



PEDESTRIAN WIND ENVIRONMENT STATEMENT

BIOLOGICAL SCIENCES PROJECT,

UNSW, KENSINGTON CAMPUS

WC248-01F03(REV6)- WS REPORT

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DOCUMENT CONTROL

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CONTENTS

Executive Summary	iv
1 Description of the proposed Development and Surrounds	v
2 Wind Climate of the Sydney Region	vii
3 Wind Effects on People	ix
4 Results and Discussion	x
4.1 Ground Level Entrances and Terrace	x
5 Conclusion	xii
6 Appendix – sydney Wind Roses	

EXECUTIVE SUMMARY

This report is in relation to the proposed development located within the Biomedical Precinct of University of New South Wales, Kensington Campus, known as the Biological Sciences Project, and presents an analysis 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; 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 architect Woods Bagot, received on 16th January 2015. No wind tunnel tests have 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 adequate wind conditions are expected to be achieved for majority outdoor trafficable areas within and around the subject development site with the inclusion of the proposed development. The site benefits from the shielding provided by the many surrounding buildings, while the eastern entrance, accessible from Botany Street, benefits from the effective use of wind mitigating devices such as the recessed building entrance.

Westerly and southerly winds may impact pedestrian comfort at the south-eastern part of the development and the terrace adjacent to Botany Road. With the implementation of a plantation and landscaping plan similar to the Landscape Concept Report, prepared by the landscape consultant Black Beetle, received on 16th January 2015, it is expected these wind effects will be ameliorated.

Two directly opposite entrances, which are the terrace entrance on Botany Street and the pedestrian entrance on Chancellery Walk respectively, may cause a pressure driven wind entry effect if these doors are opened simultaneously. Door closers or similar restraints are recommended to be installed to prevent doors from slamming.

With the inclusion of the abovementioned recommendations within the final design of the development, it is expected the wind conditions for all outdoor trafficable within and around the development will be acceptable for their intended uses.

1 DESCRIPTION OF THE PROPOSED DEVELOPMENT AND SURROUNDS

The subject development is located within the Biomedical Precinct of University of New South Wales, Kensington Campus, and is known as the Biological Sciences Project. The site is bounded by Botany Street to the east, Chancellery Walk to the west, Michael Birt Gardens and the existing Wallance Wurth building to the north of the development site. South of the development site are the existing Samuels Building and Gate 11 (to be realigned). Further to the north and west are medium rise university buildings and low rise residential houses dominate the southern and eastern aspect of the development. A survey of the local land topography indicates that the land generally rises from the west to the east. An aerial image of the site and the surroundings is shown in Figure 1.

The proposal is for an educational and research building with an overall height of 8 storeys above ground. The total height of the proposed building is approximately 32m above the ground. Laboratory rooms are located on every floor with plant rooms on Level 6 and 7. There is a communal terrace area located on Ground Floor. The atrium links Biosciences Building (D26) North Wing, Biolink Wing Building and the proposed development together.

The critical trafficable outdoor areas associated with the proposed development, which are the focus for pedestrian wind effects in this assessment, are detailed as follows:

- The pedestrian entrances at the eastern, northern and western aspect of the development on Botany Street, Michael Birt Gardens and Chancellery Walk respectively.
- The communal terrace areas located around eastern and western edge (western edge communal terrace area is to be completed as part of Stage 2 Development) on Ground Floor.
- The loading dock between the proposed building and the existing Samuels buildings on the southern elevation.



