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Clifton & Gilpin Pty Ltd C/- HIP V. HYPE

427 Albert Street, Brunswick

Wind Impact Assessment

30N-23-0417-TNT-90652-0

2 October 2024

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Executive Summary

Clifton & Gilpin Pty Ltd C/- HIP V. HYPE commissioned Vipac Engineers and Scientists Ltd to prepare a statement of wind effects for the ground level areas adjacent to the proposed development at **427 Albert Street, Brunswick.** This appraisal is based on Vipac's experience as a wind-engineering consultancy.

Drawings of the proposed development were provided by **Austin Maynard Architects** in **July 2024**.

The findings of this study can be summarized as follows:

With the 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 **standing** comfort criterion;
- Wind conditions at the Level 8 communal terrace is expected to be within the **standing** comfort criteria;
- Wind conditions at the private terraces would be expected to be within the **walking** comfort criterion; and
- The wind conditions would be expected to fulfil 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 Brisbane 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.

Vipac recommends a scaled wind tunnel study or CFD simulations be conducted in detail design stage to quantity the wind conditions and determine the proper wind control measures wherever necessary.

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1 Introduction

Vipac Engineers and Scientists has been commissioned by **Clifton & Gilpin Pty Ltd C/- HIP V. HYPE** to carry out an appraisal of the pedestrian wind effects at the ground level of the proposed development at **427 Albert 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 an 8-storey residential building with a roof height of 30.4m from street level. The site is bounded by Albert Street to the south, a park (Clifton Park West) to the north, an empty plot of land to the west (approved for a development with a similar height) and existing development to the east. A satellite image of the proposed development site 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 **Austin Maynard Architects** in **July 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: Southern 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 1.6 km radius predominately by low to mid-rise developments, with Clifton Park West and Gilpin Park lying immediately to the north and south respectively. 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.

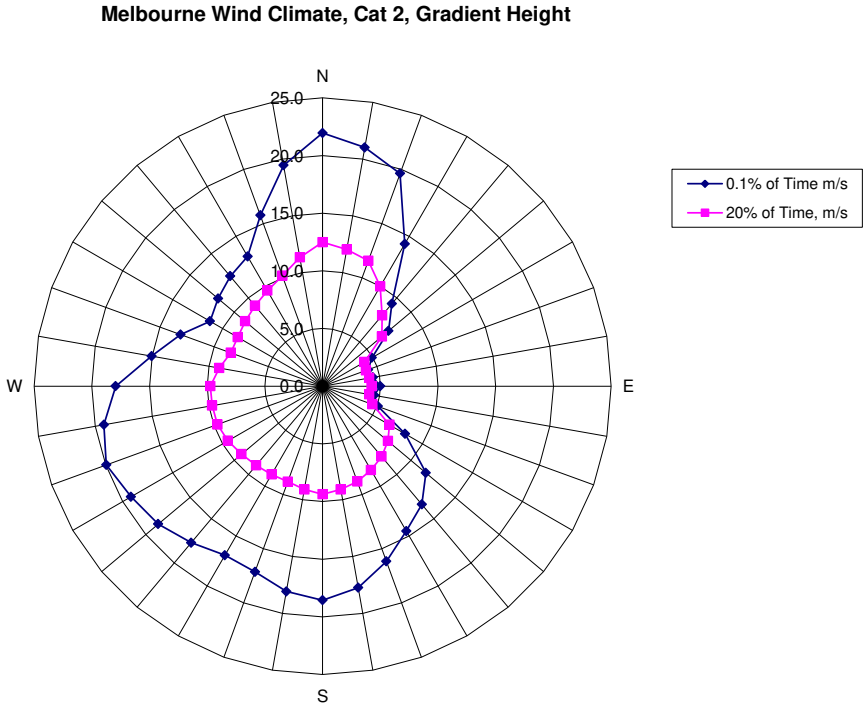


Figure 4: Directional Distribution of Mean Hourly Wind Velocities (m/s) for 0.1% and 20% exceeded at Gradient Height for Melbourne.

2.3 Building Geometry and Orientation

The proposed development is an 8-storey residential building. The overall plan-form dimensions are approximately 40m x 60m as shown in Figure 5. The main entrances are located along Albert Street and the park. The development incorporates tower setbacks from the Albert Street boundary from Level 4.

