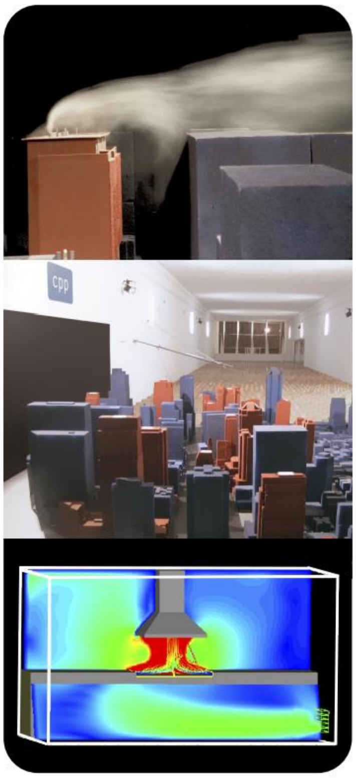
CERMAK
PETERKA
PETERSEN

WIND ENGINEERING AND AIR QUALITY CONSULTANTS

FINAL REPORT



Solar Reflectivity and Solar Access studies for:

2 FIGTREE DRIVE

Olympic Park, NSW, Australia

Prepared for:

Mirvac Projects
Level 26, 60 Margaret Street
Sydney, NSW 2000
Australia

Prepared by:

Andrew Nguyen, Project Engineer
Matt Glanville, Director

CPP Project: 8579

August 2015

CPP
Unit 2, 500 Princes Highway
St. Peters, NSW 2044, Australia
info-syd@cppwind.com
www.cppwind.com

DOCUMENT VERIFICATION

Date	Revision	Prepared by	Checked by	Approved by
03/08/15	Final DA submission	AN	MG	MG

TABLE OF CONTENTS

TABLE OF FIGURES

INTRODUCTION

An assessment of the proposed mixed-use development known as 2 Figtree Drive, Olympic Park, was carried out to analyse the potential for Solar Reflectivity glare impacts on surrounding public roadway locations. The proposed development was also analysed for Solar Access amenity compliance with the relevant local controls and with the Apartment Design Guide (as it gives effect to the Amenity provisions of SEPP65).

The development site has a frontage to Figtree Drive to the north and Australia Avenue to the east. It is also situated nearby the Olympic Park railway line. Surrounding the site are commercial properties except for the open space of Bicentennial Park to the south-east.

The development is comprised of 4 residential towers atop a one level podium; North tower of 5 storeys, East tower of 15 storeys, South tower of 10 storeys, and West tower of 11 storeys, Figure 1.

