QUALITATIVE WIND ASSESSMENT
CPP PROJECT 22259
25 MARCH 2026

47-97 Marlborough Street, Surry Hills

Surry Hills, NSW 2010

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Executive Summary

A qualitative assessment of the 47-97 Marlborough Street, Surry Hills development to be built in Surry Hills, NSW 2010 was conducted to provide an initial assessment of the surrounding pedestrian wind environment. The assessment was based on the local wind climate, CPP's experience in the region and on comparable projects, and the characteristics of the proposed development.

The wind environment around the development is likely to be generally suitable for pedestrian standing, increasing to pedestrian walking style activities from a comfort perspective with reference to the Lawson criteria around the north-west corner. These pedestrian comfort levels are considered acceptable for the intended use of the space and suitable for public accessways. No major adverse impacts to pedestrian comfort or amenity are foreseen as a result of the proposed development.

Relatively windy conditions are expected to occur on the north-west and north-east corner balconies, with calmer wind conditions on the western side of the development. Wind conditions on the roof terrace is expected to experience relatively windy conditions due to their exposed location for prevailing winds from most directions. Areas intended for long term stationary activity such as outdoor seating are likely to require treatment to ensure they are suitable for their intended use. These mitigation measures are further elaborated in this report. All locations would be expected to satisfy the safety /distress criterion.

This report is a high level qualitative assessment based on basic features of the local wind climate and proposed built environment.

CPP WIND ENGINEERING CONSULTANTS

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1. Introduction

This report has been prepared to support a State Significant Development Application (**SSDA**) SSD-78545225 for the site at 47 – 97 Marlborough Street, Surry Hills.

The Minister for Planning, or their delegate, is the consent authority for the SSDA and this application is lodged with the NSW Department of Planning, Housing and Infrastructure (**DPHI**) for assessment.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (**SEARs**) dated 19 December 2024 (SSD- 78545225). Specifically, this report has been prepared to respond to the following SEARs:

Secretary's Environmental Assessment Requirements	Refer Report Section
7. Environmental Amenity • Assess amenity impacts on the surrounding locality, including solar access, visual privacy, view loss and view sharing, as well as **wind**, lighting and reflectivity impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated.	Section 4

Project Description

The application seeks development consent for the redevelopment of the site for an in-fill affordable housing residential development comprising 172 market and affordable housing dwellings. The works will involve the adaptive reuse of the heritage listed warehouse building known as the 'Former David Jones Factory'.

Specifically, this application seeks approval for the following:

- Demolition of the existing car park on the northern portion of the site.
- Site preparation works including:
  - Tree removal.
- Excavation on the northern portion of the site.
- Alterations and additions to the existing warehouse building for the purposes of a residential flat building comprising:
- Heritage conservation works to the warehouse building and alterations to the warehouse roof profile on level 8.
- Four level addition to the warehouse building on the central portion of the site.
- 134 residential apartments across 9 levels.
- Indoor communal resident amenity and rooftop communal open space.
- Service vehicle access from Goodlet Street to an at-grade loading dock.
- Lower ground storage, plant and services area.

- Construction of a new residential flat building on the northern portion of the site comprising:
- Basement car stacker and vehicular access from Landsdowne Street.
- Retail tenancy on ground level on the corner of Marlborough Street and Landsdowne Street.
- 38 residential apartments across 9 levels.
- Landscaping and associated public domain works including a private pedestrian link along the western site boundary.
- Provision of 15% affordable housing to be managed by a community housing provider for a period of 15 years from date of the Occupation Certificate.
- Extension and augmentation of physical infrastructure and utilities as required.

Refer to Architectural Plans prepared by Wardle appended to the Environmental Impact Statement.

The Site

The site is located at 47-97 Marlborough Street, Surry Hills and is legally described as Lot 1 in DP225393 and Lot 1 in DP251056. It is regular in shape and has an area of approximately 3,413 sqm.

The site is located in the City of Sydney local government area (**LGA**) in Surry Hills, which is well-serviced by public amenities such as a supermarket, cafes, destination retail shops and a library. Community facilities such as swimming pools, tennis courts, and active open space are easily accessible. The southern portion of the site comprises a locally listed heritage item (the former David Jones Warehouse building) and the northern portion of the site accommodates a car park. The area to the east and south of the site is a Heritage Conservation Area.

The site is in a highly accessible area with the nearest Light Rail Station (Surry Hills) 200m to the north of the site. The site is also close to regular bus services in the immediate vicinity.

The existing building is built to the site boundaries. There are existing street trees along Marlborough Street, as well as some planter boxes containing vegetation on the site's north-eastern frontage to Marlborough Street.

The location of the site is illustrated in **Figure 1.**


BELVOIR ST
WILTON ST
RILEY ST
MARLBOROUGH ST
GOODLET ST
GOODLET LN
CLEVELAND ST
MILES ST
HIGH HOLBORN ST
LANSDOWNE ST
CROWN ST
32//DP1195734
1//DP1260627
Subject Site

GENERAL INFORMATION

The assessment of the wind environment around developments can ensure adverse impacts are minimized and inform designers about the suitability of outdoor areas for their intended uses. Where necessary, design modifications can be made, or intervention measures added to mitigate areas with the potential for excessive wind speeds.

The proposed development is located in Surry Hills, approximately 1.5 kilometres to the south-southeast of Sydney CBD. The surrounding terrain is comprised primarily of low-rise suburban development, with a 15 storey residential building about 150m to the north-north-west of the proposed development, Figure 1.

As the proposed building is larger than most of the surrounding structures, the addition of the proposed development is expected to have some impact on the local wind conditions, and the extents are broadly discussed in this report.

