Solar Light Reflectivity Analysis

for the proposed development known as

Peter Johnson Building, UTS Student Accommodation, Ultimo

July 14, 2008

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2	14/07/2009	Included glazing properties	AB	-	TR

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1.0 Introduction

This study is to investigate the potential impact of solar glare from the proposed development known as Peter Johnson Building, UTS Student Accommodation, Ultimo. The analysis takes into consideration potential reflectivity to street level locations and to the surrounding buildings. The site is bounded by Harris Street to the west, Ultimo Pedestrian Network to the east and adjacent buildings to the north and south. An analysis has been undertaken, based on architectural drawings prepared by Nettleton Tribe Architects, dated March 2008.

With regards to solar reflectivity, this study addresses the requirement of the City of Sydney DCP October 2003, which states under Section 4.5: *Reflectivity*;

4.5.1 *New buildings and facades should not result in glare that causes discomfort or threatens safety of pedestrians or drivers.*

4.5.2 *Visible light reflectivity from building materials used on the facades of new buildings should not exceed 20%.*

4.5.3 *A Reflectivity Report that analyses the potential solar glare from the proposed new development on pedestrians or motorists may be required.*

A reflectivity analysis of the subject development has been carried out using the technique published by Mr David N. H. Hassall (1991)[1].

The limiting veiling luminance of 500 candelas per square metre for the comfort of vehicle drivers, suggested in Hassall (1991) has been adopted as a basis of assessing the glare impact from the subject development. In meeting this criterion for vehicle drivers, conditions will also be satisfactory for pedestrians. The glare impact onto occupants of neighbouring buildings is also discussed.

A figure showing the site location is presented in Figure 1. The various aspects of the proposal are presented in Figure 2.

[1] D.N. Hassall, 1991, Reflectivity, Dealing with Rogue Solar Reflections (published by author)

