Pedestrian Wind Environment Statement

for the Concept Plan design of the proposed development located at

71-79 Macquarie Street, Sydney

November 3, 2011

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Document Control

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0	06/05/2011	Initial	KP	TR
1	07/06/2011	Comments	KP	TR
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3	03/11/2011	Final Concept Drawings	KP	

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Table of Contents

1.0 Introduction

This report is in relation to the Concept Plan design of the proposed residential development located at 71 Macquarie Street, Sydney, and presents an opinion on the likely impact of the local wind environment to the critical outdoor areas within and around the development.

The effect of wind activity within and around the proposed development 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 Concept Plan design massing drawings which have been prepared by the project architect Hassell architects, dated November 3, 2011. 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 the Sydney Region

The Sydney region is governed by three principle wind directions which 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 2004. The wind roses are attached in the appendix of this report.

Table 1: Principal Time of Occurrence of Winds for Sydney

Month(s)	Prevailing Wind Direction		
	North-Easterly	Southerly	Westerly
January through to March	X	X	
April		X	X
May through to August			X
September		X	X
October through to 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.

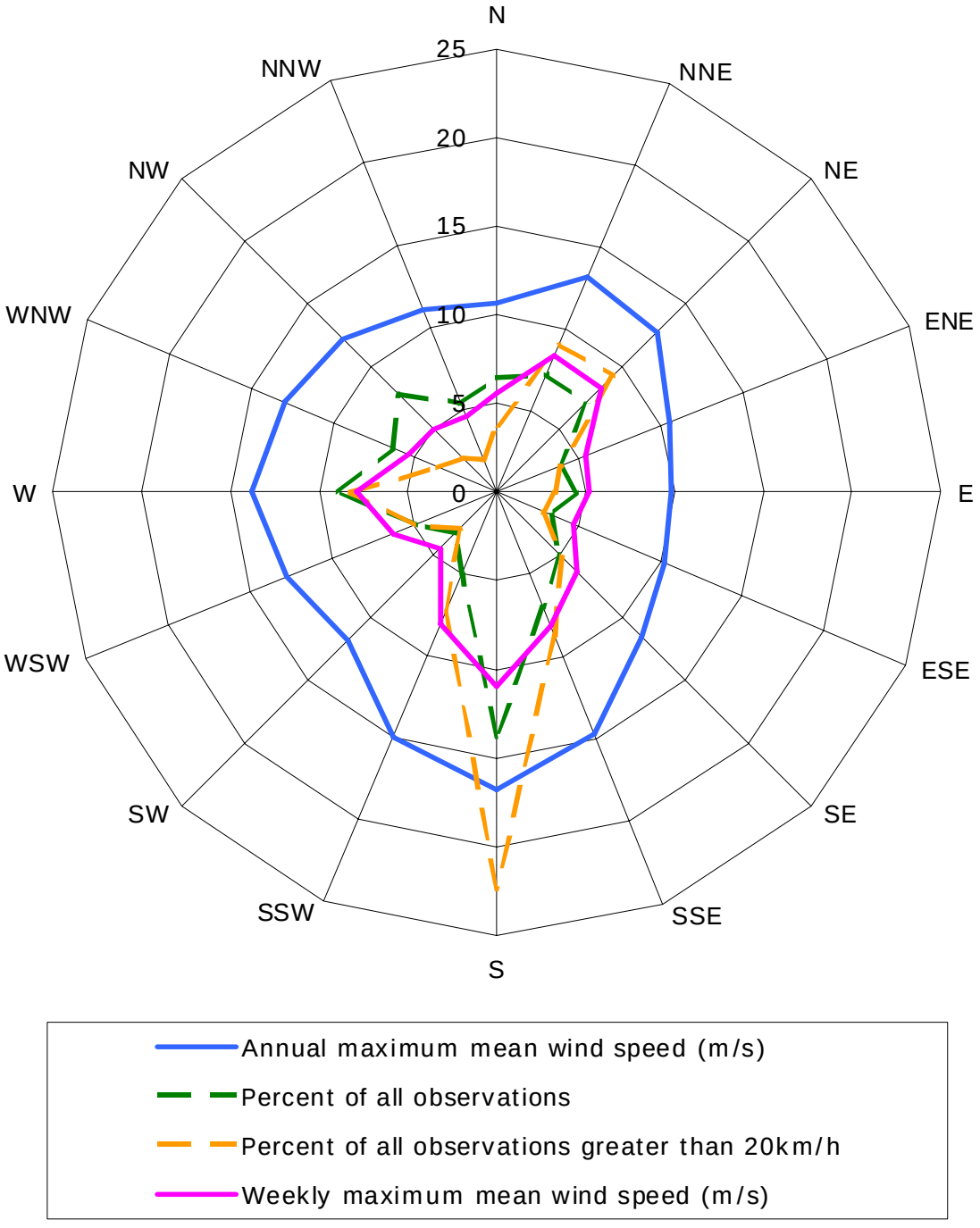


Figure 1: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10 minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

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), 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.	
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.

