PEDESTRIAN WIND ENVIRONMENT STATEMENT

PUBLIC SCHOOL AT SMALLS ROAD, RYDE

WD765-01F02(REV0)- WS REPORT

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EXECUTIVE SUMMARY

This report is in relation to the proposed Public School at Smalls Road located in Ryde, Sydney and presents an opinion on the likely impact of the proposed design on the local wind environment at the critical outdoor areas within and around the subject development. The effect of wind activity is examined for the three principal 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 project architect Conrad Gargett Ancher Mortlock Woolley, received September 12, 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 the subject development is not expected to have a significant impact on the wind conditions on the public pedestrian areas surrounding the site on Smalls Road and Lavarack Street.

It is noted that while the majority of areas will be suitable for their intended use, some areas may experience adverse wind effects, hence the following treatments have been recommended.

The Courtyard area within the building benefits from shielding of the prevailing north-easterly and westerly winds by the building form, however there is potential for adverse wind effects caused by the prevailing southerly winds funnelling through the southern entrance to the courtyard. It is recommended to maintain the proposed landscaping within The Courtyard as well as additional plantations within and upstream of the southern entrance to the main building.

The majority of elevated walkways inside the development are shielded from the prevailing wind directions, however some are exposed to the prevailing winds. It is recommended to include impermeable screens on the southern walkways that are exposed to the prevailing southerly winds, porous screens on their connecting stairwells, and impermeable balustrades on the other exposed walkways to help mitigate adverse wind conditions.

Within the site the majority of outdoor areas are expected to have wind conditions that are suitable for their intended use. It is noted, however, that wind conditions of the Games Court could be further enhanced with the inclusion of additional densely foliating trees to the north-east of the Games Court.

Note that the densely foliating vegetation should be of an evergreen variety to ensure effectiveness in wind mitigation throughout the year.

1 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The development site is located at 14 Smalls Road in Ryde, Sydney. The site is bounded by Smalls Rd to the north-west and residential houses to all other directions.

In all directions from the site are low rise residential buildings. Further to the east is North Ryde Golf Club. Further to the north is Santa Rosa Park. To the south-west of the site is Yamba Reserve. An aerial image of the subject site and the local surroundings is shown in Figure 1.

The Public School at Smalls Road is a proposed school development consisting of a large circular 3 storey building with a large central circular courtyard. The proposed development includes retaining several open fields to the north east of the primary building.

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:

- The Ground Floor pedestrian accessible areas in and around the site.
- The main building and courtyard.

Figure 1: Aerial Image of the Site Location

2 WIND CLIMATE OF THE SYDNEY REGION

The Sydney region is governed by three principal 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: Principal 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	

