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Horoz Pty Ltd

38-40 Moreland Street, Footscray

Wind Impact Assessment

30N-24-0364-TNT-93434-0

12 December 2024

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Prepared For:	**Prepared By:**
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Revision History:

Rev. #	*Comments / Details of change(s) made*	*Date*	*Revised by:*
Rev. 00	Original issue	15 Nov 2024	

Executive Summary

Horoz 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 at **38-40 Moreland Street, Footscray.** This appraisal is based on Vipac's experience as a wind-engineering consultancy.

Drawings of the proposed development were provided by **M3 Group** in **November 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 recommended **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 terrace areas would be expected to be within the recommended **standing** comfort criterion;
- Wind conditions at the swimming pool areas would be expected to be within the recommended **walking** comfort criterion;
- Wind conditions in the private balconies would be expected to be within the recommended **walking** comfort criterion; and
- Wind conditions would be expected to fulfil 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.

Table of Contents

1 Introduction

Vipac Engineers and Scientists has been commissioned by **Horoz Pty Ltd** to carry out an appraisal of the pedestrian wind effects at the ground level of the proposed development at **38-40 Moreland Street, Footscray.**

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 an 8-storey residential building with a roof height of 25.6m from lower ground floor. The site is bounded by Yewers Street and existing developments to the north, Moreland Street to the east, a parking lot to the west and a vacant lot currently under construction (four 5-8 storey buildings) to the south. The site context of the proposed development and the southern elevation 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].

Drawings of the proposed development were supplied to Vipac by **M3 Group** in **November 2024**. A list of drawings supplied is provided in Appendix C of this report.

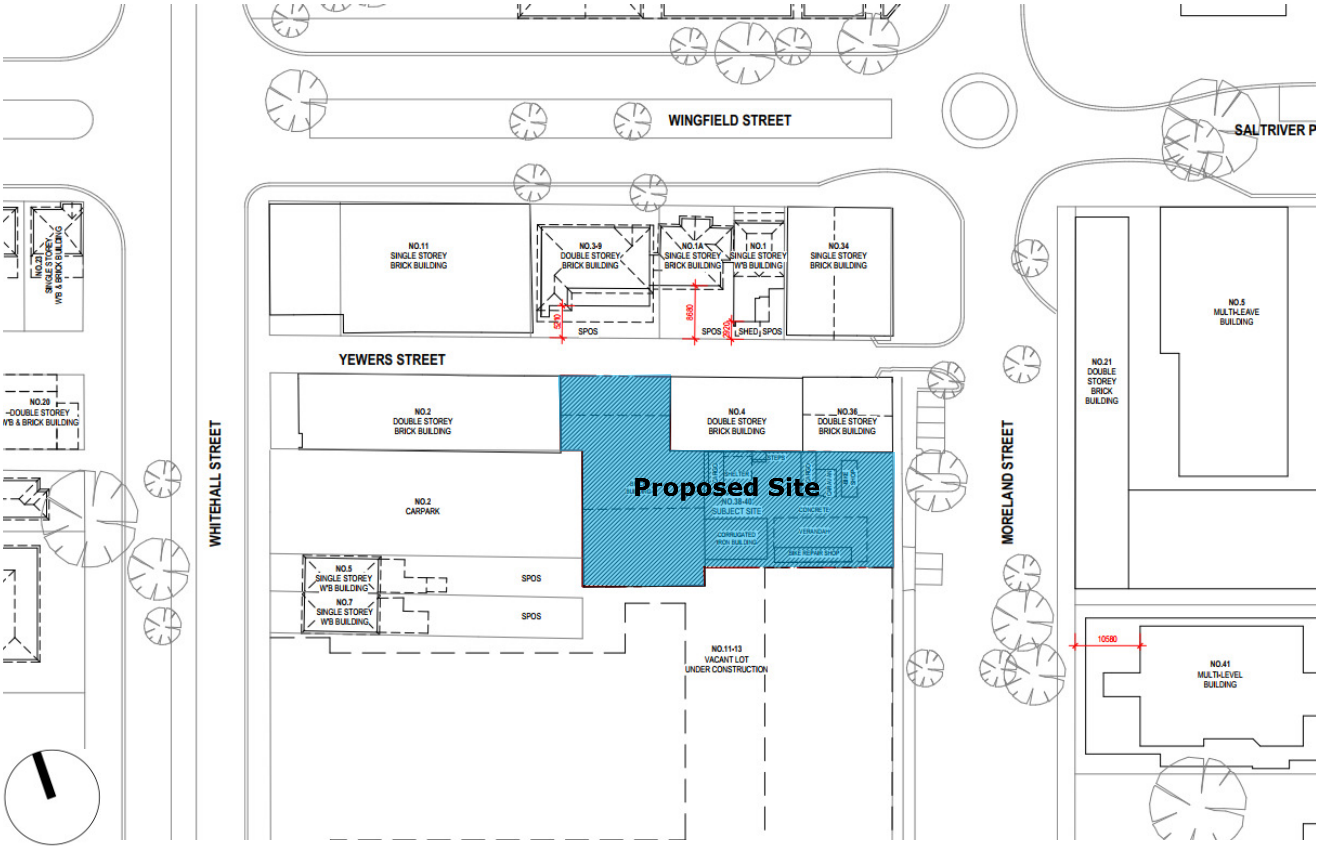


Figure 1: Site context of the proposed development.

