Vipac Engineers and Scientists Limited
279 Normanby Rd, Port Melbourne, VIC 3207 Australia
Private Bag 16, Port Melbourne, VIC 3207, Australia
t. +61 3 9647 9700 | **e.** melbourne@vipac.com.au
w. www.vipac.com.au | A.B.N. 33 005 453 627 | A.C.N. 005 453 627

107 High St Pty Ltd

107-123 High Street, Belmont, Geelong

Wind Impact Assessment

30N-24-0442-TNT-102995-1

7 November 2025

Job Title:	107-123 High Street, Belmont, Geelong
Report Title:	Wind Impact Assessment
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Prepared For:	**Prepared By:**
107 High St Pty Ltd Level 1, 85 Union St Armadale, Victoria, 3143, Australia **Contact:** Ben Cribb **Tel:** 03 9500 8866	Vipac Engineers and Scientists Limited 279 Normanby Rd, Port Melbourne, VIC 3207 Australia **Tel:** +61 3 9647 9700

Author:	Zhuyun Xu 7 Nov 2025	Principal Engineer
Reviewer:	Mark Leondaraki 7 Nov 2025	Wind Team Coordinator
Issued By:	Mark Leondaraki 7 Nov 2025	Wind Team Coordinator

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Rev. 00	Original issue	14 Apr 2025	
Rev. 01	WTT/CFD Statement Amendment	07 Nov 2025	ML

Executive Summary

107 High St 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 **107-123 High Street, Belmont**, Geelong**.** This appraisal is based on Vipac's experience as a wind-engineering consultancy.

Drawings of the proposed development were provided by **Clarke Hopkins Clarke** in **April 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;
- Wind conditions at the most main entrances would be expected to be within the **standing** comfort criterion; the corner entrance is recommended to be relocated away from the corner.
- Wind conditions at the Level 1 communal terrace would be expected to be within the recommended **standing** comfort criterion **with the recommendations**.
- Wind conditions at the private balconies/terraces would be expected to be within the recommended **Walking** comfort criterion.
- Wind conditions are assessed to be within 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.

Vipac recommends that a scaled wind tunnel study or CFD simulation be undertaken as a permit condition to quantify the wind conditions and verify appropriate wind control measures, where necessary.

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1 Introduction

Vipac Engineers and Scientists has been commissioned by 107 High St Pty Ltd to carry out an appraisal of the pedestrian wind effects at the ground level of the proposed development at **107-123 High Street, Belmont**, Geelong**.**

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 composed of two buildings with the roof heights of 24.4m and 28.8m. and low rise buildings at the southeast of Waterloo Street The site is bounded by High Street to the northwest, Waterloo Street at the middle, Wyuna Pde to the northeast and the existing development with car park to southwest and southeast. A satellite image and two typical sections of the proposed development 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 **Clarke Hopkins Clarke** in **April 2025.** A list of drawings supplied is provided in Appendix C of this report.

Figure 1: Aerial view of the proposed development site.