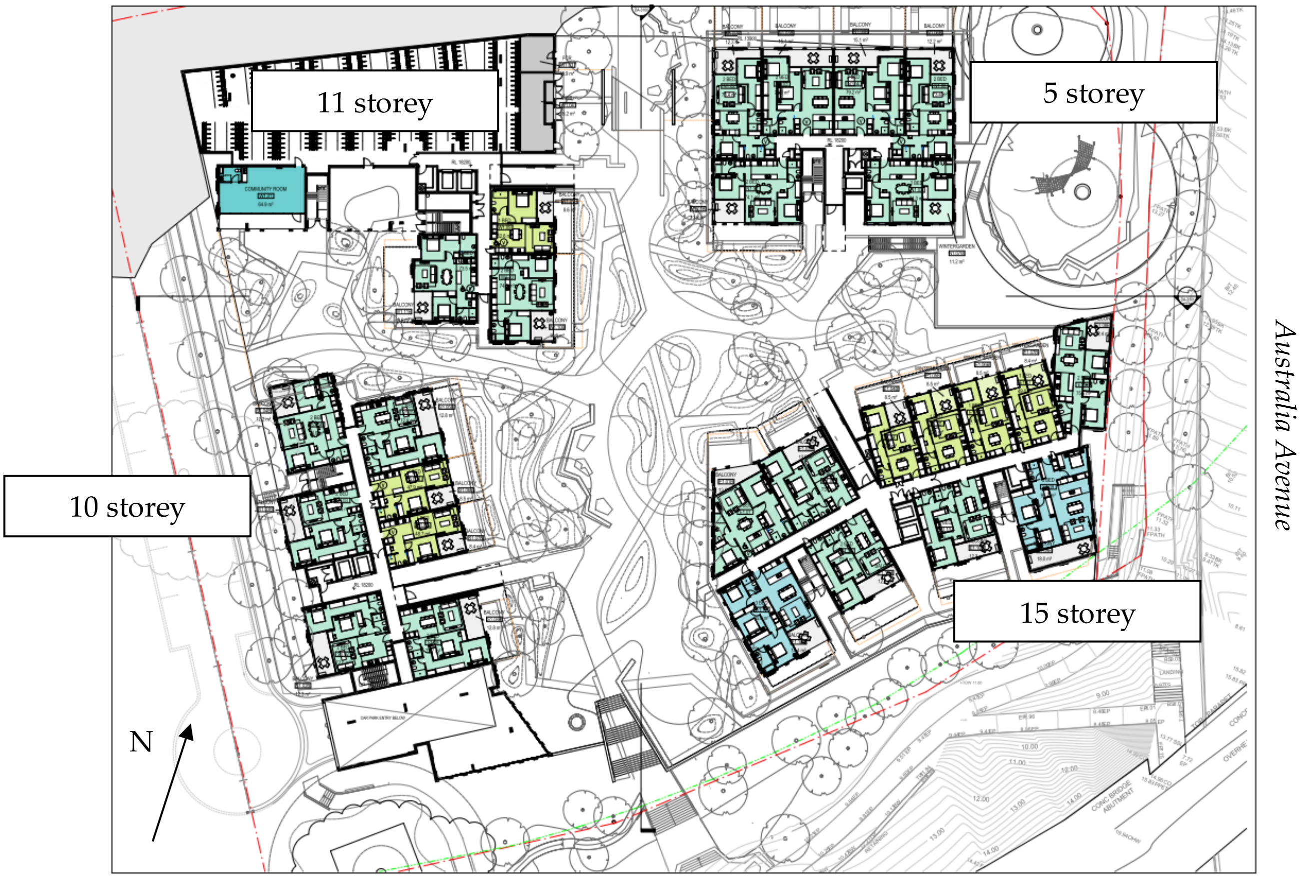


Figure 1: Location and ground floor layout of development site

REFLECTIVITY

Reflectivity Impact Considerations

CPP have not sighted specific solar reflectivity criteria for new developments within Sydney Olympic Park. Notwithstanding, many Australian Councils including Sydney Development Control Plan 2012 require assessment for potential specular and diffuse reflections emanating from proposed developments. To assess the solar impacts of the 2 Figtree Drive development, this report considers Sydney DCP 2012, General Provisions, Section 3.2.7 Reflectivity, specifically:

Provisions

(1) A Reflectivity Report that analyses potential solar glare from the proposed building design may be required for tall buildings.

(2) Generally, light reflectivity from building materials used on facades must not exceed 20%.

As required under 3.2.7, Mirvac Projects will ensure exterior elements on the facades studied in this report will have a reflectivity coefficient of 20% or less. This is defined as the percentage solar reflection when light strikes and reflects normal to the façade plane.

This report quantifies potential for solar reflections of all incident angles on glazing to impact upon the surrounds taking into consideration:

- Seasonal and diurnal solar paths (sun altitude and azimuth) at the Olympic Park altitude and the relative angle of the solar ray (reflectivity coefficients of glazing increase with increasing incident angle)
- An assumed reflectivity coefficient of 20% for the external glazing being used and the incident angle of the solar ray (allowance is made for reflectivity coefficients of glazing to increase with increasing incident angle).
- Receiver locations of interest; the alignment of adjoining public road and pathways being of particular interest.

CPP use, in part, methodology developed by Hassall (1991) and the concept of veiling glare and contrast when quantifying the potential for hazard rogue reflections onto surrounding receiver locations. Threshold Increment (TI) is the percentage by which the contrast must be increased to make the object just visible due to the addition of glare and is the parameter calculated in this study to assess the acceptability of potential reflectivity glare events. Proprietary software was used to calculate TI values at expected maximum impact locations of vehicles travelling in the directions as marked in Figure 2.

TI is a parameter used in the design of Road Lighting, e.g. AS/NZS 1158.1.1:2005 where a maximum TI value of 20% is used for all roadway lighting categories and is the TI acceptability criterion adopted in this study for assessing solar glare impact on passing traffic.