4.0 Description of the Site and Surrounds

The proposed development is located at the south-eastern corner of Circular Quay in Sydney. To the north of the site is the Quay Grand building, with the Sydney Opera House further beyond this. To the east of the site is the Royal Botanical Gardens with farm cove further to the east. To the south and south-west of the site is the Sydney CBD. While to the west of the site is the Circular Quay Ferry Terminals and The Rocks, with Darling Harbour further beyond this.

The landform in the local vicinity of the site is relatively flat around the Circular Quay area to the west of the site. The land topography slopes upwards towards the east and south of the site. There is a three level step in the land topography between the western and eastern aspect of the development site. Aerial images of the site are shown in Figures 2a to 2c.

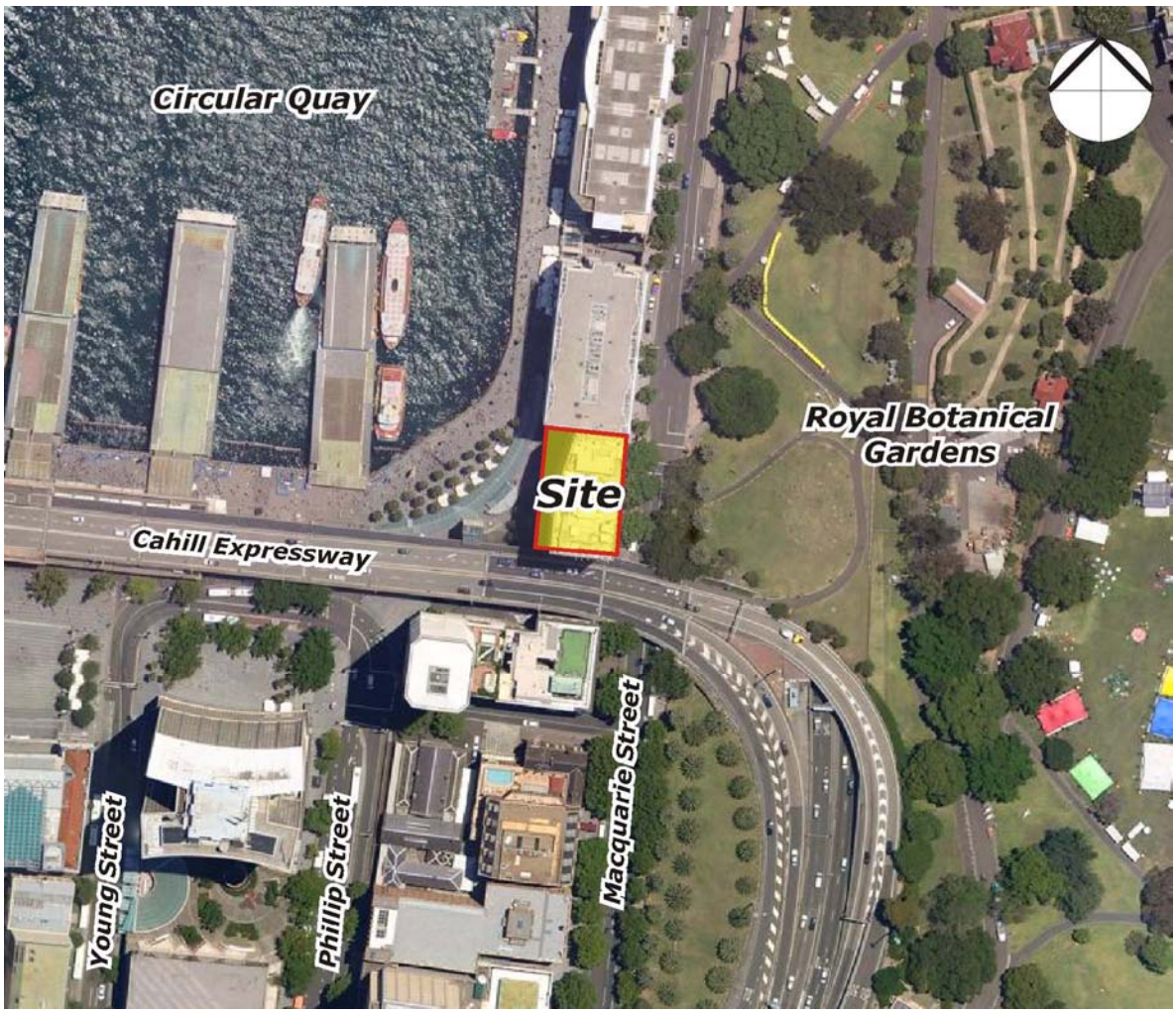


Figure 2a: Aerial Image of the Site Location

Figure 2b: Aerial Image of the Site Location (view from the south, facing north)

Figure 2c: Aerial Image of the Site Location (view from the west, facing east)

5.0 Description of the Proposed Development

The proposed development will consist of a tower of similar height and shape to the existing building currently on the site. The building is proposed to consist of serviced apartments for the lower levels and residential apartments for the upper levels.

The profile of the lower 13 levels of the tower is proposed to be extended towards the west to follow the building façade line of the adjacent Quay Grand building, and as such continue the ground level colonnade to the undercover area beneath the Cahill expressway. This will effectively create a 6m deep podium at Level 14 on the western aspect. Private balcony areas are proposed along the eastern and western aspects of the development and along the northern aspects for the section above the Quay Grand building.

A public plaza area is located at the ground level (Level 1) on the western aspect of the development site and a pedestrian accessible stairway exists along the south aspect providing access between Circular Quay on the western aspect of the site, and Macquarie Street on the eastern aspect.

6.0 Results of the Analysis

Each outdoor trafficable area has been analysed in relation to how it will be affected by winds from the three predominant wind directions for the Sydney region. 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.

North-easterly winds occur most frequently during the warmer months of the year for the Sydney region. They are typically not as strong as the southerly winds, and are usually welcomed within outdoor areas since they typically occur when it can be quite warm during the summer. 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. Westerly winds occur most frequently during the winter season for the Sydney region. 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.

6.1 Pedestrian Footpaths around the Site