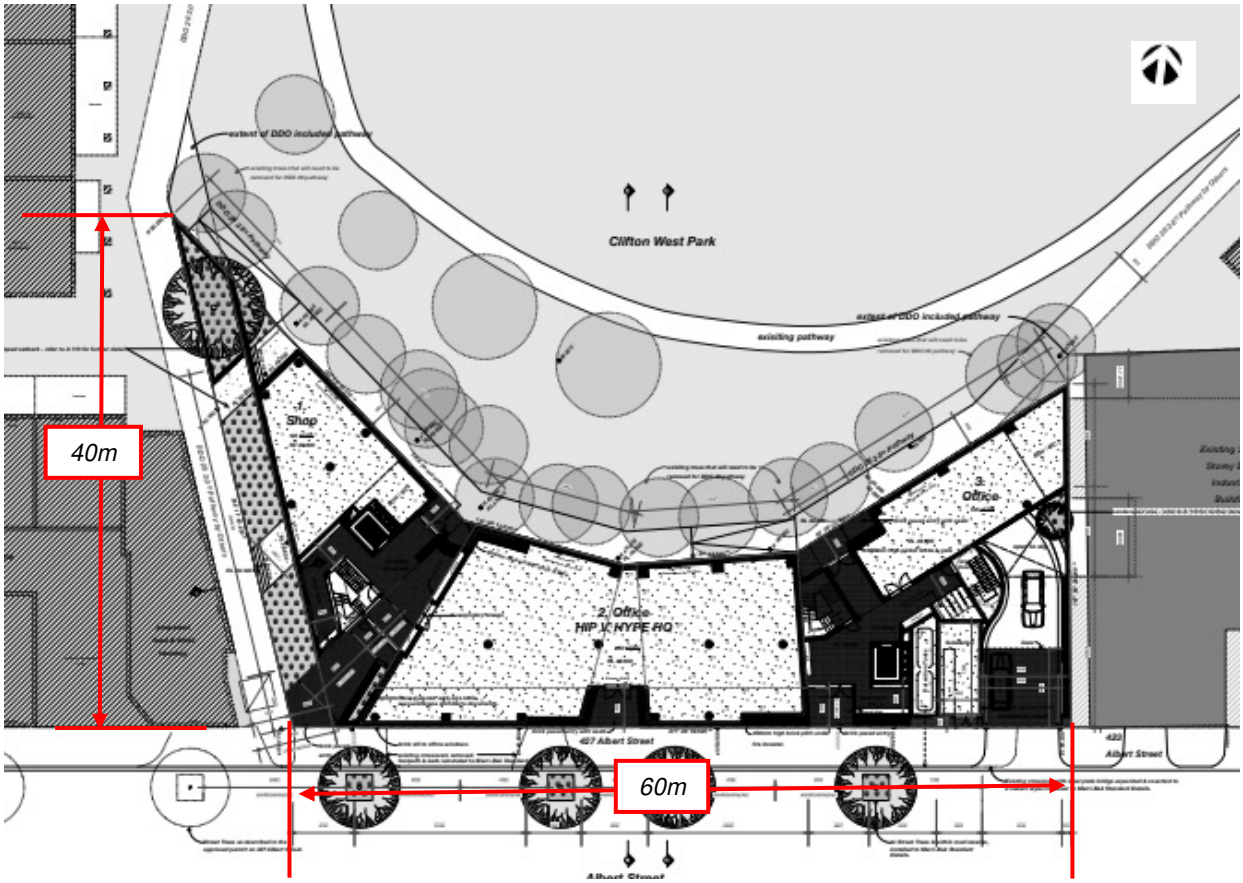


Figure 5: Ground floor plan with the overall dimensions overlaid.

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 westerly direction channelling along Albert Street, as well as from the north. The building is oriented such that adverse impacts from corner acceleration of northerly 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. However, there are approved developments immediately to the east and west of similar height that are expected to provide some shielding.

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.

