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Make Ventures Pty Ltd

342-348 Victoria Street, Brunswick

Wind Impact Assessment

30N-23-0063-TNT-55201-12

24 October 2024

Job Title:	342-348 Victoria Street, Brunswick
Report Title:	Wind Impact Assessment
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Prepared For:	**Prepared By:**
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Issued By:	Eric Yuen 24 Oct 2024		Wind Team Leader

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Rev. #	*Comments / Details of change(s) made*	*Date*	*Revised by:*
Rev. 00	Original issue	05 May 2023	
Rev. 01	Updated Drawings	19 May 2023	E. Yuen
Rev. 02-03	Updated Drawings	24 May 2023	R. Islam
Rev. 04-05	Minor Amendments	29 May 2023	R. Islam
Rev. 06	Updated Drawings	25 Oct 2023	R. Islam
Rev. 07-08	Updated Drawings	23 Nov 2023	E. Yuen
Rev. 09-11	Updated drawings	24 Jul 2024	RI
Rev. 12	Updated drawings	24 Oct 2024	ZX

Executive Summary

Make Ventures Pty Ltd commissioned Vipac Engineers and Scientists Ltd to prepare a statement of wind effects for the ground level areas adjacent to the proposed development as well as the balcony and terraces areas for the development located at **342-348 Victoria Street, Brunswick.** This appraisal is based on Vipac's experience as a wind-engineering consultancy.

Updated drawings of the proposed development were provided by **Fieldwork** in **Oct 2024**.

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;
- Wind conditions at the main entrances would be expected to be within the recommended **standing** comfort criterion;
- Wind conditions at the communal terraces would be expected to be within the recommended **standing** comfort criterion;
- Wind conditions at the seating areas would be expected to be within the recommended **sitting** comfort criterion; and
- The proposed development is expected to generate wind gusts within the safety criterion.

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 are highly recommended.

The assessments provided in this report have been made based on experience of similar situations in Melbourne 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 **Make Ventures Pty Ltd** to carry out an appraisal of the pedestrian wind effects at the ground level of the proposed development at **342-348 Victoria Street, Brunswick.**

Strong winds in pedestrian areas are frequently encountered in central business districts of cities around the world; including 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 is comprised of 4 residential buildings, with Building 1 at 38.84m, Building 2 at 32.85m, Building 3 at 28.74m & Building 4 at 34.25m. The site is bounded by a train line to the west, Victoria Street to the north, Wilkinson Street to the south and Rosser Street to the east. A satellite image of the proposed development site and various elevations of the building are shown in Figure 1 and Figure 2, respectively.

This report details the opinion of Vipac as an experienced wind engineering consultancy regarding the wind effects in ground level footpath areas adjacent to 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 a large number of 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 areas of the proposed development [2] & [3].

Updated drawings of the proposed development were supplied to Vipac by **Fieldwork** in **Oct 2024**. A list of drawings supplied is provided in Appendix C of this report.

Figure 1: Aerial view of the proposed development site.