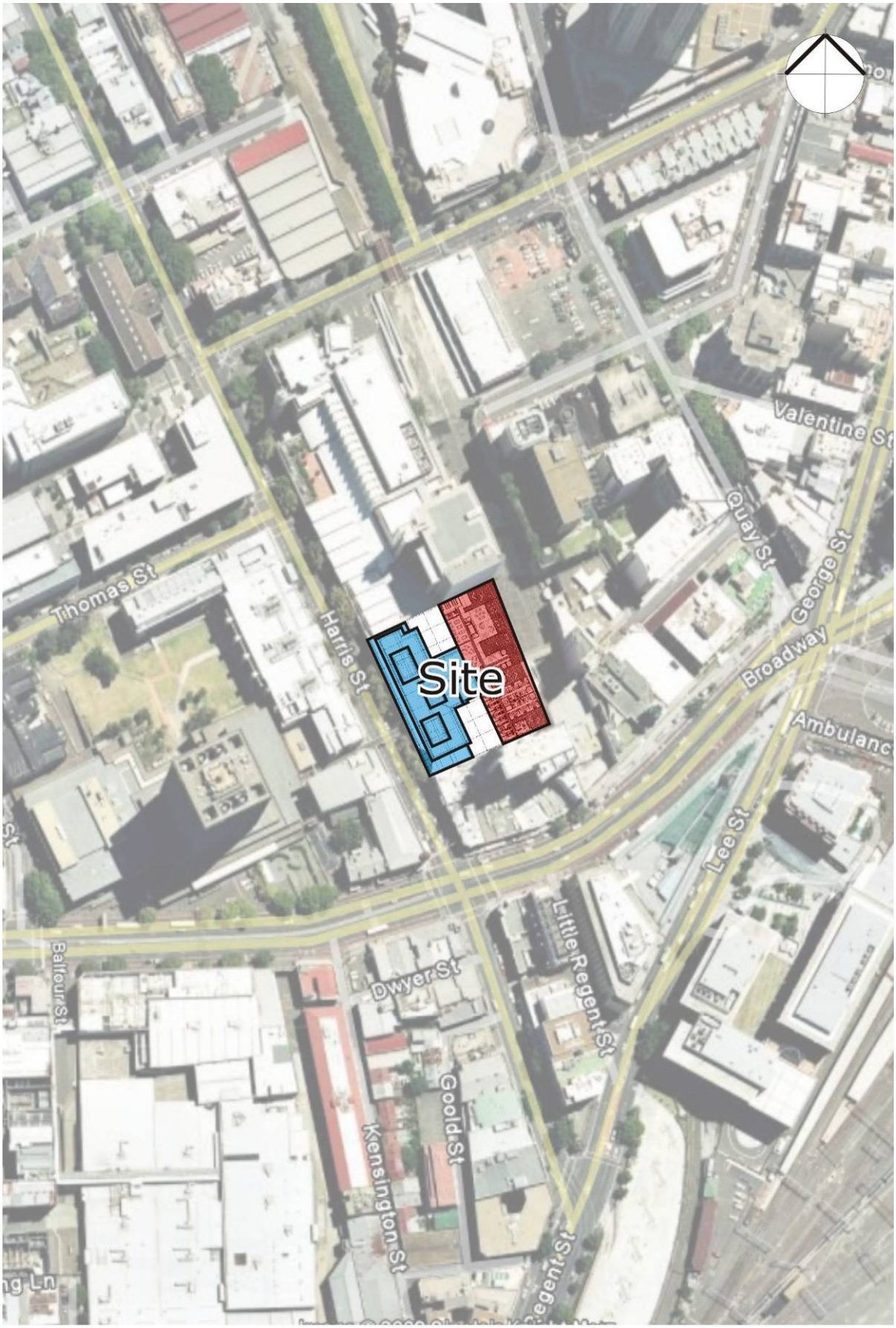

Figure 1: Aerial Image of the Proposed Development

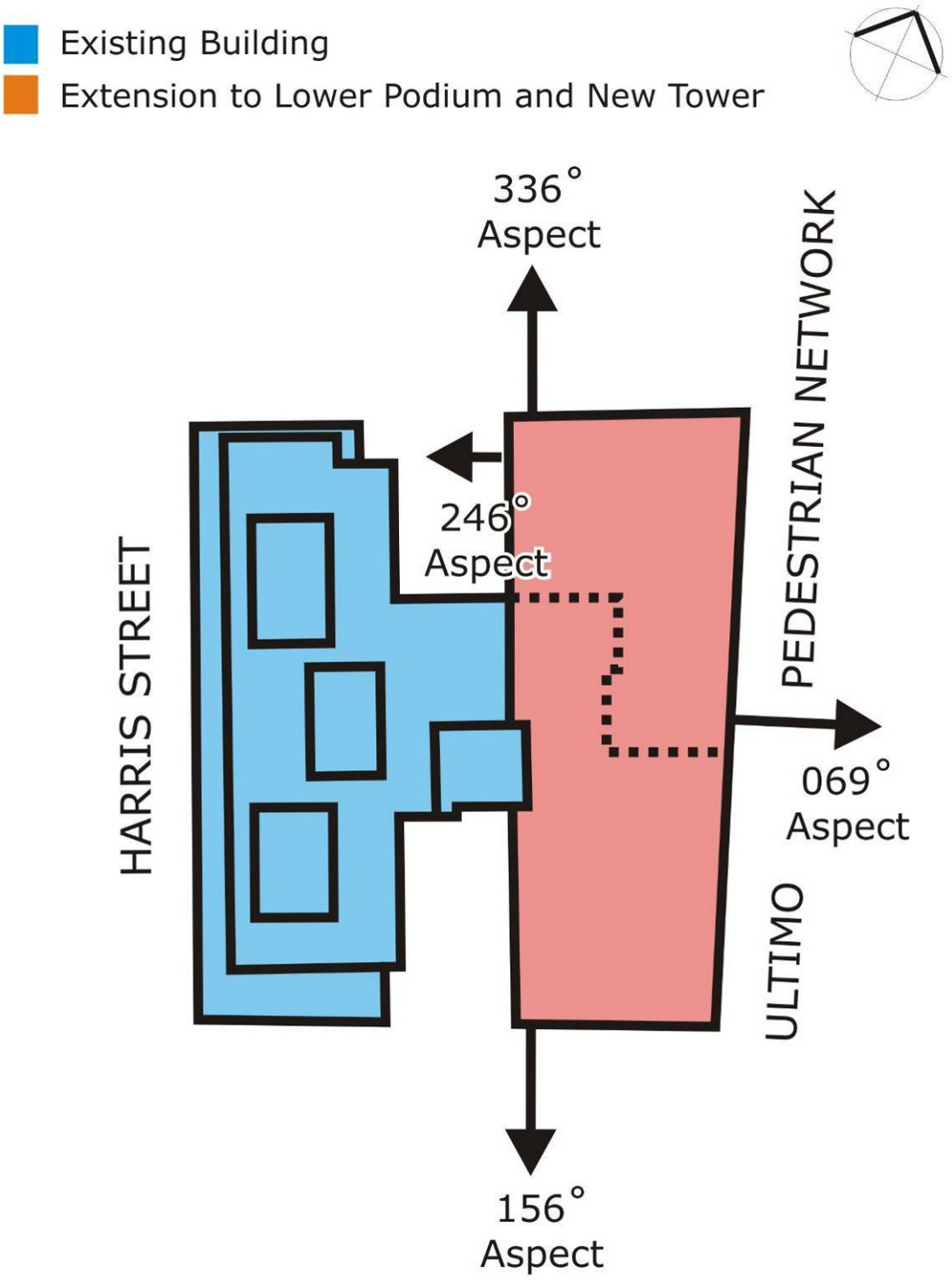

Figure 2: The Critical Aspects of the Development

2.0 Analysis

Solar charts for the various aspects of the development are presented in Appendix B. Check zones for the selected aspects have also been identified based on the data obtained from the solar charts. The check zones highlight the zones that are potentially affected by solar reflections from each aspect. The various check zones for the subject development are described in Figure 3.

It should be noted that the check zones described in Figure 3 do not take into account the effect of overshadowing by neighbouring buildings or the shielding effect of any existing trees or other obstructions. These effects are examined in the detailed analysis in the following section of this report.

The glazing of a building's façade is the major cause of solar glare. Painted surfaces, walls, etc, are far less critical and hence the main focus of this study is to determine the maximum normal specular reflectivity of the glazed surfaces of the façade to avoid adverse glare. Large flat unpainted metallic surfaces can also cause adverse glare and these are also examined in detail if necessary. The proposed glazing type for this development is the Viridian EnviroShield Performance ITO Grey 33, which has a maximum normal specular reflectivity of 5 percent.

2.1 Impact onto Drivers and Pedestrians

From the study of the check zones and with consideration of the potential overshadowing effects of neighbouring buildings, 3 street level locations have been identified for analysis. These locations are indicated in Figure 3. Table 1 summarises the effect of the various aspects on the selected study locations.

Table 1: Aspects of the Site that affect each of the Study Points

Study Point	Aspects
Point 1	069˚ and 336˚ aspects
Point 2	336˚ aspect
Point 3	336˚ aspect

Photographs have been taken from the viewpoint of drivers and pedestrians using a calibrated camera. Views from the study point locations are presented in Appendix A of this report. A scaled glare protractor has been superimposed over each photograph.

The glare protractor is used to assess the amount of glare likely to be caused and to provide a direct comparison with the criterion of 500 candelas per square metre. Alternatively, the glare protractor can be used to determine the maximum acceptable reflectivity index for the glare to be within the criterion of 500 candelas/m^2.