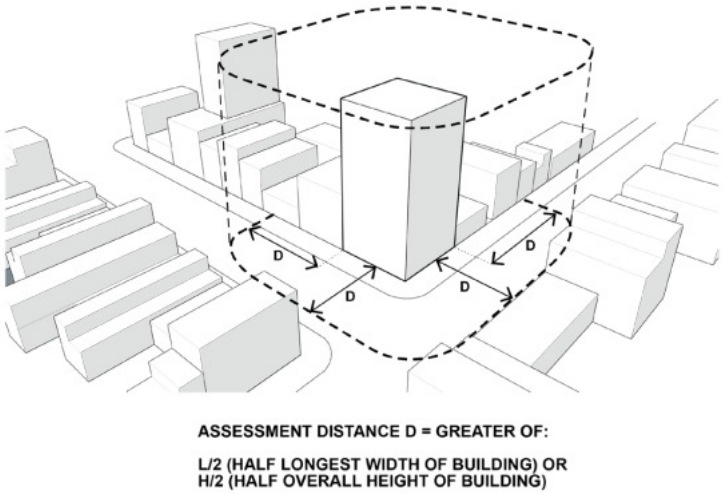


Figure 7: Assessment distance.

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.

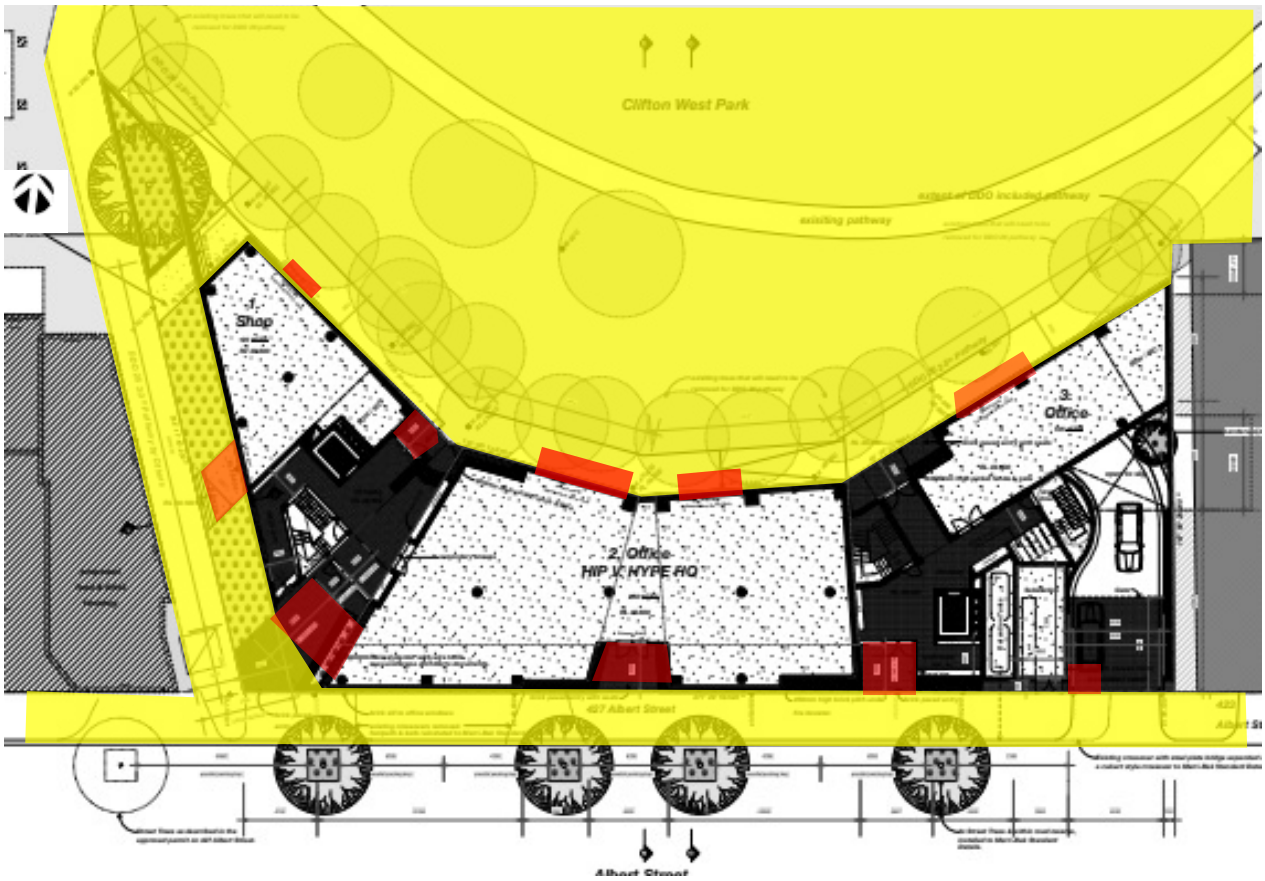
Table 2: Recommended application of criteria

