

20-22 ATCHISON STREET ST LEONARDS

Environmental Wind Impact - Desktop Study

Prepared for:

Setia Sydney Pty Ltd
Level 1, 155 Franklin Street
Melbourne, Victoria 3000

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Setia Sydney Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.031562-R01-v1.0	15 September 2025	Dr Farzin Ghanadi	Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy

EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Setia Sydney Pty Ltd, to provide a qualitative (expert opinion) study assessing the environmental wind impact of a proposed mixed-use development at 20-22 Atchison Street, St Leonards.

The development site is enclosed by Atchison Street to the south, Mitchell Street to the east, Atchison Lane to the north, and the existing high-rise tower to the west. The vicinity is characterized by medium to high-level development, featuring high-rise buildings to the south and east—both existing and approved. Immediate surroundings, progressing clockwise from the north to the southeast, predominantly provide medium-level shielding to the site.

St Leonards Wind Climate

Using long-term wind records obtained from nearby Bureau of Meteorology stations at Bankstown Airport and Sydney Kingsford Smith Airport, SLR has determined that St Leonards has local winds characteristics somewhat closer to Sydney (KS) Airport than Bankstown Airport, given the project site's distance inland from the coast. Accordingly, key prevailing wind directions of interest are the northeast, southeast and south for summer and mainly west quadrant winds for winter.

Existing Wind Environment

Close to the ground, the "regional" wind patterns described above are affected by the local terrain, topography and built environment, all of which influence the "local" wind environment.

- As noted in Section 1.3, the site will benefit from effective wind shielding in all quadrants, primarily attributed to the presence of mid to high-rise developments surrounding the proposed site.
- In the upper levels, the proposed development may be impacted by the higher wind levels originating from the north and northwest directions, given the current presence of mid-rise buildings in these specific directions. Some potential for wind channelling is also exist along neighbouring streets.

Future Wind Environment

In terms of the *future* wind environment with the proposed Development, the following features of the development are noted as being of most significance:

- The potential impact of the development on pedestrian winds along surrounding footpaths will be mitigated by the proposed substantial setback of the building façade and the inclusion of planned/existing trees- refer Figure 8.
- Keep the proposed trees and landscaping within and along the sides of the development to help reduce local wind speeds. It is recommended that all proposed landscaping be evergreen with dense foliage to maintain year-round effectiveness- refer Figure 8.
- Maintain the proposed 2.4 m-high vertical windbreak extending continuously around the outer perimeter of the communal open space on Level 4 to ensure adequate wind protection and improved comfort for users of the area- refer Figure 9.

EXECUTIVE SUMMARY

The above analysis has been made on the basis of our best engineering judgment and on the experience gained from scale model wind tunnel testing or computational fluid dynamics analysis of a range of developments. The conclusions of this SLR report are recommended to be quantified using wind tunnel testing or computational fluid dynamics analysis.

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1 INTRODUCTION

This report has been prepared to support a State Significant Development Application (SSDA) SSD-87486461 for the site at 20-22 Atchison Street, St Leonards (the site).

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 9 July 2025 (SSD-87486461). Specifically, this report has been prepared to respond to the following SEARs:

Table 1 Relevant SEARs being addressed in this report

Item	Description of Requirements
6. Environmental Amenity	<ul style="list-style-type: none">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.
23. Public Space	<ul style="list-style-type: none">If public space is proposed as part of the development, demonstrate how the development:<ul style="list-style-type: none">maximises the amenity of public spaces in line with their intended use, such as through adequate facilities, solar access, shade and wind protection.

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Setia Sydney Pty Ltd, to provide a qualitative (expert opinion) study assessing the environmental wind impact of a planning proposal for mixed-use development at 20-22 Atchison Street, St Leonards.

The assessment has been made on the basis of our best engineering judgment and on the experience gained from (decades of) scale-model Wind Tunnel Testing and CFD Simulation analysis of a range of similar scale developments.

2 Project Description

The application seeks development consent for an SSDA which will facilitate the redevelopment of the site for a shop top housing development using the recently introduced provisions under the Transit Oriented Development (TOD) reforms.

The project seeks consent for:

- Demolition of existing buildings on site and tree removal.
- Construction of a 40-storey shop top housing development comprising:
 - 4-storey mixed-use (commercial, residential and retail) podium with a retail tenancy at ground level (Atchison Street frontage).
 - 36 levels of residential apartments and residential amenities within the tower.
 - Landscaping and public amenities along the Mitchell Street eastern elevation at ground level.
 - Consolidated vehicular and loading access from Atchison Lane.
 - 5 storey basement accommodating car, bicycle and motorcycle parking, storage, plant and end of trip facilities (EOTF) for the commercial component.
- Amalgamation of Lot 1 in DP740017 and Lot 120 DP564606.
- 10% of residential floor space to be used for affordable housing via monetary contribution.
- Storage areas, utilities and service provision.
- Refer to Architectural Plans prepared by Cox Architecture appended to the Environmental Impact Statement.

2.1 The Site

The site occupies a strategic location in the St Leonards Crows Nest precinct and is in close proximity to the St Leonards railway station and Crows Nest Metro station and town centre.

The site is located at 20-22 Atchison Street, St Leonards. The site has a primary frontage to Atchison Street to the south, Mitchell Street to the east and Atchison Lane to the north. The site is located within the North Sydney Local Government Area (LGA) and is located approximately 4.5km north of the Sydney CBD.

The site comprises two allotments described as Lot 1 in DP740017 and Lot 120 DP564606 with a total area of 1374.4sqm. The site is located near the crest of a high ridgeline point, with Mitchell Street falling in elevation towards the north of the site and Atchison Street falls towards the east. The site location is outlined in Figure 1.

Figure 1 Aerial View of Development Site



Existing development on the site includes:

- 22 Atchison Street is currently occupied by six storey commercial office building and 18-20 Atchison Street comprises a three-storey commercial building which is currently vacant. The buildings were constructed in the 1980s and has a primary frontage to Atchison Street and secondary vehicular access from Atchison Lane.
- 22 Atchison Street accommodates additional vehicular access from Mitchell Street.

