PEDESTRIAN WIND ENVIRONMENT STATEMENT

197 CHURCH STREET, PARRAMATTA

WC413-01F02(REV4)- WS REPORT

3 MARCH 2015

Prepared for:

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EXECUTIVE SUMMARY

This report is in relation to a planning proposal for a site at 197 Church Street, Parramatta, and presents an analysis on the likely impact of the proposed building design on the local wind environment to 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 Sydney region; north-easterly, southerly and westerly winds. The analysis of the wind effects relating to the proposal was carried out in the context of the local wind climate, building morphology and land topography. The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the mark-up drawings which have been prepared by Robertson + Marks Architects, received 23 February 2015. No wind tunnel tests have been 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 Macquarie Street pedestrian footpath may be exposed to strong winds due to the side streaming of the westerly winds onto Macquarie Street. The downwash of the southerly winds is not expected to impact ground level wind conditions due to the large elevated openings through the southern aspect of the podium through to the eastern and northern aspects. This exposure to open air will allow for wind effects to dissipate along the Macquarie Street footpath.

To mitigate the potential effect of side streams from the westerly winds onto Macquarie Street, two options are suggested. It is recommended to incorporate an awning along the western and southern aspects of the tower base, above the podium. Alternatively, an awning at approximately 4.2m height from street level could be utilised along Macquarie Street, with a minimum width of at least 3m. Either one of these measures are expected to ameliorate the impact of the westerly winds on pedestrians on Macquarie Street.

A third optional item is suggested in the event the large elevated openings through the southern aspect of the podium through to the eastern and northern aspects are enclosed. If the podium is enclosed, an awning at approximately 4.2m height from street level should be utilised along Macquarie Street and wrapping around to Church Street, with a minimum width of at least 3m. This is expected to ameliorate the impact of the westerly winds on pedestrians on Macquarie Street, and to ameliorate the downwash effects onto Macquarie and Church Streets as a result of the enclosed podium.

The Podium Roof is expected to be exposed to a downwash effect from north to north-easterly winds, westerly winds and southerly winds, largely due to the height and exposure of the tower to these winds. To mitigate these wind effects, two optional items are suggested:

Optional Item 1: The inclusion of an awning that extends from the floor slab of the first typical tower floor, over the northern, western and southern aspects of the Podium Roof.

Optional Item 2: The inclusion of an awning that extends from the floor slab of the first typical tower floor, over the northern and western aspects of the Podium Roof, with a full height impermeable screen to meet the awning at the south-western corner. This screen could be comprised of glass or a similar transparent material. Note that if this optional item is utilised, the south-eastern edge of the podium will need to be made enclosed or non-trafficable to avoid exposure to downwash effects.

It is generally recommended to avoid corner balconies where both outer edges are open as it would expose these corner balconies to significant accelerated flow. If corner balconies are required then it would be good practise to provide a full-height screen or louvre panel along one of the outer edges.

With the recommendations of this report included in the final design, it is expected that suitable wind conditions can be achieved for all critical outdoor areas within and around the subject development.

1 DESCRIPTION OF THE SITE AND SURROUNDS

The subject site is located at 197 Church Street, Parramatta. The proposed development site is bounded by Marsden Street to the west, Macquarie Street to the south and Church Street to the east.

The development has an overall height of 250m above ground. The podium is exposed from the southern, eastern and northern aspects.

The subject development is shielded by surrounding mid to low-rise buildings. Aside from these buildings within close proximity, immediately to the north is a 12-storey high building bound by Marsden Street. The 21 storey high Commonwealth Centre is located directly to the west of the subject development, with the 12 storey high AMP Centre located to the south-west opposite Macquarie Street. An aerial image of the site location has been produced and is presented in Figure 1.

The trafficable outdoor areas associated with the proposed development, which are the focus for pedestrian wind effects in this assessment, are the pedestrian footpaths along the site, and the trafficable podium roof areas of the development.

