



**PEDESTRIAN WIND ENVIRONMENT STATEMENT
173-179 WALKER STREET, NORTH SYDNEY (PLANNING
PROPOSAL SUBMISSION)**

WD816-01F02(REV4)- WS REPORT

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Prepared for:

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DOCUMENT CONTROL

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EXECUTIVE SUMMARY

This report is in relation to the proposed development located at 173-179 Walker Street, North Sydney, and presents an opinion on the likely impact of the proposed design on the local wind environment to the critical outdoor areas within and around the subject development. The effect of wind activity is examined for the three predominant wind directions for the Sydney region; namely the north-easterly, southerly and westerly winds. The analysis of the wind effects relating to the proposed development was carried out in the context of the local wind climate, building morphology and land topography.

The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings which have been prepared by the project architect Kannfinch, received in August, 2017. No wind tunnel tests have been undertaken for the subject development, and hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

The results of this study indicate that the nearby surrounding buildings may partially shield the Ground Level entrances and communal spaces on Ground Level of the subject development from the prevailing winds. While the potential impact of the subject development on the wind conditions along Walker Street and the street level areas of the adjacent properties is expected to be minimal, this will need to be verified through wind tunnel testing. It is expected that suitable wind conditions can be achieved for the trafficable outdoor areas within and around the site on the Ground Level with the strategic inclusion of awnings, impermeable screens and by retaining the proposed tree planting at various locations.

The Level 1 terrace area may experience undesirable wind conditions due to the potential for the prevailing north-easterly and southerly winds being side streamed and downwashed off the tower façade. It is expected that these adverse wind conditions can be successfully mitigated by the strategic tree planting within the terrace.

Wind conditions within the various private balconies within the subject development benefit from being recessed into the building form and located away from the critical corner locations in plan. Nevertheless, some balconies are expected to experience wind conditions that would not be conducive for stationary activities. Whilst the design have not undergone detailed wind tunnel testing, we recommend that wintergardens are considered for all balconies to mitigate wind impacts and improve residential amenity. The effectiveness of this wind mitigation strategy should be confirmed through wind tunnel testing during a future stage of the development application.

1 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The proposed development site is located in North Sydney, bounded by Hampden Street to the north, Warringah Freeway to the east, a 21 storey apartment building (Century Plaza, 171 Walker Street) to the south and Walker street to the west. Across Walker Street to the west of the subject development is an 18 storey apartment building (Belvedere, 138 Walker Street). Further away from the site to the north and east are predominantly low to mid-rise residential buildings and single to double storey housing units. St Leonards Park is situated to the north of the subject development beyond the block. Further away from the site to the west through to south is a series of high-rise buildings.

The lower levels of the subject development, particularly the Ground Level, is expected to be partially shielded from winds coming from all directions due to the dense building morphology around the site. A survey of the local land topography around the site indicates that there is an upward slope from north to south across the site. An aerial image of the site and the local surroundings is shown in Figure 1.

The indicative architectural scheme provides for a new mixed-use development with a height of 47-storeys or 152 metres (RL 210.0). The architectural scheme comprises of:

- 7 basement levels including approximately 44 car parking spaces per level, loading spaces and plants.
- Ground Level and Level 1, consisting of the entrance lobby, retails spaces, plant and service rooms, community facilities, public park areas and landscaped terrace areas.
- 31 storeys of 'low to mid-rise' levels consisting of 1 and 2 bedroom apartments.
- 12 storeys of 'high-rise' levels consisting of 2 and 3 bedroom apartments.
- 2 storeys of 'penthouse' levels.

The critical trafficable areas associated with the proposed development, which are the focus of this assessment with regards to wind effects, are detailed as follows:

- Ground level pedestrian entrances, walkways and community spaces around the various frontages of the development, internal circulation areas as well as outdoor areas in the adjacent properties and public access ways.
- The communal terrace area on Level 1.
- The various balconies throughout the development.

