



# Pedestrian Wind Environment Statement

for the proposed development known as the  
**Project Star, Pyrmont**

September 8, 2008

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## Document Control

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2	5/9/2008	Update Figures	NT		

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## 1.0 Introduction

This report is in relation to the proposed development known as the Project Star, Pyrmont. This report presents an opinion on the likely impact of proposed design on the wind environment within and around the various outdoor areas of the site.

The effect of wind activity within and around the proposal is examined for the three predominant wind directions for Sydney; 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.

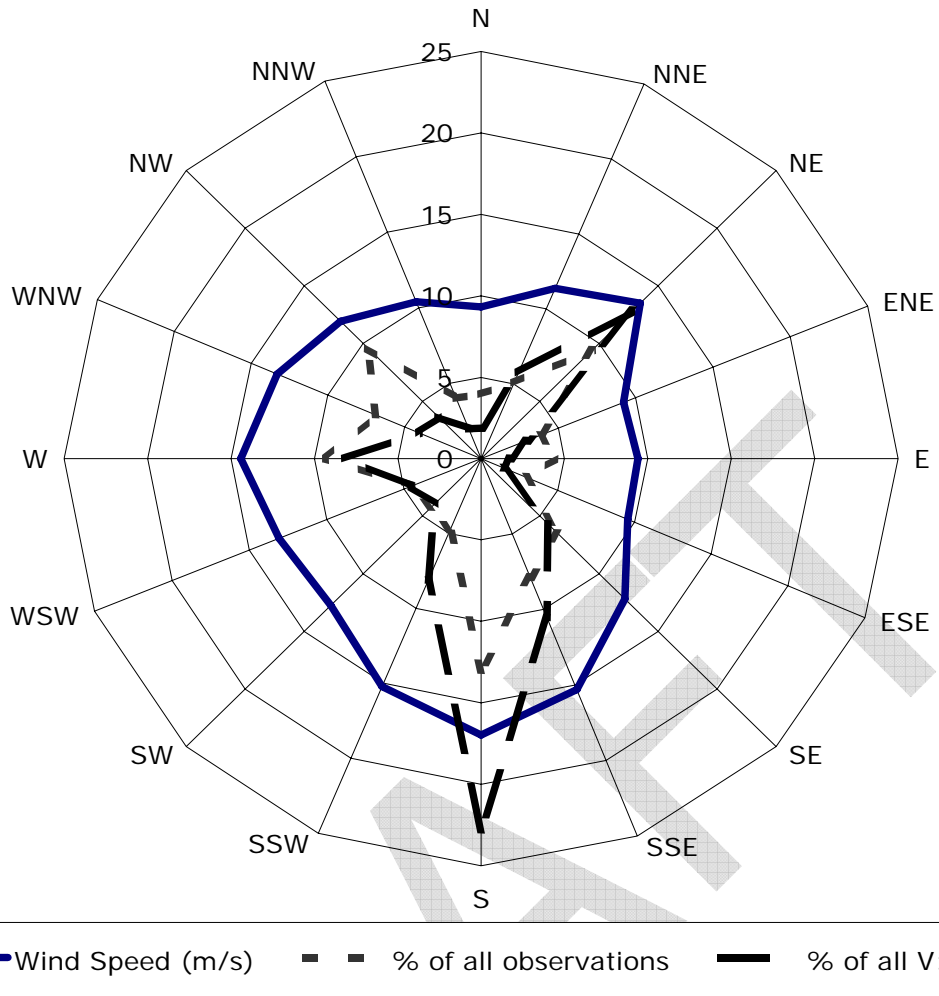
The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings prepared by The Buchan Group and Cox Richardson Architects, dated June 2008 and variations issued by the Buchan Group dated August 2008. No wind tunnel tests 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 Local Wind Climate

Three principal wind directions potentially affect the development. These winds prevail from the north-east, south and west, Table 1 is a summary of the principal time of occurrence of these winds. This summary is based on data obtained by the Bureau of Meteorology from Sydney Airport, between 1939 and 1992. Table 1 presents a summary of the principal time of occurrence of these winds.

**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	



**Figure 1: Basic Mean Wind Speed Data for Sydney, 1932-1992 (in metres per second, based on 3 hourly mean wind speeds, at 10m height at Kingsford Smith Airport)**

### 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 Proposal

The proposed upgrade of the Star City Casino consists of several developments in separate areas. These include the following:

- A new 17 storey hotel development, including a 3 level podium on the vacant switching station site to the south of the current hotel. This is known as the Star Hotel.
- Redevelopment of the retail arcade on the ground floor on the southerly end of the current site.
- Redevelopment of the eastern side of the casino building adjacent to Pirrama Road.

In addition to existing vegetation, trees have been proposed along Union Street. A site plan of the proposed development is shown in Figure 2 below.