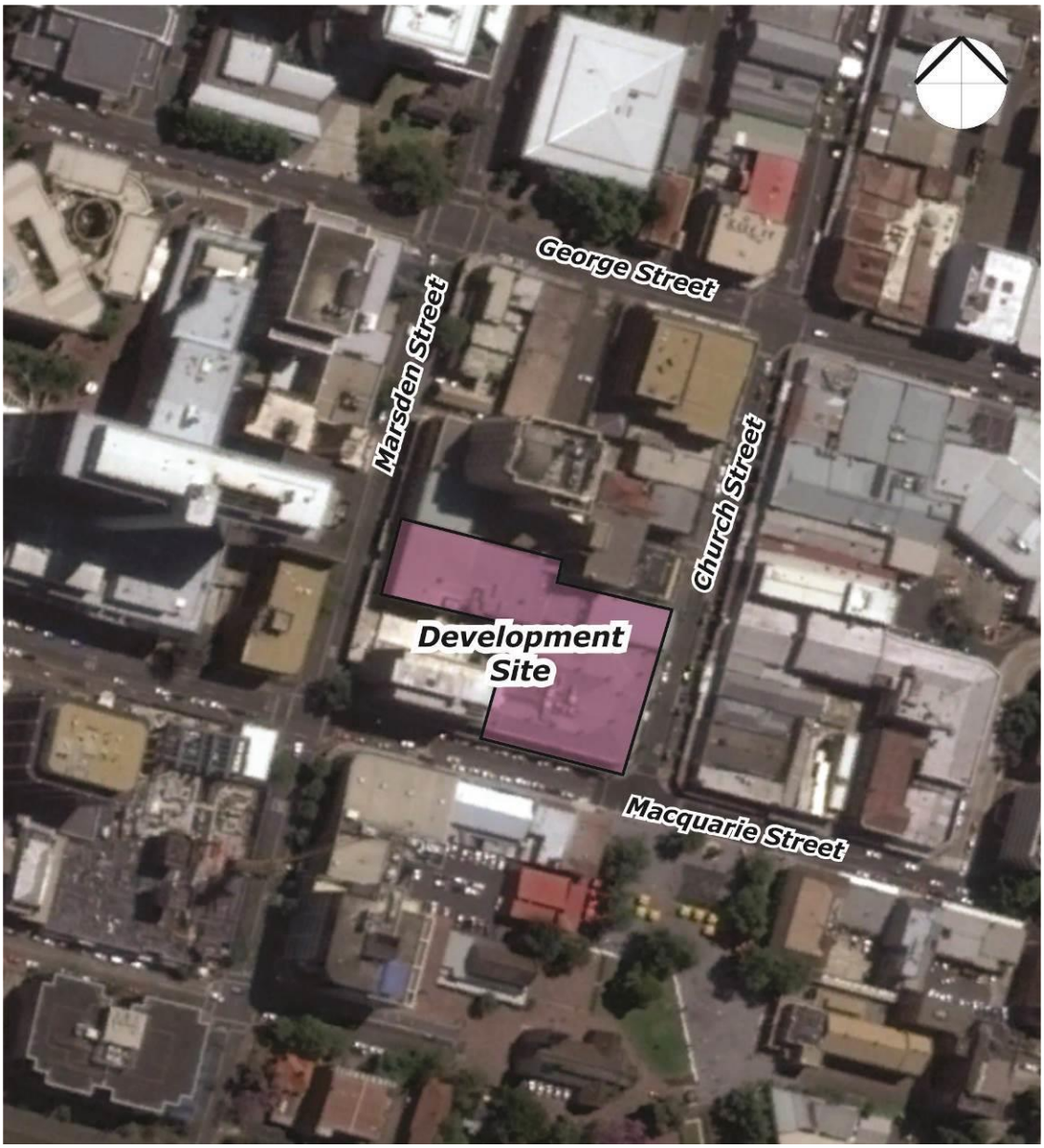

Figure 1: Aerial Image of the Proposed Development Site

2 WIND CLIMATE OF THE SYDNEY REGION

The Sydney region is governed by three principle wind directions, and these can potentially affect the subject development. These winds prevail from the north-east, south and west. A summary of the principal time of occurrence of these winds throughout the year is presented in Table 1 below. This summary is based on a detailed analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained at the meteorological station located at Kingsford Smith Airport by the Bureau of Meteorology (recorded from 1939 to 2008). From this analysis, a directional plot of the annual and weekly recurrence winds for the Sydney region is also determined, as shown in Figure 2. The frequency of occurrence of these winds is also shown in Figure 2.

As shown in Figure 2, the southerly winds are by far the most frequent wind for the Sydney region, and are also the strongest. The westerly winds occur most frequently during the winter season for the Sydney region, and although they are typically not as strong as the southerly winds, they are usually a cold wind since they occur during the winter and hence can be a cause for discomfort for outdoor areas. North-easterly winds occur most frequently during the warmer months of the year for the Sydney region, and hence are usually welcomed within outdoor areas since they are typically not as strong as the southerly or westerly winds.

Table 1: Principle Time of Occurrence of Winds for Sydney

Month	Wind Direction		
	North-Easterly	Southerly	Westerly
January	X	X	
February	X	X	
March	X	X	
April		X	X
May			X
June			X
July			X
August			X
September		X	X
October	X	X	
November	X	X	
December	X	X	

