HEGGIES

REPORT 10-7707-R1R1

Revision 1

Garvan St Vincent's Cancer Centre Glare Impact Report

PREPARED FOR

Capital Insight Pty Ltd
77 Berry Street
NORTH SYDNEY NSW 2060

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Garvan St Vincent's
Cancer Centre
Glare Impact Report

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1 INTRODUCTION

Heggies Pty Ltd (Heggies) has been engaged by Capital Insight Pty Ltd to conduct a reflectivity study of the proposed Garvan St Vincent's Cancer Centre (GSVCC) at 362 Victoria Street, Darlinghurst.

1.1 Development Site

An aerial view of the site is shown in **Figure 1**. The proposed development site is bounded by Victoria Street on the west. Liverpool Street and Burton Street are located on the north and south of the development site respectively. The area surrounding the development comprises:

- 5 to 8 storey Garvan Institute Building immediate southeast through to south of the development site.
- 2-storey Green Park Hotel located immediate north to the development site.
- 9-storey Lowy Packer Building located immediate east to the development site.
- mid to high rise buildings to the south of Burton Street (St Vincent's Hospital precinct).
- 2-storey buildings on the opposite side of Victoria Street, west to the development site.
- 8-storey building at the northeast of Liverpool and Victoria Street junction.

Figure 1 Aerial View of Proposed Development Site

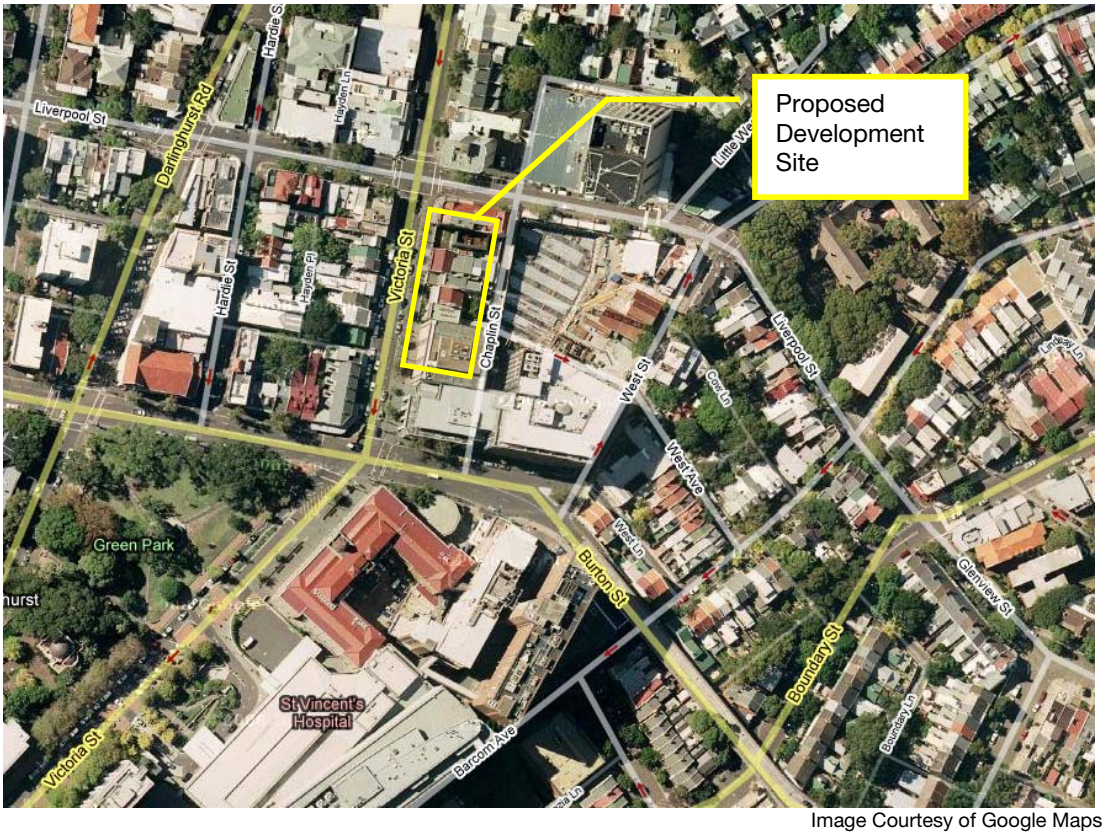


Image Courtesy of Google Maps

1.2 Development Description

The development site currently consists of a mix of low-rise commercial buildings that are to be demolished and replaced by the proposed Garvan St Vincent's Cancer Centre (GSVCC). The proposed development will be a nine storey building comprising:

- Four levels of underground carpark.
- Sublevel of habitable spaces (Level 3).
- Retail area on the ground floor (Level 4) with access to Victoria Street.
- Reception and medical/commercial area on the ground floor with entrance on Victoria Street.
- Common courtyard on the ground floor on the west of the proposed building with outdoor dinning tables.
- A roof garden on the northern side of Level 6.
- The north façade of Levels 7 to 12 is set back by 13 m.

