

Date: February 4, 2021

Reference: WA567-46F01(rev2)- WE Letter

Lend Lease

Level 14, Tower Three, International Towers
Sydney Exchange Place, 300 Barangaroo Avenue
Barangaroo, NSW 2000

Attn: David Springford

**RE: TOWER R4A, ONE SYDNEY HARBOUR, BARANGAROO
PEDESTRIAN WIND ENVIRONMENT LETTER TO REVIEW THE WIND
IMPACT OF THE CURRENT TOWER R4A PODIUM LANDSCAPE LAYOUT**

1.0 Introduction

This letter is in response to the additional information requested by the NSW Department of Planning, Industry and Environment as described below:

"Provide a Wind Impact Statement confirming that the revised layout of the podium level landscaping will provide acceptable wind mitigation outcomes for future users of the podium. Notably the 3m high screen, which formed part of the approved podium landscape plan, does not appear to form part of the proposed podium landscape design."

Windtech Consultants have previously undertaken a detailed wind tunnel study for the Level 2 podium area of Tower R4A, One Sydney Harbour, Barangaroo (Report Reference No.: WA567-11F01(rev7)- WE Report R4A - Dated: 27 November, 2015) in which a 3m high screen was proposed as a means of mitigating adverse wind conditions along the Level 2 terrace for Scenario 1. This screen is no longer required as the staging of the development has changed. Scenario 1, as detailed in the 2015 report, excludes the Crown Tower, Tower R4B and Tower R5. Given the completion of the Crown Tower, Scenario 1 is no longer applicable and therefore the local wind environment at the Level 2 terrace of Tower R4A will be different.

Furthermore, given the completion of the Crown Tower and the commencement of the construction of Tower R4B, we believe that we no longer need to consider the scenario where Tower R4B is not in place when assessing the wind conditions on the Tower R4A Level 2 terrace. Additional testing was conducted to assess the abovementioned change in project staging; the study point locations are illustrated in Figure 1 and the results summarised in Table 1.

Target Criteria

City of Sydney DCP in accordance with Draft Sydney DCP 2012 - Central Sydney Planning Review Amendment:

- Wind Comfort Standard for Standing criterion of 6m/s (5% exceedance) for standing
- Safety criterion of 24m/s (gust - 0.1% exceedance) for safety

City of Sydney DCP in accordance with Draft Sydney DCP 2012 - Central Sydney Planning Review Amendment:

- Wind Comfort Standard for Walking criterion of 8m/s (5% exceedance) for walking
- Safety criterion of 24m/s (gust - 0.1% exceedance) for safety

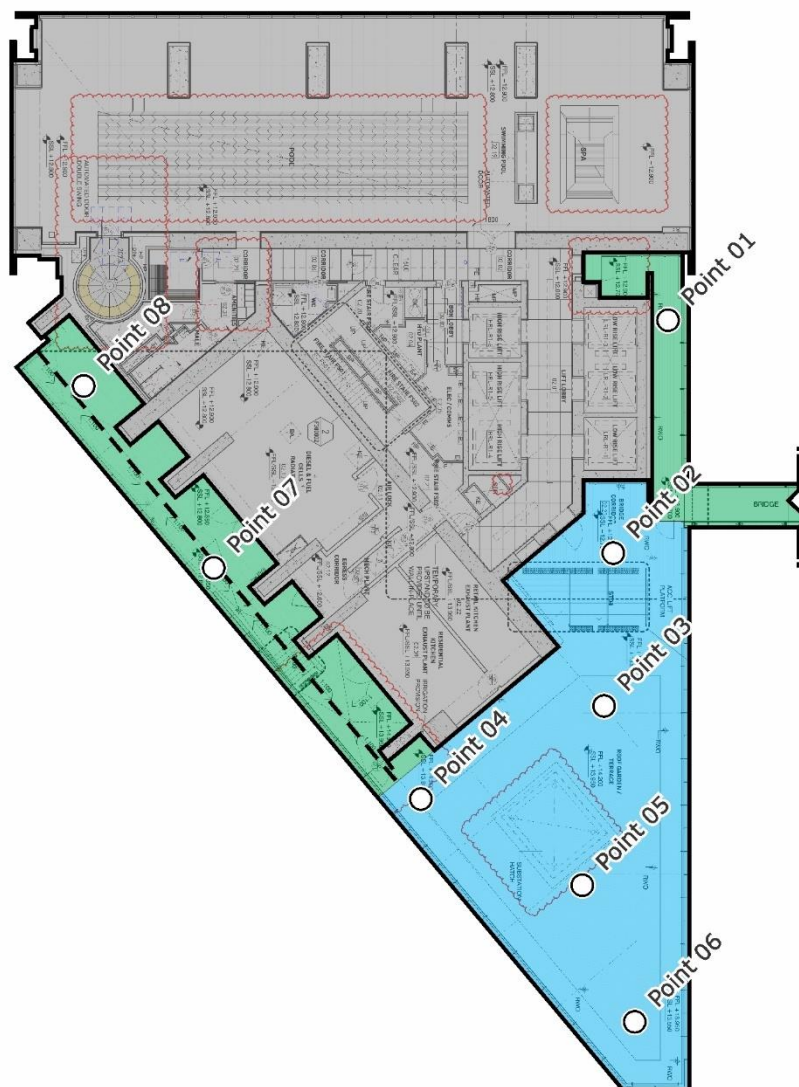
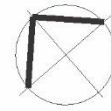


