PEDESTRIAN WIND ENVIRONMENT STATEMENT

HCCD STAGE 1A, UNIVERSITY OF NEWCASTLE

WE613-02F02(REV1)- WS REPORT

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DOCUMENT CONTROL

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EXECUTIVE SUMMARY

This report is in relation to the HCCD Stage 1A proposed development located at 16B Honeysuckle Drive, Newcastle and presents an opinion on the likely impact of the proposed design on the local wind environment on 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 Newcastle region; namely the west-north-westerly, north-easterly and southerly winds. The analysis of the wind effects relating to the proposed development 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 latest architectural drawings. No wind tunnel testing was 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 the subject development benefits from shielding provided by the subject and neighbouring buildings. Downwash wind effects are not expected to be an issue due to the low overall height and orientation of the building to the prevailing wind direction. Minor adverse wind impact in the form of corner accelerated flow from the west-north-westerly wind direction is likely to occur for the southern external area and north-east square. It is expected that the wind effects identified in the report can be ameliorated with the consideration of the following in-principle treatment strategies into the design of the development:

- Provisions should be made for the inclusion of dense, evergreen tree planting to be placed along the southern external area nature strip as well as the north-east square (refer to Figure 6). The trees should be placed such that their canopies are capable of interlocking. The trees along the north-east square must also be capable of growing at least 4-6m.

Hence with the inclusion of the abovementioned treatment strategies into the design of the development, the wind conditions along the various trafficable areas around the subject development are expected to be suitable for their intended uses.

CONTENTS

1 INTRODUCTION

An opinion on the likely impact of the proposed design on the local wind environment affecting pedestrians within the critical outdoor areas within and around the subject development is presented in this report. The analysis of wind effects relating to the proposed development was carried out in the context of the predominant wind directions for the region, building morphology of the development and nearby buildings, and local land topography. The conclusions of this report are drawn from our extensive experience in the field of wind engineering and studies of wind environment effects.

No wind tunnel testing was undertaken for this assessment. Hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection, and any recommendations in this report are made only in-principle.

2 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The development is part of the first stage of the Honeysuckle Campus and is bounded by Honeysuckle Drive to the north, Worth Place to the west, Wright Lane to the south and a vacant construction site to the east; to be developed at a later stage as part of the Honeysuckle Campus. Surrounding the site is predominantly mid-rise buildings; concentrated primarily along Honeysuckle Drive, with intermittent construction sites, such as the Honeysuckle Campus along the eastern and southern boundary of the site.

The proposed development is a singular five storey high university campus building comprised primarily of educational facilities and ancillary mechanical plantroom services. This assessment covers the critical outdoor trafficable areas associated with the proposed development, which are the ground level pedestrian thoroughfares along the Honeysuckle Drive, Worth Place and Wright Lane frontages of the site.

A survey of the land topography indicates there is a general descent towards the Hunter River to the north of the site. No major elevation changes are observed along the northern and southern aspects of the development. An aerial image of the subject site and the local surroundings is shown in Figure 1. A wider view image of the location of the site is illustrated in Figure 2.