Figure 1: Aerial view of proposed development site (Google Earth, 2023)

Figure 2: Client provided render (Top) and Typical floor plan (bottom) of proposed development.

2. Wind Climate

The proposed development lies approximately 8.5 km to the north-north-east of the Sydney Airport anemometer, which provides the best source of historical wind data for the project. To enable a qualitative assessment of the wind environment, the wind frequency and direction information measured by the Bureau of Meteorology at a standard height of 10 m at from 1995-2022 have been used in this analysis.

The wind rose for Sydney Airport is shown in Figure 3. The arms of the wind roses point in the direction from where the wind is blowing, the width and color of the arm represent the wind speed, and the length of the arm indicates the percentage of the time that the wind blows for that combination of speed and direction.

The distribution and frequency of winds during daylight hours (6am to 10pm) on an annual basis were analysed to assess the project with regards to wind comfort and safety. As can be seen from the wind rose in Figure 3, winds from the south, west, and north-east quadrants are predominant. The locations tested are susceptible to winds from some of these directions, depending on the relative position of the location tested to the geometry of the proposed development and surrounds. The majority of test locations showed to be primarily susceptible to winds from the north-east quadrant.

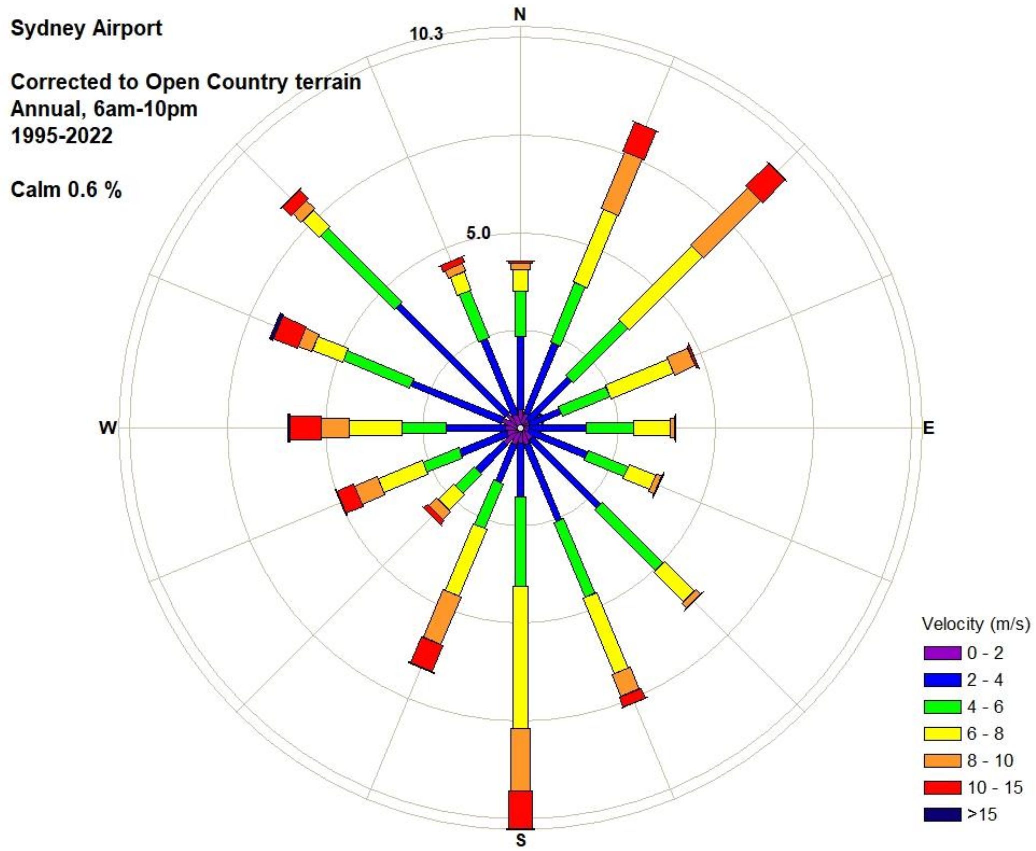

Figure 3: Probability of Wind Speeds by Direction Sydney Airport –(1995-2022, Daylight Hours (6am – 10 pm)

3. Wind Assessment Criteria

A number of researchers have suggested quantitative methods for assessing wind comfort and safety based on estimated wind speeds and local climate statistics. These criteria provide a means of evaluating the wind amenity of location based on the frequency of threshold wind speeds, noting that pedestrians will tolerate higher wind speeds for a shorter time period than lower speeds. The comfort criteria also allow planners to assess the usability, with respect to the wind environment, of different locations for various purposes.

CPP uses the widely-accepted pedestrian-level wind criteria developed by Lawson (1990). Lawson's criteria are divided into separate categories of comfort and distress (safety).

Lawson's criteria are based on wind speeds exceeded 5% of the time, and are described as categories for comfort ranging from 'Pedestrian Sitting' to 'Business Walking', allowing planners to judge the usability of locations for various intended purposes. The criteria also include a distress rating, for safety assessment, which is based on occasional (once or twice per year) wind speeds, to identify locations where wind speeds may be hazardous to pedestrians.

The Lawson comfort criteria are the basis for the Central Sydney Planning Strategy (City of Sydney, 2022) wind criteria, while the City of Sydney safety criterion is different to that defined by Lawson (Table 2)

The categories and criteria are specified in Table 1. In general, wind conditions comfortable for Sitting and Standing are considered appropriate for areas such as entrances where pedestrians are likely to gather for longer durations, while wind conditions comfortable for Casual Walking and Business Walking are more appropriate for sidewalks where pedestrians are actively in transit. Locations rated as Uncomfortable are generally less suitable for most pedestrian activities and wind control solutions are often sought. Whether mitigation is needed at a location depends upon the intended pedestrian use of the location.

