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Proposed Building Alteration and Extension
1 Lawson Square Redfern
Qualitative Wind Impact Assessment

Report Number 610.11623-R4

10 September 2013

Lawson Square Pty Ltd
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Level 9, 219 Castlereagh Street
SYDNEY NSW 2000

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Proposed Building Alteration and Extension

1 Lawson Square Redfern

Qualitative Wind Impact Assessment

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Executive Summary

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Lawson Square Pty Ltd to undertake a qualitative wind impact assessment of the proposed alterations and additions to the existing office towers at 1 Lawson Square, Redfern. The assessment forms part of the Development Application to the Sydney City Council and to accompany the Environmental Impact Statement (EIS).

The proposed development site is at 1 Lawson Square, Redfern. The site is bounded by Lawson Square to the north, Redfern Street Laneway (pedestrian link) to the south, Regent Street to the east and Gibbon Street to the west. The site currently accommodates a two tower commercial development (12 levels in height) with basement. Minor landscaping is provided along the footpath of Lawson Square and at ground level between the towers.

The proposed development comprises an 18 storey mixed use development with commercial/retail use provided at the ground floor level over one (1) level of basement car park. The western tower (Tower 1) proposes commercial space from levels 1 to 5. Levels 6 to 17 will be residential. The eastern tower (Tower 2) will be residential from Levels 1 to 17.

The existing towers with rectangular floor plans will be altered to incorporate articulated balconies to the north and some extensions along other facades

Sydney's Prevailing Winds

The Sydney wind climate is characterised by dominant (prevailing) north-easterly, westerly and southerly winds. While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and south winds generally provide the strongest gusts during summer. West quadrant winds (southwest to northwest) provide the strongest winds for the whole year.

Existing Wind Environment

Existing street level wind conditions in the vicinity of the site are likely to be close to and even exceeding the 16 m/sec "*walking comfort*" criterion for many prevailing wind directions given the degree of shielding afforded to the site by surrounding buildings, existing downwash winds on the existing 1 Lawson Square Building. Adverse winds of more than 16 m/sec are likely to be present along Lawson Square and Gibbons Street due to the streets alignments in the same directions as the prevailing winds (west and south) in Sydney.

Adverse winds of 16 m/s or more are likely to affect the residential tower at 157 Redfern Street due to limited blockage upstream conditions (eg. limited shielding from west-north west) and existing Winds channelling along Redfern Street Laneway.

Future Wind Environment

In terms of future wind environment around the proposed development, the following features of the development are noted as being of most significance:

- Downwash winds are mitigated by the proposed large awning over the Redfern Street Laneway and the proposed landscaping along the footpaths, protecting the pedestrians.
- Winds accelerating around the proposed towers corners and impacting on pedestrian footpaths
- Winds funnelling in between the proposed towers and the 18-storey tower on the immediate south to the proposed development site.

Executive Summary

- Additional shielding from horizontal and vertical windflows provided by the proposed trees along the footpaths around the development.
- The proposed landscaping as shown in the site plan in **Figure 5**, will help disperse and mitigate existing adverse windflows channelling along the footpaths and will improve the existing wind conditions around the site.

Amelioration measures (refer **Section 6**) have been recommended to mitigate any adverse wind flow conditions identified above.

Accordingly, it has been predicted that ground levels wind speeds within
all public access areas surrounding the development
should remain at their present levels or ameliorate the wind conditions
with the addition of the proposed development and its wind mitigation treatments.

The above analysis has been made on the basis of our best engineering judgment and on the experience gained from model scale wind tunnel testing or Computational Fluid Dynamics (CFD) analysis of a range of developments of similar magnitude to the currently proposed development. The analysis can be confirmed via model scale wind tunnel testing or computational fluid dynamics analysis during the detailed design phase of the project.

