



PEDESTRIAN WIND ENVIRONMENT STATEMENT
ROYAL PRINCE ALFRED HOSPITAL, NORTH-WEST
PRECINCT, CAMPERDOWN

WB374-01F02(REV2)- WS REPORT

3 JULY 2012

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DOCUMENT CONTROL

Date	Revision History	Non-Issued Revision	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
28/06/2012	Initial	-	0	KP	TR	KP
29/06/2012	Revised description of the development, and revised the final recommendation of the report.	-	1	AB	TR	AB
03/07/2012	Comments regarding Levels	-	2	KP	TR	KP

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EXECUTIVE SUMMARY

This report is in relation to the proposed development known as the Royal Prince Alfred North West Precinct, located in Camperdown, and presents an opinion on the likely impact of the proposed design on the wind environment in 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; north-easterly, southerly and westerly winds. 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 which have been prepared by the project architects peckvonhartel and Silver Thomas Stanley, dated June 26, 2012. 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 around buildings.

The results of this study indicate that the development site is generally quite well shielded from the prevailing winds by the various surrounding buildings. The proposed development is expected to have a negligible impact onto the wind conditions for the local surrounding area, and wind conditions are expected to remain suitable for the intended activities with the inclusion of impermeable balustrades around the courtyard areas of the development.

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1 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 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: Principle Time of Occurrence of Winds for Sydney

Month(s)	Prevailing 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 directional wind speeds obtained from Sydney Airport between 1939 and 2008.

As shown in Figure 1 of this report, 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. North-easterly winds are also typically not as strong as the southerly or westerly winds.

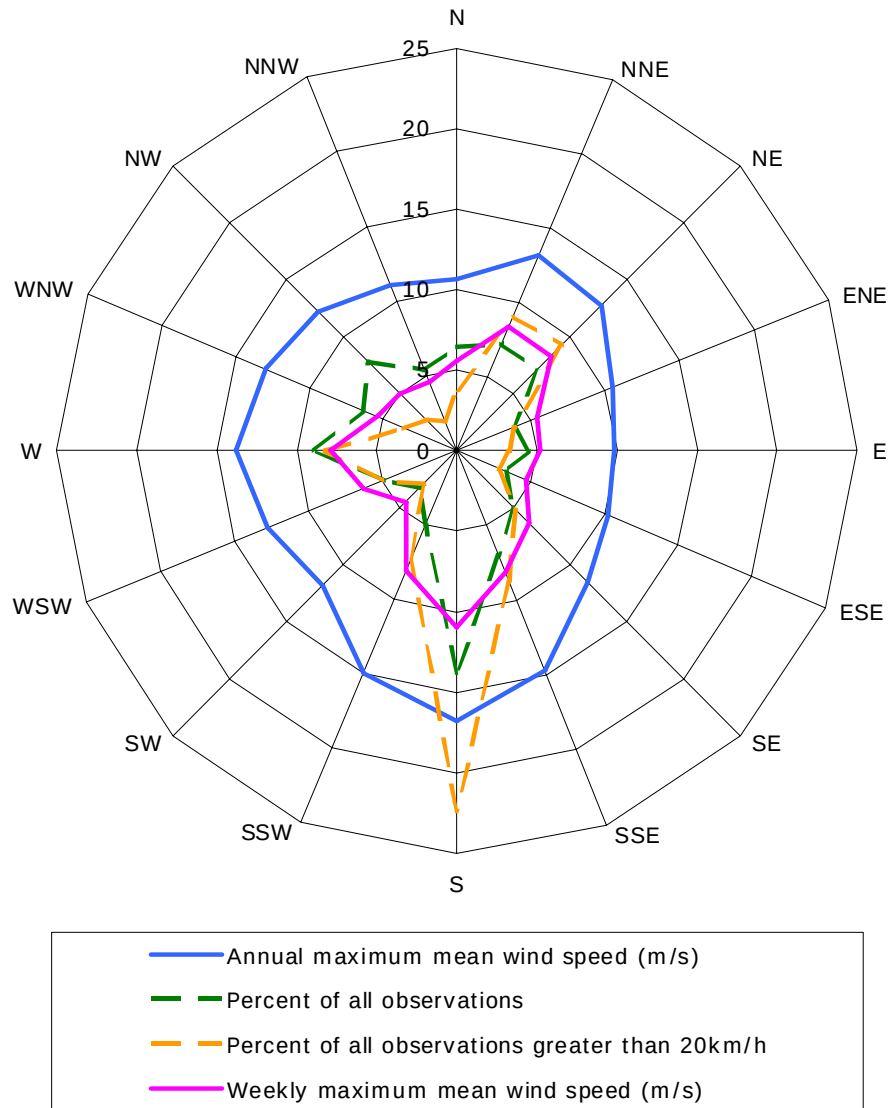


Figure 1: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on directional wind speed observations from Kingsford Smith Airport between 1939 to 2008, at 10m height in open terrain)

2 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), 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 (after Penwarden, 1975)

Type of Winds	Gust 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.	Unacceptable as a public accessway.
Gale	17.2 - 20.7	Generally impedes progress, Great difficulty with balance.	
Strong gale	20.8 - 24.4	People blown over by gusts.	Completely unacceptable.

