PEDESTRIAN WIND ENVIRONMENT STATEMENT

BANKSTOWN NORTH PUBLIC SCHOOL

WF287-01F02(REV2)- WS REPORT

MARCH 12, 2020

Prepared for:

JDH Architects

181 Oxford Street
Darlinghurst, NSW 2010

WINDTECH Consultants Pty Ltd
Head Office: 607 Forest Road, Bexley, NSW 2207, Australia
P +61 2 9503 0300 **E** reception@windtechglobal.com **W** www.windtechconsult.com

Sydney | Dubai | Hong Kong | London | Melbourne | Mumbai | New York | Singapore

DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
March 5, 2020	Initial.	0	EV	SWR	JG
March 10, 2020	Treatments updated.	1	EV	SWR	JG
March 12, 2020	Treatments updated.	2	EV	SWR	JG

EXECUTIVE SUMMARY

This report presents an opinion on the likely impact of the proposed redevelopment of Bankstown North Public School, 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 predominant wind directions for the Bankstown region; namely the north-easterly, south 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 latest architectural drawings. No wind tunnel testing was 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 relatively protected against all three prevailing wind directions, as a result of the existing and proposed tree planting. There is a potential impact on the wind comfort around Block 2 and Block 4 ground level corner locations and some elevated areas. It is expected that the wind effects identified in the report can be ameliorated with the consideration of the following treatment strategies into the design of the development:

Ground Level Areas

- The retention of existing densely foliating trees along the south-eastern site boundary corner.
- Provisions should be made for the inclusion of additional dense, tree planting. The planting should consist primarily of trees with 4m wide, interlocking canopies and be of an evergreen species to ensure their effectiveness in wind mitigation throughout the year. Palm trees are generally not recommended as they are not densely foliating.

CONTENTS

1 INTRODUCTION

An opinion on the likely impact of the proposed design on the local wind environment affecting pedestrians within the critical outdoor areas within and around the subject development is presented in this report. The analysis of wind effects relating to the proposed development was carried out in the context of the predominant wind directions for the region, building morphology of the development and nearby buildings, and local land topography. The conclusions of this report are drawn from our extensive experience in the field of wind engineering and studies of wind environment effects.

No wind tunnel testing was undertaken for this assessment. Hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection, and any recommendations in this report are made only in-principle.

2 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The proposed Bankstown North Public School redevelopment site is bounded Hume Highway to the South, Beresford Avenue to the east, Stacey Street to the north and a mixture of low-rise residential / commercial buildings abutting the site to the west. Low-rise residential buildings lie further out to the west, south and east. A commercial district occupies the north-east sector.

The existing site consists of multiple, low-level school buildings, localised towards the eastern edge of the site. Outdoor recreation areas are located between these buildings with sporting fields along the northern and western boundaries. A car park is observed along the eastern boundary, along Beresford Avenue.

The redevelopment details the construction of 2 additional buildings in place of the existing car park and a select few buildings located towards the southern end of the site. The proposed buildings, Block 2 and Block 4, are 4 and 3 storeys in height respectively and predominantly rectangular in planform. The buildings share a common rooftop and are also connected at the first and second floor via a bridge. The development proposes a new car park along the northern boundary, which connects to Beresford Avenue and Davis Lane. Additional hardscape, landscape and recreation areas are also proposed north and south of Blocks 2 and 4 with further landscaping directly north of the existing Block N building.

A survey of the land topography indicates that the land generally slopes up towards the east along Stacey Street and Hume Highway. There is also a moderate descent in a northerly direction along Beresford Avenue. An aerial image of the subject site and the local surroundings is shown in Figure 1. A wider view image of the location of the site is illustrated in Figure 2.

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 trafficable areas.
- Block 2 and Block 4 elevated areas.