Figure 1: Study Point Locations and Target Wind Speed Criteria - Level 02 Terrace

Table 1: Wind Tunnel Results Summary

Study Point	GEM (5% exceedance)			Annual Gust			Final Result
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade	
Point 01	8.0	0%	Pass	24	11	Pass	Pass
Point 02	6.0	3%	Pass	24	18	Pass	Pass
Point 03	6.0	30%	Fail	24	27	Fail	Fail
Point 04	6.0	7%	Fail	24	23	Pass	Fail, however conditions meet the comfortable walking criterion
Point 05	6.0	11%	Fail	24	24	Pass	Fail, however conditions meet the comfortable walking criterion
Point 06	6.0	5%	Pass	24	18	Pass	Pass
Point 07	8.0	0%	Pass	24	15	Pass	Pass
Point 08	8.0	2%	Pass	24	16	Pass	Pass

The results of the study show that the wind conditions on the Level 2 podium of Tower R4A will be mostly suitable for their intended uses. However, some areas will experience strong winds which exceed the relevant criteria for comfort and/or safety. Only the area represented by Point 03 experiences wind conditions that exceed the both the safety limit and comfortable walking criterion.

The revised landscape layout of the podium landscaping has been considered by Windtech. We believe that the landscape will provide some mitigation of the effect of the westerly winds. Furthermore, to address the safety limit exceedance at Point 03, a wind speed sensor will be installed to monitor the wind conditions and provide immediate feedback to the building's BMS system, which would block access to the Level 2 terrace when winds approach the safety limit.

Additional notes:

- The wind events corresponding to the exceedances of wind comfort and safety criteria are expected to be infrequent outside of the winter months and residents will be afforded comfortable enjoyment most of the time.
- Weather patterns that are conducive to strong wind conditions, and thus, initiate wind sensor warnings, will often correspond to thunderstorm wind events. These wind events are expected to occur approximately once per fortnight on average during the winter months when residents would unlikely be seeking outdoor enjoyment of the terrace area. Outside of the winter months it is expected that the warnings will be initiated approximately once every 3 months on average.
- To mitigate winds to within the wind criteria at all times would require substantial enclosing elements and as such, monitoring via a wind speed sensor may be a more appropriate solution to address the occasional exceedance of the wind safety limit, while still allowing an open outdoor environment.

2.0 Mitigation via Wind Speed Sensor

It is proposed that a wind speed sensor is placed at the critical location, as shown in Figure 2, below. Note, that while this is the optimal location, there is some flexibility in the location of the sensor and can be relocated upon careful consideration of the local wind environment of the terrace and approval from Windtech.

This sensor would be able to quantitatively measure the mean wind speed at the nominated location on the Level 2 podium. It is important that this device be connected to a display panel near the door to this terrace to warn the occupants prior to entering the terrace when wind conditions are uncomfortable/unsafe. Given that the Sydney wind climate is governed by thunderstorm wind events, it is recommended that the sensor monitor 1-minute averages and provide an update to both the display panel and building management at 1-minute intervals. It would be good if the sensor is also able to record the maximum 3-second gust during that 1-minute period.

