16 October 2014 CPP Project 7530

Central Park JV No.2
Level 12, 101 Bathurst Street
Sydney
NSW 2000

Attn: Mr. William Lam

Subject: Wind Engineering – Frasers Blocks 4N

Ref: (1) CPP report 7387 entitled 'Environmental Wind Tunnel Tests for One Central Park' dated August 2014
(2) CPP report 4946 entitled 'Solar Reflectivity Assessment for Frasers Broadway Blocks 1, 4, and 8' dated May 2009.

Dear Mr. Lam,

The purpose of this report is to outline the changes to the wind environment around the site and reflectivity due to the proposed geometry changes to Frasers Block 4N. The global wind conditions around the site are governed by more than the geometry of a single building, hence why the assessment has considered surrounding buildings.

ENVIRONMENTAL WIND CONDITIONS

The most recent wind tunnel testing was conducted on updated and as built plans for the precinct in August 2014. The results were report in CPP report 7387 entitled 'Environmental Wind Tunnel Tests for One Central Park' dated 25 August 2014. A photograph of the wind tunnel model is presented in Figure 1. The relevant results from the testing are reproduced in Figure 2 to frame the qualitative discussion on the wind conditions in and around the site with the proposed changes. The primary results reproduced show that the pedestrian areas around Block 4N are all classified as acceptable for pedestrian walking with the majority acceptable for use as public standing from a comfort perspective, such as window shopping, and pass the distress criterion. Directional results are presented in Figure 5.

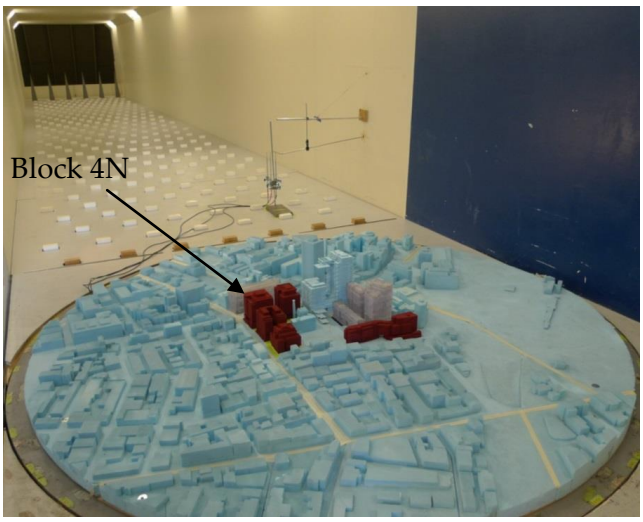

Figure 1: Photograph of the wind tunnel model viewed from the south-west

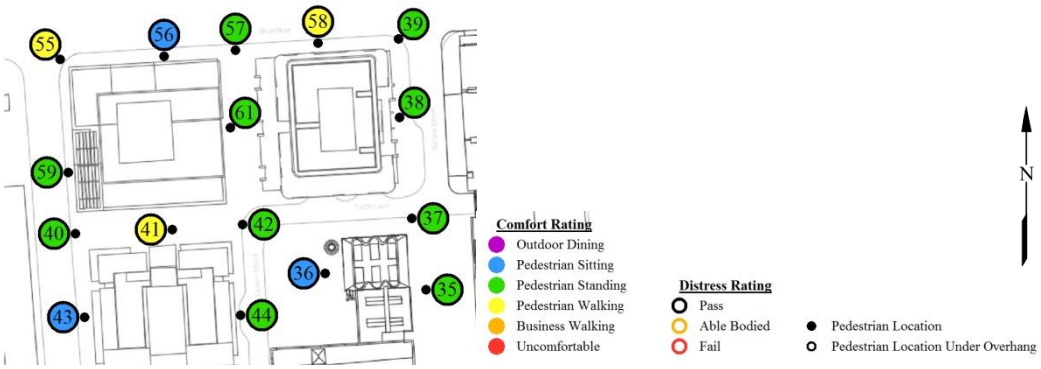

Figure 2: Results from previous wind tunnel testing

The Foster and Partners drawings dated September 2014 have been reviewed and from a wind perspective the only relevant geometric changes from those used for the wind tunnel testing model in August 2014 is the change in plan form geometry, Figure 3 and Figure 4 showing comparative drawings between the two configurations. The general massing, orientation, and form of the building have remained the same. There is a proposed water feature along the laneway to the east of the site.