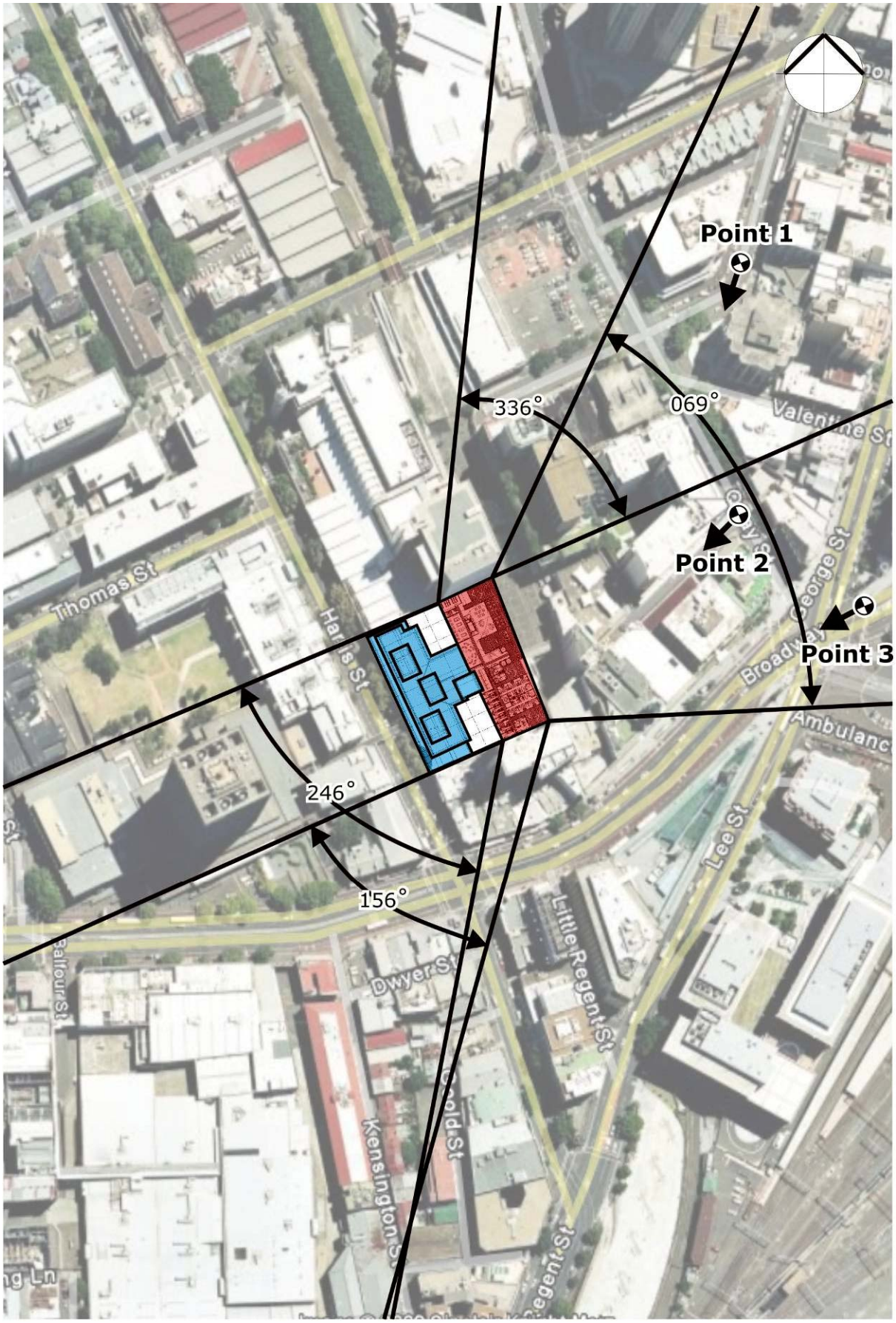

Figure 3: Check Zones and Layout of Study Points

Point 1

Point 1 is located north-east of the proposed development on Thomas Street. This point represents a critical sightline of drivers heading south-west along Thomas Street. This point is located within the check zones for the 069˚ and 336˚ aspects of the proposed development.

The analysis of Point 1, shown in Figure A1 of Appendix A, indicates that the proposed development is obscured by the existing buildings immediately east of the Site.

Hence there will be no adverse glare from the 069˚ and 336˚ aspects of the proposed development to drivers and pedestrians facing south-west along Thomas Street at Point 1.

Point 2

Point 2 is located east of the proposed development on Bijou Lane. This point represents a critical sightline of drivers heading south-west along Bijou. This point is located within the check zone for the 336˚ aspect of the proposed development.

The analysis of Point 2, shown in Figure A2 of Appendix A, indicates that the proposed development is obscured by the existing buildings immediately east of the Site.

Hence there will be no adverse glare from the 336˚ aspect of the proposed development to drivers and pedestrians facing south-west along Bijou at Point 2.

Point 3

Point 3 is located east of the proposed development on Pitt Street. This point represents a critical sightline of drivers heading south-west along Pitt Street. This point is located within the check zone for the 336˚ aspect of the proposed development.

The analysis of Point 3, shown in Figure A3 of Appendix A, indicates that the proposed development is obscured by the existing buildings immediately east of the Site.

Hence there will be no adverse glare from the 336˚ aspect of the proposed development to drivers and pedestrians facing south-west along Pitt Street at Point 3.

2.2 Impact onto Occupants of Neighbouring Buildings

More research is required to properly assess what is considered an acceptable level of veiling luminance to occupants of surrounding buildings. Rofail and Dowdle (2004)[2] have highlighted the subjectivity of glare impact to occupants of surrounding buildings as it is highly affected by a number of factors, some of these are listed below:

- the intensity of glare
- duration of glare impact
- the type of use of the building
- the type of glazing used on the neighbouring building (eg. Clear or Tinted)
- shading elements on the façade of the neighbouring building
- level of tolerance by the occupant of the neighbouring building

Our past experience, involving approximately 200 projects, tends to indicate that buildings that tend to cause nuisance to occupants of neighbouring buildings are those that have a normal specular reflectivity of visible light greater than 20%. This seems to justify the suggested limit of 20% reflectivity by many local government authorities and state planning bodies. This reflectivity is defined as the level of luminance or normal specular reflectivity of visible light.