Area	Specific location	Recommended Criteria
Public Footpaths, Access ways	Along Albert Street and park (Figure 8)	Walking
Building Entrances	Main building entrances along Albert Street and park (Figure 8)	Standing
Outdoor Communal Areas	Rooftop (Figure 9)	Walking (See discussion below)

2.5.2 Terrace / Balcony Recommended Criterion Discussion

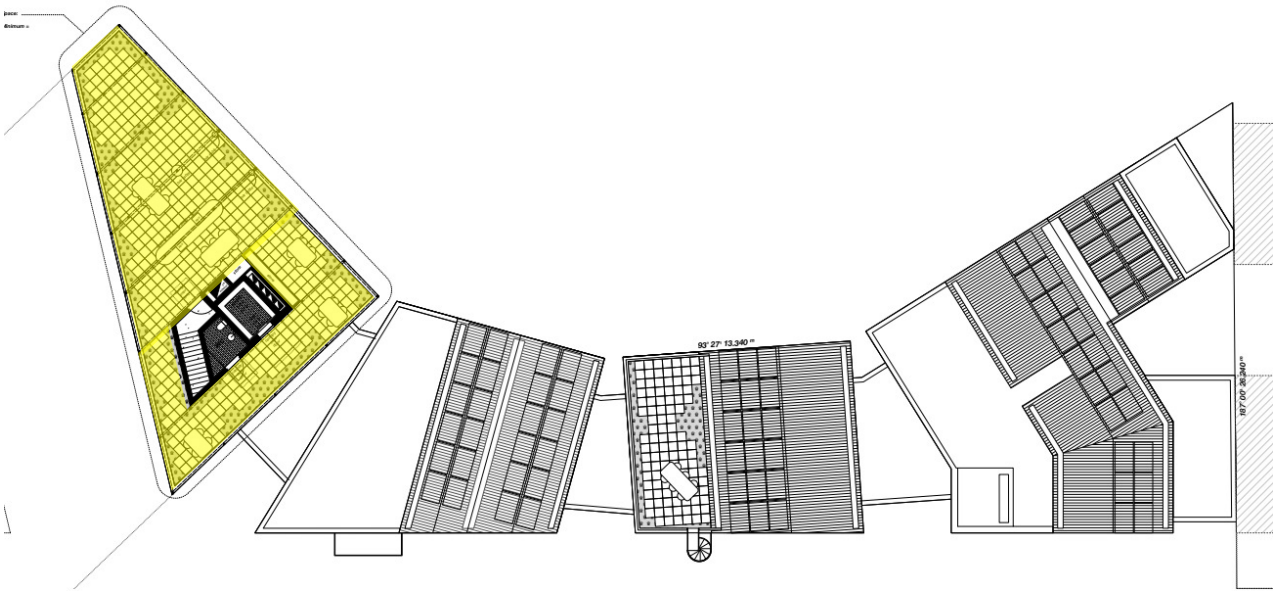
Vipac recommends as a minimum that communal terrace areas meet the criterion for walking since:

- 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;
- There is an abundance of parklands near the proposed site that can be utilised for alternative spaces.
- 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

Figure 9: Level 8 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:

- Tower setback from the south from level 4;
- Ground level setback to façade from the site boundary;
- Colonnades along the south; and
- Setback for several main entrances.

Due to the proposed height above the surrounding areas, the proposed development is particularly exposed to adverse northerly winds. Such that high wind levels are expected along Clifton Park West due to downwash, and the northeastern corner due to corner acceleration effects. In consideration of the beneficial design features above listed above, wind speeds in the remaining surrounding pedestrian streetscape are expected to be within the recommended walking comfort criterion.

