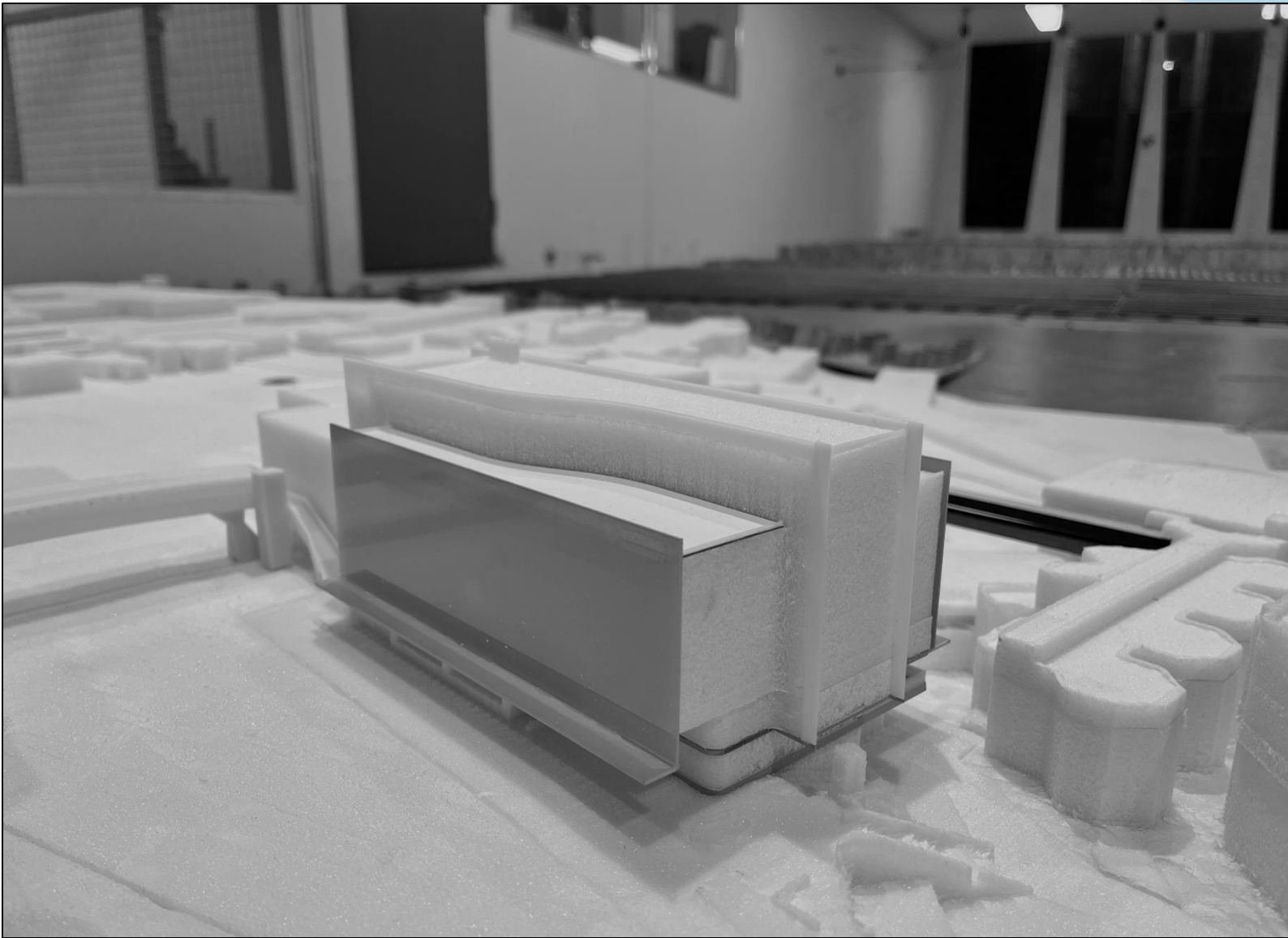




M E L
CONSULTANTS

**VICTORIA UNIVERSITY CHTF DEVELOPMENT
FOOTSCRAY**

ENVIRONMENTAL WIND CONDITIONS STUDY



MEL CONSULTANTS IS A WIND
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SPECIALISING IN DETERMINING
WIND EFFECTS ON
BUILDINGS, STRUCTURES, AND
THE ENVIRONMENT

26 September 2024

Prepared for:
Plenary Origination

Report: 23044A-WT-ENV01

SUMMARY

A wind tunnel study to quantify the pedestrian wind safety and comfort conditions for the proposed Victoria University Clinical Health Teaching Facility (VU CHTF) Development, Footscray. The wind tunnel study was completed in MEL Consultants boundary layer wind tunnel facility for 360 degrees of wind direction at 22.5-degree increments. The testing was performed using a 1/300 scale model of the proposed development based on drawings by Denton Corker Marshall received on the 22nd August, 2024. The model was inserted into a proximity model that included topography and existing and under construction buildings out to a minimum radius of 400m.

The model of the development within surrounding buildings, was tested in a simulated upstream boundary layer of the natural wind to determine likely environmental wind conditions. Mean and peak wind speeds were measured at locations within and around the development using hot-wire anemometers. The wind speed ratios determined from the wind tunnel measurements were combined with local wind climate data for the site to determine equivalent full-scale wind conditions around the proposed development. These full-scale wind conditions were compared against the Maribyrnong Planning Scheme Clause 58.04-4 Standard D17 wind safety and comfort criteria. These criteria are based on the 3 second gust wind speed for pedestrian safety and the Gust Equivalent Mean (GEM) wind speed for pedestrian comfort. The wind conditions for the Existing Configuration were also quantified to allow that assessment of the wind impacts of the proposed development. The study did not include the effects any landscaping or street trees.

The findings of this study are as follows:

- There are no exceedances of the pedestrian safety criterion for the Existing and Proposed Configurations.
- All locations in and around the proposed development satisfy the walking comfort criterion as a minimum.
- The wind conditions at the building entrances along the Ballarat Road and the VU High Street satisfy the standing comfort criterion.

- The wind conditions in the cafe with an open balustrade for the Proposed Configuration have been shown to satisfy the sitting comfort criterion. Removing the canopy along the north face of the VU CHTF increased the wind conditions in the cafe to satisfy standing comfort. The prevailing and strong north sector wind directions have been shown to be the main influence on the cafe wind conditions, therefore it is recommended that the operable louvres on the north facade of the cafe are retained in the design.
- The wind conditions in the Campus Gateway satisfy the sitting comfort criterion except on the eastern ramp landing that satisfies the walking comfort criterion. The wind conditions at the proposed marquee area satisfy the sitting comfort criterion.

No modifications to the design for wind mitigation have been recommended.



Report 23044A-WT-ENV01

September 2024

**VU CHTF DEVELOPMENT, FOOTSCRAY
ENVIRONMENTAL WIND TUNNEL MODELLING**

MEL CONSULTANTS REPORT NO: 23044A-WT-ENV01

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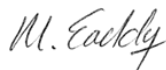
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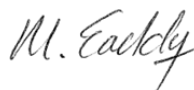
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1. INTRODUCTION

The proposed Victoria University Clinical Health Teaching Facility (VU CHTF) Development will be a 7 level building, located on a site bounded by Ballarat Road, VU Building D, VU High Street, and VU Lecture Theatre to the south, west, north, and east respectively, as shown in Figure 1.

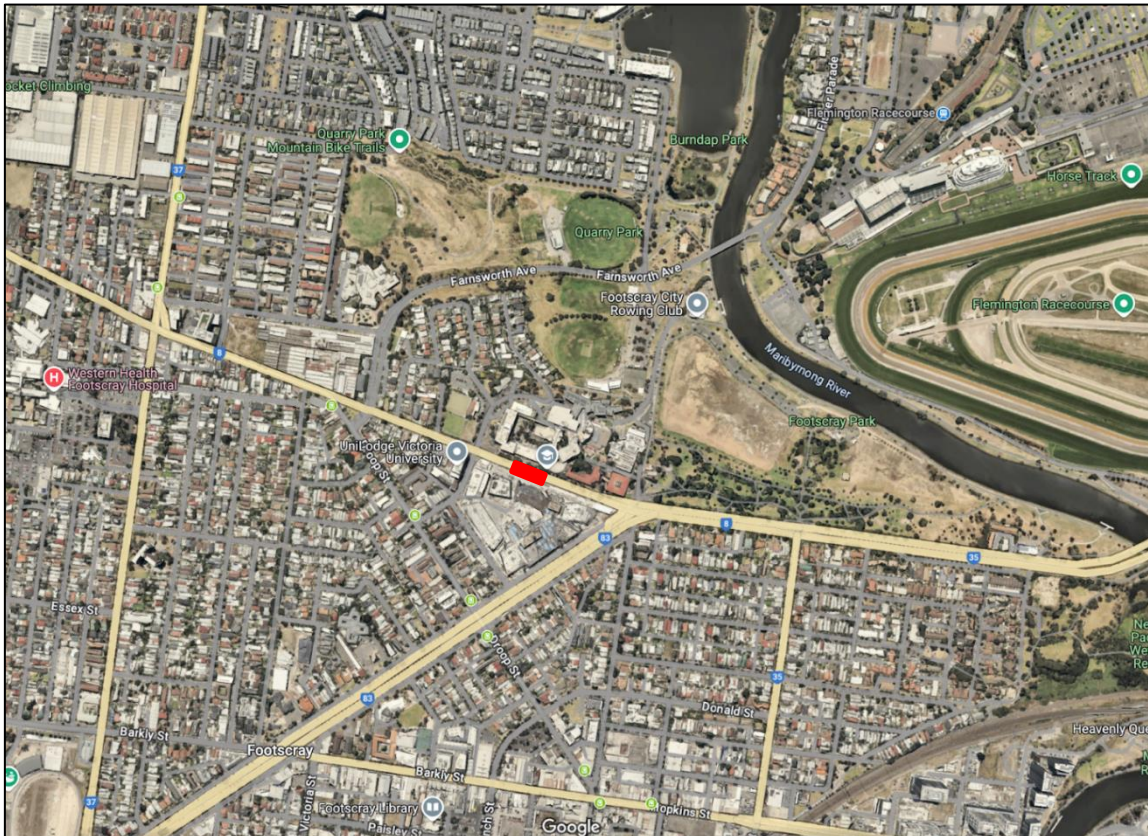


Figure 1 - Satellite imagery showing the proposed VU CHTF development site (highlighted red).

A wind tunnel study was commissioned by Plenary Origination to examine the wind conditions for the proposed VU CHTF development and, if necessary, to develop wind mitigation strategies. This report details the environmental wind assessment of the 1/300 scale model of the proposed development within a proximity model of surrounding buildings out to a minimum radius of 400m. These tests were carried out in the MEL Consultants 400kW Boundary Layer Wind Tunnel during August and September, 2024.

2. WIND TUNNEL MODEL

A 1/300 scale model of VU CHTF development was constructed from digital information provided by Denton Corker Marshall received on 22nd August 2024. The model of VU CHTF development was inserted into a proximity model of surrounding buildings out to a minimum radius of 400m. No existing or proposed landscape trees were included within the model. Photographs of wind tunnel model inserted into the proximity model are presented in Figures 2a to 2d.



Figure 2a - View from the south of the 1/300 scale model of the proposed VU CHTF Development in the wind tunnel.



Figure 2b - View from the south of the 1/300 scale model of the proposed VU CHTF Development in the wind tunnel.



Figure 2c - Close-up view from the south of the 1/300 scale model of the proposed VU CHTF Development in the wind tunnel.

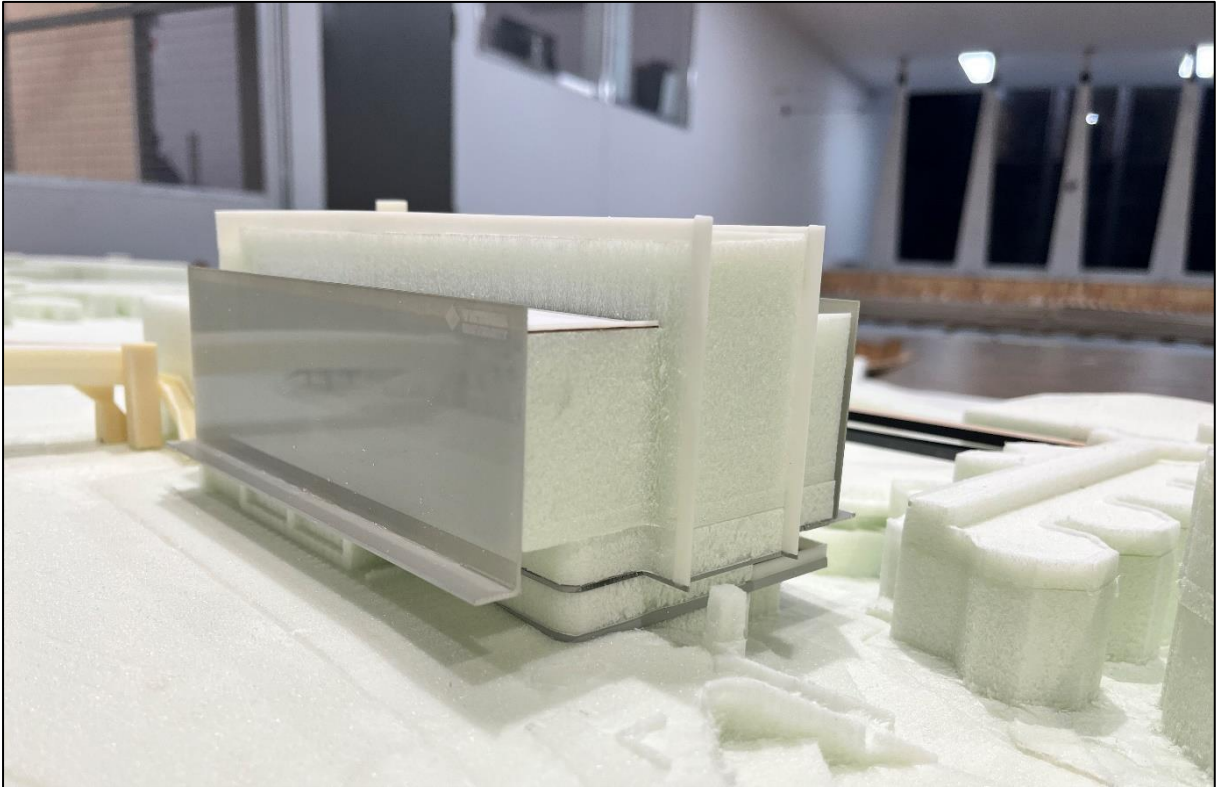


Figure 2d - Close-up view from the southeast of the 1/300 scale model of the proposed VU CHTF Development in the wind tunnel.