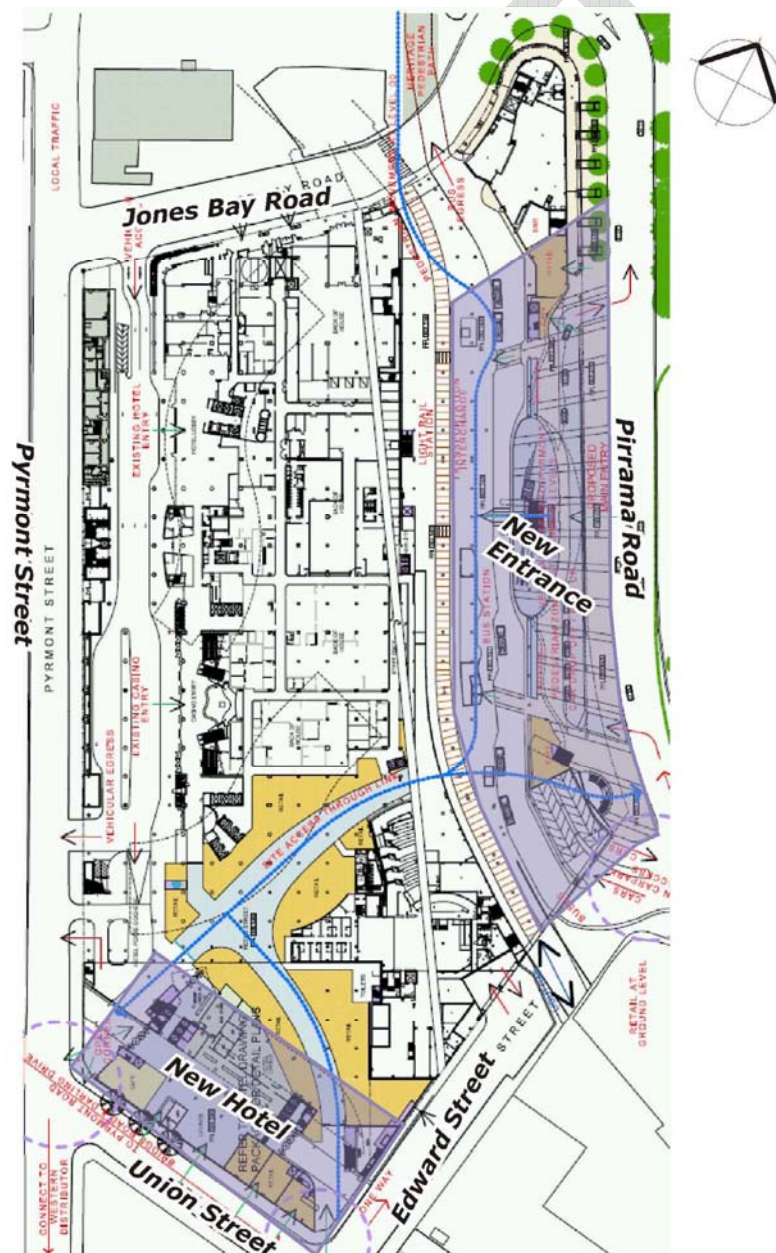
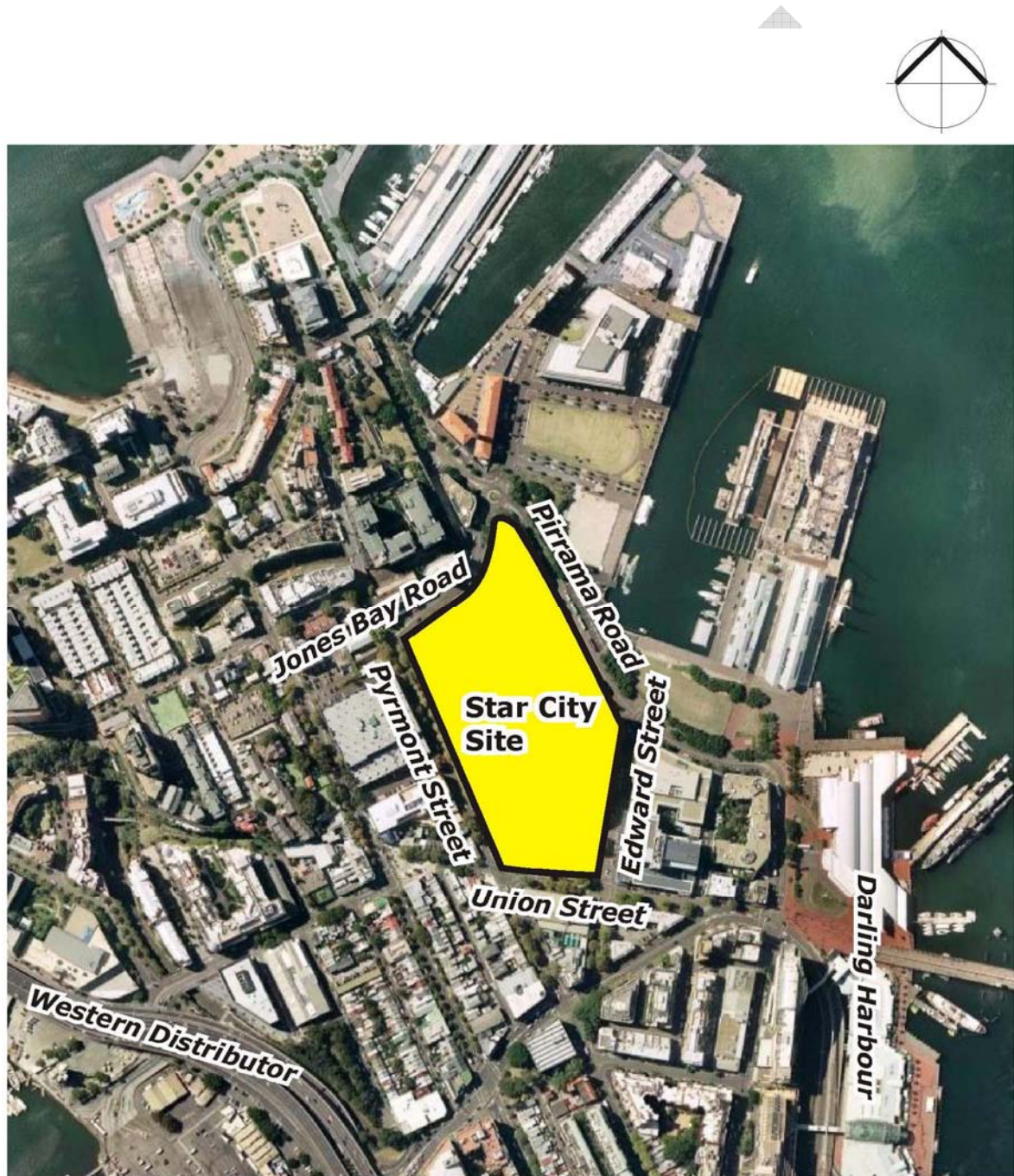