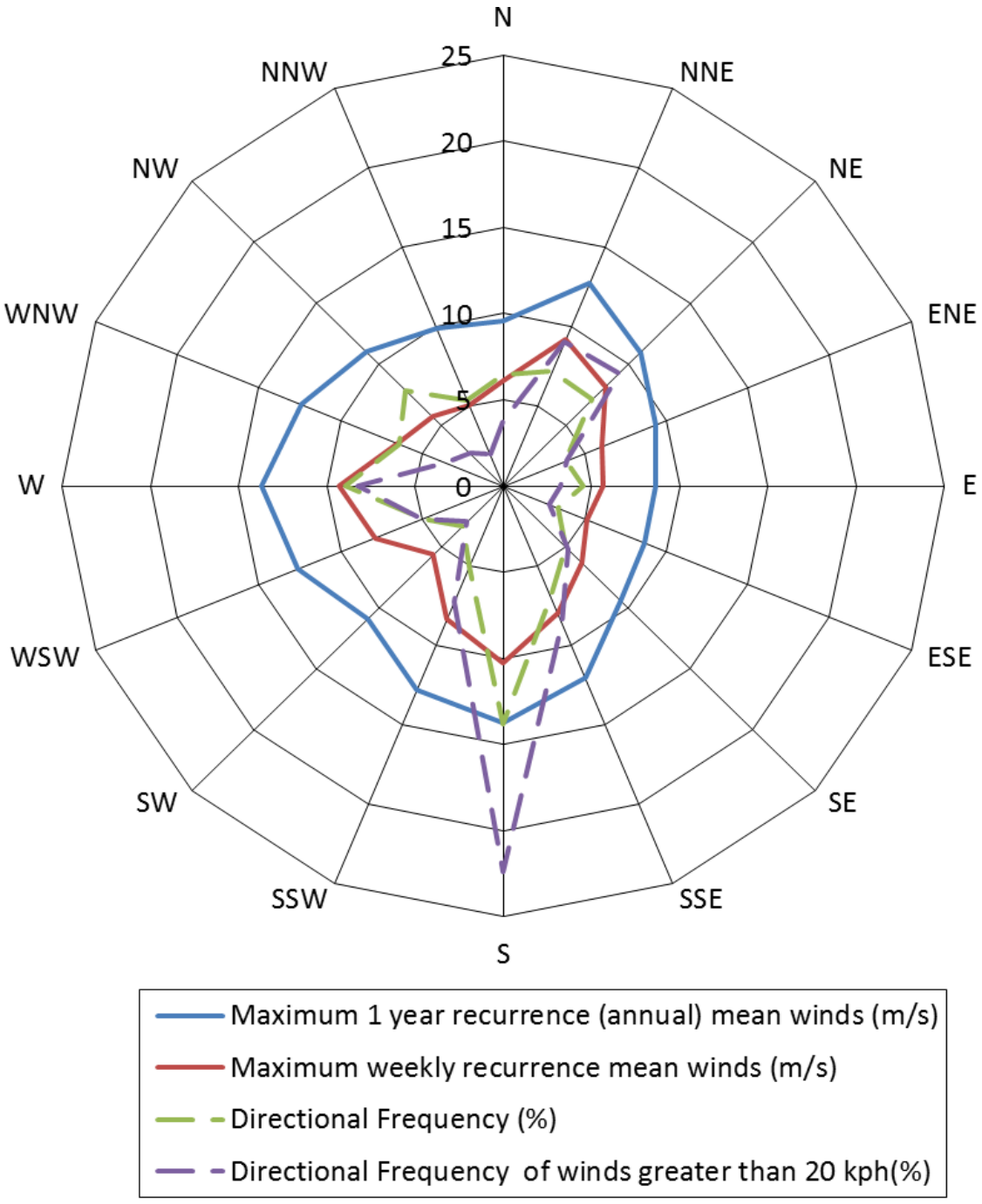

Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10-minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

3 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 Davenport, Lawson, Melbourne, Penwarden, etc, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. Some Councils and Local Government Authorities have also adopted elements of some of these into their planning control requirements in Australia. The following table is an example, which was developed by Penwarden in 1975, and describes the effects of various wind intensities on people. Note that the applicability column relates to the indicated wind conditions occurring frequently (exceeded approximately once per week on average). Higher ranges of wind speeds can be tolerated for rarer events.

Table 2: Summary of Wind Effects on People (Penwarden, 1975)

Type of Winds	Gust Speed (m/s)	Effects	Applicability
Calm, light air	0 - 1.5	Calm, no noticeable wind.	Generally acceptable for Stationary, long exposure activities such as in outdoor restaurants, landscaped gardens and open air theatres.
Light breeze	1.6 - 3.3	Wind felt on face.	
Gentle breeze	3.4 - 5.4	Hair is disturbed, Clothing flaps.	
Moderate breeze	5.5 - 7.9	Raises dust, dry soil and loose paper. Hair disarranged.	Generally acceptable for walking & stationary, short exposure activities such as window shopping, standing or sitting in plazas.
Fresh breeze	8.0 - 10.7	Force of wind felt on body.	Acceptable as a main pedestrian thoroughfare
Strong breeze	10.8 - 13.8	Umbrellas used with difficulty, Hair blown straight, Difficult to walk steadily, Wind noise on ears unpleasant.	Acceptable for areas where there is little pedestrian activity or for fast walking.
Near gale	13.9 - 17.1	Inconvenience felt when walking.	
Gale	17.2 -20.7	Generally impedes progress, Great difficulty with balance.	Unacceptable as a public accessway.
Strong gale	20.8 - 24.4	People blown over by gusts.	Completely unacceptable.

It should be noted 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 (rather than referencing specific wind speeds). Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

4 RESULTS AND DISCUSSION

The expected wind conditions are discussed in this section for the various outdoor areas within and around the subject development for each of the three predominant wind directions for the Sydney region. The interaction between the wind and the building morphology in the area was considered, and important features taken into account include the distances between the proposed building form, their overall heights and bulk, as well as the landform. Note that only the potentially critical wind effects are discussed in this report.

4.1 Street Level

The results of this assessment indicate that the Macquarie Street pedestrian footpath may be exposed to strong winds due to the side streaming of the westerly winds onto Macquarie Street. The downwash of the southerly winds is not expected to impact ground level wind conditions due to the large elevated openings through the southern aspect of the podium through to the eastern and northern aspects. This exposure to open air will allow for wind effects to dissipate along the Macquarie Street footpath.