3. ENVIRONMENTAL WIND CRITERIA

The advancement of wind tunnel testing techniques, using large boundary layer flows to simulate the natural wind, has facilitated the prediction of wind speeds likely to be induced around a development. To assess whether the predicted wind conditions are likely to be acceptable or not, the Maribyrnong Planning Scheme Clause 58.04-4 Standard D17 wind safety and comfort criteria will be used. The criteria are as follows:

Unsafe wind conditions means the annual maximum 3 second gust wind speed which exceeds 20 metres/second with the probability of exceedance of 0.1% from any wind direction considering at least 16 wind directions with the corresponding probability of exceedance percentage.

Comfortable wind conditions means hourly mean wind speed or gust equivalent mean speed from all wind directions combined with probability of exceedance less than 20% of the time, equal to or less than:

- 3 metres/second for sitting areas
- 4 metres/second for standing areas
- 5 metres/second for walking areas

Mean wind speed means the maximum of:

- Hourly mean wind speed, or
- Gust equivalent mean wind speed (3 second gust wind speed divided by 1.85)

The above comfort criteria are pass/fail criteria which assess the integrated probability of all wind directions to determine whether a location passes or fails the threshold criterion. The safety criterion is a pass/fail criterion based upon exceedance of the wind speed for any one wind direction.

The wind condition must be assessed within a distance of half the greatest length of the building, or half the total height of the building, whichever is greater.

The Maribyrnong Planning Scheme guidelines do not provide any methodology or worked example as how to obtain the 'from all wind directions combined'. Therefore,

to obtain the probability for all wind directions combined we will apply the methodology described in Melbourne (1978) to determine the probability for all wind directions. The guidelines use the definition of mean wind speed as based on the hourly wind speed so the probabilities will be determined from the hourly wind data for an applicable automatic weather station for the Melbourne Airport. The probability data used have been corrected for the approach terrain at the location of the automatic weather station and referenced to 10m in Terrain Category 2. This is the standard reference height of AS/NZS1170.2:2021.

3.1 Recommended Comfort Criteria

The proposed VU CHTF will have entrances along Ballarat Road and VU High Street, an open café and a public open space with seating area to the east of the building. Therefore, the following wind criteria are suggested:

- | | |
|----------------------------|-----------------------------|
| • Pedestrian transit areas | Walking Criterion |
| • Building entrances | Standing Criterion |
| • Cafe seating area | Sitting Criterion |
| • Outdoor seating area | Standing/Sitting Criterion* |

*The wind conditions at outdoor areas have been suggested to satisfy the walking criterion as these premises could be considered elective when external conditions would be perceived as acceptable for the desired activity. Users of these terraces will need to be educated on the wind effects and loose objects should not be left unattended in outdoor areas.

The activation of the public realm external to the site would depend on the existing wind conditions in the streetscapes that are often beyond the control of the proposed development. For cases where the existing wind conditions in the public realm external to the site are on the walking criterion, then the proposed Development should not have any adverse wind effects in these areas.

4. EXPERIMENTAL TECHNIQUE

The building model was tested in a model of the natural wind generated by flow over roughness elements augmented by vorticity generators at the beginning of the wind tunnel working section. The approach Terrain Categories have been assessed based on the definitions in AS/NZS1170.2: 2021 and has been determined as Terrain Category 3 (suburban terrain) for all wind directions.

The velocity and turbulence profiles for the Terrain Categories are provided in Appendix A.

Hot-wire anemometers and/or Irwin Probes were used to measure the local wind speeds at locations in and around the development. The positions of the measurement locations satisfied the minimum study radius from the development as required by Clause 58.04-4. Some of the positions of the measurement locations were outside the minimum radius where significant pedestrian spaces were identified. The minimum radius examined was half the building height or width, whichever is greater, measured from the site boundaries. The Test Locations at the surrounding streetscapes, building frontages, cafe, and Campus Gateway are shown in Figures 3a to 3c.

The wind tunnel velocity measurements were made for an equivalent 1 hour period in full scale and filtered to determine the mean and an equivalent full scale 3 second gust wind speed for 16 wind directions.

The following velocity ratios were measured in the wind tunnel:

$$\text{mean } \bar{V}_R = \frac{\bar{V}_{local}}{\bar{V}_{300m}}$$
$$\text{gust } \hat{V}_R = \frac{\hat{V}_{local}}{\bar{V}_{300m}}$$

where:

\bar{V}_{local} is the mean velocity

\hat{V}_{300m} is the gust velocity

V_{300m} is the velocity at the free-stream reference height of 300m

These measured velocity ratios were combined with a statistical model of the local wind climate that relates wind speed to a probability of exceedance. The model of the wind climate also includes the directional variation of wind speed (frequency). The measured wind speeds are assessed against the pedestrian safety and the pedestrian comfort criteria. The pedestrian safety criterion is applied to the annual hourly maximum wind gusts for each wind direction. The pedestrian comfort criteria are based on all wind directions combined (i.e. summation of exceedances across 360° of wind direction) and the pedestrian comfort criterion utilises the maximum of either the hourly mean wind speed, or the gust equivalent mean wind speed (GEM) as follows

$$\text{Mean wind speed for comfort criterion} = \max \left(\bar{V}, \frac{\hat{V}}{1.85} \right)$$

where:

\bar{V} is the mean wind speed

\hat{V} is the 3-second gust wind speed

$\frac{\hat{V}}{1.85}$ is the gust equivalent mean (GEM) velocity

The two model configurations examined by this study are as follows:

Existing Configuration

- Existing surrounding proximity model
- New Footscray Hospital
- Existing Building E
- Existing Building G

Proposed Configuration

- Existing surrounding proximity model
- New Footscray Hospital
- Proposed VU CHTF building
- Campus Gateway 'open space'

The wind tunnel study has been undertaken to exceed the requirements of the Australasian Wind Engineering Society Quality Assurance Manual for Wind Tunnel Studies.

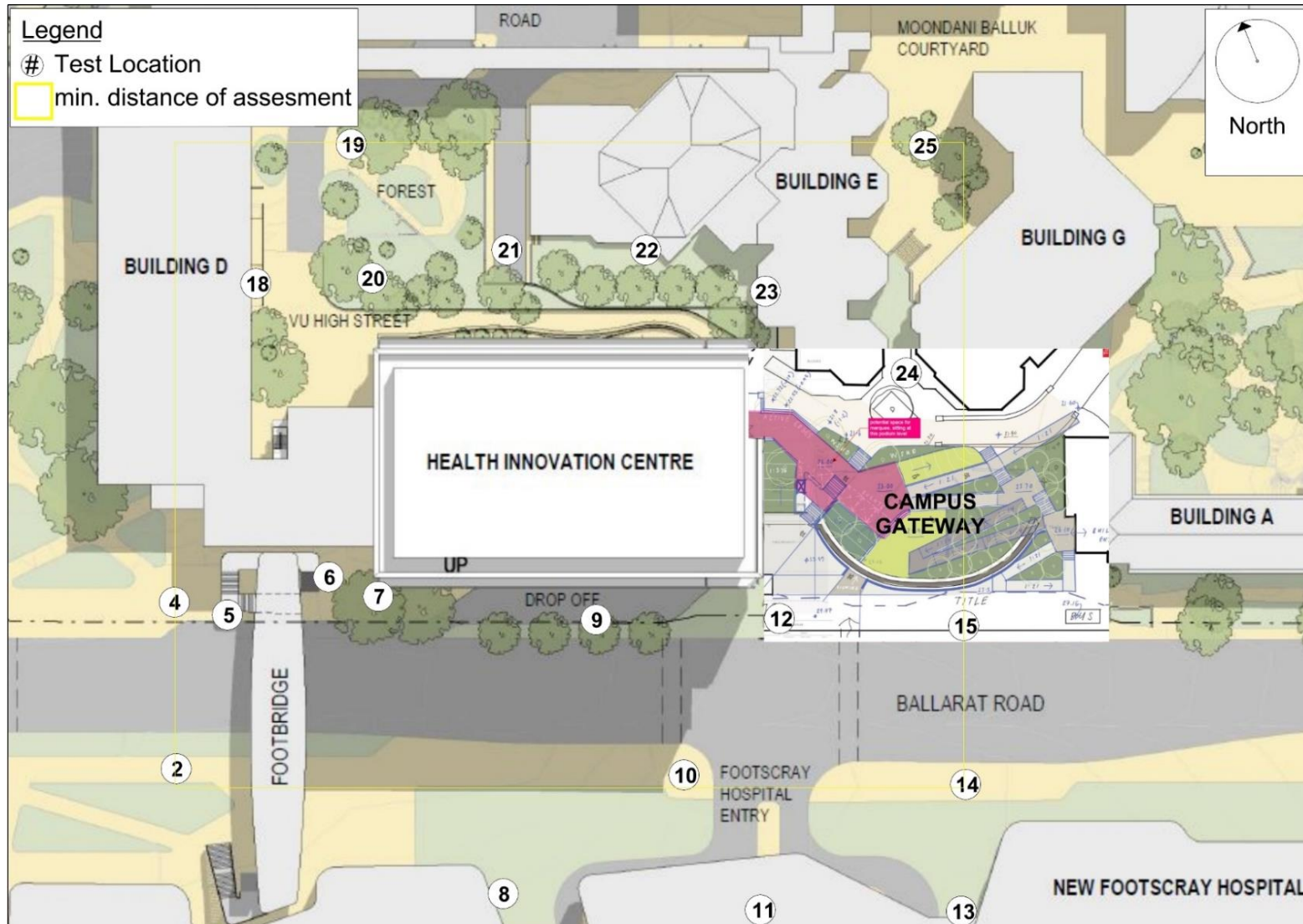


Figure 3a - Test Locations in the streetscapes surrounding the proposed VU CHTF Development.

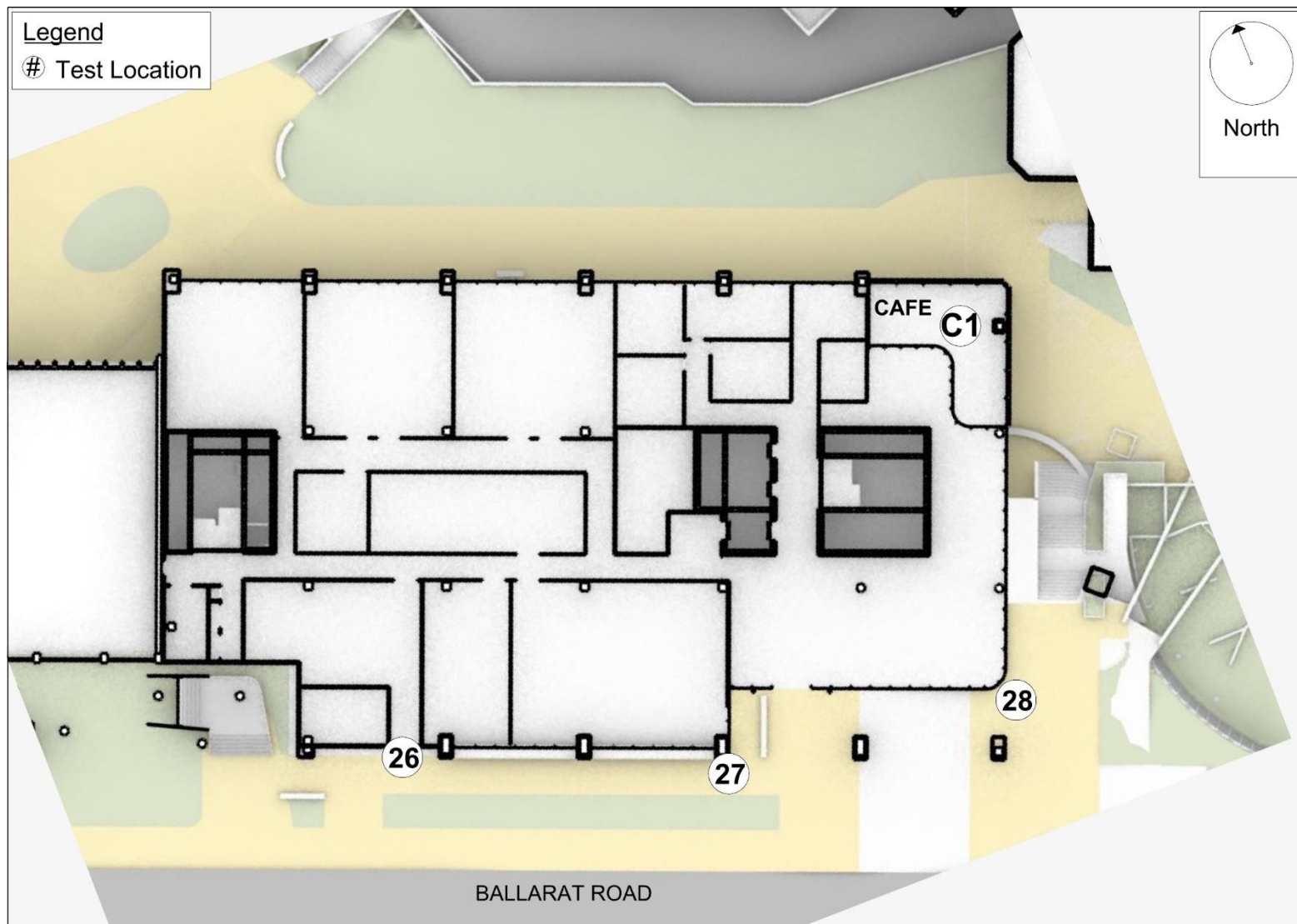


Figure 3b - Test Locations along the Ballarat Road Frontage and café area of the proposed VU CHTF Development.