3 DESCRIPTION OF THE PROPOSED DEVELOPMENT AND SURROUNDS

The proposed development comprises of the construction of a new Mental Health Unit and Ambulatory Services building in Camperdown. The site is located in the north-western precinct of the Royal Prince Alfred Hospital, and is bound by Lucas Street to the north and Brodie Street to the south. New Hospital Road is proposed along the western boundary of the site to link Brodie and Lucas Streets. Further to the east from the site is Missenden Road, and between Missenden Road and the subject development will be a temporary car parking area, although that site is marked for future development and is subject to a separate approval.

The site is surrounded by buildings of various heights, including the Queen Mary building to the west, the QE2 building to the north, the St John's College building to the east, and the Cyclotron building to the south. These buildings will be effective in providing shielding to the ground level areas of the subject development site from the prevailing winds. Further away from the site, the land topography generally gradually slopes downwards in the northerly, easterly and westerly directions. An aerial perspective of the existing site area is shown in Figures 2a and 2b, and a site plan of the development is shown in Figure 3.

The proposed development is generally rectangular in plan shape and will be 6 levels high. A plant level is proposed above this, while the Lower Ground Floor, which due to the slope in the landform across the site in the east-west direction, will only be accessible at the western end of the building. The Ground Floor will consist of the main entry on the eastern aspect with upper levels of the building extending over this area. Outdoor courtyard areas are proposed at the south-western corner on the Ground Floor and Levels 3, 4 and 5, and also at the north-western corner of Levels 3, 4 and 5.

The trafficable outdoor areas within and around the development, which are the focus for the assessment of pedestrian wind conditions for this study, are summarised as follows:

- The eastern ground level entrance to the lobby of the building.
- Pedestrian footpaths around the perimeter of the site, along Lucas Street, Brodie Street and New Hospital Road.
- Outdoor courtyard areas located at the south-western and north-western corners of the development on Ground Floor and Levels 3, 4 and 5.
- The temporary car parking area to the east of the site, although it should be noted that this is a future development site and subject to separate approval.