Primary facade materials for the proposed development include the following:

- The glazing is assumed to have a reflectivity coefficient of *less than 15%*.
- The southern facade will have powder coated aluminium panels that have the potential to cause glare, depending on colour and type of coat used.
- Other facade materials will be off form concrete, aluminium louvers and stainless steel mesh with minimal reflectivity.

2 REFLECTIVITY IMPACT METHODOLOGY AND CRITERIA

2.1 Glare Characteristics

With respect to the reflectivity impact of the proposed development, the following issues are relevant:

- At large incident angles (typically greater than 70°), the reflectivity of all glazing types *increases dramatically*. Thus, regardless of the glazing type, the potential for glare increases significantly when incoming solar rays can impact on a building close to parallel to the plane of the glazing.
- On a practical level, incoming solar rays with an altitude angle greater than 20° are intersected and obstructed by a typical windscreen roof-line. In this Report, it is assumed that the sun altitude angle must be less than 25° to have the potential to produce a traffic disability glare event.
- Pedestrian discomfort glare can occur when the sun altitude is greater than 25°. However, in most such instances, a pedestrian has the ability to adjust his/her line of sight to a more horizontal view away from the glare source.
- It is assumed that glare events can only occur when the solar altitude is greater than about 3°, enabling the entire solar disc to be visible.

2.2 Glare Acceptability Criteria

The criteria used within this Report to assess the acceptability or otherwise of glare events are the limiting values of the so-called *"Threshold Increment Value"*, or *TI Value,* of the reflection condition, as shown in **Table 1**.

Table 1 Threshold Increment (TI) Criteria

Glare Category	Classification	TI Acceptable Limit
Disability Glare (for motorists)	Major Roads	10
	Minor Roads	20
Discomfort Glare (for pedestrians)	Pedestrian Crossings	2
	Other Footpath Locations	3

2.3 Reflectivity Methodology

Heggies carries out reflectivity TI calculations using a three-stage screening process:

In the first stage, road traffic conditions are examined to exclude reflection conditions which are *"not possible"*.

- For example, traffic along many CBD streets can be one-way. Thus, it may not be possible for drivers to be impacted by solar reflections in certain instances if the reflected ray off a building of interest is in the same direction as the direction of travel of the motorist, ie the incoming reflection is from "behind" the motorist.

In the second stage, the potential for reflections is established by carrying out a "baseline" screening calculation.

- In the "baseline" analysis, the facade of interest is assumed to consist totally of reflection-producing glazing. The reflectivity coefficient of the glazing to be used is however taken into account in these baseline screening calculations.

If a reflection potential is established, accurate TI values are calculated in the third stage:

- Detailed TI calculations utilise the actual details of the facade geometry, taking into account recessing of glazing, blockage produced by horizontal and vertical shading elements, sections of masonry facade, etc.

3 GLARE IMPACT ANALYSIS

3.1 Traffic Disability Glare

3.1.1 Reflections Impacting on Victoria Street

It is firstly noted that the development's facade materials will have a reflectivity coefficient of *less than 20%*.

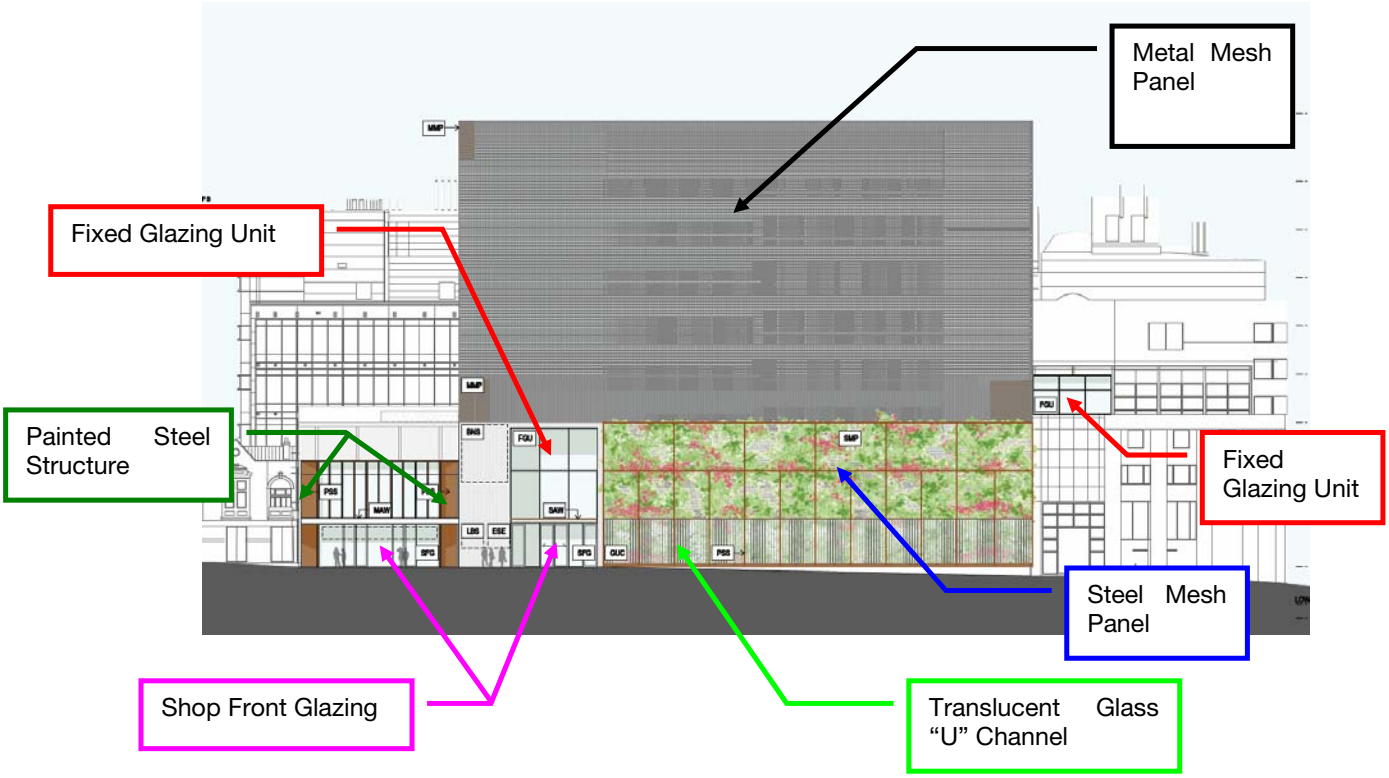
The potential risk of disability glare for motorists will only be considered for southbound traffic since Victoria Street is one way.

