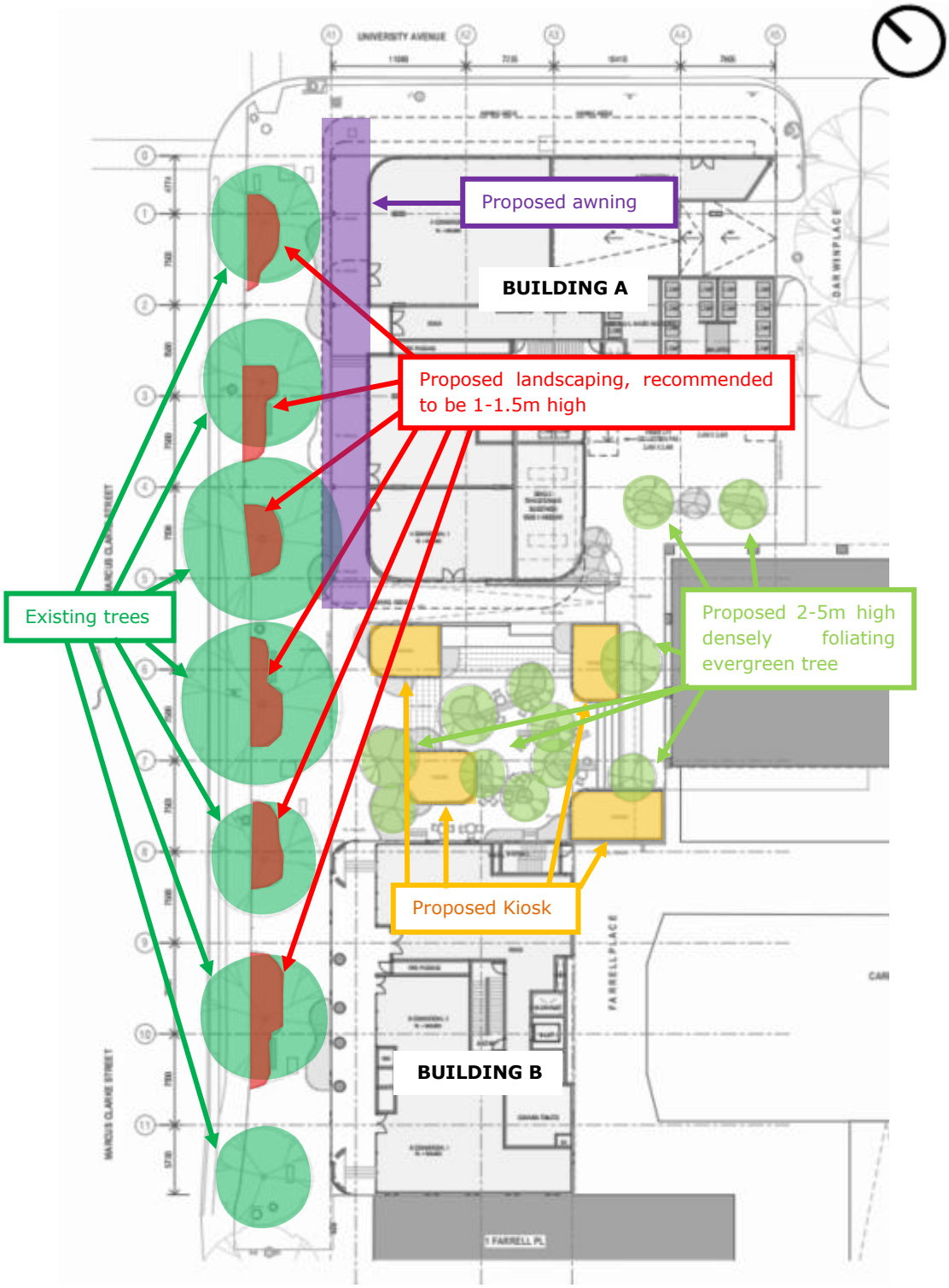


Figure 11: Ground floor plan with the proposed wind control measures overlaid

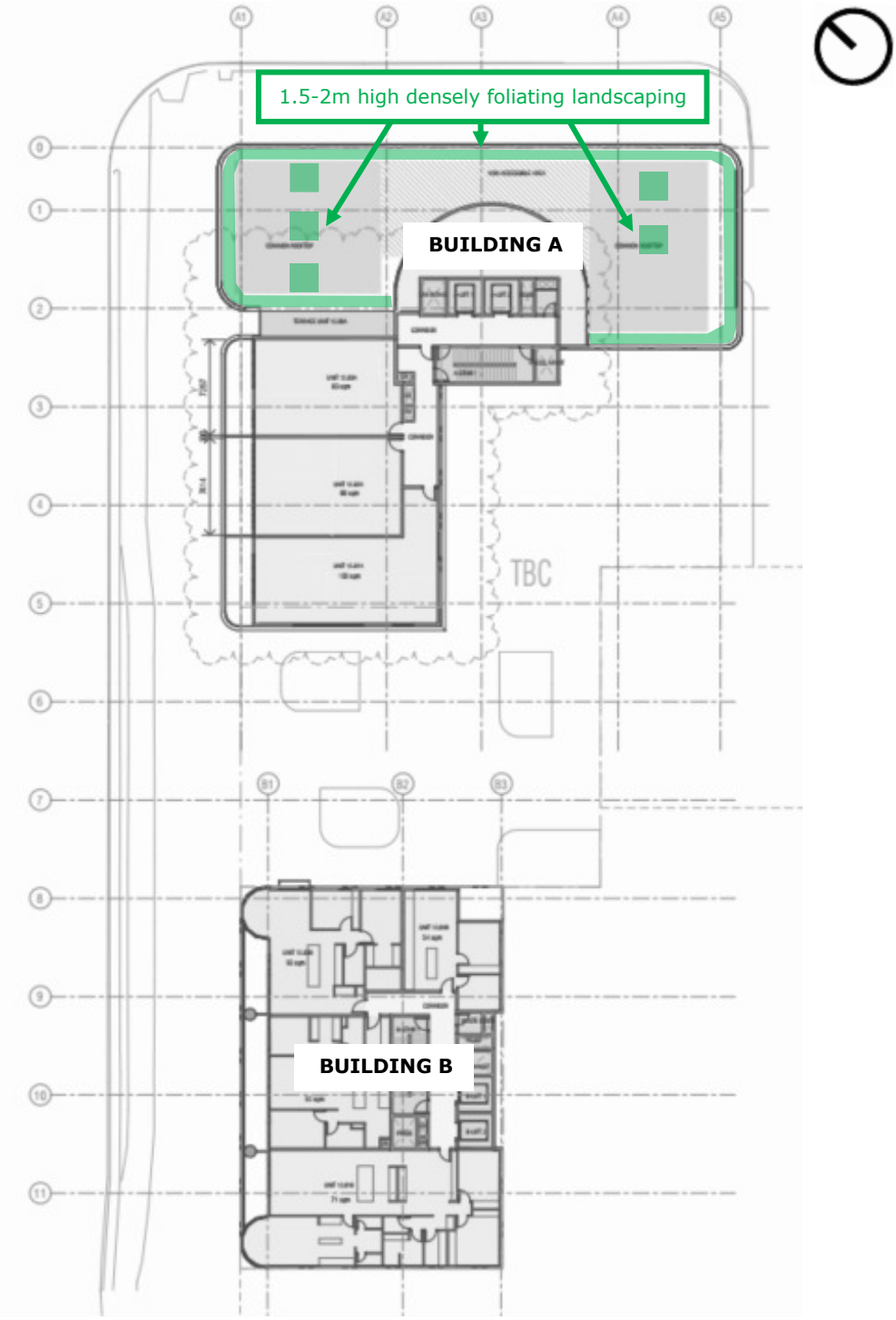


Figure 12: Level 12 plan with the recommended wind control measures overlaid

4 Conclusions

An appraisal of the likely wind conditions at the pedestrian ground level and elevated areas of the proposed development at **17-21 University Avenue, Canberra, ACT** has been made.

Vipac has carefully considered the form and exposure of the proposed development, nominated criteria for various public areas according to their function and referred to past experience to produce our opinion of likely wind conditions.

The findings of this study can be summarised as follows:

With proposed design:

- Wind conditions in the ground level footpath areas and access ways would be expected to be within the **walking** comfort criterion.
- The main entrances would be expected to be within the **standing** comfort criterion.
- The seating areas in the ground level areas would be expected to be within the **sitting** comfort criterion.
- The terraces and balconies would be expected to be within the recommended **walking** comfort criterion.
- **With recommendations,** the Common Rooftop is expected to have wind conditions within the recommended **walkding** comfort criterion.
- All areas are expected to fulfil the **Safety** criterion.

Vipac strongly recommends a CFD simulation or wind tunnel test to be conducted to quantify the wind conditions and determine the proper wind control measures wherever necessary.

As a general statement, educating occupants about wind conditions at open terrace/balcony areas during high-wind events and fixing loose, lightweight furniture on the terrace is highly recommended.