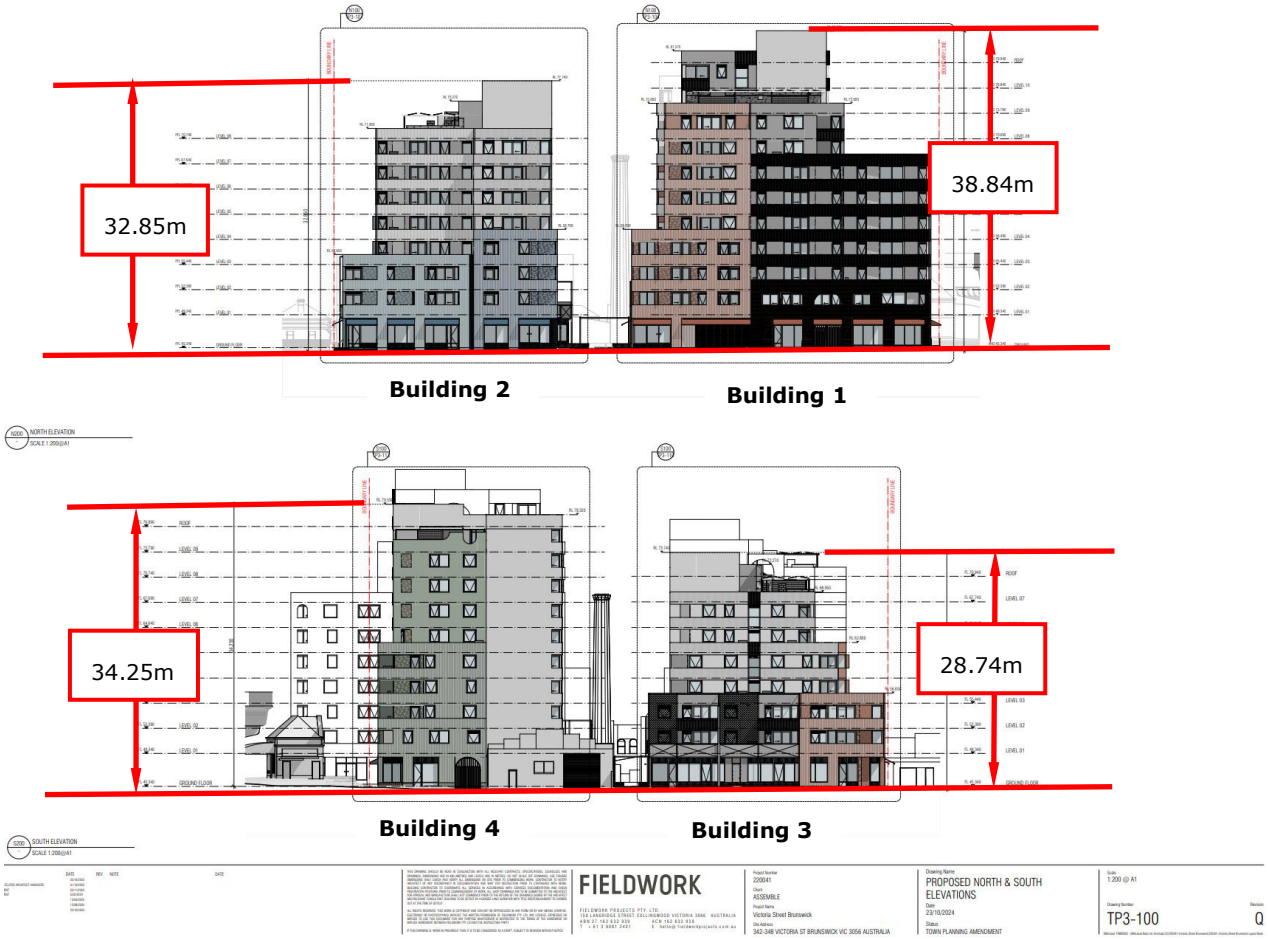


Figure 2: North (top) and south (bottom) elevations of the proposed development.

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; and
- 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 0.1% and 20% 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 in excess of 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 1.8km radius predominately by low to mid-rise developments, and Clifton Park to the west. A satellite image showing these site surroundings is shown in Figure 3.

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 3 for all wind directions (Figure 3).

