



PEDESTRIAN WIND ENVIRONMENT STATEMENT

INTERCONTINENTAL SYDNEY REFURBISHMENT, SYDNEY

WD237-01F02(REV3)- WS REPORT

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DOCUMENT CONTROL

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EXECUTIVE SUMMARY

This report is in relation to the proposed redevelopment of the Intercontinental Hotel, 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 prepared by Hassell, received December 15, 2016. 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 assessment indicate that the proposed redevelopment of the Intercontinental Hotel is expected to have a negligible impact on the ground level wind environment conditions. It is expected the wind conditions to be similar to existing wind conditions within the various ground level, outdoor trafficable areas within and around the subject development site.

The results of this study indicate that wind conditions within and around the remaining outdoor trafficable areas of the site are expected to be acceptable for their intended uses with the following recommendations incorporated into the design:

- Retention of the proposed impermeable screens separating the new seating spaces adjacent to the Macquarie Street entrance on Level 5. These screens may be portable and placed/removed at the operator's discretion.
- The inclusion of a 1.5m high impermeable balustrade along the northern aspect of the pool deck on Level 9.
- Retain the proposed landscaping around the perimeter of the private terraces on Level 13.
- Retention of the proposed full height impermeable screens/privacy walls separating the terraces on Level 31A.
- The inclusion of a 1.5m high impermeable balustrade along the eastern aspect of the terraces on Level 31A.
- The inclusion of 2m high impermeable screens around the north-eastern and south-eastern corners as well as the western perimeter edge of the Level 32 terrace.
- The inclusion of 1.5m high impermeable balustrades around the remaining perimeter edge of the Level 32 Terrace.

Note that for the proposed landscaping to be effective as a wind mitigation device they should be of a densely foliating and evergreen variety to ensure their effectiveness throughout the entire year. The planting should be spaced such that the foliage is able to inter-lock between plants to ensure bracing and suitable protection to the plant during stronger winds.

Furthermore, the use of loose glass-tops and light-weight sheets or covers (including loose BBQ lids) is not appropriate on high-rise outdoor terraces and balconies. Lightweight furniture is not recommended unless it is securely attached to the balcony or terrace floor slab.

With the inclusion of the recommended treatments in the final design of the development, it is expected that suitable wind conditions will be achieved for all outdoor trafficable areas within and around the site. The inclusion of additional densely foliating vegetation such as trees or hedge planting within and around the various outdoor trafficable areas of the site is expected to be effective in further enhancing the localised wind conditions.

1 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The development site is located in the north-eastern portion of the Sydney CBD, bounded by Bridge Street to the south, Phillip Street to the west and Macquarie Street to the east. On the same block to the north are the Justice and Police Museum, the Sir Stamford Hotel and the old Health Department building, the block is then bounded by Alfred Street to the north. In the immediate vicinity of the development site to the north and north-west there is a mix of medium and high rise commercial buildings, further away towards the north is Circular Quay and Sydney Harbour. Surrounding the site to the south and west are the dense, high-rise buildings which form the Sydney CBD and the Royal Botanic Gardens to the east. An aerial image of the subject site and the local surroundings is shown in Figure 1.

The proposed redevelopment includes the existing Intercontinental Hotel (comprising a 32 storey tower and the repurposed Treasury Building) and a 3 storey addition to the 7 storey Transport House. The critical trafficable areas associated with the proposed redevelopment, which are the focus of this assessment with regards to wind effects, are detailed as follows:

- Outdoor seating and terraces on Level 05.
- Pool deck atop Transport House on Level 09.
- Various private outdoor terraces located on Level 31A.
- Club Lounge terrace on 32.



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 1939 to 2008). 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	