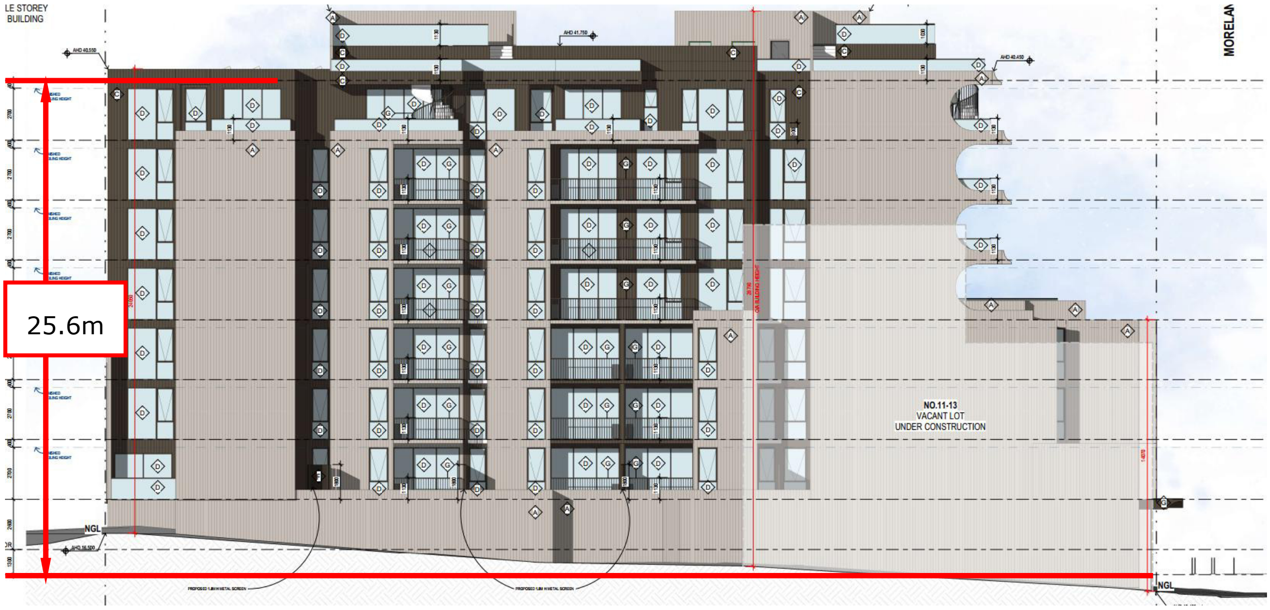


Figure 2: South elevation of the proposed development.

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 1.5km radius predominately by low to mid-rise developments, with Footscray Park and Flemington Racecourse to the far north. 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 2.5 for 330-360 & 0-40 azimuth degrees, and Terrain Category 3 for all other wind directions (Figure 3).

