



Solar Light Reflectivity Analysis for the proposed development known as Site 4B, Sydney Olympic Park, Homebush Bay

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Document Control

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1.0 Introduction

This study is to investigate the potential impact of solar glare from the proposed development known as Site 4B at Sydney Olympic Park, Homebush Bay. An analysis of the potential impact of solar glare from the proposed development has been undertaken based on architectural drawings prepared by the project architect Bates Smart, received November 29, 2010.

With regards to visible solar light reflectivity, this study addresses the requirements of Section 6.2.4 of the Sydney Olympic Park Master Plan 2002, which states;

“Visible light reflectivity from building materials used on the façades of new buildings should not exceed 20%.”

This study also assesses whether the proposed development can cause adverse solar glare to pedestrians and drivers in the local surrounding streets, and for occupants within the various surrounding buildings. The analysis 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 been addressed in the study.

An aerial photograph of the site is presented in Figure 1. The various aspects of the proposal are presented on Figure 2.

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



Figure 1: Site Location

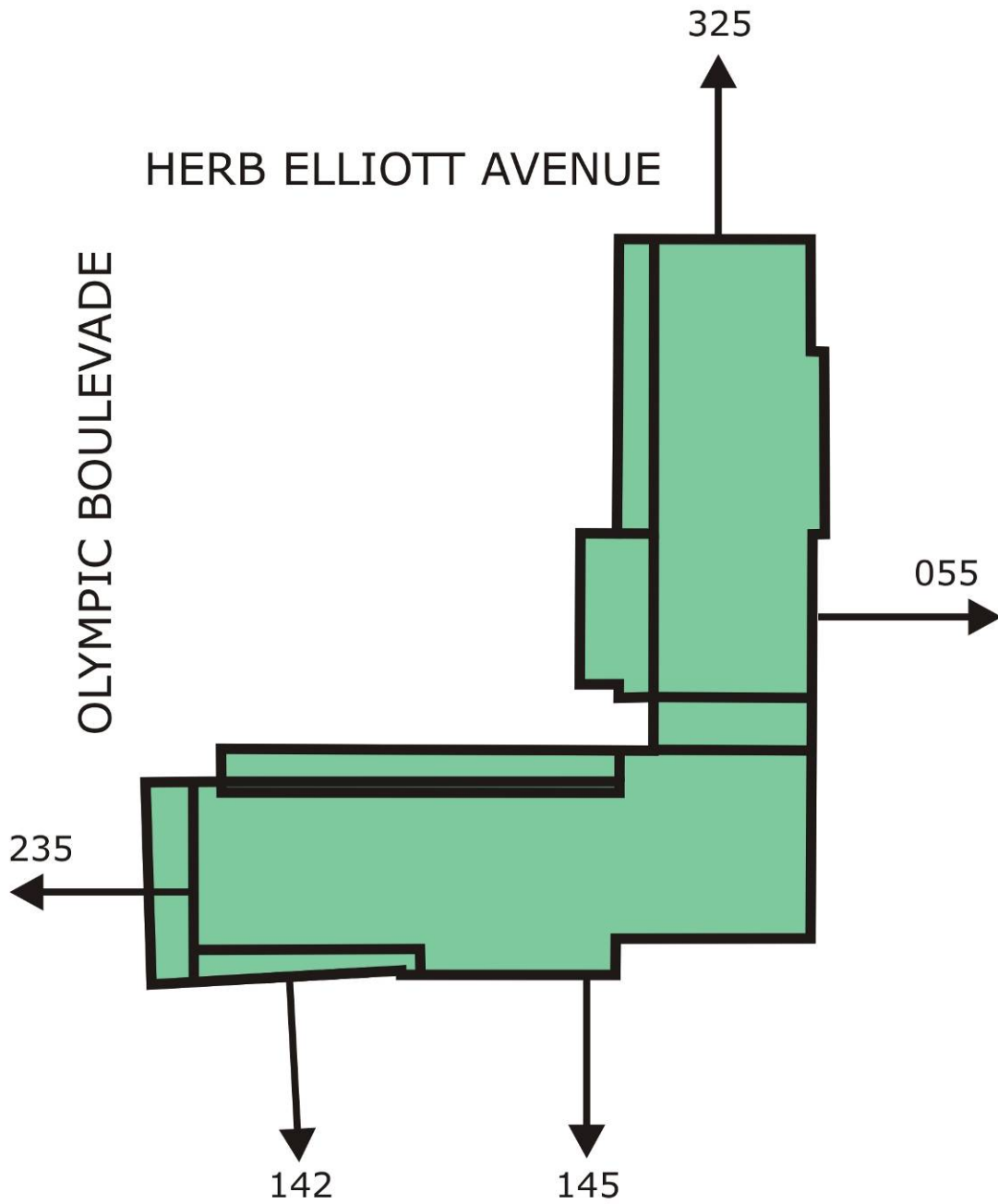


Figure 2: The Critical Aspects of the Proposed Development

2.0 Methodology

Solar charts for the various aspects of the proposed 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.

2.1 Impact onto Drivers and Pedestrians

From the study of the check zones shown in Figure 3, 5 street level locations have been identified for detailed analysis. These locations are also indicated in Figure 3. Table 1 summarises the effect of the various critical aspects of the proposed development on the selected study locations.

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

Study Point	Aspects
Point 1	325° aspect
Point 2	325° aspect
Point 3	055° and 325° aspects
Point 4	055° and 325° aspects
Point 5	142° and 145° aspects

For each of the street level study points a photograph has been taken from the viewpoint of drivers and pedestrians at the study point location using a calibrated camera. These 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/m².



Figure 3: Check Zones and Layout of Study Points

2.1.1 Drivers heading south along Showground Road

Points 1 and 2 are located to the north of the proposed development site on Showground Road, with Point 2 located closer to the development than Point 1. These points represent critical sightlines of drivers heading south along Showground Road, and are located within the check zone for the 325° aspect of the proposed development.