2.2 Surrounds

In terms of the surrounding buildings:

- The surrounding built environment comprises mid to high-rise buildings located on the west and south sides of the project site.
- To the north and northeast sides of the development, there are low to mid rise developments that are anticipated to provide limited shielding, particularly on the upper levels, affecting the development.
- The surrounding topography is variable, with a downward gradient from the east to west aligning with Atchison Street.

Figure 2 Surrounding Built Environment



3 SYDNEY'S WIND CLIMATE

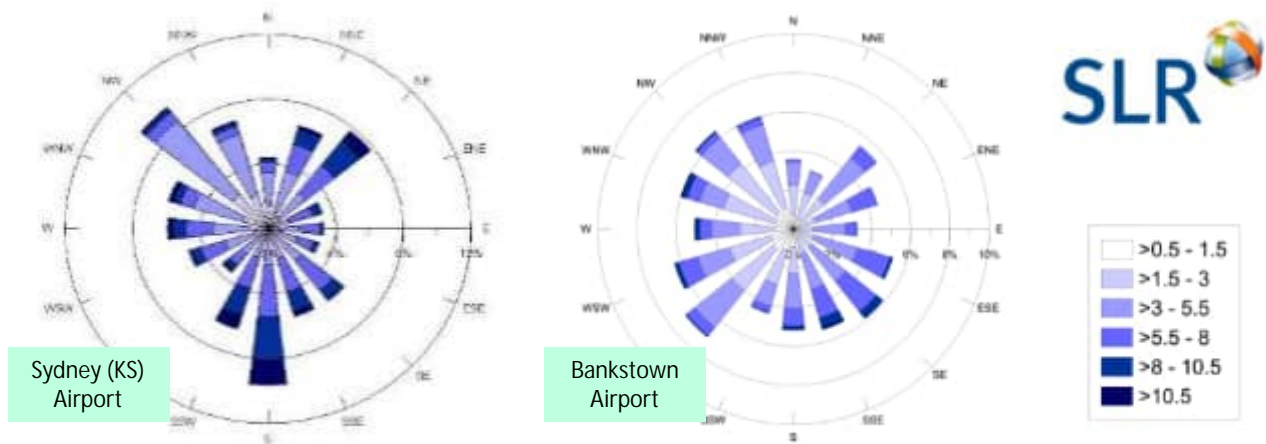
The data of interest in this study are the mean hourly wind speeds and largest gusts experienced throughout the year (especially higher, less frequent winds), how these winds vary with azimuth, and the seasonal break-up of winds into the primary Sydney Region wind seasons.

3.1 Annual and Seasonal Variations

Key characteristics of Sydney's Regional Wind Climate are illustrated in two representative wind roses shown in Figure 3, taken from Bureau of Meteorology (BoM) data recorded during the period 1999-2017 at Sydney (Kingsford Smith) Airport and Bankstown Airport. A review of the associated seasonal wind roses (refer Appendix A) shows that Sydney is affected by two primary wind seasons with relatively short (1-2 month) transition periods in between:

- Summer winds occur mainly from the northeast, southeast and south. While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and southerly winds generally provide the strongest gusts during summer. Both northeast winds (as sea breezes) and stronger southerly winds associated with "Southerly Busters" and "East Coast Lows" typically have a significantly greater impact along the coastline. Inland, these systems lose strength and have altered wind direction characteristics.
- Winter/Early Spring winds occur mainly from west quadrants and to a lesser extent from the south. West quadrant winds provide the strongest winds during winter and in fact for the whole year, particularly at locations away from the coast.

Figure 3 Annual Wind Roses for Sydney (KS) Airport and Bankstown Airport (BoM Data)



3.2 Wind Exposure at the Site – the "Local" Wind Environment

Close to the ground, the "regional" wind patterns described above are affected by the local terrain, topography and built environment, all of which influence the "local" wind environment.

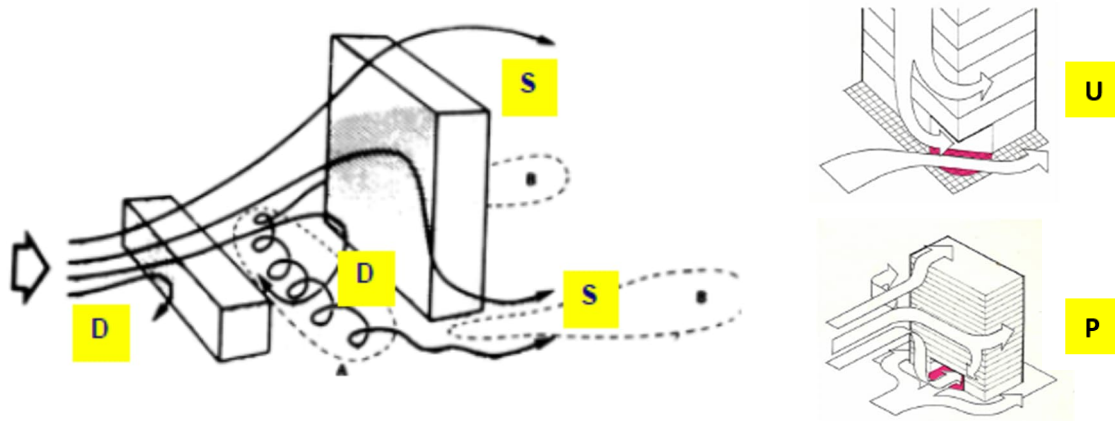
- As noted in Section 1.3, the site will benefit from effective wind shielding in all quadrants, primarily attributed to the presence of mid to high-rise developments surrounding the proposed site.
- In the upper levels, the proposed development may impact the higher wind levels originating from the north and northwest directions, given the current presence of mid-rise buildings in these specific directions. Some potential for wind channelling is also exist along neighbouring streets.

