Pedestrian Wind Environment Statement

for the proposed development known as the

Macquarie Park Commerce Centre

August 25, 2010

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Document Control

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1.0 Introduction

This report is in relation to the proposed development known as the Macquarie Park Commerce Centre, located at the corner of Waterloo Road and Lane Cove Road, Macquarie Park, and presents an opinion on the likely impact of proposed design on the local wind environment within and around the site.

The effect of wind activity within and around the proposed development is examined for the three predominant wind directions for the Sydney region, i.e. north-east, south and west. The analysis of the wind effects relating to the proposal 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 Bates Smart, dated in August, 2010. No wind tunnel tests have been undertaken for the subject development. As such, 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.

2.0 Regional Wind Climate for Sydney

The Sydney region is governed by three principal wind directions. 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 an analysis of wind rose data obtained by the Bureau of Meteorology from Kingsford Smith Airport between 1939 and 2000. The wind roses are attached in the appendix of this report.

Table 1: Principal Time of Occurrence of Winds – Sydney Region

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	

A directional plot of the annual and weekly recurrence winds for the Sydney region is shown in Figure 1 below. The frequency of occurrence of these winds is also shown in Figure 1. This plot has been produced based on an analysis of recorded wind speed data obtained from Kingsford Smith Airport from 1939 to 2008.