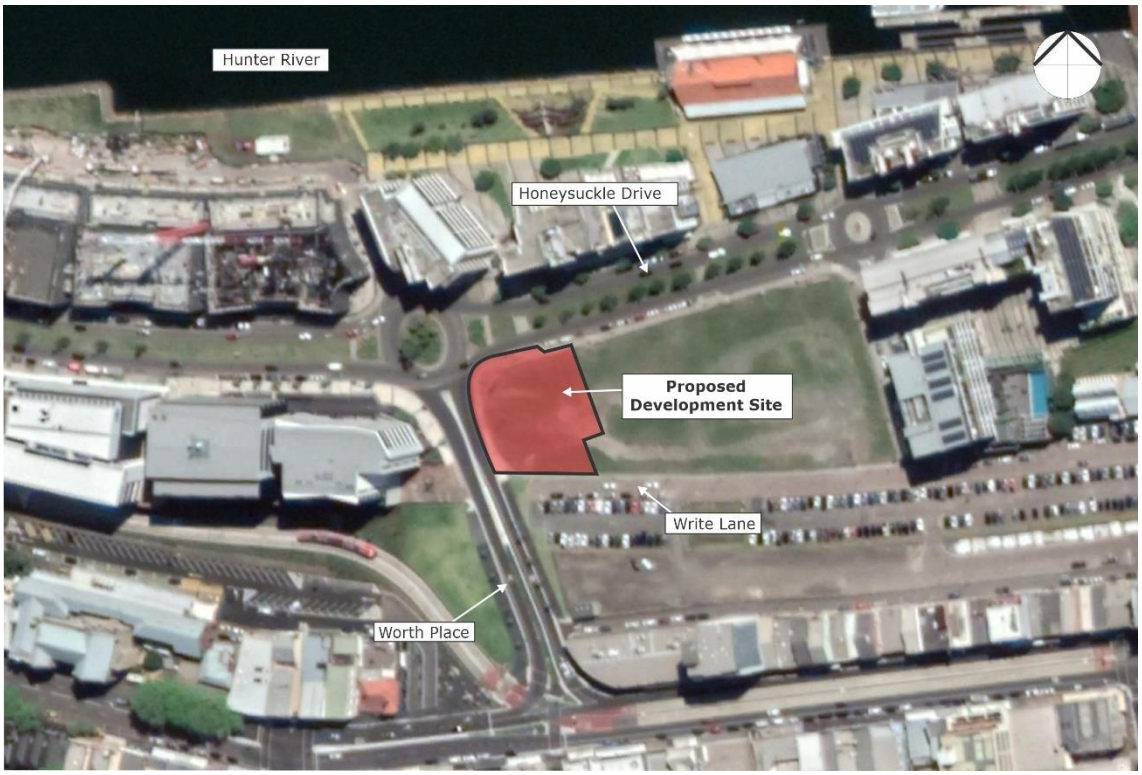

Figure 1: Aerial Image of the Site Location

Figure 2: Wider View Aerial Image of the Site Location

3 REGIONAL WIND

The Newcastle region is governed by three principle wind directions, and these can potentially affect the subject development. These winds prevail from the west-north-west, north-east and south directions. A directional plot of the annual and 5% probability of exceedance winds for the Newcastle region is shown in Figure 3. The frequency of occurrence of these winds is also shown in Figure 3. The seasonal frequency of the prevailing wind directions is shown in Figure 4. The west-north-westerly winds are the most frequent and occur predominantly throughout the winter months, while the north-easterly and southerly winds occur most frequently throughout the summer months. These plots have been produced based on an analysis of recorded wind speed data obtained from Williamtown Airport from 1958 to 2013.