4 Building-wind interaction – General Observations

The impact of wind flowing past buildings has well understood general impacts at ground level – refer Figure 4. In general, the taller the building, the more pronounced the impact on ground level winds.

- Downwash winds “D” are the winds which impact on the windward face of a building and are then deflected downwards to Ground Level in a vertical direction
- Accelerating Shearflow winds “S” are the winds which experience an acceleration as they pass by the building edges and roof as the wind flow moves around and past the building
- Concentrated adverse windflow can also be created when winds are accelerated by the negative pressure area at an undercroft (“U”) or through passages (“P”) at the base of buildings.

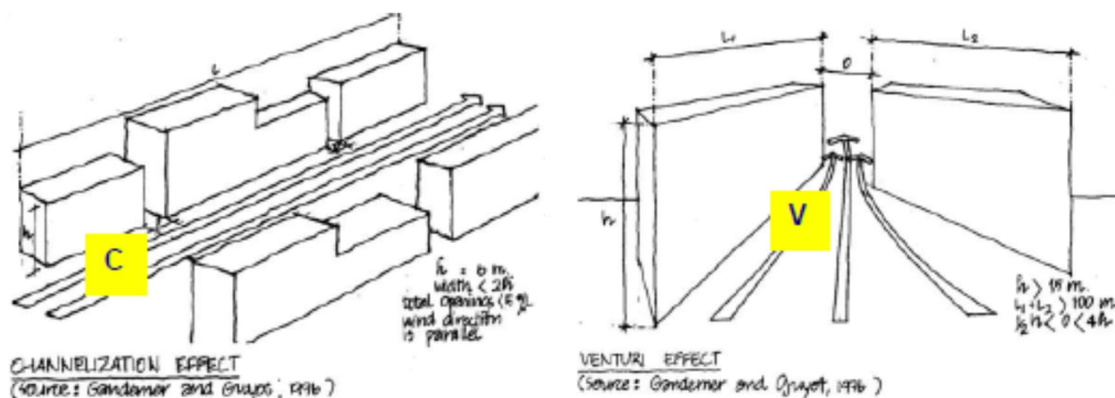
Figure 4 Wind Flow Patterns Past Regular Shaped Buildings



The grouping of buildings can also have an impact on surrounding pedestrian winds – refer Figure 5.

- Channelling Effect winds “C” result when there are rows of parallel buildings (especially taller ones) where the gaps in between the buildings line up with prevailing wind directions.
- Venturi Effect winds “V” result when wind flow is forced to pass between two converging buildings or groups of buildings with a resulting increase in flow.

Figure 5 Wind Flow Patterns Past Groups of Buildings



5 WIND ACCEPTABILITY CRITERIA

5.1 Standard Local Government Criteria

The choice of suitable criteria for evaluating the acceptability of particular ground level conditions has been the subject of relatively recent research. The acceptability criteria that have been developed from this research and currently referenced by most Australian Local Government Development Control Plans have been summarised below in Tabel 1.

Table 2 Standard Local Government Wind Acceptability Criteria

Type of Criteria	Limiting Gust Wind Speed Occurring Once Per Year	Activity Concerned
Safety	24 m/s	Knockdown in Isolated Areas
	23 m/s	Knockdown in Public Access Areas
Comfort	16 m/s	Comfortable Walking
	13 m/s	Standing, Waiting, Window Shopping
	10 m/s	Dining in Outdoor Restaurant

The primary objectives relating to the above wind impact criteria are as follows:

1. The general objective is for annual 3-second gust wind speeds to remain at or below the so-called 16 m/s "Walking Comfort" criterion. Whilst this magnitude may appear somewhat arbitrary, its value represents a level of wind intensity above which the majority of the population would find unacceptable for comfortable walking on a regular basis at any particular location.
2. In many urban locations, either because of exposure to open water conditions or because of street "canyon" effects, etc, the 16 m/s "Walking Comfort" level may already be currently exceeded. In such instances a new development should ideally not exacerbate existing adverse wind conditions and, wherever feasible and reasonable, ameliorate such conditions.
3. It can be seen in Tabel 1 that the recommended limiting wind speeds for spaces designed for long-term exposure activities such as sitting, outdoor dining, etc., are lower (ie more stringent) than for "walking comfort".

5.2 Application of Wind Criteria

The criteria provided in Tabel 1 (especially in relation to Comfort) should not be viewed as "hard" numbers as the limiting values were generally derived from subjective assessments of wind acceptability. Such assessments have been found to vary considerably with the height, strength, age, etc., of the pedestrian concerned. A further factor for consideration is the extent of windy conditions, and some relaxation of the above criteria may be acceptable for small areas under investigation provided the general site satisfies the relevant criteria.

6 WIND IMPACTS OF THE PROPOSED REDEVELOPMENT

6.1 Existing Winds – Wind Impact and Effects

Existing street level wind conditions in the vicinity of the site could be close to or greater than 16 m/s “walking comfort” criterion for some prevailing wind directions, resulting from channelling of winds along aligning streets. The surrounding built environment which consists of significant high-rise buildings to some orientations, offers some protection to the majority of wind directions.

Northeast Winds

Dense medium to lower-level shielding is provided to the northeast, consisting of medium level development immediately surrounding the site with low level residential housing beyond that. Additionally, northeast winds are generally mild and the potential for exceedance of the 16 m/s criterion along pedestrian pathways is small, i.e. occurrences, if any, are likely to be very infrequent.

Southerly Winds

Shielding to the immediate south of the site is generally high-rise development. Considering this, there should be large levels of protection against winds occurring from the south. There remains some risk for channelling of winds between buildings, particularly along Mitchell Street and it is likely winds could exceed 16 m/s along associated pedestrian pathways even with existing landscaping.

Westerly Winds

There is some high-level shielding provided via the neighbouring Quest apartments and to some extent through the high-rise apartments connected to St Leonards Station. Potential for wind channelling along Atchison Street and Atchison Lane is present, there is limited existing landscaping in the vicinity of the site and there may be exceedances of the 16 m/s criterion along neighbouring pathways.