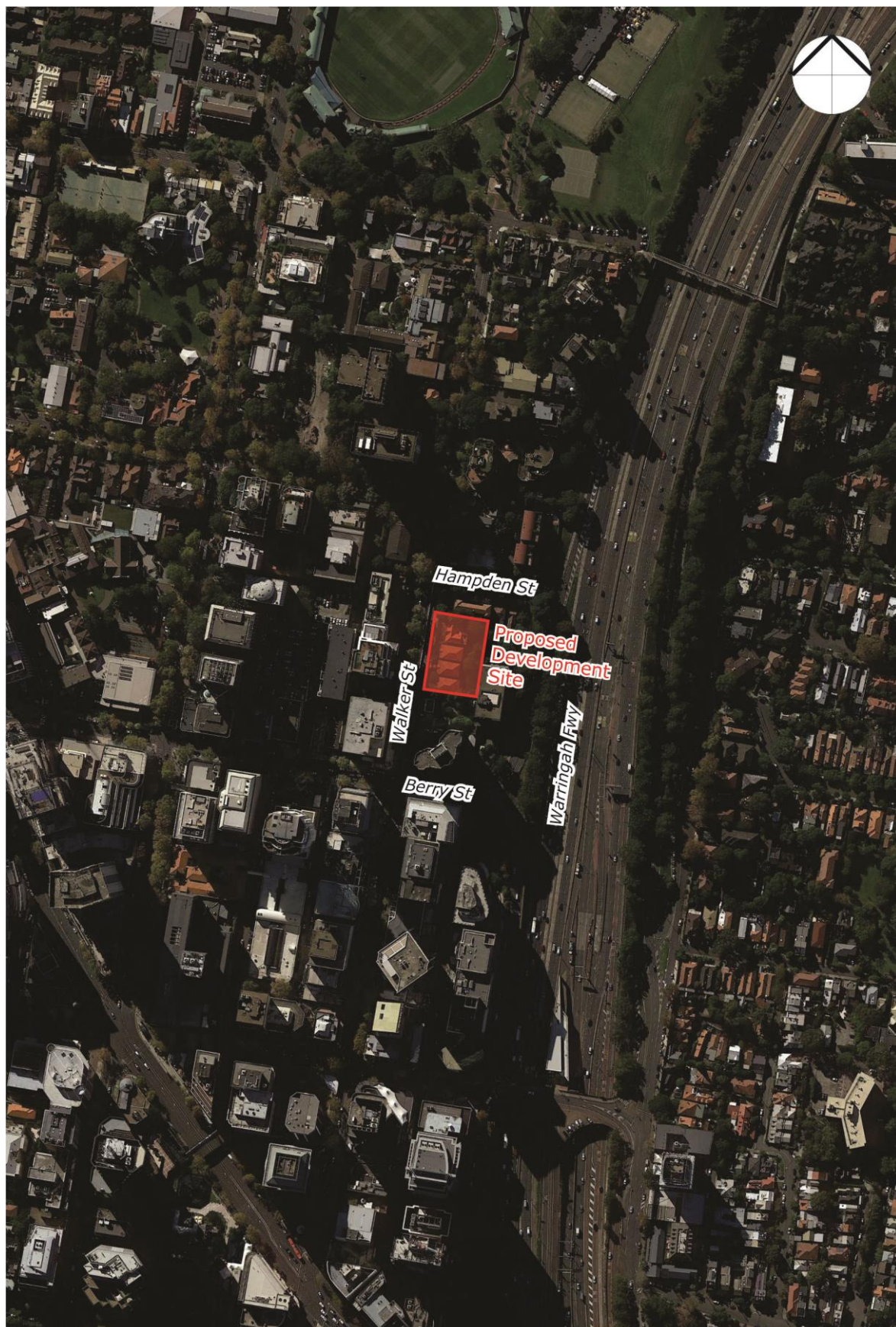


Figure 1: Aerial Image of the Site Location

2 WIND CLIMATE OF THE SYDNEY REGION

The Sydney region is governed by three principle wind directions, and these can potentially affect the subject development. These winds prevail from the north-east, south and west. A summary of the principal time of occurrence of these winds throughout the year is presented in Table 1 below. This summary is based on a detailed analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained at the meteorological station located at Kingsford Smith Airport by the Bureau of Meteorology (recorded from 1995 to 2016). From this analysis, a directional plot of the annual and weekly recurrence winds for the Sydney region is also determined, as shown in Figure 2. The frequency of occurrence of these winds is also shown in Figure 2.

As shown in Figure 2, the southerly winds are by far the most frequent wind for the Sydney region, and are also the strongest. The westerly winds occur most frequently during the winter season for the Sydney region, and although they are typically not as strong as the southerly winds, they are usually a cold wind since they occur during the winter and hence can be a cause for discomfort for outdoor areas. North-easterly winds occur most frequently during the warmer months of the year for the Sydney region, and hence are usually welcomed within outdoor areas since they are typically not as strong as the southerly or westerly winds.