Figure 2: Site Plan

## 5.0 Site Analysis

The site is located between Pirrama Road, Jones Bay Road, Pymont Street, Union Street and Edward Street, Pymont. An aerial photograph of the site is presented in Figure 3. The site is located near Darling Harbour and the Western Distributor. Immediately surrounding the site from the east, through south, to the north, are many commercial and residential buildings of varying heights. To the north and north-east are wharf developments that protrude into the harbour. Further away from the site in most directions are commercial and residential buildings of varying heights, with small areas of water also present. Across the Darling Harbour to the east is the Sydney CBD.



**Figure 3: Aerial Image of the Proposed Development Site**

## 6.0 Results

For each of the three predominant wind directions, 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.

### 6.1 North-Easterly Winds

The pedestrian ground level areas around the site are generally well shielded from north-easterly winds by the neighbouring buildings and landscaping. With a planting scheme plan similar to that indicated in the landscape drawings shown in Figure 4, wind conditions around the site are expected to be further enhanced. It is expected that the tiered nature of the balconies and the convex overhanging facade near the proposed entrance on Pirrama Road will also enhance the wind conditions.

The north-eastern corner of the site at the intersection of Pirrama Road and Jones Bay Roads and the eastern corner of the site at the intersection of Pirrama Road and Edward Street may be exposed to adverse north-easterly winds coming around the respective corner of the proposed development. It is expected that the existing trees indicated on the architectural drawings in this area will enhance the wind conditions at these locations.

The tiered balconies areas near the proposed entrance on Pirrama Road may be adversely impacted by the north-easterly winds. However, it is expected that with the use of impermeable balustrades, similar to those indicated on the architectural drawings, these areas will be acceptable for their intended use. It is expected that as the outdoor area on level 1 is open only on one side that wind conditions in this area will be further enhanced. The wind conditions on the level 3 deck will be further enhanced by the clear roofing indicated on the architectural drawings.

Due to the design and spacing between the proposed Star Hotel tower and the existing Star City development, it is expected that the proposed tower may contribute to a funnelling effect occurring on the Level 3 deck. With the addition of two overlapping 3m high screens between the proposed Star Hotel tower and the existing tower as shown in Figure 5, it is expected that the wind conditions in this area will be suitable for its intended use. To determine the exact design and size of these screens to mitigate against the expected funnelling effect, a full wind tunnel study should be undertaken, as part of the detail design stage.

It is expected that the open gaming area, the roof garden and the roof terrace of the Star Hotel development will be shielded from the north-easterly winds by the existing Star City Casino and the proposed tower component of the Star Hotel.

It is not expected that the proposed development will have any adverse effects to the wind conditions in the local surrounding streets and pedestrian footpaths.

## **6.2 Southerly Winds**

The pedestrian ground level areas around the site are generally well shielded from southerly winds by the neighbouring buildings and landscaping. With a planting scheme plan similar to that indicated in the architectural drawings shown in Figure 4, wind conditions around the site are expected to be further enhanced. It is expected that the awnings over the pedestrian footpaths indicated on the architectural drawings will also enhance the wind conditions.

The western corner of the site at the intersection of Pyrmont and Union Street and the eastern corner of the site at the intersection of Union and Edward Street may be exposed to adverse southerly winds coming around the respective corner of the proposed Star Hotel development. It is expected that in addition to the protection offered by the surrounding buildings that the proposed trees and landscaping indicated on the architectural drawings will further enhance the wind conditions at these locations.

The outside gaming area and roof garden in the proposed hotel development may be adversely affected by the southerly winds. However, it is expected that with the use of impermeable balustrades and full height wall fins, similar to those indicated on the architectural drawings, that the outdoor gaming area will be acceptable for its intended use. With the inclusion of a high parapet wall along the outer perimeter of the roof garden in the proposed Star Hotel development, similar to that shown in the architectural drawings, it is expected that this area will be suitable for occasional use. It is expected that the roof terrace will be protected from the southerly winds by the proposed Star Hotel development.

It is expected that all of the proposed development associated with the entrance on Pirrama Road will be shielded from the southerly winds by the existing Star City Casino and the proposed Star Hotel tower.

It is not expected that the proposed development will have any adverse effects to the wind conditions in the local surrounding streets and pedestrian footpaths.