Satisfaction of the safety rating is generally required for areas accessible to the general public. A rating of 'Able-Bodied' may be acceptable for areas with managed access or where pedestrians are unlikely to be present under adverse conditions.

Pedestrians' perception of wind can often be subjective and vary depending on regional difference in wind climate and thermal conditions, as well as by individual. Calibration to the local wind environment should be taken into account when evaluating predicted wind comfort conditions. Note that the ratings of 'Uncomfortable' and 'Safety' are the words of the published wind criteria and applicability may vary by project and location.

Table 1: Wind Comfort criteria (after Lawson, 1990)

COMFORT RATING	U_{EQUIV}*	DESCRIPTION
Dining**	< 2 m/s	Calm / light breezes suitable for outdoor restaurant uses, seating areas, and other amenities based on CPP experience.
Sitting	2-4 m/s	Calm or light breezes suitable for long duration seating areas, and other amenities.
Standing	4-6 m/s	Gentle breezes suitable for sitting for shorter periods, main entrances and bus stops where pedestrians may linger.
Pedestrian Walking	6-8 m/s	Moderate winds appropriate for window shopping and strolling along a downtown street, or park.
Business Walking	8-10 m/s	Relatively high speeds that can be tolerated if one's objective is to walk, run, or cycle.
Uncomfortable	> 10 m/s	Strong winds unacceptable for all pedestrian activities; wind mitigation is typically required.

*U_{Equiv} = Max (U_{Mean}, U_{Gust} / 1.85).
*U_{Equiv} speeds are based on an annual exceedance of 5% (~8 hours / week) assessed over all hours.
** For regular outdoor dining, and in semi-enclosed spaces, it has been the experience of CPP that the comfort rating of Sitting may be windier than desired and a comfort criterion of 4 m/s or less may be more applicable.
Note: The criteria of the Central Sydney Planning Strategy use the Sitting, Standing, and Walking criteria and consider wind speeds above the Walking criterion as Uncomfortable. Additionally, the criteria assess the wind climate for daylight hours only (6am-10pm)

Table 2: Wind Safety Criteria (after Lawson, 1990 – Top, City of Sydney, 2022 – bottom)

SAFETY RATING	U_{EQUIV}*	DESCRIPTION
○ Pass	< 15 m/s	Meets wind safety criterion.
○ Able-Bodied	15-20 m/s	Acceptable where only able-bodied people would be expected; not acceptable for frail persons or cyclists
○ Fail	>20 m/s	Excessive wind speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is often required.

* U_{Equiv} = Max (U_{Mean}, U_{Gust} / 1.85).
*U_{Equiv} speeds are based on an annual exceedance of 0.022% (~2 / year or 1 / season) assessed over all hours.

SAFETY RATING	U_{EQUIV}*	DESCRIPTION
○ Pass	< 24 m/s	Meets wind safety criterion.
○ Fail	> 24 m/s	Excessive wind speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is often required.

* U_{Max} speeds are based on an annual exceedance of the maximum 0.5 s gust wind speed in and hour over daylight hours (6 am to 10 pm), 0.0171% (1 / year).

4. Assessment

SITE DESCRIPTION

The development site is surrounded in most directions by low-rise buildings, with a 15 storey residential building at 133 Belvoir Street to the north-north-west of the proposed development, and a region of open parkland to the south-east quadrant. Topography around the site has a gradual increase in slope from the south, west, and east to the site which will create a slight acceleration of flow from these directions. Winds in such surrounds tend to experience less channelling than areas with many tall structures, with local effects instead being dictated by exposed buildings and their relation to prevailing strong wind directions. Several wind flow mechanisms such as downwash and channelling flow are described in Appendix A, and the effectiveness of some common wind mitigation measures are described in Appendix B.

The subject site is located on a block bounded by Goodlet Street to the west, Marlborough St to the south, and Devonshire Street to the east. The proposed development is comprised of a rectangular building, rising to eight storeys tall, with a large alcove in the centre connected with the neighbouring Edgeview Tower building to the west (Figure 4). As the proposed building is larger than most of the surrounding structures, the addition of the proposed development is expected to have some impact on the local wind conditions, and the extents are broadly discussed in this report.

Figure 4: 3D model of the proposed development

WINDS FROM THE NORTH-EAST

The site is relatively exposed to winds from the north-east quadrant approaching over low-rise suburbia and a slight decrease in topography. Due to the orientation of the building relative to north, the approach wind would impinge the north-east corner of the proposed development, encouraging horizontal flow rather than downwash towards the ground. The adjacent Edgeview Tower to the west would direct the majority of flow further around the west, though some pressure driven flow would be expected through the communal outdoor area to the west of the subject site, particularly under the overhang. All areas around the site would be expected to satisfy the Lawson distress criterion.

Figure 5: Flow patterns for winds from the north-east

WINDS FROM THE SOUTH

Winds from the south quadrant will approach over a large region of low-rise suburban development. The incident flow from the south would impinge the south-east corner of the building, reducing downwash reaching the ground level. Winds with a slight west component would impinge on the narrow south façade generating some downwash with the potential to causing accelerated wind speeds at the south-east corner of the site. The flow would accelerate along the broad east face of the building causing windier conditions close to the north-east corner balconies and at the street corner. If milder conditions are desired on the balconies, partial or full enclosure of the short north side of the balconies would be an effective way to mitigate strong cross flow through the balcony spaces. Similar to winds from the north-east, pressure driven flow would be expected in the communal outdoor area to the west of the site. All areas around the site are expected to pass the safety/distress criterion during winds from the south.