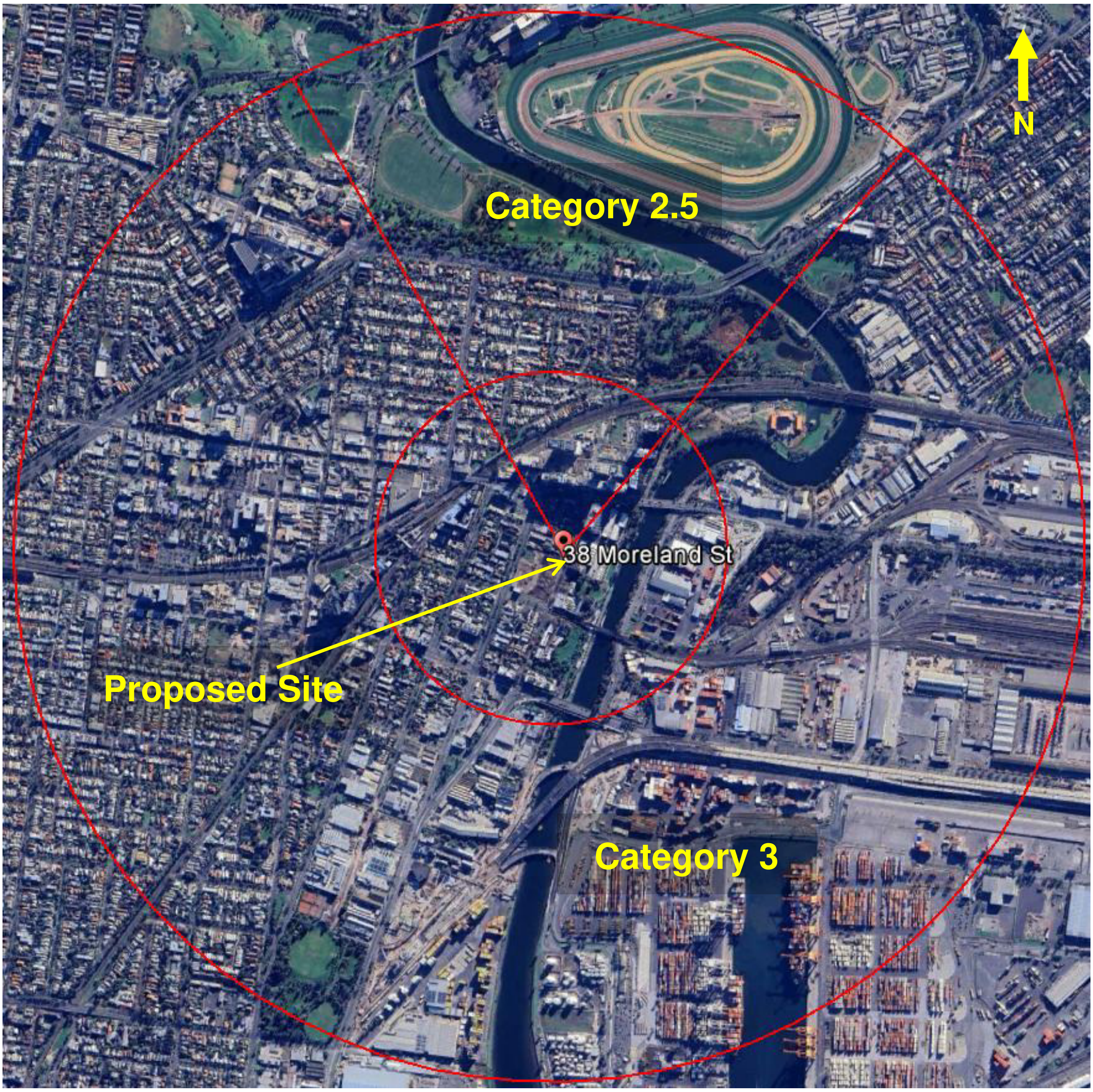


Figure 3: Assumed terrain categories for wind speed estimation.

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.

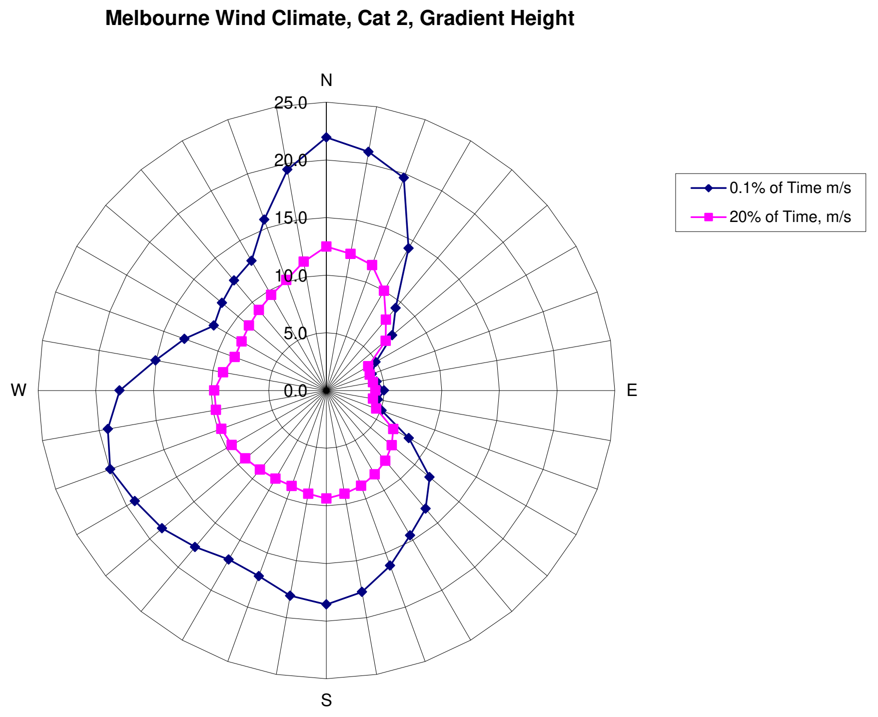


Figure 4: Directional Distribution of Mean Hourly Wind Velocities (m/s) for 0.1% and 20% exceeded at Gradient Height for Melbourne.

2.3 Building Geometry and Orientation

The proposed development is an 8-storey residential building. The overall plan-form dimensions are approximately 34.4m x 54.3m as shown in Figure 5. The main entrances are located on Moreland Street. The development incorporates tower setbacks from the east and north.