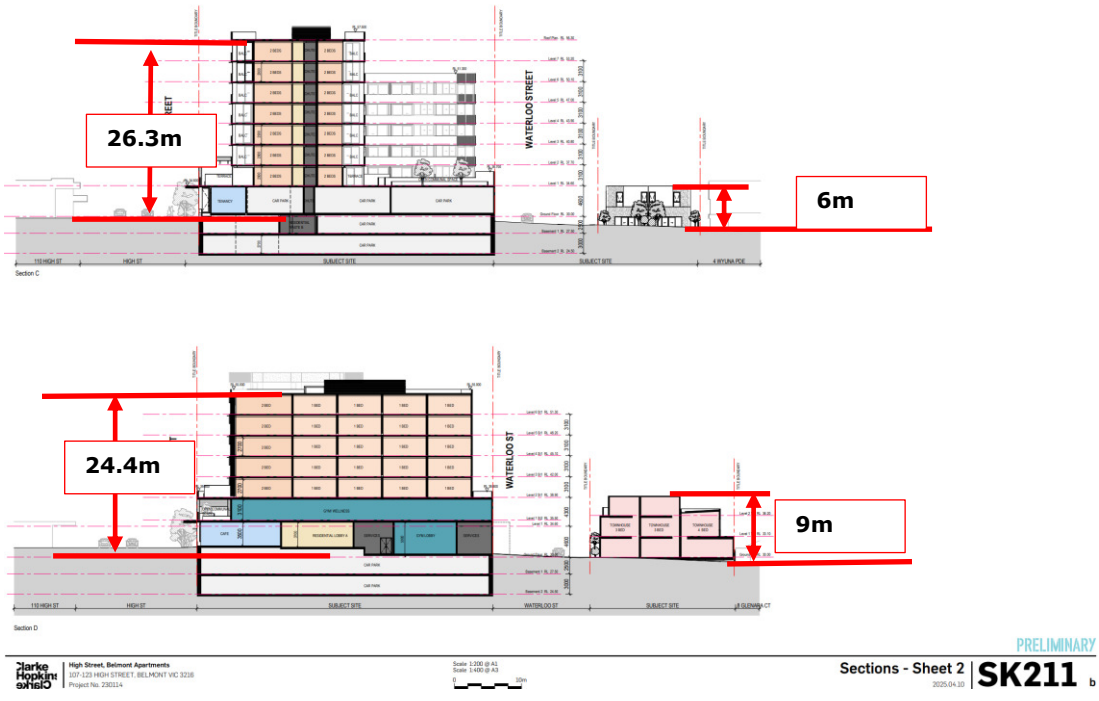

Figure 2: Typical sections of the proposed development.

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 2 km radius predominately by suburban housings. 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).