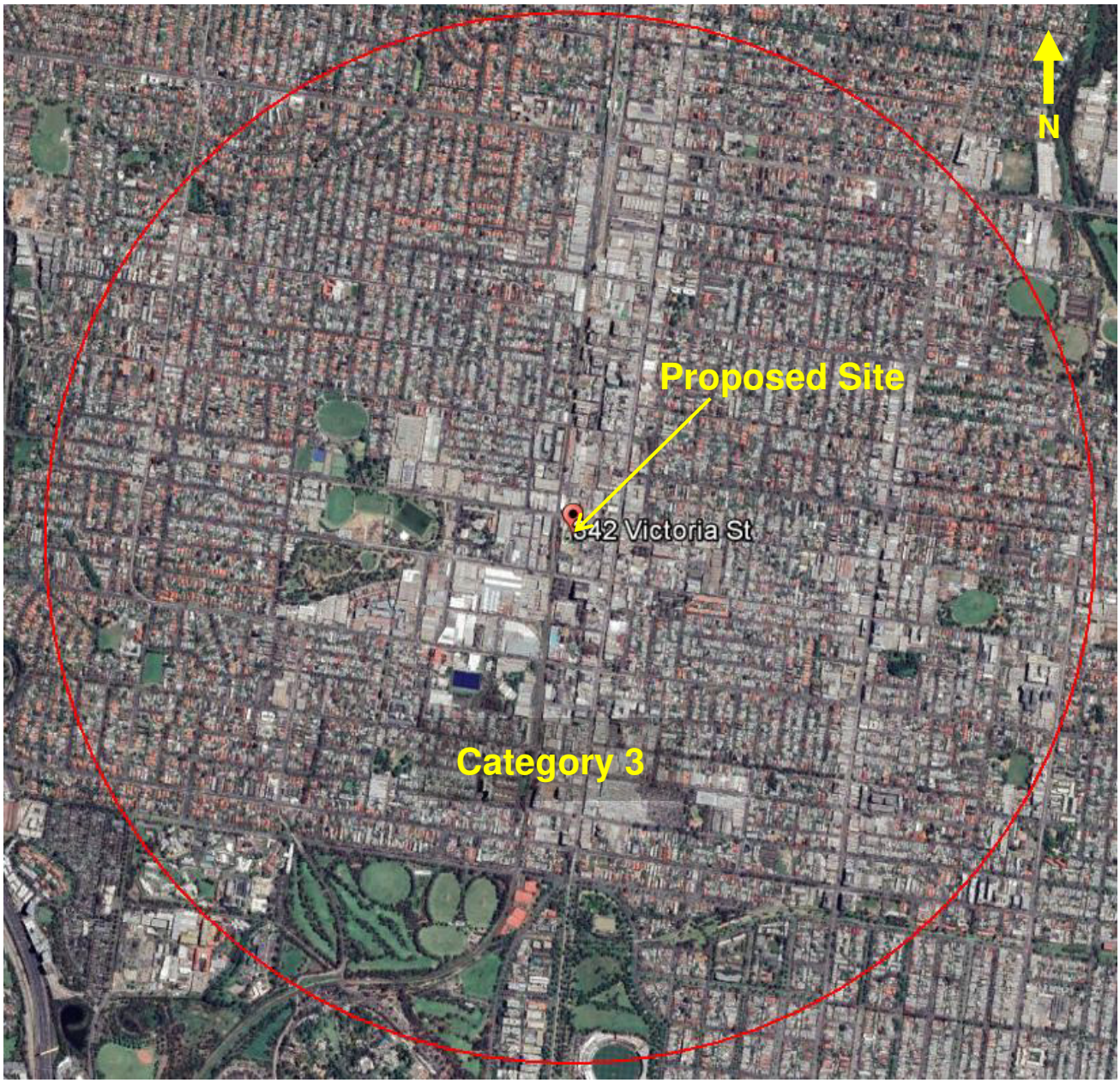


Figure 3: Assumed terrain categories for wind speed estimation.

2.2 Regional Wind Climate

The mean and gust wind speeds have been recorded in the Melbourne area 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 0.1% of time and 20% of time exceeded are shown in Figure 4. The wind data at this free stream height is common to all Melbourne city sites and may be used as a reference to assess ground level wind conditions at the site.

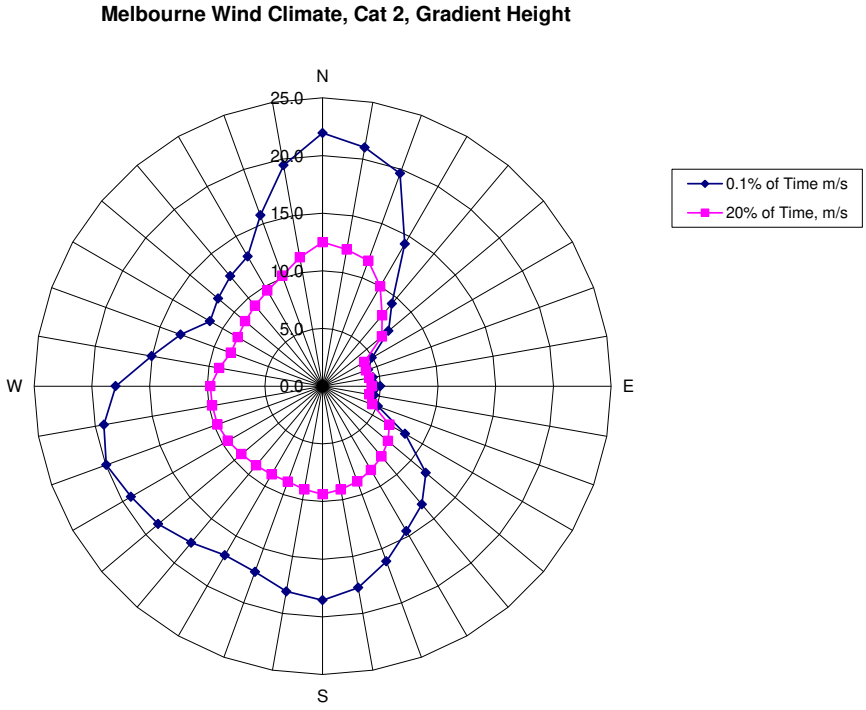


Figure 4: Directional Distribution of Mean Hourly Wind Velocities (m/s) for 0.1% and 20% exceeded at Gradient Height for Melbourne.

2.3 Building Geometry and Orientation

The proposed development is comprised of 4 buildings between 28.74m-38.84m. The overall plan-form dimensions are approximately 73.4m x 117.4m as shown in Figure 5. The main entrances are located throughout site. The development incorporates tower setbacks from all surrounding street boundaries.