It is suggested that a red light turns on when the wind conditions at Point 03 exceed 11.3m/s with the following message "strong wind conditions do not exit". It is also recommended that an alert be given to building management to evacuate and close off the terrace once the 1-minute mean readings exceed 16m/s (equivalent to a 3-second gust of 21m/s or a 0.5 second gust of 24m/s).

It should be noted that this design advice applies specifically to the Level 2 podium terrace in Tower R4A.

The above cut off wind speeds are based on the following conversion from 1-minute mean to hourly mean:

$$G = \frac{\hat{U}_{ssec}}{\bar{U}_{Tsec}} = 1 + 0.5 I_u \ln(T/t) \quad 5.1)$$

Where:

G is the ratio of the maximum gust speed within a specified period to the mean wind speed.

I_u is the longitudinal turbulence intensity, which is 0.2 in this case.

T Is the averaging period.

t is the gust duration.

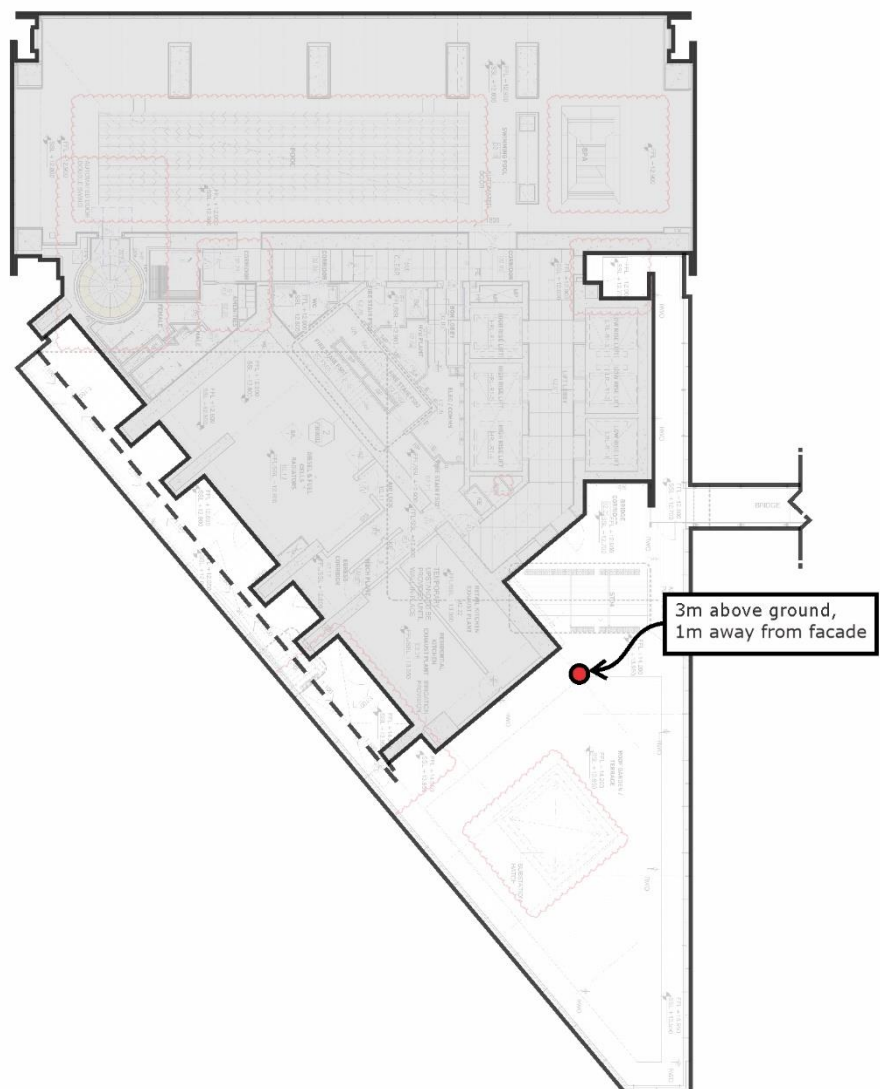


Figure 1: Recommended location of the wind speed sensor

DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
January 22, 2021	Initial.	0	EV	SWR	TR
February 2, 2021	Additional results information and discussion included.	1	EV	SWR	TR
February 4, 2021	Minor changes in wording.	2	EV	SWR	TR/BU

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