The pedestrian footpath along the Macquarie Street boundary is expected to have similar wind conditions to the existing development. The pedestrian footpath is relatively shielded by the predominate wind directions by the proposed development to the west, the Cahill Expressway bridge to the south and the existing densely foliating trees within the Royal Botanical Gardens. The expected wind conditions along the pedestrian footpath will be investigated in further detail during the project application phase to ensure wind conditions are suitable for the intended uses.

The public plaza area on the western aspect of the site is expected to be similar to or better than the existing wind conditions. The extension of

the ground level colonnade from the Quay Grand building to the north of the site and continue around to the west along the Cahill Expressway is expected to be relatively shielded from any potentially adverse winds with the setback in the building profile at Level 14 reducing any potentially adverse downwash effects as a result of the westerly winds. The expected wind conditions within the public plaza area will be investigated in further detail during the project application phase to ensure wind conditions are suitable for the intended uses.

The pedestrian accessible stairway along the southern aspect of the site is expected to be suitable for the intended use as a pedestrian thoroughfare due to shielding provided by the proposed development and extended colonnade. It is recommended that wind tunnel testing be undertaken at a more detailed design stage to ensure that no adverse impact is created by the development on the stairway due to the north-easterly and westerly winds.

6.2 Various Private Balconies

Private balconies are proposed along the eastern and western aspects of the development for all levels of the tower and along the northern aspects for the section above the Quay Grand building. The detailed layout of the residential units and balconies has not been developed at this stage and as such in-principle design strategies have been recommended which are relevant to the site.

The design strategies outlined below should be incorporated in the final design to ensure appropriate wind conditions within the various balconies:

- Impermeable full-height privacy screens between the apartments;
- Impermeable balustrades along the perimeter of the various private balcony areas;
- Full height impermeable screens/ blade walls along the southern edge of the tower to ensure the southern balconies are not exposed to the direct southerly winds of north-easterly winds side-streaming around the corner of the building.
- Ensure that any L-shaped or U-shaped corner balconies have adequate screening provided to minimize the potential for side-streams entering these balconies.

With the inclusion of these recommendations in the detailed design for the private balconies, wind conditions will potentially be suitable for their intended uses. A more detailed analysis of the development should be undertaken once the design of the tower has been further developed during the Detailed Design Application Stage.