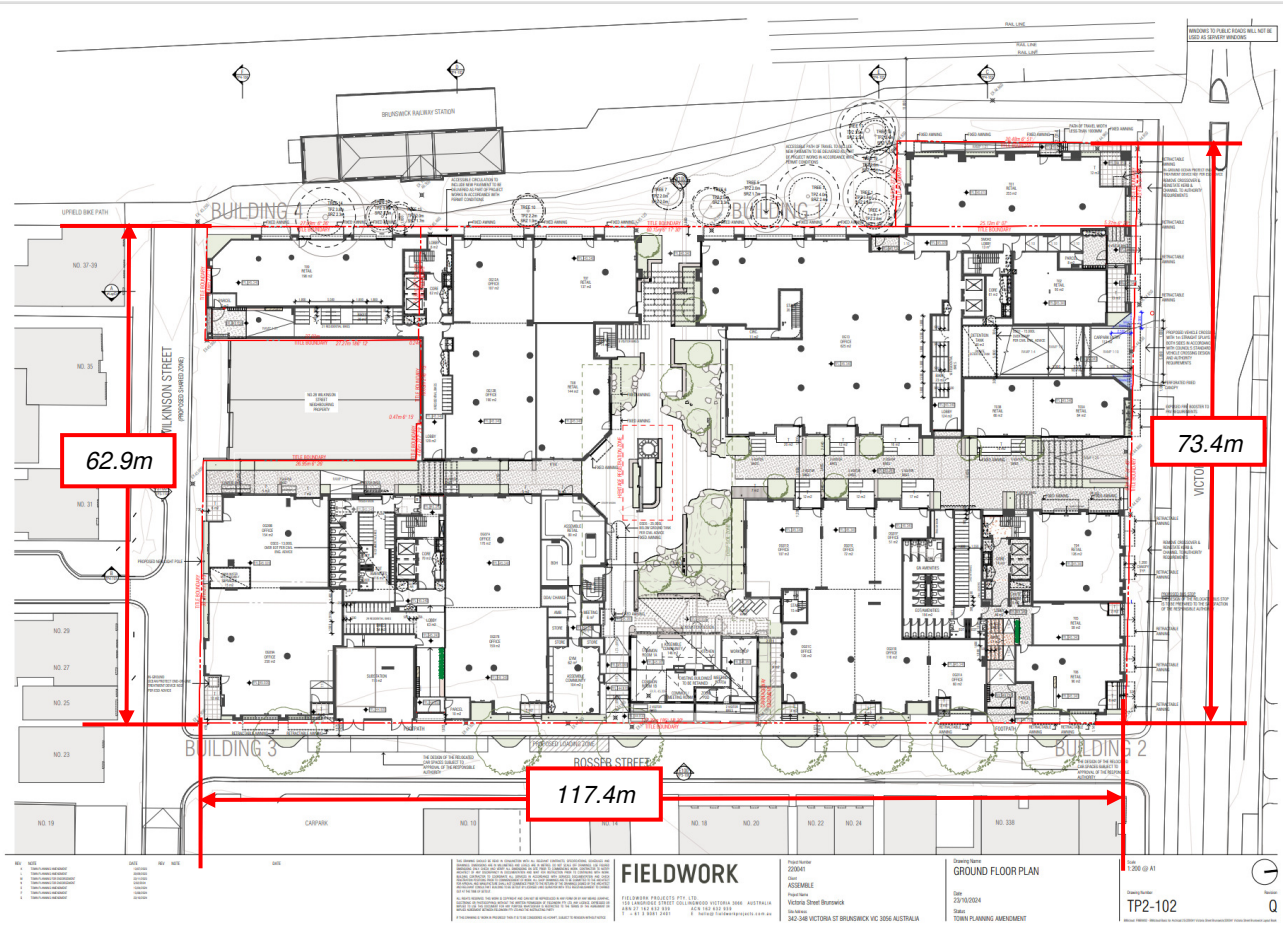


Figure 5: Ground floor plan with the overall dimensions overlaid.

2.4 Flow interactions with Adjacent Developments

The immediately adjacent developments are shown in Figure 6. At ground level, the site is exposed to direct winds from the northerly and westerly directions channelling along the rail line and Victoria Street respectively. The building is oriented such that adverse impacts from corner acceleration 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 6: Immediately adjacent surroundings and their approximate number of storeys (S).

2.5 Assessment Criteria

The following wind comfort criteria detailed in Table 1 were applied in this study.

Table 1: Wind Comfort Criteria as per Clause 58.04-4

Unsafe	Comfortable
Annual maximum 3 second gust wind speed exceeding **20m/sec** with a probability of exceedance of 0.1% considering at least 16 wind directions.	Hourly mean wind speed or gust equivalent mean speed from all wind directions combined with probability of exceedance less than 20% of the time, equal to or less than: **3m/sec** for sitting areas (outdoor cafés) **4m/sec** for standing areas (window shopping, queuing) **5m/sec** for walking areas (steady steps for most pedestrians)

This criterion specifically calls for the safety criterion to be used to assess infrequent winds (e.g. peak event of ≤ 0.1% of the time); and the perceived pedestrian comfort to be assessed based on frequently occurring winds (e.g. winds that occurs 80% of the time).

In Table 1, the mean wind velocity is defined as the maximum of hourly mean or gust equivalent mean (Gust/1.85)

This criteria specifies that safe and comfortable wind conditions must be achieved in publicly accessible areas within a distance equal to half the longest width of the building measured from all facades or half the overall height of the building, whichever is greater, as shown in Figure 7.

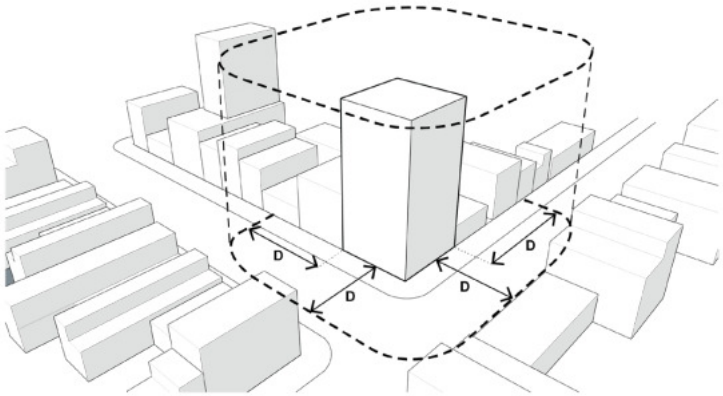


Figure 7: Assessment distance.