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1 INTRODUCTION

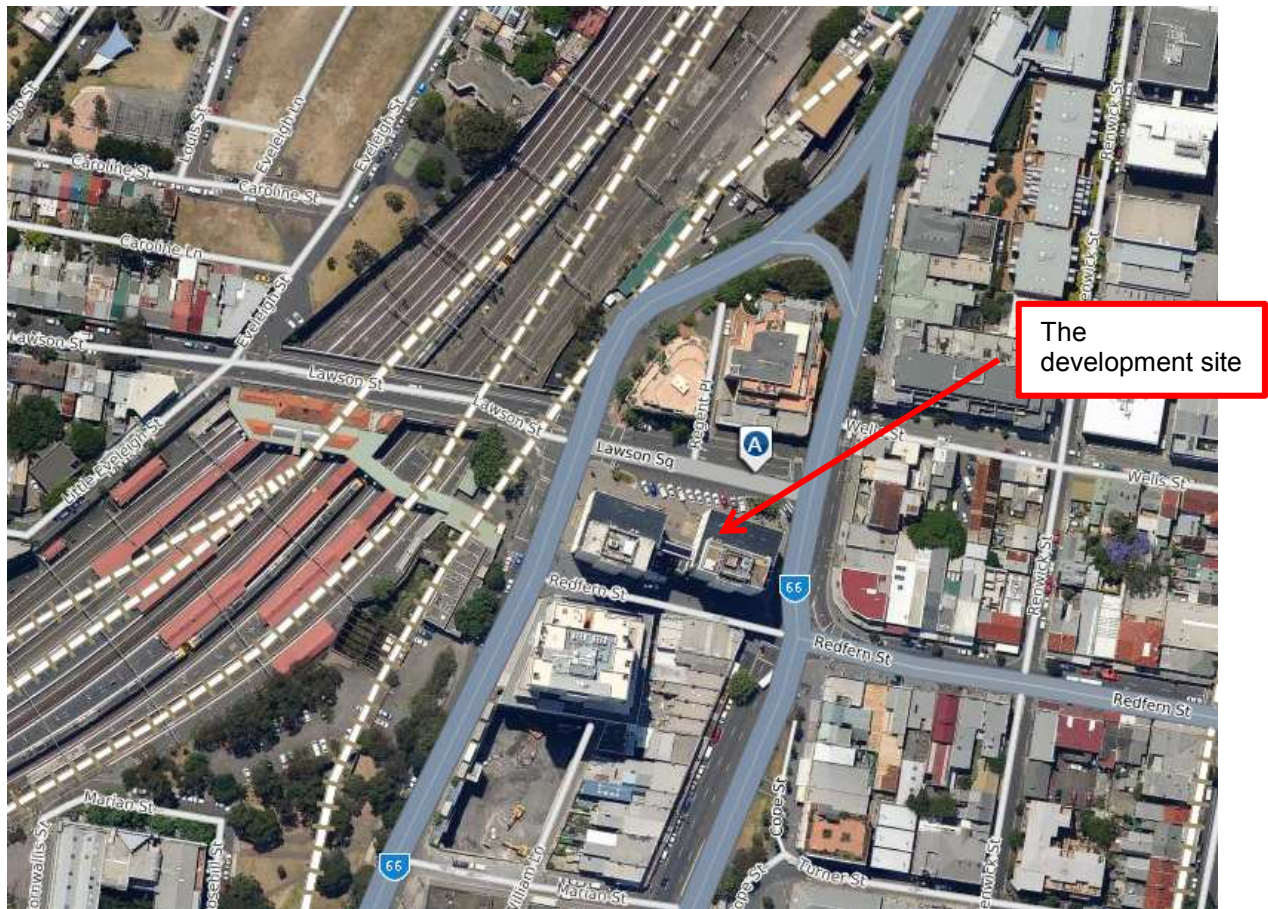
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1.1 Development Site

The proposed development site is at 1 Lawson Square, Redfern. The site is bounded by Lawson Square to the north, Redfern Street Laneway (pedestrian link) to the south, Regent Street to the east and Gibbons Street to the west. The site currently accommodates a two tower commercial development (12 levels in height) with basement. Minor landscaping is provided along the footpath of Lawson Square.



Figure 1 Site Location



The character of the immediate locality is mixed, and includes residential, commercial and public use buildings. To the north, on the opposite side of Lawson Square, there are commercial and residential properties comprising a two (2) storey commercial building named Redfern House built in 1904 and seven (7) storey mixed use residential and commercial building named Lawson Point. To the east, on the opposite side of Regent Street, is a mixed use commercial and residential five (5) storey building, various two (2) and three (3) storey commercial buildings.

Redfern Train station is located on the west of the site (on the west of Gibbons Street) and high-rise 18-storey 157 Redfern Street residential tower is on the immediate south to the proposed western tower. Being close to Redfern Station, there are a lot of public activities around the site (e.g. pedestrians walking along Redfern Street and Lawson Square to and from the station, etc)