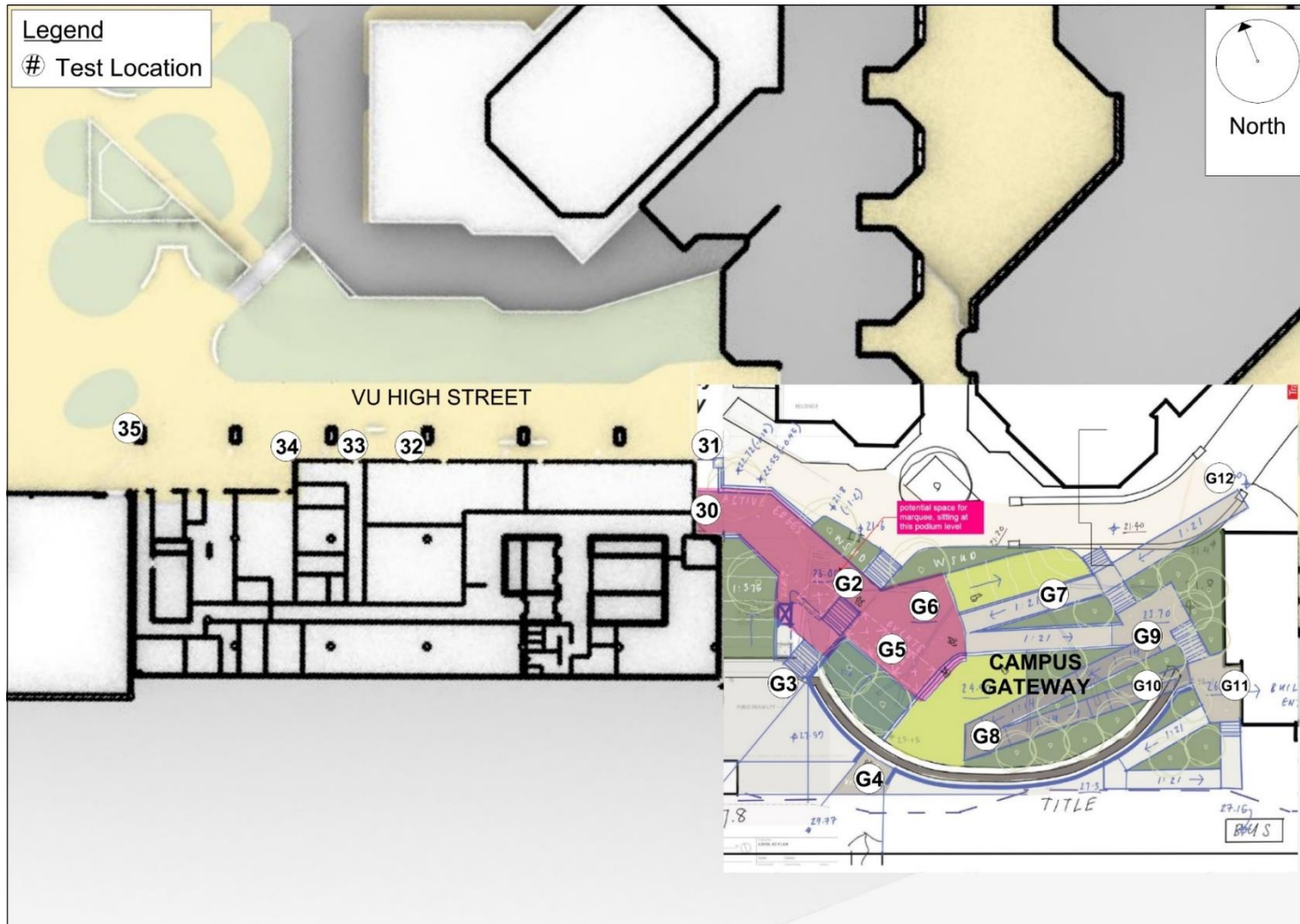


Figure 3c - Test Locations along the VU High Street Frontage and Campus Gateway Open Space of the proposed VU CHTF Development.

5. DISCUSSION OF RESULTS

The assessment of the wind safety and comfort criteria are presented in Tables 1 to 5. The Tables detail the yearly exceedances and mean wind speed for wind comfort, peak wind speed for wind safety, and the result compared to the recommended wind safety and comfort criteria.

The wind conditions for the Existing Configuration have been provided where applicable, for comparison purposes.

5.1 Wind Safety Assessment

The wind conditions for the Existing and Proposed Configurations at all Test Locations satisfy the safety criterion. The annual maximum 3 second gust wind speed from each of the 16 wind directions are also presented in polar plots and compared against the safety criterion in Appendix B.

5.2 Wind Comfort Assessment

In addition to the tabular format, the assessment of the pedestrian comfort for the Existing and Proposed Configurations are summarised in the following;

Figures 4a to 4c

Existing Configuration

Figures 5a to 5c

Proposed Configuration

The figures present the pedestrian comfort criteria satisfied using colour code system, where different colours have been used to represent the wind criteria satisfied at each Test Location.

5.2.1 Pedestrian Footpaths and Accessways

The wind conditions for the Proposed Configuration at all Test Locations at the immediate surrounds and the surrounding streetscapes of the development satisfy the walking comfort criterion at a minimum, with most locations satisfying the standing or sitting comfort criteria.

5.2.2 Building Entrances

The wind conditions for the Proposed Configuration at all Test Locations at the building entrances along Ballarat Road and VU High Street satisfy the recommended standing comfort criterion.

5.2.3 Level 3 Cafe

The wind conditions for the Proposed Configuration at the Level 3 cafe with an open balustrade satisfy the recommended sitting comfort criterion. Removing the canopy along the north face of the VU CHTF increased the wind conditions in the cafe to satisfy standing comfort. The prevailing and strong north sector wind directions have been shown to be the main influence on the cafe wind conditions, therefore it is recommended that the operable louvres on the north facade of the cafe are retained in the design.

5.2.4 Campus Gateway Open Space

The wind conditions for the Proposed Configuration at the Campus Gateway open space have been shown to satisfy the sitting comfort criterion, except on the east landing of the ramp that satisfied the walking comfort criterion. The wind conditions at the proposed marquee area satisfy the sitting comfort criterion.

Table 1: Pedestrian Wind Comfort and Safety – Ballarat Road

Configuration		Wind Criteria							
		Comfort					Safety		
		Yearly exceedence of given wind speed			Mean wind speed (exceeded 20% of year)	Recommended criterion	Result (compared against Recommended criterion) Pass/Fail	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
		Sitting (3m/s) %	Standing (4m/s) %	Walking (5m/s) %					
2	Proposed	47.3%	31.5%	18.9%	4.9	walking	Pass	18.4	Pass
	Existing	28.7%	17.3%	10.6%	3.7	N/A	N/A	17.0	Pass
4	Proposed	37.9%	23.5%	14.5%	4.3	walking	Pass	18.3	Pass
	Existing	35.8%	21.3%	13.0%	4.1	N/A	N/A	17.9	Pass
5	Proposed	31.2%	16.1%	8.2%	3.7	walking	Pass	14.9	Pass
	Existing	23.9%	10.0%	3.8%	3.2	N/A	N/A	13.7	Pass
6	Proposed	42.0%	28.1%	17.5%	4.7	walking	Pass	17.9	Pass
	Existing	31.8%	17.2%	8.1%	3.8	N/A	N/A	15.0	Pass
7	Proposed	31.2%	17.5%	8.7%	3.8	walking	Pass	16.8	Pass
	Existing	20.1%	8.3%	2.9%	3.0	N/A	N/A	12.8	Pass
8	Proposed	14.3%	7.9%	4.1%	2.5	walking	Pass	14.0	Pass
	Existing	10.7%	4.8%	1.8%	2.1	N/A	N/A	11.5	Pass
9	Proposed	20.3%	8.2%	3.0%	3.0	walking	Pass	13.1	Pass
	Existing	27.4%	13.1%	5.5%	3.5	N/A	N/A	13.0	Pass
10	Proposed	23.6%	13.8%	8.1%	3.3	walking	Pass	16.0	Pass
	Existing	19.8%	10.9%	5.3%	3.0	N/A	N/A	13.9	Pass
11	Proposed	6.3%	2.2%	0.5%	1.8	walking	Pass	10.9	Pass
	Existing	7.3%	2.6%	0.6%	2.0	N/A	N/A	10.6	Pass
12	Proposed	27.1%	14.4%	6.6%	3.5	walking	Pass	16.2	Pass
	Existing	29.0%	14.2%	6.2%	3.5	N/A	N/A	14.6	Pass
13	Proposed	5.8%	1.7%	0.3%	1.7	walking	Pass	8.9	Pass
	Existing	4.8%	1.2%	0.2%	1.6	N/A	N/A	8.6	Pass
14	Proposed	20.6%	11.5%	5.8%	3.0	walking	Pass	15.1	Pass
	Existing	20.0%	10.4%	4.8%	3.0	N/A	N/A	13.9	Pass
15	Proposed	13.0%	6.1%	2.6%	2.4	walking	Pass	12.3	Pass
	Existing	12.2%	5.0%	1.7%	2.5	N/A	N/A	11.3	Pass

Table 2: Pedestrian Wind Comfort and Safety –VU High Street

Configuration		Wind Criteria							
		Comfort					Safety		
		Yearly exceedence of given wind speed			Mean wind speed (exceeded 20% of year)	Recommended criterion	Result (compared against Recommended criterion)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
		Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)					
% % %									
18	Proposed	17.9%	7.5%	2.7%	2.9	walking	Pass	11.6	Pass
	Existing	19.2%	8.6%	3.5%	2.9	N/A	N/A	12.6	Pass
19	Proposed	29.9%	15.7%	7.5%	3.6	walking	Pass	15.0	Pass
	Existing	29.6%	15.0%	6.4%	3.6	N/A	N/A	13.9	Pass
20	Proposed	24.9%	13.0%	6.0%	3.4	walking	Pass	16.2	Pass
	Existing	24.4%	12.8%	5.9%	3.3	N/A	N/A	16.3	Pass
21	Proposed	20.2%	8.0%	2.7%	3.0	walking	Pass	11.3	Pass
	Existing	20.5%	10.3%	4.9%	3.0	N/A	N/A	14.0	Pass
22	Proposed	2.5%	0.3%	0.0%	1.4	standing	Pass	7.3	Pass
	Existing	2.0%	0.3%	0.1%	1.7	N/A	N/A	8.4	Pass
23	Proposed	0.5%	0.0%	0.0%	1.3	standing	Pass	5.8	Pass
	Existing	0.4%	0.1%	0.0%	1.0	N/A	N/A	6.3	Pass
24	Proposed	13.9%	4.7%	1.3%	2.6	walking	Pass	10.3	Pass
	Existing	6.9%	1.5%	0.2%	2.1	N/A	N/A	8.4	Pass
25	Proposed	20.1%	9.2%	3.6%	3.0	walking	Pass	13.7	Pass
	Existing	22.0%	9.3%	3.5%	3.1	N/A	N/A	13.5	Pass

Table 3: Pedestrian Wind Comfort and Safety – Ballarat Road Frontage and Level 3 Café

Configuration		Wind Criteria							
		Comfort					Safety		
		Yearly exceedence of given wind speed			Mean wind speed (exceeded 20% of year)	Recommended criterion	Result (compared against Recommended criterion)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
		Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)					
% % %									
26	Proposed	11.5%	4.7%	1.7%	2.3	standing	Pass	11.2	Pass
	Existing	25.6%	12.4%	5.1%	3.4	N/A	N/A	15.7	Pass
27	Proposed	22.3%	9.8%	4.2%	3.1	walking	Pass	16.1	Pass
	Existing	25.6%	12.4%	5.1%	3.4	N/A	N/A	15.7	Pass
28	Proposed	19.5%	8.3%	3.7%	3.0	walking	Pass	16.1	Pass
	Existing	22.9%	9.1%	3.3%	3.2	N/A	N/A	12.8	Pass
C1	Proposed	15.6%	8.4%	3.8%	2.6	sitting	Pass	12.8	Pass
	Proposed without north canopy	21.2%	13.9%	8.8%	3.1	N/A	N/A	19.0	Pass

Table 4: Pedestrian Wind Comfort and Safety – VU High Street Frontage

Configuration		Wind Criteria							
		Comfort					Safety		
		Yearly exceedence of given wind speed			Mean wind speed (exceeded 20% of year)	Recommended criterion	Result (compared against Recommended criterion)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
		Sitting (3m/s) %	Standing (4m/s) %	Walking (5m/s) %					
30	Proposed	15.6%	8.0%	3.4%	2.6	standing	Pass	12.4	Pass
	Existing	18.6%	7.8%	2.9%	2.9	N/A	N/A	13.4	Pass
31	Proposed	21.1%	10.8%	5.1%	3.1	walking	Pass	13.8	Pass
	Existing	13.8%	4.5%	1.1%	2.6	N/A	N/A	9.8	Pass
32	Proposed	11.2%	5.2%	2.1%	2.3	standing	Pass	11.9	Pass
	Existing	21.4%	11.6%	6.5%	3.1	N/A	N/A	15.8	Pass
33	Proposed	14.5%	7.4%	3.5%	2.5	standing	Pass	13.4	Pass
	Existing	12.7%	4.6%	1.4%	2.5	N/A	N/A	10.5	Pass
34	Proposed	17.8%	8.5%	3.5%	2.8	walking	Pass	13.8	Pass
	Existing	12.4%	4.1%	1.0%	2.5	N/A	N/A	10.0	Pass
35	Proposed	19.3%	10.4%	5.7%	2.9	walking	Pass	15.5	Pass
	Existing	17.5%	9.7%	5.3%	2.8	N/A	N/A	15.1	Pass

Table 5: Pedestrian Wind Comfort and Safety – Campus Gateway

Configuration		Wind Criteria							
		Comfort					Safety		
		Yearly exceedence of given wind speed			Mean wind speed (exceeded 20% of year)	Recommended criterion	Result (compared against Recommended criterion)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
		Sitting (3m/s) %	Standing (4m/s) %	Walking (5m/s) %					
G2	Proposed	13.9%	6.2%	2.3%	2.5	sitting	Pass	11.3	Pass
	Existing	17.4%	7.4%	3.2%	2.8	walking	Pass	15.2	Pass
G3	Proposed	18.6%	7.3%	2.7%	2.9	N/A	N/A	13.9	Pass
	Existing	21.7%	10.2%	4.6%	3.1	walking	Pass	16.5	Pass
G4	Proposed	26.4%	12.5%	5.6%	3.4	N/A	N/A	15.9	Pass
	Existing	4.4%	0.8%	0.1%	2.0	sitting	Pass	8.7	Pass
G5	Proposed	19.7%	7.8%	2.7%	3.0	sitting	Pass	13.1	Pass
	Existing	17.5%	6.9%	2.9%	2.9	walking	Pass	14.1	Pass
G6	Proposed	13.5%	4.3%	1.2%	2.6	walking	Pass	11.5	Pass
	Existing	35.2%	20.3%	11.6%	4.0	walking	Pass	16.2	Pass
G7	Proposed	4.5%	0.9%	0.2%	1.9	walking	Pass	9.4	Pass
	Existing	10.2%	3.1%	0.9%	2.4	walking	Pass	10.3	Pass
G8	Proposed	7.6%	1.7%	0.4%	2.2	N/A	N/A	9.8	Pass
	Existing	13.7%	4.5%	1.3%	2.6	walking	Pass	11.0	Pass
G9	Proposed	10.2%	2.4%	0.5%	2.4	N/A	N/A	9.2	Pass
	Existing	13.7%	4.5%	1.3%	2.6	walking	Pass	11.0	Pass
G10	Proposed	10.2%	2.4%	0.5%	2.4	N/A	N/A	9.2	Pass
	Existing	10.2%	2.4%	0.5%	2.4	N/A	N/A	9.2	Pass
G11	Proposed	10.2%	2.4%	0.5%	2.4	N/A	N/A	9.2	Pass
	Existing	10.2%	2.4%	0.5%	2.4	N/A	N/A	9.2	Pass
G12	Proposed	10.2%	2.4%	0.5%	2.4	N/A	N/A	9.2	Pass
	Existing	10.2%	2.4%	0.5%	2.4	N/A	N/A	9.2	Pass

