PEDESTRIAN WIND ENVIRONMENT STATEMENT

LEES1 BUILDING, UNIVERSITY OF SYDNEY

WC596-04AF02(REV0)- WS REPORT (LEES1)

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Prepared for:

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DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
May 20, 2016	Update of previous report (report reference WC596-03AF02(rev1), dated April 13, 2016) for the latest design scheme.	0	MC	TR	MC

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EXECUTIVE SUMMARY

This report is in relation to the proposed development of Building LEES1 located within the University of 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 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 Rice Daubney, received during May 2016. 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 benefits from shielding provided by the existing densely foliating trees along the subject developments southern boundary. It is therefore recommended that these existing trees are retained in the final development landscape design. However, the assessment also indicates that the site is exposed to the prevailing westerly winds that have the potential to down-wash and side-stream around the corners of the development. Therefore it is recommended that an awning or screening be included along the western side of the development along "Eastern Avenue", this solution will be further developed during the Design Development phase of the project.

With the inclusion of the recommendations made within this report into the final design, it is expected that suitable wind conditions can be achieved for all critical outdoor areas within and around the subject development. Wind tunnel testing is recommended to quantify the wind conditions throughout the development and the recommended treatment strategies.

1 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The development site is located within the University of Sydney grounds, bordering Barff Road to the east, Eastern Avenue to the west, and City Road to the south.

Neighbouring the site to the north is the eight-storey Carslaw Building, which is proposed to be interconnected with this development for Levels 1 to 4. There is significant vegetation along the southern edge, extending to the east. Further from the site are four-storey university buildings to the south, the three-storey Madsen building to the west and the six-storey proposed F23 building to the south-west. An aerial image of the site and the surroundings is shown in Figure 1.

The proposed development consists of a laboratory development rising 8 storeys above ground level, with laboratory and associated stores on levels 1 to 4, office spaces on levels 5 to 7 and plant services on level 8. It is noted that there are no balconies and only a single entrance point to the building from the external environment.

The critical trafficable areas associated with the proposed development, which are the focus for pedestrian wind effects in this assessment, are the site frontages along Eastern Avenue and Barff Road.