Figure 1: Aerial Plan 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	

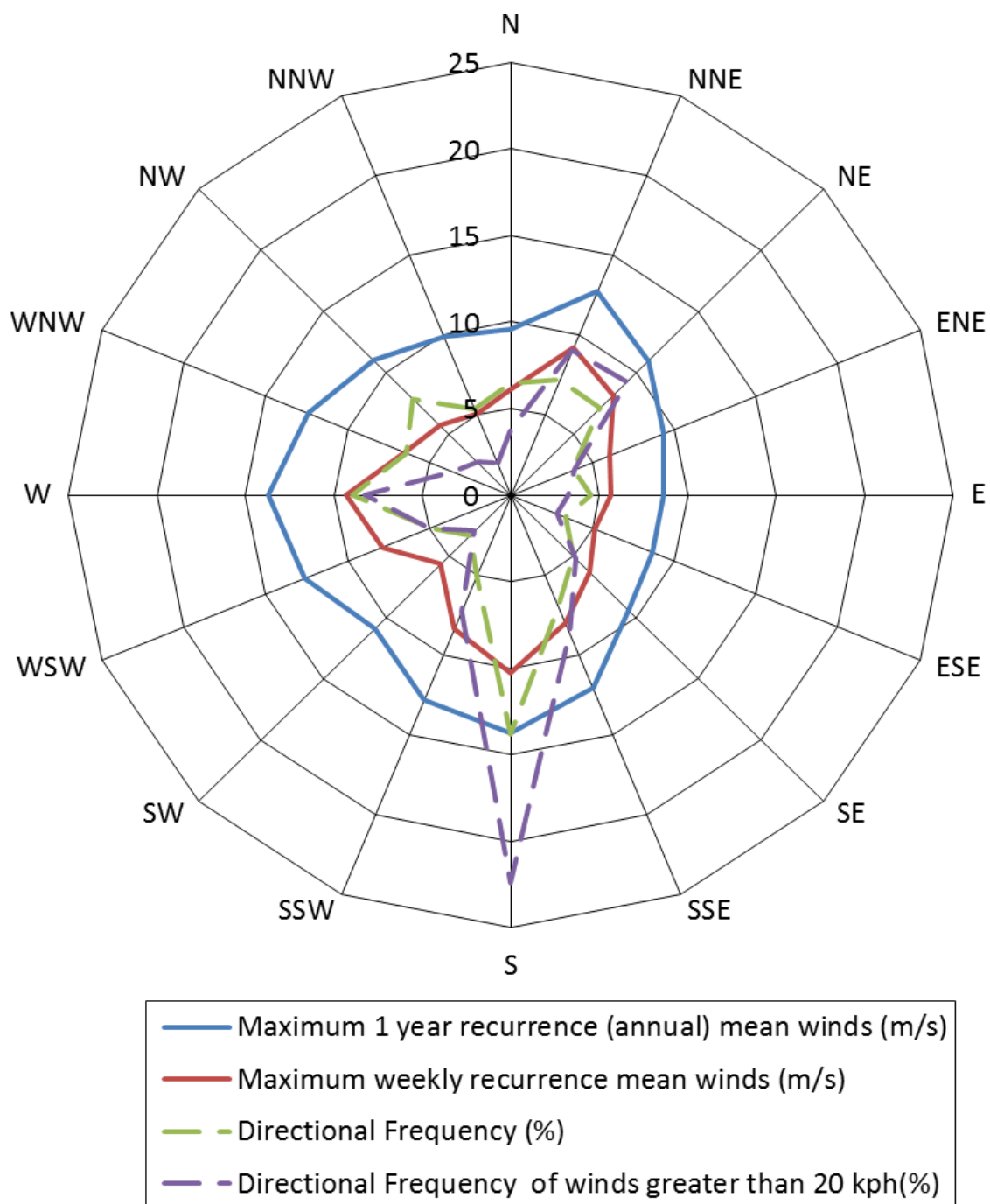


Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10-minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

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 also 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	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.	
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 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.

4.1 Ground Level Entrances and Terrace

Wind conditions for the pedestrian entrances accessible from Chancellery Walk and Botany Street are expected to be acceptable for pedestrian activity with the addition of the proposed development due to the shielding provided from the neighbouring medium rise buildings to the west and north of the subject development and the effective use of existing wind mitigating devices such as the existing densely foliating trees along Chancellery Walk and the recessed building entrance from Botany Street.

Wind conditions for the pedestrian entrance on the northern elevation via Michael Birt Gardens are expected to be acceptable for pedestrian activity due to the shielding provided from the surrounding medium rise buildings. The existing densely foliating trees and landscaping along Michael Birt Gardens are acting as the effective wind mitigating devices, therefore, should be retained in the final design of the development.

Wind conditions for the Ground Level terrace on the north-western corner of the development are expected to be acceptable for occupant activities due to the shielding provided from the adjacent buildings. However, the two directly opposite entrances, which are the terrace entrance on Botany Street and the pedestrian entrance on Chancellery Walk respectively, may cause a pressure driven wind entry effect if these doors are opened simultaneously. Door closer or similar restrains are recommended to be installed to prevent doors from slamming. Alternatively, computer controlled door restraining device is recommended to make sure only one entrance door should be opened at any time. Note that the windiest condition within the building on the ground floor is expected to be around the narrowest section of the corridor.