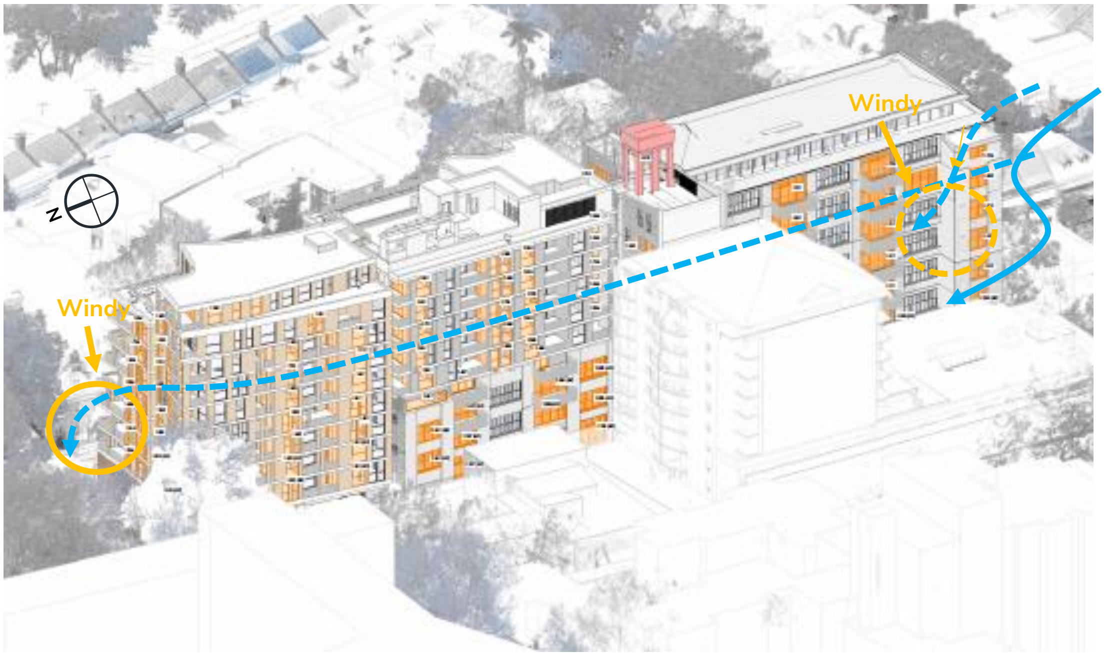

Figure 6: Flow patterns for winds from the south/south-south-west

WINDS FROM THE WEST

Winds from the west quadrant will approach over a large region of low-rise suburban development and a gradual increase in slope, creating a slightly higher wind speed of approaching flow from this direction. The flow would impinge on the broad face of the north-west side of the tower, inducing some downwash to accelerate around the north-west corner of the development. Some of the flow would also be directed to the top north-west balconies, creating a high wind speed region across this balcony.

Due to the massing of the Edgeview Tower on the western side being connected to the proposed development, relatively mild wind conditions are expected for the communal outdoor space to west of the site at Level 1. This also creates mild wind conditions near the building entrances on the western side of the development. All areas around the site are expected to pass the safety/distress criterion during winds from the west.

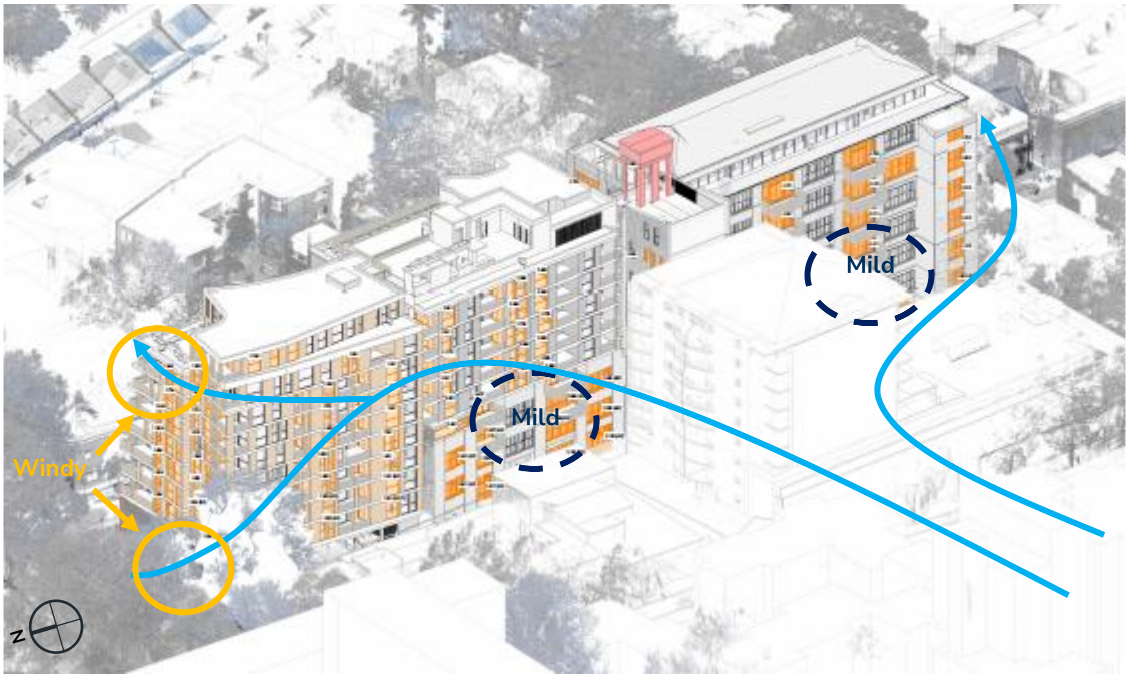

Figure 7: Flow patterns for winds from the west

SUMMARY – PUBLIC DOMAIN

For most locations, wind conditions for majority of the locations within the proposed development site are expected to remain similar to the existing wind conditions. Mild wind conditions are expected near the building entrances on the western side of the development, with windier conditions near the north-west corner of the building. From a pedestrian comfort perspective, the wind environment around the proposed development site is likely to be classified as acceptable for pedestrian standing or walking under Lawson. These pedestrian comfort levels would be suitable for public accessways, and for stationary short-term exposure activities. All locations would be expected to satisfy the safety/distress criterion.