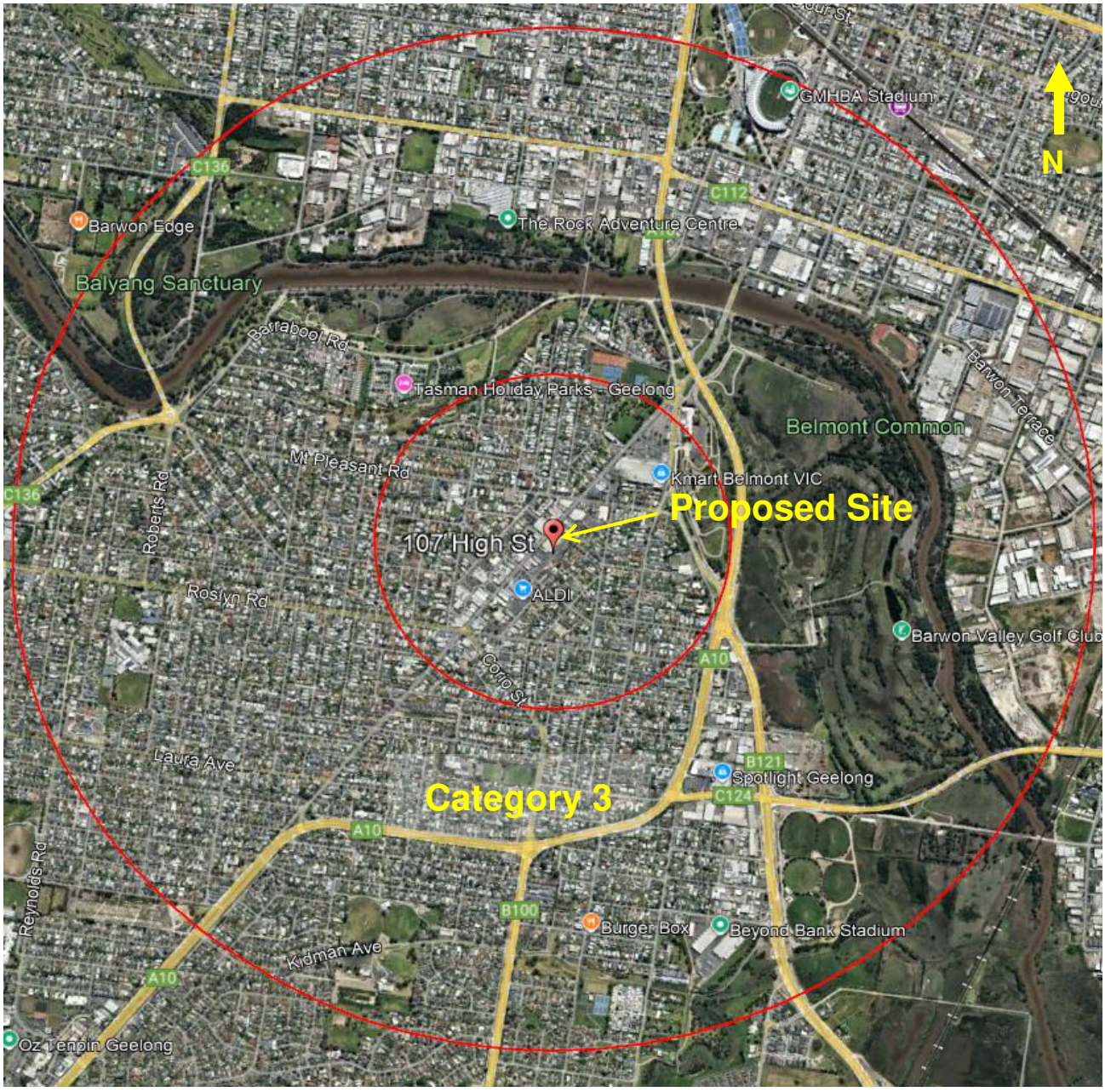

Figure 3: Assumed terrain categories for wind speed estimation.

2.2 Regional Wind Climate

The mean and gust wind speeds have been recorded in the Geelong area from 2006-2013 at the following stations: Ivictori64, IGeelong1 and I90580764. These data have 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) is shown in Figure 4. The relation of the probability of exceedance vs wind speeds and directions is shown in Figure 5. The wind data is common to all Geelong city sites and may be used as a reference to assess ground level wind conditions at the Site.

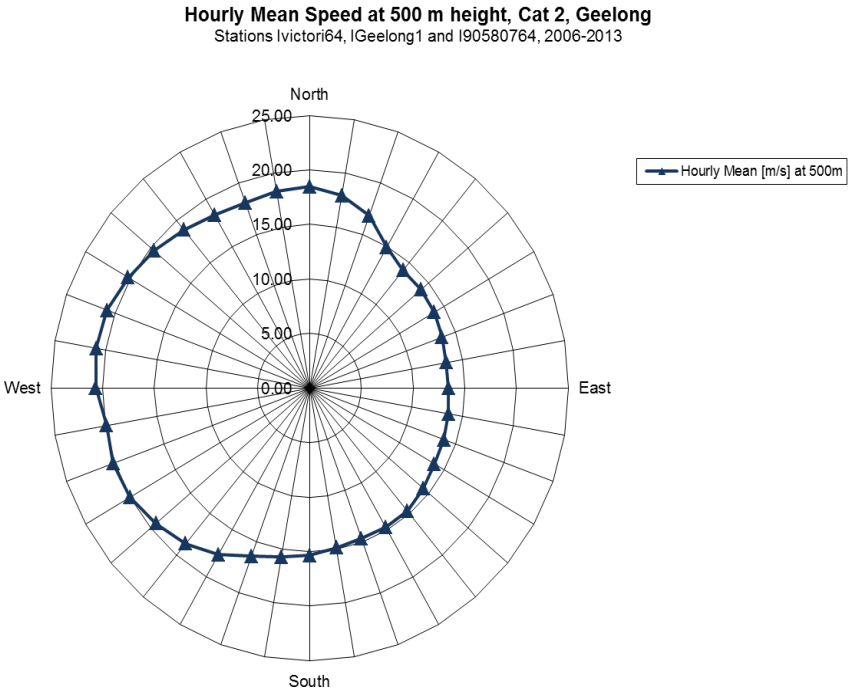

Figure 4: Directional Distribution of Annual Return Period Mean Hourly Wind Velocities (m/s) at Gradient Height for Geelong.