**Figure 2a: Aerial Perspective of the Existing Site
(view from the south, facing north)**



**Figure 2b: Aerial Perspective of the Existing Site
(view from the north, facing south)**

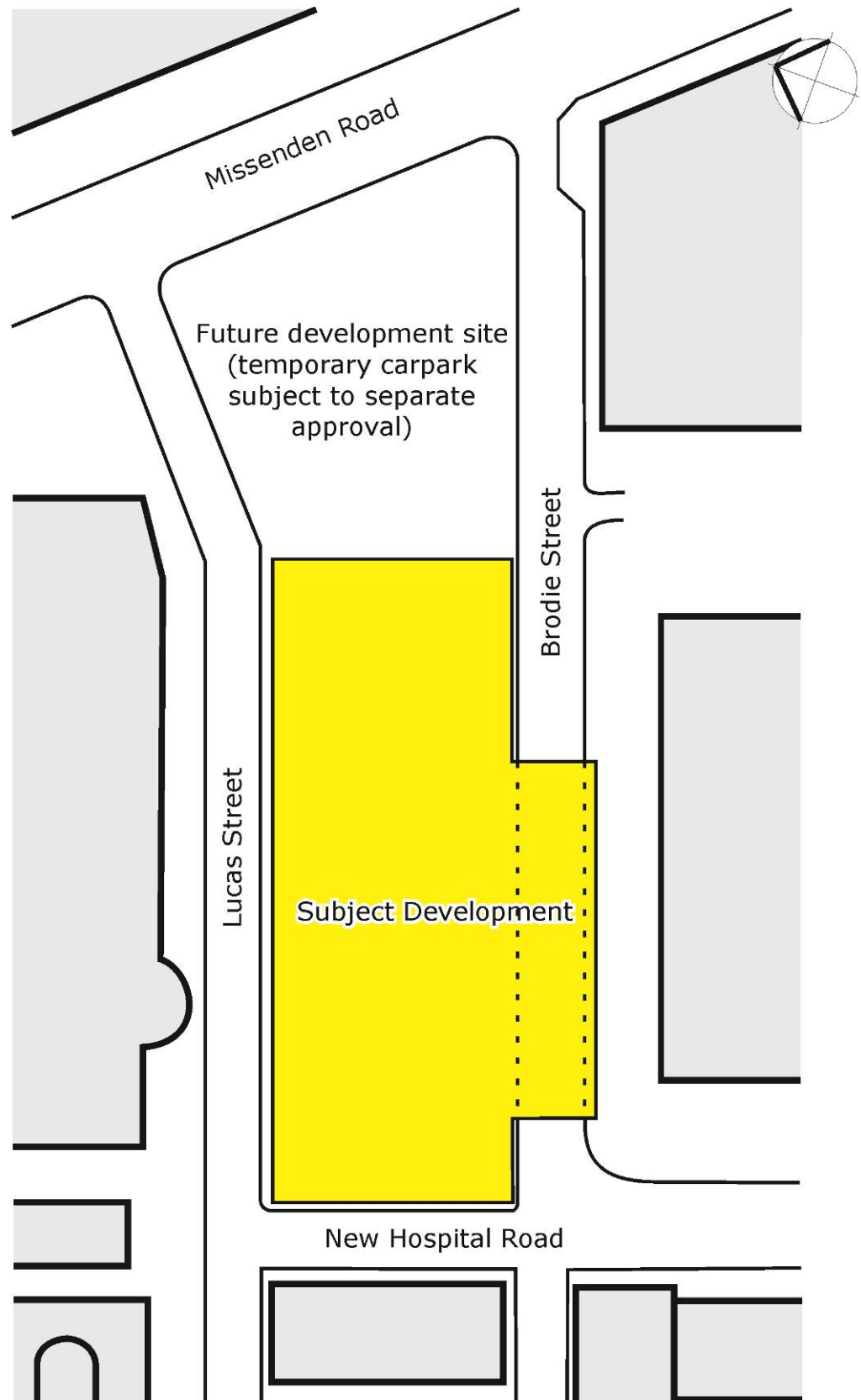


Figure 3: Site Plan

4 RESULTS AND DISCUSSION

The expected wind conditions for the various outdoor areas within and around the subject development are discussed in this section of the report with respect to each of the three predominant wind directions for the Sydney region. The interaction between the prevailing wind and the building morphology in the area was considered, and important features taken into account include the distances between the proposed building form, their overall heights and bulk, as well as the landform. Note that only the potentially critical wind effects are discussed in this report.

The pedestrian footpath areas along Lucas Street, Brodie Street and the New Hospital Road are generally well shielded from the prevailing winds by the other nearby buildings associated with the Royal Prince Alfred Hospital. The section of Brodie Street which the development extends over is expected to be shielded from the westerly winds by the existing Endocrine Research Facility building. The western end of the site may be exposed to the prevailing southerly winds as they pass around the eastern end of the Queen Mary building, although it should be noted that the inclusion of the proposed development is not expected to have any adverse impact onto the wind conditions for that area of the site.

The Entry Forecourt area is relatively exposed to the north-easterly winds due to the lack of shielding provided by the temporary car parking area at the eastern end of the site, although the inclusion of a building on that future redevelopment site is likely to provide effective shielding. However, the St John's college building on the eastern side of Missenden Road will also provide shielding from the north-easterly winds and hence adequate wind conditions can be expected.

The various proposed courtyard areas at the north-western and south-western corners of the building are generally shielded from the prevailing winds, and the stepped building profile of the subject development will be effective in breaking-up speed-up effects around the corner of the development. Nonetheless, to ensure adequate wind conditions are achieved for the various courtyard areas of the development, it is recommended to have impermeable balustrades around the perimeter of these areas.

Hence the proposed development is expected to have a negligible impact onto the wind conditions for the local surrounding area, and wind conditions are expected to remain suitable for the intended activities with the inclusion of the abovementioned recommendation for impermeable balustrades around the courtyard areas of the development.

5 CONCLUSION

An analysis of the wind environment impact with respect to the three principal wind directions for the Sydney region has been undertaken for the proposed development known as the Royal Prince Alfred North West Precinct, located in Camperdown. The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings by peckvonhartel and Silver Thomas Stanley, dated June 26, 2012. 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.

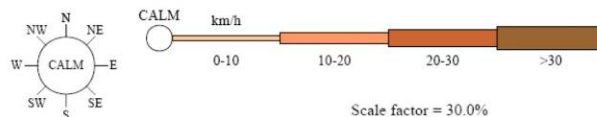
The results of this study indicate that the development site is generally quite well shielded from the prevailing winds by the various surrounding buildings. The proposed development is expected to have a negligible impact onto the wind conditions for the local surrounding area, and wind conditions are expected to remain suitable for the intended activities with the inclusion of impermeable balustrades around the courtyard areas of the development.