The height of the proposed development means that only southbound traffic within 85 m of the facades has the potential for adverse glare.

Western Facade

The western facade consists of aluminium louvers, off form concrete, stainless steel mesh and glass u-channel as shown in **Figure 2**. The potential for the facade materials to cause glare is considered limited.

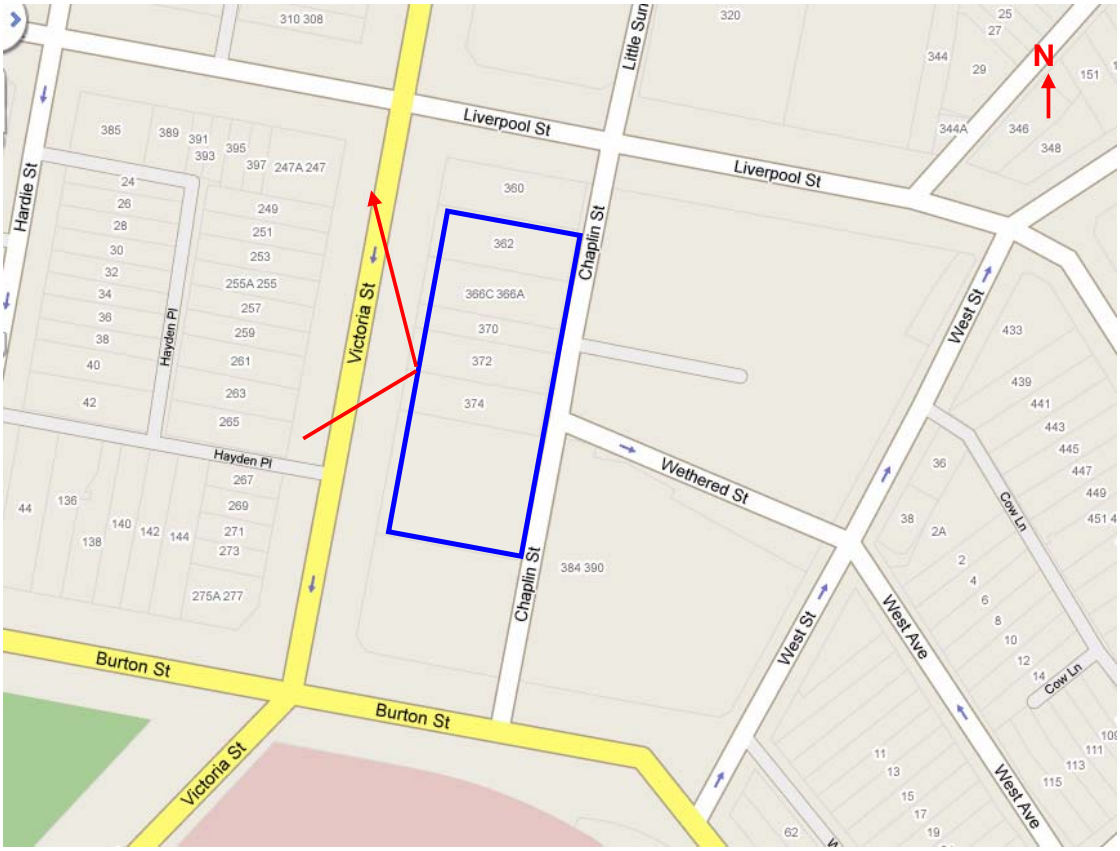
Figure 2 West Elevation



Reflection conditions associated with the development's western facade that have been examined are (refer **Figure 3**):

- Low altitude late afternoon rays in the summer striking the facade from the west-southwest to with reflections towards the north along Victoria Street.