Figure 2 Photo of Existing Site – View from the Southwest

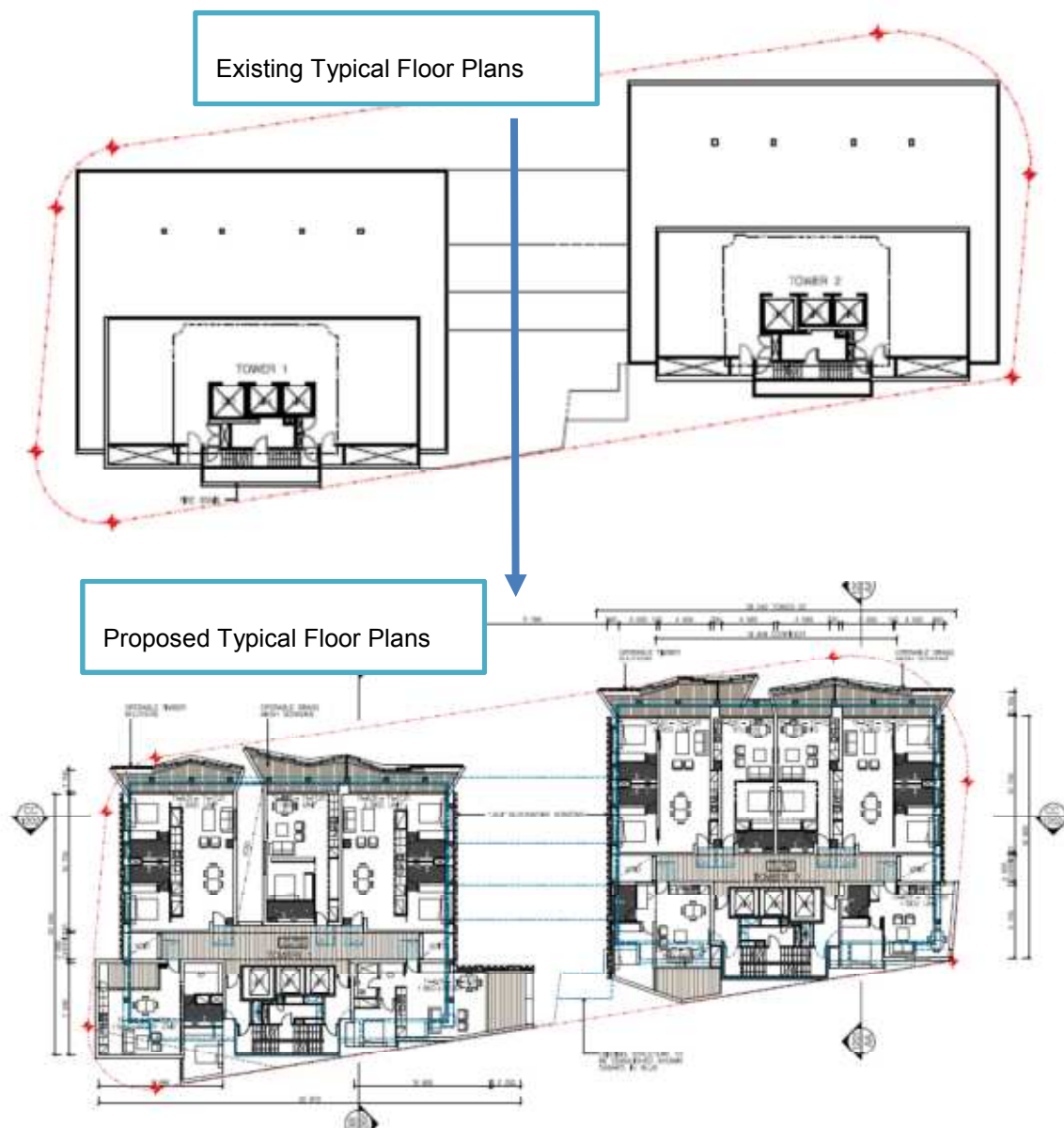


1.2 Proposed Alterations and Additions

The proposed development comprises an 18 storey mixed use development with commercial/retail use provided at the ground floor level over one (1) level of basement car parking. The western tower (Tower 1) proposes commercial space from levels 1 to 5. Levels 6 to 17 will be residential. The eastern tower (Tower 2) will be residential from Levels 1 to 17.

The existing towers with rectangular floor plans will be altered to incorporate articulated balconies to the north and some extensions along other facades as shown in **Figure 3**.

Figure 3 Conversion of Typical Floor Plans



2 SYDNEY'S WIND CLIMATE

The data of interest in this study are the annual extreme, mean hourly wind speeds and largest gusts experienced throughout the year, how these winds vary with azimuth, and the seasonal break-up of winds into the primary Sydney wind seasons.

2.1 Seasonal Winds

In relation to key characteristics of the Sydney Region Wind Climate (refer wind roses provided in **Appendix A**) relevant to the wind impact assessment of the proposed development, we note that Sydney is affected by two primary wind seasons:

- Summer winds occur mainly from the northeast, southeast and south.
 - While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and south winds generally provide the strongest gusts during summer.
- Winter/Early Spring winds occur mainly from the west and the south.
 - West quadrant winds (southwest to northwest) provide the strongest winds during winter and in fact for the whole year.

2.2 Wind Exposure at the Site – the “Local” Wind Environment

Close to the ground, the “regional” wind patterns described above are affected by the local terrain and topography.

- The development site receives reasonable shielding at lower levels from the low to high-rise developments surrounding the development site.
- The site is somewhat more exposed to winds from the southwest quadrant due to the channelling along the railway line in close proximity to the proposed development.

3 WIND ACCEPTABILITY CRITERIA

3.1 Standard Local Government Criteria

The choice of suitable criteria for evaluating the acceptability of particular ground level conditions has been the subject of relatively recent research. The acceptability criteria that have been developed from this research and currently referenced by most Australian Local Government Development Control Plans have been summarised below in **Table 1**.

Table 1 Standard Local Government Wind Acceptability Criteria

Type of Criteria	Limiting Gust Wind Speed Occurring Once Per Year	Activity Concerned
Safety	24 m/s	Knockdown in Isolated Areas
	23 m/s	Knockdown in Public Access Areas
Comfort	16 m/s	Comfortable Walking
	13 m/s	Standing, Waiting, Window Shopping
	10 m/s	Dining in Outdoor Restaurant

The primary objectives relating to the above wind impact criteria are as follows:

- The general objective is for annual 3-second gust wind speeds to remain at or below the so-called 16 m/sec “*Walking Comfort*” criterion. Whilst this magnitude may appear somewhat arbitrary, its value represents a level of wind intensity which the majority of the population would find unacceptable for comfortable walking on a regular basis at any particular location.
- In many urban locations, either because of exposure to open water conditions or because of street “canyon” effects, etc, the 16 m/sec “*Walking Comfort*” level may already be currently exceeded. In such instances a new development should ideally not exacerbate existing adverse wind conditions and, wherever feasible and reasonable, ameliorate such conditions.
- It can be seen in **Table 1** that the recommended limiting wind speeds for spaces designed for activities such as seating, outdoor dining, etc, are lower than for “walking comfort”.

