

Solar Light Reflectivity Analysis
for the proposed development located at
88 Walker Street & 77-81 Berry
Street, North Sydney

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1.0 Introduction

This study is to investigate the potential impact of solar glare from the proposed development located at 88 Walker Street & 77-81 Berry Street, North Sydney. The analysis takes into consideration potential reflectivity to street level locations and to the surrounding buildings.

The proposed development consists of two towers. The office building is bounded by Little Spring Street to the east, Spring Street to the south, Denison Street to the west and an adjacent building to the north. The hotel building is bounded by Walker Street to the east, Little Spring Street to the west and adjacent buildings to the north and south. The office building is connected to the hotel building by a link bridge over Little Spring Street. An analysis has been undertaken, based on architectural drawings prepared by Rice Daubney Architects, dated February 2009.

With regards to solar reflectivity, this study addresses the requirement of the North Sydney Council DCP 2002, which states under Sections 6.2f and 20.2d

Pedestrians and motorists are not affected by reflected light, reflectivity from buildings is minimized.

The North Sydney Council DCP does not stipulate a value for the maximum normal specular reflectivity of visible light of building facade materials; however many other councils within the Sydney metropolitan area have generally adopted a requirement for the maximum normal specular reflectivity of visible light to be 20% for all building facade materials. This upper limit of 20% for the maximum normal specular reflectivity of visible light from the building facade is in close agreement with our own experience for limiting adverse glare to occupants of neighbouring buildings. However, the effect of the proposed development on the sight lines of drivers and pedestrians in the surrounding streets may necessitate lower values to be recommended. This study investigates the effect the proposed development will have to those areas.

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 on Figure 2.