APPENDIX A - WIND ROSES FOR THE SYDNEY REGION

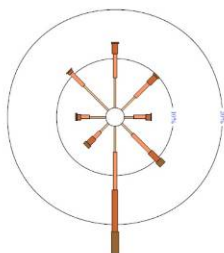
WIND FREQUENCY ANALYSIS (in km/h)

SYDNEY AIRPORT AMO STATION NUMBER 066037

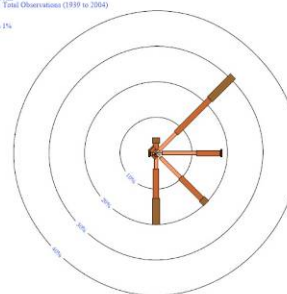
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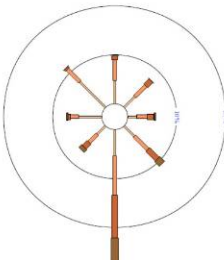
9 am Jan
1933 Total Observations (1939 to 2004)
Calm 1%



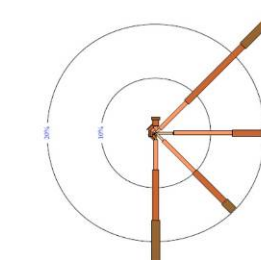
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1941 Total Observations (1939 to 2004)
Calm 1%



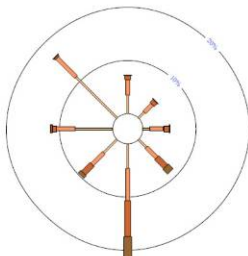
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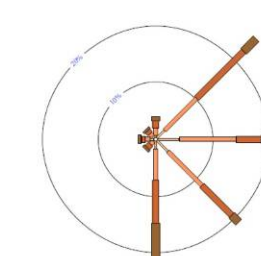
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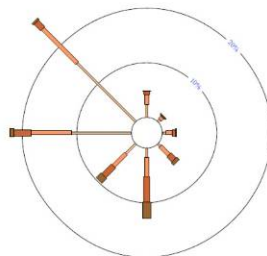
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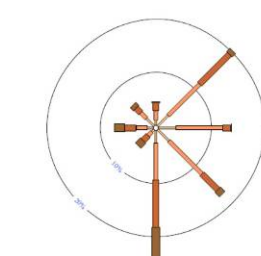
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1773 Total Observations (1939 to 2004)
Calm 2%



9 am Apr
1963 Total Observations (1939 to 2004)
Calm 14%



3 pm Apr
1961 Total Observations (1939 to 2004)
Calm 2%



Wind directions are divided into eight compass directions. Calm has no direction.

An asterisk (*) indicates that calm is less than 1%.

An observed wind speed which falls precisely on the boundary between two divisions (eg 10 km/h) will be included in the lower range (eg 1-10 km/h). Only quality controlled data have been used.



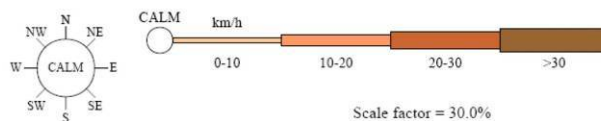
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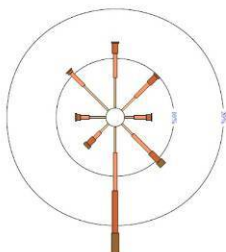
WIND FREQUENCY ANALYSIS (in km/h)

SYDNEY AIRPORT AMO STATION NUMBER 066037

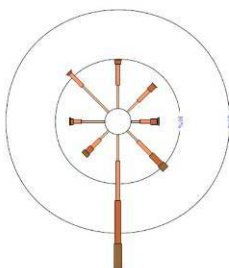
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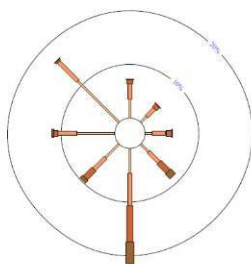
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1925 Total Observations (1939 to 2004)
Calm 13%



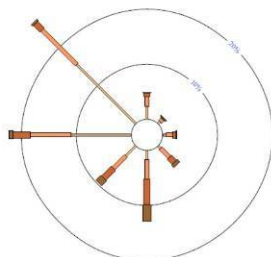
9 am Feb
1780 Total Observations (1939 to 2004)
Calm 13%