2.5.1 Use of Adjacent Pedestrian Occupied Areas & Recommended Comfort Criteria

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

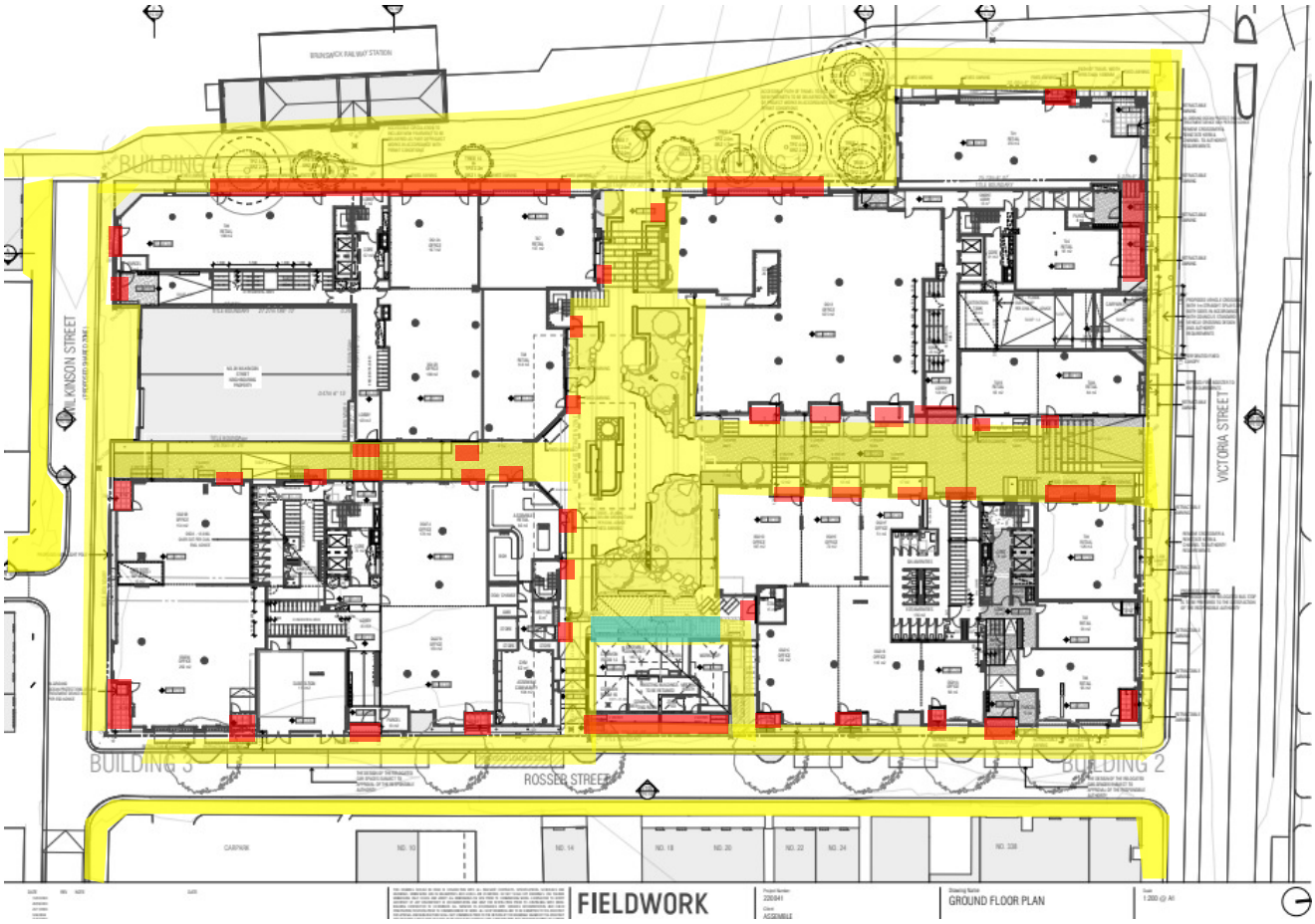
Table 2: Recommended application of criteria

Area	Specific location	Recommended Criteria
Public Footpaths, Access ways	Along Victoria Street, Wilkinson Street, Rosser Street and the Upfield Shared Path (Figure 8)	Walking
Building Entrances	Main building entrances along throughout site (Figure 8)	Standing
Outdoor Communal Areas	Located on the levels 7-9 (Figure 9 - Figure 11)	Standing
Seating Areas	East of site	Sitting
Balcony/Terraces	Up the height of the building	Walking (See discussion below)