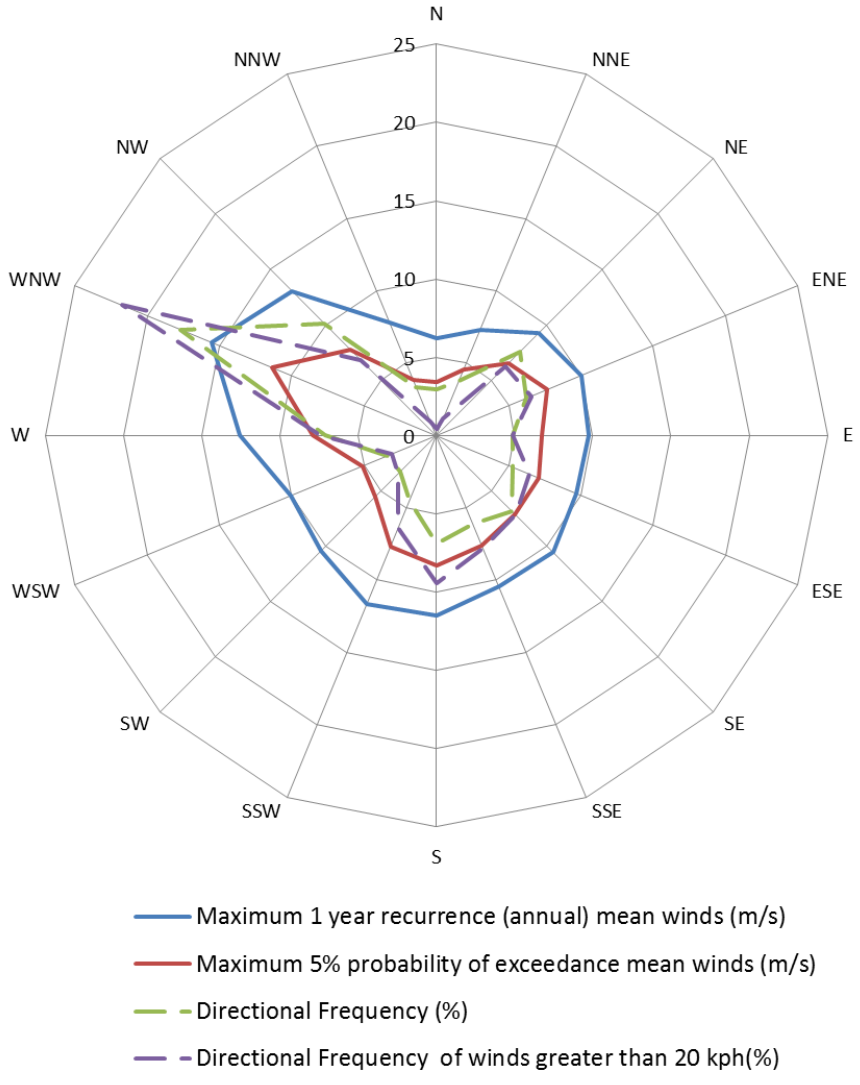

Figure 3: Annual and 5% probability of exceedance Mean Wind Speeds, and Frequencies of Occurrence, for the Newcastle Region (based on 10-minute mean observations from Williamtown Airport from 1958 to 2013, corrected to open terrain at 10m)

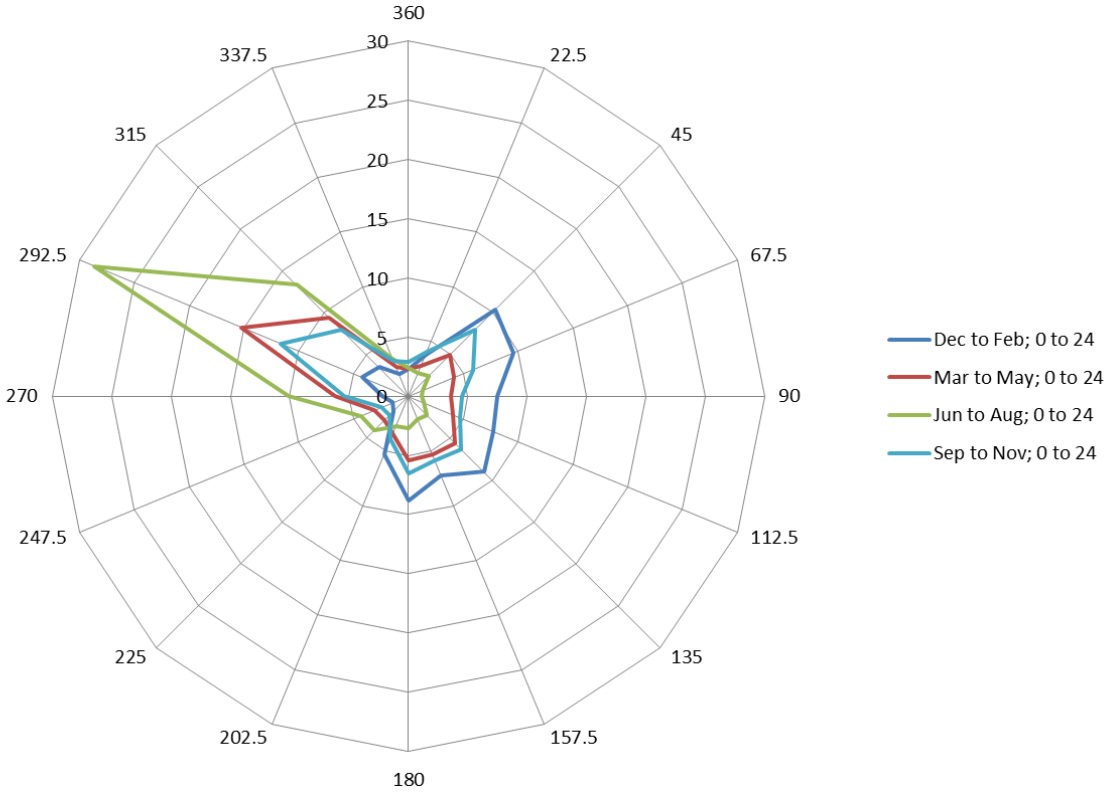

Figure 4: Seasonal Frequency of Mean Wind Speeds for the Newcastle Region (based on 10 minute mean observations from Williamtown Airport from 1958 to 2013, corrected to open terrain at 10m)

4 PEDESTRIAN WIND COMFORT AND SAFETY

4.1 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 A.G. Davenport, T.V. Lawson, W.H. Melbourne, and A.D. Penwarden, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. Some Councils and Local Government Authorities have adopted elements of some of these into their planning control requirements.