Table 1: Principle Time of Occurrence of Winds for Sydney

Month	Wind Direction		
	North-Easterly	Southerly	Westerly
January	X	X	
February	X	X	
March	X	X	
April		X	X
May			X
June			X
July			X
August			X
September		X	X
October	X	X	
November	X	X	
December	X	X	

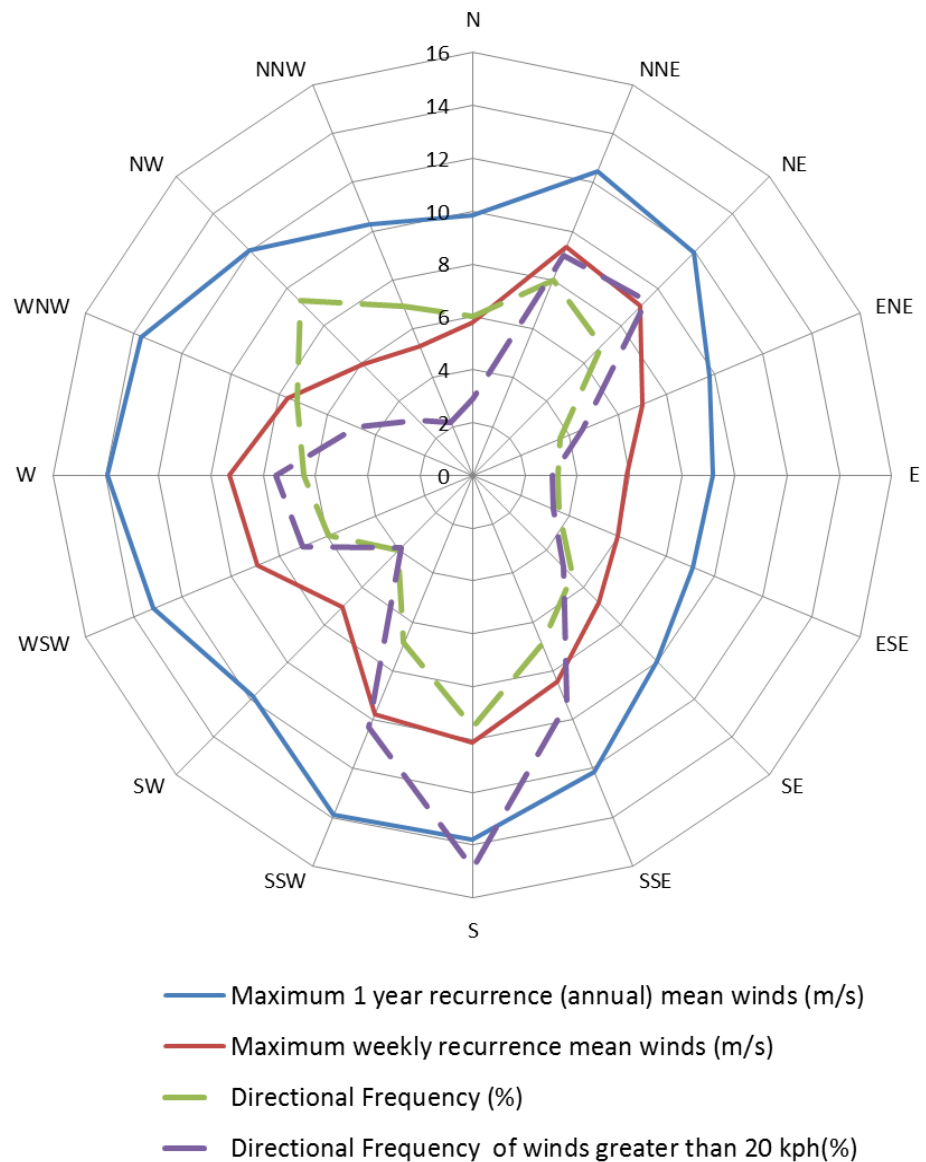


Figure 2: Directional Hourly Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (for the annual and weekly return periods, referenced to standard open terrain at a height of 10m above ground)

3 WIND EFFECTS ON PEOPLE

The acceptability of wind in any area is dependent upon its use. For example, people walking or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Various other researchers, such as A.G. Davenport, T.V. Lawson, W.H. Melbourne, A.D. Penwarden, etc, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. Some Councils and Local Government Authorities have also adopted elements of some of these into their planning control requirements in Australia. The following table is an example, which was developed by A.D. Penwarden in 1975, and describes the effects of various wind intensities on people. Note that the applicability column relates to the indicated wind conditions occurring frequently (exceeded approximately once per week on average). Higher ranges of wind speeds can be tolerated for rarer events.