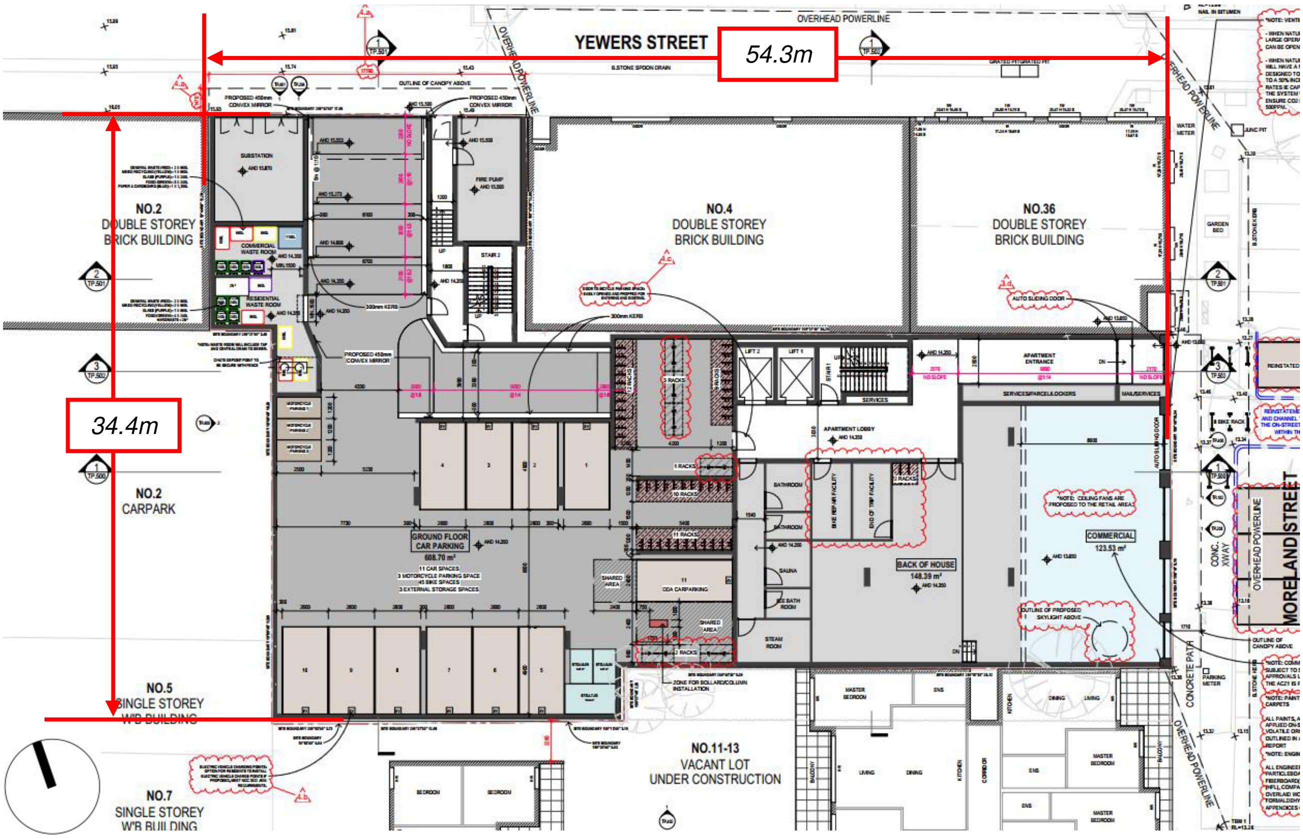


Figure 5: Ground floor plans with the plan-form dimensions overlaid.

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 direction channelling along Moreland Street. The building is oriented such that adverse impacts from corner acceleration of northerly winds is not expected at ground level. The development is taller than most surrounding buildings and so is exposed to winds at the upper levels.