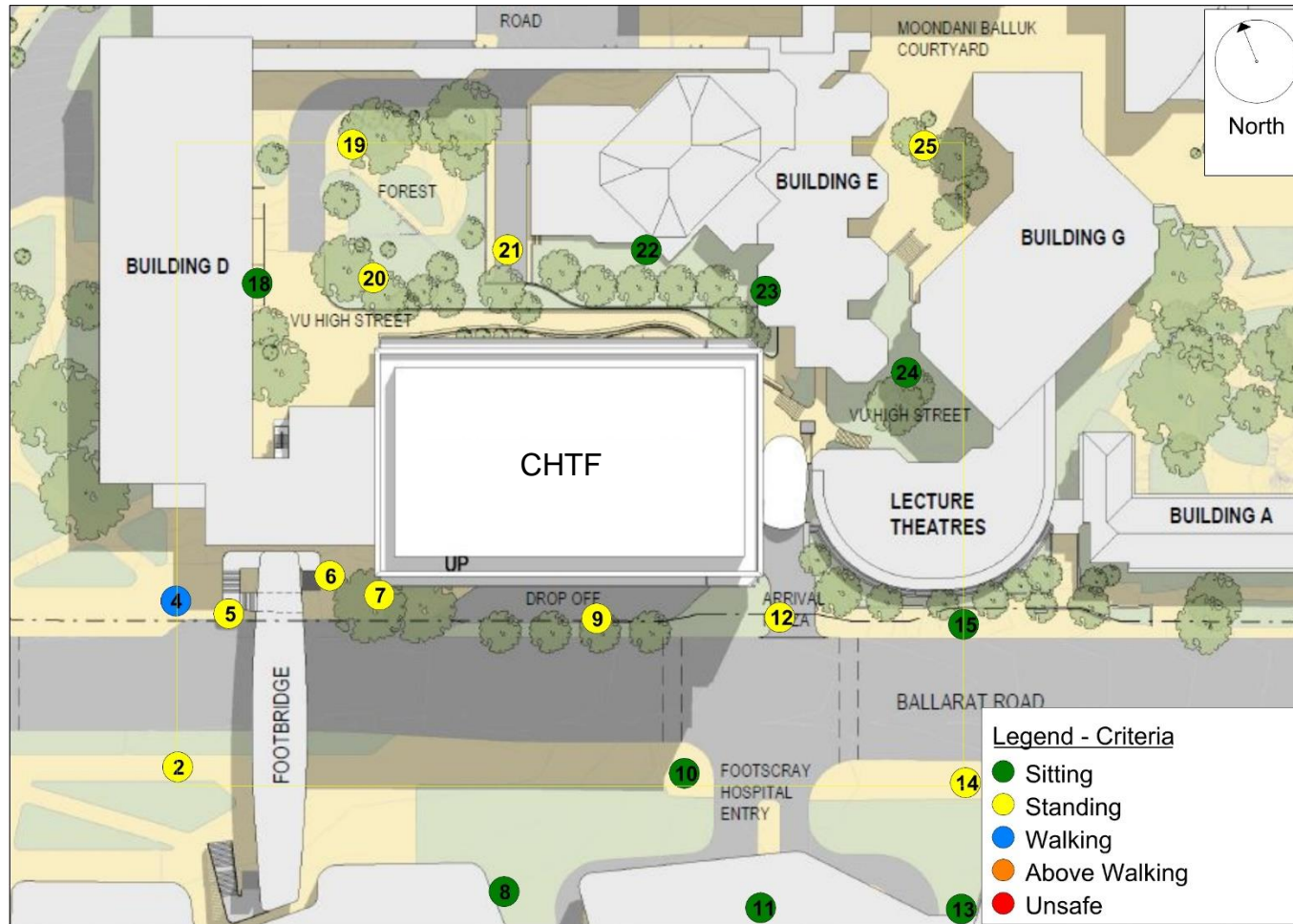


Figure 4a - Summary of wind criteria satisfied on the surrounding streetscapes for the Existing Configuration of the VU CHTF Development.

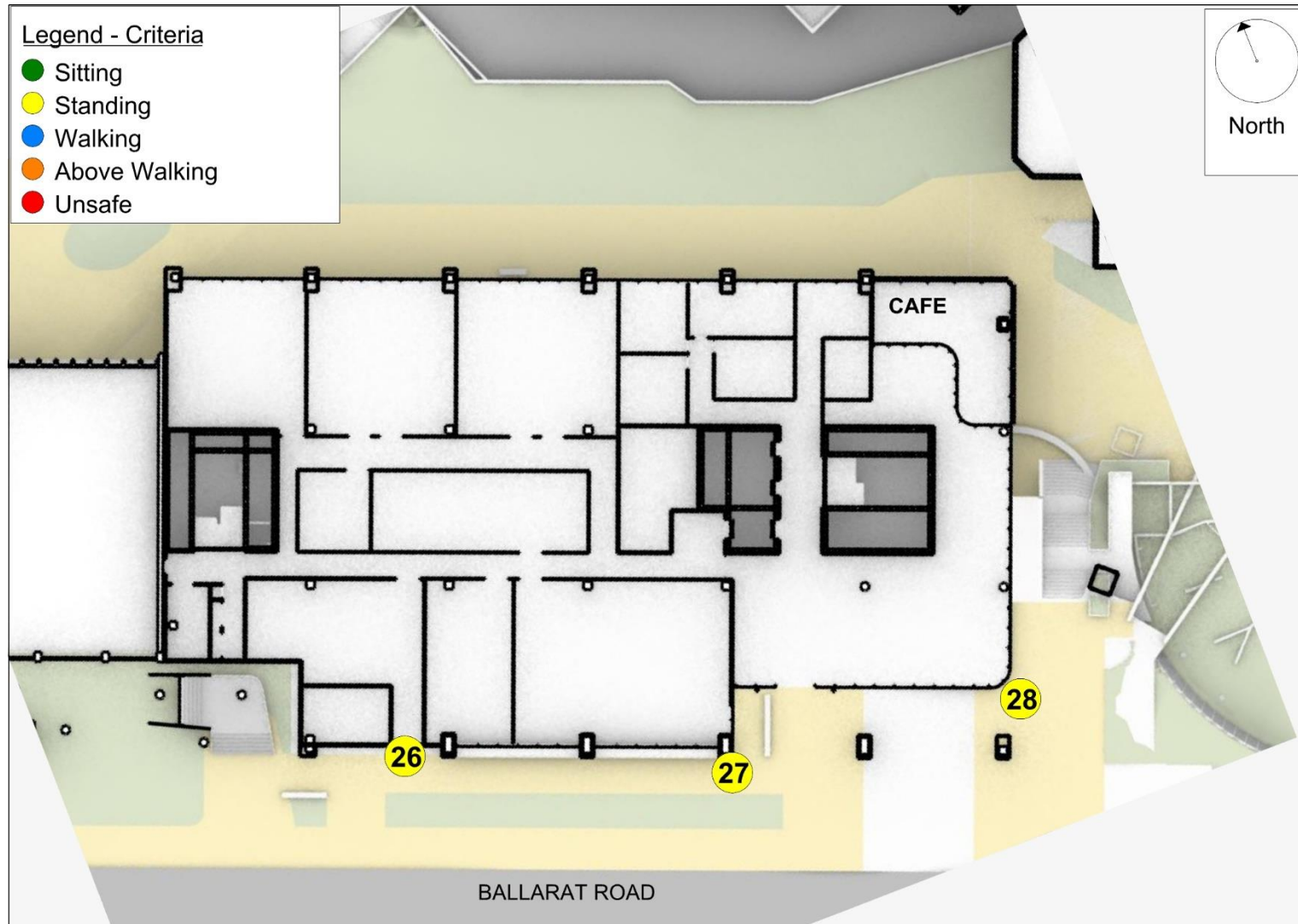


Figure 4b - Summary of wind criteria satisfied along Ballarat Street Frontage for the Existing Configuration of the VU CHTF Development.

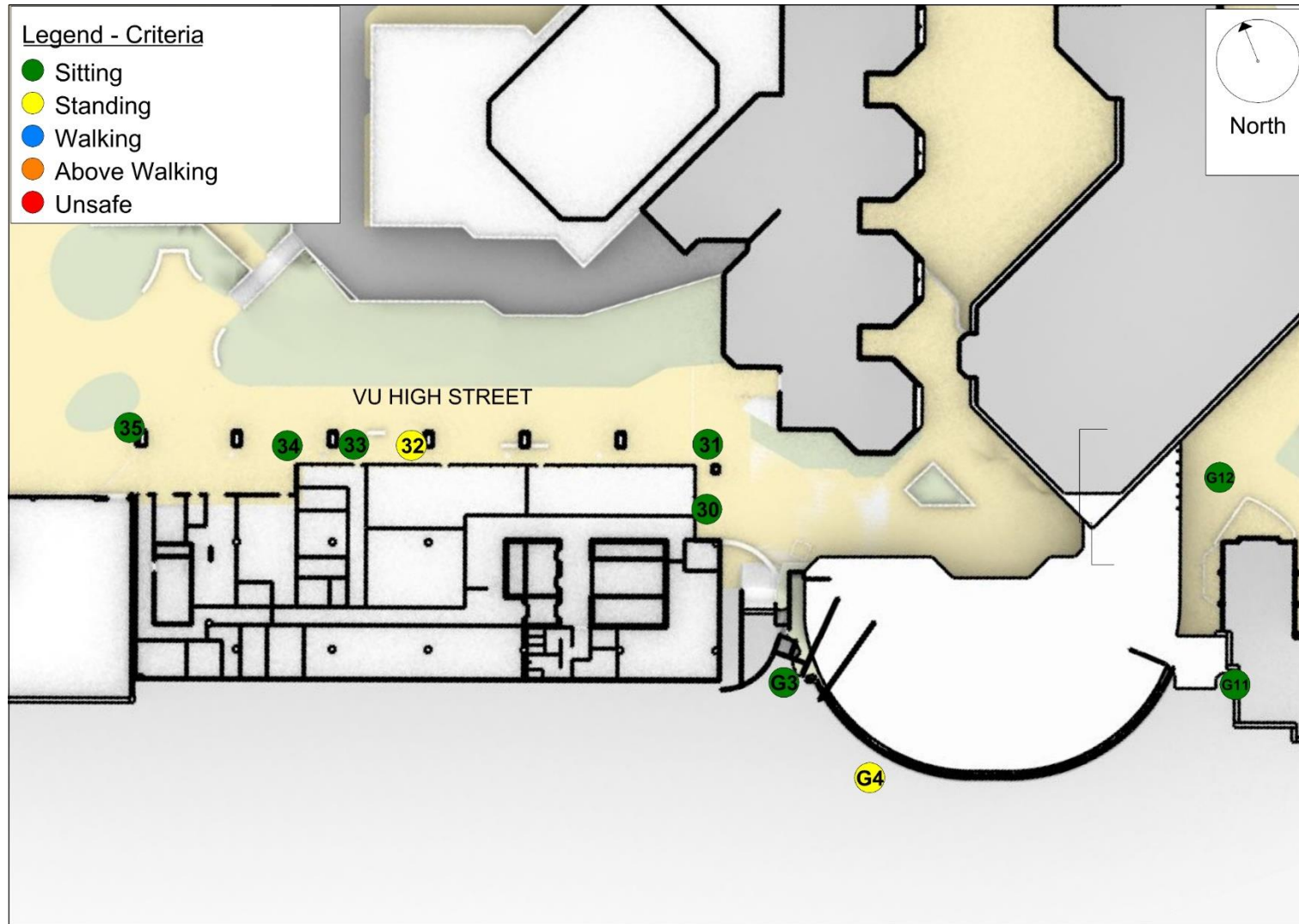


Figure 4c - Summary of wind criteria satisfied along VU High Street Frontage and Lecture Theatre (to be demolished for future Campus Gateway) for the Existing Configuration of the VU CHTF Development.