A site survey of these points has been undertaken, and photographs showing the viewpoint of drivers heading south along Showground Road at these locations were obtained using a calibrated camera. The photographs were scaled to enable the glare meter to be overlaid onto the images, as shown in Figures A1 and A2 of Appendix A.

On closer inspection of Figure 3, it is noted that Point 1 is only within the check zone for the 325° aspect at the south-western end of the development. An analysis of the glare meter overlaid onto the viewpoint at Point 1 indicates that the aforementioned aspect from including Level 5 and above is within the zone of sensitive vision for drivers heading south at this location. For the solar glare to be reflected to Point 1 within the zone of sensitive vision, from the aforementioned aspect, the sun's angle of azimuth range and angle of inclination range would need to be between 316° and 319° and 5° and 9.5° respectively. The standard sun chart for the Sydney region indicates that the sun does not operate within these ranges, and hence solar glare cannot be reflected to Point 1 from the 325° aspect at the south-western end of the development.

Point 2 is also only within the check zone for the 325° aspect at the south-western end of the development. An analysis of the glare meter overlaid onto the viewpoint at Point 2 indicates that the aforementioned aspect from including Level 3 and above is within the zone of sensitive vision for drivers heading south at this location. For the solar glare to be reflected to Point 2, within the zone of sensitive vision, from the aforementioned aspect, the sun's angle of azimuth range and angle of inclination range would need to be between 313° and 318° and 5° and 10° respectively. The standard sun chart for the Sydney region indicates that the sun does not operate within these ranges, and hence solar glare cannot be reflected to Point 2 from the 325° aspect at the south-western end of the development.

2.1.2 Drivers heading south-west along Herb Elliot Avenue

Points 3 and 4 are located to the north-east of the proposed development site on Herb Elliot Avenue, with Point 4 located closer to the development than Point 3. These points represent critical sightlines of drivers heading south-west along Herb Elliot Avenue, and are located within the check zones for the 055° and 325° aspects of the proposed development.

A site survey of these points has been undertaken, and photographs showing the viewpoint of drivers heading south-west along Herb Elliot Avenue at these locations were obtained using a calibrated camera. The

photographs were scaled to enable the glare meter to be overlaid onto the images, as shown in Figures A3 and A4 of Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 3 indicates that the view of the proposed development is blocked by the existing densely foliating trees to the north-east of the development site lining the southern side of Herb Elliot Avenue. Hence there will be no adverse glare reflected from the proposed development to drivers and pedestrians heading south-west along Herb Elliot Avenue at Point 3.

An analysis of the glare meter overlaid onto the viewpoint at Point 4 indicates that the view of the proposed development is blocked by the existing densely foliating trees to the north-east of the development site lining the southern side of Herb Elliot Avenue. Hence there will be no adverse glare reflected from the proposed development to drivers and pedestrians heading south-west along Herb Elliot Avenue at Point 4.

2.1.3 Drivers heading north-west along Olympic Boulevard

Point 5 is located to the south of the proposed development site on Olympic Boulevard. This point represents a critical sightline of drivers heading north-west along Olympic Boulevard, and is located within the check zones for the 142° and 145° aspects of the proposed development.

A site survey of Point 5 has been undertaken, and the photograph showing the viewpoint of drivers heading north-west along Olympic Boulevard at this location was obtained using a calibrated camera. The photograph was scaled to enable the glare meter to be overlaid onto the images, as shown in Figures A5 of Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 5 indicates that the view of the proposed development is outside the zone of sensitive vision for drivers heading north-west at this location.

Hence there will be no adverse glare reflected from the proposed development to drivers and pedestrians heading north-west along Olympic Boulevard at Point 5.

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% or less to avoid adverse solar glare to occupants of neighbouring buildings.

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

6.0 Conclusion

An analysis has been undertaken to assess the potential impact of solar glare from the proposed development known as Site 4B at Sydney Olympic Park, Homebush Bay. The analysis has been carried out using the technique published by Mr David N. H. Hassall, and the architectural drawings prepared by the project architect Bates Smart, received November 29, 2010.

The results of the study indicate that to avoid any adverse glare to drivers and pedestrians on the surrounding streets, occupants of neighbouring buildings, and to comply with the requirements of Section 6.2.4 of the Sydney Olympic Park Master Plan 2002, the following recommendations have been made on the reflectance properties of the glazing to be used on the façade;

- All remaining glazed areas of the façade of the development should have a maximum normal specular reflectivity of visible light of 20%.

With these recommendations satisfied, the results of this analysis indicate that the proposed development will not cause adverse solar glare to vehicle drivers or pedestrians in any of the surrounding streets and other outdoor areas. It is also expected that no adverse glare impacts will result with regards to the occupants of neighbouring buildings. Hence the requirements for reflectivity from Section 6.2.4 of the Sydney Olympic Park Master Plan 2002 will also be satisfied with the implementation of the abovementioned recommendations.