To mitigate the potential effect of side streams from the westerly winds onto Macquarie Street, two options are suggested. As per Figures 3a and 3b, it is recommended to incorporate an awning along the western and southern aspects of the tower base, above the podium. Alternatively, an awning at approximately 4.2m height from street level could be utilised along Macquarie Street, as indicated in Figures 4a and 4b, with a minimum width of at least 3m. Either one of these measures are expected to ameliorate the impact of the westerly winds on pedestrians on Macquarie Street.

A third optional item is suggested in the event the large elevated openings through the southern aspect of the podium through to the eastern and northern aspects are enclosed. If the podium is enclosed, an awning at approximately 4.2m height from street level should be utilised along Macquarie Street and wrapping around to Church Street, with a minimum width of at least 3m. This is indicated in Figures 5a and 5b as *Optional Item 3*. This is expected to ameliorate the impact of the westerly winds on pedestrians on Macquarie Street, and to ameliorate the downwash effects onto Macquarie and Church Streets as a result of the enclosed podium.

4.2 Podium and Balconies

The Podium Roof is expected to be exposed to a downwash effect from north to north-easterly winds, westerly winds and southerly winds, largely due to the height and exposure of the tower to these winds. To mitigate these wind effects, two optional items are suggested:

Optional Item 1: The inclusion of an awning that extends from the floor slab of the first typical tower floor, over the northern, western and southern aspects of the Podium Roof, as indicated in Figures 3a and 3b.

Optional Item 2: The inclusion of an awning that extends from the floor slab of the first typical tower floor, over the northern and western aspects of the Podium Roof, with a full height impermeable screen to meet the awning at the south-western corner, as indicated in Figures 4a and 4b. This screen could be comprised of glass or a similar transparent material. Note that if this optional item is utilised, the south-eastern edge of the podium (highlighted blue in Figure 4a) will need to be made enclosed or non-trafficable to avoid exposure to downwash effects.

It is generally recommended to avoid corner balconies where both outer edges are open as it would expose these corner balconies to significant accelerated flow. If corner balconies are required then it would be good practise to provide a full-height screen or louvre panel along one of the outer edges.

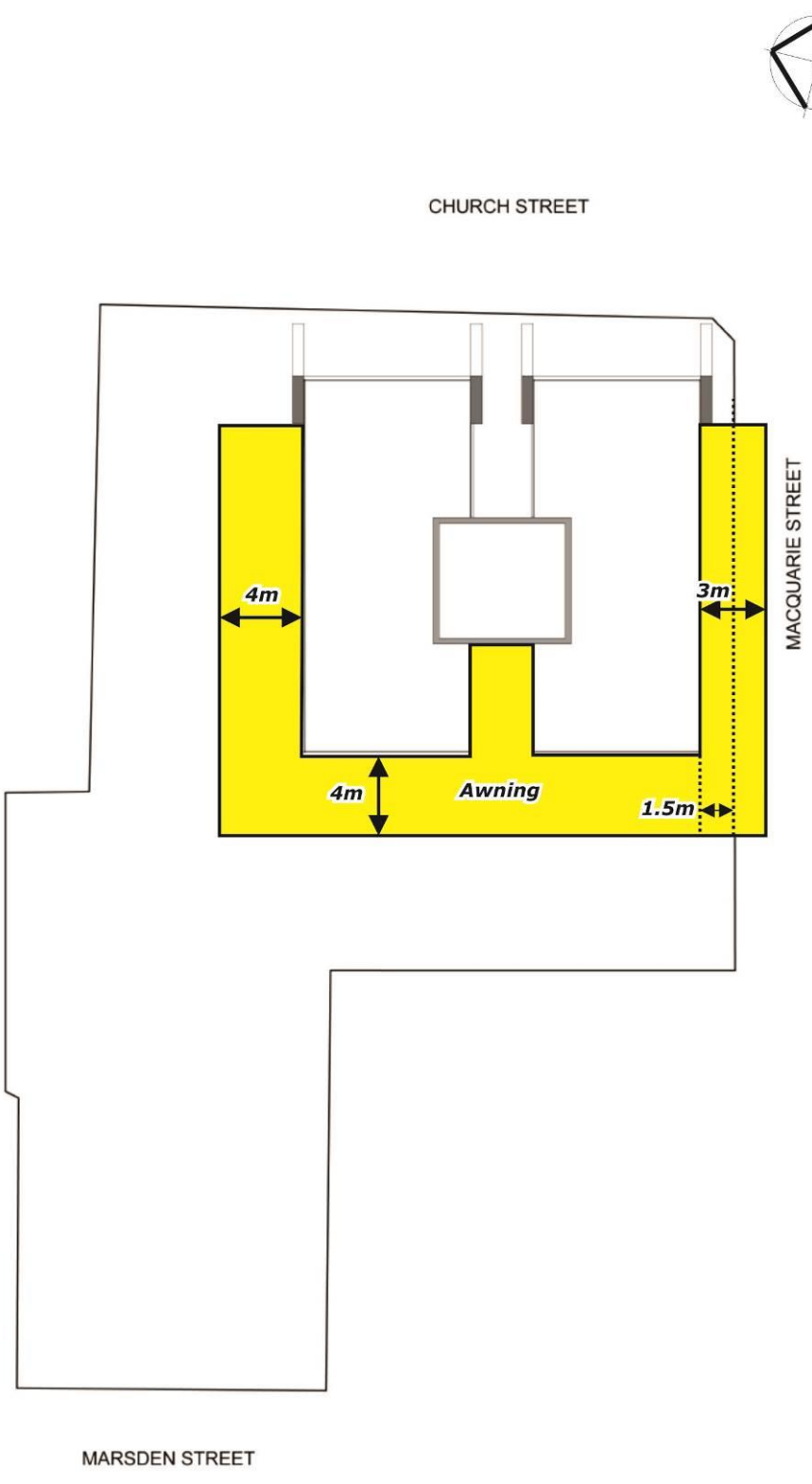

Figure 3a: Recommended Treatments – Podium Roof (Optional Item 1)