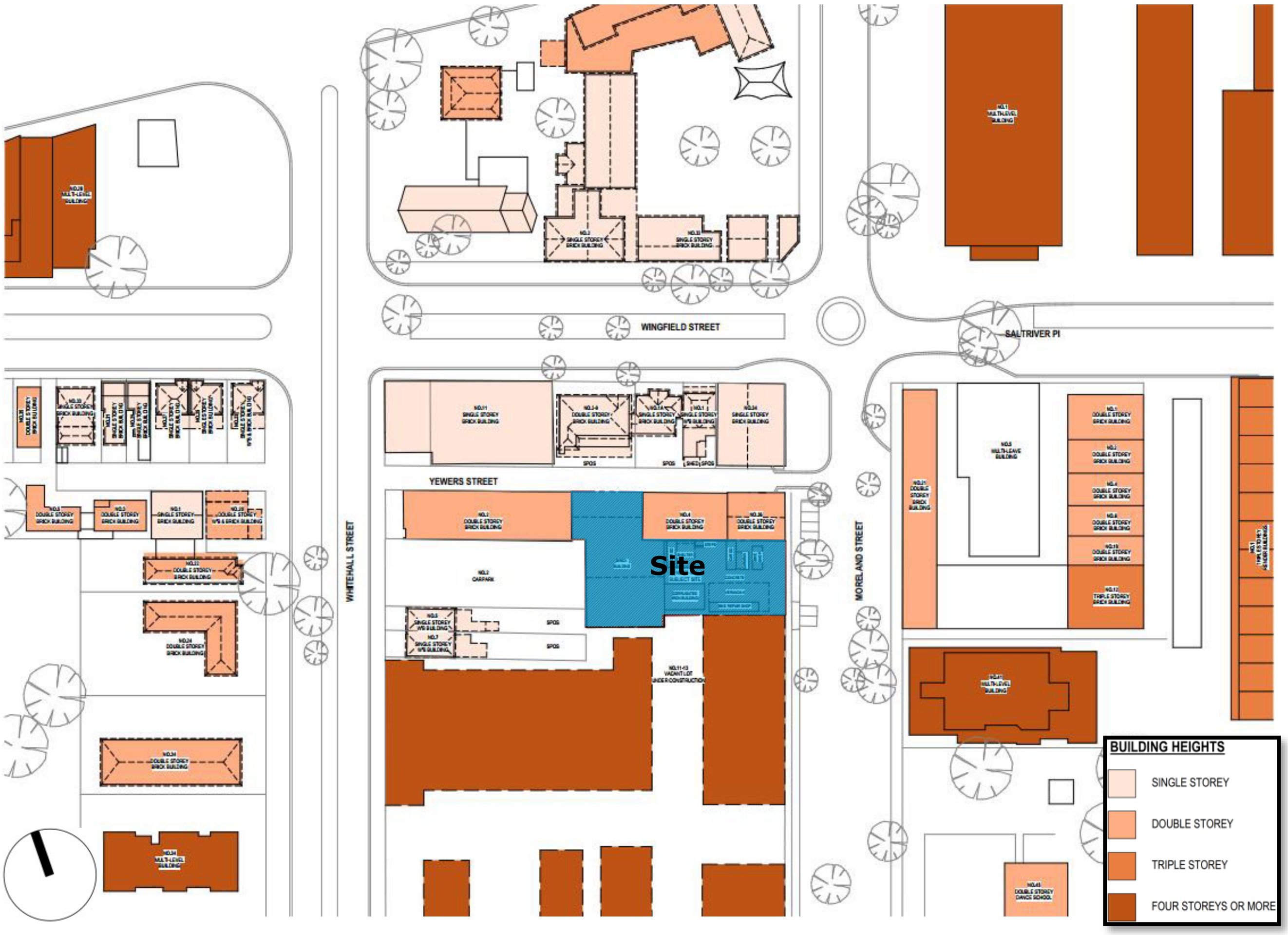


Figure 6: Immediately adjacent surroundings and their approximate number of storeys.

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.

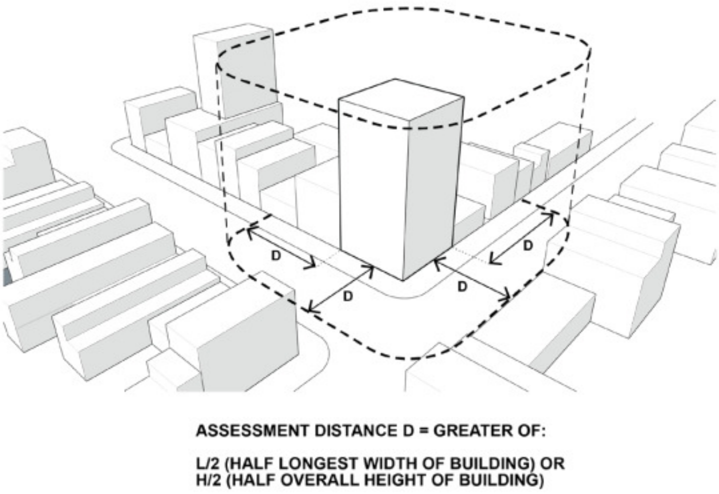


Figure 7: Assessment distance.

2.5.1 Use of Adjacent Pedestrian Occupied Areas & Recommended Comfort Criteria

The 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.