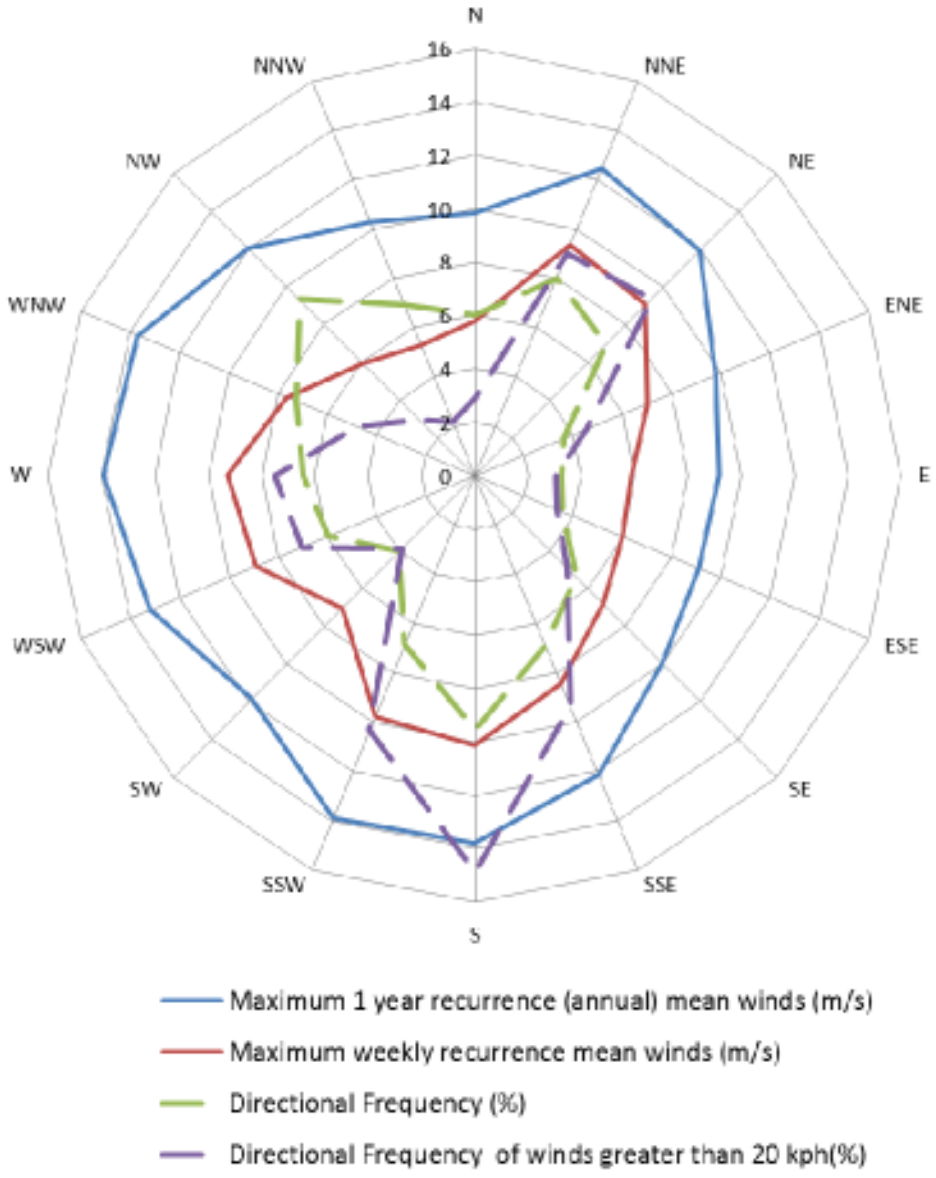

Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10-minute mean observations from Kingsford Smith Airport from 1995 to 2016, corrected to open terrain at 10m)

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 are 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 to be effective in wind mitigation, trees should be densely foliating and evergreen, with interlocking canopies where possible.

Note that only the potentially critical wind effects are discussed in this report. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects, and will be quantitatively verified during the wind tunnel study.

4.1 Ground Floor pedestrian accessible areas in and around the site

4.1.1 Street Frontages

The inclusion of the development is not expected to have an impact on the wind conditions along Smalls Road or at the Lavarack Street entrance. Wind conditions of the pedestrian accessible areas around the development are expected to be similar to existing conditions.

4.1.2 Playing Fields

The playing fields are being retained in essentially their original form and the wind conditions are expected to be similar to existing conditions.

4.1.3 Games Court

The Games Court benefits from shielding of the prevailing southerly and westerly winds from tree plantings. The Games Court area is, however, exposed to the prevailing north-easterly winds as they accelerate over the Playing Fields. It is expected that the wind conditions of the Games Court area will be suitable for its intended use however wind conditions could be further enhanced with tree plantations to the north-east of the area.

Note that the densely foliating vegetation to ensure their effectiveness in wind mitigation.

4.2 The Main Building and Courtyard

4.2.1 The Courtyard

The Courtyard benefits from shielding of the prevailing north-easterly and westerly winds by the building form, however there is potential for adverse wind effects caused by the prevailing southerly winds funnelling through the southern entrance to the Courtyard.

To help mitigate the prevailing southerly winds, it is recommended to include additional plantations upwind of the entrance, between the Games Court and the entrance, to slow the prevailing southerly winds as they approach the building. This is shown in Figure 3a.

To help mitigate the adverse wind effects of the prevailing southerly winds within the Courtyard it is important to maintain the dense tree plantings and landscaping within the Courtyard to assist baffling wind flows that may circulate around the circular courtyard.

Additional landscaping is recommended to assist in mitigating localised wind flows that pass through the development. These include landscaping behind the southern aspect of the additional hall seating, and landscaping around the inside and outside of the western entrance to the Courtyard. This is shown in Figure 3b.

Note that the densely foliating vegetation should be of an evergreen variety to ensure effectiveness in wind mitigation throughout the year.

4.2.2 The Elevated Walkways

The elevated walkways inside the development are largely shielded from the prevailing wind directions except for those along the north-eastern edge, and the southern edge. It is recommended to include impermeable balustrades in these areas to help mitigate prevailing winds.