## **6.3 Westerly Winds**

The pedestrian ground level areas around the site are generally well shielded from westerly winds by the neighbouring buildings and landscaping. With a planting scheme plan similar to that indicated in the architectural drawings shown in Figure 4, wind conditions around the site are expected to be further enhanced. It is expected that the awnings over the pedestrian footpaths indicated on the architectural drawings will also enhance the wind conditions.

The western corner of the site at the intersection of Pyrmont and Union Street may be exposed to adverse westerly winds coming around the corner of the proposed development. It is expected that in addition to the protection offered by the surrounding buildings that the proposed

trees and landscaping indicated on the architectural drawings will enhance the wind conditions at these locations.

The outside gaming area and roof garden in the proposed Star Hotel development may be adversely affected by the westerly winds. It is recommended that the addition of either a full height screen or louvered panelling on the western side of the gaming area as shown in Figure 6 be incorporated into the final design. It is expected that with the additional of a full height screen or louvered panelling on the west edge of the Level 1 outdoor area, wind conditions will be suitable for its intended use. With the inclusion of a high parapet wall along the outer perimeter of the roof garden in the proposed Star Hotel development, similar to that shown in the architectural drawings, it is expected that this area will be suitable for occasional use. It is expected that the roof terrace will be protected from the westerly winds by the proposed Star Hotel development.

The entrance to the ground level retail area located near the corner of Pyrmont and Union Streets may be subjected to adverse westerly winds. Allowances for a door and screen arrangement similar to that shown in Figure 7 should be made. It is expected that with the addition of an arrangement similar to that shown in Figure 7 that the wind conditions in this area will be suitable for their intended use. Note: it was assumed that the ground level retail area will not be fully enclosed, if additional doors were added to other entrances, the wind conditions at the above mentioned entrance may change.

It is expected that all of the proposed development associated with the entrance on Pirrama Road will be shielded from the westerly winds by the existing Star City Casino and the proposed Star Hotel tower.

It is not expected that the proposed development will have any adverse effects to the wind conditions in the local surrounding streets and pedestrian footpaths.