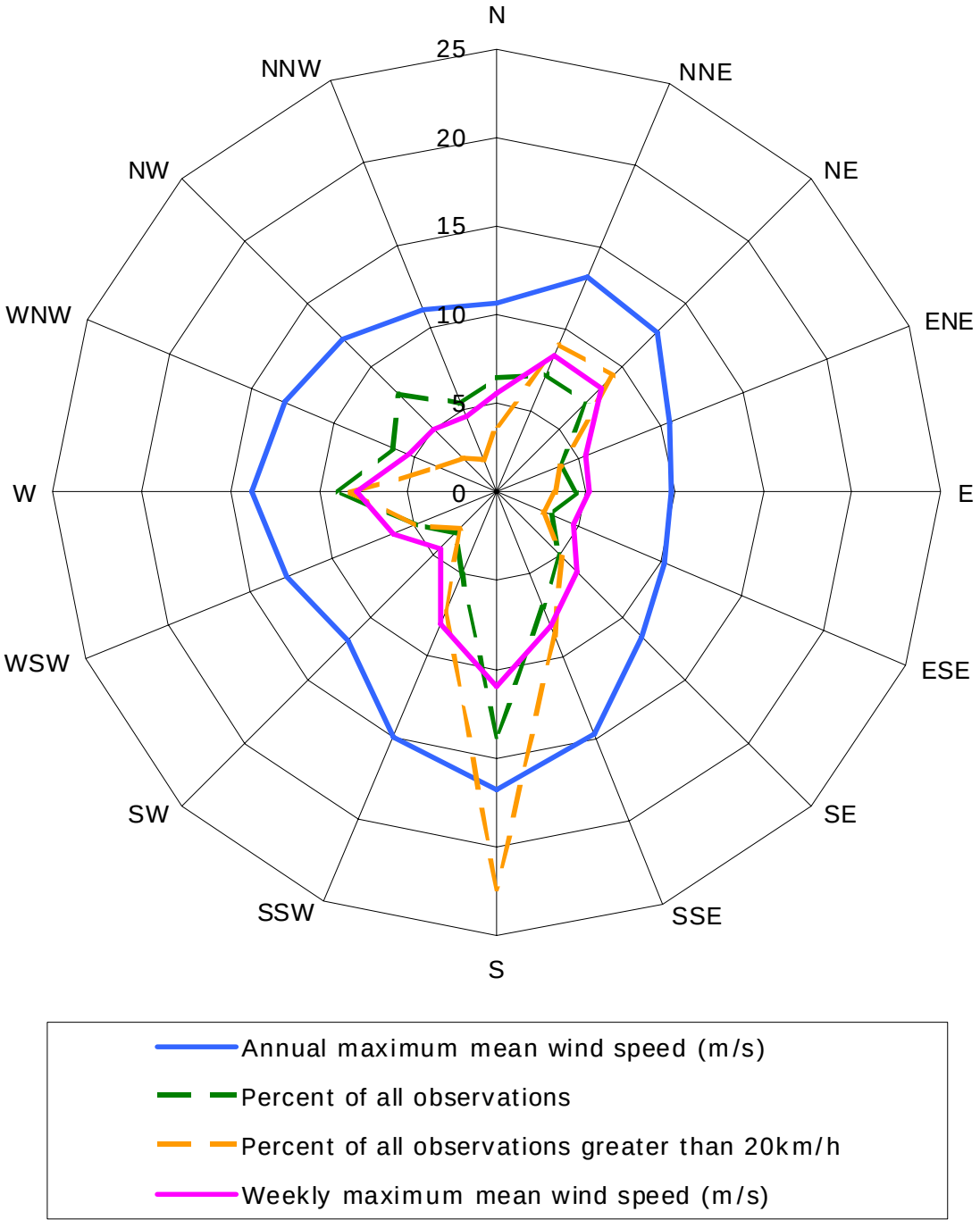

Figure 1: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10 minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

3.0 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.

The following table, developed by Penwarden (1975), is a modified version of the Beaufort Scale, and describes the effects of various wind intensities on people. Note that the applicability column related to 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 (after Penwarden, 1975)

Type of Winds	Beaufort Number	Gust Speed (m/s)	Effects	Applicability
Calm, light air	1	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	2	1.6 - 3.3	Wind felt on face	
Gentle breeze	3	3.4 - 5.4	Hair is disturbed, Clothing flaps	
Moderate breeze	4	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	5	8.0 - 10.7	Force of wind felt on body	Acceptable as a main pedestrian thoroughfare
Strong breeze	6	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	7	13.9 - 17.1	Inconvenience felt when walking.	
Gale	8	17.2 -20.7	Generally impedes progress, Great difficulty with balance.	Unacceptable as a public accessway.
Strong gale	9	20.8 - 24.4	People blown over by gusts.	Completely unacceptable.

4.0 Description of the Site and the Proposed Development

The proposed development site is bounded by Coolinga Street to the north-west, Waterloo Road to the north-east, Lane Cove Road to the south-east, and Giffnock Avenue to the south-west. Figure 3 shows an aerial image with the location of the site.

The landform around the site rises to the west of the site along Lane Cove Road. The proposed development is located in the commercial district of Macquarie Park and is generally surrounded by low to mid-rise commercial buildings, such as the seven storey high Hyundai Building directly south-west to the site. Surrounding the site are several large trees along Coolinga Street, Giffnock Avenue, Waterloo and Lane Cove Road. These trees are expected to provide effective shielding from the prevailing winds.

The proposed development site consists of 4 commercial office buildings, designated Buildings A, B, C and D as per the architectural drawings and indicated in Figure 4. Building A is 18 levels high above ground and the remaining Buildings of the site are 9 levels high above ground.

This report assesses the likely wind conditions to the various outdoor areas of the site accessible by pedestrians. The architectural drawings indicate two main outdoor accessible areas associated with the proposed development, which are detailed as follows:

- The ground level pedestrian thoroughfares within and around the proposed development.
- The rooftop helipad on Building A.