2.5.2 Terrace / Balcony Recommended Criterion Discussion

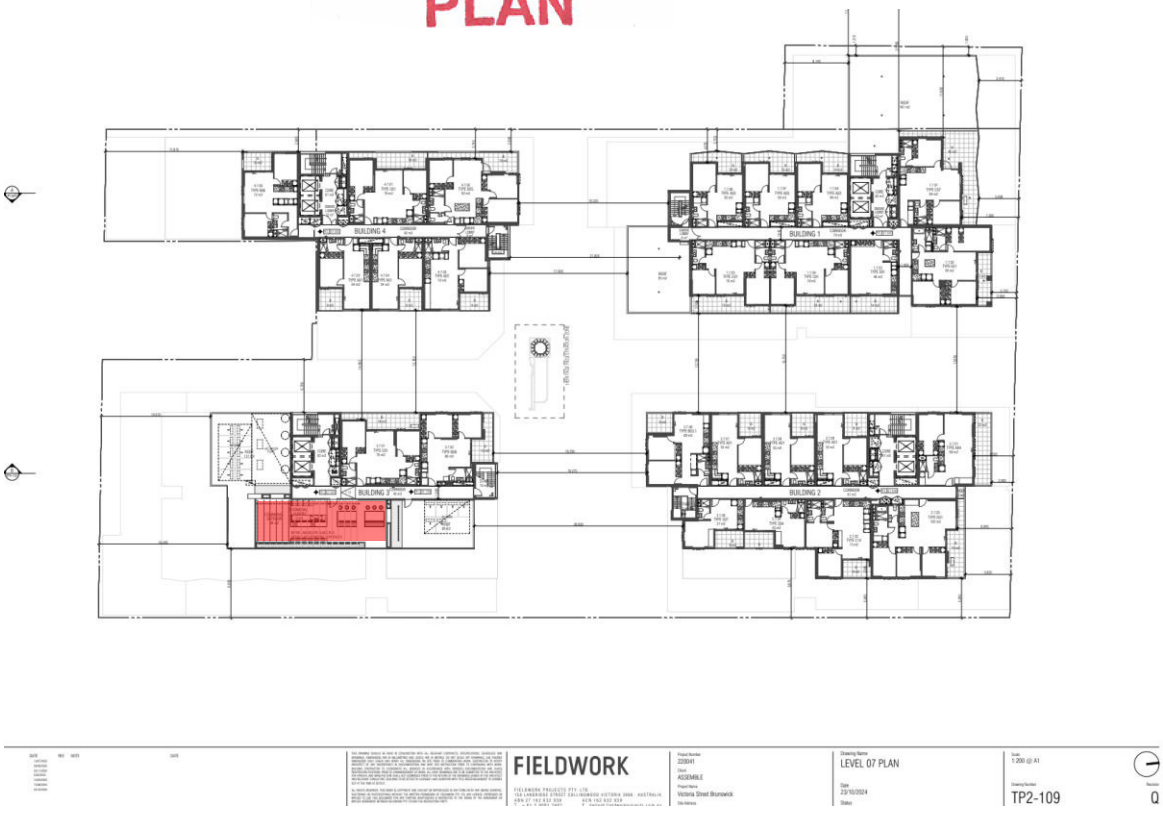
There are Private Balconies and Terraces located up the height of the development. Vipac recommends as a minimum that balcony/terrace areas meet the criterion for walking since:

- 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;
- many similar developments in Melbourne and other Australian capital cities experience wind conditions on balconies and elevated deck areas in the vicinity of the criterion for walking.



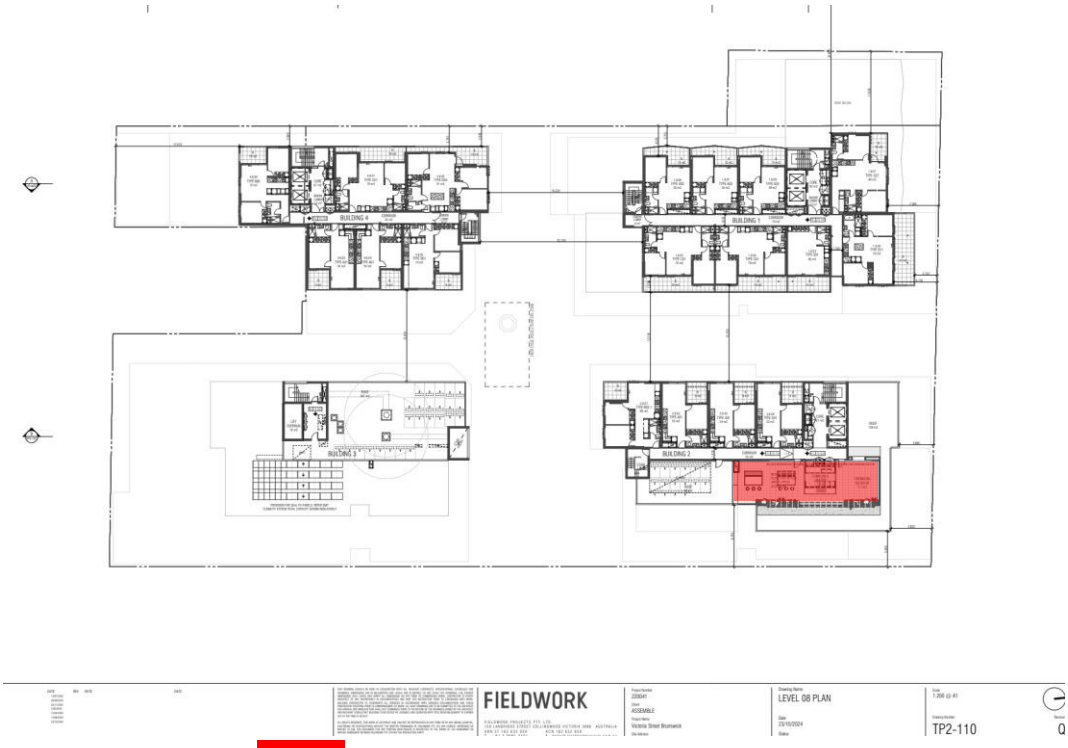
Recommended to fulfil Walking *Recommended to fulfil Standing* *Recommended to fulfil Sitting*

Figure 8: Ground floor plan with recommended wind criteria overlaid.