Appendix A

Analysis of Sight-Lines from the
Various Study Locations

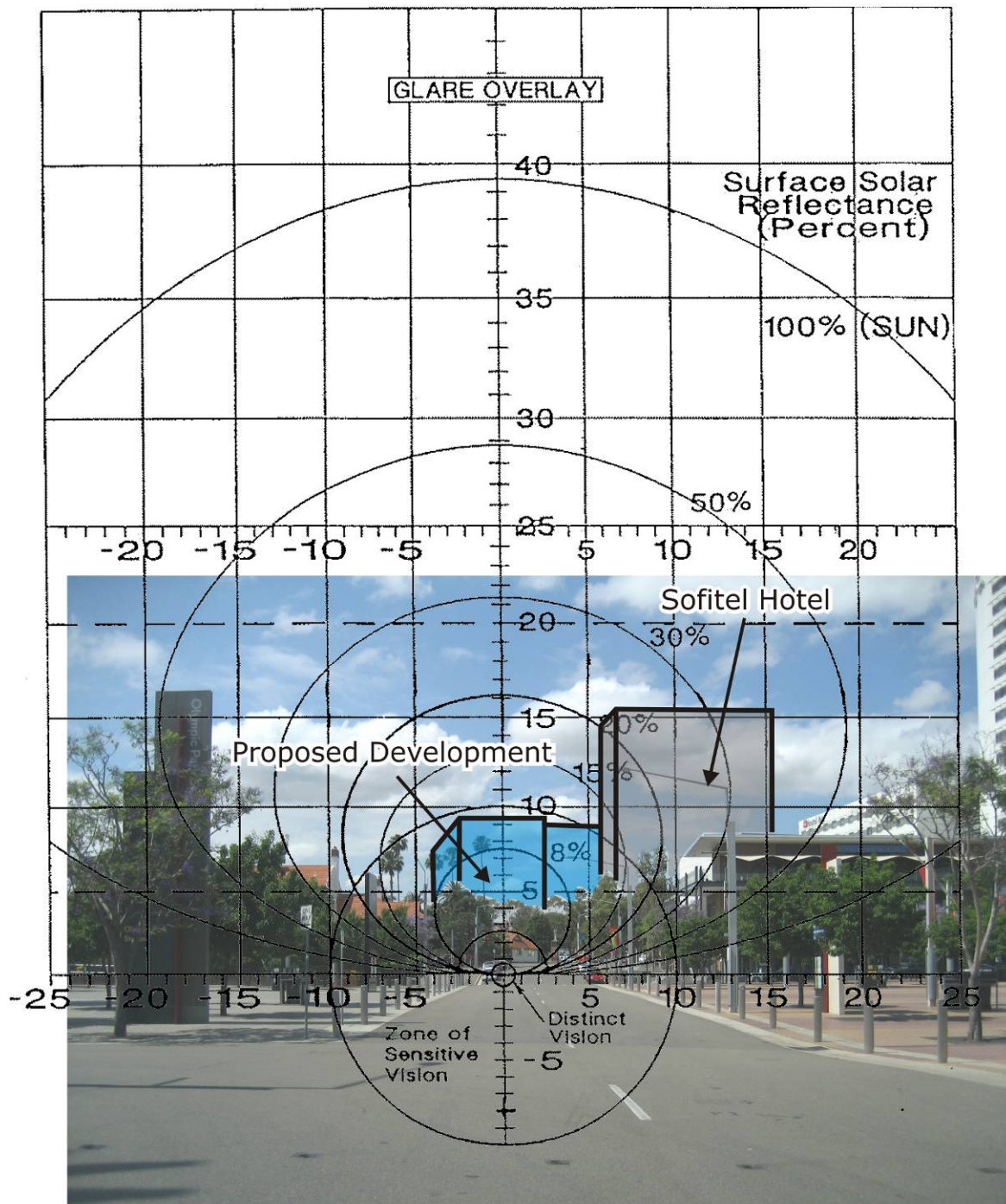


Figure A1: Glare Overlay for Point 1