Upper-Level Winds

Existing upper-level wind conditions at the site are likely to exceed the 10 m/s “outdoor eating” comfort criterion for some prevailing wind directions at elevations above the height limits of surrounding buildings and where there is potential for channelling between those surrounding buildings.

6.2 Future Winds – Predicted Wind Flow Patterns

The proposed development and surrounding built environment which consists of mid to high-rise development to the majority of wind directions offer adequate shielding at ground level. In this section, guidance is provided on the specific regions where there exists the potential to exceed the criteria for acceptable wind comfort. The prevailing wind directions and the anticipated impact of the proposed development on surrounding footpaths, primary entry points, internal public access areas, seating and dining areas, etc are identified in Figure 6 and Figure 7.

Figure 6 Areas of Interest – Lower Ground & Ground Levels

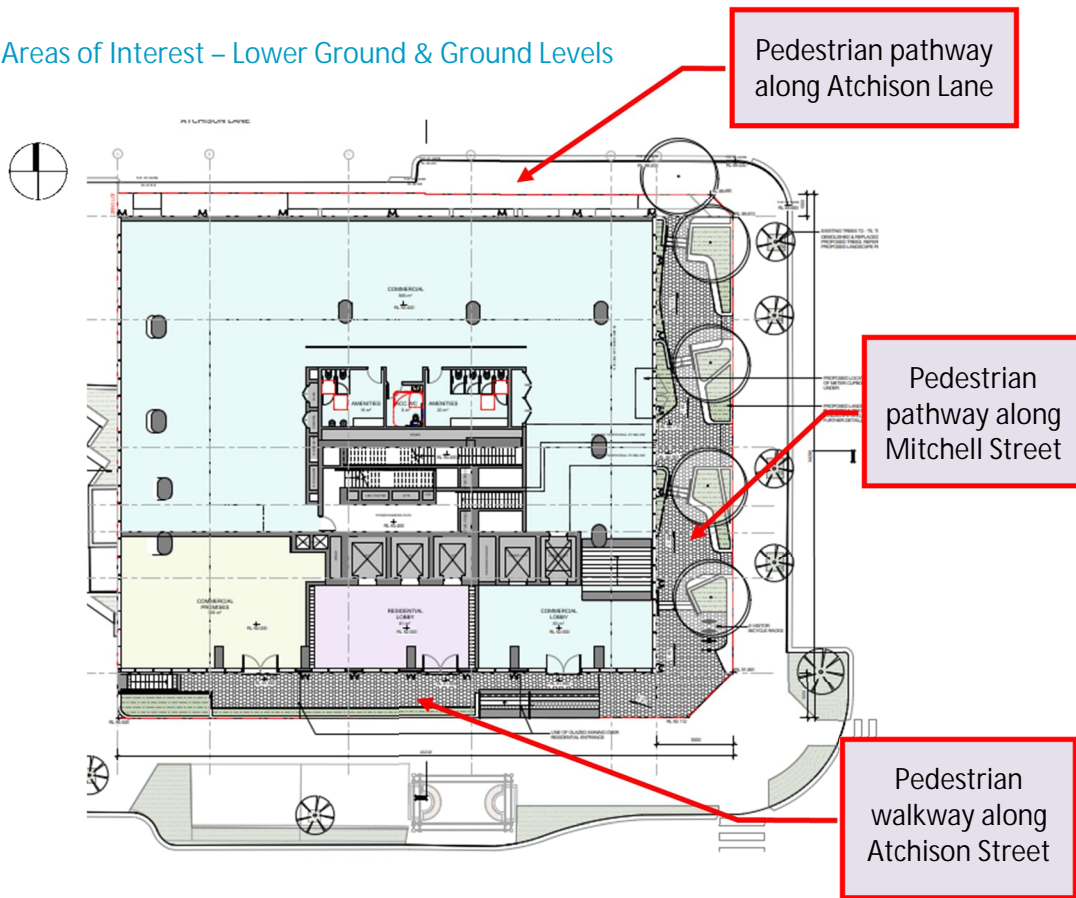
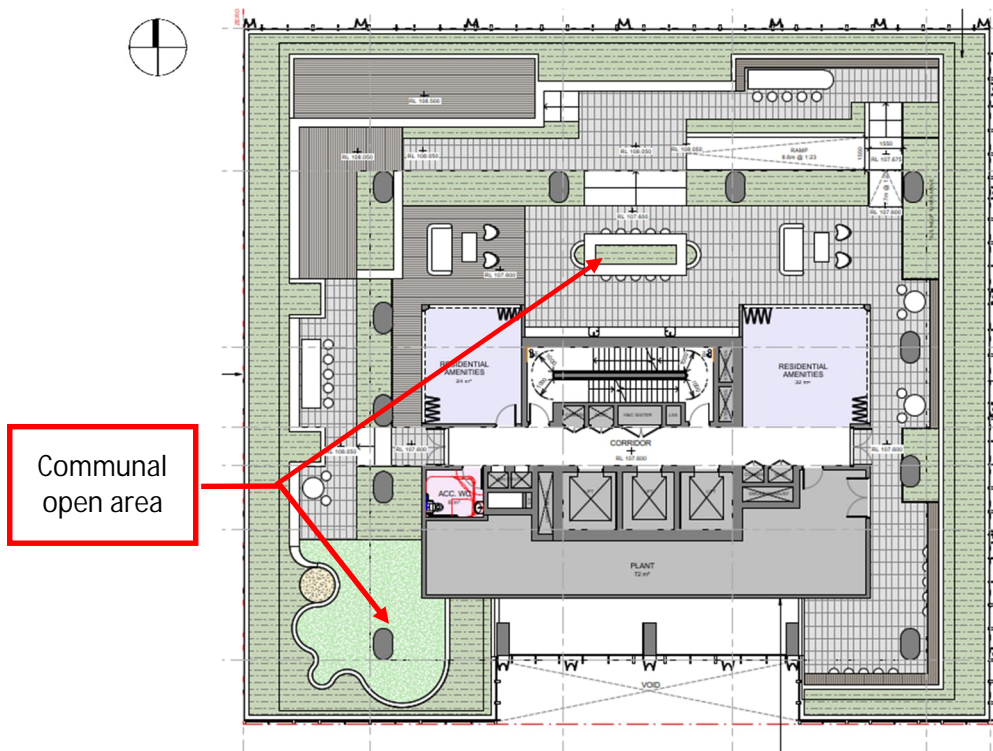