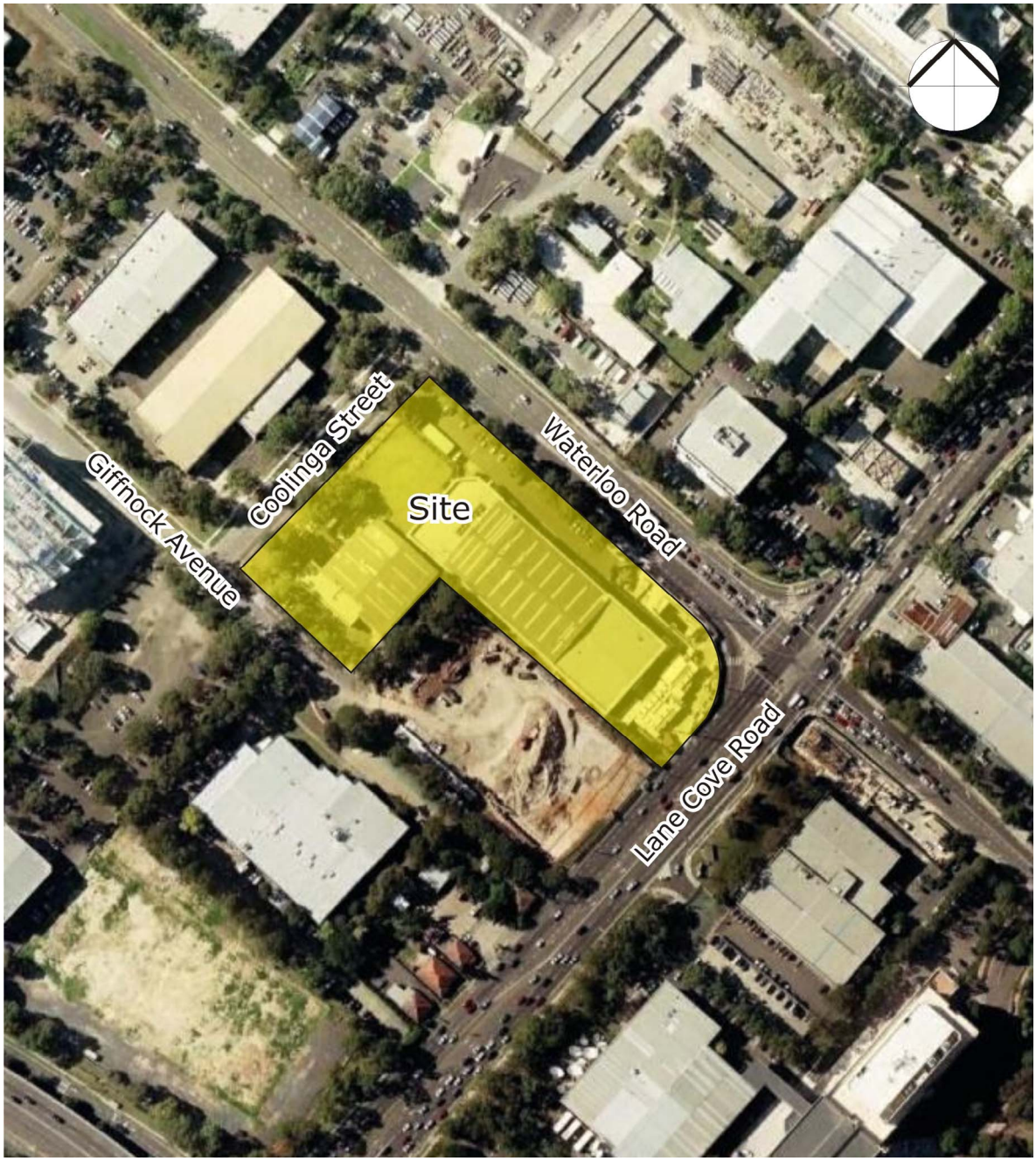

Figure 3: Aerial Image of the Site Location

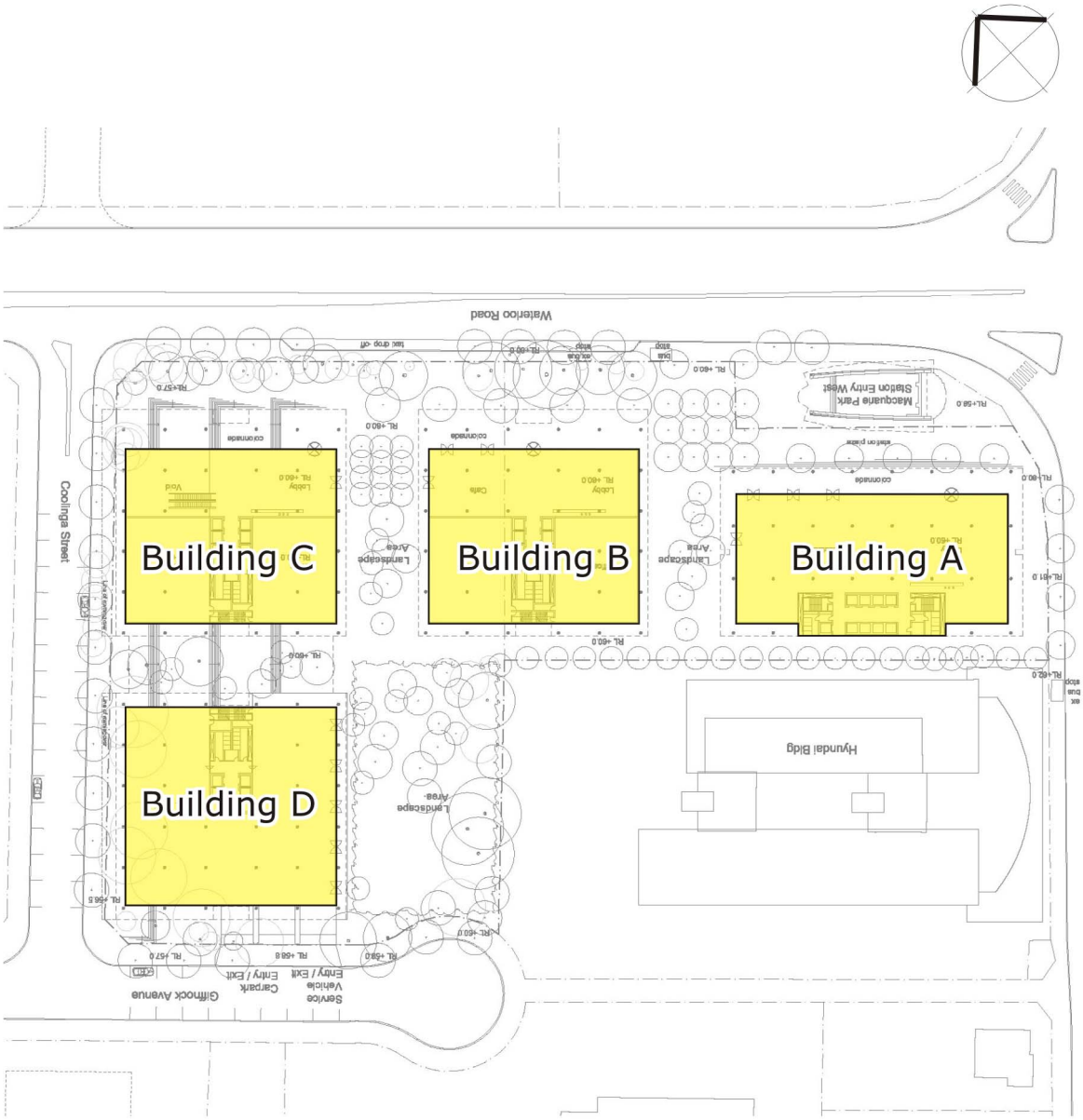

Figure 4: Proposed Development Site

5.0 Results of the Analysis

For each of the three predominant wind directions for the Sydney region, the interaction between the wind and the building morphology in the area was considered. Important features taken into account include the distances between the proposed building forms, their overall heights and bulk, as well as the landform. Only the potentially critical wind effects are discussed in this report.

This section discusses only the potentially critical wind effects. Wind effects not discussed here are not expected to be critical.

5.1 North-Easterly Winds

The wind conditions for the pedestrian thoroughfares along the perimeter of the proposed development are expected to be quite similar to the existing conditions and acceptable for their intended uses due to the wind mitigation provided by the proposed and existing densely foliating trees.

The pedestrian thoroughfares between Buildings A and B, and B and C are exposed to adverse north-easterly winds funneled between these developments. The adverse wind conditions within these areas are expected to be mitigated with the inclusion of densely foliating trees in a vegetation scheme similar to that in the architectural drawing. The elements of the proposed planting scheme that we feel are important for wind mitigation have been highlighted in Figure 4. The various pedestrian thoroughfares between the buildings of the development site are expected to be acceptable for their intended uses provided that the minimum planting suggested in Figure 4 is implemented.

The helipad on the rooftop of Building A is exposed to adverse north-easterly winds due to an up-wash effect along the north-eastern façade of the building. It is expected the wind conditions on the helipad can be mitigated with the north-eastern and south-western external walls of the plant room below are made porous, as indicated in Figure 5, diffusing the up-washed wind.