Where high TI values are identified it is useful to investigate the angular limits of façade reflections relative to the motorist observer using a glare protractor (Hassall

1991). The glare protractor comprises a series of loops indicating whether a glare source will be above a predetermined veiling glare limit for the resultant % level of cladding reflectivity.

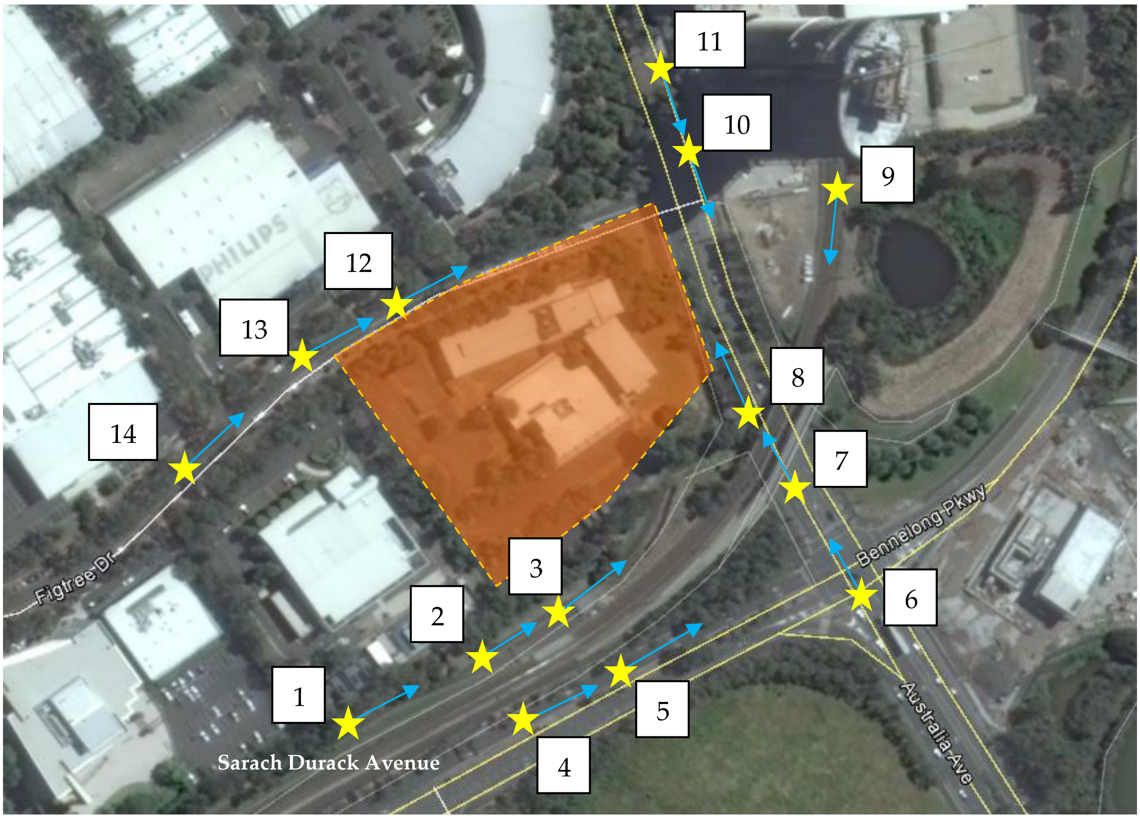


Figure 2: Investigated impact locations of vehicles and trains travelling in indicated directions

Calculations in this report assume specular type reflective façade surfaces, where the reflected ray angle is equal to the incident solar ray angle; being valid for most smooth surface glazing materials. Other building materials, including the proposed metallic screening, produce diffuse components of reflection that are not directly quantified by the methodology adopted in this report. By definition, diffuse reflections have a greater scatter of reflected angles with lower concentration of reflected light in any given direction and are generally less likely to cast hazardous distant disability glare reflections than glazing. Notwithstanding, these materials have potential to produce discomfort glare and it is recommended that for all non-glazed surfaces that darker, low lustre matte finishes be adopted.

Reflectivity Impacts Results

<u>Specular Reflections</u>

Australia Avenue

The proposed development is of moderate height, so solar reflections from the facades are able to extend a limited distance from the site.

Vehicles at the investigated locations 7 and 8, Figure 2, travelling north along Australia Avenue towards the development site were found to experience low levels of solar reflections from the east façade of the East Tower, between 11am and noon during the winter months, depicted in Figure 3.