WIND CONDITIONS WITHIN THE DEVELOPMENT

ROOFTOP TERRACE

Accessible areas at the rooftop terrace are proposed on Level 10. Penthouse balconies facing the east side are expected to experience windier conditions from southerly and easterly winds but is shielded from the prevailing westerly winds. The 1100 mm high hit and miss brick wall provides some shielding for winds from the west, resulting in slightly milder wind conditions pool cabanas area. Increasing the brick wall to a minimum height of 1800 mm could improve wind conditions if this area is intended for any medium-long term stationary activities such as outdoor seating.

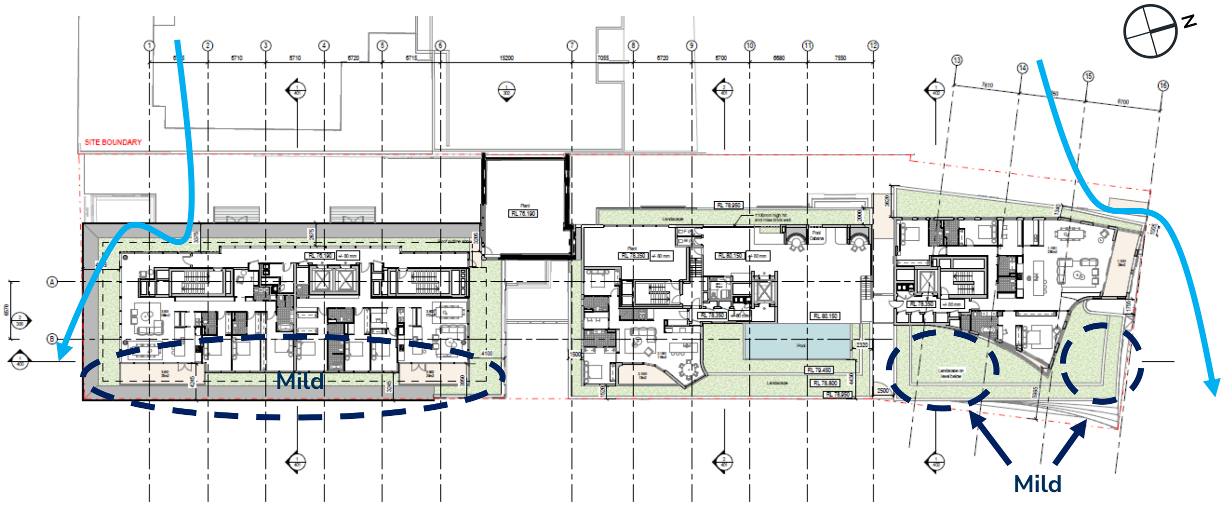

Figure 8: Flow patterns for winds from the west

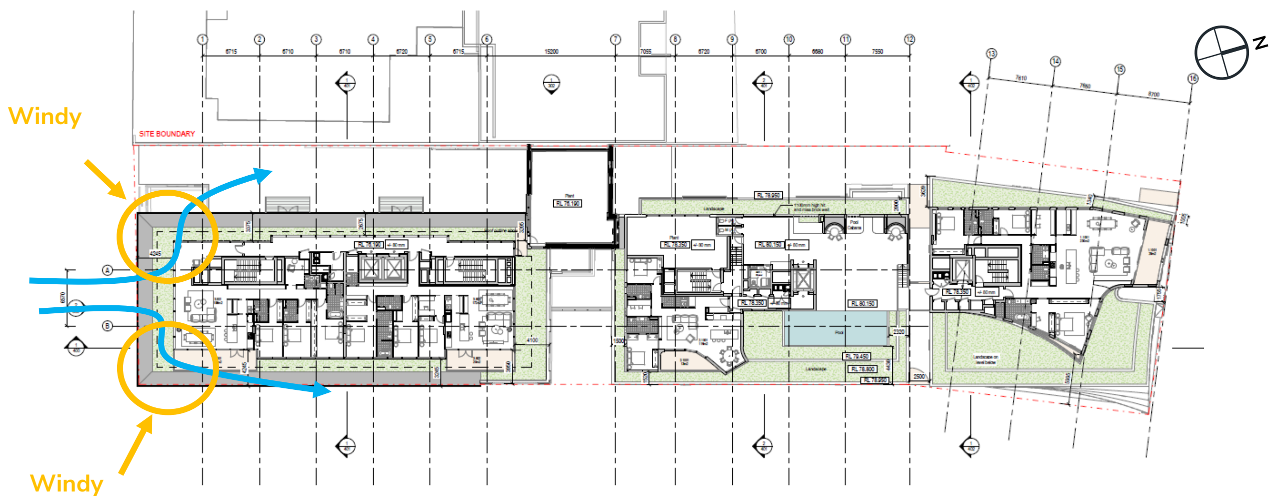

Figure 9: Flow patterns for winds from the south

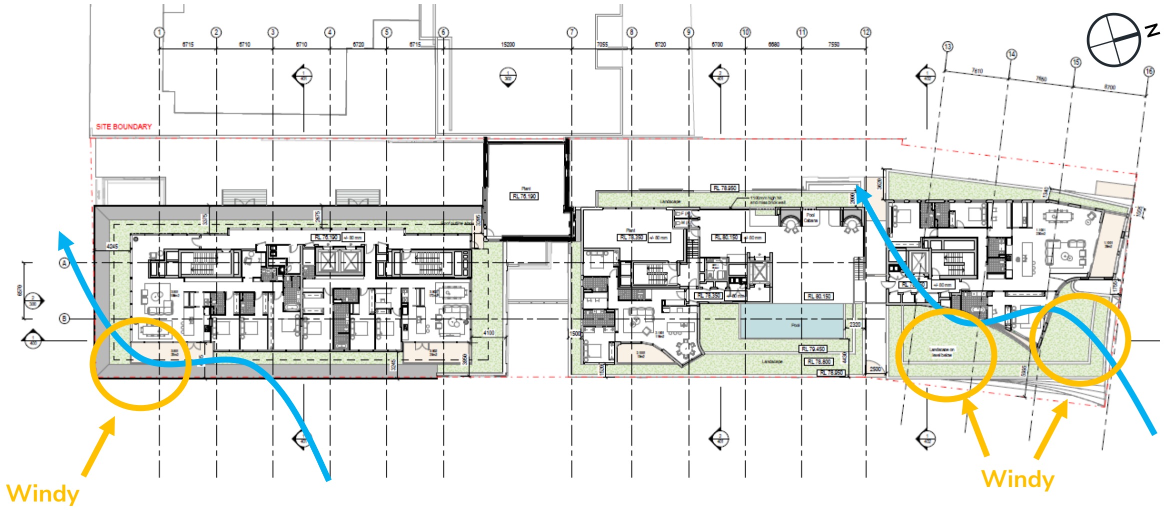

Figure 10: Flow patterns for winds from the east

BALCONIES

Corner balconies indicated at the north-west and north-east corner are expected to experience slightly windier conditions as prevailing southerly and westerly winds impinge the broad east and west face of the building and accelerate around these corners. Implementation of solid/porous screen (>60% Solidity) on the northern side and western side of these corner balconies would effectively mitigate against these strong cross flows (Shown in Figure 11).

Figure 11: Implementation of partial or full enclosure on the north and west face of corner balconies (blue)

5. Conclusion

Cermak Peterka Petersen Pty. Ltd. has provided a qualitative assessment of the impact of the proposed 47-97 Marlborough Street, Surry Hills project on the local wind environment in and around the development site. Being slightly larger than most surrounding structures, the proposed development will have some effect on the local wind environment, though any changes are not expected to be significant from the perspective of pedestrian comfort or safety. Wind conditions around the development are expected to be classified as acceptable for pedestrian standing or walking from a Lawson comfort perspective, with some windier conditions on the north-west and north-east corners and pass the distress/safety