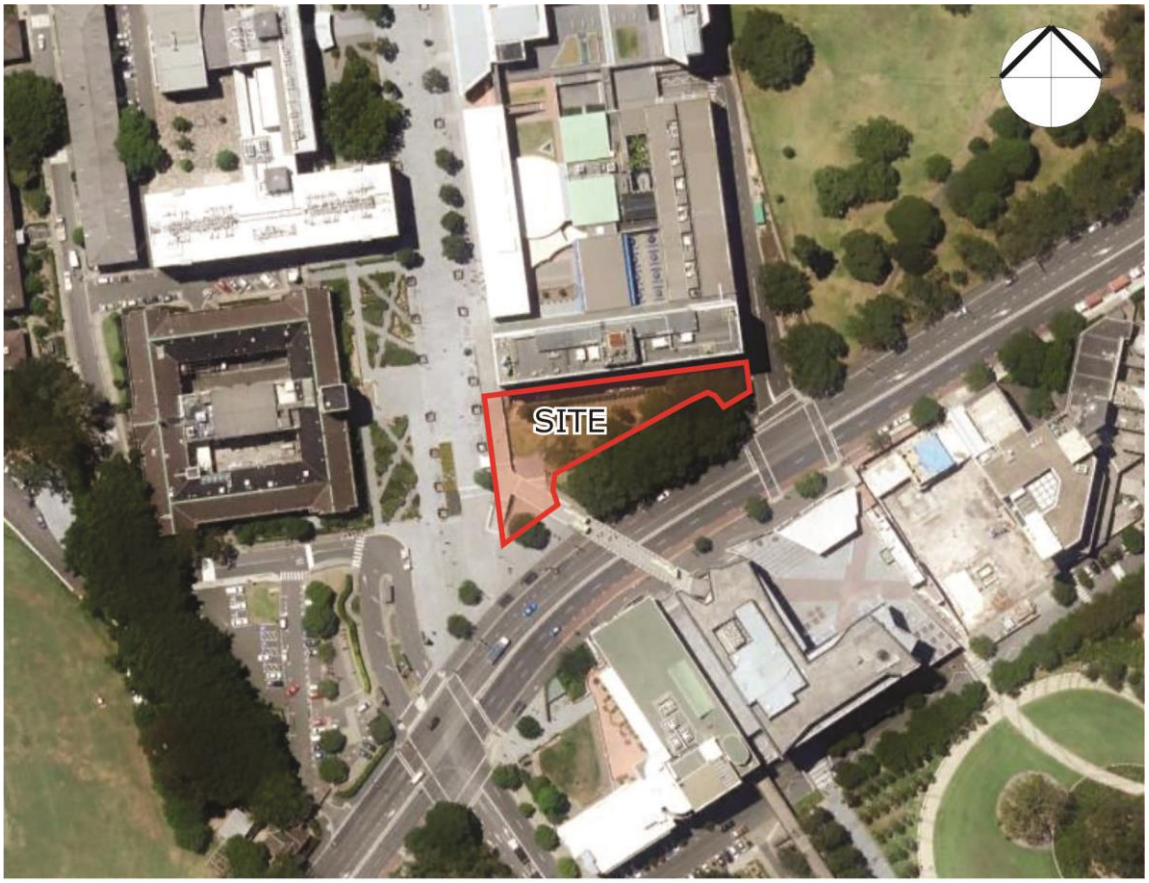

Figure 1: Aerial Image of the Site Location

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	

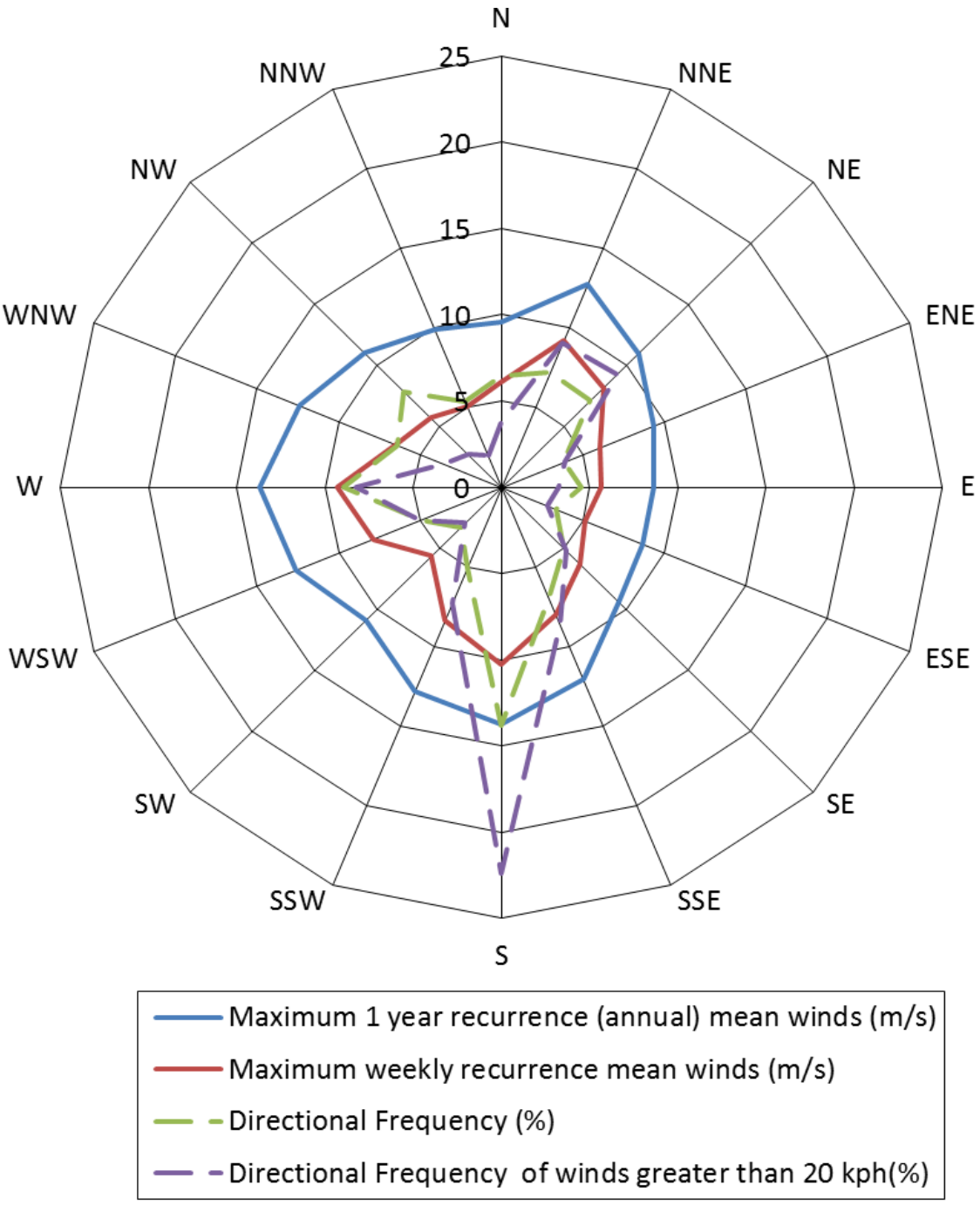

Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10-minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

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.

4.1 Pedestrian Walkway along Eastern Avenue Site Frontage

The pedestrian walkway along Eastern Avenue is expected to be exposed to side-streaming effects from the westerly winds. It is noted that the significant tree planting to the south is effective at mitigating any adverse effects caused by the prevailing southerly wind, while the building itself shields Eastern Avenue from the north-easterly wind.