Westerly and southerly winds may also impact pedestrian comfort at the south-eastern part of the development and the terrace adjacent to Botany Road. With the implementation of a plantation and landscaping plan similar to the Landscape Concept Report, prepared by the landscape consultant Black Beetle, received on 16th January 2015, it is expected these wind effects will be ameliorated. The section of Landscape Concept Report is also shown in Figure 3 below.

The southerly and westerly winds may potentially cause a funnelling effect between the proposed building and the existing Samuels buildings. It is expected that this area will be suitable for use as a roadway. Further wind analysis and mitigation measures may be required if this area is to be used as a pedestrian thoroughfare.

Note that the proposed trees should be capable of growing to a height of at least 4 m with 4m canopy, and be of an evergreen species to ensure their effectiveness in the wind mitigation throughout the entire year.

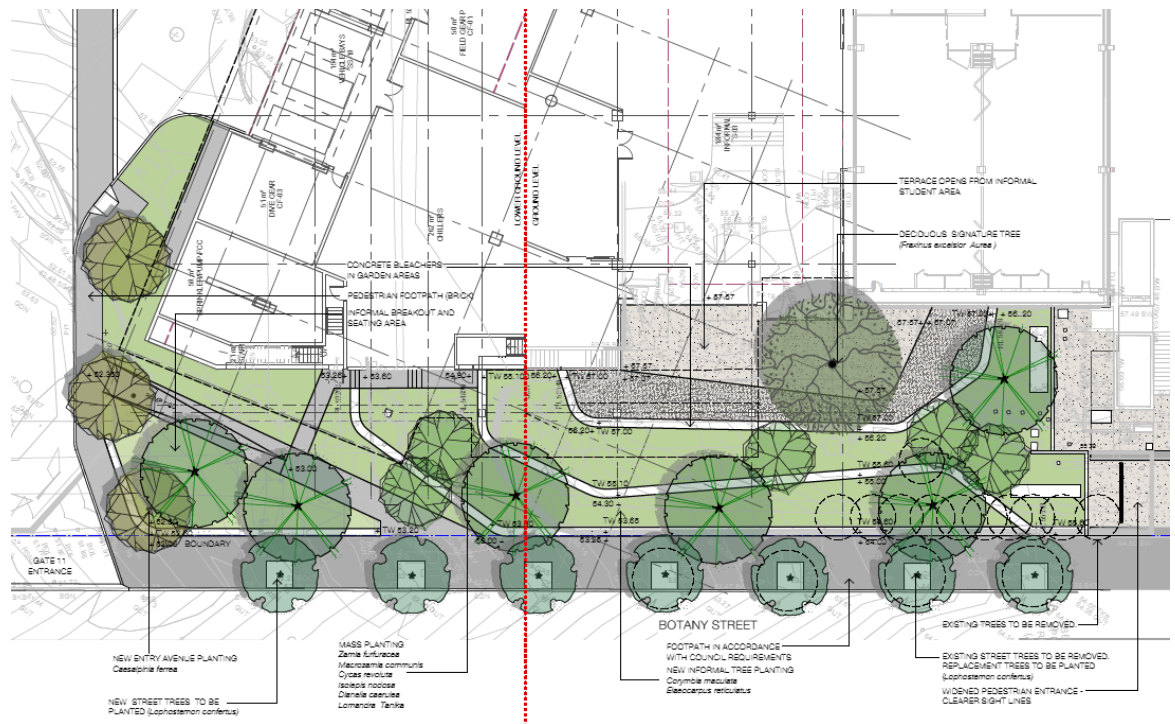


Figure 3: Landscape Concept Report

5 CONCLUSION

An analysis of the wind environment impact with respect to the three principal wind directions for the Sydney region has been completed for the proposed development within the Biomedical Precinct of University of New South Wales, Kensington Campus, known as the Biological Sciences Project. 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 Woods Bagot, received on 16th January 2015. No wind tunnel tests have 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.