Hence, a general recommendation is made that all glazing used on the facades of the development have a normal specular reflectivity of visible light of 20 percent or less to avoid adverse solar glare to occupants of neighbouring buildings.

The proposed glazing type for this development only has a maximum normal specular reflectivity of 5 percent, and hence the development will satisfy the above recommendation.

[2] A.W. Rofail and B. Dowdle, 2004, “Reflectivity Impact on Occupants of Neighbouring Properties” International Conf. on Building Envelope Systems & Technologies, Sydney.

3.0 Conclusion

A reflectivity analysis of the proposed development located at known as Peter Johnson Building, UTS Student Accommodation, Ultimo has been carried out using the technique published by Mr David N. H. Hassall.

To avoid any adverse glare to drivers and pedestrians on the surrounding streets of the proposed development site, and to comply with the requirements of the City of Sydney DCP October 2003, Section 4.5 for reflectivity, it is recommended that all areas of the façade of the development should have a maximum normal specular reflectivity of visible light of 20 percent. The results of the analysis indicate that the neighbouring buildings around the subject site will block the view of the proposed development along the critical sightlines on the surrounding streets. This provides effective mitigation of solar glare to drivers in the surrounding streets.

The proposed glazing type for this development only has a maximum normal specular reflectivity of 5 percent, and hence the development will satisfy the above recommendation. The proposed development will not cause adverse solar glare to drivers or pedestrians in any of the surrounding streets, other outdoor areas or to the occupants of the surrounding buildings.