Figure 1: Aerial Image of the Site Location

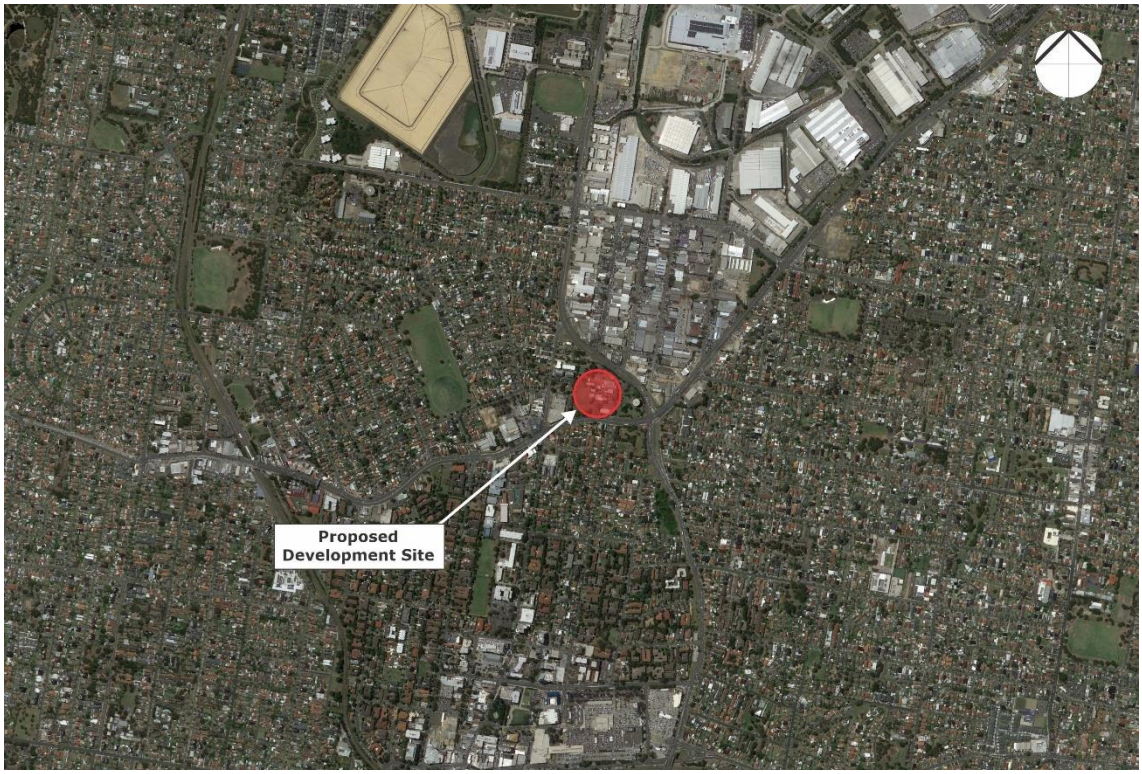

Figure 2: Wider View Aerial Image of the Site Location

3 REGIONAL WIND

The Bankstown region is governed by three principal wind directions, and these can potentially affect the subject development. These winds prevail from the north-east, south to south-east and west. These wind directions were determined from an analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained at the meteorological station located at Bankstown Airport by the Bureau of Meteorology. The data has been collected from this station from 1993 to 2016 and corrected so that it represents winds over standard open terrain at a height of 10m above ground level. Figure 3 shows a summary of this analysis in the form of, a directional plot of the annual and 5% exceedance mean winds for the Bankstown region is also determined. The frequency of occurrence of these winds is also shown in Figure 3.