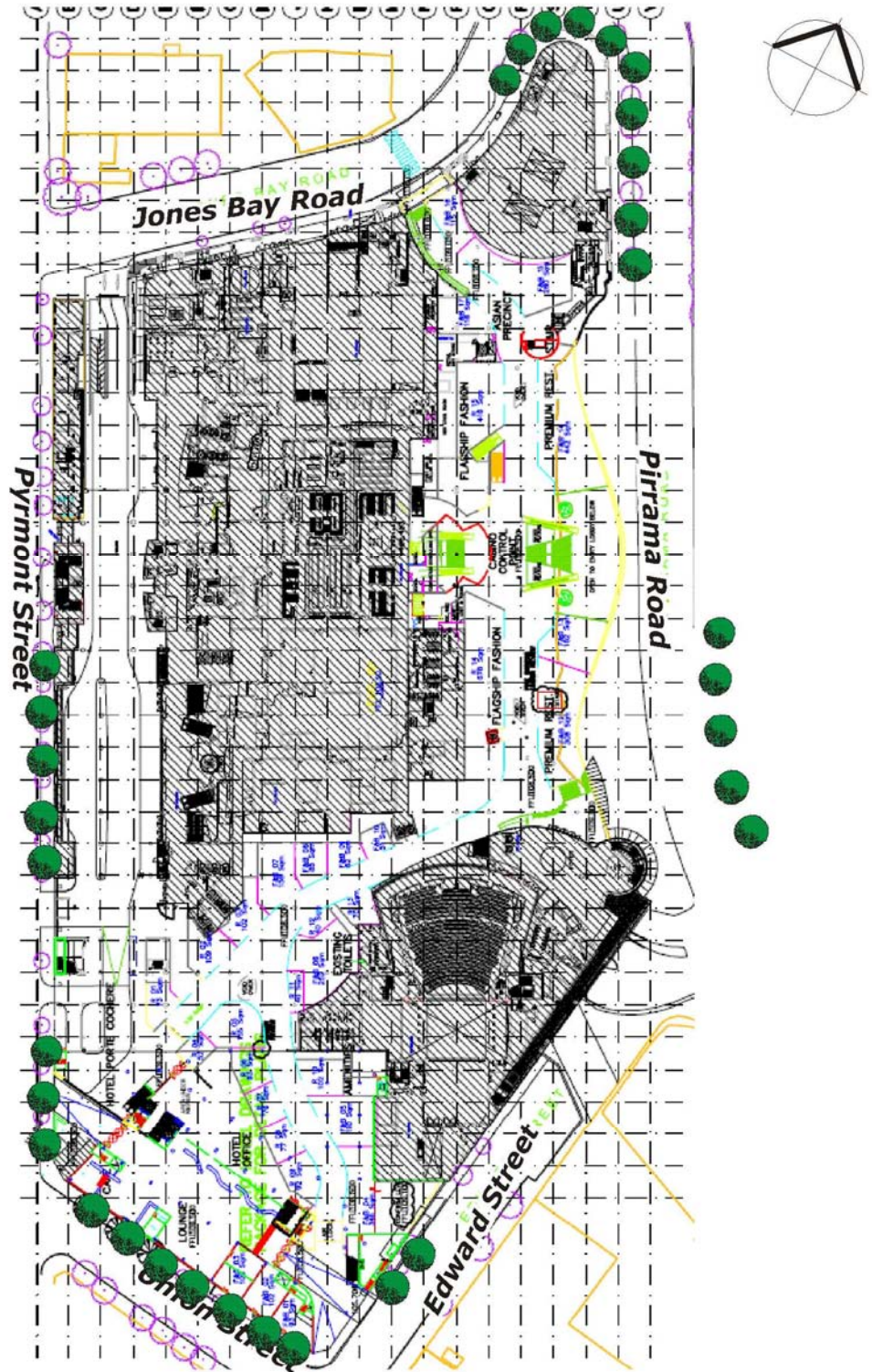


Figure 4: Trees as shown in Architectural Drawings

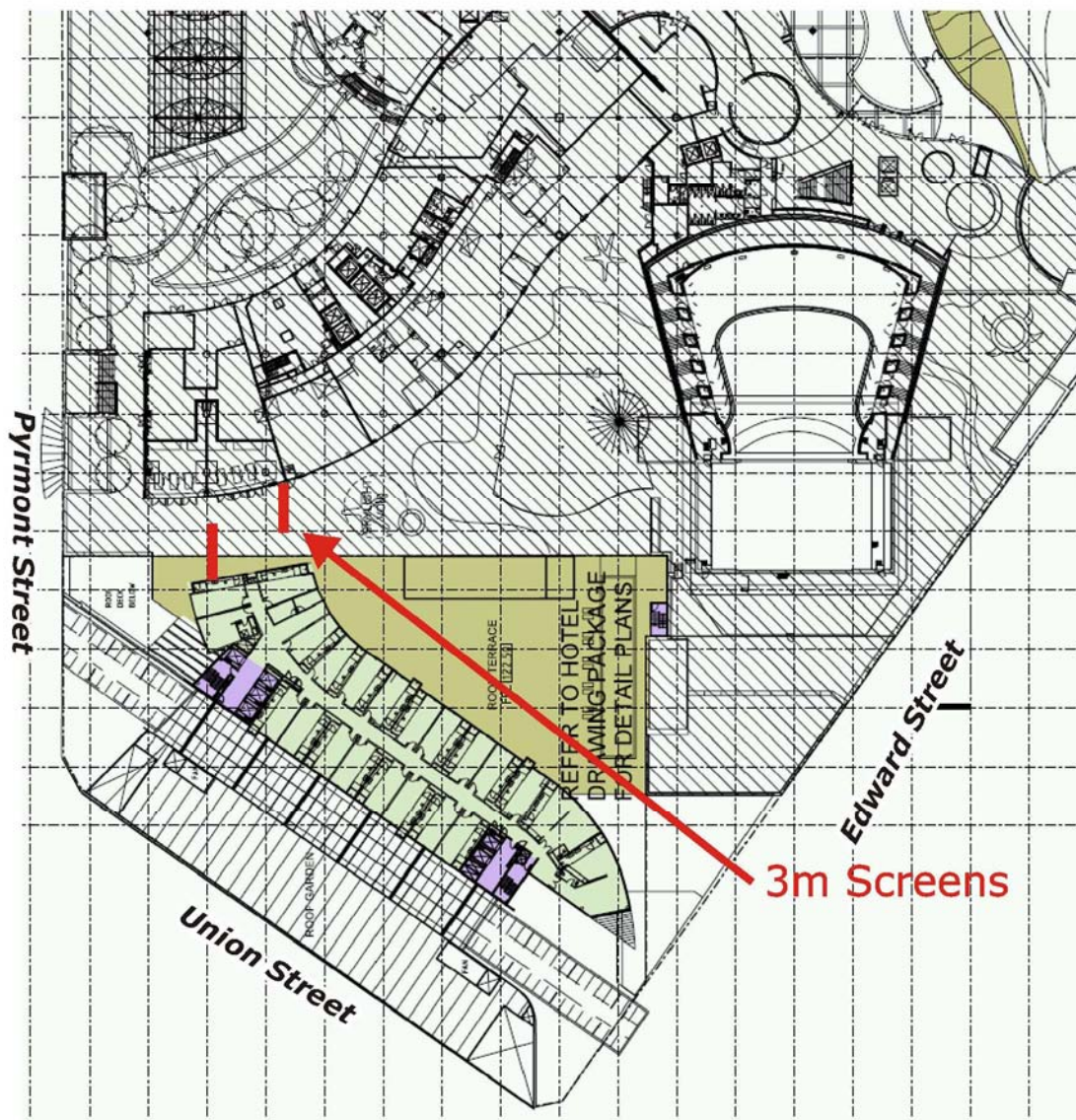


Figure 5: Location of Level 3 full height screens

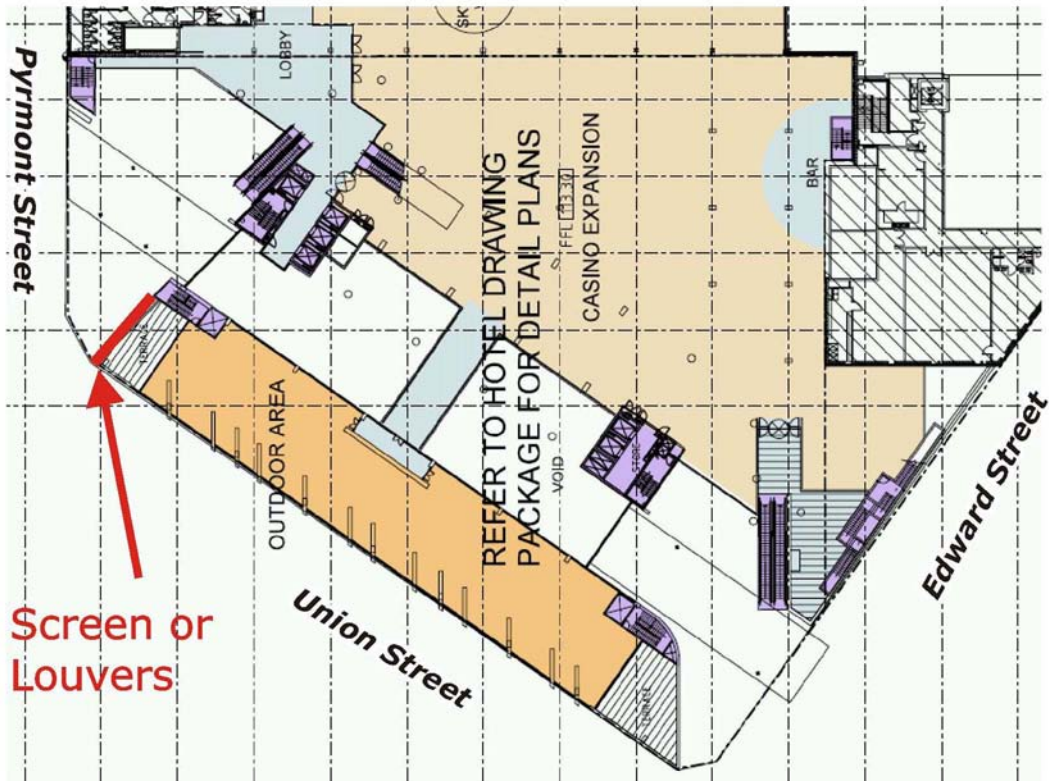


Figure 6: Location of Level 1 screen or louvers