Figure 3 Potential Reflective Glare Conditions for Western Facade

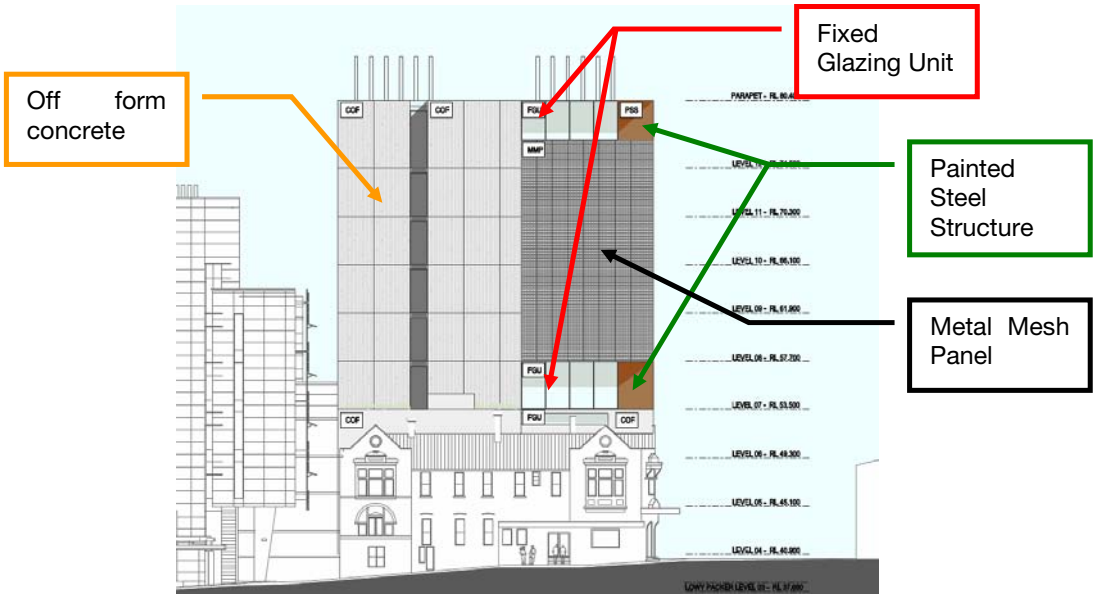


In relation to the late afternoon reflections, the baseline TI screening calculations (ie assuming uninterrupted glazing flush with building faced perimeter) indicated no glare potential for motorists travelling southbound. Further detailed calculations are therefore not carried out.

Northern Facade

The northern facade of the development will be fitted with off form concrete, aluminium louvers and painted steel limiting the potential for the facade to cause glare, refer **Figure 4**.

Figure 4 North Elevation

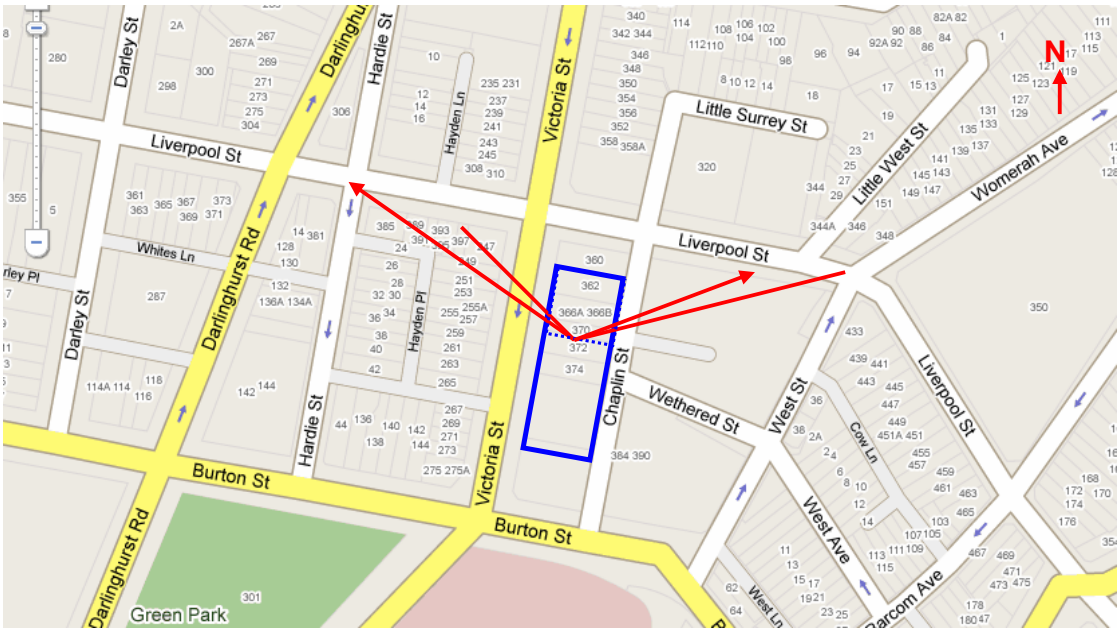


The Green Park Hotel is located in front of the northern facade and only the upper part of the facade will thus have potential to cause adverse glare.