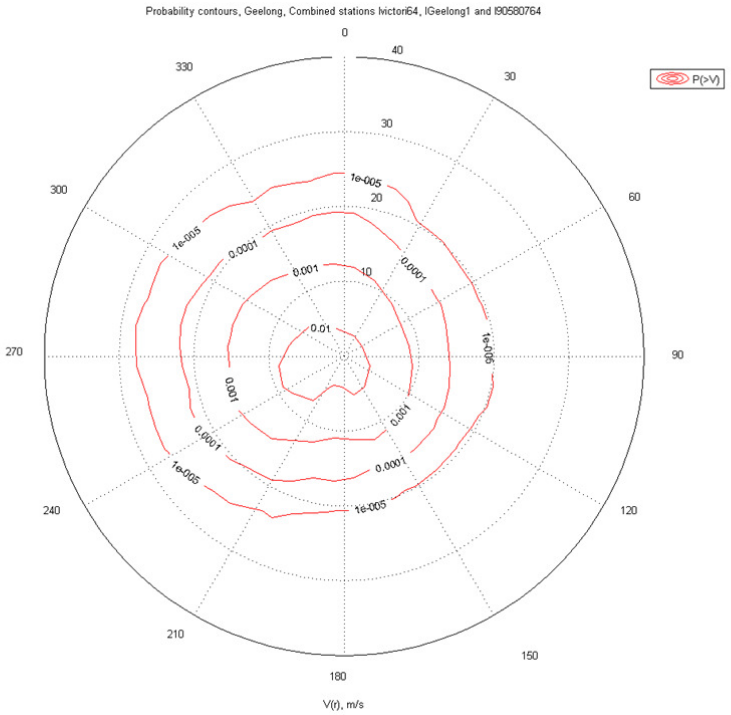

Figure 5: Probability Distribution of Mean Hourly Wind Velocities (m/s) at Gradient Height for Geelong.

2.3 Building Geometry and Orientation

The proposed development is composed of two buildings. The overall plan-form dimensions are approximately 75 m x 44m for the northern building and 75 m x 21 m for the southern building (as shown in Figure 6). For the main buildings at northwest of Waterloo Street, the main entrances are located on High Street and Wyuna Pde. There is a mechanical lobby entry at Waterloo Street.