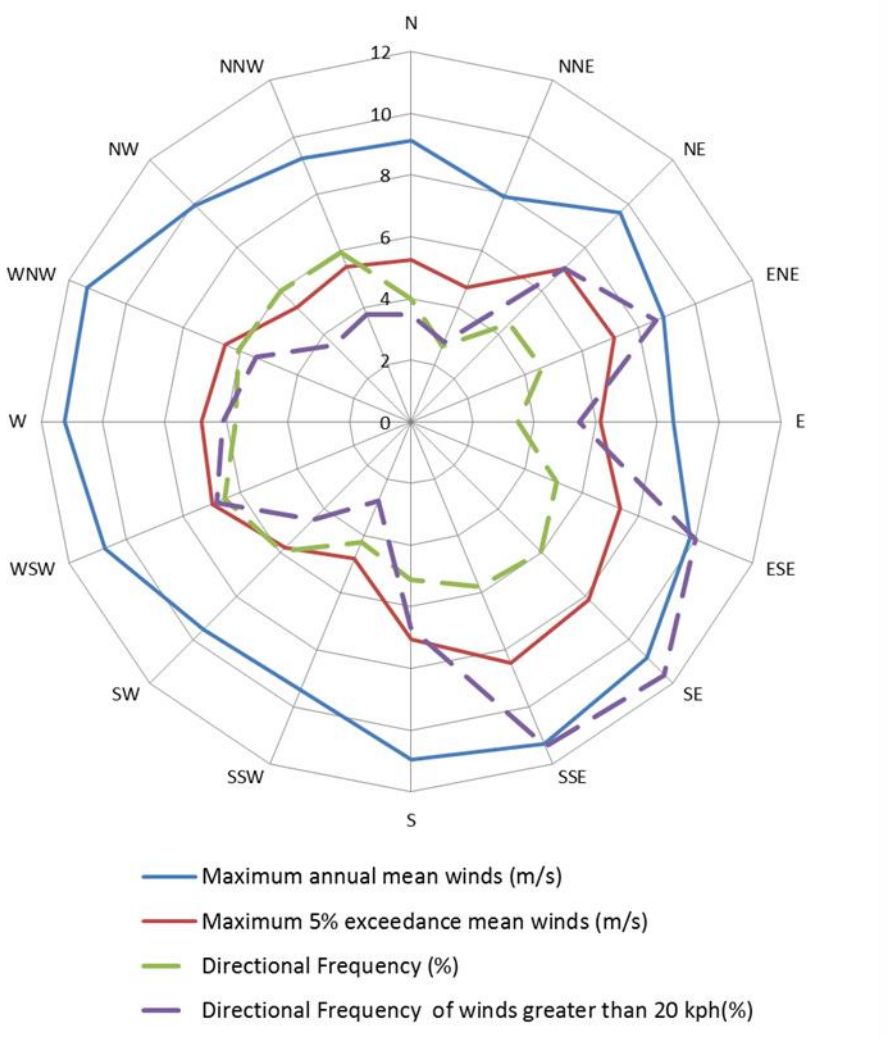

Figure 3: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Bankstown Region (Observations from Bankstown Airport from 1993 to 2016, corrected to open terrain at 10m)

4 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, and A.D. Penwarden, 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.

For example, A.D. Penwarden (1973) developed a modified version of the Beaufort scale which describes the effects of various wind intensities on people. Table 1 presents the modified Beaufort scale. Note that the effects listed in this table refers to wind conditions occurring frequently over the averaging time (a probability of occurrence exceeding 5%). Higher ranges of wind speeds can be tolerated for rarer events.

Table 1: Summary of Wind Effects on People (A.D. Penwarden, 1973)

Type of Winds	Beaufort Number	Mean Wind Speed (m/s)	Effects
Calm	0	Less than 0.3	Negligible.
Calm, light air	1	0.3 – 1.6	No noticeable wind.
Light breeze	2	1.6 – 3.4	Wind felt on face.
Gentle breeze	3	3.4 – 5.5	Hair is disturbed, clothing flaps, newspapers difficult to read.
Moderate breeze	4	5.5 – 8.0	Raises dust, dry soil and loose paper, hair disarranged.
Fresh breeze	5	8.0 – 10.8	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.8 – 13.9	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant.
Near gale	7	13.9 – 17.2	Inconvenience felt when walking.
Gale	8	17.2 – 20.8	Generally impedes progress, difficulty balancing in gusts.
Strong gale	9	Greater than 20.8	People blown over.