As an example; analysis of an eastbound motorist on Lachlan Street at location 8 showed,

reflections start = 11:30 am TI = 1.5%

reflections peak = 12:00 pm TI = 4%

reflections cease = 12.15 pm TI = 1.5%

It is evident that TI values are lower than the TI limits described above for roads for about an hour during this early morning period. At the remaining investigated locations along Australia Avenue, similar negligible levels of solar reflections were found.

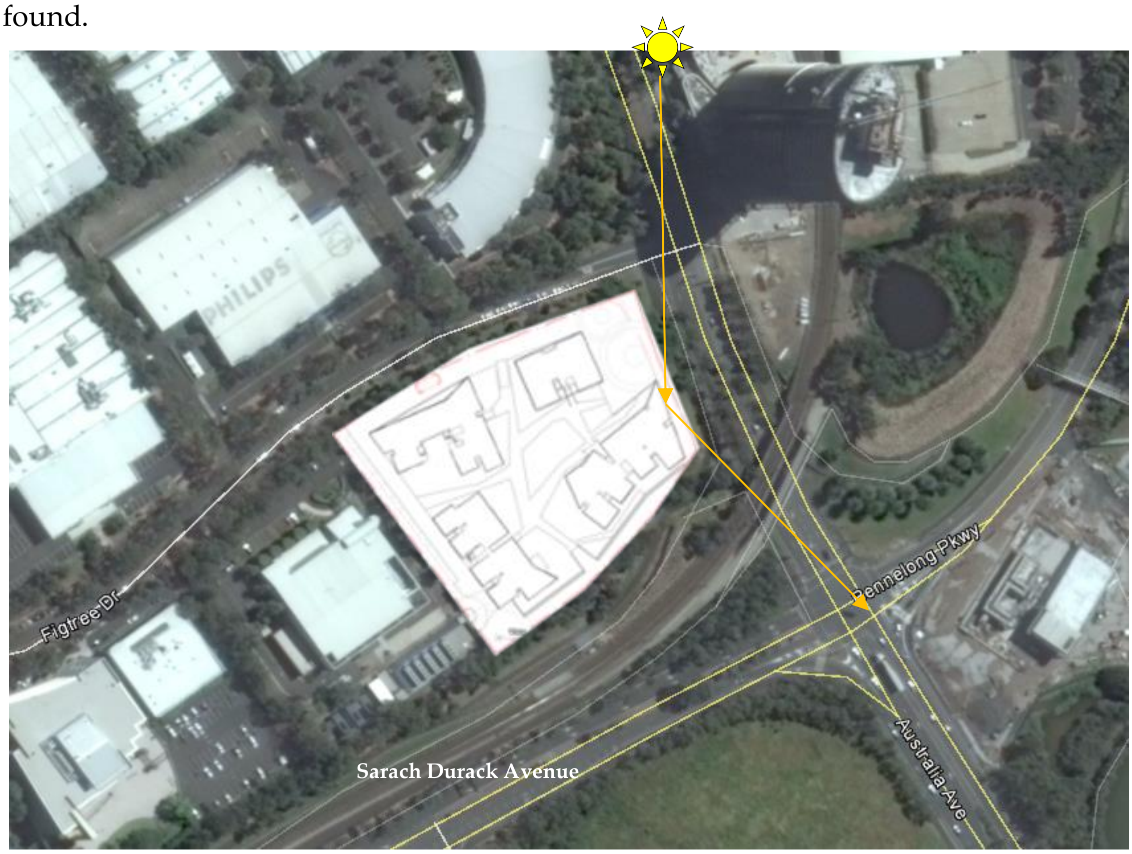


Figure 3: Incident and reflection of solar rays emanating from the East Tower

Sarah Durack Avenue

Vehicles travelling west along Sarach Durack Avenue at the investigated locations 4 and 5, Figure 2 towards the development were found to experience no detrimental solar reflections emanating from the development.

Figtree Avenue

Vehicles travelling west along Figtree Drive at the investigated locations 12, 13 and 14, Figure 2, towards the development were found to experience low levels of solar reflections emanating from the north façade of the west tower depicted in Figure 4.