criterion. Some mild regions are expected at the western side of the building due to the flow around the compound massing with the adjacent Edgeview Tower to the immediate west. No adverse conditions requiring specific mitigation are foreseen, however local amelioration may be advised for areas intended for long-term stationary activities.

References

Lawson, T.V. (1990), “The Determination of the Wind Environment of a Building Complex before Construction” Department of Aerospace Engineering, University of Bristol, Report Number TVL 9025.

City of Sydney (2022), Central Sydney Planning Strategy.

Appendix A – Wind Flow Mechanisms

When the wind hits a large isolated building, the wind is accelerated down and around the windward corners, Figure A1 this flow mechanism is called downwash and causes the windiest conditions at ground level on the windward corners and sides of the building. In Figure A1smoke is being released into the wind flow to allow the wind speed, turbulence, and direction to be visualised. The image on the left shows smoke being released across the windward face, and the image on the right shows smoke being released into the flow at about third height in the centre of the face.

Techniques to mitigate the effects of downwash winds on pedestrians include the provision of horizontal elements, the most effective being a podium to divert the flow away from pavements and building entrances. Awnings along street frontages perform a similar function, and the larger the horizontal element, the more effective it will be in diverting the flow.

Channelling occurs when the wind is accelerated between two buildings or along straight streets with buildings on either side.

Figure A2 shows the wind at mid and upper levels on a building being accelerated substantially around the corners of the building. When balconies are located on these corners, they are likely to be breezy, and will be used less by the owner due to the regularity of stronger winds. Owners quickly become familiar with when and how to use their balconies. If the corner balconies are deep enough, articulated, or have regular partition privacy fins, then local calmer conditions can exist.