3.2 Application of Standard Council Wind Criteria

The criteria provided in **Table 1** should not be viewed as “*hard*” numbers as the limiting values were generally derived from subjective assessments of wind acceptability. Such assessments have been found to vary with the height, strength, age, etc, of the pedestrian concerned.

A further factor for consideration is the extent of windy conditions, and some relaxation of the above criteria may be acceptable for small areas under investigation provided the general site satisfies the relevant criteria.

Finally, it is noted that the limiting wind speed criteria in **Table 1** are based on the maximum wind gust occurring (on average) once per year. Winds at all other times, ie monthly winds, weekly winds, etc, would be of lesser magnitude. So for example, a location with a maximum annual gust of 10 m/sec would experience winds throughout the year of a generally very mild nature, conducive to stationary activities (seating, dining, etc).

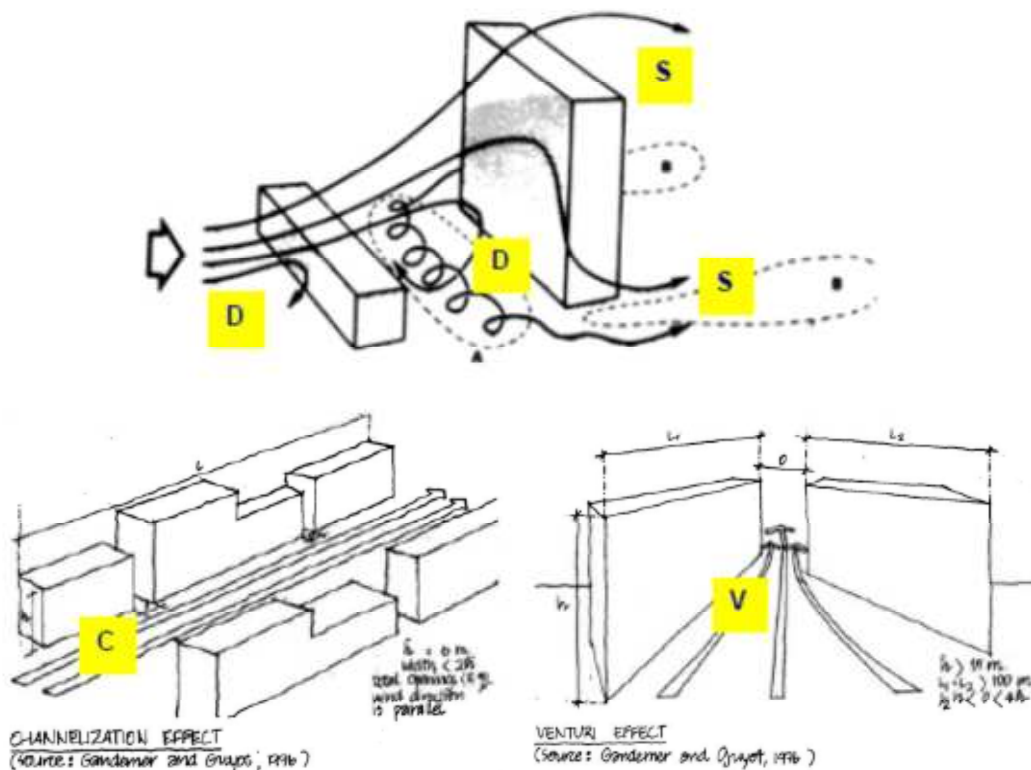
4 BUILDING-WIND INTERACTION – SOME GENERAL OBSERVATIONS

The impact of wind flowing past buildings has well known general impacts at ground level – refer **Figure 4**:

- **Downwash winds “D”** are the winds which impact on the windward face of a building and are then deflected downwards to ground level in a vertical direction
- Accelerating **Shearflow winds “S”** are the winds which experience an acceleration as they pass by the building edges and roof as the windflow moves around and past the building

In general, the taller the building, the more pronounced the impact on ground level winds. Local building details can also influence winds in the immediate vicinity, eg building undercrofts are often associated with local acceleration of winds.

Figure 4 Windflow Patterns Past Regular Shaped Buildings



The grouping of buildings can also have an impact on resulting pedestrian winds – refer **Figure 4**:

- **Canyon Effect winds “C”** result when there are rows of parallel buildings (especially taller ones) where the gaps in between line up with prevailing wind directions.
- **Venturi Effect winds “V”** result when windflow is forced to pass between two converging buildings or groups of buildings with a resulting increase in flow.