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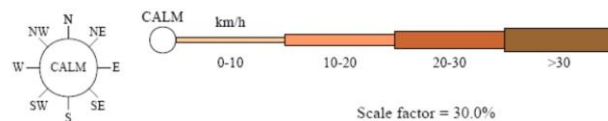
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6 APPENDIX – SYDNEY WIND ROSES

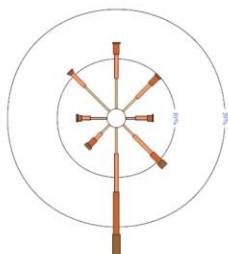
WIND FREQUENCY ANALYSIS (in km/h)

SYDNEY AIRPORT AMO STATION NUMBER 066037

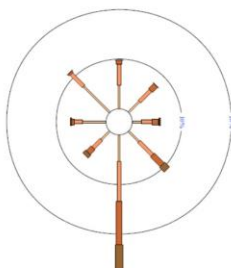
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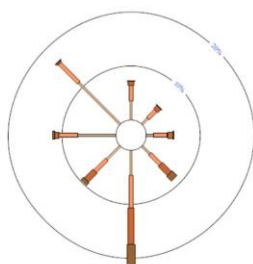
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1935 Total Observations (1939 to 2004)
Calm 1%



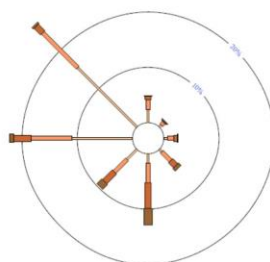
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1780 Total Observations (1939 to 2004)
Calm 13%



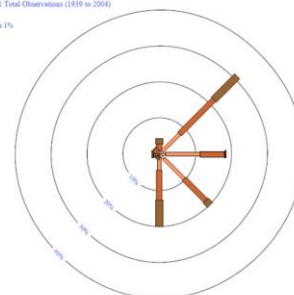
9 am Mar
1968 Total Observations (1939 to 2004)
Calm 14%



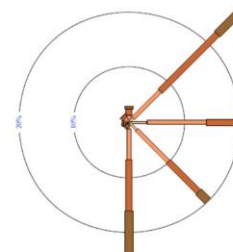
9 am Apr
1863 Total Observations (1939 to 2004)
Calm 14%



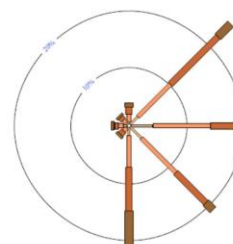
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1841 Total Observations (1939 to 2004)
Calm 1%



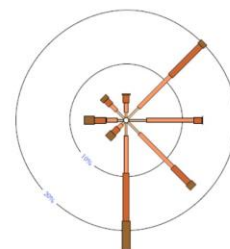
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1776 Total Observations (1939 to 2004)
Calm 1%



3 pm Mar
1975 Total Observations (1939 to 2004)
Calm 2%



3 pm Apr
1863 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%.

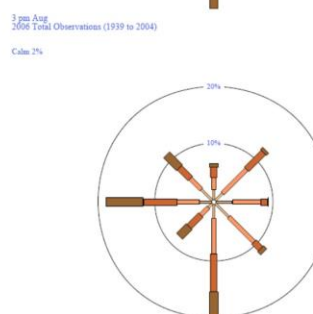
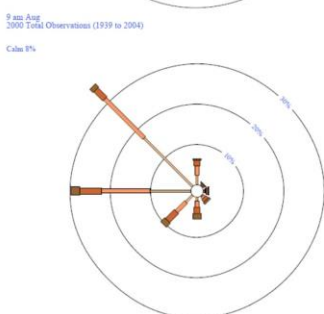
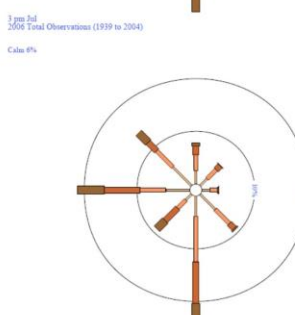
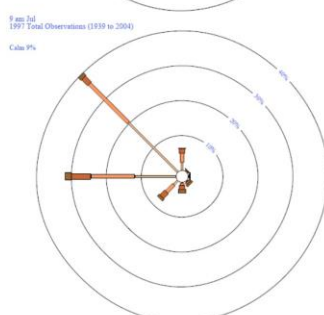
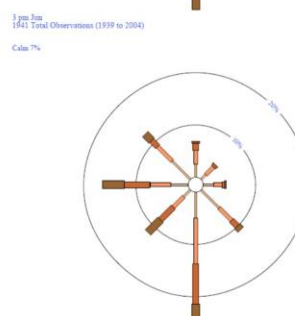
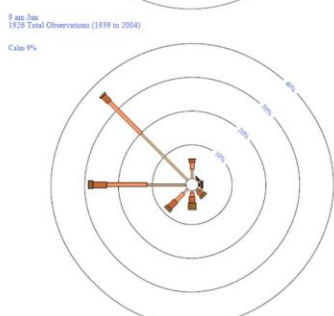
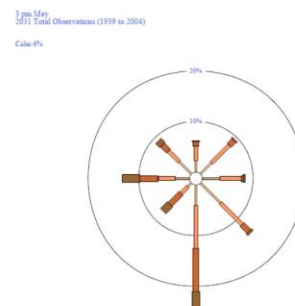
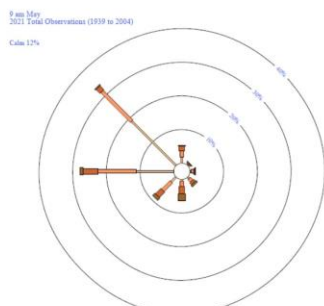
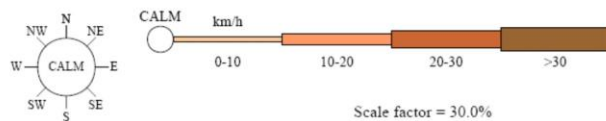
An observed wind speed which falls precisely on the boundary between two divisions (eg 10km/h) will be included in the lower range (eg 1-10 km/h). Only quality controlled data have been used.