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

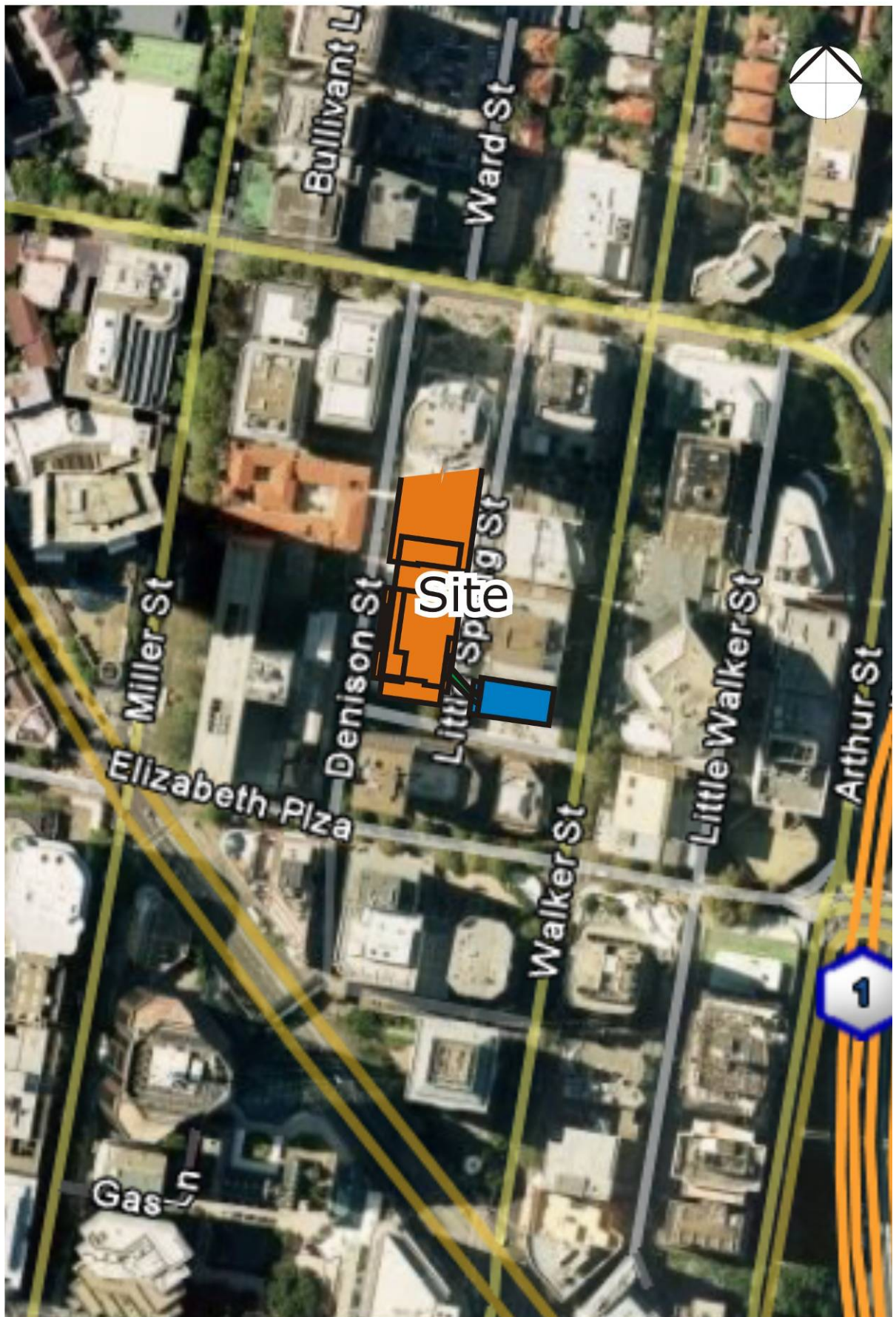


Figure 1: Aerial Image of the Proposed Development

- Hotel Tower
- Office Tower Including Podium Section
- Link Bridge

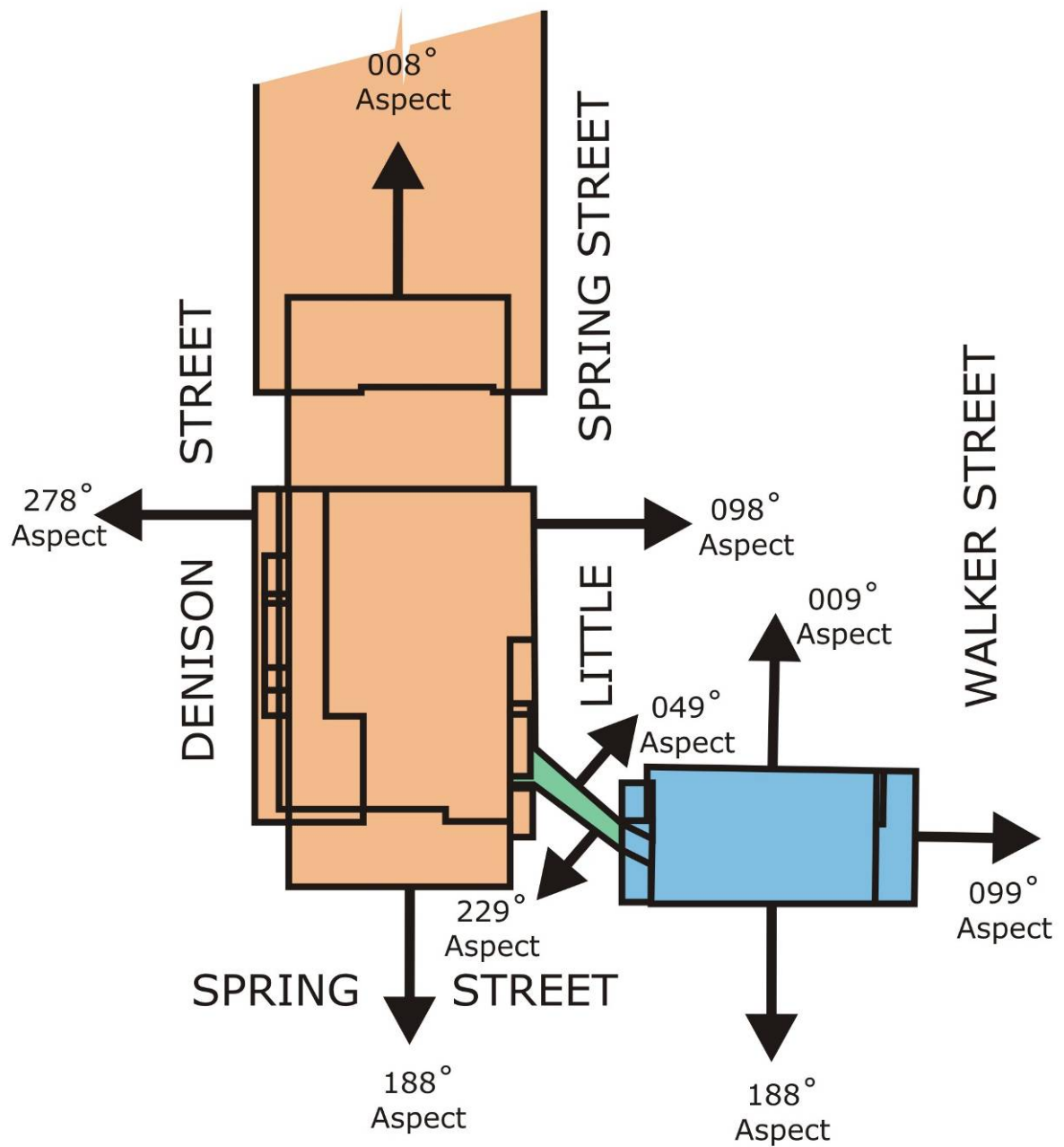


Figure 2: The Critical Aspects of the Development

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.