Appendix A

Analysis of Sight-Lines from the Various Study Locations

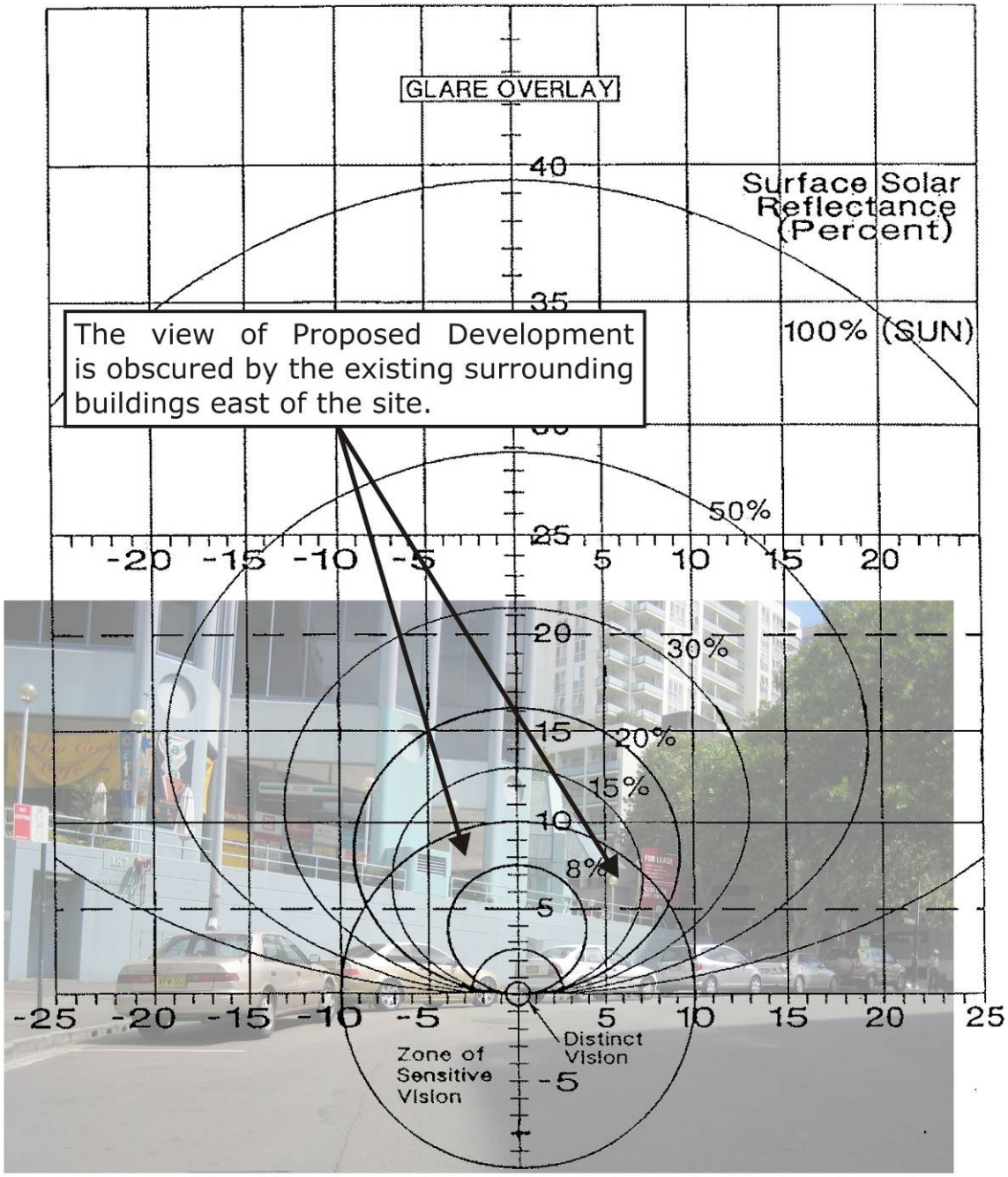

Figure A1: Glare Overlay for Point 1

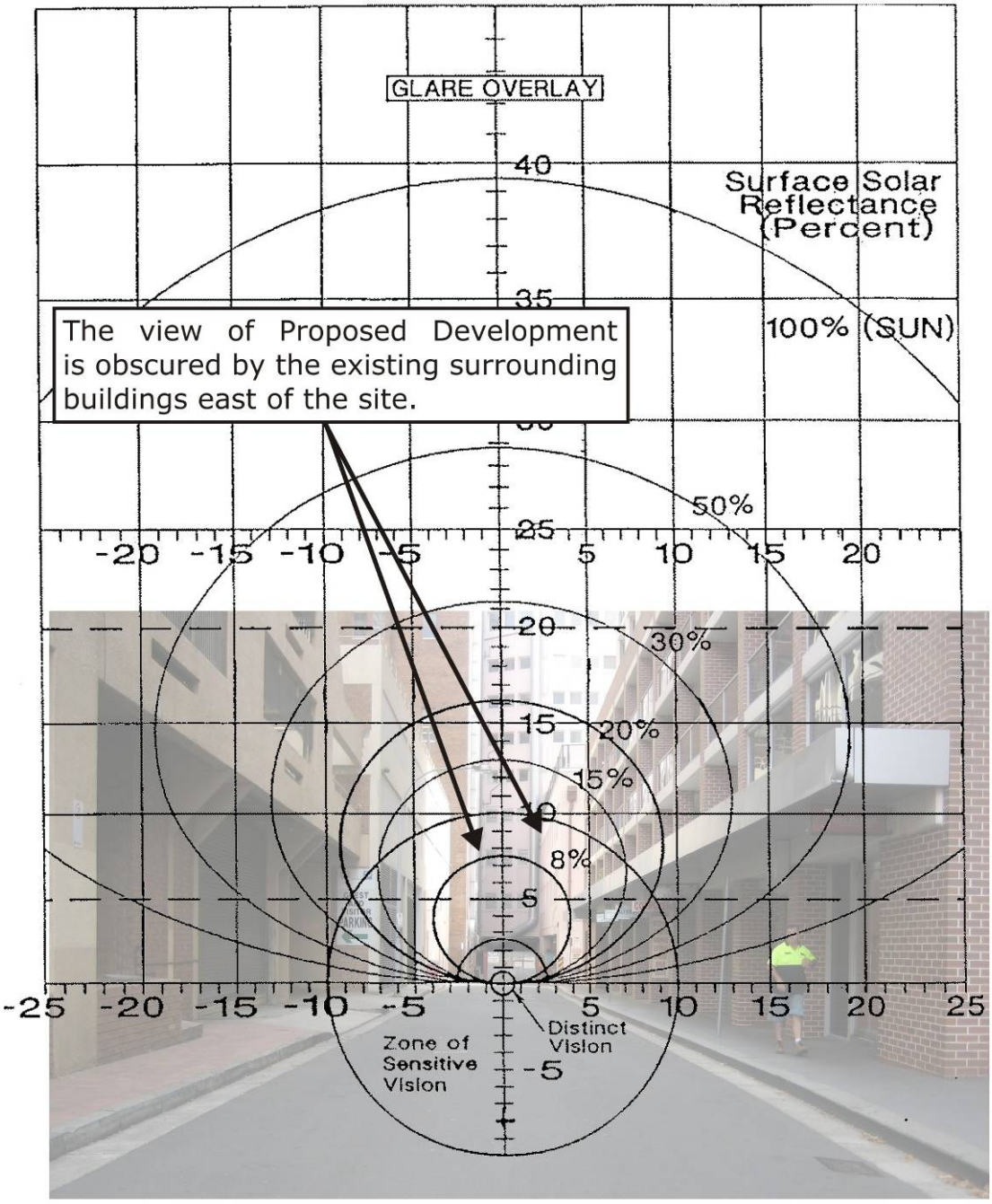