The walkways along the southern entrance are particularly exposed to the prevailing southerly winds. It is recommended to include 2m high impermeable screening along the southern edge of the walk ways, and porous screens along the southern edges of the stairwells.

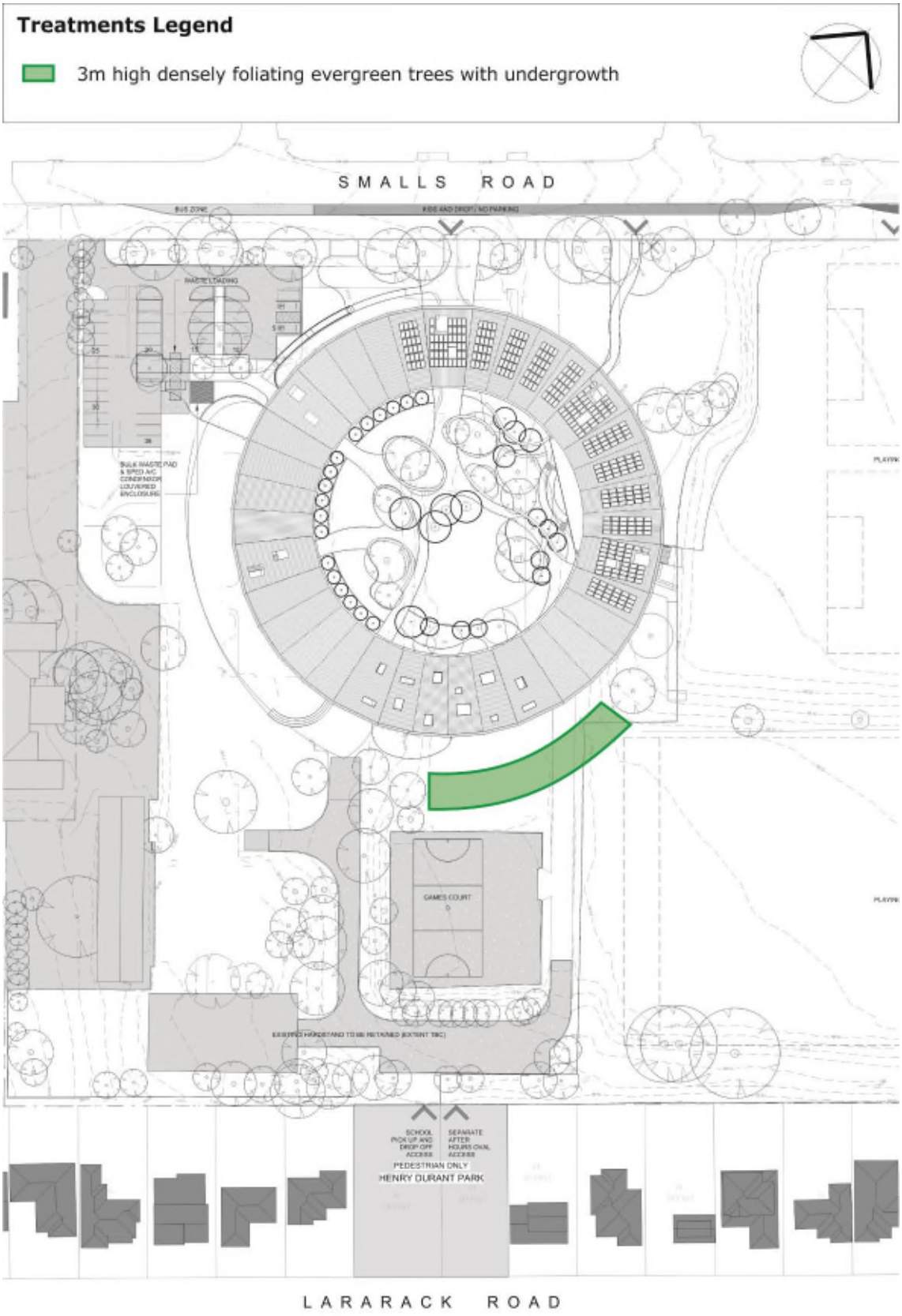

Figure 3a: Recommended plantation area for the prevailing southerly winds entering The Courtyard

Figure 3b: Recommended landscaping within The Courtyard