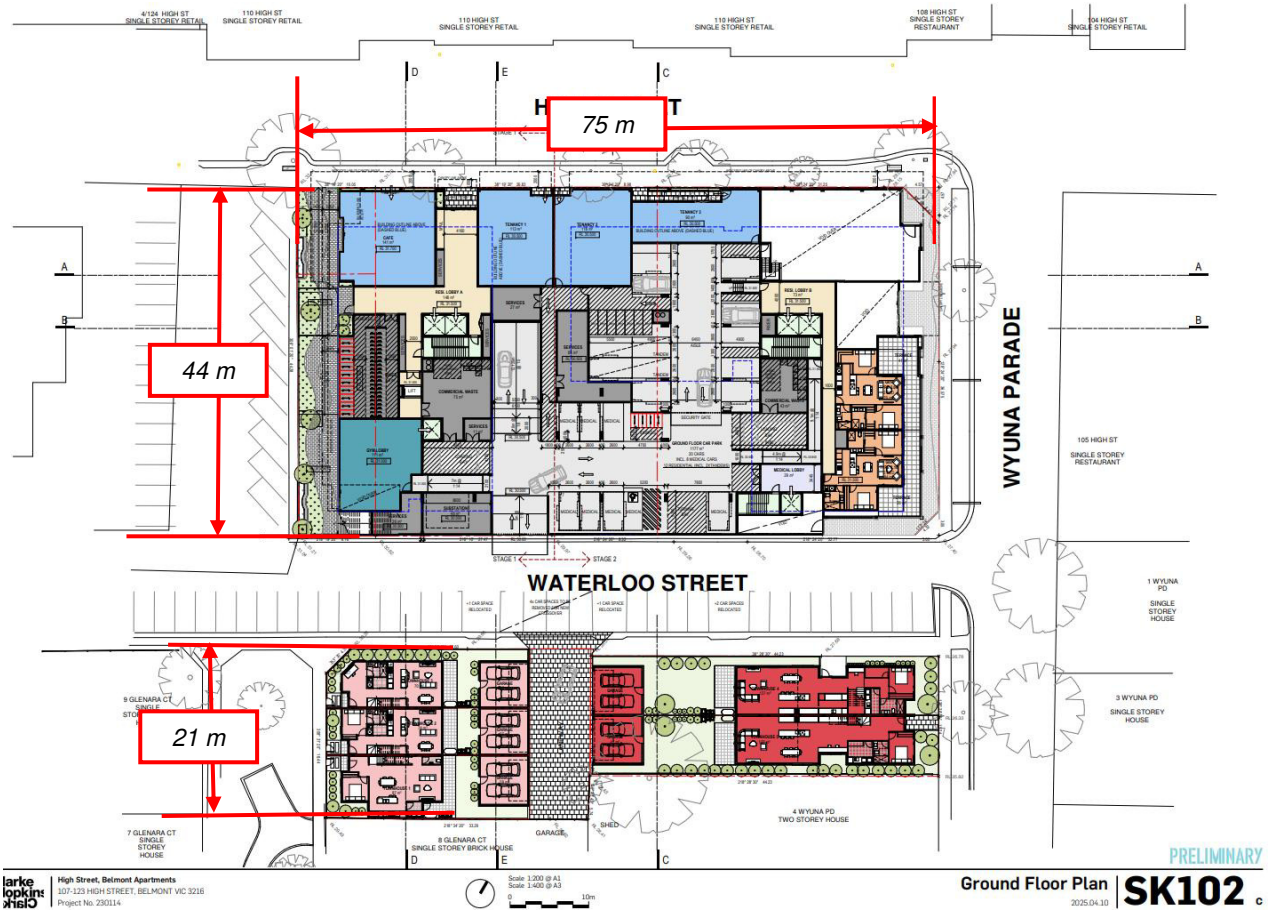

Figure 6: Ground floor plans with the plan-form dimensions overlaid.

2.4 Flow interactions with Adjacent Developments

The immediately adjacent developments are low rise structures and shown in Figure 7. At ground level, the site is exposed to direct winds from the westerly and northerly directions channelling along High Street and Wyuna Pde. The building is oriented such that adverse impacts from corner acceleration is expected at building corners. 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 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 8.

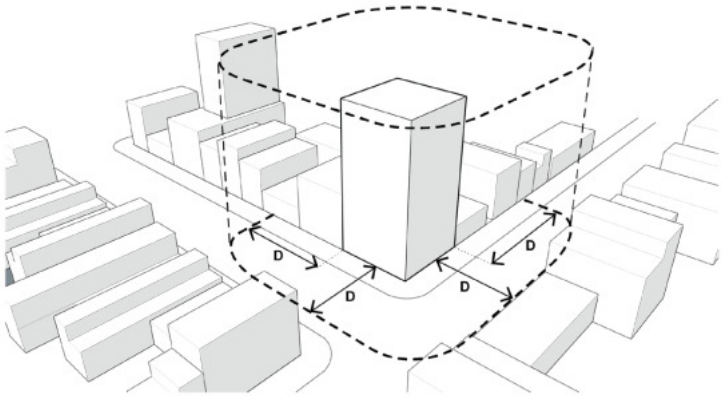

Figure 8: Assessment distance.

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 High Street, Waterloo Street, Wyuna Pde and laneways (Figure 9)	Walking
Building Entrances	Main building entrances at High Street, Wyuna Pde the mechanical lobby entrance at Waterloo Street (Figure 9)	Standing
Outdoor Communal Areas	Located on Level 1(Figure 10)	Standing
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 Geelong and other Australian capital cities experience wind conditions on balconies and elevated deck areas in the vicinity of the criterion for walking.

In this study, the communal terraces at Level 1 are assessed against the more stringent standing criterion (refer Table 2).

Figure 9: Ground floor plan with recommended wind criteria overlaid.