Figure 7 Areas of Interest - Level 4



6.3 Future Wind Environment – Areas of Interest

Location	Wind Direction	Existing Environment	Wind Anticipate	Future Wind Environment	Key wind issues and whether mitigation may be needed
Atchison Lane Pedestrian Pathway	Northeast	Likely comply		Likely comply	The pedestrian walkways underwent moderate shielding due to the development of mid-rise buildings upstream. While the suggested development could introduce downwash onto Atchison Lane, the 1.5m setback from this street's façade below effectively reduces wind levels in the surrounding area. If wind-mitigating elements, such as street footpath landscaping, are not incorporated, the planned development could potentially result in some wind channelling onto the walkway when exposed to northeasterly winds.
	South/Southeast	Likely comply		Likely comply	The walkway is shielded from direct winds coming from south. Moreover, the existence of the planned building serves as a protective barrier, ensuring minimal exposure to south winds in the pedestrian pathways.
	West	Likely comply		Likely comply	The street features a pronounced incline designed to augment wind channelling along the footpath, and the suggested building could amplify this effect. Therefore, additional mitigation measures, such as the incorporation of substantial trees boasting expansive canopies and the implementation of surrounding landscaping, may be necessary.
Atchison Street Pedestrian Pathway	Northeast	Likely comply		Likely comply	The walkway is shielded from direct winds originating from the northeast, with the planned building acting as a barrier to minimize exposure to southerly winds along the pedestrian pathways. Nevertheless, the acceleration around corners may create elevated wind levels from the northeast in the designated dining/seating space on Atchison Street footpaths. Therefore, strategically placing landscaping and substantial trees in the area will play a crucial role in improving efforts to reduce wind impact.
	South/Southeast	Likely comply		Likely comply	The pedestrian walkways receive adequate shielding due to the development of high-rise buildings upstream. While the suggested development could introduce downwash onto Atchison Street, the 3m setback from this street's façade below effectively reduces wind levels in the surrounding area.
	West	Likely comply		Likely comply	The pedestrian walkways are well-shielded by high-rise buildings upstream, but the proposed development could cause wind channelling during

Location	Wind Direction	Existing Environment	Wind Anticipate	Future Wind Environment	Key wind issues and whether mitigation may be needed
					westerly winds. To mitigate this, include wind-mitigating elements like large trees with generous canopies or street footpath landscaping.
Mitchell Street Pedestrian Pathway	Northeast	Likely comply		Likely comply	While the impact of northeasterly winds on this area is limited by moderate shielding from upstream, the forthcoming developments may result in increased wind levels from the northeast, especially around corners in the designated dining/seating space. To further minimize the impact of high-speed winds on the footpaths, the strategic placement of landscaping and sizable trees in the vicinity will be instrumental in enhancing wind reduction efforts.
	South/Southeast	Likely comply		Likely comply	The pedestrian walkways receive adequate shielding due to the development of high-rise buildings upstream. Nevertheless, the proposed development may lead to wind channelling onto the walkway during exposure to southerly winds. To address this, the impact of wind can be alleviated by incorporating wind-mitigating elements, such as large trees with a generous canopy and landscaping along the street footpath or colonnades can contribute to this mitigation effort.
	West	Likely comply		Likely comply	The proposed development has the potential to create some downwash due to west winds. This impact intensifies around the building's corner, despite the inclusion of proposed trees and landscaping. Additional wind mitigation measures are required, particularly in the southwest corner of Level 1.
Communal open space on Level 4	Northeast	na		Likely comply	The open space may be exposed to elevated wind conditions from the northeast; however, the presence of mid-rise buildings on the NE side of the proposed development provides a degree of protection. To further improve conditions, vertical windbreaks are proposed along the northern outer perimeter. These interventions will also help reduce the overall impact of prevailing winds.
	South/Southeast	na		Likely comply	The communal open space on level 4 benefits from effective shielding against southerly winds, thanks to the tall building on the south side of the proposed development.
	West	na		Likely comply	Although the neighbouring high-rise building to the west will help reduce the impact of prevailing winds, wind acceleration may still occur around the

Location	Wind Direction	Existing Environment	Wind	Anticipate Wind Environment	Future Key wind issues and whether mitigation may be needed
					building corners, potentially increasing wind speeds in this area. To address this, vertical windbreaks are proposed along the outer perimeter. These measures will also contribute to reducing the broader influence of prevailing winds across the development.

7 WIND MITIGATION RECOMMENDATIONS

Based on the latest design scheme many aspects of the proposed development have been designed in such way as to avoid direct exposure to the stronger prevailing winds impacting the site. The previous section provided guidance as to the areas where the adopted wind acceptability criteria had the potential to be exceeded and an indication as to the likely local optimum wind treatment strategy, eg whether the wind condition of interest is likely to arise from accelerating winds which require vertical windbreaks (such as landscaping) or downwash winds which require horizontal windbreaks (such as awnings, canopies). In the absence of dedicated wind mitigation solutions, the wind conditions of potential concern in relation to the reference scheme include:

- The adjacent pedestrian walkways and seating/dining areas
- Communal open areas on Level 4
- Corner balconies

7.1 Already Planned Wind Mitigation

The following features, already planned for the development, will have a significant, ameliorating impact on local wind conditions.

- Comprehensive landscaping/trees will be integrated throughout the entire development, including large tree on the adjacent footpaths.
- Integrating building setbacks along pedestrian pathways and in front of certain entrances.