7.0 Conclusions

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 located at 71 Macquarie Street, Sydney. The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the Concept Plan massing drawings which have been prepared by the project architect Hassell architects, dated November 3, 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.

The results of this study indicate that wind conditions for all outdoor trafficable areas of the development are expected to be suitable for their intended uses and be similar to or better than the existing conditions around the site. Recommendations have been made within this report for consideration during the more detailed design stages of this development.

A more detailed analysis of the development should be undertaken once the design of the tower has been further developed during the Detailed Design Application Stage.

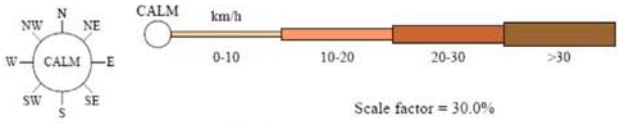
Appendix

Wind Roses for the
Sydney Region

WIND FREQUENCY ANALYSIS (in km/h)

SYDNEY AIRPORT AMO STATION NUMBER 066037

Latitude: -33.94 ° Longitude: 151.17 °



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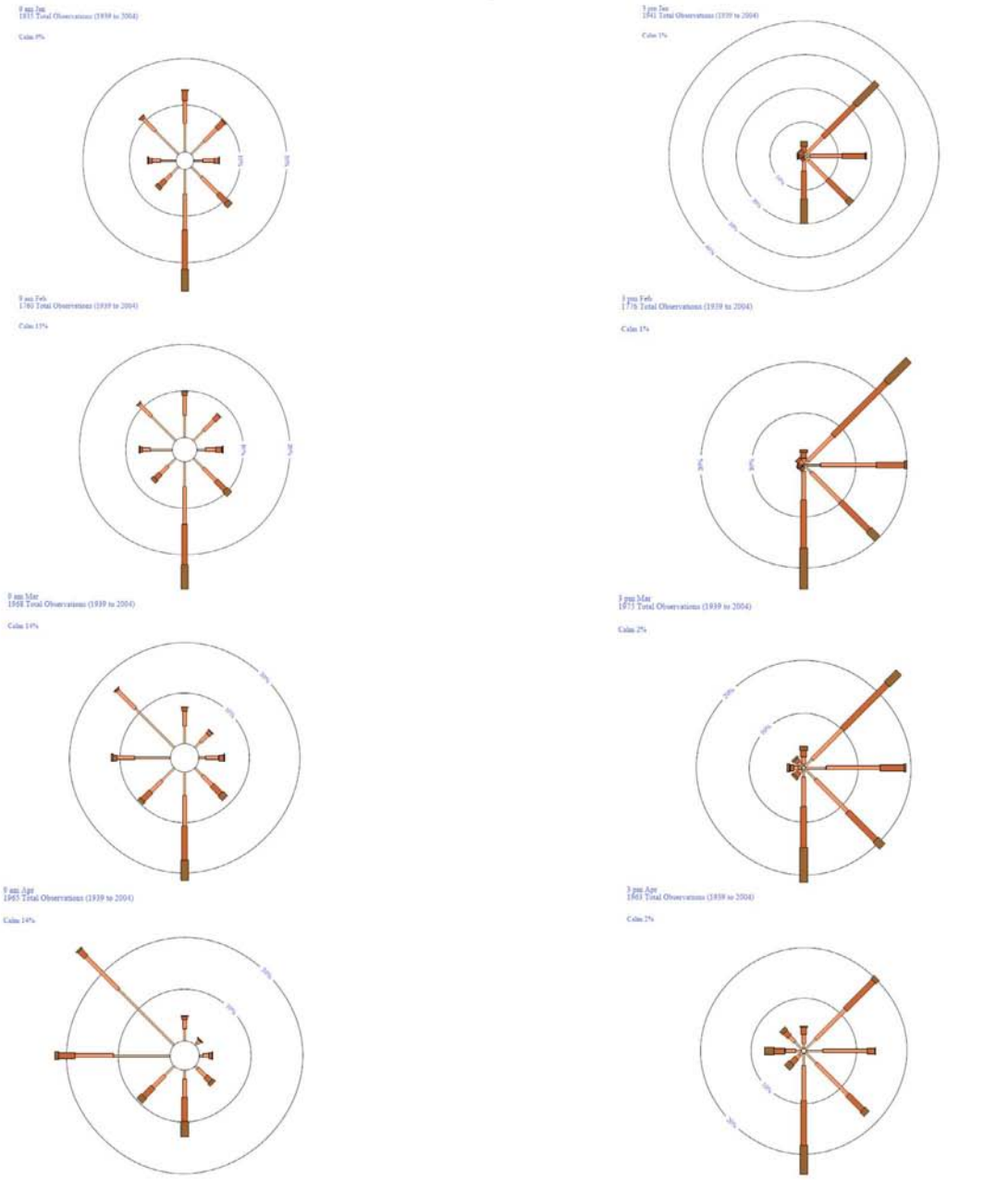