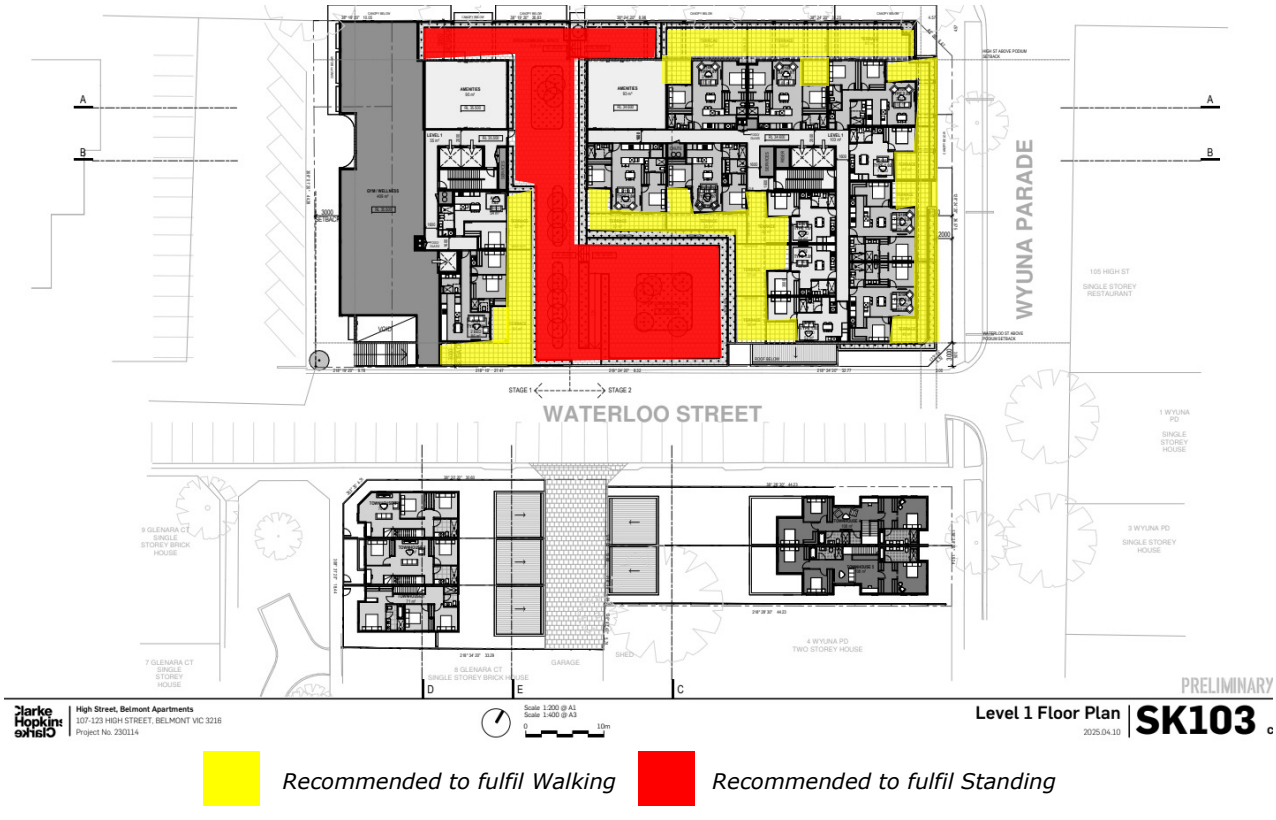

Figure 10: Level 1 plan with recommended wind criteria overlaid

3 Pedestrian Level Wind Effects

3.1 Discussion & Recommendations

Due to the proposed height above the surrounding areas, the proposed development is particularly exposed to adverse northwestern winds due to downwash, such that high wind levels are expected along High Street. However, the proposed canopy and tower set back design are expected to mitigate this adverse wind effects. The footpaths are expected to have wind conditions within walking criterion and main entrances could achieve standing wind conditions.

The entrance at the corner might be expected to have high wind conditions. It is recommended to relocate the entrance away from the corner (Figure 11).