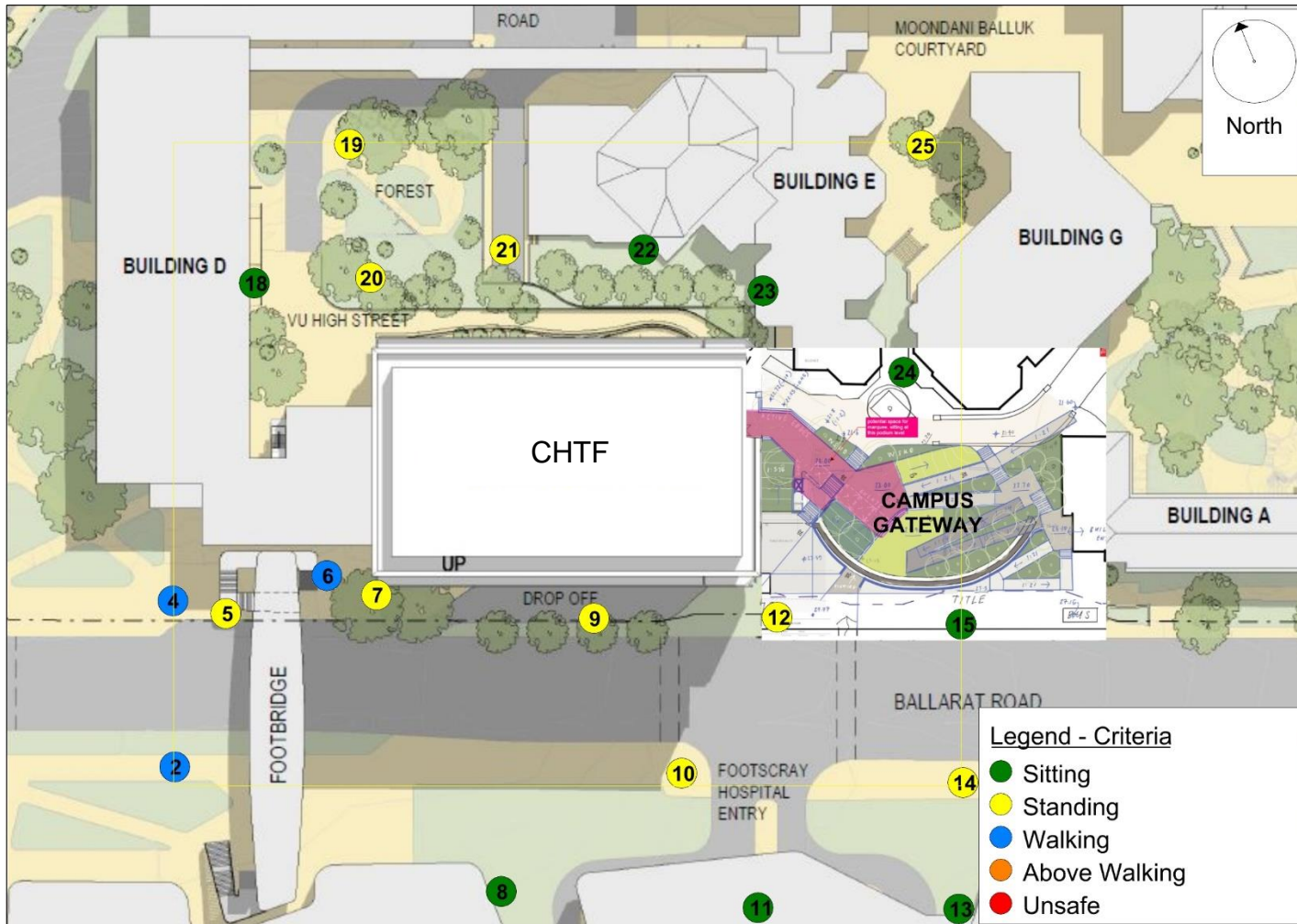


Figure 5a - Summary of wind criteria satisfied on the surrounding streetscapes for the Proposed Configuration of the VU CHTF Development.

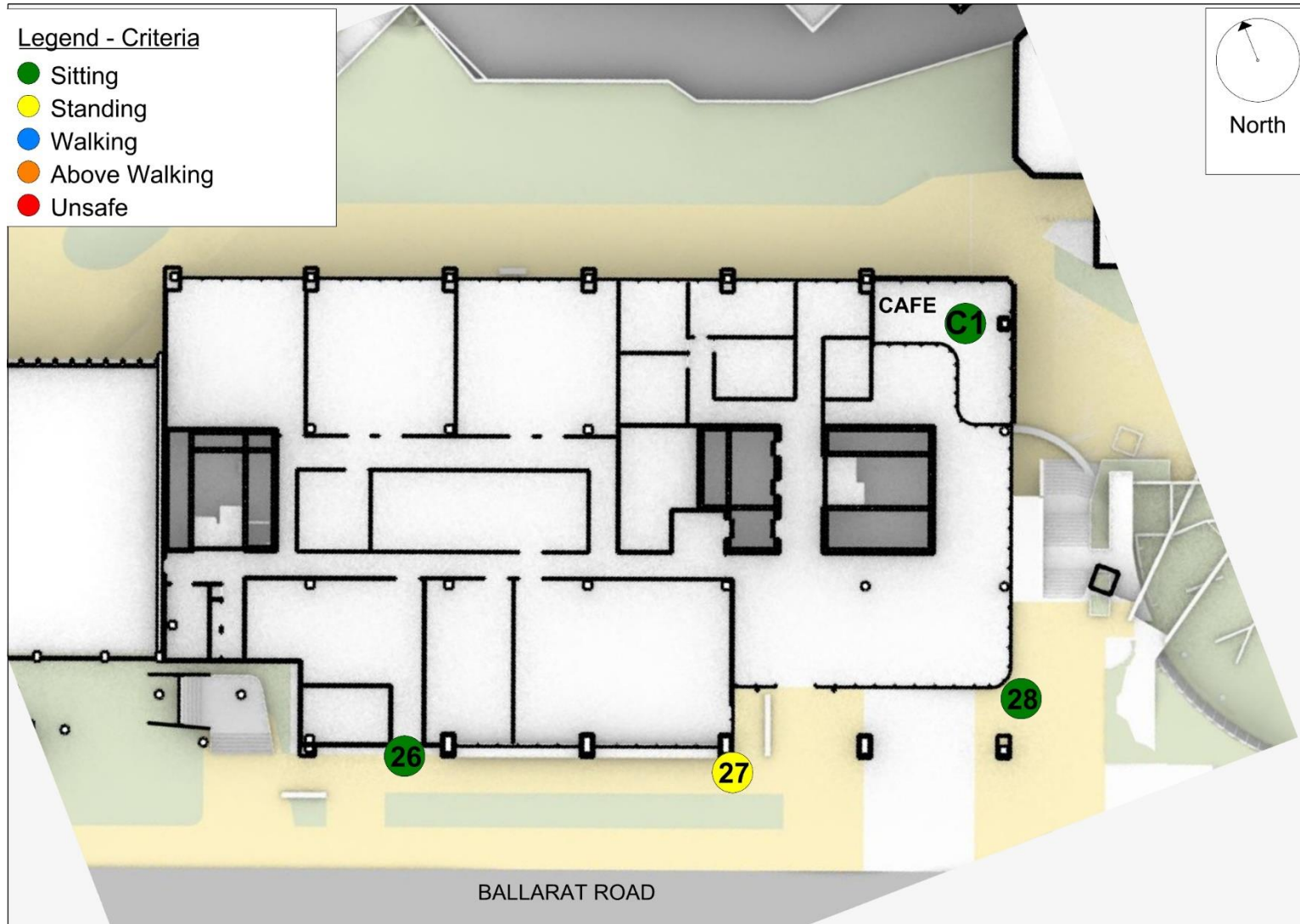


Figure 5b - Summary of wind criteria satisfied along Ballarat Street Frontage and Café for the Proposed Configuration of the VU CHTF Development.

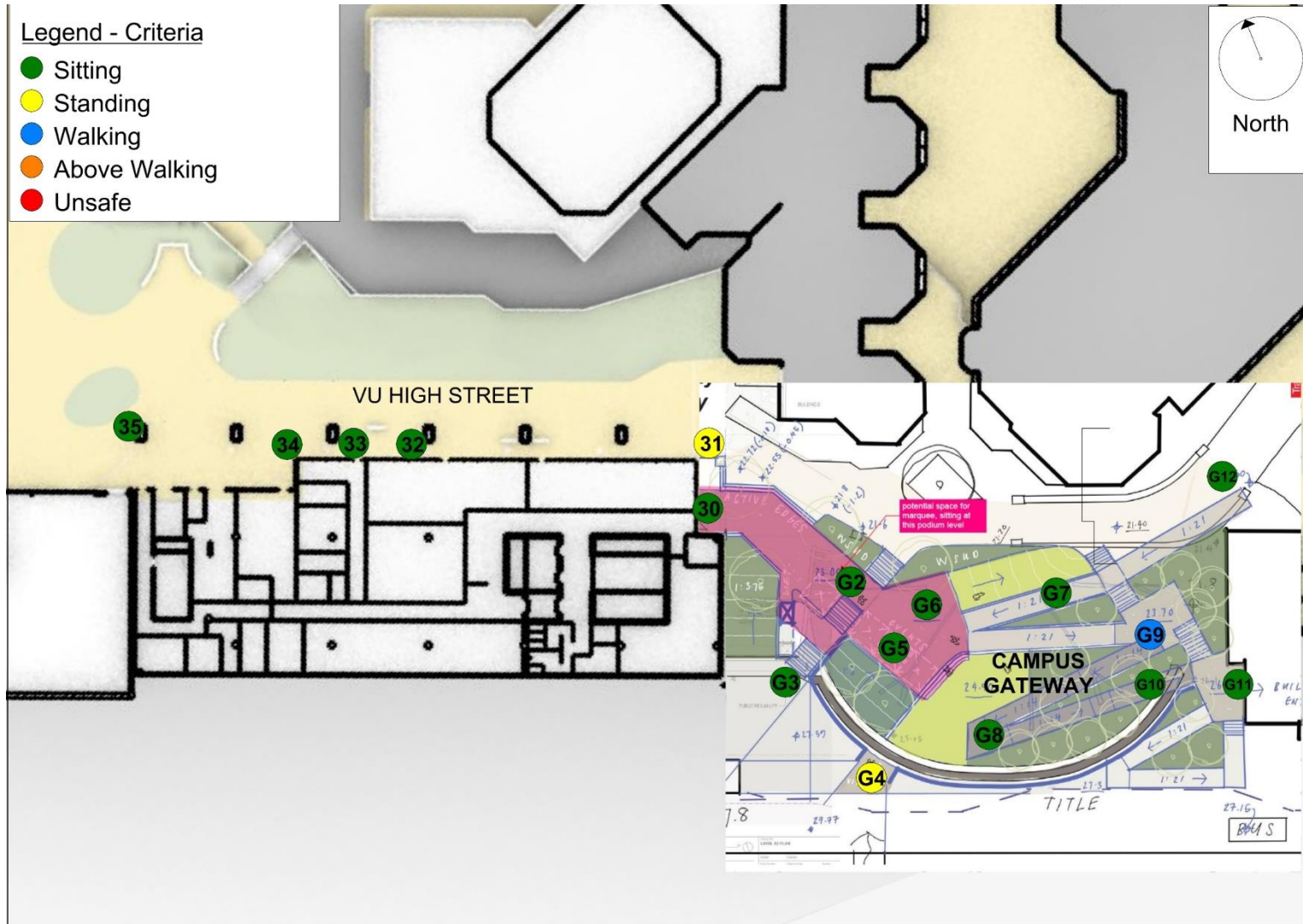


Figure 5c - Summary of wind criteria satisfied along VU High Street Frontage and Campus Gateway for the Proposed Configuration of the VU CHTF Development.

APPENDIX A – VELOCITY AND TURBULENCE PROFILES

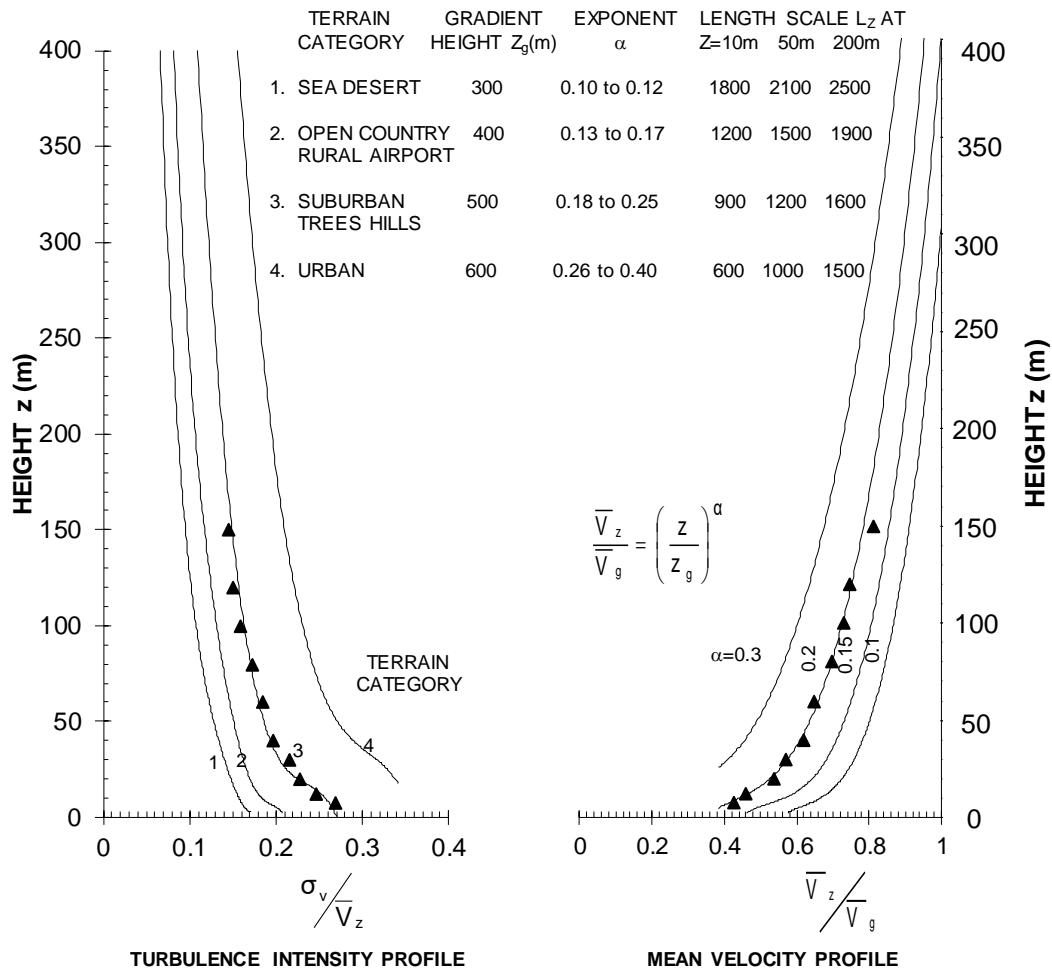


Figure A1 -1/300 scale TC3 boundary layer turbulence intensity and mean velocity profiles in the MEL Consultants Boundary Layer Wind Tunnel 4.8m x 2.2m working section, scaled to full scale dimensions.