Tested Proposed

Figure 3: Floor plans: Ground (T), Level 5-10 (B)

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Tested Proposed

Figure 4: North elevation

As the building massing has not changed the wind conditions at ground level around the site are expected to be similar to those measured previously as presented in Figure 2.

The markedly more open nature of the north and south façade near the pedestrian entrances to the through site link will increase the flow through the laneway. As the laneway cross-sectional area is reasonably constant, there is expected to be a uniform wind speed along the entire length of the passageway. As this laneway is for access only, there is no perceived issue with the intended use of the space as it would be expected to be classified as acceptable for pedestrian standing. The perception of pedestrians to wind conditions in a semi-outdoor space is different to that in an outdoor space and therefore the applicability of outdoor criteria to such areas has not been researched. The outdoor restaurant area at the north of the laneway would require amelioration measures, such as vertical screens or planting to the north and south, to make the area suitable for outdoor café-style seating.

The significant change in the articulation of the south and north façade has the potential to cause an increase in vertical flow in this channel and through the link for winds from the south. However, the south façade is significantly shielded by Block 4S thereby mitigating this concern.

All locations around the site are expected to be classified for pedestrian walking or better, and pass the distress criterion. The semi-outdoor spaces and residential outdoor areas throughout the site are expected to meet the wind speed for café-style activities for about 80% of the time.

REFLECTIVITY

The previous analysis described two solar reflectivity issues from the north façade of Blocks 1 and 4N onto Broadway. These events occurred from 7 am to 9 am during March and October when the rising sun strikes all levels of the north facades reflecting to the west along Broadway, and around 5 pm during April and September when the setting sun strikes all levels of the north facades reflecting to the east-north-east along Broadway. As the orientation of the building has not changed, these issues will remain

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with the proposed buildings. The deletion of some façade articulation and solar tubes with supporting vertically aligned framework along the north façade of Block 4N, will increase the likelihood of reflections along Broadway during these events.

Vertical fin elements to the northern facades will be required in lieu, and CPP have been in discussions with the designing architects regarding their configuration. In essence, it is recommended vertical fin be included to block high incident angle reflections whereby a fin depth ratio of 1:8 is adopted over much of the northern facades. This means the fin needs to be 1 unit for every 8 units of glazing width being protected, for example a framed glazing unit utilising a 200 mm deep fins placed at 1600 mm centres. Alternatively where the glazing is recessed behind an adjacent opaque wall of sufficient depth, fins will not be needed.

From the previous studies the additional relevant recommendation was for all areas of the northern façade of Block 1 and 4N and along the north half of the east façade of Block 4N to install cladding or glazing with a reflectivity coefficient of less than10%. The creation of the passage between the two buildings does not create any reflectivity concerns.

CONCLUSIONS

The general massing of the Frasers Block 4N is similar to that used in the wind tunnel testing conducted in August 2014. It is considered that the environmental wind conditions around the site will not change significantly with the proposed amendments to the geometry. The wind conditions in the majority of the areas surrounding these buildings, including the new pedestrian link, would be considered suitable for pedestrian standing activities and pass the distress criterion. The conditions would be expected to meet the City of Sydney DCP for non-active frontages.

The wind conditions in the relatively open ground floor area are expected to be suitable for pedestrian standing.

Solar reflections form the north façade in particular, have the potential to impact upon roadway locations on Broadway during certain periods of the year. The design of appropriate measures to mitigate these issues is being developed with the design team incorporating vertical fin elements projecting from the north façade.