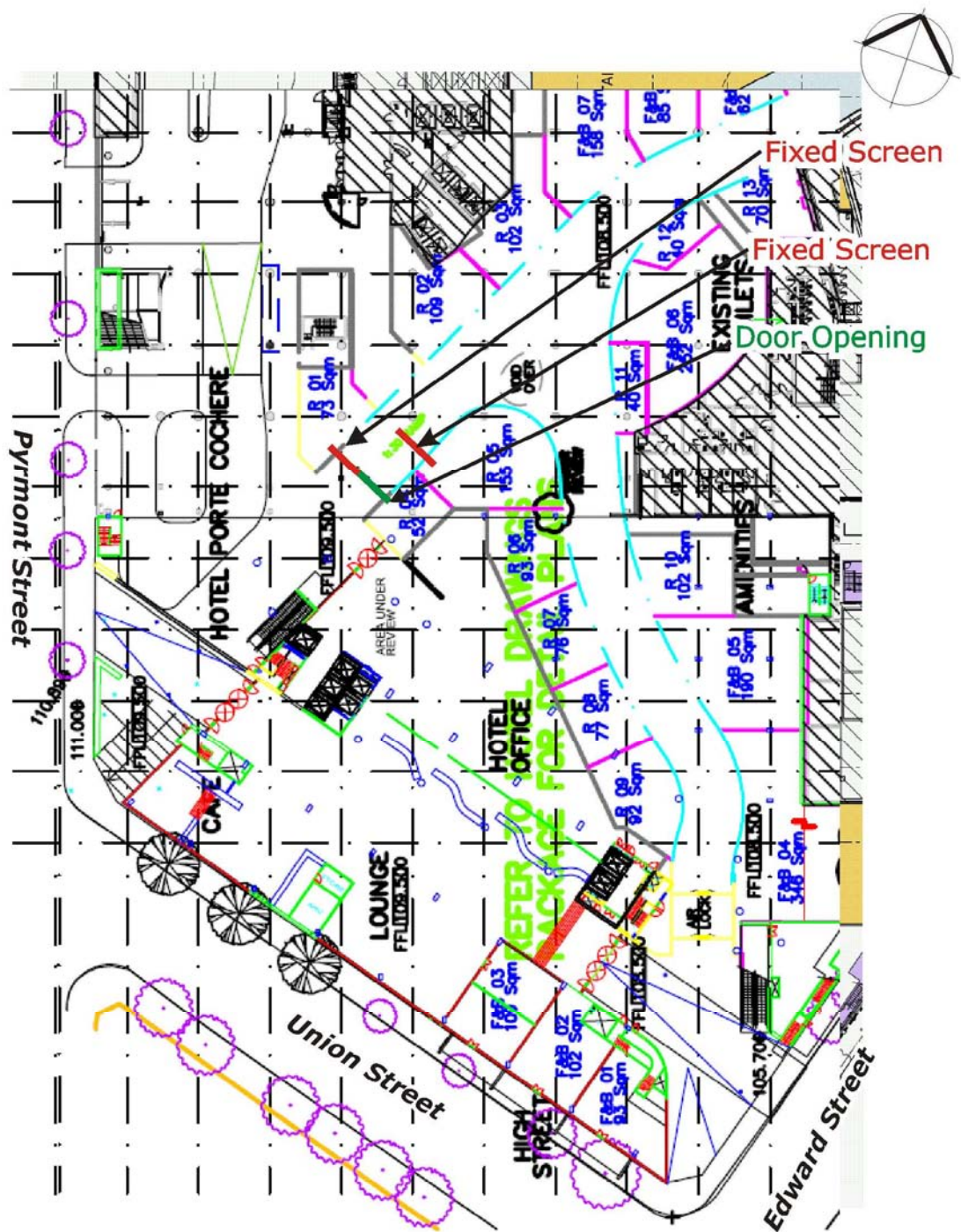


Figure 7: Location of Retail Level Door and Screens

## 7.0 Conclusions

An analysis of the wind environment impact with respect to the principal wind directions for Sydney has been completed for the proposed development known as Project Star, Pyrmont.