For example, A.D. Penwarden (1973) developed a modified version of the Beaufort scale which describes the effects of various wind intensities on people. Table 1 presents the modified Beaufort scale. Note that the effects listed in this table refers to wind conditions occurring frequently over the averaging time (a probability of occurrence exceeding 5%). Higher ranges of wind speeds can be tolerated for rarer events.

Table 1: Summary of Wind Effects on People (A.D. Penwarden, 1973)

Type of Winds	Beaufort Number	Mean Wind Speed (m/s)	Effects
Calm	0	Less than 0.3	Negligible.
Calm, light air	1	0.3 – 1.6	No noticeable wind.
Light breeze	2	1.6 – 3.4	Wind felt on face.
Gentle breeze	3	3.4 – 5.5	Hair is disturbed, clothing flaps, newspapers difficult to read.
Moderate breeze	4	5.5 – 8.0	Raises dust, dry soil and loose paper, hair disarranged.
Fresh breeze	5	8.0 – 10.8	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.8 – 13.9	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant.
Near gale	7	13.9 – 17.2	Inconvenience felt when walking.
Gale	8	17.2 – 20.8	Generally impedes progress, difficulty balancing in gusts.
Strong gale	9	Greater than 20.8	People blown over.

4.2 Wind Speed Criteria

For pedestrian comfort, the A.G. Davenport (1972) criteria are used in conjunction with the GEM wind speed using a 5% probability of exceedance. Research by A.W. Rofail (2007) has shown that the A.G. Davenport (1972) criteria, used in conjunction with a GEM wind speed, has proven over time and through field observations to be the most reliable indicator of pedestrian comfort. The criteria and general description of usage considered in this study are summarised in Tables 2 and 3 for pedestrian comfort and safety, respectively.

Table 2: Comfort Criteria (from A.G. Davenport, 1972)

Classification	Description	Maximum 5% Exceedance GEM Wind Speed (m/s)
Long Exposure (Sitting)	Long duration stationary activities such as in outdoor restaurants and theatres, etc.	3.5
Short Exposure (Standing)	Short duration stationary activities (generally less than 1 hour), including window shopping, waiting areas, etc.	5.5
Comfortable Walking (Walking)	For pedestrian thoroughfares, private swimming pools, most communal areas, private balconies and terraces, etc.	7.5

Table 3: Safety Criterion (from W.H. Melbourne, 1978)

Classification	Description	Annual Maximum Gust Wind Speed (m/s)
Safety	Safety criterion applies to all trafficable areas.	23

Although this assessment is of a qualitative nature, the abovementioned criteria are considered when assessing the wind environment impacts. It should be noted, however, 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. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

5 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. The interaction between the wind and the building morphology in the area is considered and important features taken into account including the distances between the surrounding buildings and the proposed building form, as well as the surrounding landform. Note that only the potentially critical wind effects are discussed in this report.

5.1 Ground Level Areas

The Ground Level pedestrian footpath areas along the boundary of the site will be used primarily for circulation. It is recommended that these circulation areas satisfy the Comfortable Walking criterion (refer to Figure 5) which requires wind speeds of less than 7.5m/s with a 5% probability of exceedance (refer to Table 2).

These circulation areas are expected to benefit from shielding provided by the subject development and the existing surrounding mid-rise buildings, particularly from direct wind impact from the prevailing south and north-east directions. Pedestrian footpaths along Honeysuckle Drive and Write Lane are likely to experience some discomfort as a result of their partial alignment with the prevailing west-north-westerly winds. It should be noted that this is an existing wind effect for the site, and the retention of any existing localised shrubs, street trees or other forms of densely foliating vegetation is expected to preserve the local wind conditions for this area. Hence it is expected that these circulation areas will either satisfy the comfortable walking criteria or be comparable to existing wind conditions and hence be suitable for their intended uses.

Pedestrian sensitivity to wind flow may be heightened at building entrances, seating and large communal recreation zones because of the duration of usage of these areas. Pedestrians which occupy these spaces would generally have lower tolerance to high wind speeds. It is therefore recommended that these areas satisfy the short exposure criterion (refer to Figure 5) which requires wind speeds of less than 5.5m/s with a 5% probability of exceedance (refer to Table 2).

Wind down-washing off the façade of the subject development is not expected to be an issue due to the low overall height and orientation of the building to the prevailing wind directions. The proposed impermeable awning as indicated in the architectural drawings is expected to be effective in deflecting any potential down-wash wind away from these areas and hence is recommended to be retained in the final design of the development.