Reflection conditions associated with the development's northern facade that have been examined are (refer **Figure 5**):

- Low altitude morning rays in the winter striking the facade from the east-northeast with reflections towards the west-northwest.

Figure 5 Potential Reflective Glare Conditions for Northern Facade



In relation to the early morning reflections, the baseline TI screening calculations (ie assuming uninterrupted glazing flush with building faced perimeter) indicated that motorists travelling southbound on Victoria Street experience limited glare. The calculated TI values are well below the limit for what is acceptable.

Calculations at all relevant locations yield negligible or non-existent TI values for reflections onto Victoria Street and detailed calculations are therefore not carried for the northern facade.

3.1.2 Reflections Impacting on Liverpool Street

It is firstly noted that the development's facade material will have a reflectivity coefficient of *less than 20%*.

The height of the development presents a potential for adverse glare for traffic within 85 m of the facades.

Western Facade

The western facade consists of aluminium louvers, off form concrete, stainless steel mesh and glass u-channel closest to the ground. The potential for the facade materials to cause glare is considered limited.

Reflection conditions associated with the building's western facade that have been examined are (refer **Figure 3**):

- Low altitude late afternoon rays in the summer striking the facade from the west-southwest to with reflections towards the north.

In relation to the late afternoon reflections, the baseline TI screening calculations indicated no glare potential for motorists travelling westbound. Further detailed calculations are therefore not carried out.

Northern Facade

The Green Park Hotel is located in front of the northern facade and only the upper part of the facade will thus have potential to cause adverse glare.

The northern facade of the development will be fitted with off form concrete, aluminium louvers and painted steel limiting the potential for the facade to cause glare.

Reflection conditions associated with the development's northern facade that have been examined are (refer **Figure 5**):

- Low altitude morning rays in the winter striking the facade northeast with reflections towards the northwest along Liverpool Street.
- Low altitude mid afternoon rays in the winter striking the facade from the northwest with reflections towards the northeast along Liverpool Street.

In relation to the morning reflections, calculations show that motorists travelling eastbound will experience no glare from the northern facade of the development.

In relation to the mid afternoon reflections, the baseline TI screening calculations (ie assuming uninterrupted glazing flush with building faced perimeter) indicated that motorists travelling westward on Liverpool Street experience limited glare. The calculated TI values are however well below the limit for what is acceptable.

Calculations at all relevant locations yield negligible or non-existent TI values for reflections onto Liverpool Street and detailed calculations are therefore not carried out for the northern facade.

3.1.3 Reflections Impacting on Burton Street

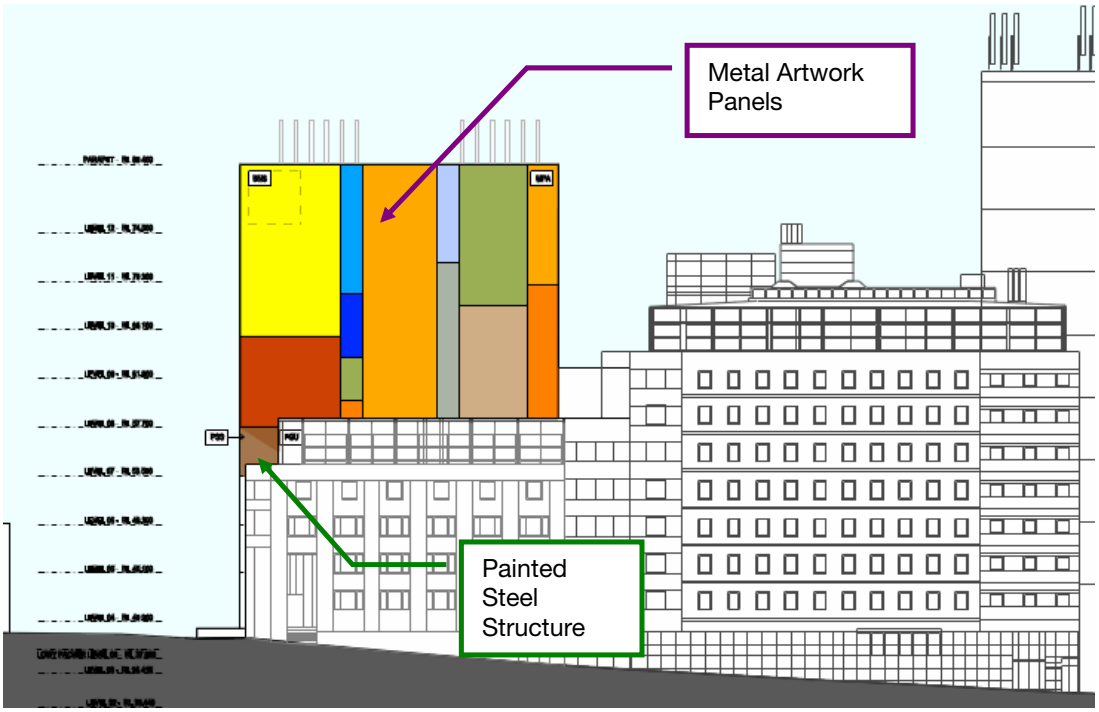
The height of the development presents a potential for adverse glare for traffic within 85 m of the facades.