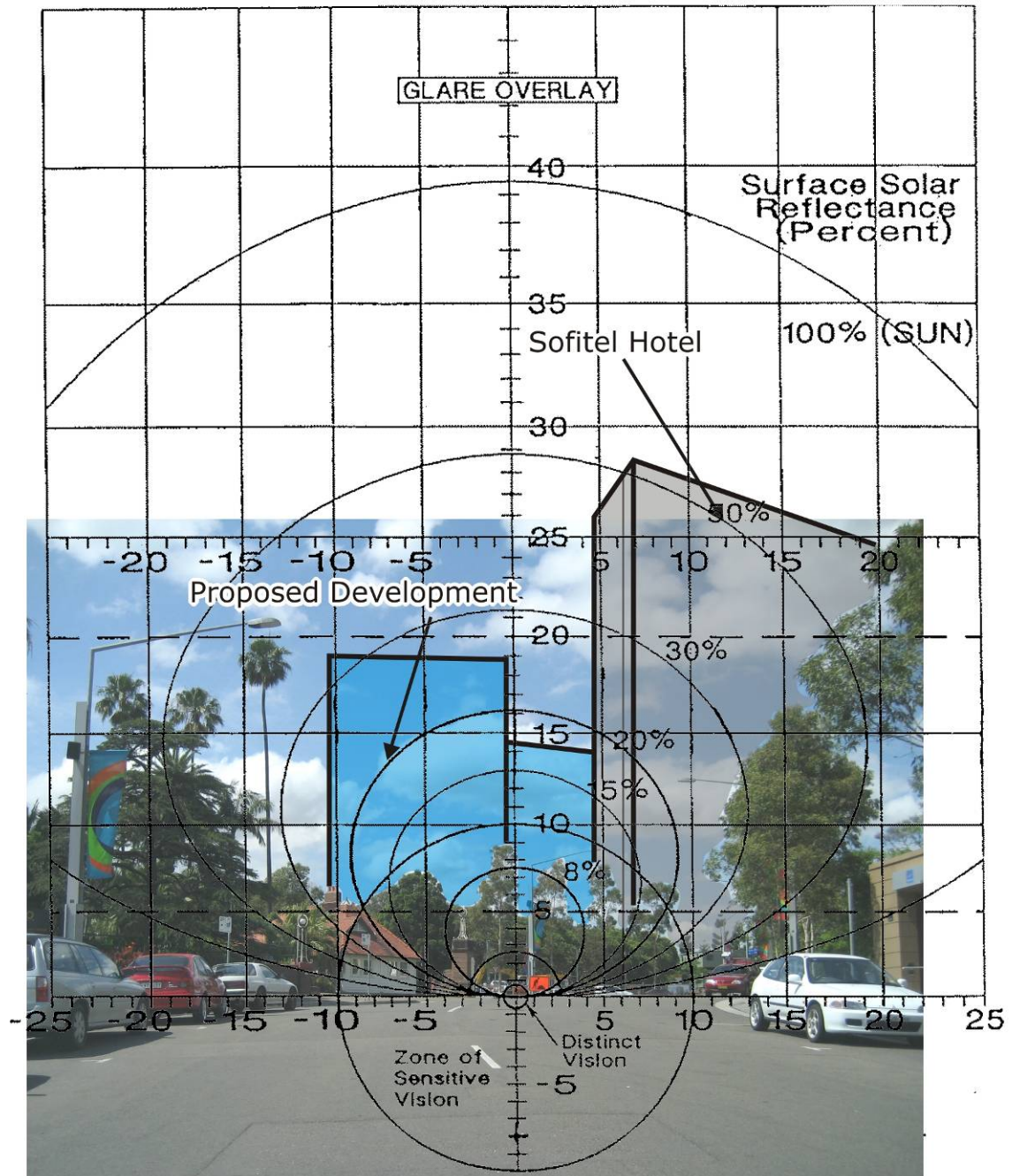


Figure A2: Glare Overlay for Point 2

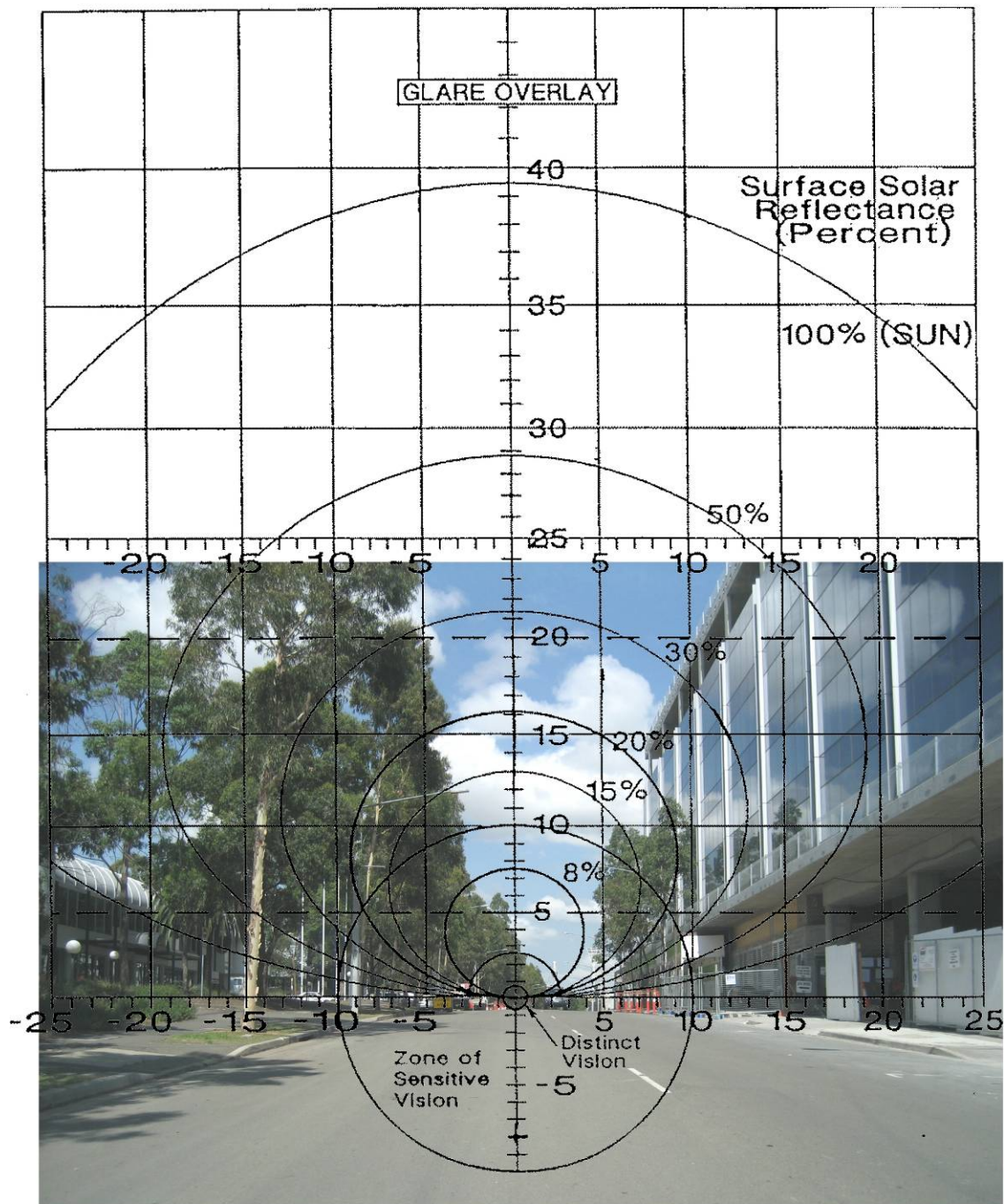


Figure A3: Glare Overlay for Point 3