The westerly winds are expected to cause side-streaming effects at the interface between the development and the pedestrian footbridge due to the lack of upstream shielding and the shape of the west-facing façade. In order to mitigate the flow path between the high pressure façade and the areas of pedestrian thoroughfare below, an awning or strategic screening arrangement along the western site frontage is recommended. This treatment solution will be further developed as part of the Design Development phase of the project with further analysis and/or testing undertaken to ensure suitable conditions for patrons is provided. It is noted that the currently proposed building overhang in this area is considered too high to be an effective wind mitigation device. This treatment strategy area is also shown in Figure 3.

4.2 Pedestrian Walkway along Barff Road Site Frontage

The alignment of Barff Road to the southerly wind, along with the likelihood of buildings to the north capturing the prevailing north-easterly wind will cause adverse wind conditions along Barff Road. It is noted that these are existing effects, and are not expected to be worsened by this development. The shielding of the development to the south by the significant tree planting is expected to mitigate any potential adverse wind effects along Barff Road caused by this development.

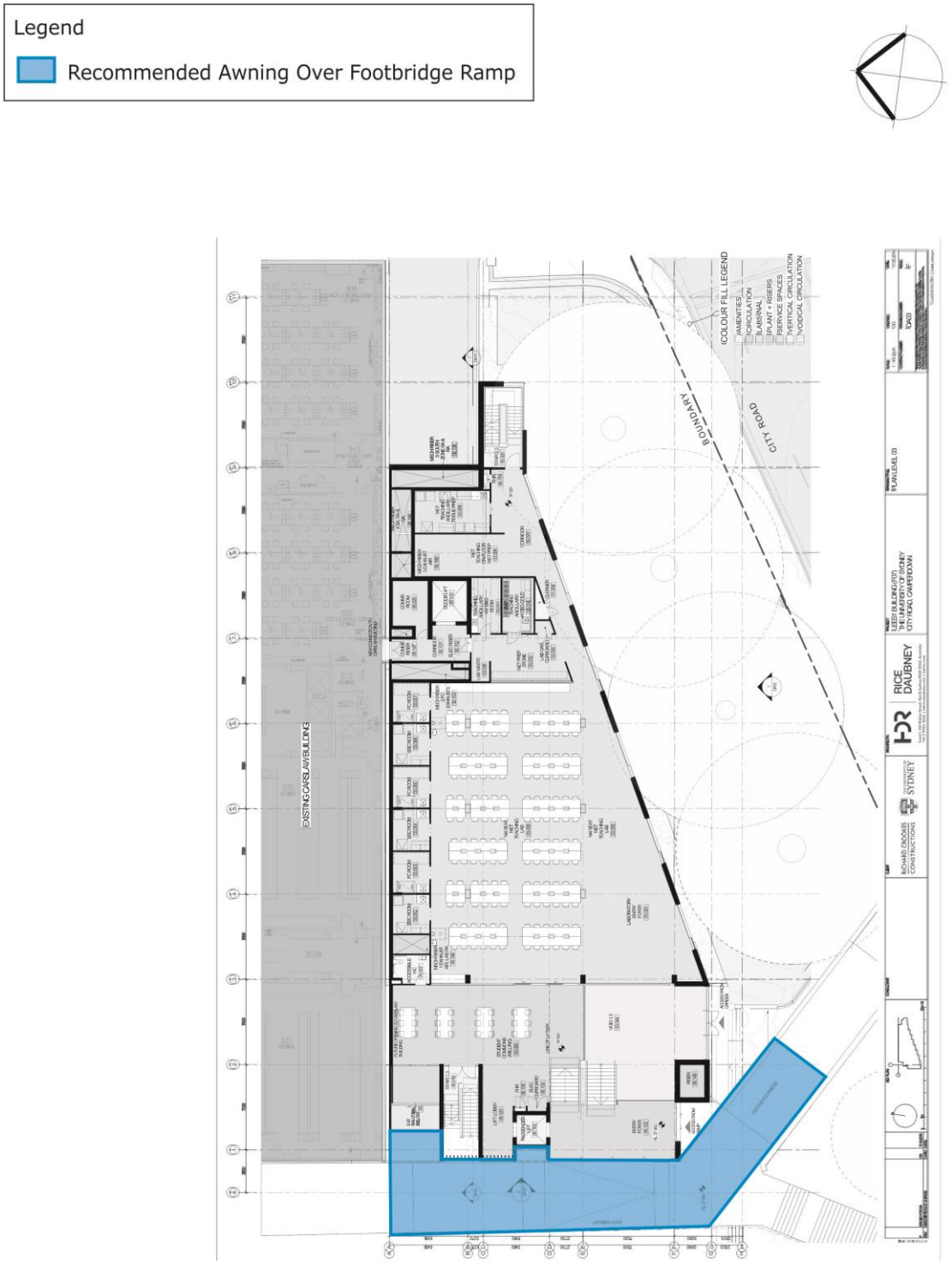

Figure 3: Eastern Avenue Site Frontage