Wind directions are divided into eight compass directions. Calm has no direction.
An asterisk (*) indicates that calm is less than 1% .
An observed wind speed which falls precisely on the boundary between two divisions (eg 10km/h) will be included in the lower range (eg 1-10 km/h). Only quality controlled data have been used.

Australian Government
Bureau of Meteorology

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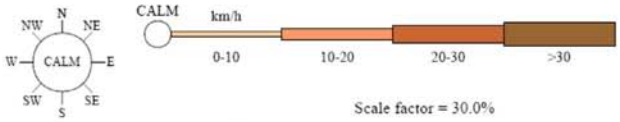

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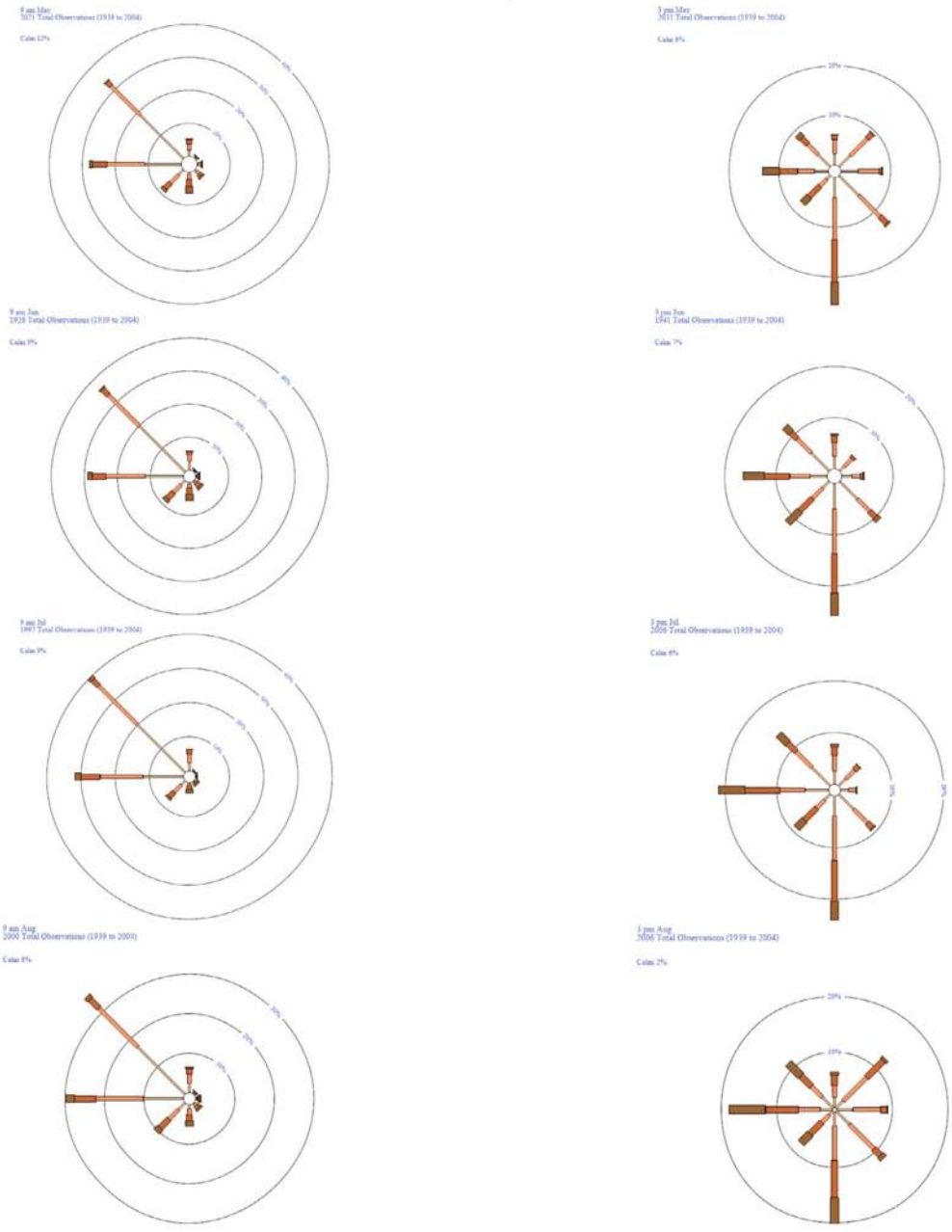