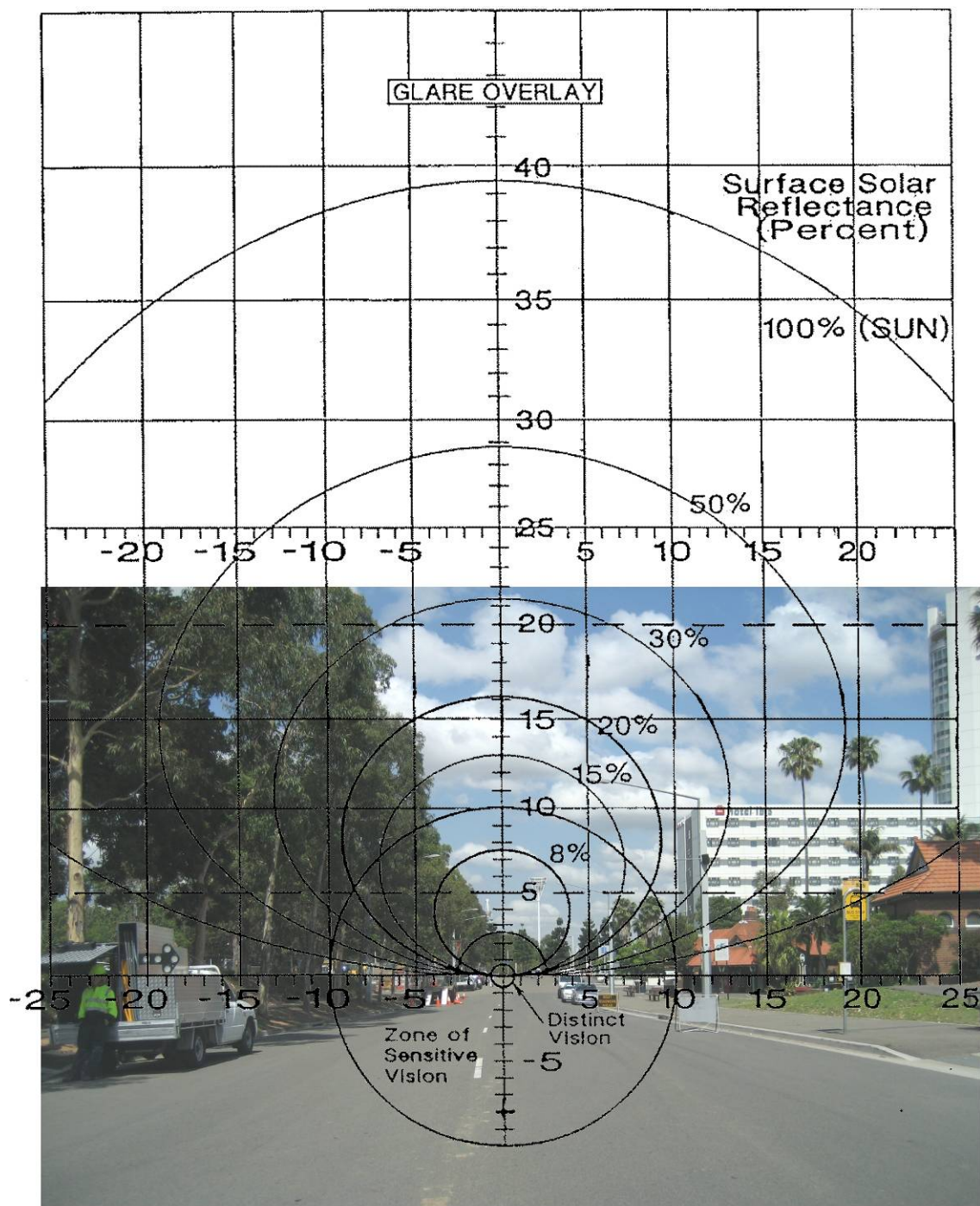


Figure A4: Glare Overlay for Point 4

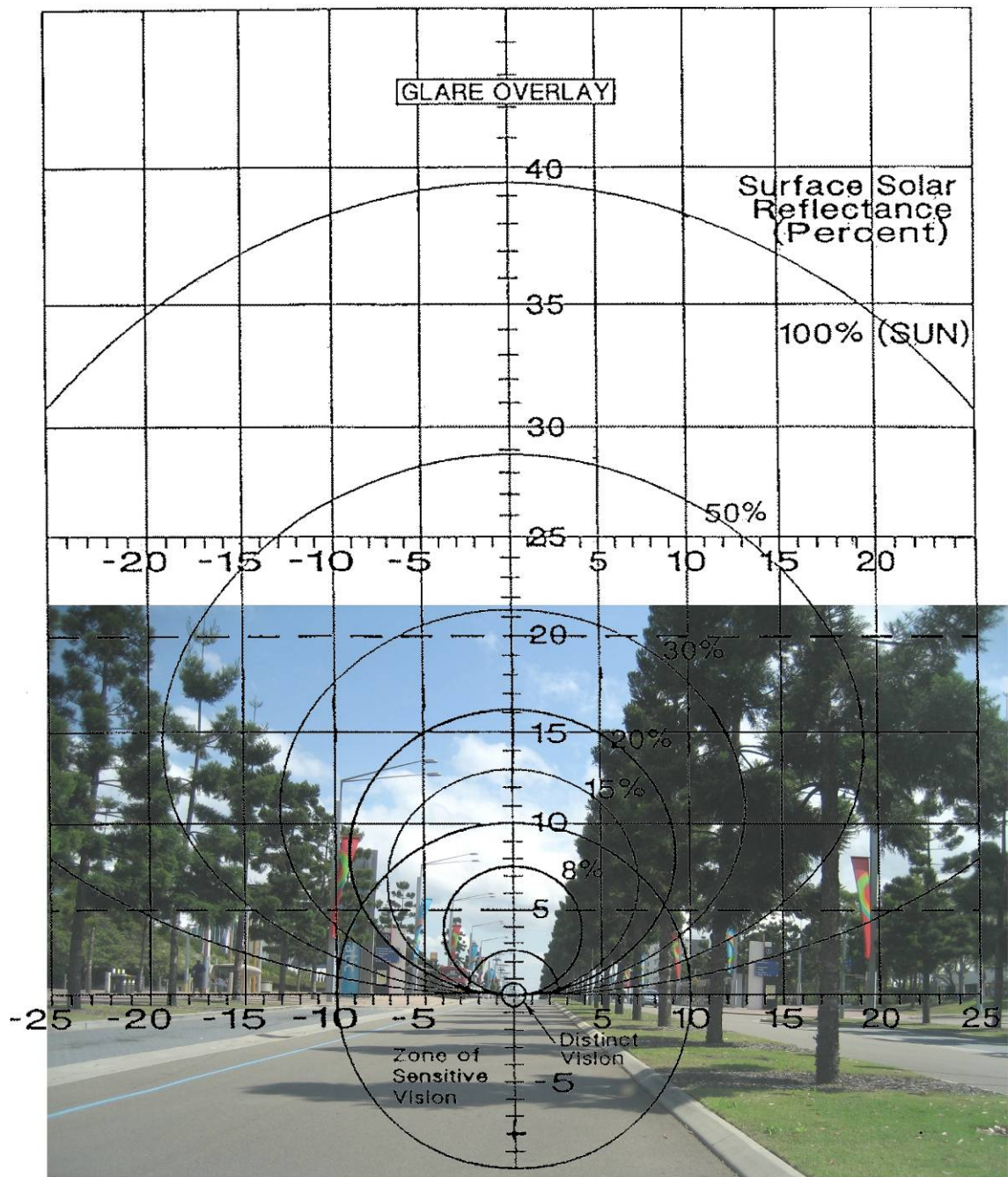


