



PEDESTRIAN WIND ENVIRONMENT STATEMENT
NEPEAN HOSPITAL AND INTEGRATED AMBULATORY SERVICES
REDEVELOPMENT – SSDA

WD818-01AF02(REV2) - WS REPORT

APRIL 6, 2018

Prepared for:

Health Infrastructure

Level 21, 363 George Street Sydney, NSW 2000

DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
December 13, 2017	Initial	0	DR	KP	HK
December 18, 2017	Updated title and development description	1	HK	KP	HK
April 06, 2018	Updated Client info and minor changes	2	SWR	KP	SWR

The work presented in this document was carried out in accordance with the Windtech Consultants Quality Assurance System, which is based on International Standard ISO 9001.

This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for our Client's particular requirements which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Windtech Consultants Pty Ltd. This report should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

EXECUTIVE SUMMARY

This report is in relation to the proposed Stage 1 building of Nepean Hospital, Penrith, and presents an opinion on the likely impact of the proposed design on the local wind environment of 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 Penrith region; namely the northerly to north-easterly, southerly to south-easterly 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 project architects BVN Architecture, received December, 2017. No wind tunnel testing has 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 assessment indicate that wind conditions within and around the various outdoor areas of the site are potentially exposed to adverse wind effects. These include the potential for down-wash effects off the building façade and accelerating flows around the corners of the building. The following treatment recommendations are made to mitigate these potential wind effects:

- Include densely foliating tree planting and other landscaping within and around the development including the central courtyard area. Note that evergreen tree planting should be implemented for areas affected by westerly and southerly to south-easterly winds to ensure its effectiveness throughout the year.
- Awnings over the pedestrian footpaths within and around the site.
- Localised operator controlled screening for longer duration activities such as café seating areas.

With the inclusion of the abovementioned treatments, it is possible to achieve suitable conditions for the outdoor accessible areas. Note that due to the overall massing of the proposed subject development, wind tunnel testing is recommended to be undertaken as part of the detailed design phase of the subject development. This will provide a quantitative analysis of the wind conditions and determine the size and extent of the treatments required to ensure suitable wind conditions are achieved at all outdoor accessible locations within and around the development.

1 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The development site is located within Nepean Hospital, Penrith, and is currently mainly comprised of the hospital carpark. The site is predominantly surrounded by low-rise and medium-rise hospital buildings. The proposed subject development consists of a single tower of 14 storeys. The railway line and the Great Western Highway lie to the north of the development with Kingswood Station to the west. Further from the site lie low-rise residential buildings to the east, south and west, a mixture of low-rise residential and commercial buildings and open fields to the north. Penrith CBD and Penrith Station are also located to the west of the subject development site.

A survey of the land topography indicates that the land rises gradually from the east to the west as well as rising slightly from the south to north. An aerial image of the subject site and the local surroundings is shown in Figure 1.

The critical trafficable areas associated with the proposed development are the ground floor areas, which are accessible by pedestrians and are the focus of this assessment with regards to wind effects.



Figure 1: Aerial Image of the Site Location

2 WIND CLIMATE OF THE PENRITH REGION

The Penrith region is governed by three principal wind directions, and these can potentially affect the subject development. These winds prevail from the north to north-east, south to south-east and west. A summary of the principal time of occurrence of these winds throughout the year is presented in Table 1. This summary is based on an analysis of wind rose data obtained by the Bureau of Meteorology from Penrith lakes AWS between 1995 and 2010. The wind patterns shown in the wind roses for this region are similar to the detailed analyses performed for Sydney Basin airports, including Sydney Airport and Richmond Airport.

For the Penrith region, the north to north-easterly winds occur most frequently during the warmer months of the year. They are typically not as strong as the southerly winds, and are usually welcomed within outdoor areas since they typically occur when it can be quite warm during the summer. The south to south-easterly winds are by far the most frequent wind for the Penrith region, and are also the strongest. Westerly winds occur most frequently during the winter season for the Penrith region. These are usually a cold wind since they occur during the winter, and hence can be a cause for discomfort for outdoor areas.

Table 1: Principal Time of Occurrence of Winds for Penrith

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

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 this section for the various outdoor areas within and around the subject development for each of the three predominant wind directions for the Penrith 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 trafficable areas are located within and around the site boundary, with pedestrian footpaths between the various hospital buildings and a central courtyard area within the tower development. With the additional massing of the development, wind conditions are expected to be stronger than existing site conditions, as the current site is mainly comprised of a carpark. Any building massing within the site boundary is generally expected to have this effect especially at the corners of the development. Shielding from the prevailing winds by adjacent developments is limited due to the exposed nature of the site.

The northerly to north-easterly prevailing winds are expected to impact the site directly due to its exposure from this wind direction. The slightly stepped back northern façade is expected to help mitigate the adverse downwashing winds along the inner northern façade onto the ground level central courtyard. However, sidestreaming is expected to occur at the north-eastern and north-western corners of the site, where the winds tend to accelerate around the corner.

The south to south-easterly prevailing winds are expected to impact the site by causing adverse direct winds, sidestreaming at the south-eastern and south-western corners of the development and downwashing winds along the southern façade. Westerly sidestreaming winds are expected to impact primarily the north-western and south-western corners, and the western aspect of the development through downwash. The south-western link building of the proposed development is expected to provide some shielding from the westerly winds between the proposed development and the North and East Blocks.

It is expected that the westerly, south to south-easterly and potentially the north to north-easterly winds, will be funnelled between East Block building and the proposed development causing adverse wind conditions in this area.

It is recommended to include densely foliating planting to the north of the development, potentially throughout the carpark, as this is expected to help mitigate adverse conditions caused by the north to north-easterly winds by slowing down direct winds upstream of the site. Additional planting is also recommended to the west and the south-east of the site, especially around corners of the development. Awnings on the northern, southern and western aspects wrapping around the corners are expected to aid in mitigating the downwash effects and prevent them from combining with other wind effects at the corners of the buildings. Including

landscaping as well as an awning or canopy within the central lawn is expected to further improve wind conditions in this area. For areas where longer duration stay is expected, such as cafés, localised operator controlled screening could be implemented to further improve wind conditions.

Due to the height difference of the proposed development with respect to the surrounding buildings, there is potential for adverse downstream wind effects to occur as the wind interacts with the building form. Wind tunnel testing is recommended to be undertaken as part of the detailed design phase of the subject development. This will provide a quantitative analysis of the wind conditions and determine the size and extent of the treatments to ensure suitable wind conditions are achieved in all trafficable areas within and around the development.