APPENDIX B – PEDESTRIAN SAFETY PLOTS

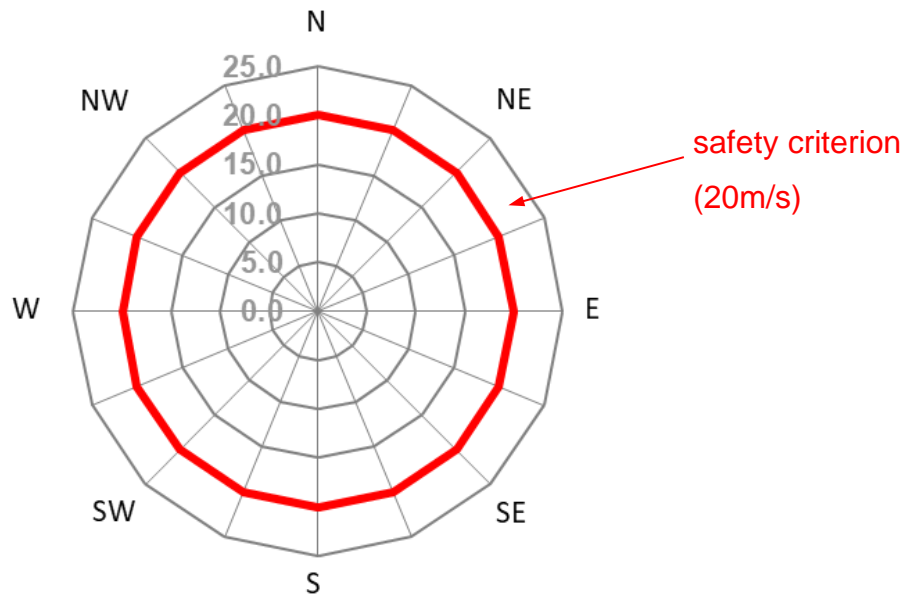
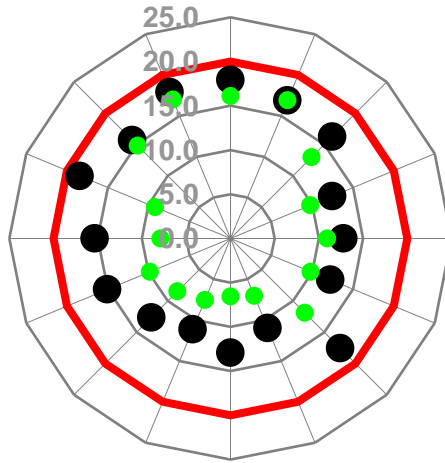


Figure B1 – Environmental wind safety criterion for Melbourne Region based on local 3 second peak gust wind speed

Test Location

2

North



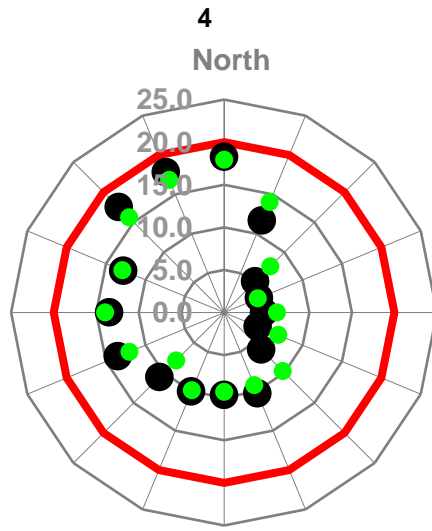
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	47.3%	31.5%	18.9%	4.9	Pass	18.4	Pass
● Existing Configuration	28.7%	17.3%	10.6%	3.7	Pass	17.0	Pass
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Test Location



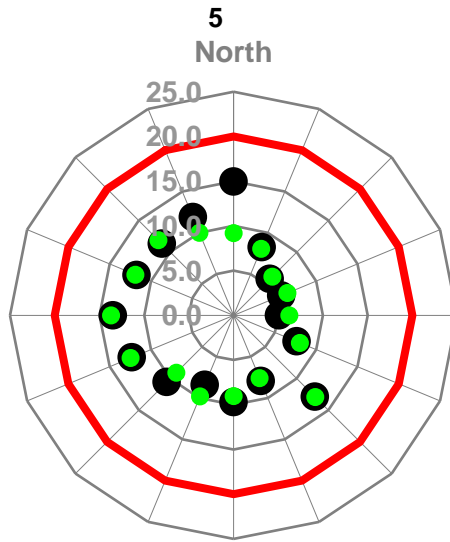
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	37.9%	23.5%	14.5%	4.3	Pass	18.3	Pass
● Existing Configuration	35.8%	21.3%	13.0%	4.1	Pass	17.9	Pass
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Test Location



SAFETY

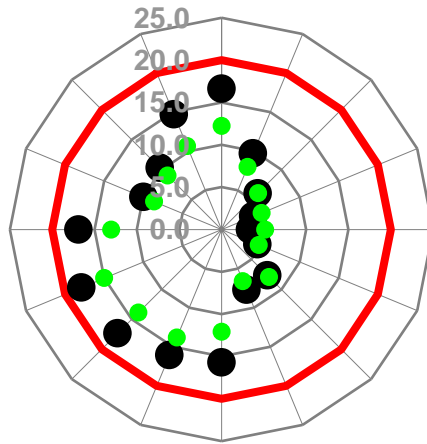
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	31.2%	16.1%	8.2%	3.7	Pass	14.9	Pass
● Existing Configuration	23.9%	10.0%	3.8%	3.2	Pass	13.7	Pass
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Test Location

6
North



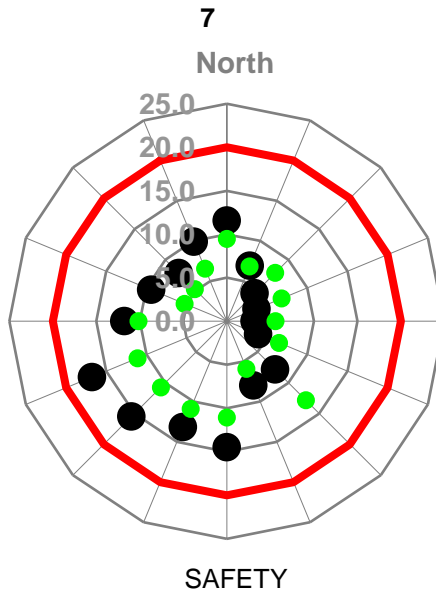
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	42.0%	28.1%	17.5%	4.7	Pass	17.9	Pass
● Existing Configuration	31.8%	17.2%	8.1%	3.8	Pass	15.0	Pass
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Test Location

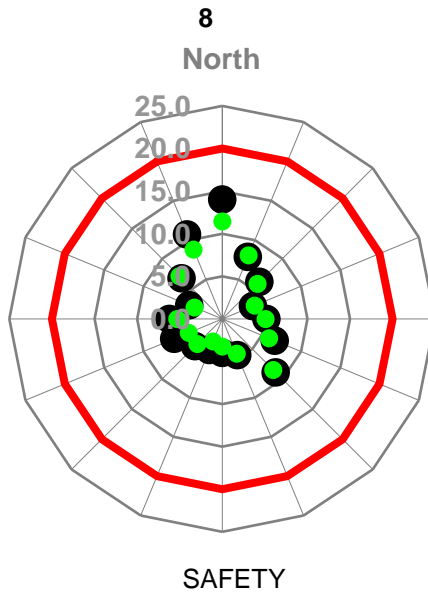


Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	31.2%	17.5%	8.7%	3.8	Pass	16.8	Pass
● Existing Configuration	20.1%	8.3%	2.9%	3.0	Pass	12.8	Pass
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Test Location



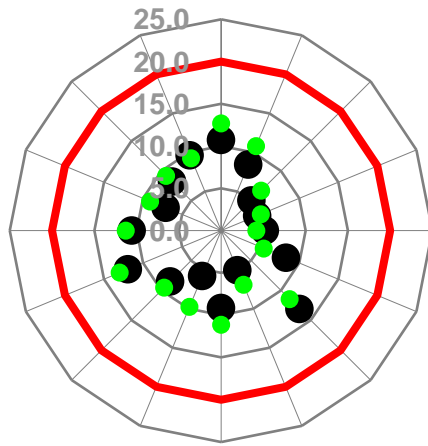
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	14.3%	7.9%	4.1%	2.5	Pass	14.0	Pass
● Existing Configuration	10.7%	4.8%	1.8%	2.1	Pass	11.5	Pass
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Test Location

9
North



SAFETY

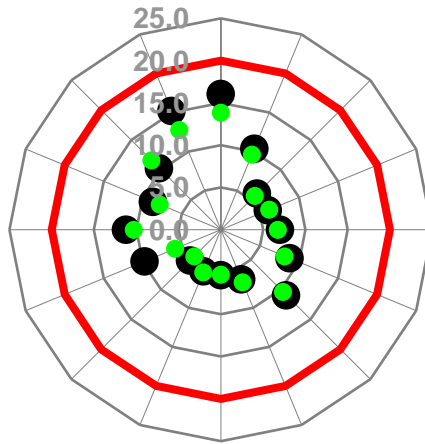
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	20.3%	8.2%	3.0%	3.0	Pass	13.1	Pass
● Existing Configuration	27.4%	13.1%	5.5%	3.5	Pass	13.0	Pass
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Test Location

10
North



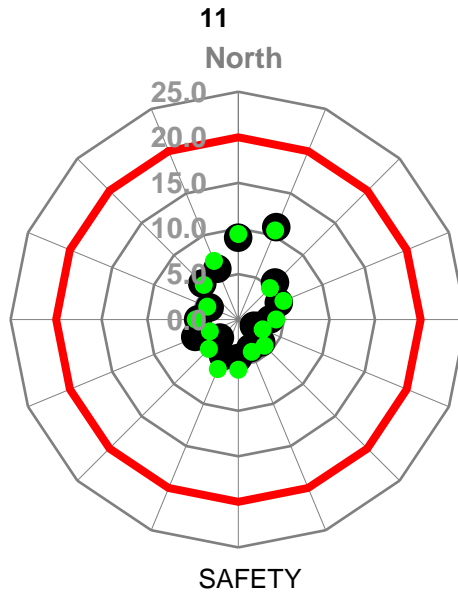
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	23.6%	13.8%	8.1%	3.3	Pass	16.0	Pass
● Existing Configuration	19.8%	10.9%	5.3%	3.0	Pass	13.9	Pass
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Test Location



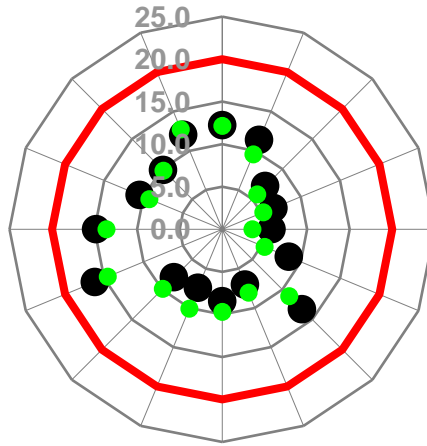
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	6.3%	2.2%	0.5%	1.8	Pass	10.9	Pass
● Existing Configuration	7.3%	2.6%	0.6%	2.0	Pass	10.6	Pass
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Test Location

12
North



SAFETY

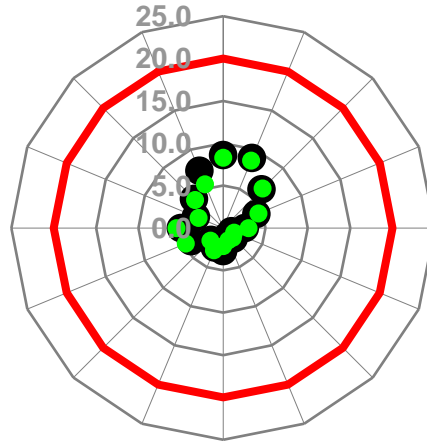
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	27.1%	14.4%	6.6%	3.5	Pass	16.2	Pass
● Existing Configuration	29.0%	14.2%	6.2%	3.5	Pass	14.6	Pass
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Test Location

13
North



SAFETY

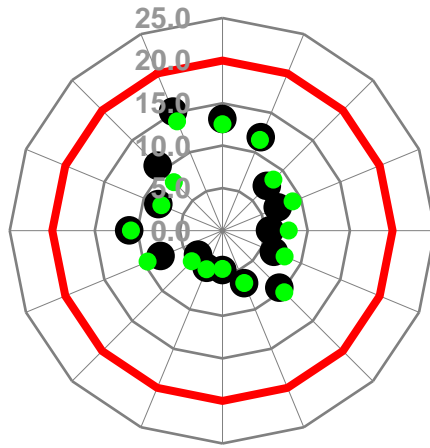
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	5.8%	1.7%	0.3%	1.7	Pass	8.9	Pass
● Existing Configuration	4.8%	1.2%	0.2%	1.6	Pass	8.6	Pass
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Test Location

14
North



SAFETY

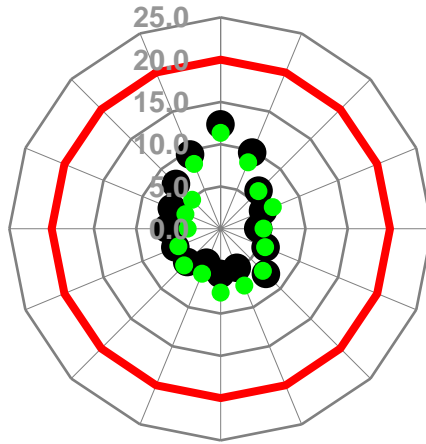
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	20.6%	11.5%	5.8%	3.0	Pass	15.1	Pass
● Existing Configuration	20.0%	10.4%	4.8%	3.0	Pass	13.9	Pass
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Test Location

15
North



SAFETY

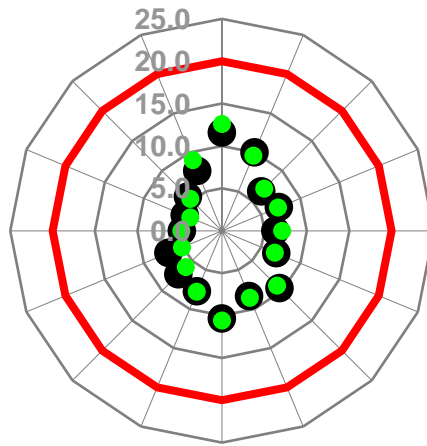
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	13.0%	6.1%	2.6%	2.4	Pass	12.3	Pass
● Existing Configuration	12.2%	5.0%	1.7%	2.5	Pass	11.3	Pass
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Test Location

18
North



SAFETY

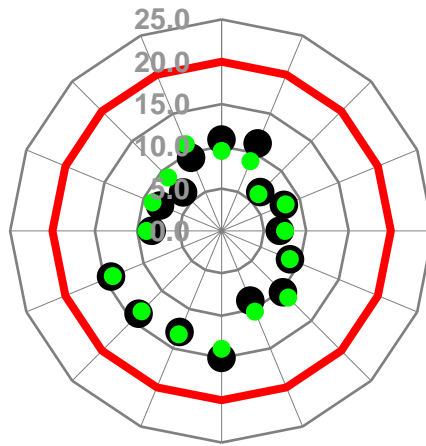
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	17.9%	7.5%	2.7%	2.9	Pass	11.6	Pass
● Existing Configuration	19.2%	8.6%	3.5%	2.9	Pass	12.6	Pass
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Test Location