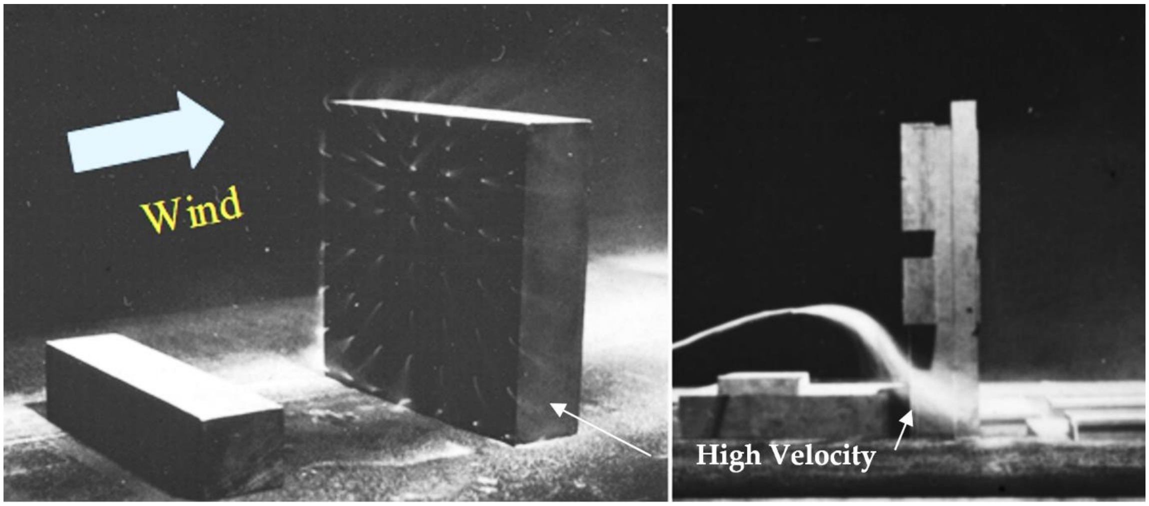

Figure A1: Flow visualisation around a tall building.

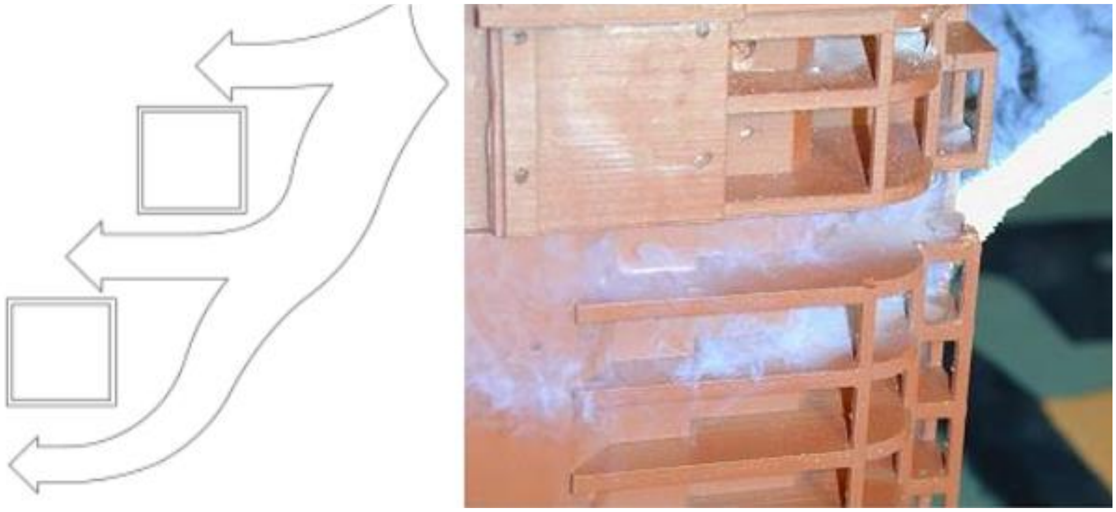

Figure A2: Channelling between buildings (L) and visualisation through corner balconies (R).

Appendix B - Wind Impact Planning Guidelines

It is well known that the design of a building will influence the quality of the ambient wind environment at its base. Below are some suggested wind mitigation strategies that should be adopted into precinct planning guidelines and controls (see also Cochran, 2004).

Building form – Canopies

A large canopy may interrupt the flow as it moves down the windward face of the building. This will protect the entrances and sidewalk area by deflecting the downwash at the second storey level, Figure B1. However, this approach may have the effect of transferring the breezy conditions to the other side of the street. Large canopies are a common feature near the main entrances of large office buildings.

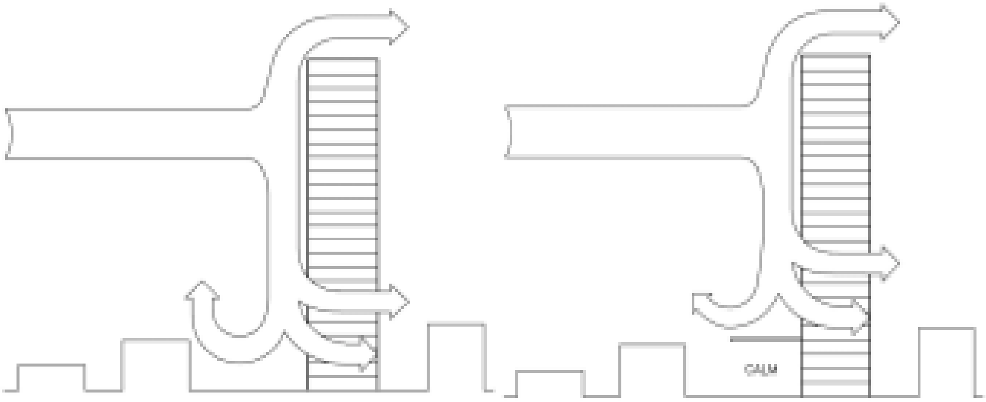

Figure B1: Canopy Windbreak Treatment. (L) Downwash to street level may generate windy conditions for pedestrians. (R) A large canopy is a common solution to this pedestrian-wind problem at street level.

Building form – Podiums

The architect may elect to use an extensive podium for the same purpose, Figure B2, if it complies with the design mandate. This is a common architectural feature for many major projects, but it may be counterproductive if the architect wishes to use the podium roof for long-term pedestrian activities, such as a pool or tennis court.