5 WIND IMPACT OF THE PROPOSED DEVELOPMENT

5.1 Existing Winds – Wind Impact and Effects

Existing street level wind conditions in the vicinity of the site are likely to be close to and even exceeding the 16 m/sec “*walking comfort*” criterion for many prevailing wind directions given the degree of shielding afforded to the site by surrounding buildings, existing downwash winds on the existing 1 Lawson Square Building. Adverse winds of more than 16 m/sec are likely to be present along Lawson Square and Gibbons Street due to the streets alignments in the same directions as the prevailing winds (west and south) in Sydney.

Northeast Winds

Reasonable shielding is available to the north and northeast from the low-rise commercial buildings. In addition, northeast winds are generally mild and the potential therefore for exceedance of the 16 m/sec criterion along the pedestrian pathways at the site is small, i.e. occurrences, if any, are likely to be very infrequent.

South Quadrant (Southeast to Southwest) Winds

The potential for stronger wind conditions (ie exceeding the 16 m/sec criterion) to occur from the south clockwise around to the southwest is moderate, given the degree of shielding provided by upstream buildings and alignment of local streets.

Westerly Winds

To the west, which provides the highest winds affecting the Sydney region, the proposed development site is affected by these strong winds due to the low level of wind mitigation from the west and alignment of local streets

Existing upper level wind conditions at the site are likely to exceed the 16 m/sec “*walking comfort*” criterion for stronger prevailing wind directions (eg west) given the absence of surrounding buildings of significant height. Shielding will be provided by the under-construction 18-storey residential tower to the immediate south of the west tower of the proposed development.

5.2 Future Winds – Predicted Windflow Patterns

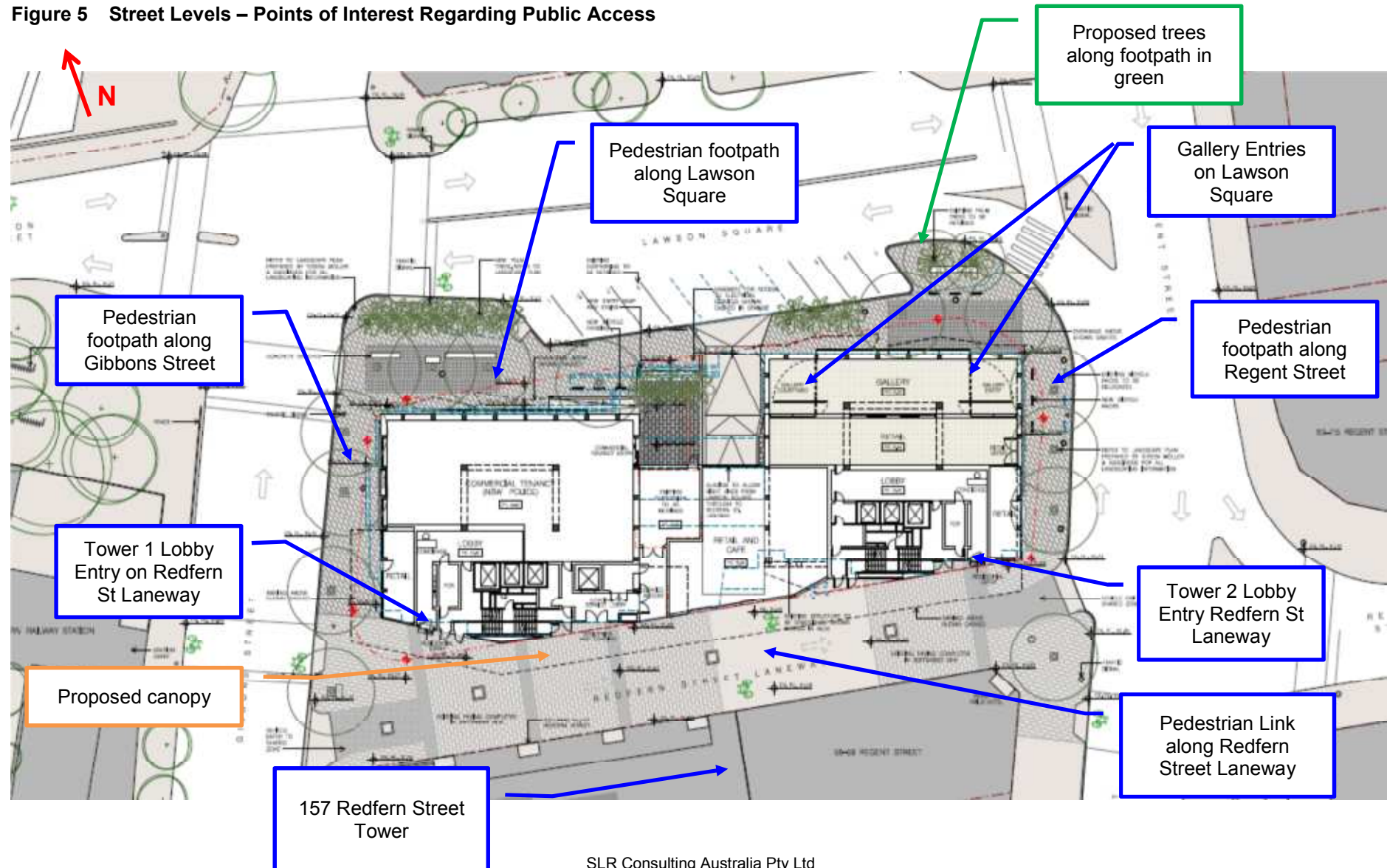
The following sections analyse the expected impacts of the proposed development on the pedestrian wind environment in the adjacent streetscape. The mitigation of wind impact has been considered in the amended development application and the design of the proposal has subsequently been modified. For example: the addition of an awning over the pedestrian laneway along the south façade.