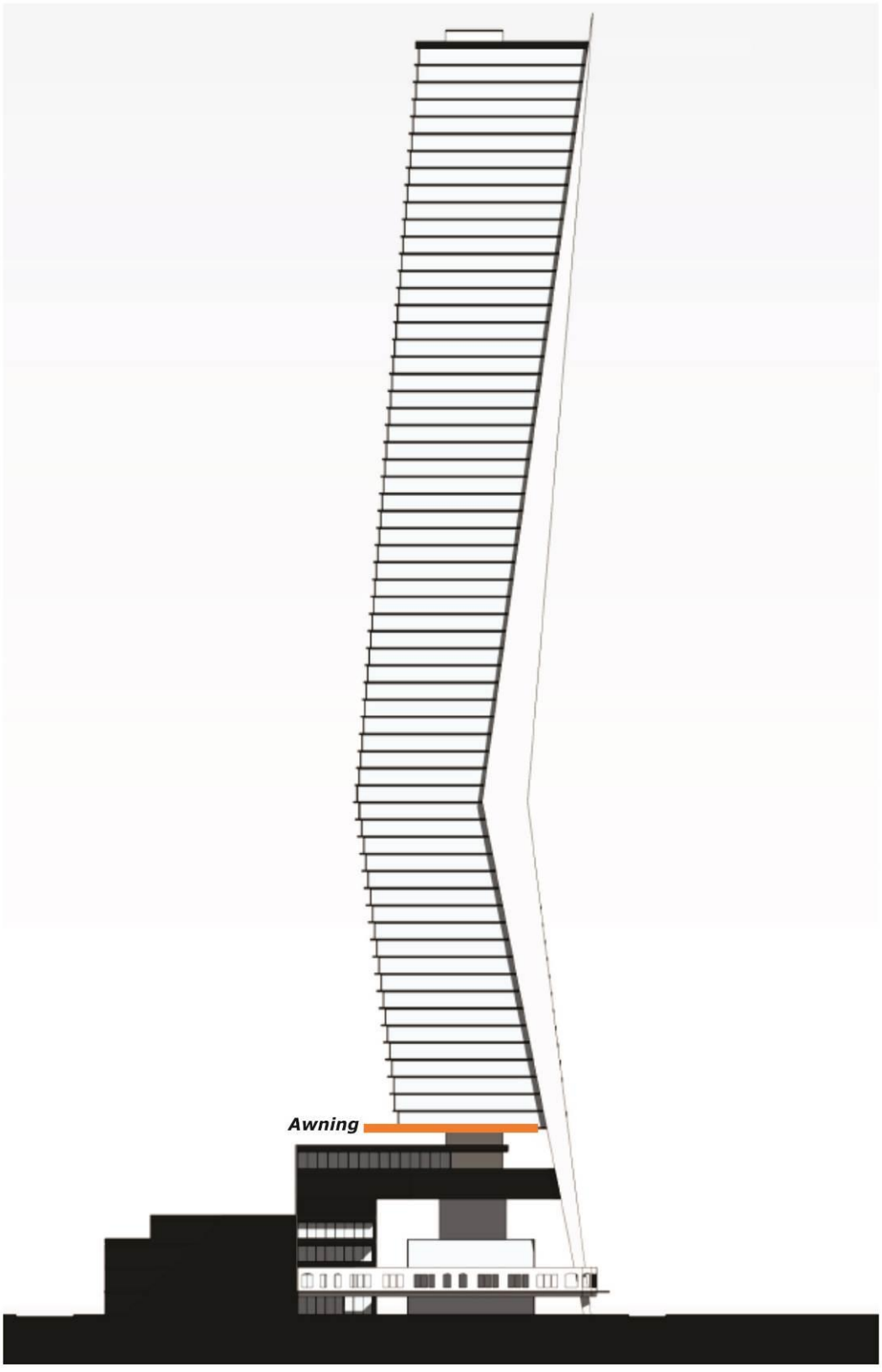

Figure 3b: Recommended Treatments – Southern Elevation (Optional Item 1)