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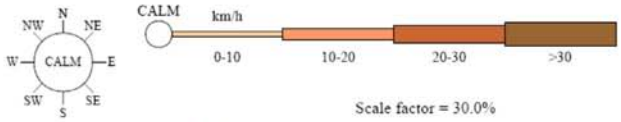

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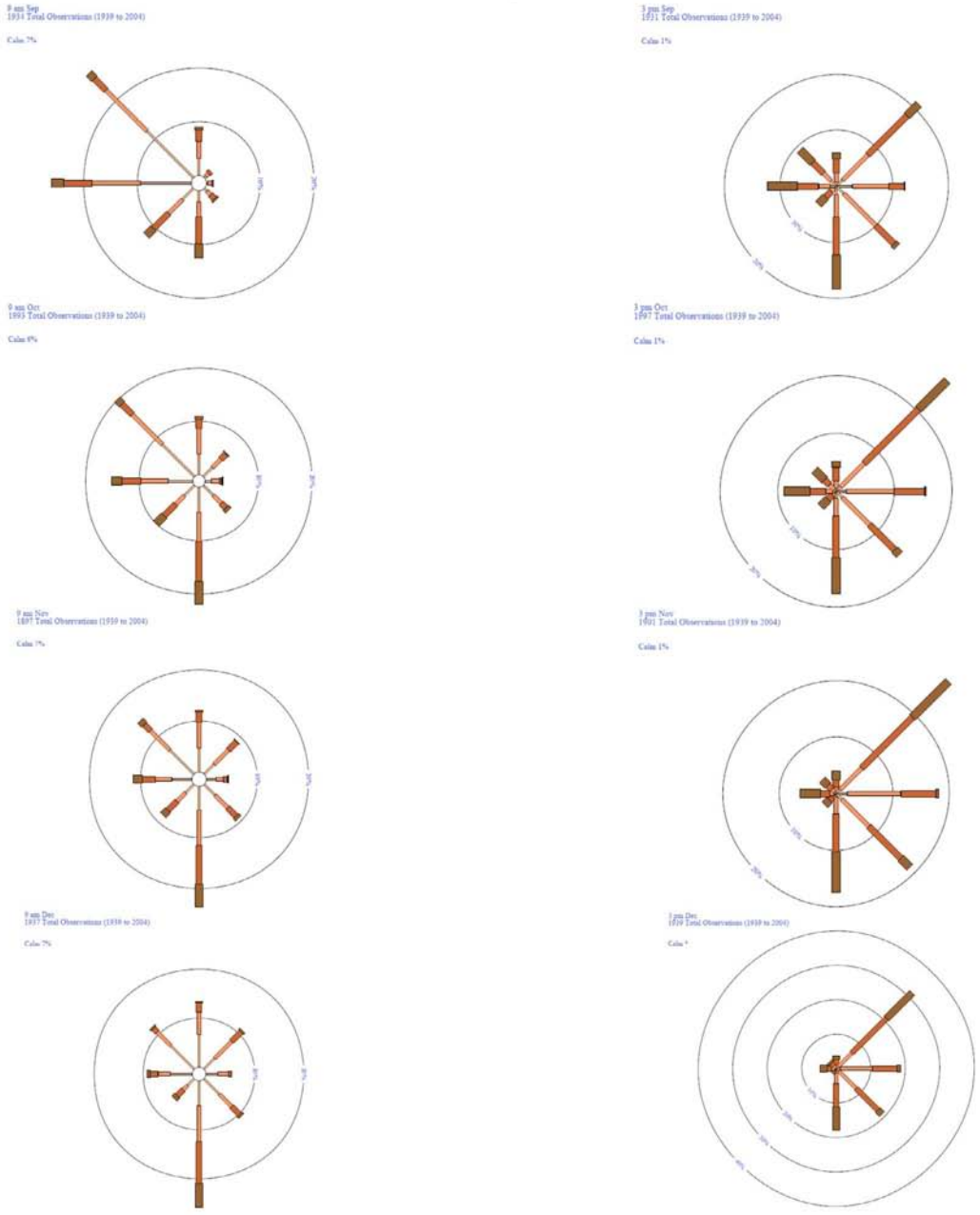

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