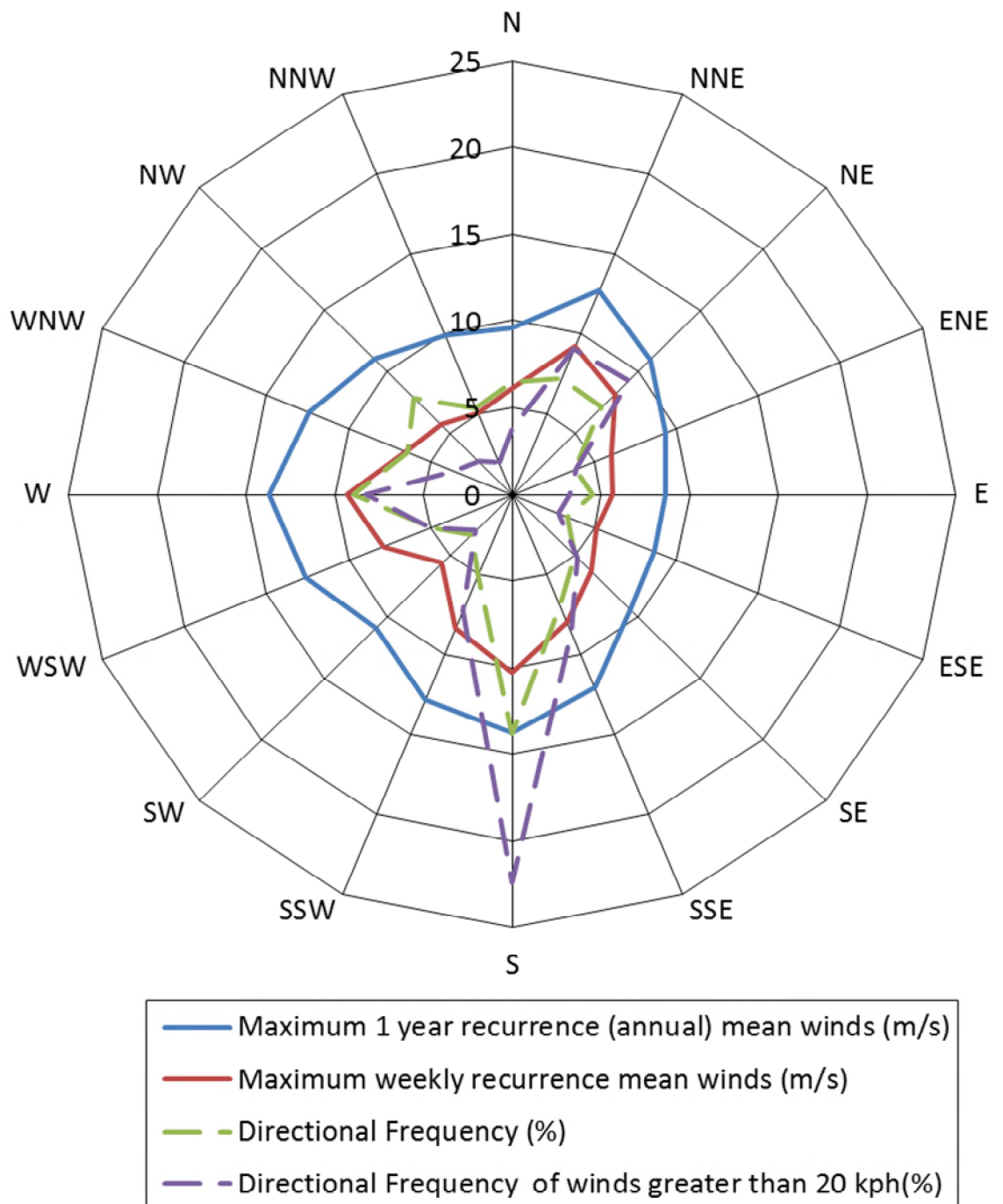


Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10-minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

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 Davenport, Lawson, Melbourne, 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 adopted elements of some of these into their planning control requirements in Australia.

The following table is an example, which was developed by 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 (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 three predominant wind directions for the Sydney region. The interaction between the wind and the building morphology in the area is considered and important features taken into account including the distances between the surrounding buildings and the proposed building form, their overall heights and bulk, as well as the surrounding landform. Note that only the potentially critical wind effects are discussed in this report.

The development site is expected to benefit from considerable shielding from the CBD to the south and west as well as limited shielding from the medium and high rise buildings directly to the north. The upper levels of the development are noted to be exposed to winds from the north-east and east due to the relatively open terrain in these directions.

4.1 Ground Level Terraces and Footpaths

The proposed redevelopment of the Intercontinental Hotel is expected to have a negligible impact on the ground level wind environment conditions. However a number of street level areas are to be repurposed for outdoor seating/dining. As highlighted in Section 3, such areas generally require a higher standard for wind amenity than those which function only as thoroughfares.

The new bar terrace on the south-eastern corner will benefit from the recessed design into the built form and is thus expected to experience wind conditions suitable for its intended use.

The new seating adjacent to the Macquarie Street entrance on the eastern aspect is expected to benefit from shielding provided by the landscaping on either side of Macquarie Street and the Royal Botanic Gardens further to the east. The seating area however remains partially exposed to the prevailing north-easterly and southerly winds which may side stream around the built form of the Treasury Building.

4.2 Level 31A

The proposed terraces on Level 31A are exposed to the prevailing north-easterly and southerly winds they are expected to benefit from single aspect design which is expected to minimise the tendency of winds side streaming around the north-eastern and south-eastern corners to adversely impact the local wind environment. Accordingly it is recommended that the full height impermeable screens/privacy walls separating these outdoor spaces be retained. Furthermore in order to reduce the effects of direct winds on these terraces, particularly from the north-easterly direction, it is recommended that 1.5m impermeable balustrades is included along the eastern perimeter edge of the terraces.

4.3 Pool & Club Lounge Terraces

The outdoor pool deck on Level 9 benefits from the shielding provided by the subject development to the prevailing southerly and westerly winds. However it is potentially exposed to the direct north-easterly winds. It is expected the wind conditions along the outdoor pool deck to be acceptable for its intended uses with the inclusion of a 1.5m impermeable balustrade along the northern perimeter edge of the pool deck.

The outdoor terrace on Level 32 is exposed to the prevailing north-easterly, southerly and westerly winds. While this terrace is expected to benefit from shielding due to the surrounding buildings, the variable nature of this shielding as well as the relative height of this area mean that further measures are expected to be required in order to ameliorate the adverse direct wind effects on the terrace. Hence it is recommended that the following treatments are incorporated into the design of the development to mitigate the adverse wind effects along the outdoor terrace:

- The inclusion of 2m high impermeable screens around the north-eastern and south-eastern corners as well as the western perimeter edge of the Level 32 terrace, as indicated in Figure 3.
- The inclusion of 1.5m high impermeable balustrades around the remaining perimeter edge of the Level 32 Terrace, as indicated in Figure 3.

4.4 General Notes

Note that for the proposed landscaping to be effective as a wind mitigation device they should be of a densely foliating and evergreen variety to ensure their effectiveness throughout the entire year. The planting should be spaced such that the foliage is able to inter-lock between plants to ensure bracing and suitable protection to the plant during stronger winds.

Furthermore, the use of loose glass-tops and light-weight sheets or covers (including loose BBQ lids) is not appropriate on high-rise outdoor terraces and balconies. Lightweight furniture is not recommended unless it is securely attached to the balcony or terrace floor slab.

With the inclusion of the abovementioned treatment recommendations it is expected that wind conditions for all outdoor trafficable areas within the subject development will be suitable for their intended uses.

Recommended Treatments

- 1.5m impermeable balustrade
- 2m impermeable screen



Figure 3: Recommended treatments for Level 32