Figure A2: Glare Overlay for Point 2

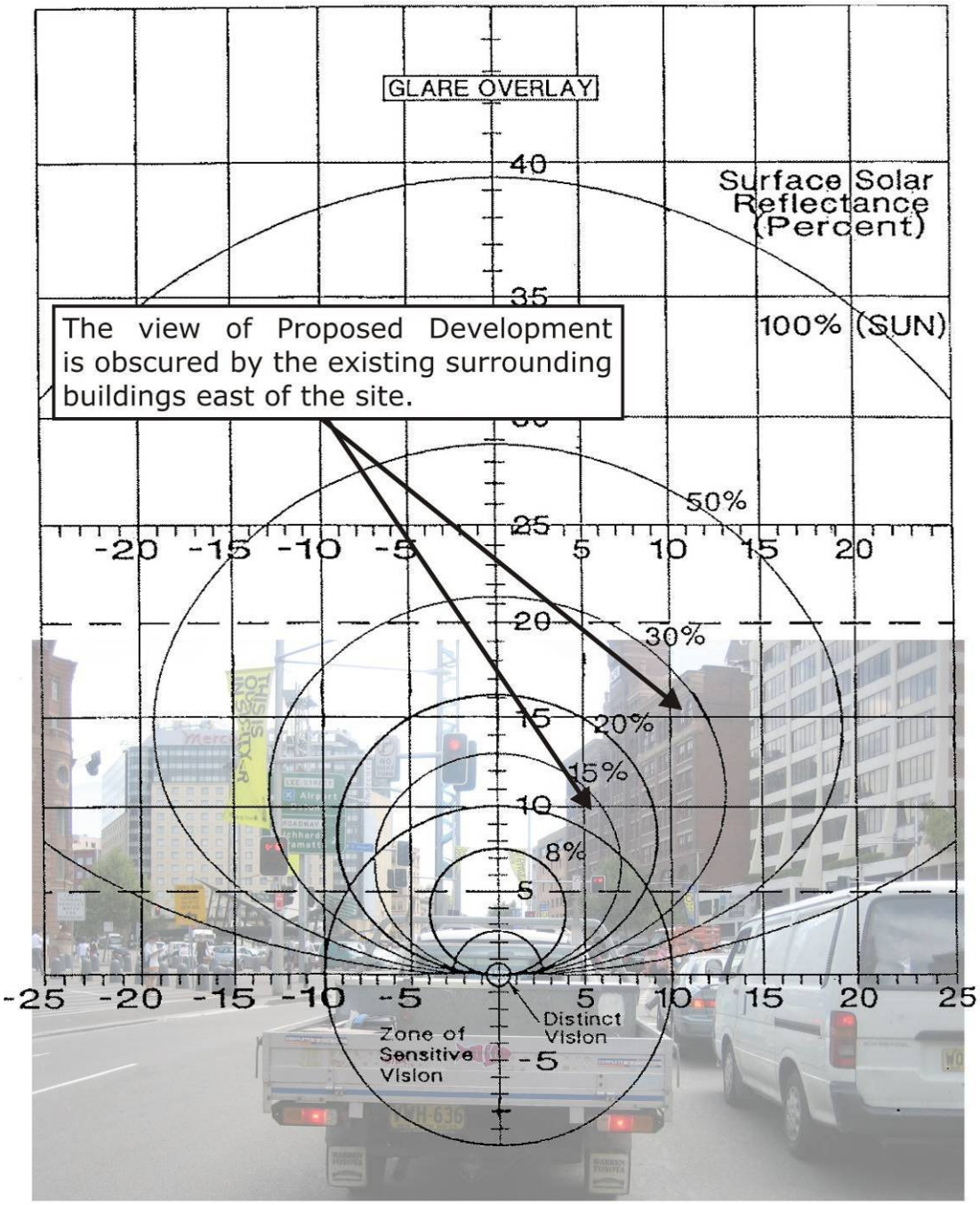

Figure A3: Glare Overlay for Point 3

Appendix B