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 The Buchan Group and Cox Richardson Architects, dated June, 2008 and variations issued by The Buchan Group dated August 2008. 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 the study indicate that the pedestrian ground level areas are generally well shielded from the principal winds by the existing and proposed tree planting scheme (Figure 4) and awnings shown on the architectural drawings, and by the existing neighbouring buildings. Note that for trees to be effective in wind mitigation they should be of a densely foliating variety, and an evergreen species to ensure their effectiveness during the winter months.

It is expected that in general the wind conditions for the balconies, outdoor gaming areas and terraces will be acceptable for their intended use if impermeable balustrades and roofing similar to those indicated in the architectural drawings are included in the final development. Certain outdoor areas will also be shielded by the existing Star City Casino and the proposed Star Hotel tower. With the addition of two 3m high screens in between the proposed Star Hotel tower and the existing Star City tower on Level 3 (Figure 5), it is expected that any potential funnelling effect between these towers will be ameliorated and this area will be suitable for its intended use. It is expected that with the addition of either a full height screen or panel louvring on the western side of the Level 1 outdoor gaming area in the proposed Star Hotel development (Figure 6) that this area will be acceptable for its intended use. Allowances should be made for the inculcation of a door and baffle screen arrangement at the Pyrmont and Union Street entrance to the ground level retail area, with these additions this area should be suitable for its intended use.

The recommendations in this report are made in principle, and due to the complexity, height and exposure of the proposed development (particularly the tower component) it is advised that a wind tunnel study of the site be conducted at a later more detailed design stage. This study may be especially important in ensuring that the wind conditions in the outdoor gaming areas are suitable for their intended use. A wind tunnel study will also provide quantitative wind measurements as required by the Central Sydney DCP.

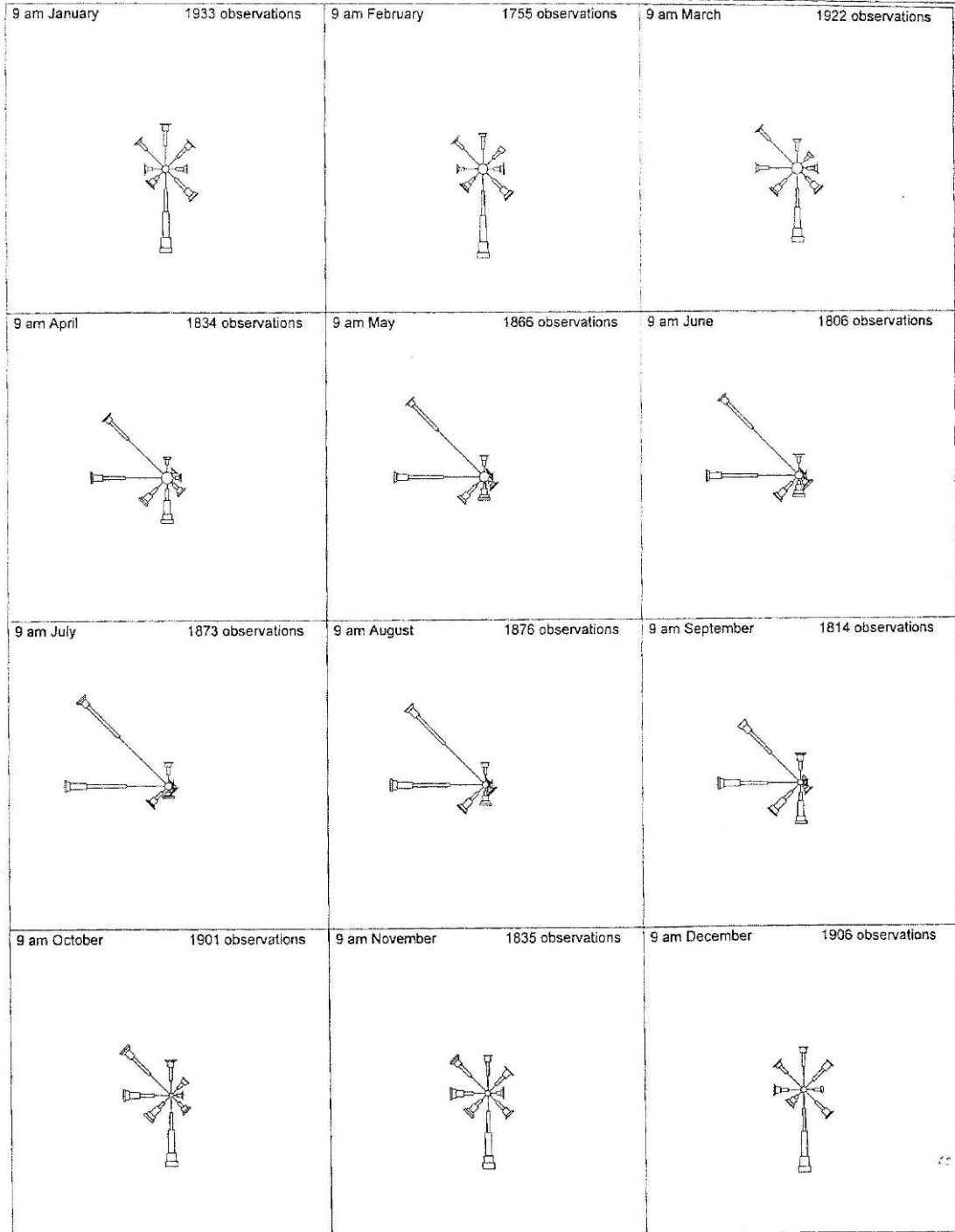
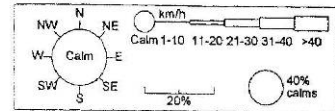
It is not expected that the proposed development will have any adverse effects to the wind conditions to the local surrounding streets and pedestrian footpaths and thoroughfares.