Figure A5: Glare Overlay for Point 5

Appendix B

Solar Charts for the
Various Critical Aspects of the
Proposed Development

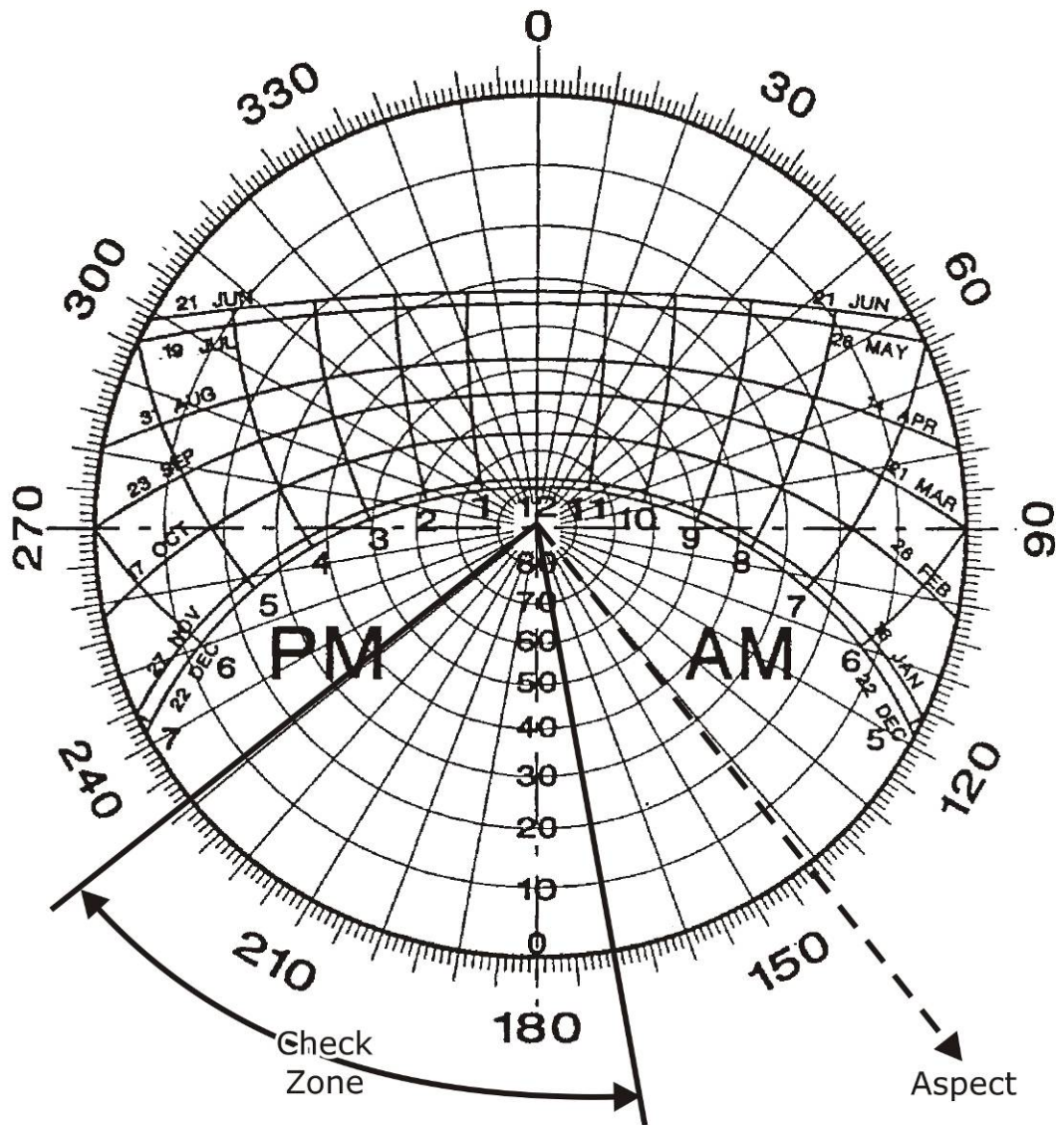