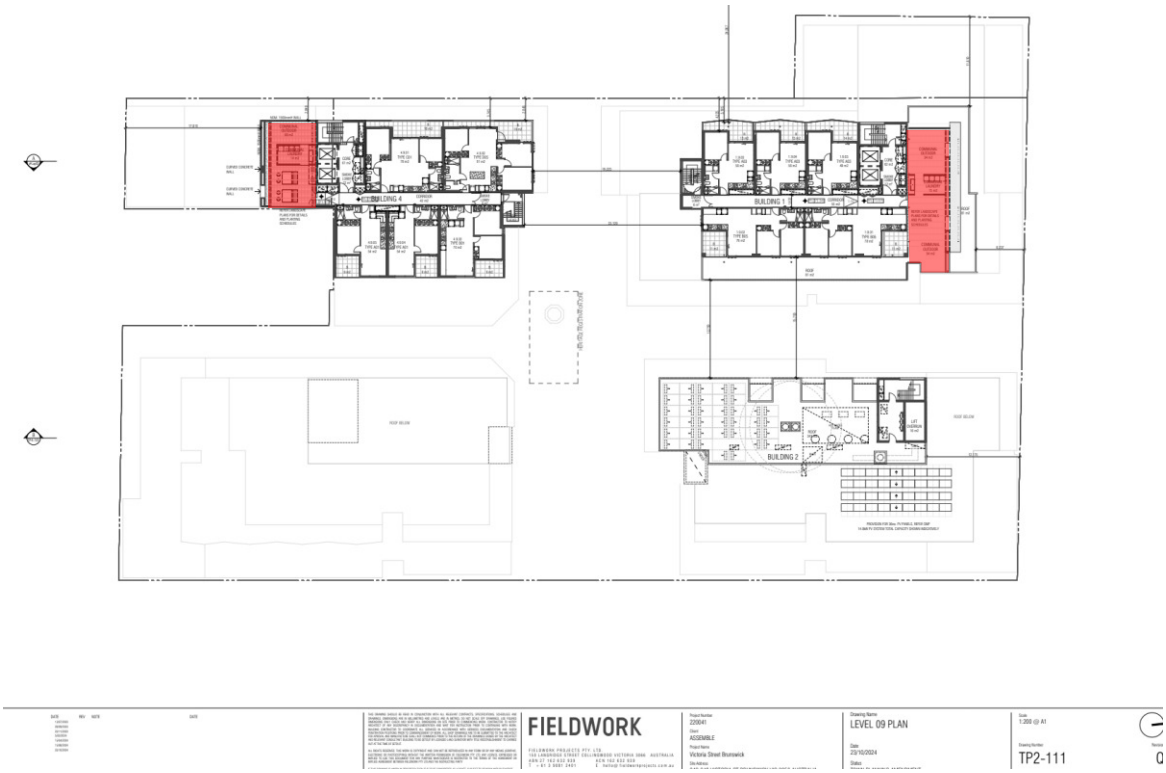
Recommended to fulfil Standing

Figure 9: Floor plans of level 7 with recommended wind criteria overlaid.



Recommended to fulfil Standing

Figure 10: Floor plan of level 8 with recommended wind criteria overlaid.



Recommended to fulfil Standing

Figure 11: Floor plans of level 9 with recommended wind criteria overlaid.

3 Pedestrian Level Wind Effects

3.1 Discussion & Recommendations

The proposed design has a number of features that are expected to be beneficial to the pedestrian wind environment. This is inclusive but not limited to the following:

- Canopies above active frontages
- Setback entrances
- Arbours structures at strategic locations
- Landscaping
- Setback tower design for all buildings; and
- Protruding and articulated façade elements and colonnades.

Some channelling of northerly winds between Buildings 1 & 2, westerly winds between Buildings 1 & 4 and south westerly winds between Buildings 3 & 4 are expected to cause some uncomfortable winds. However, the strategically placed arbour structures at these locations are expected to be beneficial to the wind environment. Most pedestrian footpaths are expected to be within the recommended walking comfort criterion, some uncomfortable winds are expected at the northern-western corner of Building 1 due to corner acceleration effects. However, the setback corner is expected to assist in ameliorating these adverse winds. Additionally, the extensive landscaping throughout the precinct is expected to provide further shielding value to the public realm, such that the central plaza and laneways are expected to meet the more stringent standing or sitting wind comfort criterion.

Similarly, the main entrances throughout the site are expected to benefit from the proposed landscaping and arbour structures. Furthermore, many of the entrances are also setback from the articulated façade. Such that the wind speeds at all entrance locations are expected to be within the recommended standing comfort criterion.

The outdoor dining area to the east off the Rosser Street terrace area located beneath an extensive pergola and is also shielded by the proposed landscaping to the west. As such, this area is expected to meet the recommended sitting comfort criterion.