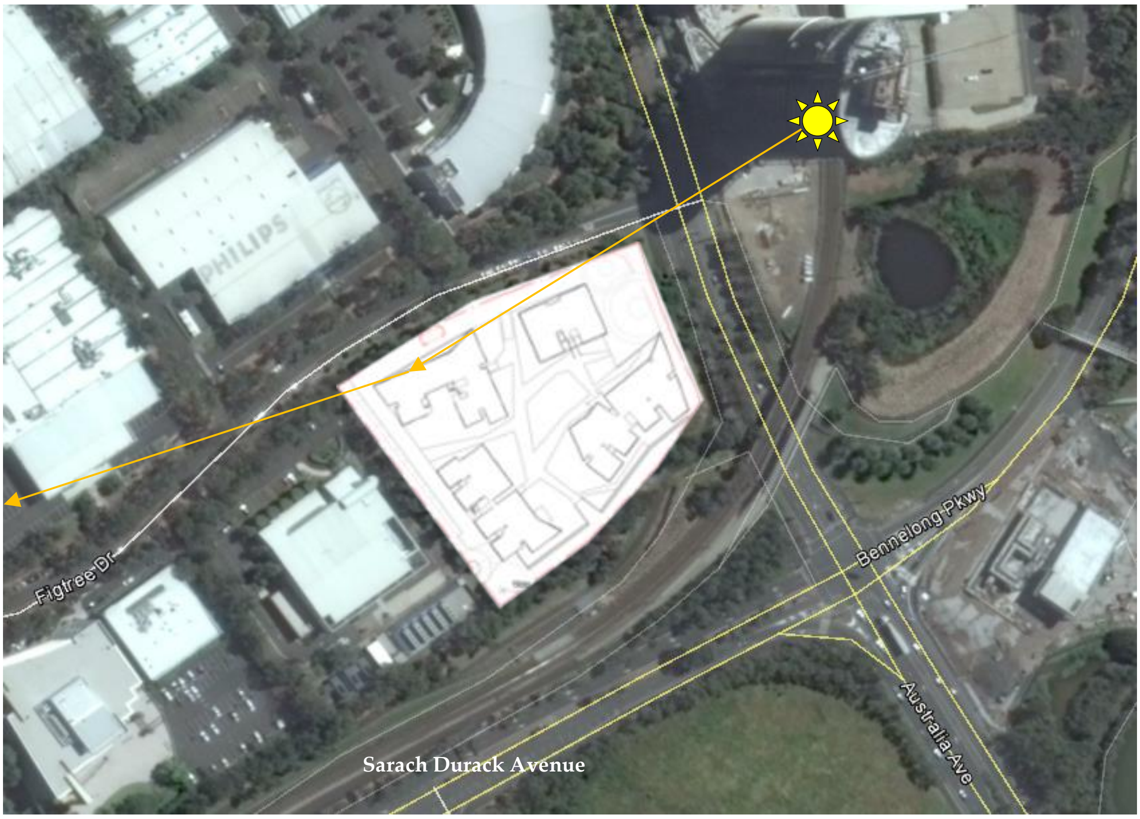


Figure 4: Incident and reflection of solar rays emanating from the West Tower

As an example; analysis of an eastbound motorist on Figtree Drive at location 13 showed,

reflections start = 7:00 am TI = 4%

reflections peak = 7:30 am TI = 12%

reflections cease = 8:15 am TI = 8%

It is evident that TI values are lower than the TI limits described above for roads for about an hour during this early morning period. At the remaining investigated locations along Figtree Drive, similar negligible levels of solar reflections were found.

Olympic Park Railway Line

Trains at investigated location 1 travelling west along the railway line towards the development were found to experience low levels of solar reflection emanating from the south façades of the South Tower of the development, depicted in Figure 5.

As an example; analysis of an eastbound motorist on Figtree Drive at location 13 showed,

reflections start = 7:00 am TI = 4%

reflections peak = 7:30 am TI = 9.5%

reflections cease = 7:55 am TI = 7%

It is evident that TI values are lower than the TI limits described above for roads for about an hour during this early morning period. At the remaining investigated locations along Figtree Drive, similar negligible levels of solar reflections were also found emanating from the south façade of the East tower and the west façade of the South Tower.