The assessments provided in this report have been made based on experience of similar situations in Canberra and around the world. As with any opinion, it is possible that an assessment of wind effects based on experience and without experimental validation may not account for all complex flow scenarios in the vicinity.

This Report has been Prepared

For

syz

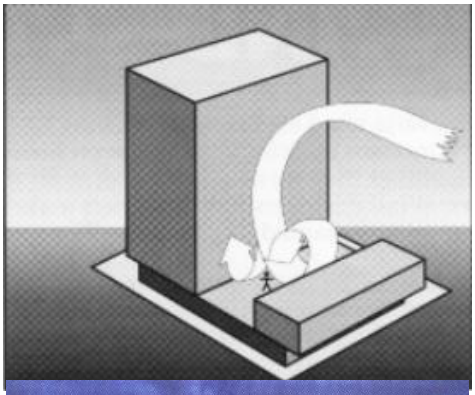
By

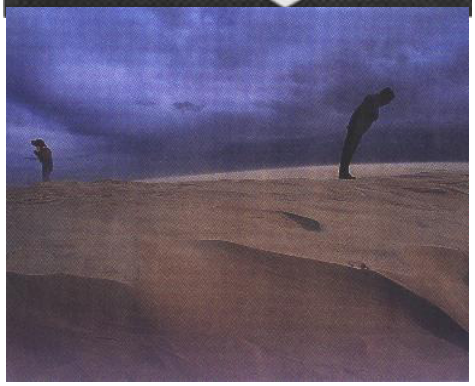
VIPAC ENGINEERS & SCIENTISTS PTY LTD.

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 References

[1] *Structural Design Actions, Part 2: Wind Actions*, Australian/New Zealand Standard 1170.2:2011

[2] *Wind Effects on Structures* E. Simiu, R Scanlan, Publisher: Wiley-Interscience

[3] *Architectural Aerodynamics* R. Aynsley, W. Melbourne, B. Vickery, Publisher: Applied Science Publishers

[4] *The Aerodynamic Characteristics of Windbreaks, Resulting in Empirical Design Rules* J. Gandemer, Publisher: *Journal of Wind Engineering and Industrial Aerodynamics*

[6] *Wind Protection by Model Fences in a simulated Atmospheric Boundary Layer* J.K. Rain, D.C. Stevenson, Publisher: *Journal of Industrial Aerodynamics, 2*

[7] *Criteria for Environmental Wind Conditions* W.H Melbourne, Publisher: *Journal of Wind Engineering and Industrial Aerodynamics*

[8] *Wind Design Guide* J. Bennett Publisher: *BBSC 433 – Architectural Aerodynamics*

[9] *Central City Built Form Review: Wind Assessments*, Global Wind Technology Services

[10] *Wind Guidelines for Planning Applicants* H. Fricke Publisher: *Moonee Valley City Council*

Appendix C Drawings List

Drawings Received: **August 2025**

TA2422_ BASEMENT 01.pdf

TA2422_ BASEMENT 02.pdf

TA2422_ BASEMENT 03.pdf

TA2422_ BASEMENT 04.pdf

TA2422_ BUILDING A EAST & WEST ELEVATIONS.pdf

TA2422_ BUILDING A NORTH & SOUTH ELEVATIONS.pdf

TA2422_ BUILDING A SHORT SECTION 1 & 2.pdf

TA2422_ BUILDING A SHORT SECTION 3.pdf

TA2422_ BUILDING B EAST & WEST ELEVATIONS.pdf

TA2422_ BUILDING B NORTH & SOUTH ELEVATIONS.pdf

TA2422_ BUILDING B SHORT SECTION 1 & 2.pdf

TA2422_ GA LEVEL 01.pdf

TA2422_ GA LEVEL 02.pdf

TA2422_ GA LEVEL 03.pdf

TA2422_ GA LEVEL 04.pdf

TA2422_ GA LEVEL 05.pdf

TA2422_ GA LEVEL 06.pdf

TA2422_ GA LEVEL 07.pdf

TA2422_ GA LEVEL 08.pdf

TA2422_ GA LEVEL 09.pdf

TA2422_ GA LEVEL 10.pdf

TA2422_ GA LEVEL 11.pdf

TA2422_ GA LEVEL 12.pdf

TA2422_ GA LEVEL 13.pdf

TA2422_ GA LEVEL GROUND.pdf

TA2422_ OVERALL LONG SECTION 1.pdf

TA2422_ OVERALL LONG SECTION 2.pdf

TA2422_GA_LEVEL 14 & ROOF-A.pdf

TA2422_GA_LEVEL 15.pdf

TA2422_GA_LEVEL ROOF-B.pdf