Several of the key entrances are setback from the streetscape by its articulated façade. As such that these entrances are expected to be within the recommended standing comfort criterion. The western entrance into the Shop / Office is exposed to downwash action of south westerly winds. However, it should be noted that wind speeds will be expected to be within the recommended standing comfort criterion once the neighbouring development at 429 Albert Street has completed construction.

The roof-yard is relatively exposed to winds from most directions, even with the approved neighbouring developments in consideration. The proposed pergola and mesh screen over a portion of the area and landscaping are expected to provide some shielding. Wind speeds in roof yard are expected to be within the recommended walk comfort criterion. This is suitable given the intent of the space.

The private balconies 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:

- Small dimensions;
- Setback nature for most balconies;
- 0.8m high solid balustrades on the level 4 balconies; and
- Full height steel netting across most balconies.

In consideration of these design features, wind speeds at the private terraces are expected to be well within the recommended walking comfort criterion.

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

Vipac recommends a scaled wind tunnel study be conducted in the detail design stage to quantify the wind conditions and determine the proper wind control measures wherever necessary.

4 Conclusions

An appraisal of the likely wind conditions at the pedestrian ground level and terrace areas of the proposed development at **427 Albert 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 the 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 **standing** comfort criterion;
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- The wind conditions would be expected to fulfil 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 Brisbane 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.

Vipac recommends a scaled wind tunnel study or CFD simulations be conducted in detail design stage to quantity the wind conditions and determine the proper wind control measures wherever necessary.

This Report has been Prepared

For

Clifton & Gilpin Pty Ltd C/- HIP V. HYPE

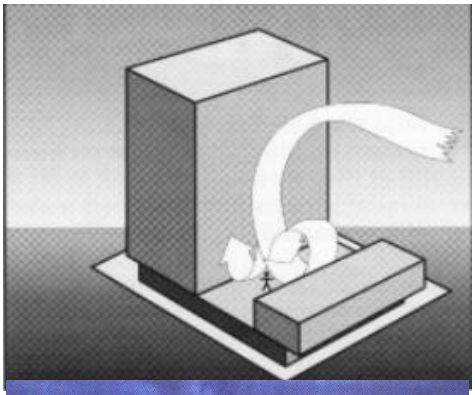
By

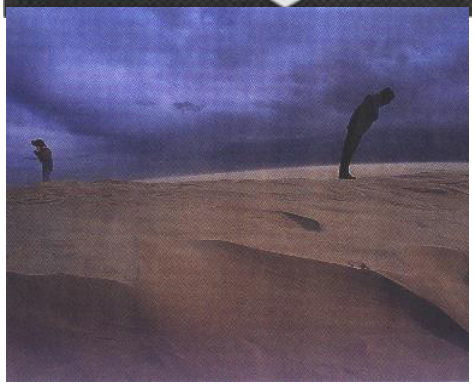
VIPAC ENGINEERS & SCIENTISTS PTY LTD.

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

Appendix C Drawings List

Drawings received: **July 2024**

Sheet No.	Sheet Title
A 001	Site Context
A 002	Plan: Existing Site Conditons & Demolition Plan
A 100	Plan: Level Ground
A 101	Plan: Level One
A 102	Plan: Level Two
A 103	Plan: Level Three
A 104	Plan: Level Four
A 105	Plan: Level Five
A 106	Plan: Level Six
A 107	Plan: Level Seven
A 108	Plan: Level Eight (Rooftop)
A 109	Plan: Basement Levels; Mezz & B
A 110	Plan: Landscape Level Ground
A 111	Plan: Landscape Level 4 & Rooftop
A 112	Diagram: Solar Acces Study to Communal Roofyard
A 201	Elevation: Streetscape North & South
A 202	Elevation: South (Albert Street)
A 203	Elevation: East & West
A 204	Elevation: South
A 206	Elevation: Lightwells
A 301	Section: A-A & B-B
A 302	Section: C-C & D-D
A 401	Diagram: BADS Compliance Plans
A 402	Diagram: BADS Compliance Plans
A 403	Diagram: BADS Compliance Plans
A 501	Diagram: Shadow Impact Study 21/9 at 09:00am > 12:00pm
A 502	Diagram: Shadow Impact Study 21/9 at 01:00pm > 4:00pm
A 503	Diagram: Shadow Impact Study 21/9 at 05:00pm