Solar Charts for the Various Aspects of the Proposal

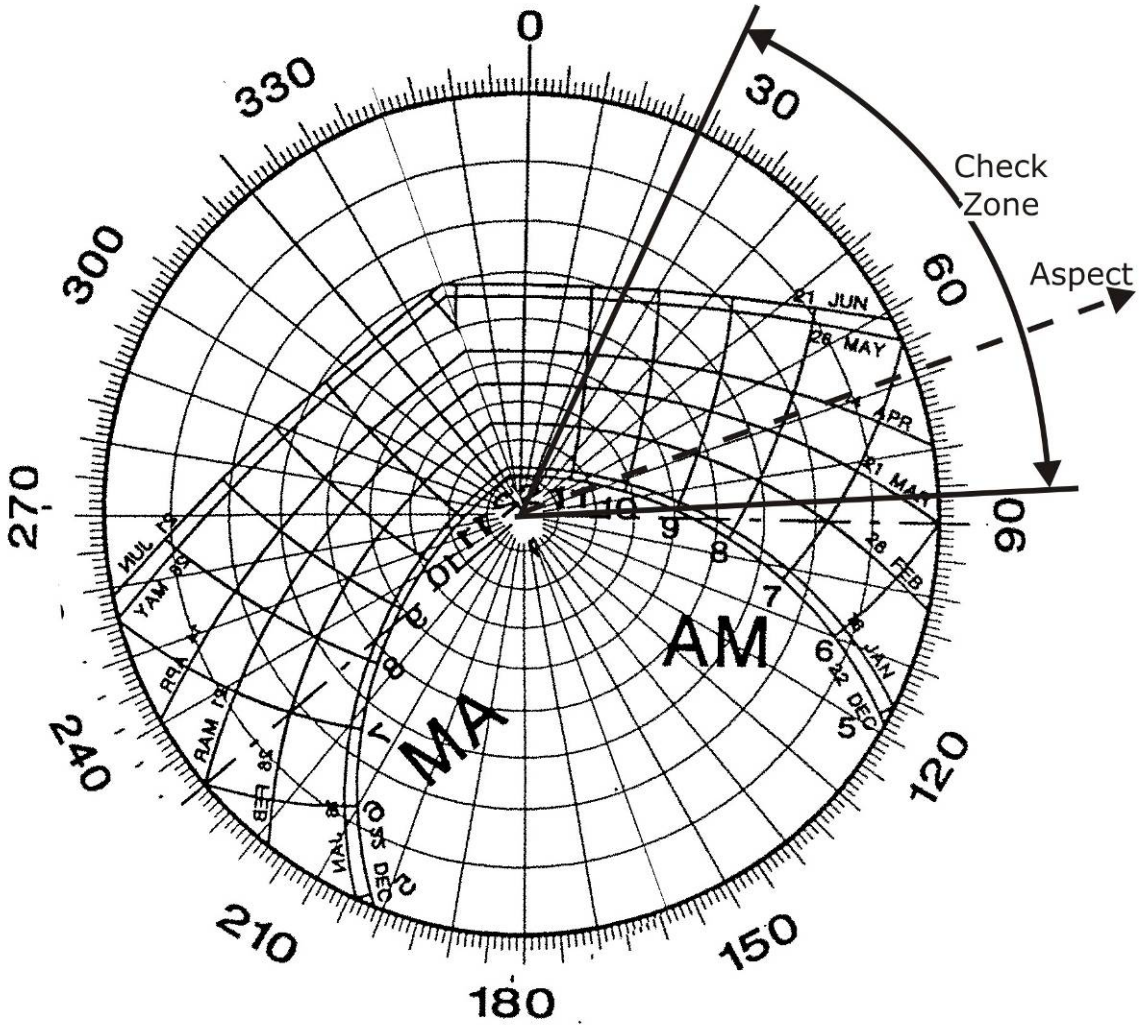

Figure B1: Sun Chart for Aspect 069°

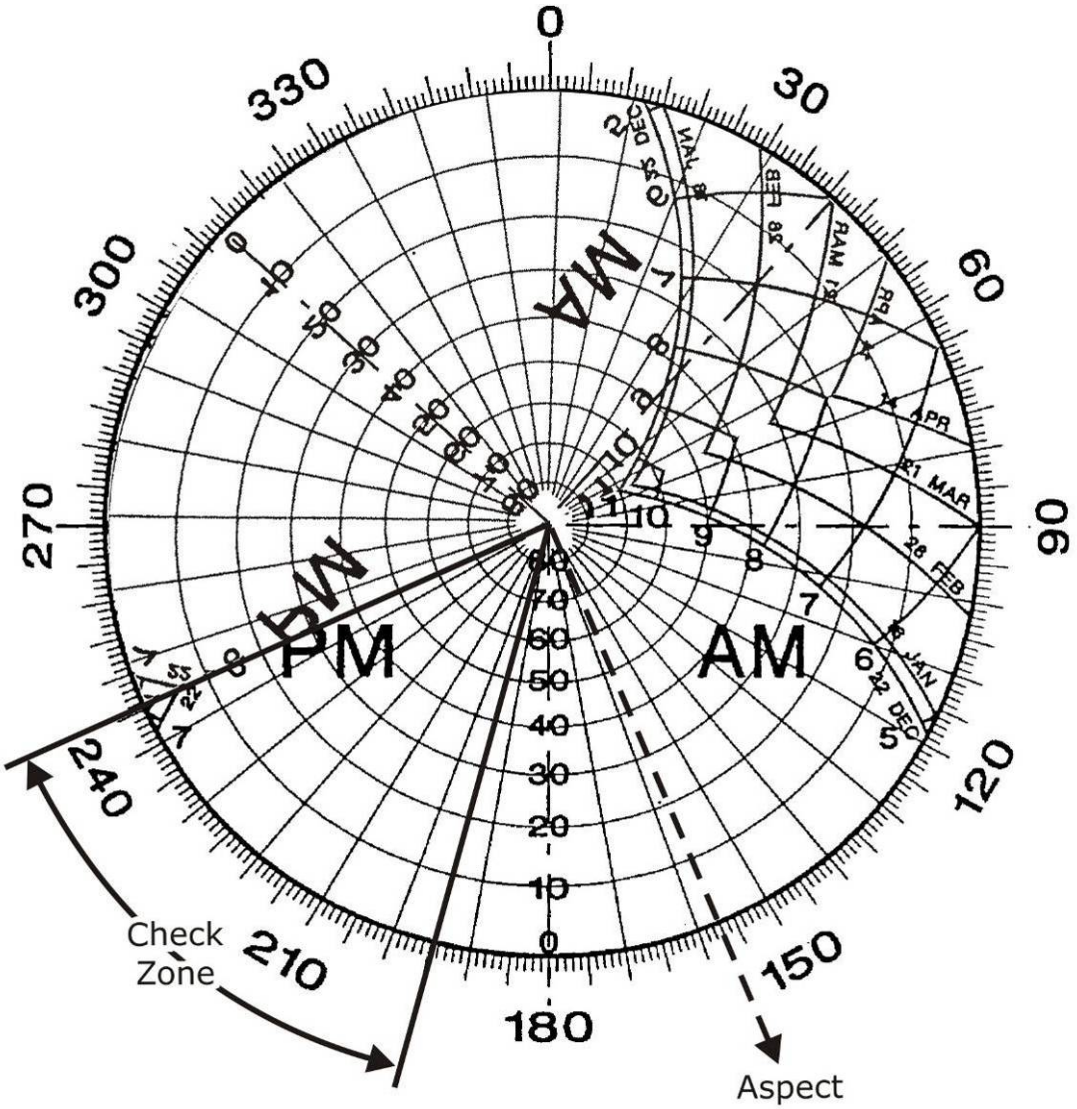

Figure B2: Sun Chart for Aspect 156°