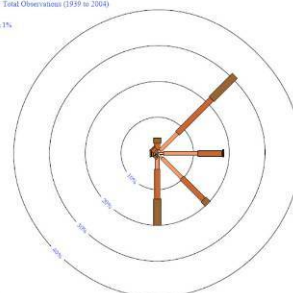
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1968 Total Observations (1939 to 2004)
Calm 14%



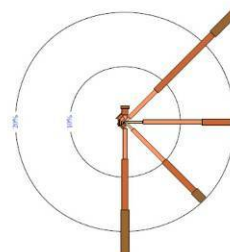
9 am Apr
1963 Total Observations (1939 to 2004)
Calm 14%



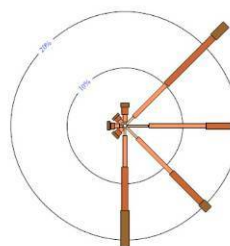
3 pm Jan
1541 Total Observations (1939 to 2004)
Calm 1%



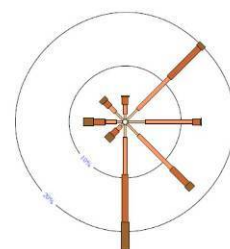
3 pm Feb
1776 Total Observations (1939 to 2004)
Calm 1%



3 pm Mar
1773 Total Observations (1939 to 2004)
Calm 2%



3 pm Apr
1563 Total Observations (1939 to 2004)
Calm 2%



Wind directions are divided into eight compass directions. Calm has no direction.

An asterisk (*) indicates that calm is less than 1%.

An observed wind speed which falls precisely on the boundary between two divisions (eg 10km/h) will be included in the lower range (eg 1-10 km/h). Only quality controlled data have been used.



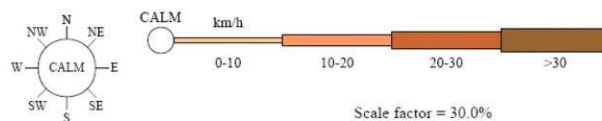
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WIND FREQUENCY ANALYSIS (in km/h)

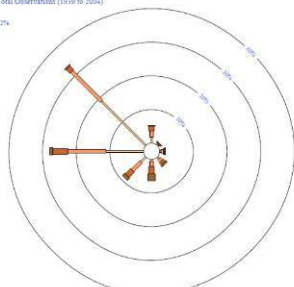
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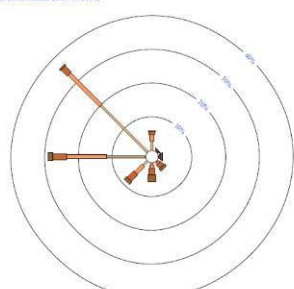
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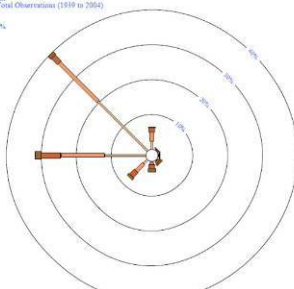
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Calm 9%



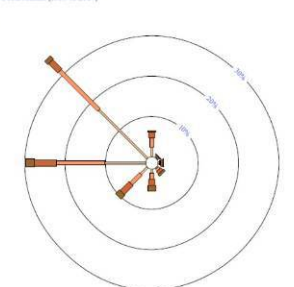
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1997 Total Observations (1939 to 2004)

Calm 9%



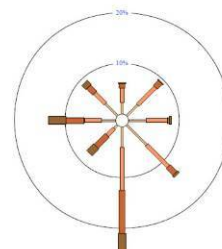
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2000 Total Observations (1939 to 2004)

Calm 8%



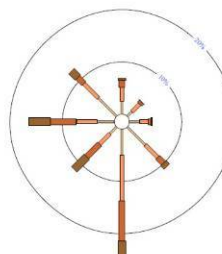
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2001 Total Observations (1939 to 2004)

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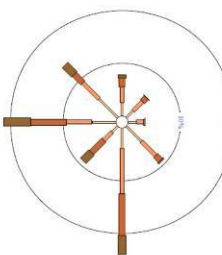
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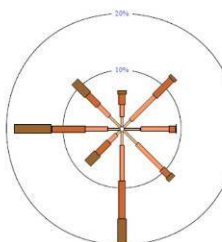
3 pm Jul
2006 Total Observations (1939 to 2004)

Calm 6%



3 pm Aug
2006 Total Observations (1939 to 2004)

Calm 2%



Wind directions are divided into eight compass directions. Calm has no direction.

An asterisk (*) indicates that calm is less than 1%.

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