The communal terraces for all buildings have a number of features that are expected to be beneficial to the pedestrian wind environment. This is inclusive but not limited to the following:

- Relatively small dimensions;
- 1.2-1.5m high solid balustrades across all buildings; and
- Arbour and roof structures

With these design choices, wind speeds at all communal terraces are expected to be within the recommended standing comfort criterion. The more shielded areas behind higher windscreens are expected to meet the more stringent standing or sitting wind comfort criterion.

The proposed development would be expected to have wind conditions within the safety criterion.

It should be noted that this study is based on experience only and has not utilised any experimental data for the analysis.

4 Conclusions

An appraisal of the likely wind conditions at the pedestrian ground level and terrace areas of the proposed development at **342-348 Victoria Street, Brunswick** 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:

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The assessments provided in this report have been made based on experience of similar situations in Melbourne 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

Make Ventures Pty Ltd

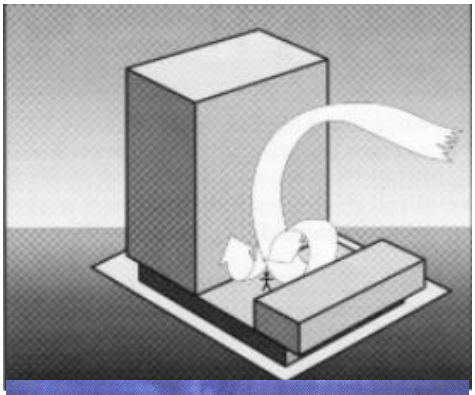
By

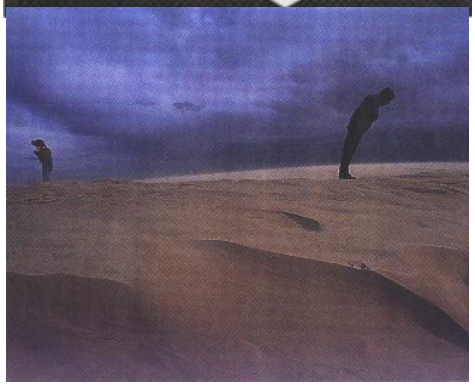
VIPAC ENGINEERS & SCIENTISTS PTY LTD.

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

Appendix C Drawings List

Architectural plans (Revision Q) received: 23rd Oct 2024

ARCHITECTURAL DRAWINGS SCHEDULE	
	DRAWING NAME
TP0-000	COVER SHEET
TP0-001	DEVELOPMENT SUMMARY
TP0-002	BADS ASSESSMENT
TP0-003	BADS ASSESSMENT
TP0-004	BADS ASSESSMENT
TP0-005	BADS ASSESSMENT
TP2-100	BASEMENT LEVEL 02 PLAN
TP2-101	BASEMENT LEVEL 01 PLAN
TP2-102	GROUND FLOOR PLAN
TP2-103	LEVEL 01 PLAN
TP2-104	LEVEL 02 PLAN
TP2-105	LEVEL 03 PLAN
TP2-106	LEVEL 04 PLAN
TP2-107	LEVEL 05 PLAN
TP2-108	LEVEL 06 PLAN
TP2-109	LEVEL 07 PLAN
TP2-110	LEVEL 08 PLAN
TP2-111	LEVEL 09 PLAN
TP2-112	LEVEL 10 PLAN
TP2-114	ROOF LEVEL PLAN
TP2-115	28 WILKINSON STREET INDICATIVE CONCEPT PLANS
TP2-116	PUBLIC AREAS PLAN
TP2-117	13 & 15 ROSSER STREET
TP3-100	PROPOSED NORTH & SOUTH ELEVATIONS
TP3-101	PROPOSED EAST & WEST ELEVATIONS
TP3-102	PROPOSED NORTH & SOUTH SECTIONAL ELEVATIONS
TP3-103	PROPOSED EAST & WEST SECTIONAL ELEVATIONS
TP3-104	BUILDING 1 - PROPOSED NORTH & SOUTH ELEVATIONS
TP3-105	BUILDING 1 - PROPOSED EAST ELEVATION
TP3-106	BUILDING 1 - PROPOSED WEST ELEVATION
TP3-107	BUILDING 2 - PROPOSED NORTH & SOUTH ELEVATIONS
TP3-108	BUILDING 2 - PROPOSED EAST ELEVATION
TP3-109	BUILDING 2 - PROPOSED WEST ELEVATION
TP3-110	BUILDING 3 - PROPOSED NORTH & SOUTH ELEVATIONS
TP3-111	BUILDING 3 - PROPOSED EAST ELEVATION
TP3-112	BUILDING 3 - PROPOSED WEST ELEVATION
TP3-113	BUILDING 4 - PROPOSED NORTH & SOUTH ELEVATIONS
TP3-114	BUILDING 4 - PROPOSED EAST ELEVATION
TP3-115	BUILDING 4 - PROPOSED WEST ELEVATION
TP4-100	SITE SECTION A
TP4-101	SITE SECTION B
TP4-102	SITE SECTION C
TP4-103	SITE SECTION D
TP4-104	CARPARK RAMP SECTION
TP4-105	SITE SECTION E
TP4-106	SITE SECTION F