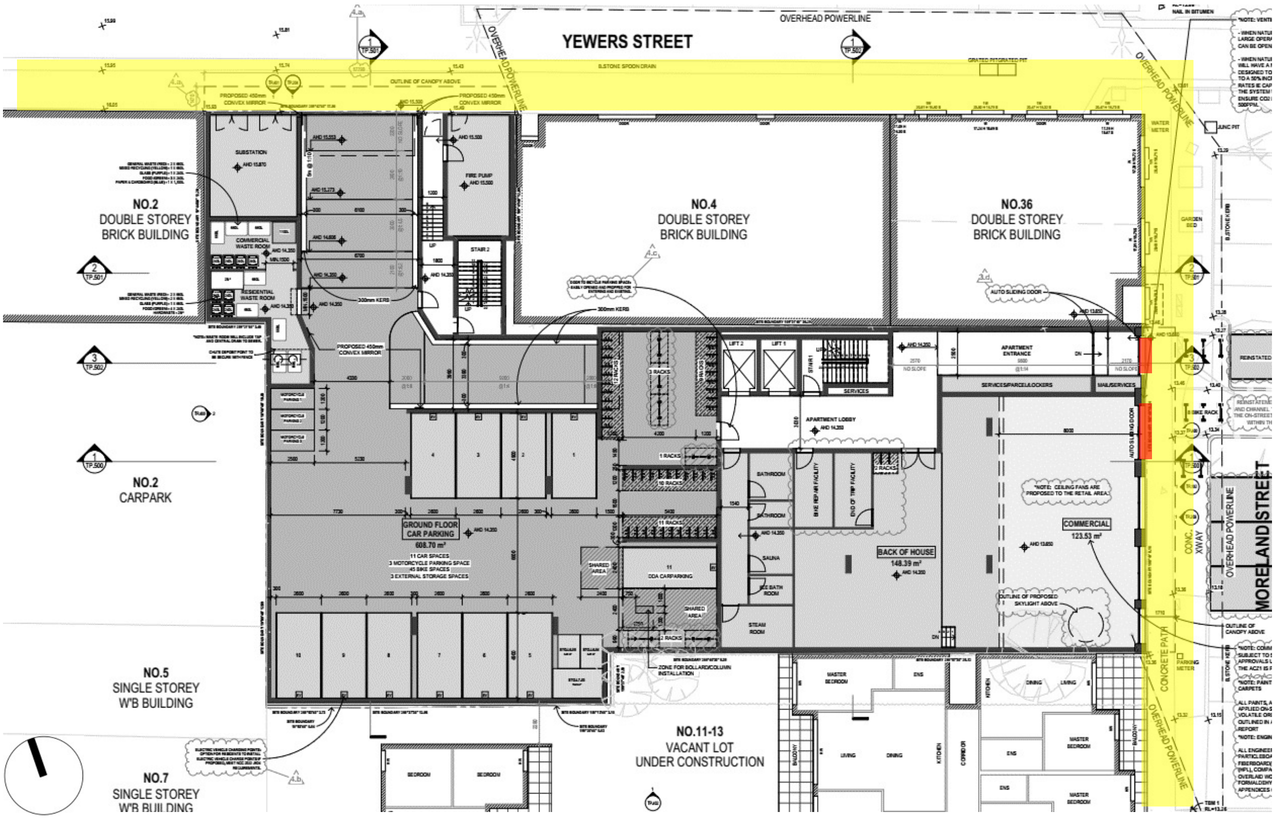
Table 2: Recommended application of criteria

Area	Specific location	Recommended Criteria
Public Footpaths, Access ways	Along Moreland Street and Yewers Street (Figure 8)	Walking
Building Entrances	Main building entrances along Moreland Street (Figure 8)	Standing
Outdoor Communal Areas	Level 1 and rooftop (Figure 9 and Figure 10)	Standing
Swimming Pool Areas	Rooftop (Figure 10)	Walking
Balcony/Terraces	Up the height of the building (Figure 9 for Level 1)	Walking (See discussion below)

2.5.2 Terrace / Balcony Recommended Criterion Discussion

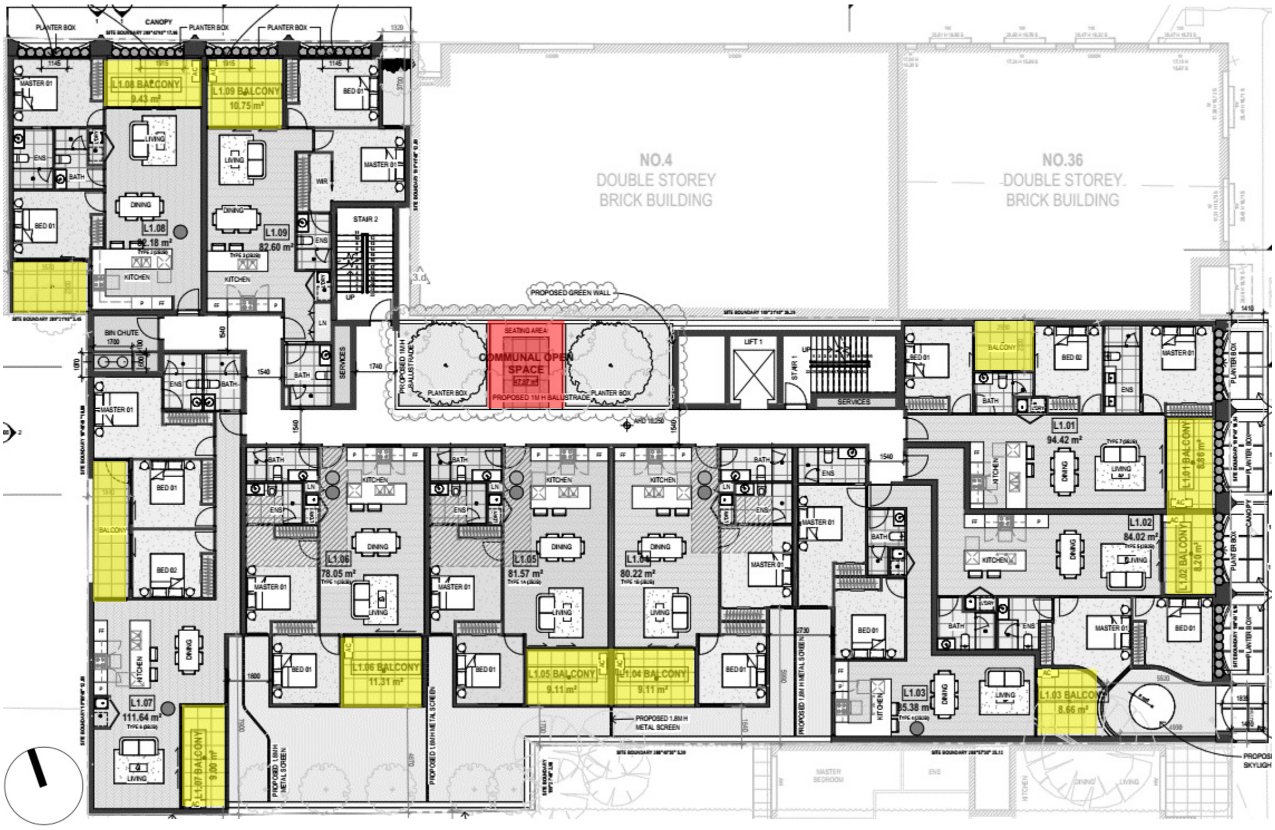
There are Private Balconies and Terraces located up the height of the development. Vipac recommends as a minimum that balcony/terrace areas meet the criterion for walking since:

- 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, whiel a pedestrian or person using a public area may not have this option.
- 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.



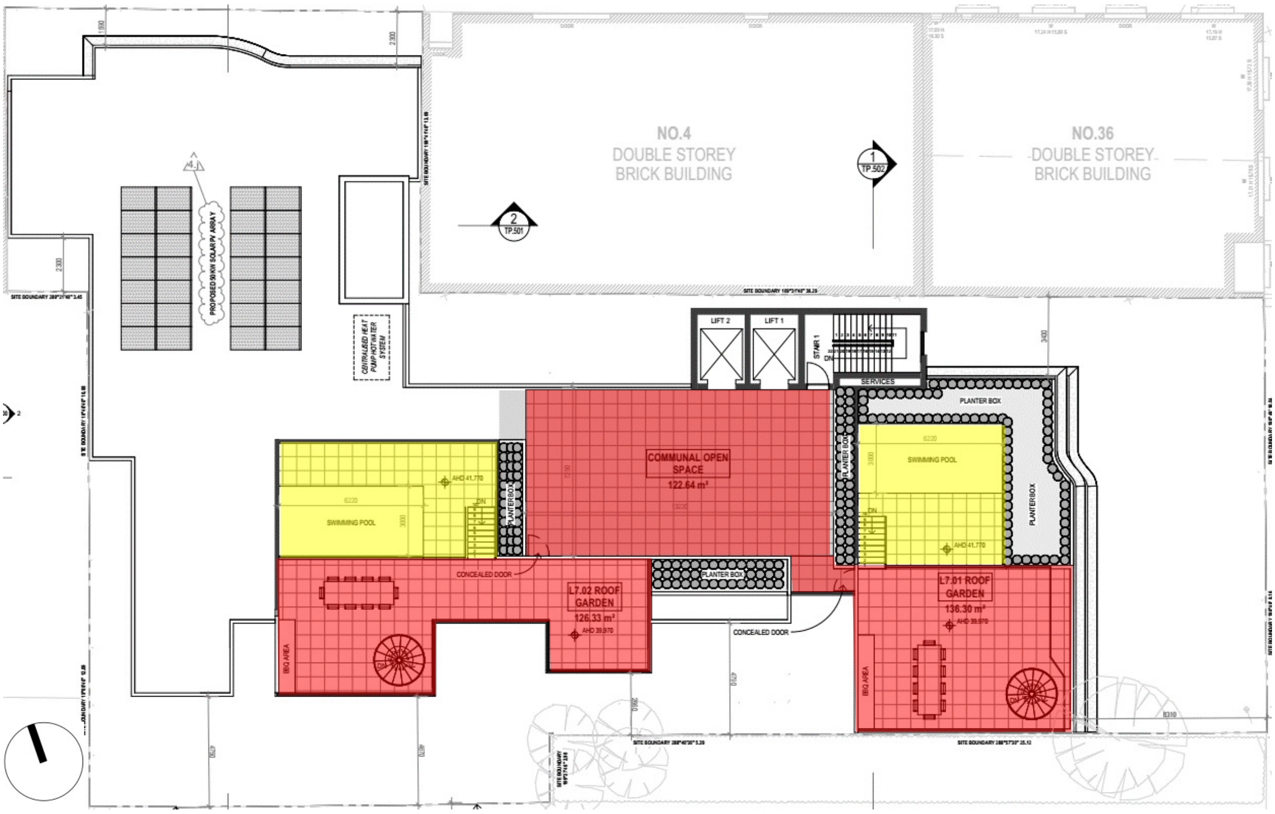
Recommended to fulfil Walking
Recommended to fulfil Standing

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



Recommended to fulfil Walking *Recommended to fulfil Standing*

Figure 9: Level 1 plan with recommended wind criteria overlaid.



Recommended to fulfil Walking
Recommended to fulfil Standing

Figure 10: Roof plan 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:

- Relative low overall height;
- Tower setback design;
- Canopy along Moreland Street and Yewers Street; and
- Colonnades along Moreland Street.

In consideration of the design features listed above, wind speeds at the pedestrian footpaths and main entrances are expected to be within the recommended walking and standing comfort criteria respectively.