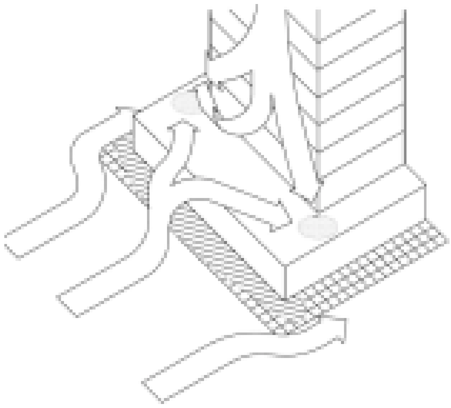

Figure B2:The tower-on-podium massing often results in reasonable conditions at ground level, but the podium may not be useable.

Building form – Arcades

Another massing issue, which may be a cause of strong ground-level winds, is an arcade or thoroughfare opening from one side of the building to the other. This effectively connects a positive pressure region on the windward side with a negative pressure region on the lee side; a strong flow through the opening often results, Figure B3. The uninvitingly windy nature of these open areas is a contributing reason behind the use of arcade airlock entrances (revolving or double sliding doors).

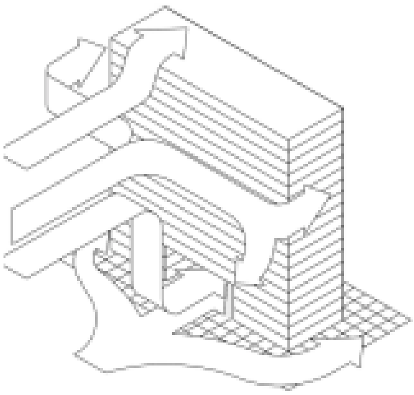

Figure B3: An arcade or open column plaza under a building frequently generates strong pedestrian wind condition.

Building form – Alcove

An entrance alcove behind the building line will generally produce a calmer entrance area at a mid-building location, Figure B4(L). In some cases, a canopy may not be necessary with this scenario, depending on the local geometry and directional wind characteristics. The same undercut design at a building corner is usually quite unsuccessful, Figure B4 (R), due to the accelerated flow mechanism described in Figure B1 and the ambient directional wind statistics. If there is a strong directional wind preference, and the corner door is shielded from those common stronger winds, then the corner entrance may work. However, it is more common for a corner entrance to be adversely impacted by this local building geometry. The result can range from simply unpleasant conditions to a frequent inability to open the doors.

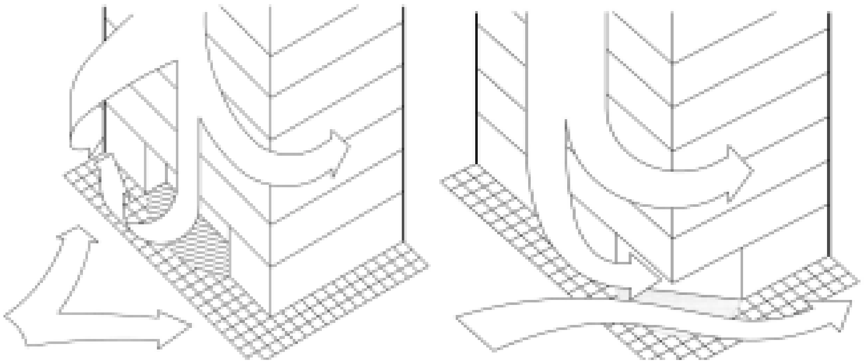

Figure B4: Alcove Windbreak Treatment. (L) A mid-building alcove entrance usually results in an inviting and calm location. (R) Accelerated corner flow from downwash often yields an unpleasant entrance area.

Building form – Façade profile and balconies

The way in which a building's vertical line is broken up may also have an impact. For example, if the floor plans have a decreasing area with increased height the flow down the stepped windward face may be greatly diminished. To a lesser extent the presence of many balconies can have a similar impact on ground level winds, although this is far less certain and more geometry dependent. Apartment designs with many elevated balconies and terrace areas near building ends or corners often attract a windy environment to those locations. Mid-building balconies, on the broad face, are usually a lot calmer, especially if they are recessed. Corner balconies are generally a lot windier and so the owner is likely to be selective about when the balcony is used or endeavours to find a protected portion of the balcony that allows more frequent use, even when the wind is blowing.

Use of canopies, trellises, and high canopy foliage

Downwash Mitigation – As noted earlier, downwash off a tower may be deflected away from ground-level pedestrian areas by large canopies or podium blocks. The downwash then effectively impacts the canopy or podium roof rather than the public areas at the base of the tower, Figure B2. Provided that the podium roof area is not intended for long-term recreational use (e.g. swimming pool or tennis court), this massing method is typically quite successful. However, some large recreational areas may need the wind to be deflected away without blocking the sun (e.g. a pool deck), and so a large canopy is not an option. Downwash deflected over expansive decks like these may often be improved by installing elevated trellis structures or a dense network of trees to create a high, bushy canopy over the long-term recreational areas. Various architecturally acceptable ideas may be explored in the wind tunnel prior to any major financial commitment on the project site.

Horizontally accelerated flows between two tall towers may cause an unpleasant, windy, ground-level pedestrian environment, which could also be locally aggravated by ground topography. Horizontally accelerated flows that create a windy environment are best dealt with by using vertical porous screens or substantial landscaping. Large hedges, bushes or other porous media serve to retard the flow and absorb the energy produced by the wind. A solidity ratio (i.e. proportion of solid area to total area) of about 60-70% has been shown to be most effective in reducing the flow's momentum. These physical changes to the pedestrian areas are most easily evaluated by a model study in a boundary-layer wind tunnel.

References

Cochran L., (2004) Design Features to Change and/or Ameliorate Pedestrian Wind Conditions, Proceedings of the ASCE Structures Congress, Nashville, Tennessee, May 2004.