Only the upper part of the southern and eastern facades have the possibility to cause adverse glare on Burton Street, since the lower parts of the facades are blocked by the existing Garvan Institute.

Southern Facade

It is firstly noted that the development's facade material will have a reflectivity coefficient of *less than 50%*. A reflectivity coefficient of 50% corresponds to yellow powder coated aluminium panels and is considered a worst case scenario. Other colours will have lower reflectivity, refer **Figure 6**. The lower part of the southern facade is shielded by the Garvan Institute, reducing the potential for glare.

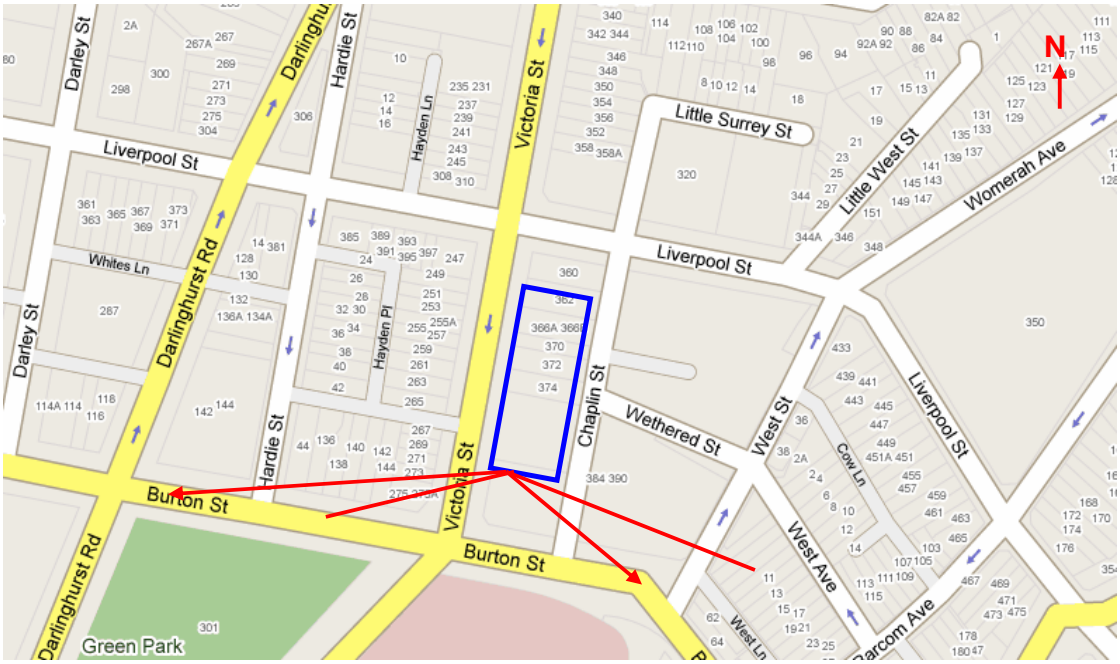
Figure 6 South Elevation



Reflection conditions associated with the development's southern facade that have been examined are (refer **Figure 7**):

- Low altitude early morning rays in the summer striking the facade from southeast with reflections towards the southwest along Burton Street.
- Low altitude late afternoon rays in the summer striking the facade from the southwest with reflections towards the southeast along Burton Street.

Figure 7 Potential Reflective Glare Conditions for Southern Facade



In relation to the early morning reflections, the baseline TI screening calculations (ie assuming uninterrupted glazing flush with building faced perimeter) indicated that motorists travelling eastbound on Burton Street will experience no glare from the southern facade of the building.