The Level 1 communal terrace features 1m high balustrades, small dimensions and a setback design. As such, wind speeds here are expected to be within the recommended standing comfort criterion.

The rooftop communal terrace areas are shielded by the lift overrun, 1.1m high solid balustrades and the swimming pool areas that are raised by 1.8m. As such, wind speeds are expected to be within the recommended standing comfort criterion.

The swimming pool areas are shieled by 1-1.1m high solid balustrades. As such, wind speeds are expected to be within the recommended walking comfort criterion.

Most private terraces feature small dimensions and a setback design. The larger private terraces from level 4 to level 8 are shielded by the roof above and 1.1m high solid balustrades. As such, wind speeds at all private terraces are expected to be within the recommended walking comfort criterion.

The wind conditions would be expected to fulfil the safety criterion throughout the site.

After careful consideration, Vipac predicts wind levels to be elevated in some locations due to the proposed development. However, they are not expected to exceed the recommended comfort / safety criteria for their respective locations. As such, no recommendations for wind amelioration have been provided.

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 balcony areas of the proposed development at **38-40 Moreland Street, Footscray** 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 recommended **walking** comfort criterion;
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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.

This Report has been Prepared

For

Horoz Pty Ltd

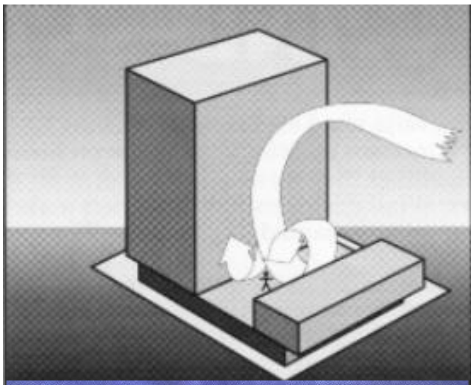
By

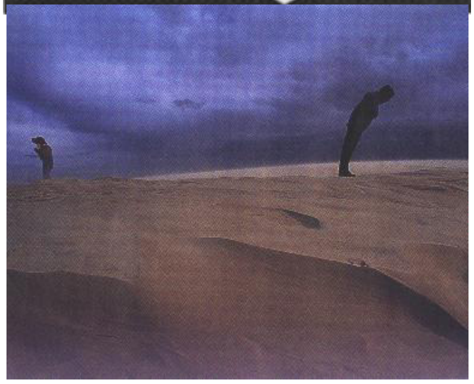
VIPAC ENGINEERS & SCIENTISTS PTY LTD.

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 1170.2:2021

[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: **November 2024**

38-40 MORELAND STREET, FOOTSCRAY

Sheet List				
Sheet Number	Sheet Name	Rev.	Description	Date
TP.000	COVER SHEET	F	Issue for Lodgement	22/07//2024
TP.100	PROJECT SUMMARY	G	Issur to Respond to RFIs	18/11/2024
TP.101	EXISTING SITE CONTEXT	F	Issue for Lodgement	22/07//2024
TP.102	EXISTING STREETSCAPE	F	Issue for Lodgement	22/07//2024
TP.103	BUIDING HEIGHTS	F	Issue for Lodgement	22/07//2024
TP.104	BUILDING USE	F	Issue for Lodgement	22/07//2024
TP.105	ZONES	F	Issue for Lodgement	22/07//2024
TP.106	OPPORTUNITIES & CONSTRAINTS	F	Issue for Lodgement	22/07//2024
TP.200	PRECEDENT	F	Issue for Lodgement	22/07//2024
TP.201	FORM GENERATION	F	Issue for Lodgement	22/07//2024
TP.202	DESIGN RESPONSE	F	Issue for Lodgement	22/07//2024
TP.203	PROPOSED STREETSCAPE	F	Issue for Lodgement	22/07//2024
TP.204	PROPOSED STREETSCAPE	F	Issue for Lodgement	22/07//2024
TP.205	FACADE METHODOLOGY	F	Issue for Lodgement	22/07//2024
TP.206	FACADE METHODOLOGY	F	Issue for Lodgement	22/07//2024
TP.300	BASEMENT 2 FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.301	BASEMENT 1 FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.302	GROUND FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.303	LEVEL 1 FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.304	LEVEL 2 FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.305	LEVEL 3 FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.306	LEVEL 4 FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.307	LEVEL 5 FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.308	LEVEL 6 FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.309	LEVEL 7 FLOOR PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.310	ROOF PLAN	G	Issur to Respond to RFIs	18/11/2024
TP.400	ELEVATIONS	F	Issue for Lodgement	22/07//2024
TP.401	ELEVATIONS	G	Issur to Respond to RFIs	18/11/2024
TP.402	ELEVATIONS	F	Issue for Lodgement	22/07//2024
TP.403	FINISH SCHEDULE	G	Issur to Respond to RFIs	18/11/2024
TP.500	SECTIONS	F	Issue for Lodgement	22/07//2024
TP.501	SECTIONS	F	Issue for Lodgement	22/07//2024
TP.502	SECTIONS	F	Issue for Lodgement	22/07//2024