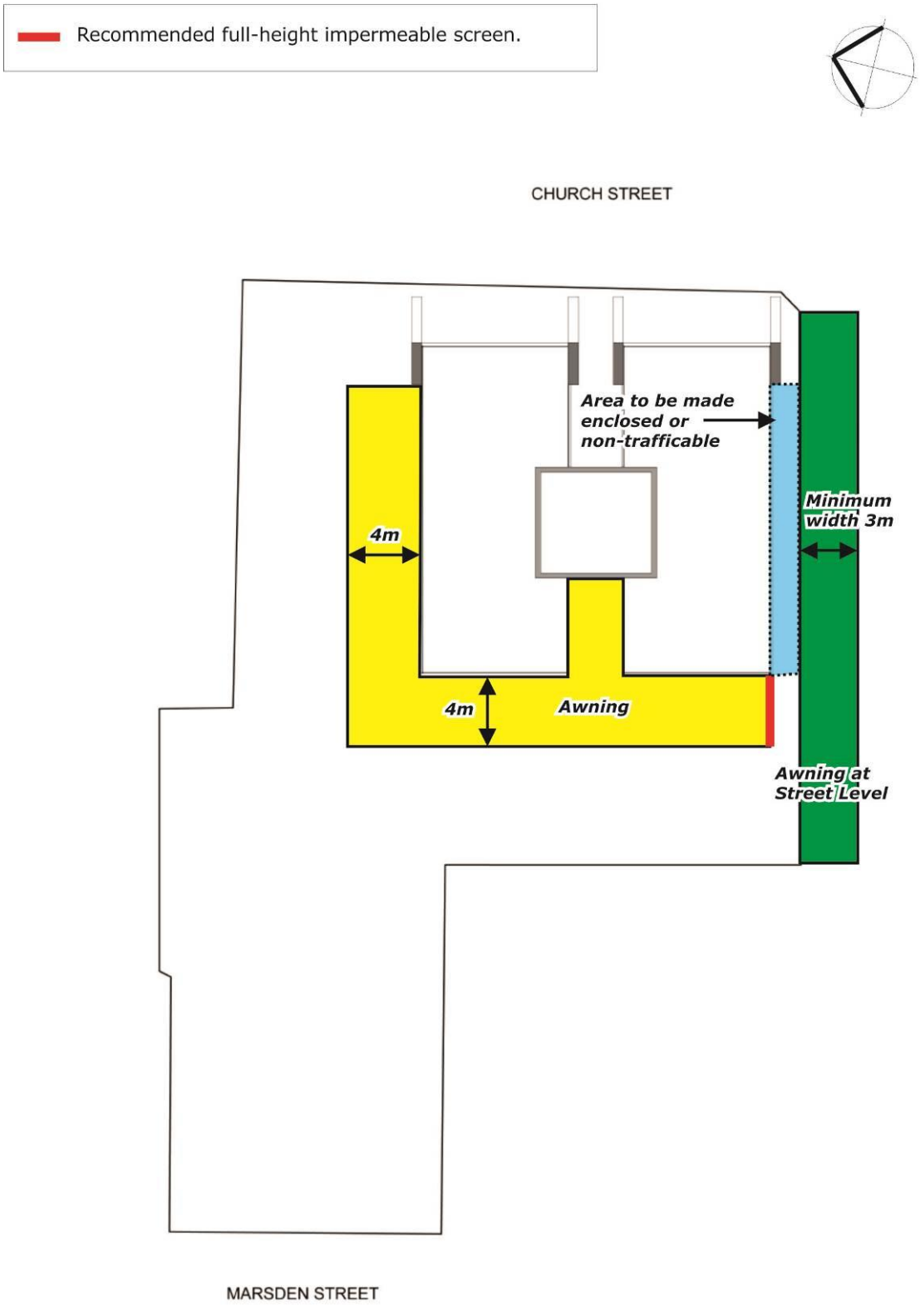

Figure 4a: Recommended Treatments – Podium Roof and Street Level (Optional Item 2)