I hope this is of assistance, please do not hesitate to contact me on 9551 2000 if you would like to discuss any aspect of this report.

Yours sincerely,

Graeme Wood
Director

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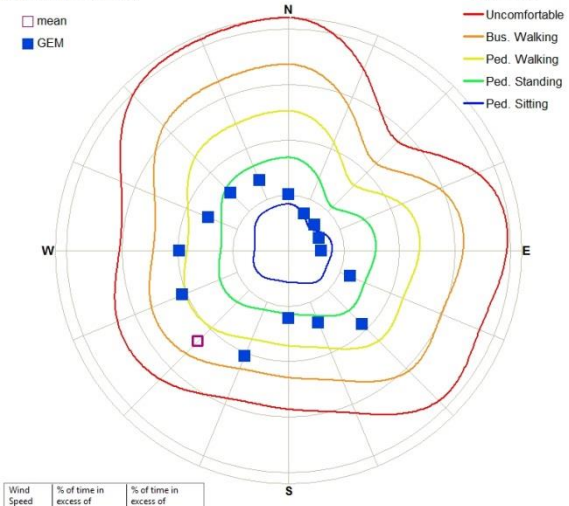
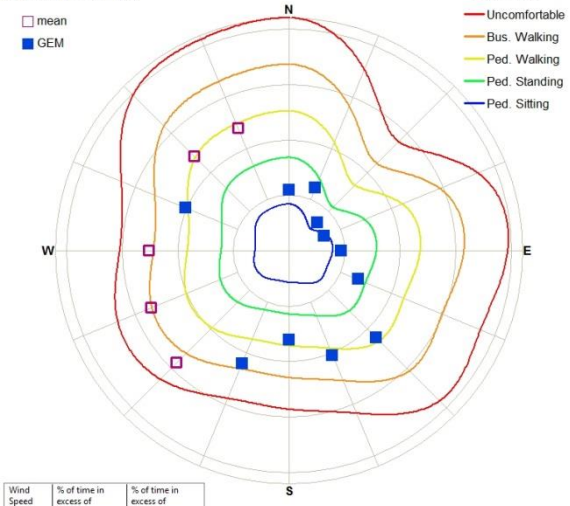
LOCATION 40



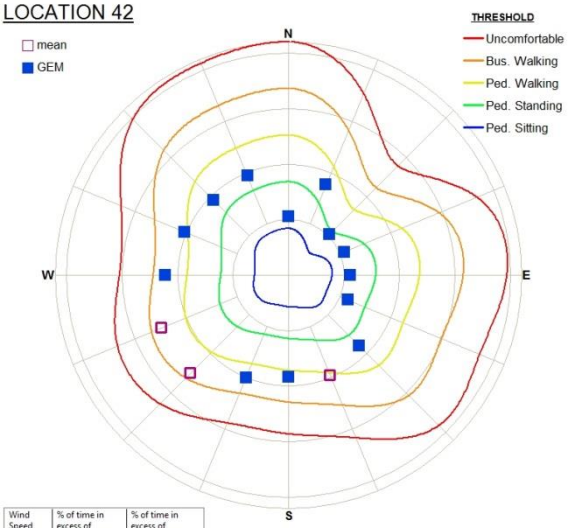
Wind Speed (m/s)	% of time in excess of Mean	% of time in excess of GEM
2.0	31.8	44.5
4.0	9.3	12.1
6.0	2.0	2.3
8.0	0.3	0.3
10.0	0.0	0.0
4.8	**5.0**	Ped Standing
10.3	**0.022**	Pass
5.1	Ped Standing	**5.0**
10.4	Pass	**0.022**