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, 6 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	229° aspect
Point 2	229° aspect
Point 3	098°, 118° and 229° aspects
Point 4	188° and 278° aspects
Point 5	049° aspect
Point 6	049° 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/m².

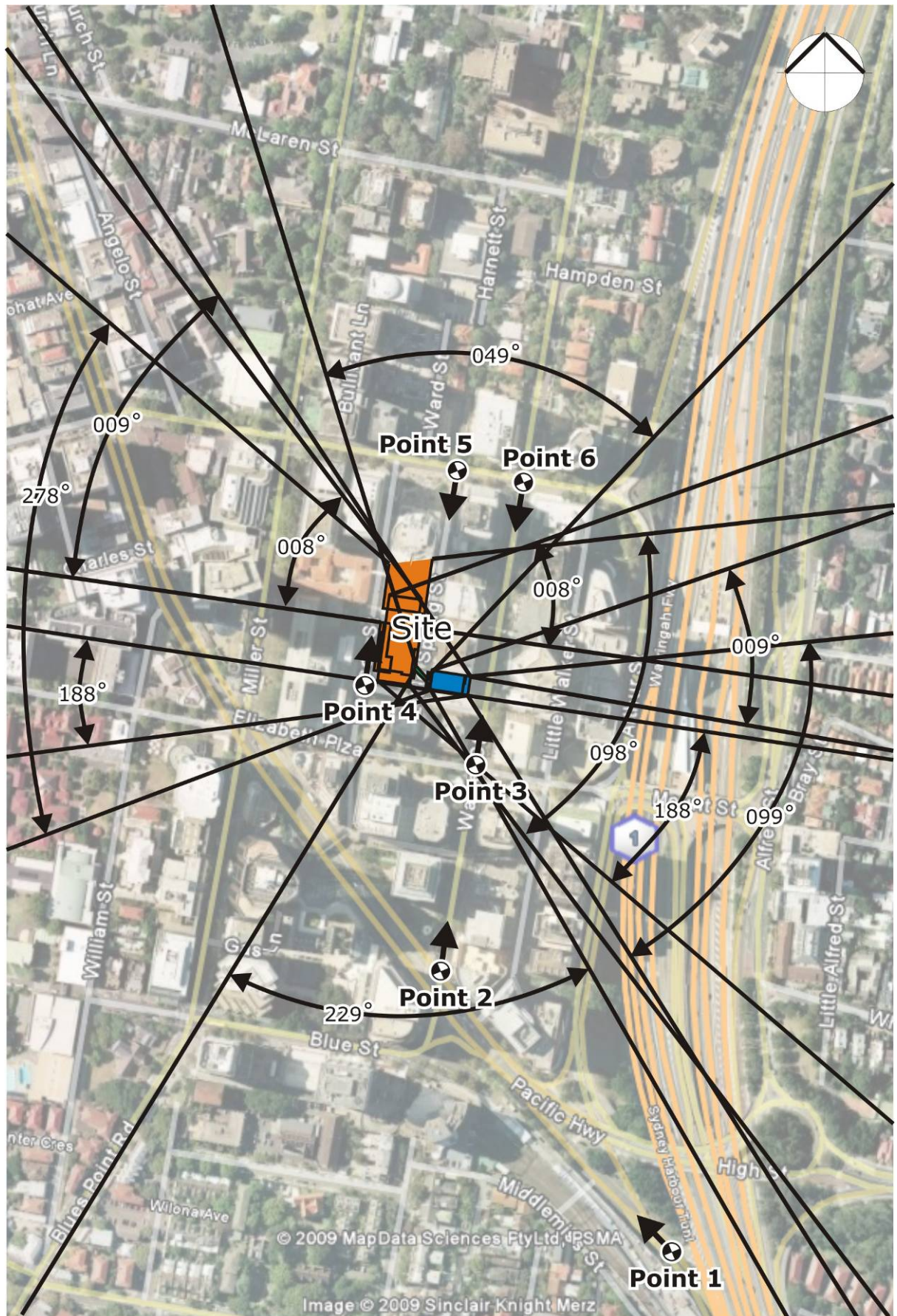


Figure 3: Check Zones and Layout of Study Points

Point 1

Point 1 is located south of the proposed development on the Pacific Highway. This point represents a critical sightline of drivers heading north-west along the Pacific Highway. This point is located within the check zones for the 229° aspect of the proposed development.