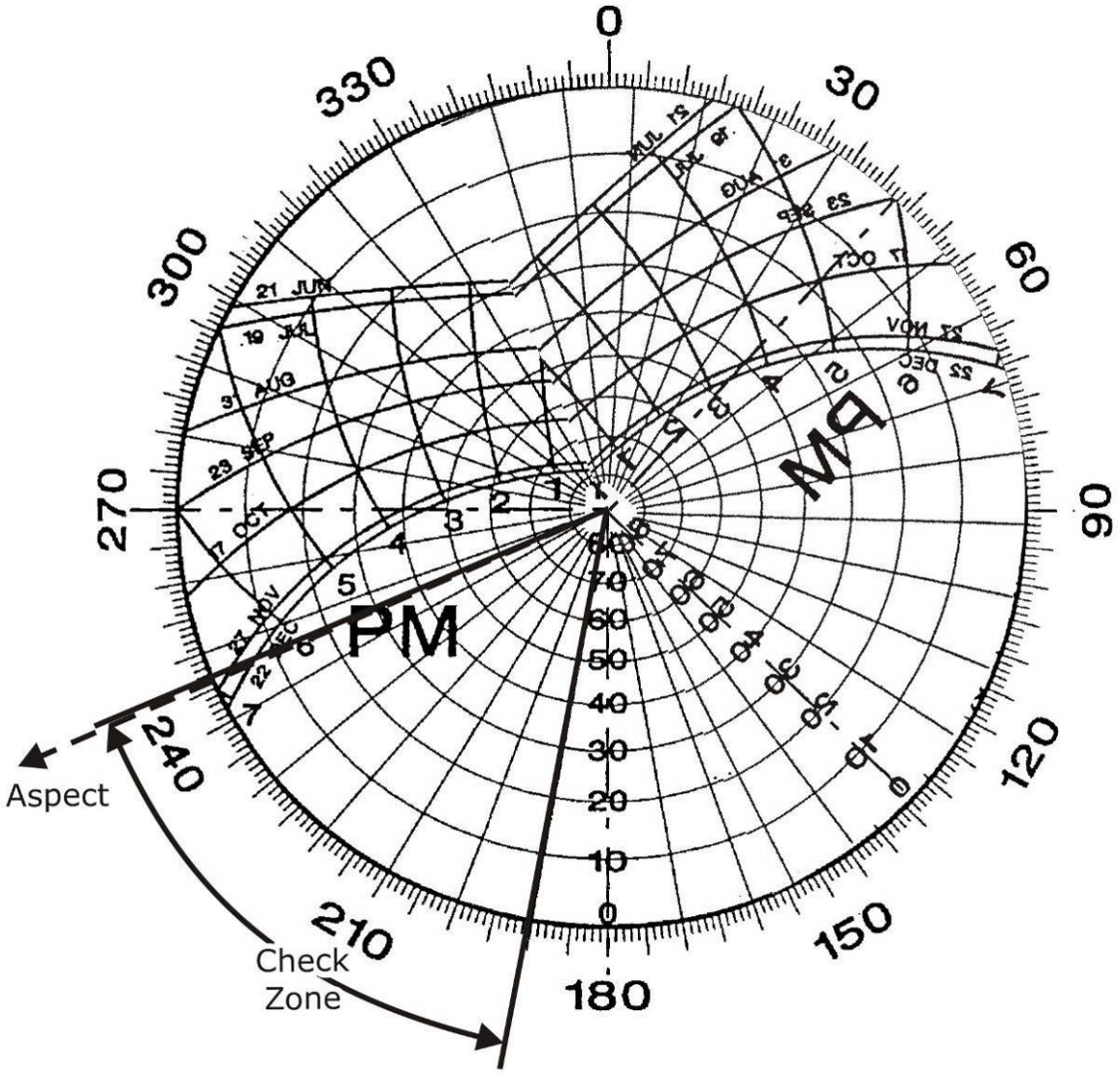

Figure B3: Sun Chart for Aspect 246°

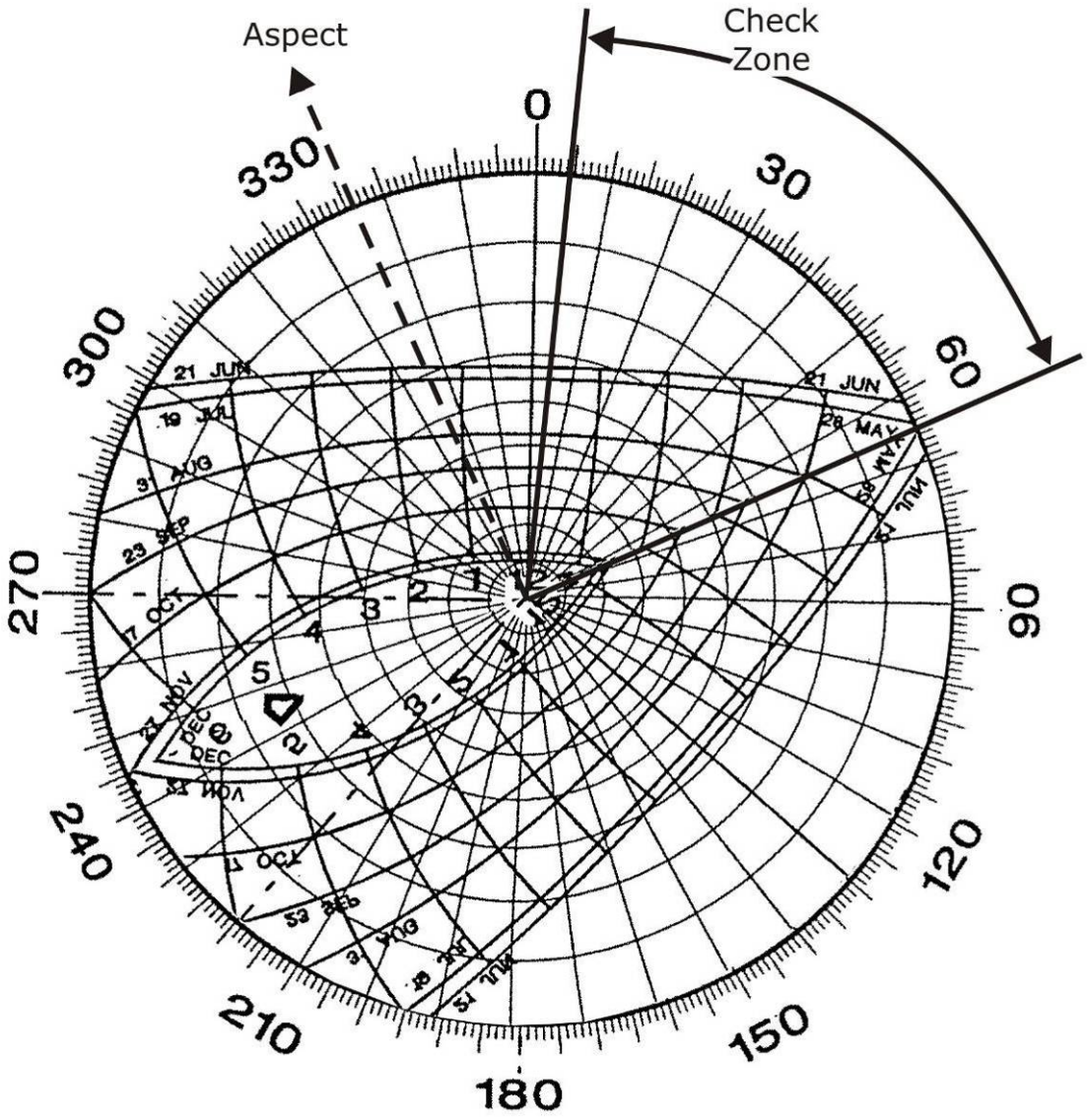

Figure B4: Sun Chart for Aspect 336°