19
North



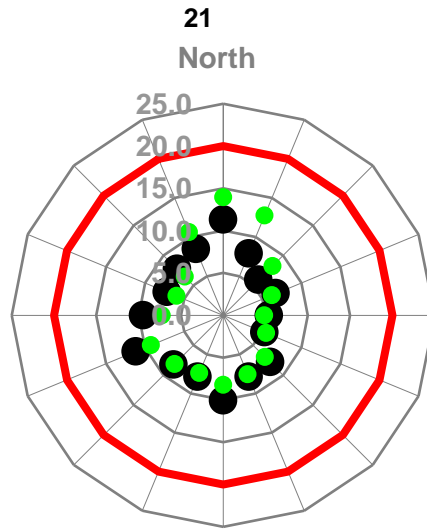
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	29.9%	15.7%	7.5%	3.6	Pass	15.0	Pass
● Existing Configuration	29.6%	15.0%	6.4%	3.6	Pass	13.9	Pass
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Test Location



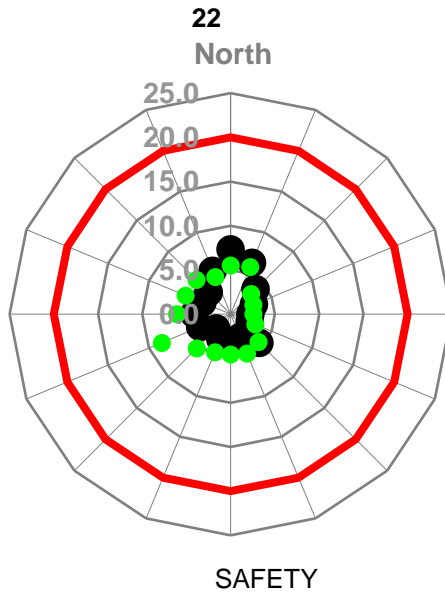
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	20.2%	8.0%	2.7%	3.0	Pass	11.3	Pass
● Existing Configuration	20.5%	10.3%	4.9%	3.0	Pass	14.0	Pass
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Test Location

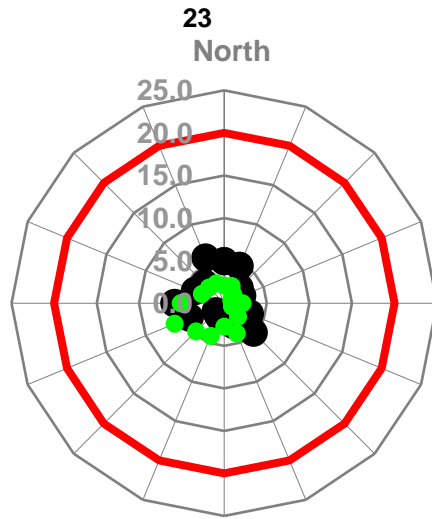


Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	2.5%	0.3%	0.0%	1.4	Pass	7.3	Pass
● Existing Configuration	2.0%	0.3%	0.1%	1.7	Pass	8.4	Pass
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Test Location



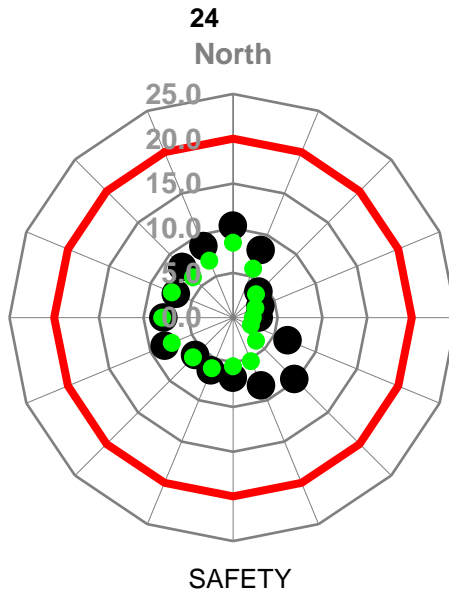
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	0.5%	0.0%	0.0%	1.3	Pass	5.8	Pass
● Existing Configuration	0.4%	0.1%	0.0%	1.0	Pass	6.3	Pass
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Test Location



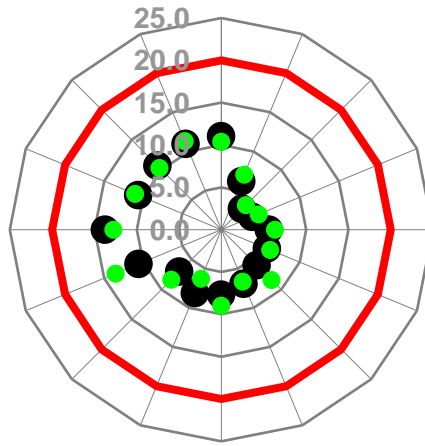
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	13.9%	4.7%	1.3%	2.6	Pass	10.3	Pass
● Existing Configuration	6.9%	1.5%	0.2%	2.1	Pass	8.4	Pass
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Test Location

25
North



SAFETY

Local peak 3 second gust wind speed (m/s)

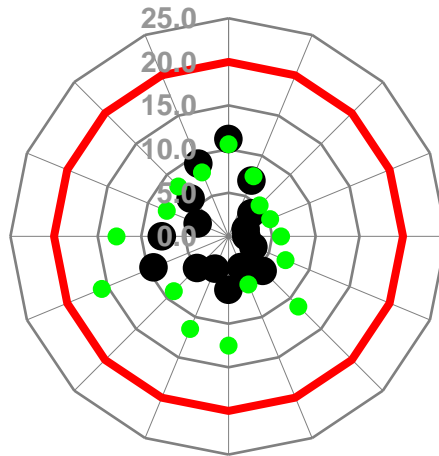
Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	20.1%	9.2%	3.6%	3.0	Pass	13.7	Pass
● Existing Configuration	22.0%	9.3%	3.5%	3.1	Pass	13.5	Pass
■							
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Test Location

26

North



SAFETY

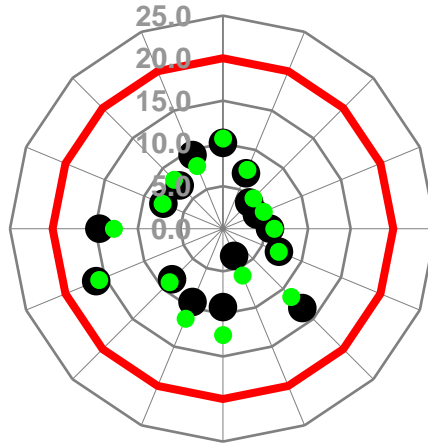
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	11.5%	4.7%	1.7%	2.3	Pass	11.2	Pass
● Existing Configuration	25.6%	12.4%	5.1%	3.4	Pass	15.7	Pass
■ Proposed Configuration without north canopy							
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Test Location

27
North



SAFETY

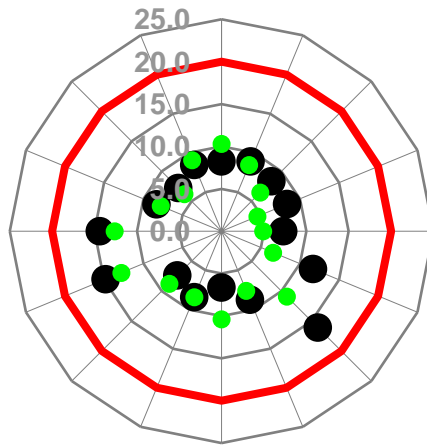
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	22.3%	9.8%	4.2%	3.1	Pass	16.1	Pass
● Existing Configuration	25.6%	12.4%	5.1%	3.4	Pass	15.7	Pass
■ Proposed Configuration without north canopy							
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■							
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▲							

Test Location

28
North



SAFETY

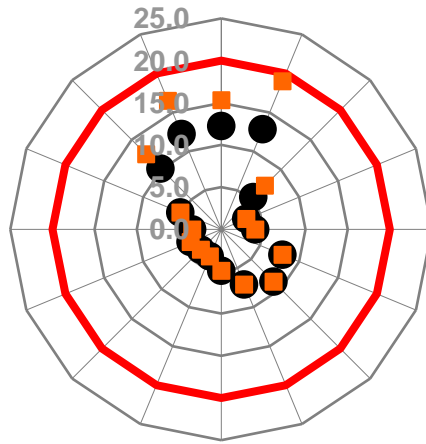
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	19.5%	8.3%	3.7%	3.0	Pass	16.1	Pass
● Existing Configuration	22.9%	9.1%	3.3%	3.2	Pass	12.8	Pass
■ Proposed Configuration without north canopy							
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■							
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▲							

Test Location

C1
North



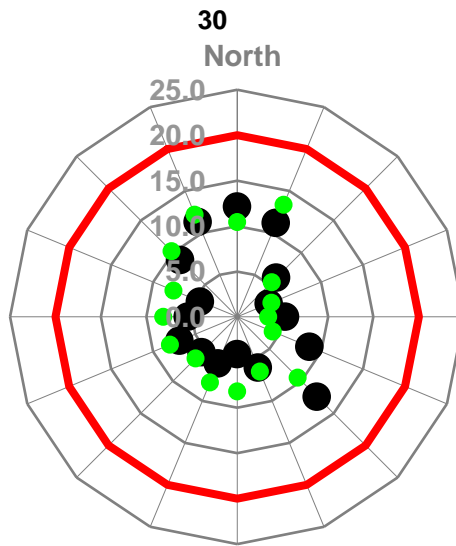
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 3m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	15.6%	8.4%	3.8%	2.6	Pass	12.8	Pass
● Existing Configuration							
■ Proposed Configuration without north canopy	21.2%	13.9%	8.8%	3.1	Fail	19.0	Pass
◆							
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■							
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Test Location



SAFETY

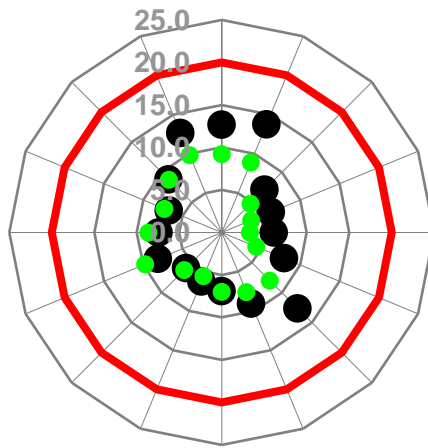
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	15.6%	8.0%	3.4%	2.6	Pass	12.4	Pass
● Existing Configuration	18.6%	7.8%	2.9%	2.9	Pass	13.4	Pass
■							
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Test Location

31
North



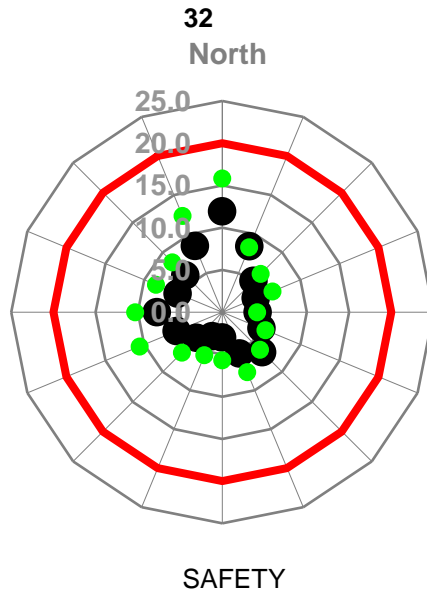
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	21.1%	10.8%	5.1%	3.1	Pass	13.8	Pass
● Existing Configuration	13.8%	4.5%	1.1%	2.6	Pass	9.8	Pass
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Test Location



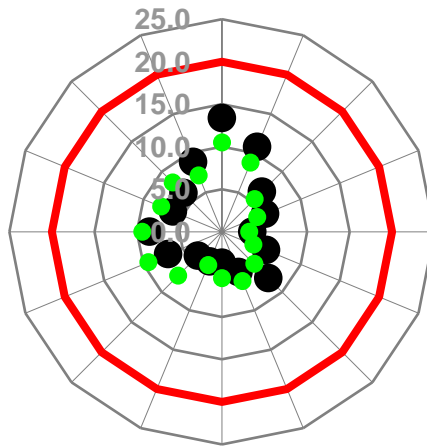
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	11.2%	5.2%	2.1%	2.3	Pass	11.9	Pass
● Existing Configuration	21.4%	11.6%	6.5%	3.1	Pass	15.8	Pass
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Test Location

33
North



SAFETY

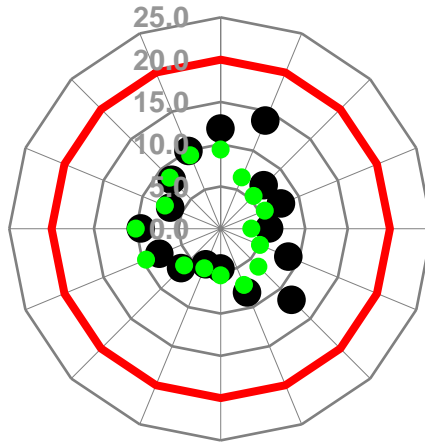
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	14.5%	7.4%	3.5%	2.5	Pass	13.4	Pass
● Existing Configuration	12.7%	4.6%	1.4%	2.5	Pass	10.5	Pass
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Test Location

34
North



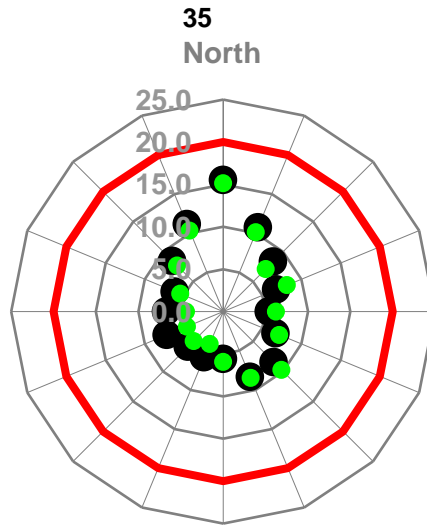
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	17.8%	8.5%	3.5%	2.8	Pass	13.8	Pass
● Existing Configuration	12.4%	4.1%	1.0%	2.5	Pass	10.0	Pass
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Test Location