The wind impact of the proposed development is described by examining the impact of prevailing wind conditions on all public access areas of interest within and external to the development.

The analysis is made on the basis of our best engineering judgement and on the experience gained from model scale wind tunnel testing of a range of developments of similar magnitude to the currently proposed development.

Area of interest (i.e. surrounding footpaths, primary entry points, internal public access areas, seating and dining areas, etc.) are identified in **Figure 5**.

Figure 5 Street Levels – Points of Interest Regarding Public Access



5.3 Northeast Winds

Location	Wind Impact
Pedestrian Footpath along Lawson Square	Potential impact here should be approaching the 16 m/sec, affected by (existing condition): - Shielding from upstream buildings and existing landscaping - Shielding from proposed landscaping - Downwash caused by wind impacting on the north façade of the proposed development and diverted towards the ground.
Gallery entries on Lawson Square	Potential impact here should be less than the 16 m/sec, affected by : - Shielding from upstream buildings and proposed landscaping - Downwash caused by wind impacting on the east façade of the proposed development and diverted towards the ground is mitigated by the awnings and balconies above.
Pedestrian Footpath along Regent Street	Potential impact here should be less than or close to the 16 m/sec, affected by (existing condition): - Shielding from upstream buildings and existing and proposed landscaping - Downwash caused by wind impacting on the east façade of the proposed development and diverted towards the ground.
Tower 2 Lobby Entry on Redfern St Laneway	Potential impact here should be less than or close to the 16 m/sec, affected by (existing condition): Shielding from upstream buildings and proposed development itself
Pedestrian Link along Redfern Street Laneway	Potential impact here should be less than the 16 m/sec, affected by (existing condition): - Shielding from proposed development itself. - Wind acceleration around the southeast corner of Tower 2 and impact on the Regent Street entrance of the pedestrian link. - Wind funnelling in between the two towers and impacting on this area. - Mitigation via proposed landscape
Tower 1 Lobby Entry on Redfern St Laneway	Potential impact here should be less than the 16 m/sec, affected by: Shielding from proposed development itself and upstream buildings
Pedestrian Footpath along Gibbons Street	Potential impact here should be less than the 16 m/sec, affected by: Shielding from proposed development itself and upstream buildings
157 Redfern Street Tower	Potential impact here should be less than to the 16 m/sec, affected by: Shielding from upstream buildings and proposed development itself
Upper level unit balconies	Potential impact here should be less than the 16 m/sec, affected by: - Winds impacting on the development, being generally mild but with occasional higher wind speeds - Shielding from the proposed operable vertical louvres surrounding the balconies.

5.4 South and Southeast Winds

Location	Wind Impact
Pedestrian Footpath along Lawson Square	Potential impact here should be less than the 16 m/sec , affected by: Shielding from upstream buildings and proposed development itself
Gallery entries on Lawson Square	Potential impact here should be less than the 16 m/sec , affected by (existing condition): - Shielding from upstream buildings - Shielding from the development itself.
Pedestrian Footpath along Regent Street	Potential impact here should be at or even exceeding the 16 m/sec , affected by (existing condition): - Shielding from upstream buildings - Downwash caused by wind impacting on the east façade of the proposed development and diverted towards the ground. - Mitigation provided by the proposed footpath trees.
Tower 2 Lobby Entry on Redfern St Laneway	Potential impact here should be less than the 16 m/sec , affected by: - Shielding from upstream buildings - Downwash caused by wind impacting on the south façade of the proposed development and diverted towards the ground is mitigated by the large awning over the entry
Pedestrian Link along Redfern Street Laneway	Potential impact here should be less than or close to the 16 m/sec , affected by (existing condition): - Shielding from upstream buildings, particularly the high-rise building at 157 Redfern Street - Downwash caused by wind impacting on the south façades of the proposed development and diverted towards the ground is mitigated by the proposed awning along the south façade on the alley
Tower 1 Lobby Entry on Redfern St Laneway	Potential impact here should be less than the 16 m/sec , affected by: - Shielding from upstream buildings - Downwash caused by wind impacting on the south façade of the proposed development and diverted towards the ground is mitigated by the large awning over the entry
Pedestrian Footpath along Gibbons Street	Potential impact here should be less than the 16 m/sec , affected by: - Shielding from proposed development itself and upstream buildings - Southerly winds channelling along Gibbons Street and accelerating around 157 Redfern Street building corners and impacting on the footpath. - Mitigation provided by proposed trees along Gibbons Street footpath
157 Redfern Street Tower	Potential impact here should be at the 16 m/sec and increasing with height to the south balconies (existing condition, not affected by the proposed development) , affected by: Strong seasonal southerly wind impacting the south facing balconies within the proposed development
Upper level unit balconies	Potential impact here should be at the 16 m/sec and increasing with height , affected by: Strong seasonal southerly wind impacting the south facing balconies within the proposed development