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. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

5 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. 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, as well as the surrounding landform. Note that only the potentially critical wind effects are discussed in this report.

The recommended criterion for wind conditions for circulation areas is 7.5m/s with a 5% probability of exceedance, whereas short duration stationary activities (e.g. main entrances, communal balconies/recreation areas etc) will need to satisfy a more stringent comfort criterion of 5.5m/s with a 5% probability of exceedance. Although this assessment is of a qualitative nature, the abovementioned criteria are considered when assessing the wind environment impacts.

5.1 Ground Level Trafficable Areas

The wind conditions at ground level primarily depend on the orientation of the development relative to the principal wind directions and the impact of neighbouring buildings and vegetation. Given the wide aspect of the proposed Block 2 and Block 4 buildings as well as the extent of existing and proposed planting, it is expected that the proposed hardscape area will be adequately shielded from direct wind impact from all the prevailing wind directions within the Bankstown region.

It is unlikely that there will be wind downwashing off the eastern or western façades of Blocks 1 and 2 as a result of the small building aspect relative to the prevailing westerly and north-easterly wind directions. Wind downwashing from the south is also expected to be minimal as a result of the low height of the development.

The proposed landscape areas, which are localised within the hardscape area, are expected to provide shielding from north-easterly wind sidestreaming along the northern building aspect.

Corner accelerated flow is likely to occur along the north-western corner of Block 2 and the south-eastern corner of Block 4 due the westerly and southerly winds respectively. As a result, the following treatment strategies are expected to be effective in mitigating the abovementioned potential wind effects, hence they are recommended to be considered in the design of the development:

- The retention of existing densely foliating trees along the south-eastern site boundary corner (refer to Figure 4).

- Provisions should be made for the inclusion of additional dense, tree planting. The planting should consist primarily of trees with 4m wide, interlocking canopies and be of an evergreen species to ensure their effectiveness in wind mitigation throughout the year. Palm trees are generally not recommended as they are not densely foliating. (refer to Figure 4).

5.2 Block 2 and Block 4 Elevated Areas

Wind conditions for centralised balconies are expected to benefit from the shielding provided by the effective use of their recessed design into the overall building form. The wind conditions experienced on these balconies are expected to be suitable for their intended use.

Elevated corner balconies will likely be exposed to corner accelerated flow from the north-east and west prevailing wind directions. Shielding in the form of 1.2-1.3m high impermeable balustrades and full-height porous, perimeter screening is noted within the design of the corner balconies. It is expected that wind conditions experienced along the corner balconies will be suitable for their intended use as a result of the proposed screening and overall low height of the development.

In addition, it is also expected that the impact of southerly wind funnelling through the elevated connecting bridge areas will be minimal due to the overall low height of the two buildings as well as the direct shielding provided by the tree south of the proposed buildings. It is therefore recommended that the existing large tree planting south of the development be retained (refer to Figure 4).

Figure 4: Suggested Treatment Strategy – Ground Level

6 REFERENCES

Davenport, A.G., 1972, "An approach to human comfort criteria for environmental conditions". Colloquium on Building Climatology, Stockholm.

Lawson, T.V., 1973, "The wind environment of buildings: a logical approach to the establishment of criteria". Bristol University, Department of Aeronautical Engineering.

Lawson, T.V., 1975, "The determination of the wind environment of a building complex before construction". Bristol University, Department of Aeronautical Engineering.

Lawson, T.V., 1980, "Wind Effects on Buildings - Volume 1, Design Applications". Applied Science Publishers Ltd, Ripple Road, Barking, Essex, England.

Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions". *Journal of Wind Engineering and Industrial Aerodynamics*, vol. 3, pp241-249.

Penwarden, A.D. (1973). "Acceptable Wind Speeds in Towns", Building Science, vol. 8: pp259–267.

Penwarden, A.D., Wise A.F.E., 1975, "Wind Environment Around Buildings". Building Research Establishment Report, London.