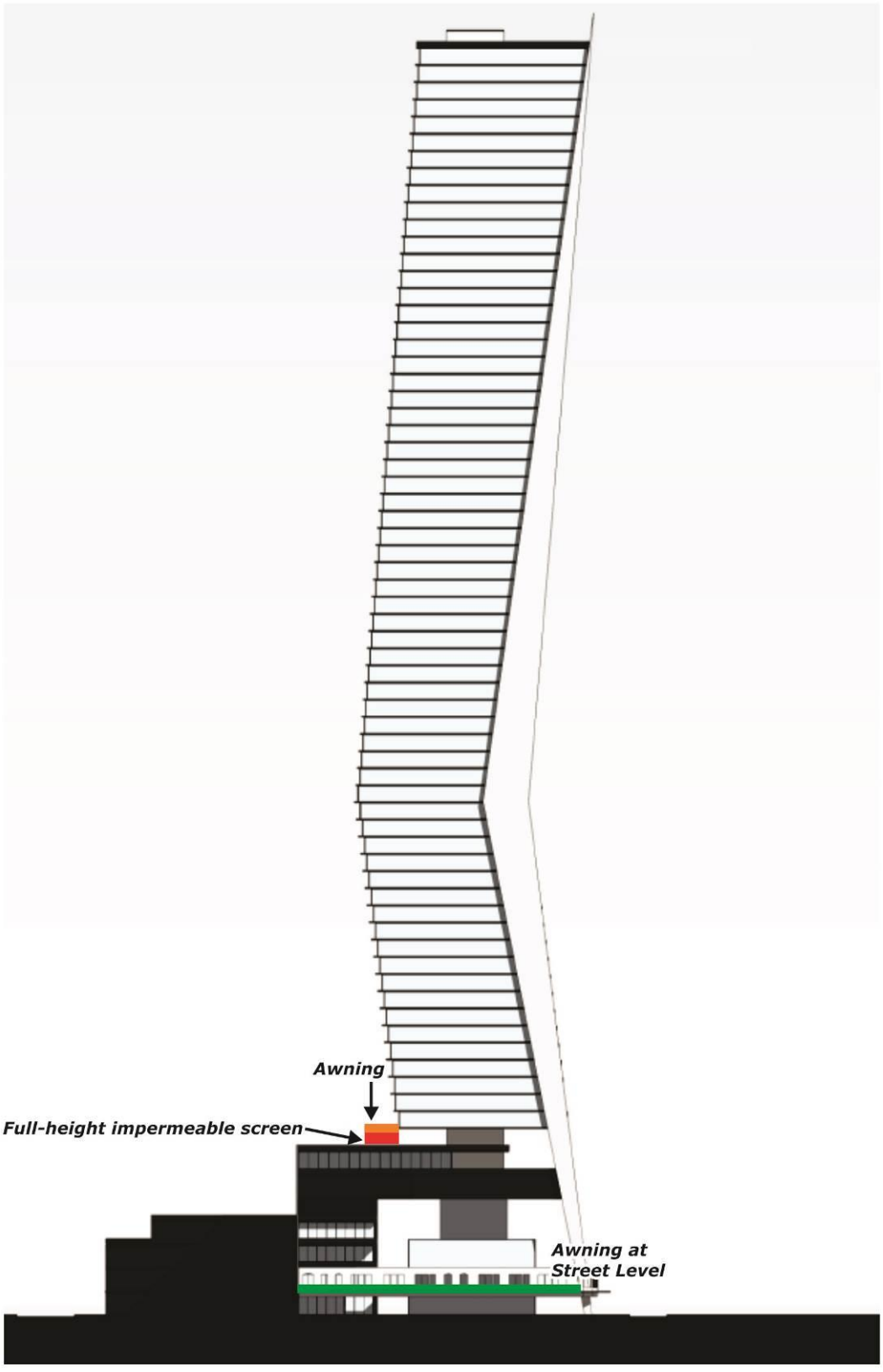

Figure 4b: Recommended Treatments – Southern Elevation (Optional Item 2)

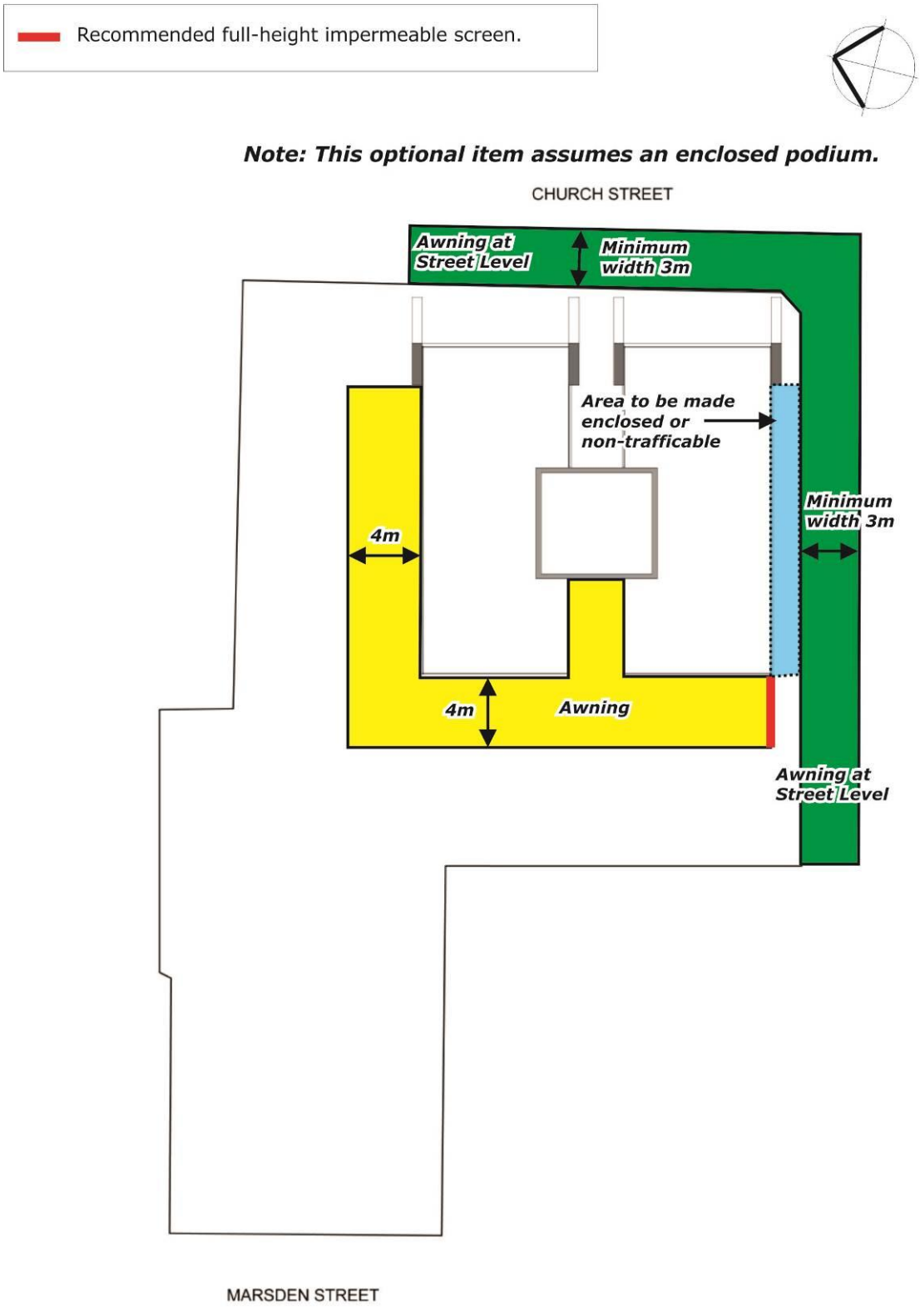

Figure 5a: Recommended Treatments – Podium Roof and Street Level (Optional Item 3)