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WIND FREQUENCY ANALYSIS (in km/h)
SYDNEY AIRPORT AMO STATION NUMBER 066037
Latitude: -33.94 ° Longitude: 151.17 °



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.



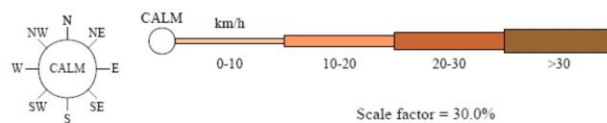
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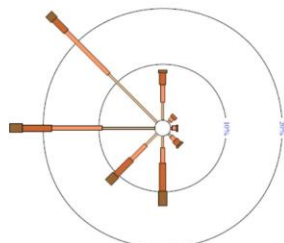
WIND FREQUENCY ANALYSIS (in km/h)

SYDNEY AIRPORT AMO STATION NUMBER 066037

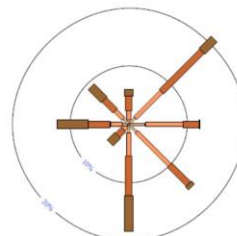
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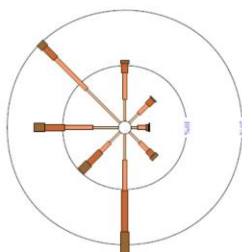
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Calm 7%



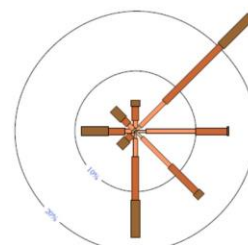
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1931 Total Observations (1939 to 2004)
Calm 1%



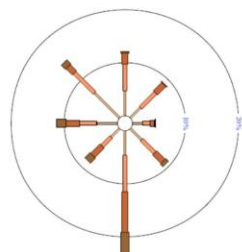
9 am Oct
1993 Total Observations (1939 to 2004)
Calm 6%



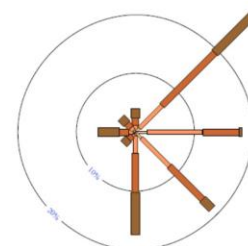
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1991 Total Observations (1939 to 2004)
Calm 1%



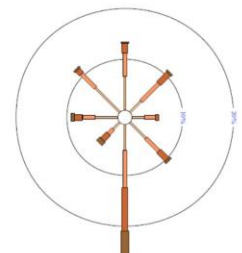
9 am Nov
1991 Total Observations (1939 to 2004)
Calm 7%



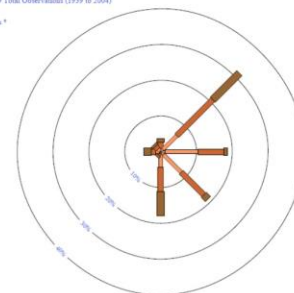
3 pm Nov
1991 Total Observations (1939 to 2004)
Calm 1%



7 am Dec
1931 Total Observations (1939 to 2004)
Calm 7%



3 pm Dec
1931 Total Observations (1939 to 2004)
Calm *



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