LOCATION 41



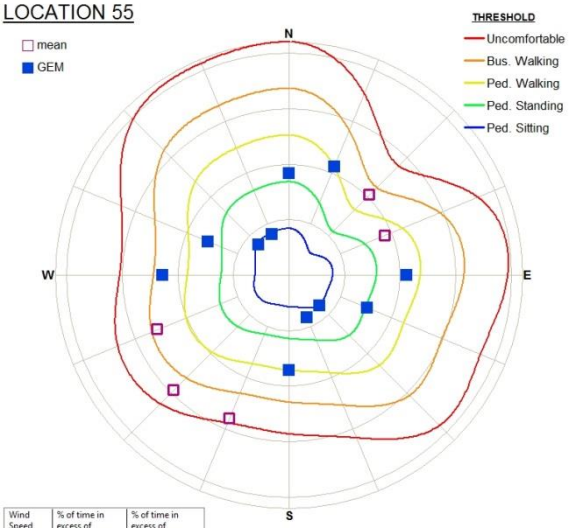
Wind Speed (m/s)	% of time in excess of Mean	% of time in excess of GEM
2.0	52.7	62.1
4.0	17.1	21.4
6.0	5.4	6.1
8.0	1.3	1.3
10.0	0.3	0.2
6.1	**5.0**	Ped Walking
12.9	**0.022**	Pass
6.2	Ped Walking	**5.0**
12.4	Pass	**0.022**

LOCATION 42



Wind Speed (m/s)	% of time in excess of Mean	% of time in excess of GEM
2.0	52.5	63.1
4.0	16.2	20.3
6.0	3.5	4.6
8.0	0.6	0.8
10.0	0.1	0.1
5.5	**5.0**	Ped Standing
11.1	**0.022**	Pass
5.8	Ped Standing	**5.0**
11.2	Pass	**0.022**

LOCATION 55



Wind Speed (m/s)	% of time in excess of Mean	% of time in excess of GEM
2.0	46.1	55.8
4.0	19.9	23.7
6.0	7.3	6.5
8.0	1.8	1.2
10.0	0.4	0.2
6.5	**5.0**	Ped Walking
13.7	**0.022**	Pass
6.3	Ped Walking	**5.0**
12.3	Pass	**0.022**

Figure 5: Directional wind results (cont.)

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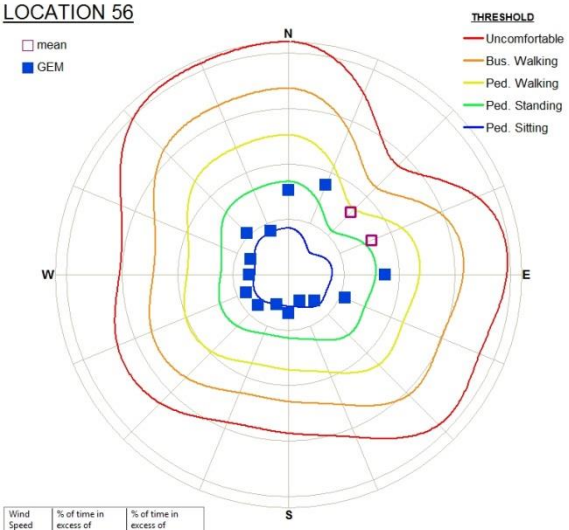
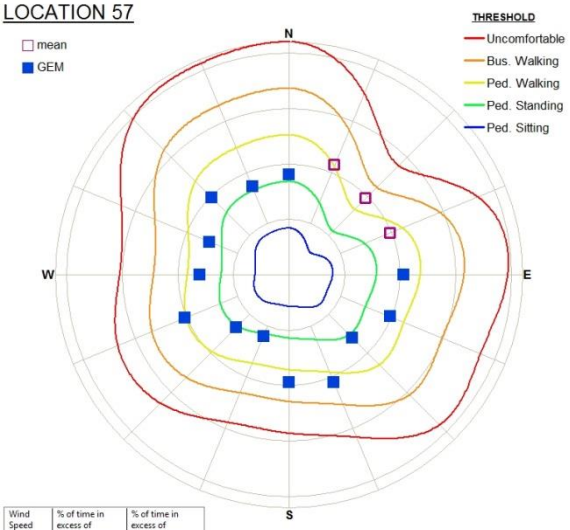
LOCATION 56