5.5 Westerly Winds

Location	Wind Impact
Pedestrian Footpath along Lawson Square	Potential impact here should be exceeding the 16 m/sec, affected by (existing condition): - Winds channelling along Lawson Square - Winds accelerating around the northwest corners of the proposed towers. - Wind mitigated by the proposed landscaping along Lawson Square
Gallery entries on Lawson Square	Potential impact here should be less than the 16 m/sec, affected by: Shielding from upstream buildings and proposed development itself.
Pedestrian Footpath along Regent Street	Potential impact here should be less than the 16 m/sec, affected by: Shielding from upstream buildings and proposed landscaping along Lawson Square
Tower 2 Lobby Entry on Redfern St Laneway	Potential impact here should be less than the 16 m/sec, affected by: Wind funnelling in between the the proposed development and 157 Rdefern Street high-rise tower should dissipated at the entry point
Pedestrian Link along Redfern Street Laneway	Potential impact here should be approaching and even exceeding the 16 m/sec, affected by (existing condition): - Wind accelerating around the southwest corner of Tower 1 and northwest corner of 157 Redfern Street high-rise tower and impacting on the Gibbons Street entrance of the pedestrian link. - Wind funnelling in between the Tower 1 of the proposed development and 157 Rdefern Street high-rise tower and impacting on this area. - Mitigation provided by the proposed trees along Gibbons Street and awning
Tower 1 Lobby Entry on Redfern St Laneway	Potential impact here should be exceeding the 16 m/sec, affected by: - Wind funnelling in between the Tower 1 of the proposed development and 157 Rdefern Street high-rise tower and impacting on this area. - Mitigation provided by the proposed Gibbons footpath trees and large awning.
Pedestrian Footpath along Gibbons Street	Potential impact here should be exceeding the 16 m/sec, affected by (existing condition): - Downwash caused by wind impacting on the west façade of the proposed development and diverted towards the ground. - Mitigation provided by the proposed footpath trees.
157 Redfern Street Tower	Potential impact here should be at the 16 m/sec and increasing with height to the west balconies (existing condition, not affected by the proposed development), affected by: - Strong seasonal southerly wind impacting the west facing balconies within the proposed development - Winds channelling along Redfern Street Laneway, impacting on the entrance of the building (existing condition)
Upper level unit balconies	Potential impact here should be less than the 16 m/sec, affected by: Strong westerly winds impacting the balconies at higher levels are mitigated by the proposed operable vertical louvres surrounding the north-facing balconies.

6 WIND AMELIORATION RECOMMENDATIONS

On the basis of the expected wind impacts outlined in **Section 5.2**, recommendations for wind break features are made in areas where winds are expected to

- Approach or Exceed the 16 m/sec walking comfort criterion

These wind mitigation recommendations are summarised in **Table 2**.

Table 2 Recommended Wind Mitigation

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
Pedestrian Footpath along Lawson Square	Moderate to High Winds likely to exceed 16m/s for northeast and westerly winds (<i>existing condition</i>) Winds for other directions will be below 16 m/s.	Mitigation provided by trees proposed along the Lawson Square footpath No Mitigation Required
Galleries entries on Lawson Square	Mild Winds will be below 16 m/s.	The entries are protected from downwash winds by the awning above No Mitigation Required
Pedestrian Footpath along Regent Street	Moderate to High Winds likely to exceed 16m/s for southeast winds (<i>Existing conditions</i>) Winds for other directions will be below 16 m/s.	Mitigation provided by trees proposal along the Regent Street footpath No Mitigation Required
Tower 2 Lobby Entry on Redfern Street Laneway	Mild Winds will be below 16 m/s.	Mitigation provided by large awning above entry No Mitigation Required
Pedestrian Link along Redfern Street Laneway	High Winds likely to exceed 16m/s for all prevailing winds. (<i>Existing conditions</i>)	Mitigation provided by trees proposed along the Redfern Street Laneway No Mitigation Required
Tower 1 Lobby Entry on Redfern Street Laneway	Moderate to High Winds likely to exceed 16m/s for westerly winds (<i>Existing conditions</i>) Winds for other directions will be below 16 m/s.	Mitigation provided by large awning above entry and trees on Gibbons Street footpath No Mitigation Required
Pedestrian Footpath along Gibbons Street	Moderate to High Winds likely to exceed 16m/s for westerly winds (<i>Existing conditions</i>) Winds for other directions will be below 16 m/s.	Increased downwash winds due to increase in building height. Mitigation provided by trees proposal along the Regent Street footpath No Mitigation Required

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
157 Redfern Street Tower	Moderate to High Winds likely to exceed 16m/s for westerly and southerly winds (<i>Existing conditions</i>) Winds for other directions will be below 16 m/s.	Adverse winds of 16 m/s or more are likely to affect the residential tower at 157 Redfern Street due to limited blockage upstream conditions (eg. limited shielding from west-north west) and existing Winds channelling along Redfern Street Laneway. It is anticipated that the proposed alteration at 1 Lawson Square will have very minor or no negative wind impact on the residential tower at 157 Redfern Street. No Mitigation Required
Upper level unit south balconies	High Winds are likely to be above 16m/s on south balconies for southerly winds.	Mitigation Recommended Vertical wind mitigation devices such as vertical sliding louvres or perpendicular louvres or wind screen protection (via the use of the pull-down screens) or a management plan needs to be instituted to mitigate the potential for this occurrence, e.g. signage on balconies, resident notices, etc.