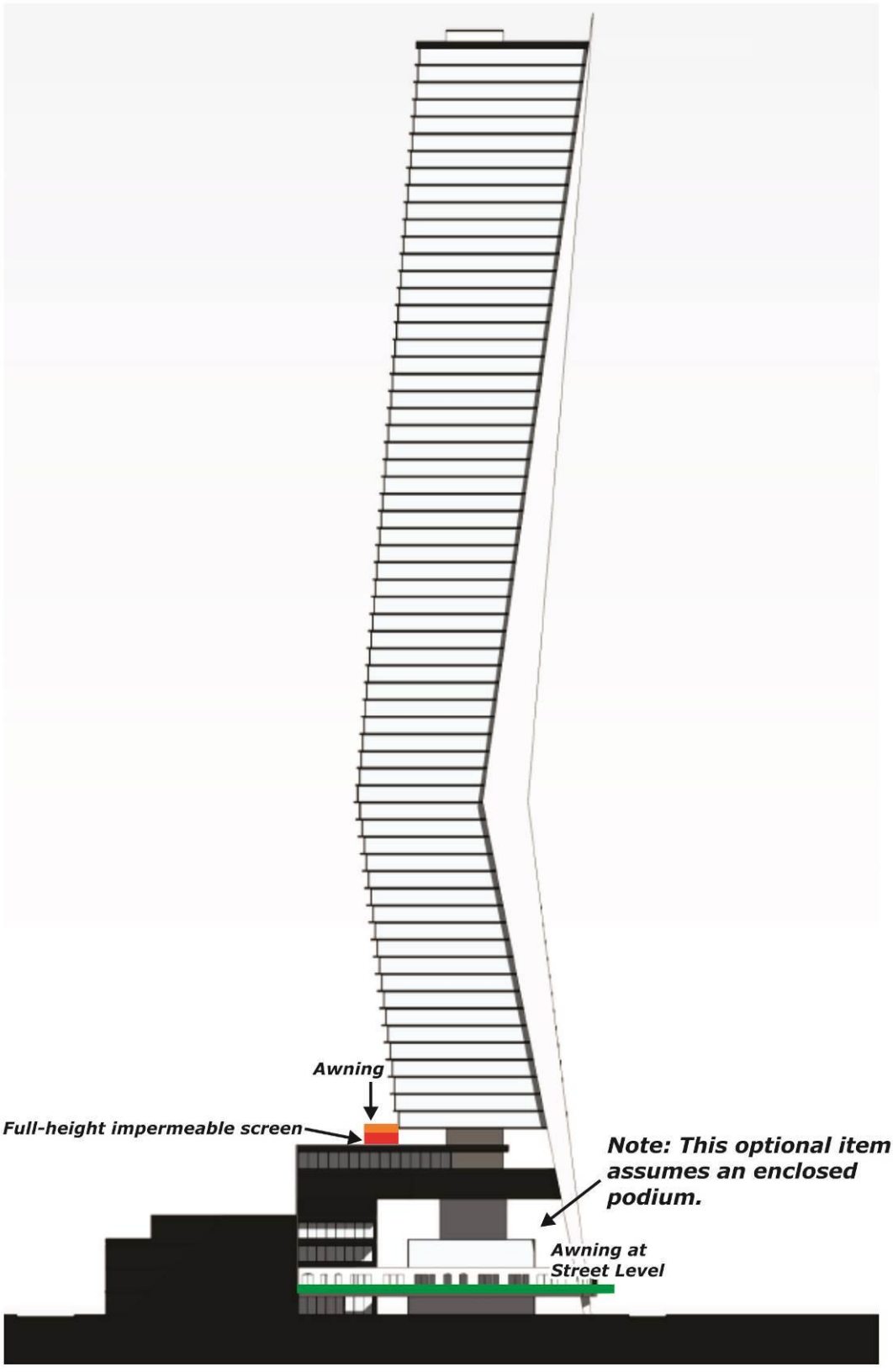

Figure 5b: Recommended Treatments – Southern Elevation (Optional Item 3)

5 CONCLUSION

An analysis of the wind environment impact with respect to the three principal wind directions for the Sydney region has been completed in relation to a planning proposal for a site at 197 Church Street, Parramatta, and presents an analysis on the likely impact of the proposed building design on the local wind environment to 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 Sydney region; north-easterly, southerly and westerly winds. The analysis of the wind effects relating to the proposal was carried out in the context of the local wind climate, building morphology and land topography. The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the mark-up drawings which have been prepared by Robertson + Marks Architects, received 23 February 2015. No wind tunnel tests have been 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.

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