Figure B2: Sun Chart for Aspect 142°

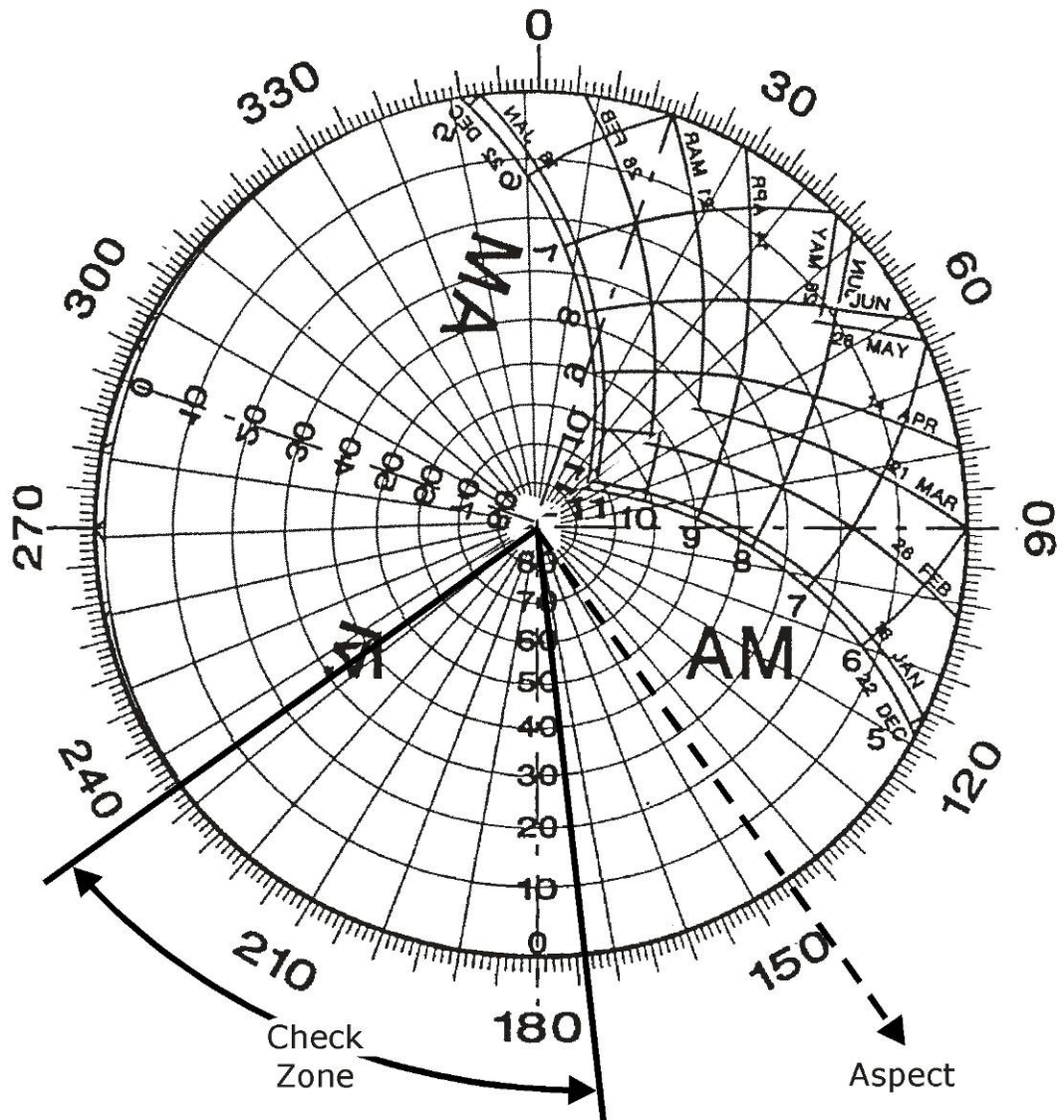


Figure B3: Sun Chart for Aspect 145°