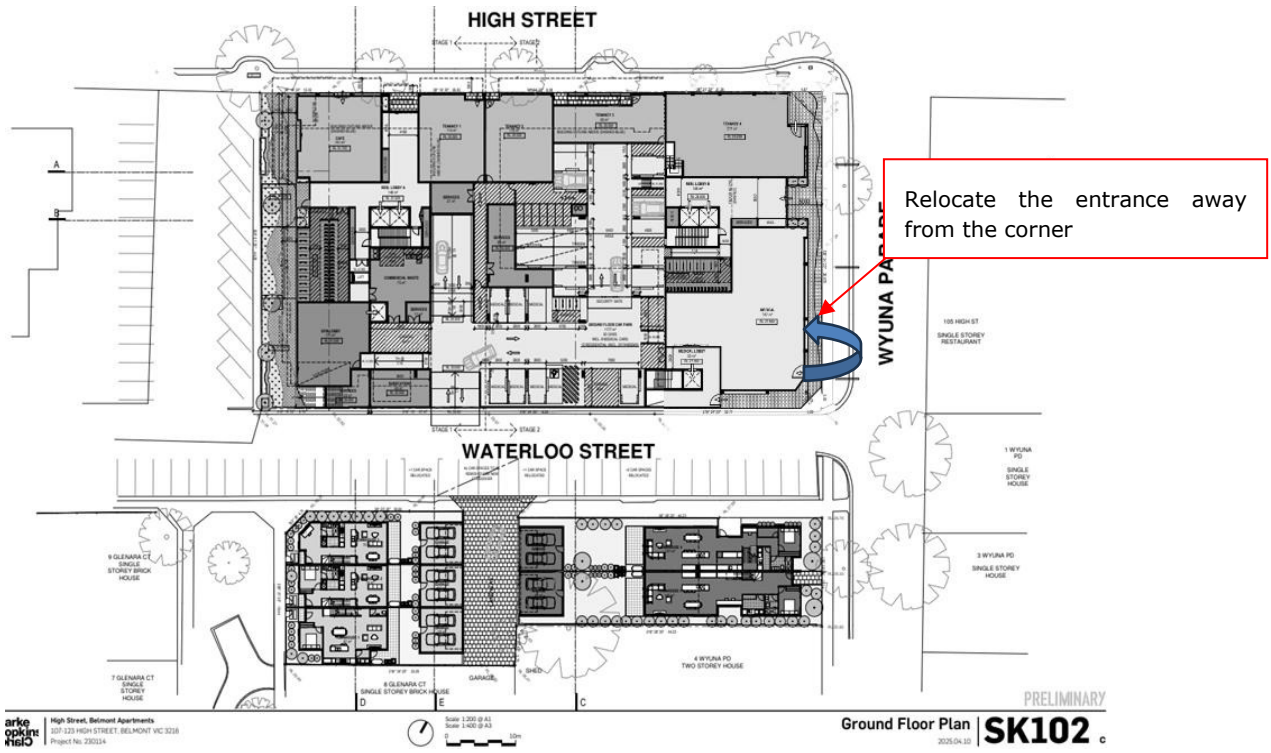

Figure 11: ground floor plan with the recommended wind control measures overlaid.

The proposed landscaping of the communal terrace at level 1 is expected to be beneficial to the wind conditions. However, the landscaping or balustrade at the outer edges of the communal terraces are recommended at least 1.5 m high to shelter the areas within the standing wind criterion (Figure 12).

The private terraces/ balconies are expected to fulfil the recommended walking criterion in general.

The gust wind speeds are expected to be within the safety criterion.