Mid-level corner accelerated flow is expected to impact the southern external area and the north-east square. This adverse wind effect is contingent on the completion of the Lot A2 development. It is expected that the Lot A2 development will aid in mitigating this adverse wind

condition. Provisions should be made for the inclusion of dense, evergreen tree planting to be placed along the southern external area nature strip as well as the north-east square (refer to Figure 6). The trees should be placed such that their canopies are capable of interlocking. The trees along the north-east square must also be capable of growing at least 4-6m.

Hence with the inclusion of the abovementioned treatment strategies into the design of the development, the wind conditions along the various ground level trafficable areas around the subject development are expected to satisfy the target criteria and be suitable for their intended uses.

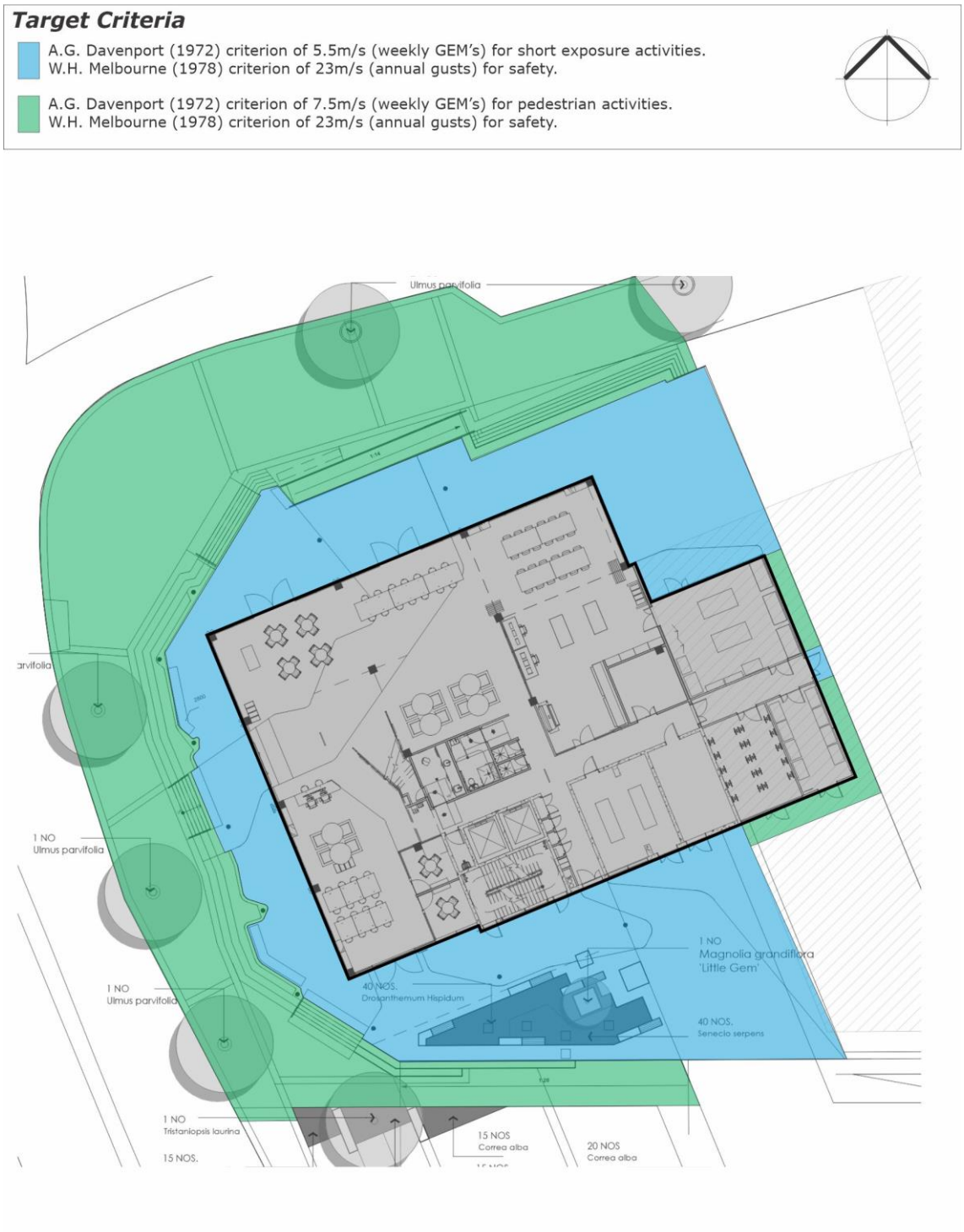

Figure 5: Target Wind Speed Criteria

Figure 6: Suggested Treatment Strategy

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