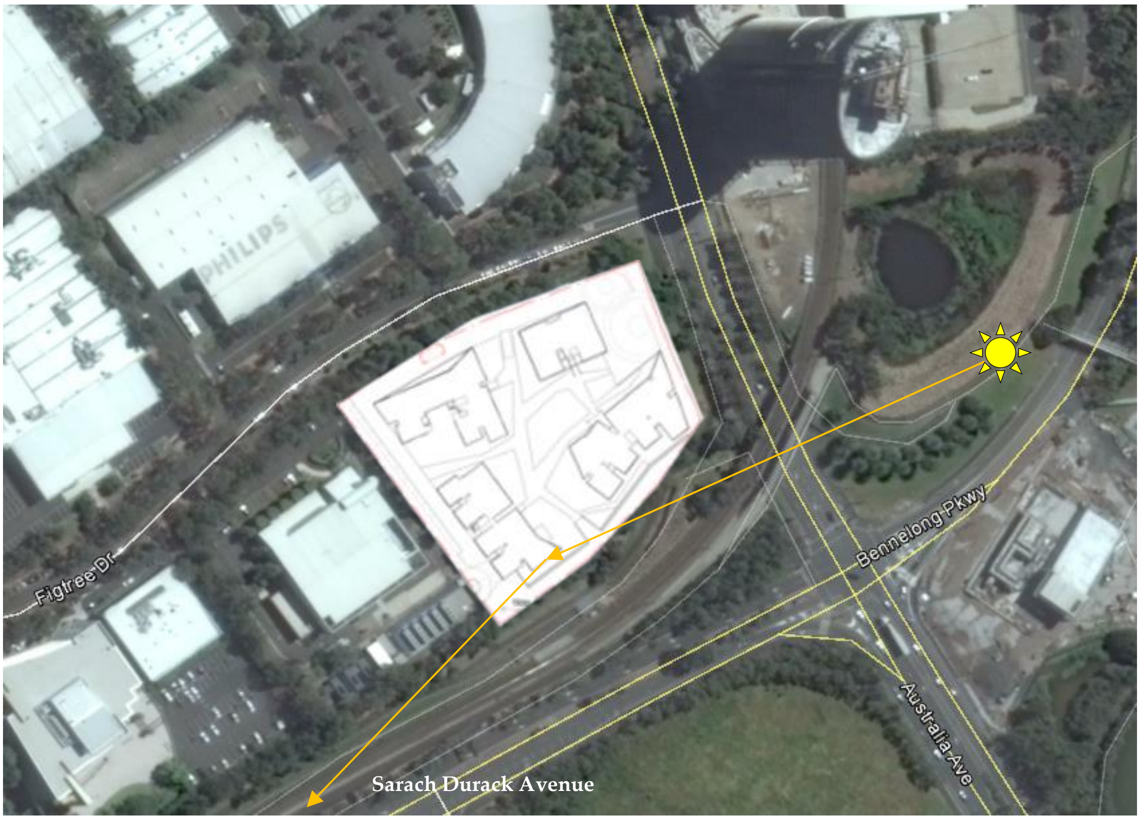


Figure 5: Incident and reflection of solar rays emanating from the South Tower

When the solar rays are at low altitudes, specular solar reflections can potentially become a problem at ground level against the retail shop-front glazing along the podium level. Awnings extending over the shop-front glazing will shade the windows from all but the lowest altitude solar rays which will be largely blocked by upstream buildings and terrain.

The proposed development's final design will use inset balconies in each tower. The inset nature will help reduce the potential for intrusive solar glares in the late mornings and early afternoons.

Diffuse Reflections

Non-glazed façade elements to be developed during detailed design should each be assessed for potential to generate nuisance reflections. Elements such as metal balcony balustrades have the potential to generate localised glare of both a diffuse and specular nature that can produce a discomfort glare and affect the amenity of the site. All these elements should have a reflectivity coefficient of less than 20%. Furthermore, it is recommended that all metal screening possess non-glazed surfaces of low lustre, matte finishes.

CONCLUSIONS

The proposed development at 2 Figtree Drive in Olympic Park is expected to produce low level solar reflections that are not expected to have detrimental effects on vehicles and trains travelling in directions approaching the development site. The recessed nature of the façade balconies in the finalised design will help prevent the solar reflections occurring near parallel to the façade. Adopting non-glazed elements with low lustre, matte finished surfaces are also recommended.

REFERENCES

New South Wales State Government, Council of the City of Sydney, Sydney Development Control Plans, Section 5, 18/03/2015