With these treatments incorporated into the final design, it is not expected that there will be any adverse wind effects caused by the north-easterly winds to the various outdoor areas within the proposed development and will be suitable for its intended uses.

5.2 Southerly Winds

The wind conditions for the pedestrian thoroughfares along Waterloo Road, Coolinga Street and Giffnock Avenue are expected to be acceptable for their intended uses due to the combination of shielding provided by the proposed development and the proposed tree planting. The pedestrian thoroughfares along Lane Cove Road are exposed to strong southerly winds side-streaming around the southern corner of Building A. This wind effect is expected to be ameliorated with the inclusion of densely foliating trees around that corner of Building A, in an arrangement similar to that proposed in the architectural drawings.

The proposed pedestrian thoroughfares between the buildings of the development are exposed to adverse southerly winds due to the funneling effect between the buildings of the site and the Hyundai building to the south-west. The adverse wind conditions within these areas are expected to be mitigated with the inclusion of densely foliating trees in the gaps between the proposed buildings, in an arrangement similar to that in the architectural drawings.

The elements of the proposed planting scheme that we feel are important for wind mitigation have been highlighted in Figure 4.

The helipad on the rooftop of Building A is exposed to adverse southerly winds due to an up-wash effect along the south-western façade of the building. It is expected this wind effect can be mitigated if the north-eastern and south-western external walls of the plant room below are made porous, as indicated in Figure 5, diffusing the up-washed wind.

With the above treatments incorporated into the final design, it is not expected that there will be any adverse wind effects caused by the southerly winds to the various outdoor areas within the proposed development and will be suitable for its intended uses.

5.3 Westerly Winds

The wind conditions for the pedestrian thoroughfares along Waterloo and Lane Cove Road are expected to be acceptable for their intended uses due to the combination of shielding provided by the proposed development and the proposed tree planting. The pedestrian thoroughfares along Coolinga Street and Giffnock Avenue are exposed to direct westerly winds side-streaming along the north-western facades of Buildings C and D. The adverse wind conditions within these areas are expected to be ameliorated with the inclusion of densely foliating trees in a vegetation scheme similar to that proposed in the architectural drawings.

The pedestrian thoroughfares between the Buildings A and B, and between Building A and the adjacent Hyundai Building to the south-west can be potentially affected by a funneling of the westerly winds between these buildings. This wind condition can be mitigated with the inclusion of densely foliating evergreen trees between Buildings A and B and around the southern corner of Building A, in a scheme similar to that proposed in the architectural drawings. Note that for vegetation to be effective in mitigating adverse westerly winds for the Sydney region, which predominantly occur during the winter months of the year, they should be of an evergreen species.

The elements of the proposed planting scheme that we feel are important for wind mitigation have been highlighted in Figure 4.

The various pedestrian thoroughfares between the buildings of the development site are expected to be acceptable for their intended uses provided that the minimum planting suggested in Figure 4 is implemented.

The helipad on the rooftop of Building A is exposed to adverse westerly to south-westerly winds due to an up-wash effect along the south-

western façade of the building. It is expected the wind conditions on the helipad can be mitigated with the north-eastern and south-western external walls of the plant room below are made porous, as indicated in Figure 5, diffusing the up-washed wind.

With the abovementioned treatments incorporated into the final design, it is not expected that there will be any adverse wind effects caused by the westerly winds to the various outdoor areas within the proposed development and will be suitable for its intended uses.