Table 2: Summary of Wind Effects on People (A.D. Penwarden, 1975)

Type of Winds	Mean Wind Speed (m/s)	Effects	Applicability
Calm, light air	0 - 1.5	Calm, no noticeable wind.	Generally acceptable for Stationary, long exposure activities such as in outdoor restaurants, landscaped gardens and open air theatres.
Light breeze	1.6 - 3.3	Wind felt on face.	
Gentle breeze	3.4 - 5.4	Hair is disturbed, Clothing flaps.	
Moderate breeze	5.5 - 7.9	Raises dust, dry soil and loose paper. Hair disarranged.	Generally acceptable for walking & stationary, short exposure activities such as window shopping, standing or sitting in plazas.
Fresh breeze	8.0 - 10.7	Force of wind felt on body.	Acceptable as a main pedestrian thoroughfare
Strong breeze	10.8 - 13.8	Umbrellas used with difficulty, Hair blown straight, Difficult to walk steadily, Wind noise on ears unpleasant.	Acceptable for areas where there is little pedestrian activity or for fast walking.
Near gale	13.9 - 17.1	Inconvenience felt when walking.	
Gale	17.2 - 20.7	Generally impedes progress, Great difficulty with balance.	Unacceptable as a public accessway.
Strong gale	20.8 - 24.4	People blown over by gusts.	Completely unacceptable.

It should be noted that wind speeds can only be accurately quantified with a wind tunnel study. This assessment addresses only the general wind effects and any localised effects that are identifiable by visual inspection and the acceptability of the conditions for outdoor areas are determined based on their intended use (rather than referencing specific wind speeds). Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

4 RESULTS AND DISCUSSION

The expected wind conditions are discussed in the following sub-sections of this report for the various outdoor areas within and around the subject development for each of the prevailing wind directions for the Sydney region as outlined in Section 2. The interaction between the wind and the building morphology in the area was considered, and important features taken into account include the distances between the building forms, their overall heights and bulk, as well as the landform. Note that only the potentially critical wind effects that are identifiable by visual inspection are discussed in this report. It is recommended that wind tunnel testing be undertaken at the next planning phase to verify the conclusions presented in this report.

4.1 Ground Level Pedestrian Accessible Areas

The built form of the Ground Level and Level 1 of the subject development along Walker Street is similar to that of the existing double storey terrace houses at the site and tower component is significantly set back from Hampden St. Hence, it is expected that the proposed development will have minimal effect on the wind conditions in Hampden St. The development will also have minimal impact on the wind conditions along Walker St, due site being relatively shielded by upstream buildings in the westerly and southerly direction.

However, there is a potential impact from the south-easterly and north-easterly winds over the Warringah Hwy. The extent of such impact will need to be verified through wind tunnel testing.

The wind conditions within public park and community open space areas situated towards the north of the site will benefit from retaining the proposed tree planting around the north-western corner as well as along the northern and eastern boundaries of the open space.

The inclusion of awnings wrapping around the north-eastern corners of the eastern and the middle modules of the tower (closing the inter-module gaps) are likely to avoid the occurrence of undesirable wind effects around the northern entrances as the north-easterly and southerly winds may side stream and downwash off the tower façade due to its modular built form. An alternative to the segment of the awning covering the eastern aspect of the eastern module would be the inclusion of a high impermeable screen along the northern perimeter of the terrace on Level 1.

4.2 Level 1 Terrace

The terrace area located around the south-eastern corner of the subject development at Level 1 may experience undesirable wind conditions due to the potential for the prevailing north-easterly and southerly winds being side streamed and downwashed off the tower façade. It is expected that these uncomfortable wind conditions can be successfully mitigated by the strategic tree planting within the terrace (particularly near the eastern and southern perimeter).

4.3 Private Balconies

Wind conditions within the various private balconies within the subject development benefit from being recessed into the building form and located away from the critical corner locations in plan. Nevertheless, some balconies are expected to experience wind conditions that would not be conducive for stationary activities. Whilst the design have not undergone detailed wind tunnel testing, we recommend that wintergardens are considered for all balconies to mitigate wind impacts and improve residential amenity. The effectiveness of this wind mitigation strategy should be confirmed through wind tunnel testing during a future stage of the development application.

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