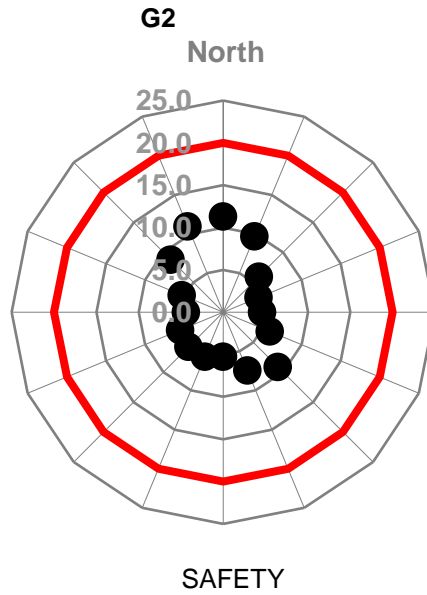
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	19.3%	10.4%	5.7%	2.9	Pass	15.5	Pass
● Existing Configuration	17.5%	9.7%	5.3%	2.8	Pass	15.1	Pass
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Test Location

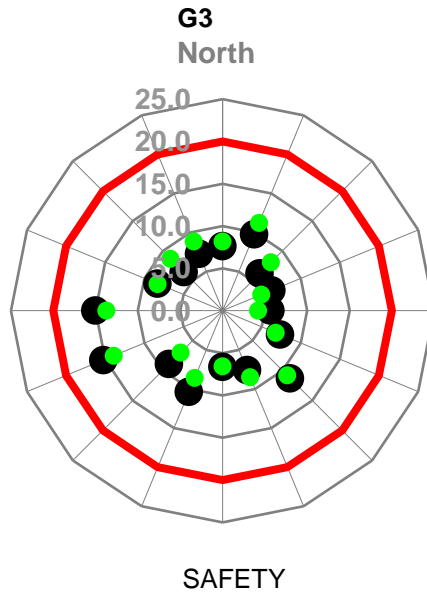


Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 3m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	13.9%	6.2%	2.3%	2.5	Pass	11.3	Pass
● Existing Configuration							
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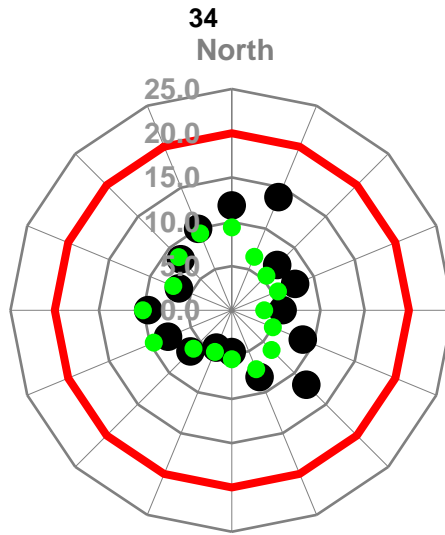
Test Location



SAFETY
 Local peak 3 second gust wind speed (m/s)
 Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	17.4%	7.4%	3.2%	2.8	Pass	15.2	Pass
● Existing Configuration	18.6%	7.3%	2.7%	2.9	Pass	13.9	Pass
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Test Location



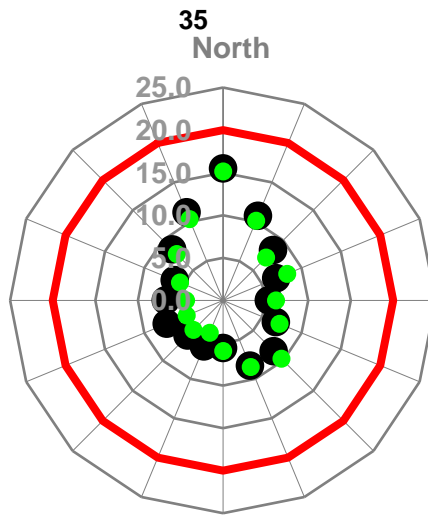
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	17.8%	8.5%	3.5%	2.8	Pass	13.8	Pass
● Existing Configuration	12.4%	4.1%	1.0%	2.5	Pass	10.0	Pass
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Test Location



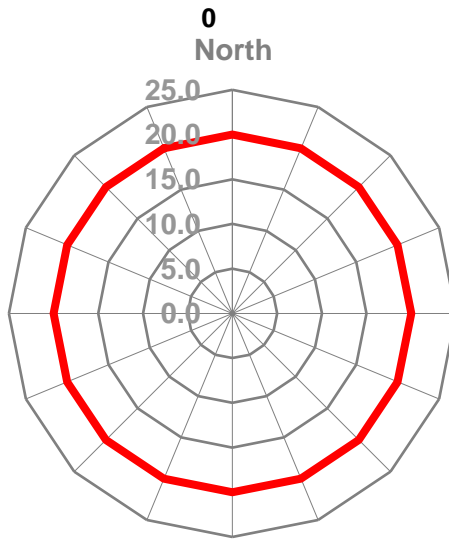
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	19.3%	10.4%	5.7%	2.9	Pass	15.5	Pass
● Existing Configuration	17.5%	9.7%	5.3%	2.8	Pass	15.1	Pass
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Test Location



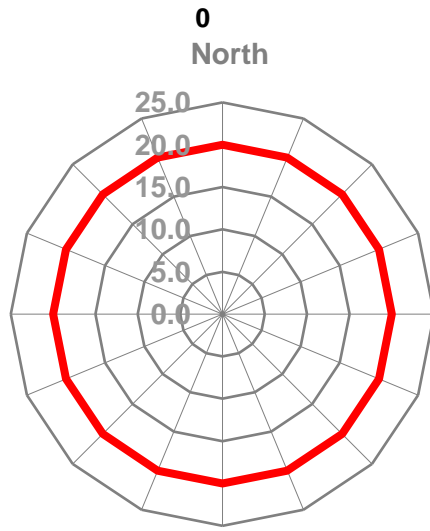
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration							
● Existing Configuration							
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Test Location



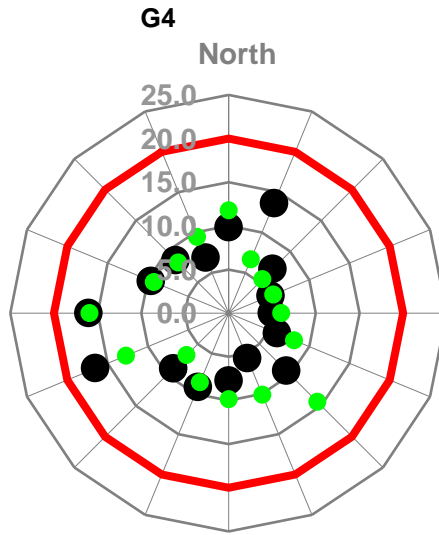
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	%	%	%	m/s	Pass/Fail	m/s	Pass/Fail
● Existing Configuration							
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Test Location



SAFETY

Local peak 3 second gust wind speed (m/s)

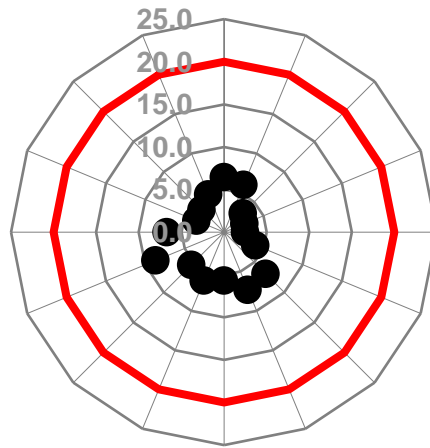
Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	21.7%	10.2%	4.6%	3.1	Pass	16.5	Pass
● Existing Configuration	26.4%	12.5%	5.6%	3.4	Pass	15.9	Pass
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Test Location

G5

North



SAFETY

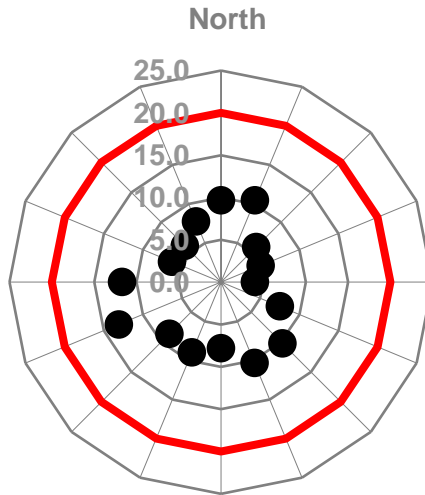
Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 3m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	4.4%	0.8%	0.1%	2.0	Pass	8.7	Pass
● Existing Configuration							
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Test Location

G6



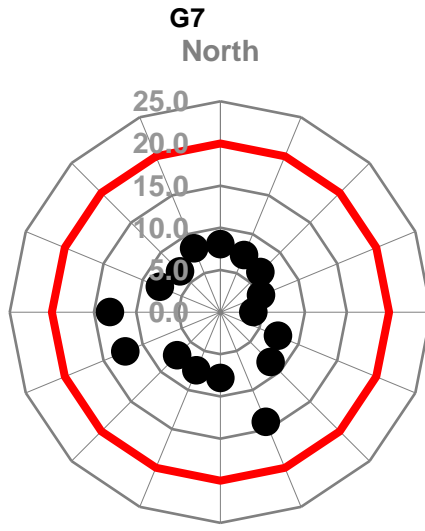
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 3m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	19.7%	7.8%	2.7%	3.0	Pass	13.1	Pass
● Existing Configuration							
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Test Location



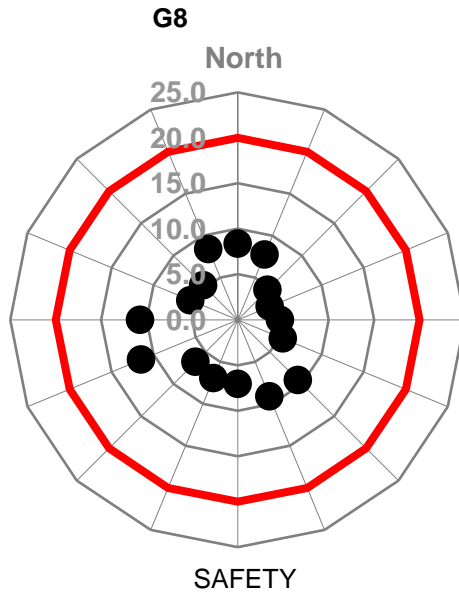
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	17.5%	6.9%	2.9%	2.9	Pass	14.1	Pass
● Existing Configuration							
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Test Location



Local peak 3 second gust wind speed (m/s)

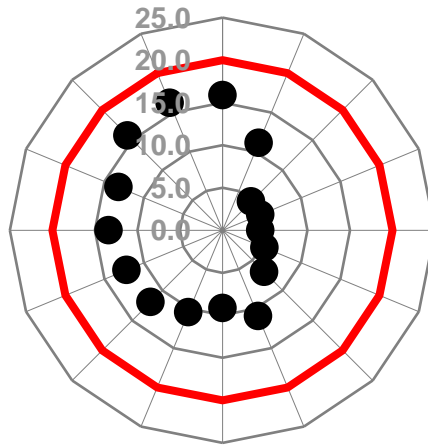
Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	13.5%	4.3%	1.2%	2.6	Pass	11.5	Pass
● Existing Configuration							
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Test Location

G9

North



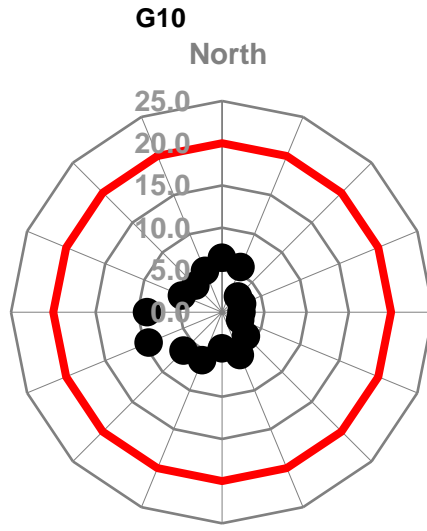
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
● Proposed Configuration	35.2%	20.3%	11.6%	4.0	Pass	16.2	Pass
● Existing Configuration							
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Test Location



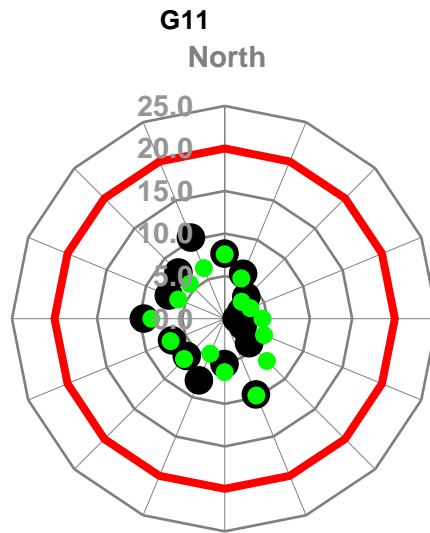
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria				Safety Criterion		
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	4.5%	0.9%	0.2%	1.9	Pass	9.4	Pass
● Existing Configuration							
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Test Location



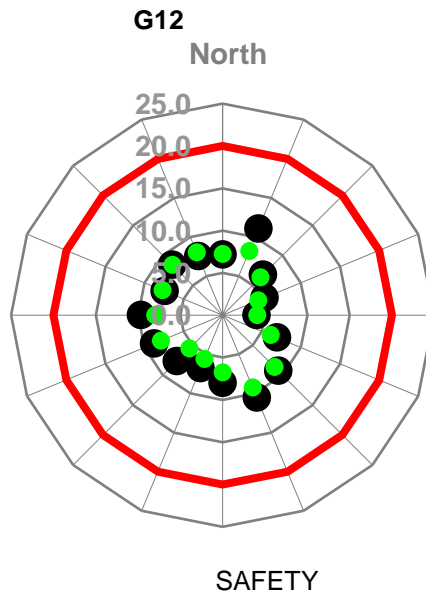
SAFETY

Local peak 3 second gust wind speed (m/s)

Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 4m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	10.2%	3.1%	0.9%	2.4	Pass	10.3	Pass
● Existing Configuration	7.6%	1.7%	0.4%	2.2	Pass	9.8	Pass
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Test Location



Local peak 3 second gust wind speed (m/s)
 Safety Wind Speed = 20m/s

Configuration	Wind Comfort Criteria					Safety Criterion	
	Exceedence of given wind speed per year			Mean wind speed (exceeded 20% of year)	Result (compared against Target wind speed of 5m/s)	Peak wind speed (of all wind directions)	Result (compared against Safety wind speed of 20m/s)
	Sitting (3m/s)	Standing (4m/s)	Walking (5m/s)				
%	%	%	m/s	Pass/Fail	m/s	Pass/Fail	
● Proposed Configuration	13.7%	4.5%	1.3%	2.6	Pass	11.0	Pass
● Existing Configuration	10.2%	2.4%	0.5%	2.4	Pass	9.2	Pass
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