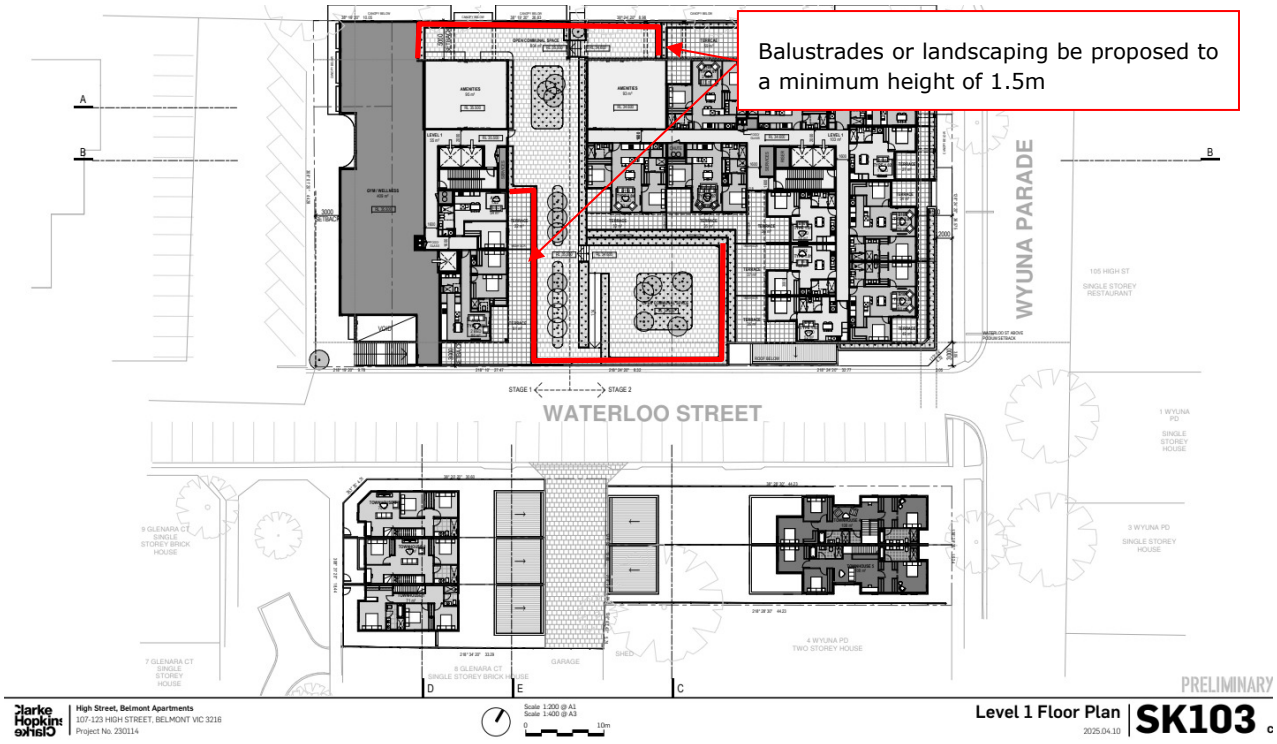

Figure 14: Level 9 plan with the recommended wind control measures overlaid.

It should be noted that this study is based on experience only and has not utilised any experimental data for the analysis. Vipac recommends that a scaled wind tunnel study or CFD simulation be undertaken as a permit condition to quantify the wind conditions and verify appropriate wind control measures, where necessary.

4 Conclusions

An appraisal of the likely wind conditions at the pedestrian ground level and communal terrace areas of the proposed development at **107-123 High Street, Belmont**, Geelong 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 Geelong 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 that a scaled wind tunnel study or CFD simulation be undertaken as a permit condition to quantify the wind conditions and verify appropriate wind control measures, where necessary.

This Report has been Prepared

For

107 High St Pty Ltd

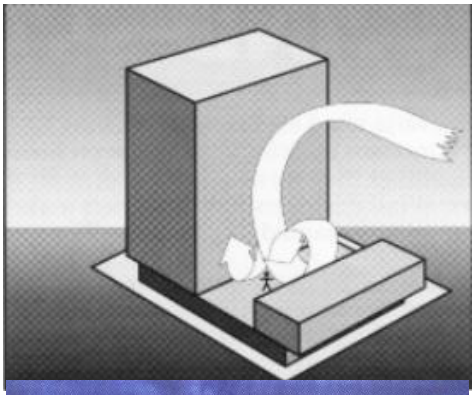
By

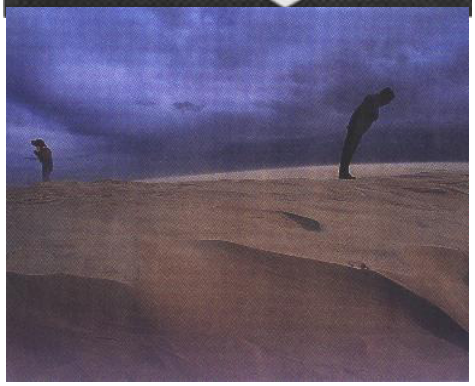
VIPAC ENGINEERS & SCIENTISTS PTY LTD.

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

Drawings Received: **April, 2025**

Drawing Number	Drawing Title	Reversion	Date
SK101	BASEMENT 1 FLOOR PLAN	C	
SK102	GROUND FLOOR PLAN	C	
SK103	LEVEL 1 FLOOR PLAN	C	
SK104	LEVEL 2 PODIUM FLOOR PLAN	B	
SK105	LEVEL 3 FLOOR PLAN	B	
SK108	LEVEL 6 FLOOR PLAN	B	2025/04/10
SK109	LEVEL 7 FLOOR PLAN	B	
SK110	ROOF PLAN	B	
SK210	SECTIONS – SHEET 1	B	
SK211	SECTIONS – SHEET 2	B	
SK212	SECTIONS – SHEET 3	C	