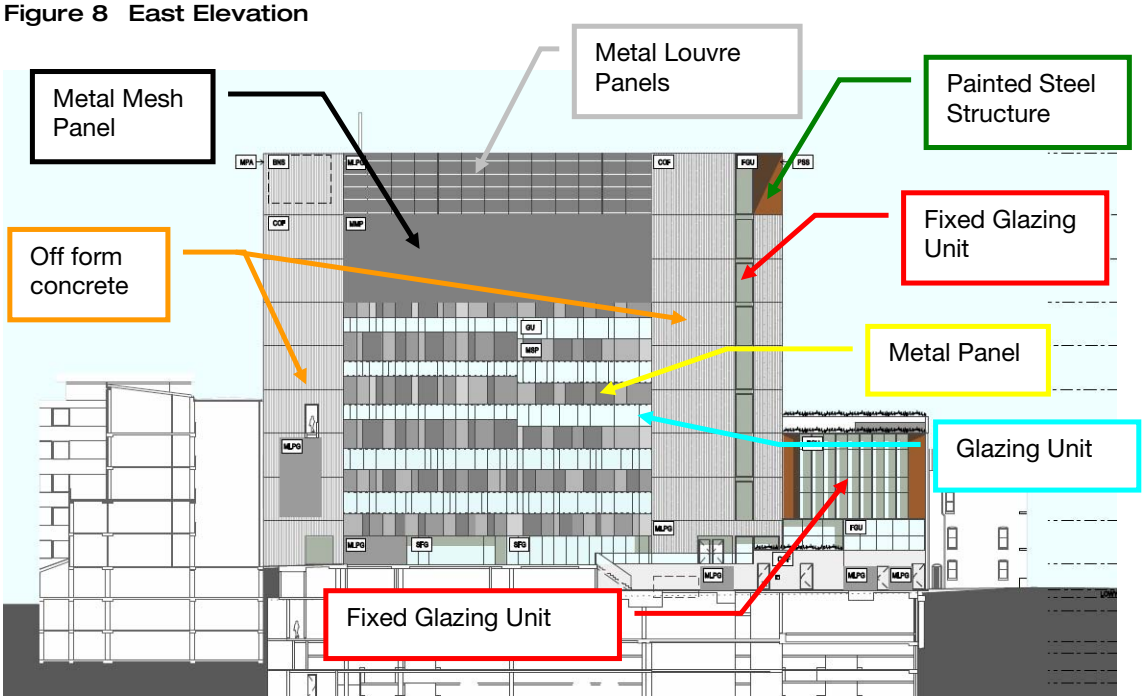
In relation to the late afternoon reflections, calculations show that motorists travelling westbound experience no glare from the southern facade of the building.

Calculations at all relevant locations yield negligible or non-existent TI values for reflections onto Burton Street and detailed calculations are therefore not carried out for the southern facade.

Eastern Facade

The main facade materials of the eastern facade are off form concrete, glazing, metal mesh panel, metal louvre panels and metal panel as shown in **Figure 8**. The metal panel has relatively high reflectivity (around 50%) while the other material will have a low potential to cause glare.

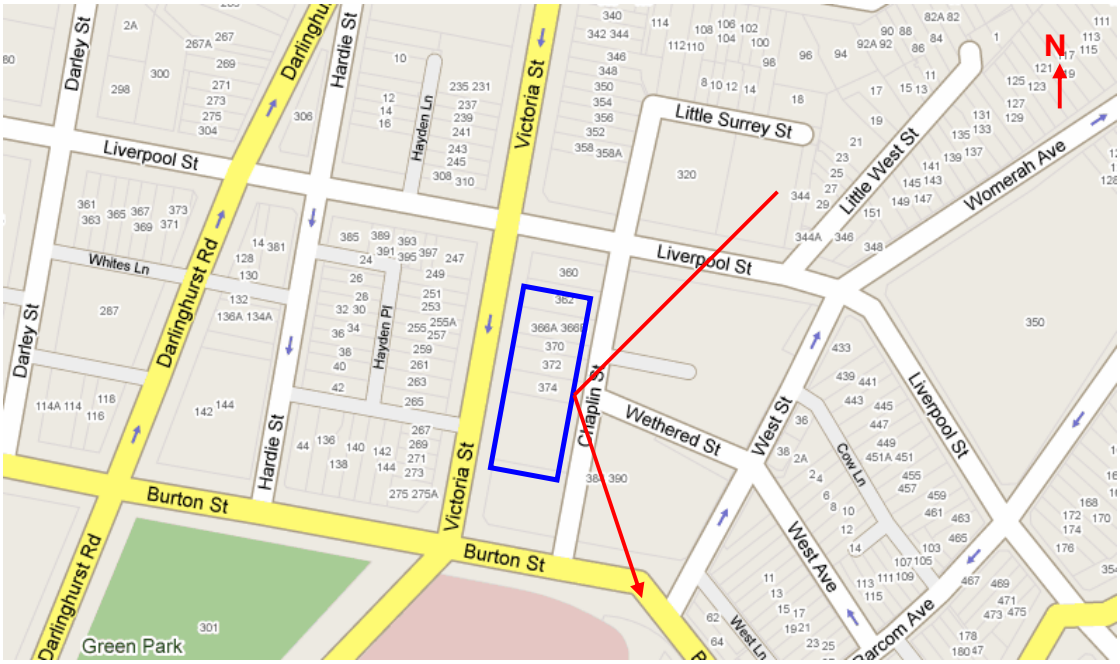
Figure 8 East Elevation



Reflection conditions associated with the development's eastern facade that have been examined are (refer **Figure 9**):

- Low altitude early morning rays in the winter striking the facade from northeast with reflections towards the southeast towards Burton Street.