# Appendix

Wind Roses for Kingsford Smith  
(Sydney) Airport, 1939-2000

# Wind Roses using available data between 1939 and 2000 for SYDNEY AIRPORT AMO

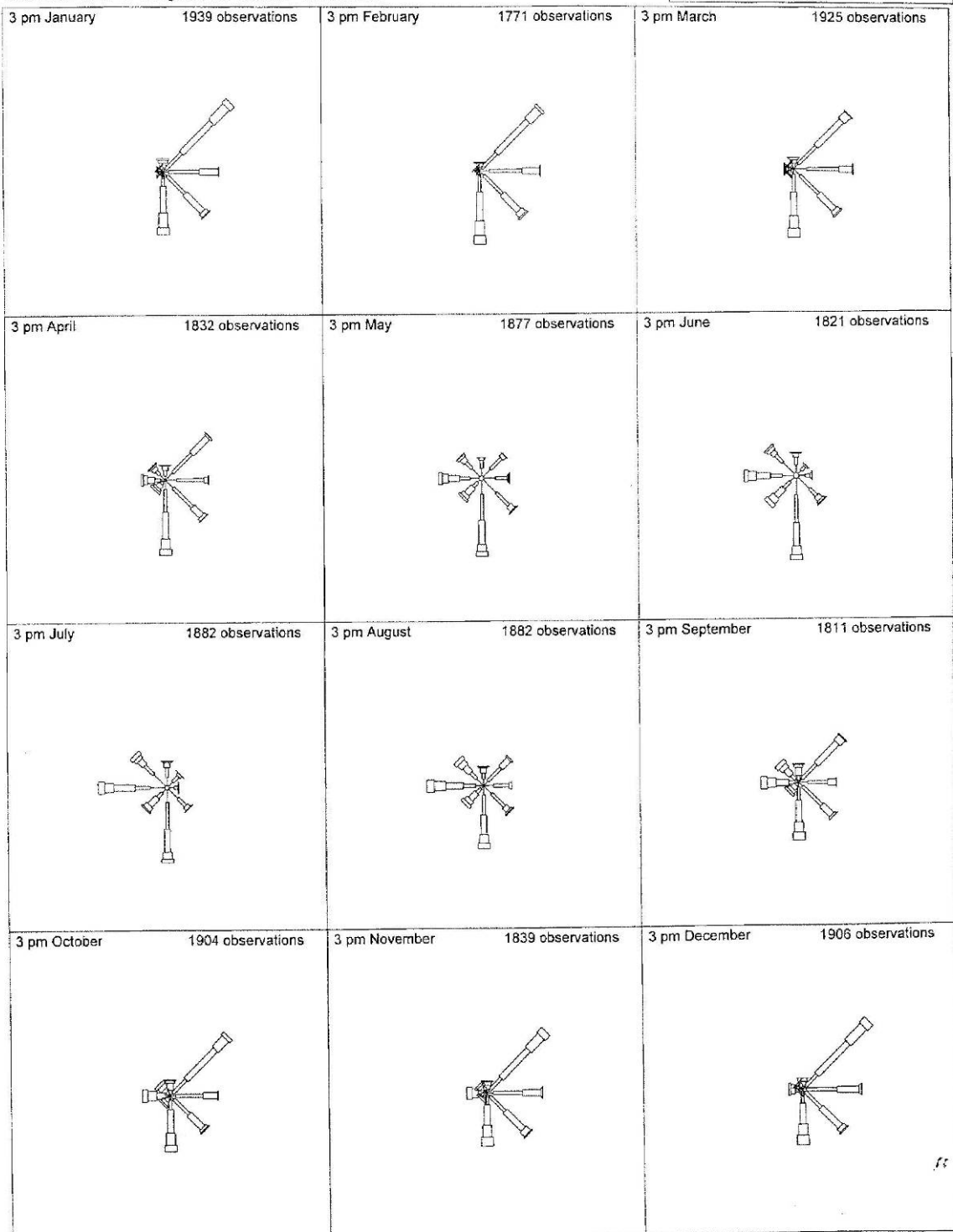
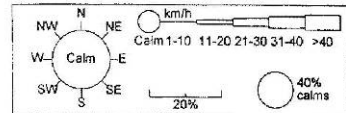
Site Number 066037 • Locality: SYDNEY AIRPORT • Opened Jan 1929 • Still Open  
 Latitude 33°56'28"S • Longitude 151°10'21"E • Elevation 6m



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# Wind Roses using available data between 1939 and 2000 for SYDNEY AIRPORT AMO

Site Number 066037 • Locality: SYDNEY AIRPORT • Opened Jan 1929 • Still Open  
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