6.1 Effect of Proposed Landscaping Surrounding the Site

As per **Section 5.3** to **Section 5.5**, it has been predicted that the winds will exceed the 16 m/sec walking comfort criterion at several pedestrian locations such as on Regent Street and Gibbons Street footpaths. These are existing wind conditions and the proposed alteration of 1 Lawson Square will have a very minor impact on the existing wind conditions. The proposed alternation attempts to improve existing wind conditions via additional landscaping along Gibbons Street, Lawson Square and Regent Street (refer to **Figure 5**).

The existing landscaping surrounding the site is shown in **Figure 6** below.

Figure 6 North View of Development Site



Courtesy of Nearmap, dated 3 August 2013

It can be seen that the landscaping around the development site is limited. The additional landscaping as shown in the site plan in **Figure 5**, is proposed to mitigate existing adverse wind conditions along the footpaths. The proposed landscaping will therefore improve the wind around the site.

The full mitigation properties of the proposed trees will be most effective when the trees have dense foliage and therefore “ever green” are preferred and the leaves will help to disperse strong winds.

Deciduous trees could be used to mitigate summer winds (eg Northeast Winds). In general, “ever green” trees are more effective for wind mitigation.

Due to the lack of existing landscaping present along the footpaths surrounding the proposed 1 Lawson Square site, the existing pedestrian winds conditions are moderately high. The proposed redevelopment of the site is expected to improve the wind conditions through a combination of street tree planting and new awnings. Whilst the majority of the street trees are deciduous (London Plane Tree) the provision of some evergreen species such as Cabbage Tree Palm should assist the winds conditions during the winter months. The number of proposed trees means that even if some of the trees die or fail to thrive, there will still be an improvement to wind conditions, albeit minor. The same principle applies for the time period required for the trees to reach a mature height.

7 CONCLUSION

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Lawson Square Pty Ltd to undertake a qualitative wind impact assessment of the proposed alterations and additions to the existing office towers at 1 Lawson Square, Redfern. The assessment forms part of the Development Application to the Sydney City Council and to accompany the Environmental Impact Statement (EIS).

Sydney's Prevailing Winds

The Sydney wind climate is characterised by dominant (prevailing) north-easterly, westerly and southerly winds. While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and south winds generally provide the strongest gusts during summer. West quadrant winds (southwest to northwest) provide the strongest winds for the whole year.

Existing Wind Environment

Existing street level wind conditions in the vicinity of the site are likely to be close to and even exceeding the 16 m/sec *"walking comfort"* criterion for many prevailing wind directions given the degree of shielding afforded to the site by surrounding buildings, existing downwash winds on the existing 1 Lawson Square Building. Adverse winds of more than 16 m/sec are likely to be present along Lawson Square and Gibbons Street due to the streets alignments in the same directions as the prevailing winds (west and south) in Sydney.

Adverse winds of 16 m/s or more are likely to affect the residential tower at 157 Redfern Street due to limited blockage upstream conditions (eg. limited shielding from west-north west) and existing Winds channelling along Redfern Street Laneway. It is anticipated that the proposed alteration at 1 Lawson Square will have very minor or no negative wind impact on the residential tower at 157 Redfern Street.

Future Wind Environment

In terms of future wind environment with the proposed development, the following features of the development are noted as being of most significance:

- Downwash winds are mitigated by the proposed large awning over the Redfern Street Laneway and the proposed landscaping along the footpaths, protecting the pedestrians.
- Winds accelerating around the proposed towers corners and impacting on pedestrian footpaths
- Winds funnelling in between the proposed towers and the 18-storey tower on the immediate south to the proposed development site.
- Additional shielding from horizontal and vertical windflows provided by the proposed trees along the footpaths around the development.
- The proposed landscaping as shown in the site plan in **Figure 5**, will help disperse and mitigate existing adverse windflows channelling along the footpaths and will improve the existing wind conditions around the site.

Amelioration measures (refer **Section 6**) have been recommended to mitigate any adverse wind flow conditions identified above.

Accordingly, it has been predicted that ground levels wind speeds within all public access areas surrounding the development should remain at their present levels or ameliorate the wind conditions with the addition of the proposed development and its wind mitigation treatments.

The above analysis has been made on the basis of our best engineering judgment and on the experience gained from model scale wind tunnel testing or computational fluid dynamics analysis of a range of developments of similar magnitude to the currently proposed development. The analysis can be confirmed via model scale wind tunnel testing or computational fluid dynamics analysis during the detailed design phase of the project.

Appendix A

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SYDNEY WIND ROSES