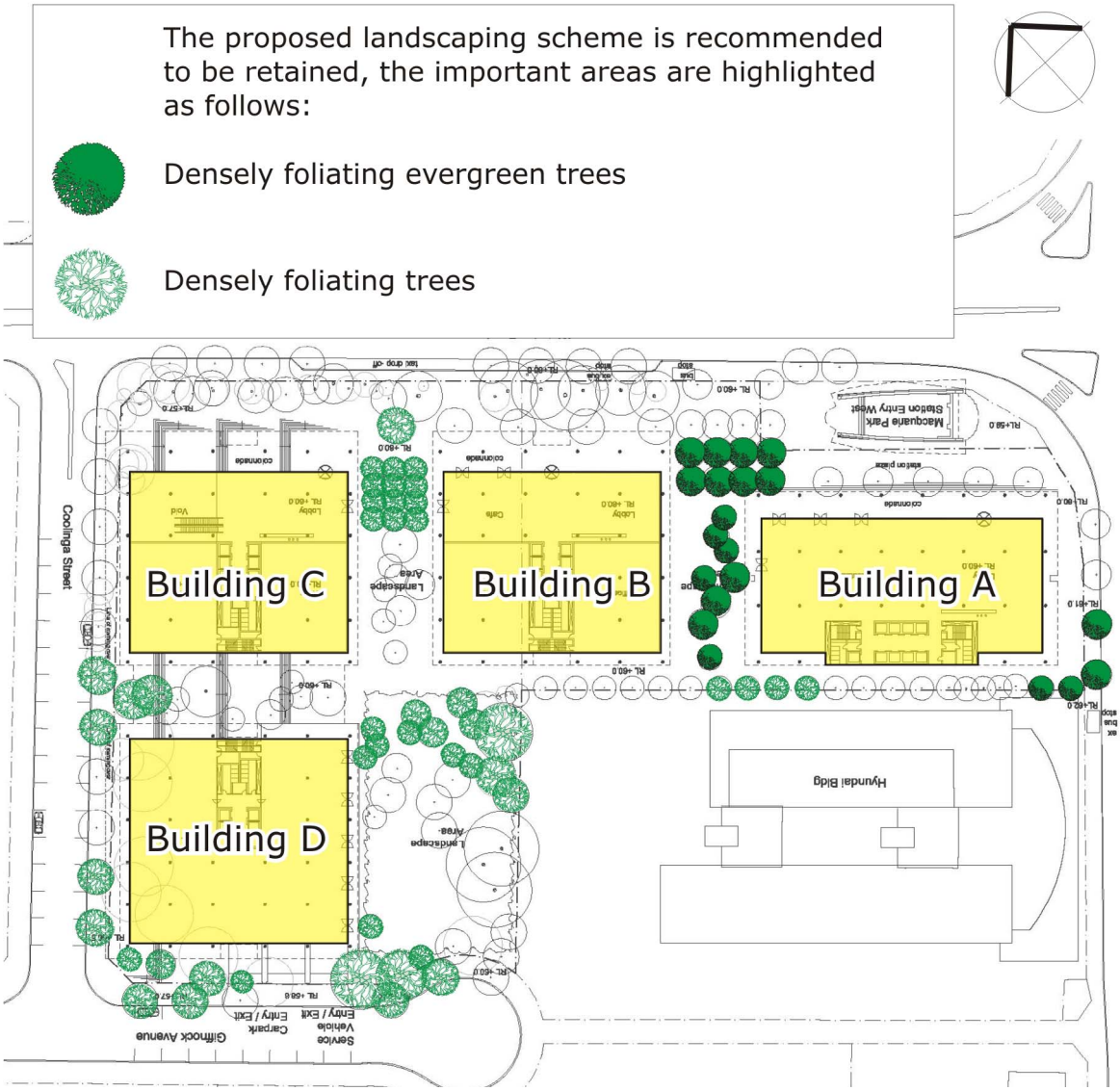

Figure 4: Recommended Treatments – Ground Level

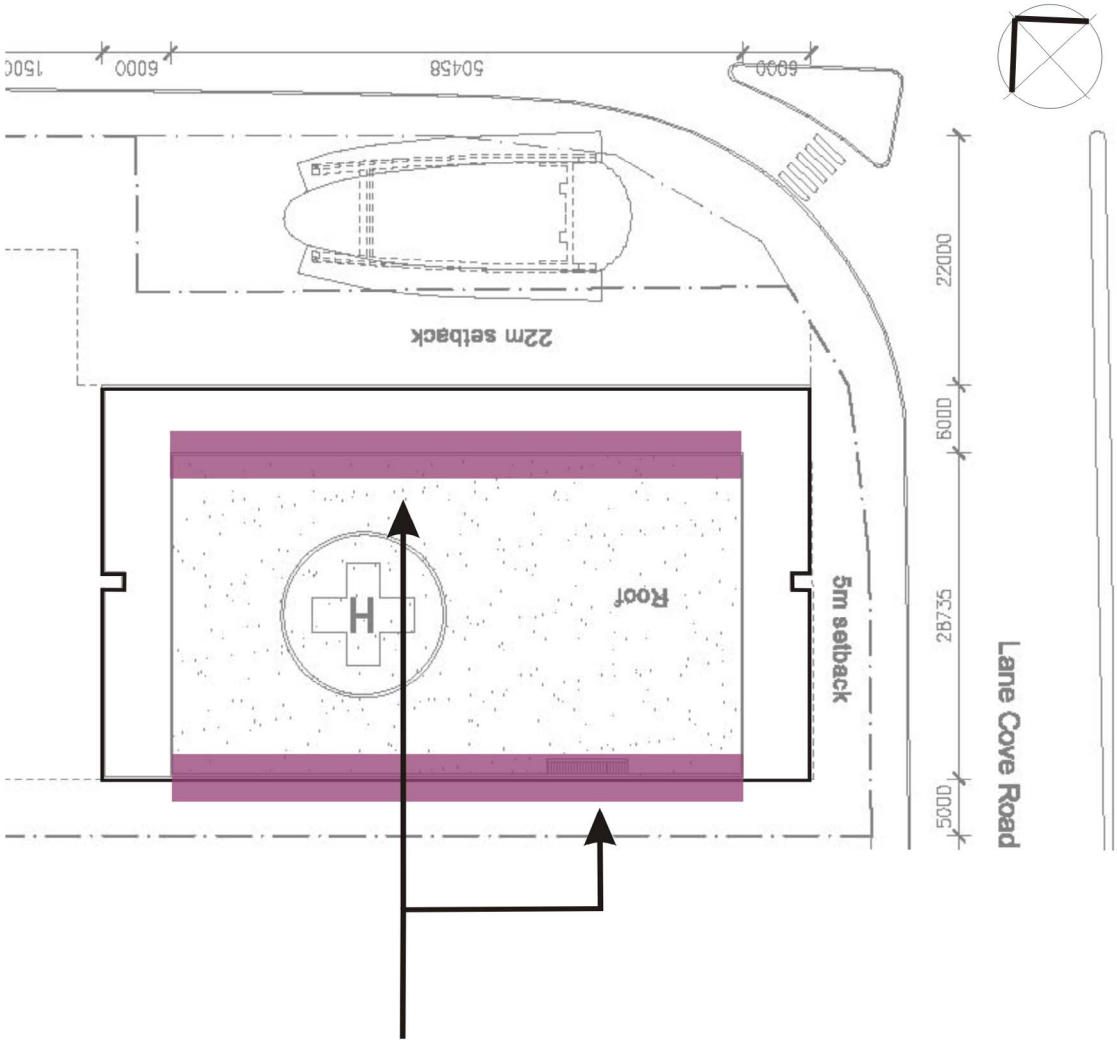

Figure 5: Recommended Treatments – Building A Plant Room

6.0 Conclusions

An analysis of the wind environment impact with respect to the principal wind directions for the Sydney region has been completed for the proposed development known as the Macquarie Park Commerce Centre, located at the corner of Waterloo Road and Lane Cove Road, Macquarie Park.

No wind tunnel tests have been undertaken for the subject development. As such, 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 study indicate that wind conditions for most of the outdoor areas within and around the proposed development will be suitable for the intended uses. However, there are some areas of the development where treatments have been recommended to ensure adequate wind conditions are achieved for all outdoor trafficable areas within the site. In particular, the prevailing winds are expected to be funneled between certain buildings and funneled around the southern corners of Buildings A and D. In addition, an up-wash effect is likely on the proposed rooftop helipad on Building A. The recommended treatments are listed as follows:

- Implementation of the proposed ground level landscape plan.
- The north-eastern and south-western external walls of the plant room on Building A are to be made porous.

With the above recommendations incorporated into the design, wind conditions for the various outdoor areas within and around the proposed development will be acceptable for the intended uses of those areas.