7.2 Additional Wind Mitigation Recommendations

On the basis of the expected wind impacts outlined in Section 6, the following recommendations for wind amelioration features are made in areas where winds are expected to approach or exceed the relevant 10 m/s, 13 m/s or 16 m/s criterion depending on the designed use for that area. These serve as recommendations for the submission of a future development application.

[Lower Ground and Ground Level– refer Figure 8](#)

It has been predicted that ground level and level 1 wind speeds within all public access areas surrounding the development should remain at their present levels or be reduced with the proposed development and its wind mitigation treatments. Consequently:

- Uphold the street trees to mitigate the impact of local wind speeds.
- Keep the proposed trees and landscaping along the sides of the development to help reduce local wind speeds. It is recommended that all proposed landscaping be evergreen with dense foliage to maintain year-round effectiveness. Based on the landscape plans, all proposed landscaping is to be evergreen with dense foliage, ensuring effectiveness throughout the year.
- Maintain setbacks on ground level building entries to diminish wind speeds potentially caused by downwash and redirecting airflow on the pathways.

[Communal open areas on Levels 4 – refer Figure 9](#)

- Maintain the proposed 2.4 m-high vertical windbreak along the outer perimeter of the communal open space on Level 4.

During the Detailed Design phase of the project, once the design of the various building facades is finalised, further modelling could be carried out to confirm zones of the building, by height and by plan view location (eg which building corners), where wind mitigation (ie beyond the standard balustrade height) may be beneficial IF it is intended for balconies to be used all-year-round. The preference here would be for detailed 3D CFD Simulation Modelling rather than Wind Tunnel Testing, given the issue of balcony scaling at typical 1:400 wind tunnel test scales.

Figure 8 Wind Mitigation for Ground Level

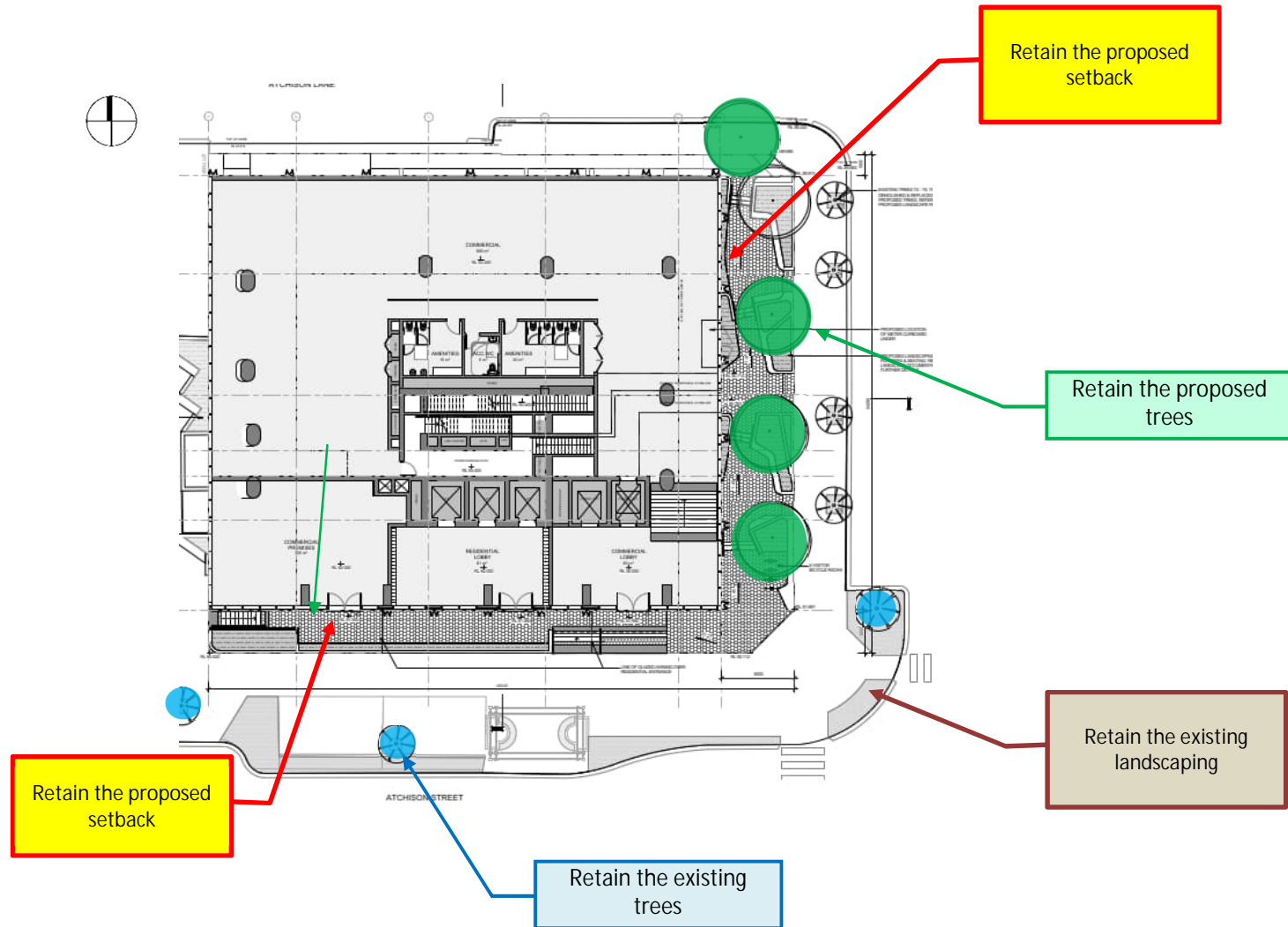
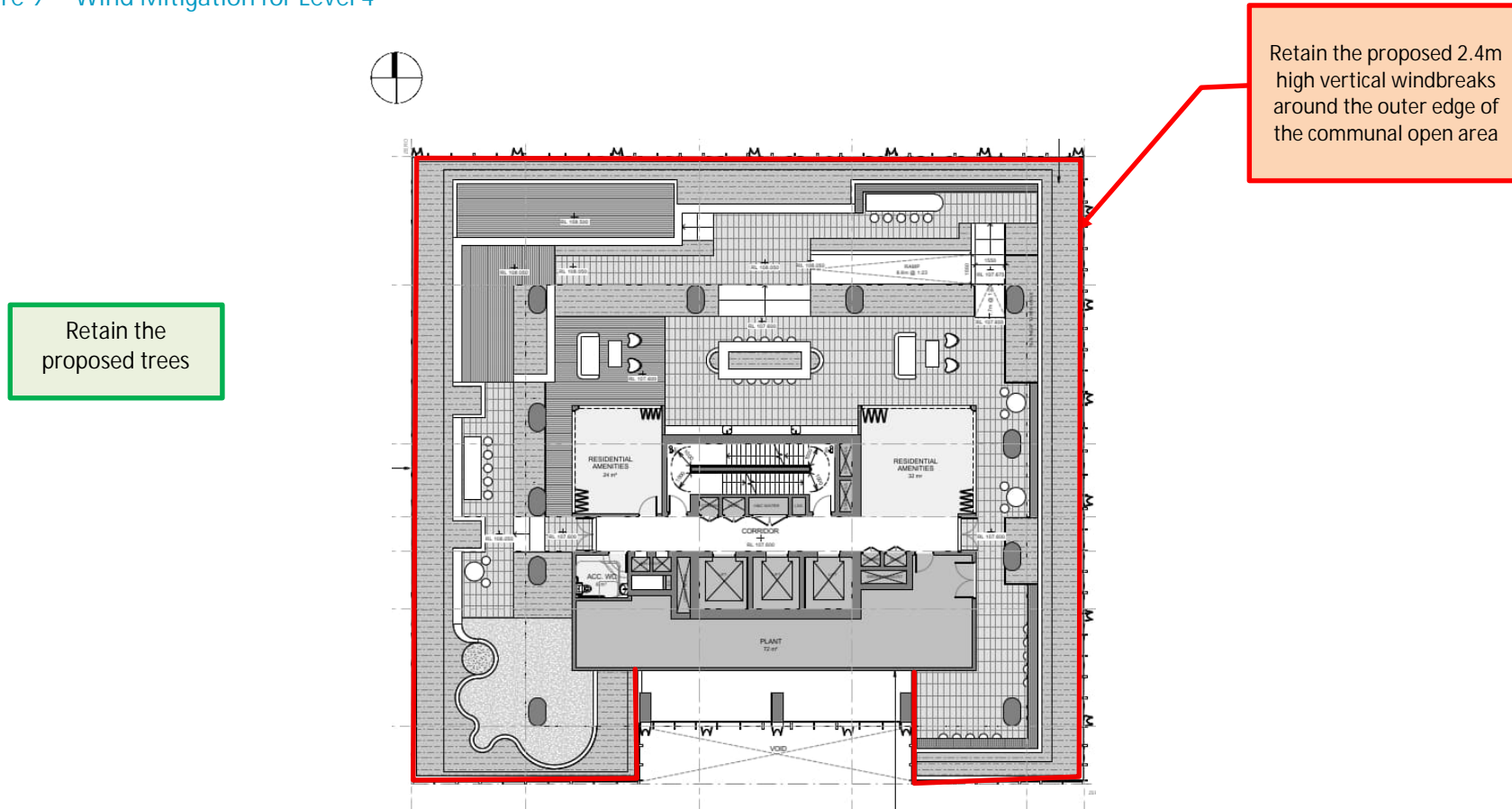