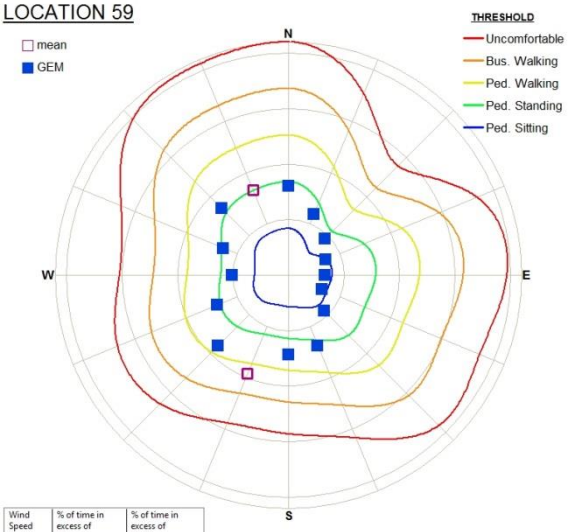
Wind Speed (m/s)	% of time in excess of Mean	% of time in excess of GEM
2.0	18.1	24.3
4.0	4.5	4.6
6.0	0.3	0.2
8.0	0.0	0.0
10.0	0.0	0.0
3.8	**5.0**	Ped Sitting
7.2	**0.022**	Pass
3.9	Ped Sitting	**5.0**
7.0	Pass	**0.022**

LOCATION 57



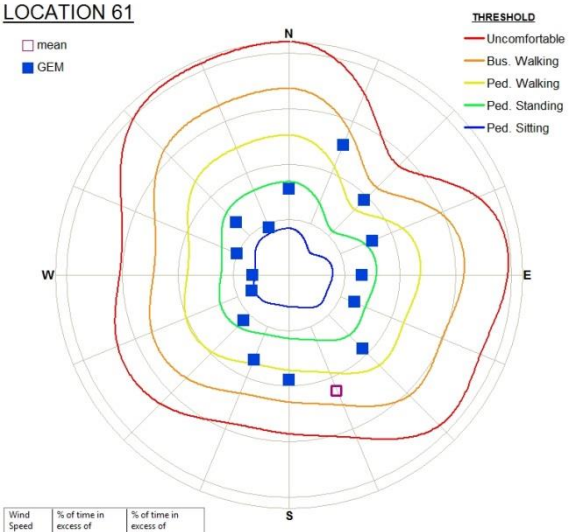
Wind Speed (m/s)	% of time in excess of Mean	% of time in excess of GEM
2.0	54.4	66.3
4.0	14.8	21.9
6.0	2.3	3.5
8.0	0.2	0.3
10.0	0.0	0.0
5.3	**5.0**	Ped Standing
9.5	**0.022**	Pass
5.7	Ped Standing	**5.0**
10.2	Pass	**0.022**

LOCATION 59



Wind Speed (m/s)	% of time in excess of Mean	% of time in excess of GEM
2.0	28.1	42.1
4.0	5.1	7.4
6.0	0.8	0.8
8.0	0.1	0.1
10.0	0.0	0.0
4.0	**5.0**	Ped Sitting
9.3	**0.022**	Pass
4.3	Ped Standing	**5.0**
9.0	Pass	**0.022**

LOCATION 61



Wind Speed (m/s)	% of time in excess of Mean	% of time in excess of GEM
2.0	39.7	50.7
4.0	14.3	18.8
6.0	2.7	4.2
8.0	0.2	0.4
10.0	0.0	0.0
5.3	**5.0**	Ped Standing
9.9	**0.022**	Pass
5.8	Ped Standing	**5.0**
10.2	Pass	**0.022**

Figure 5: Directional wind results (cont.)

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