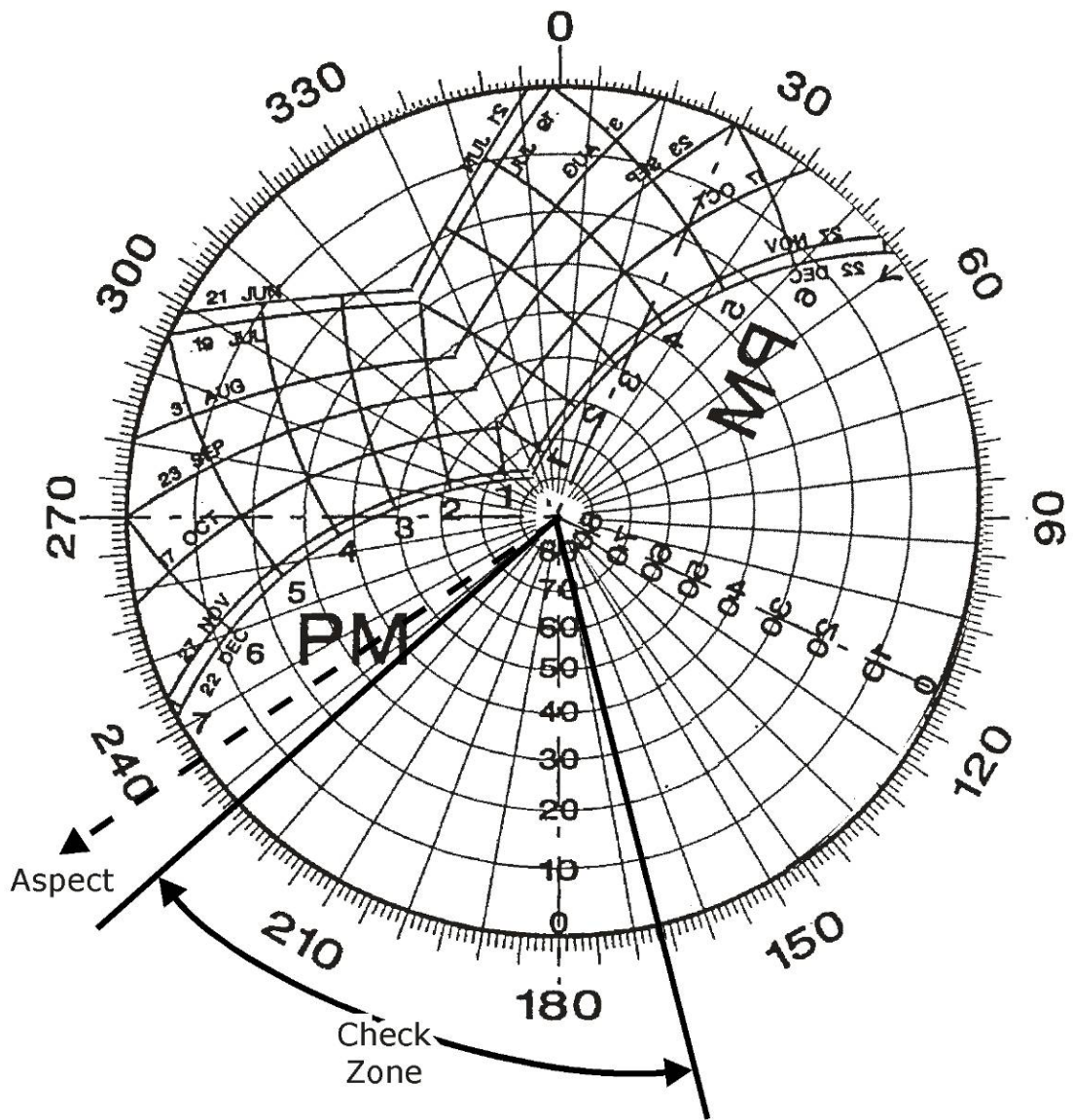


Figure B4: Sun Chart for Aspect 235°

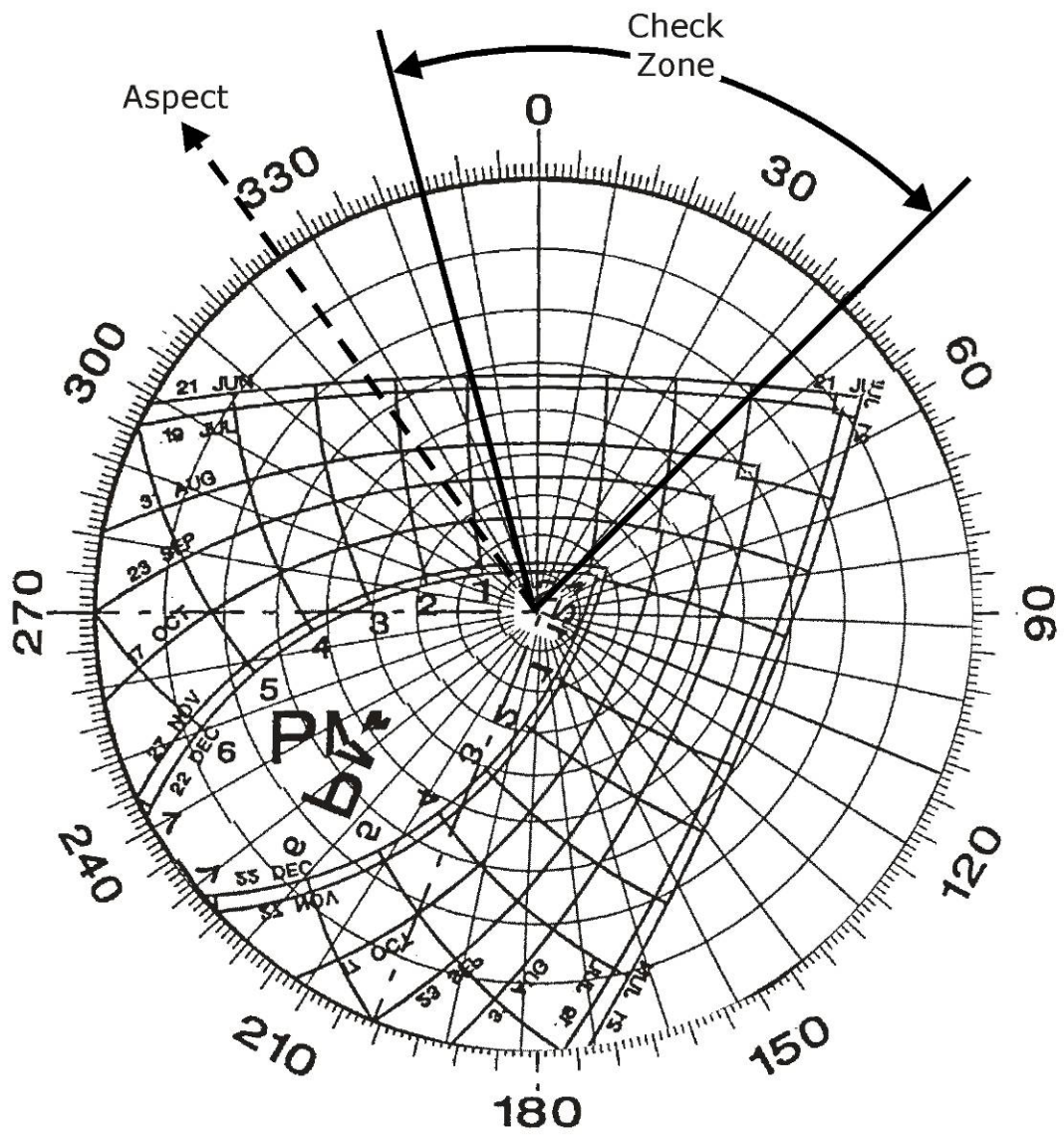


Figure B5: Sun Chart for Aspect 325°