Figure 9 Wind Mitigation for Level 4



8 Conclusion

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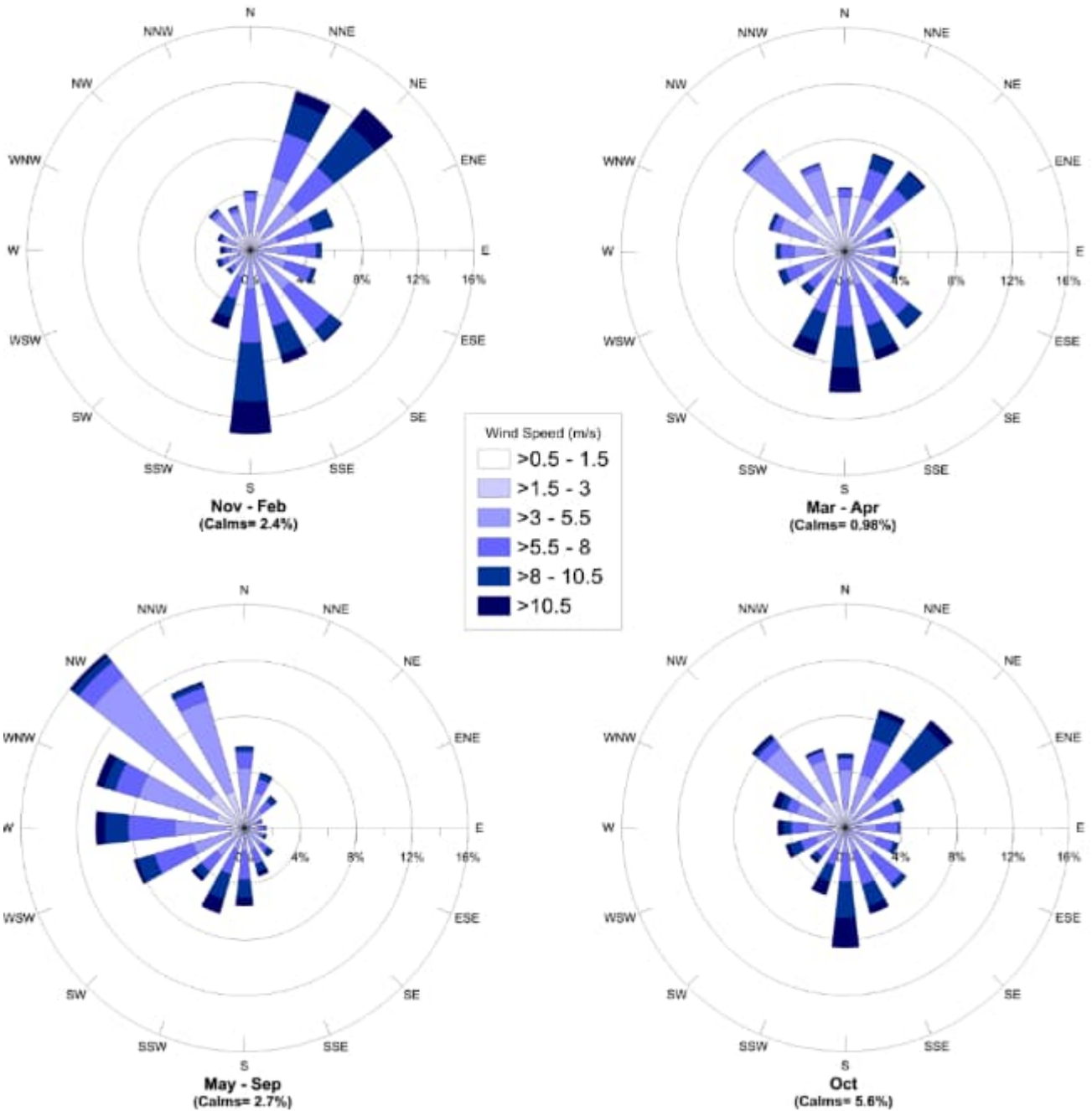
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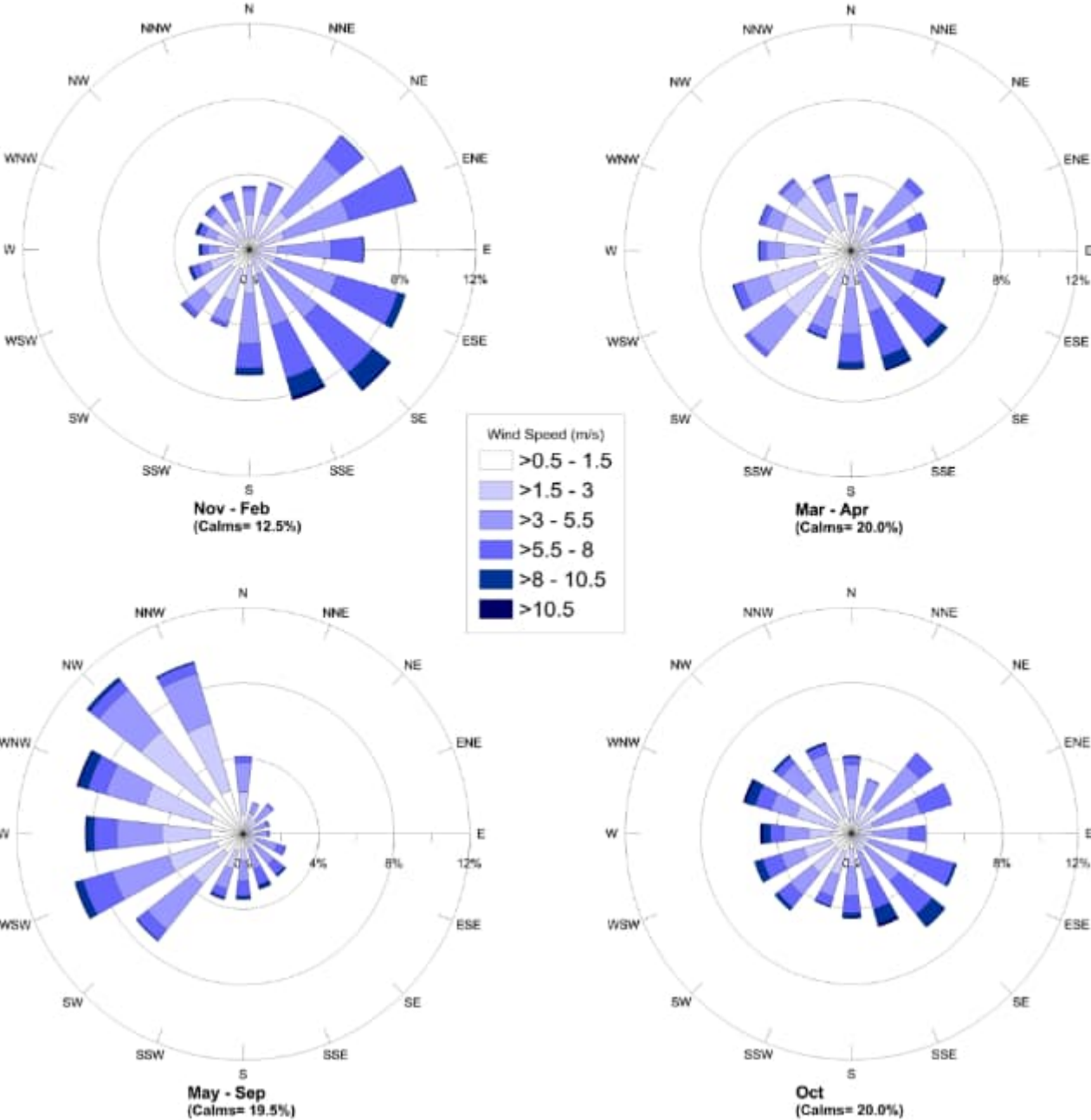
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- Maintain the proposed 2.4 m-high vertical windbreak extending continuously around the outer perimeter of the communal open space on Level 4 to ensure adequate wind protection and improved comfort for users of the area- refer Figure 9.

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APPENDIX A

Seasonal Wind Roses for Bureau of Meteorology Met Stations
at Sydney (Kingsford Smith) Airport and Bankstown Airport





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