Figure 9 Potential Reflective Glare Conditions for Eastern Facade



In relation to the early morning reflections, the baseline TI screening calculations indicated that there is a potential for motorists travelling westbound on Burton Street experiencing excessive glare from the eastern facade of the building. The calculated TI values are slightly above the limit for what is acceptable. Closer analysis reveals that all reflections from the eastern facade will in reality be blocked by the 8-storey Garvan Institute located southeast of the development.

The glare impact assessment shows that all relevant locations yield TI values below the limit for reflections onto Burton Street and detailed calculations are therefore not carried out.

3.2 Pedestrian Discomfort Glare

The above calculations were repeated to examine glare conditions affecting pedestrian locations, especially at nearby traffic intersections.

Preliminary calculations (facade consisting of only reflective glazing) showed potential risk of pedestrian discomfort glare from the north facade of the development for pedestrians facing south at the Liverpool Street-Victoria Street pedestrian crossing. The potential for discomfort glare exist pre noon in the winter. Pedestrians are however expected to be able to adjust there line of sight.

The potential for discomfort glare also exist for the western facade for pedestrians crossing Burton Street at the Burton Street-Victoria Street pedestrian crossing. Reflections occur in the winter at noon for a period of 5 minutes and pedestrians are expected to adjust their line of site for this short period.

The potential for discomfort glare for pedestrians is therefore considered limited.

3.3 Glare Intensity

The calculations undertaken to investigate TI values around the site show that the local glare intensity, expressed as Cd/m^2, in surrounding public areas is well below the Sydney City Council limiting criterion of 500 Cd/m^2.

4 REFLECTIVITY - CONCLUSIONS

The Reflectivity Analysis of the development shows that there will be no elements within the development facades that are capable of causing adverse glare events at surrounding locations for motorists (disability glare) or pedestrians (discomfort glare) under any reflection condition. This is due to the following factors:

- The development's glazing will have a reflectivity coefficient of *less than 15%*.
- The powder coated aluminium panel walls will have a reflectivity coefficient of *less than 50%*.
- The proposed buildings dimensions and limited number of streets affected.
- Shielding by surrounding mid-rise buildings.
- The facade design of the development involves a mix of materials which limit the potential to generate significant glare, including:
  - Facade materials which will not create glare, eg precast concrete, off form concrete and metal mesh panels.
  - Facade materials with limited potential to cause glare, eg aluminium louvers covering several sections of the facades.

In summary, through a combination of choice of glazing, facade design, facade orientation and surrounding thoroughfare orientation, no facades of the development will produce reflections causing either disability glare for passing motorists or unacceptable discomfort glare for passing pedestrians.

ARCHITECTURAL DRAWING LIST

DRAWING NO	ISSUE	TITLE	DATE
ARC-DA-A-01	C	SITE ANALYSIS	06.10.09
ARC-DA-D-B1	I	LEVEL B1 PLAN	06.10.09
ARC-DA-D-B2	I	LEVEL B2 PLAN	06.10.09
ARC-DA-D-01	J	LEVEL 1 PLAN	06.10.09
ARC-DA-D-02	K	LEVEL 2 PLAN	06.10.09
ARC-DA-D-03	L	LEVEL 3 PLAN	06.10.09
ARC-DA-D-04	K	LEVEL 4 PLAN	06.10.09
ARC-DA-D-05	J	LEVEL 5 PLAN	06.10.09
ARC-DA-D-06	J	LEVEL 6 PLAN	06.10.09
ARC-DA-D-07	K	LEVEL 7 PLAN	06.10.09
ARC-DA-D-08	J	LEVEL 8 PLAN	06.10.09
ARC-DA-D-09	J	LEVEL 9 PLAN	06.10.09
ARC-DA-D-10	I	LEVEL 10 PLAN	06.10.09
ARC-DA-D-11	H	LEVEL 11 PLAN	06.10.09
ARC-DA-D-12	I	LEVEL 12 PLAN	06.10.09
ARC-DA-D-13	H	ROOF PLAN	06.10.09
ARC-DA-E-01	I	NORTH ELEVATION	06.10.09
ARC-DA-E-02	I	WEST ELEVATION	06.10.09
ARC-DA-E-03	H	SOUTH ELEVATION	06.10.09
ARC-DA-E-04	I	NORTH ELEVATION	06.10.09
ARC-DA-F-01	I	SECTION 1-1’	06.10.09
ARC-DA-F-02	H	SECTION 2-2’	06.10.09
ARC-DA-F-03	H	SECTION 3-3’	06.10.09
ARC-DA-F-04	I	SECTION 4-4’	06.10.09