The analysis of Point 1, shown in Figure A1 of Appendix A, indicates that the view of the proposed development is obscured by the existing surrounding buildings to the south of the site.

Hence there will be no adverse glare from the 229° aspect of the proposed development to drivers and pedestrians facing north-west along the Pacific Highway at Point 1.

Point 2

Point 2 is located south of the proposed development on Walker Street. This point represents a critical sightline of drivers heading north along Walker Street. This point is located within the check zones for the 229° aspect of the proposed development.

The analysis of Point 2, shown in Figure A2 of Appendix A, indicates that the view of the proposed development is obscured by the existing foliating trees on the west side of Walker Street.

Hence there will be no adverse glare from the 229° aspect of the proposed development to drivers and pedestrians facing north along Walker Street at Point 2.

Point 3

Point 3 is located south-east of the proposed development on Walker Street. This point represents a critical sightline of drivers heading north along Walker Street. This point is located within the check zones for the 098°, 118° and 229° aspects of the proposed development.

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

Hence there will be no adverse glare from the 098°, 118° and 229° aspects of the proposed development to drivers and pedestrians facing north along Walker Street at Point 3.

Point 4

Point 4 is located south-west of the proposed development. This point represents a critical sightline of pedestrians heading north along western side of the office tower. This point is located within the check zones for the 188° and 278° aspects of the proposed development.

The analysis of Point 4, shown in Figure A4 of Appendix A, indicates that the 278° aspect of proposed office tower podium between gridlines 5 to 10 up to the Conference Level are within the zone of sensitive vision for drivers and pedestrians facing north at this location. It has been calculated that for

glare to be reflected back to Point 4 off the 278° aspect of proposed office tower podium, the sun inclination would have to be between 2° to 8° from the horizon with an azimuth angle of approximately 0°. It is noted that for Sydney, the minimum angle of inclination of the sun at 0° azimuth is 32° occurring at the winter solstice, therefore solar glare does not reach the 278° aspect of the proposed office tower podium between gridlines 5 to 10 up to the Conference Level.

Hence there will be no adverse glare from the 188° and 278° aspects of the proposed development to drivers and pedestrians facing north along western side of the office building at Point 4.

Point 5

Point 5 is located north of the proposed development on Little Spring Street. This point represents a critical sightline of drivers heading south along Little Spring Street. This point is located within the check zone for the 049° aspect of the proposed development.

The analysis of Point 5, shown in Figure A5 of Appendix A, indicates that the 049° aspect of the link bridge is within the zone of sensitive vision for drivers and pedestrians facing south at this location. It has been calculated that for glare to be reflected back to Point 5 off the 049° aspect of the link bridge, the sun inclination would have to be approximately 1 degree from the horizon and have an azimuth angle of approximately 89 degrees. It is noted that the proposed hotel building is sufficiently tall to prevent the solar glare from reaching the 049° aspect of the link bridge.

Hence there will be no adverse glare from the 049° aspect of the link bridge to drivers and pedestrians facing south along Little Spring Street at Point 5.

Point 6

Point 6 is located north-east of the proposed development on Walker Street. This point represents a critical sightline of drivers heading south along Walker Street. This point is located within the check zones for the 049° aspect of the proposed development.

The analysis of Point 6, shown in Figure A6 of Appendix A, indicates that the view of the proposed development is obscured by the existing surrounding buildings.

Hence there will be no adverse glare from the 049° aspect of the proposed development to drivers and pedestrians facing north along Walker Street at Point 6.

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 including the Beau Monde Residential Tower immediately north of the development.

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 88 Walker Street, North Sydney 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 North Sydney DCP 2002, Sections 6.2f and 20.2d, the following recommendation has been made on the reflectivity properties of the glazing to be used on the facade to satisfy minimum comfort levels for the occupants of the neighbouring buildings;

- All areas of the façade of the development including the louvers should have a maximum normal specular reflectivity of visible light of 20 percent.

With these recommendations satisfied, the results of this analysis indicate that the proposed development will not cause adverse solar glare to drivers or pedestrians in any of the surrounding streets, other outdoor areas and the surrounding buildings.

Appendix A

Analysis of Sight-Lines from the Various Study Locations

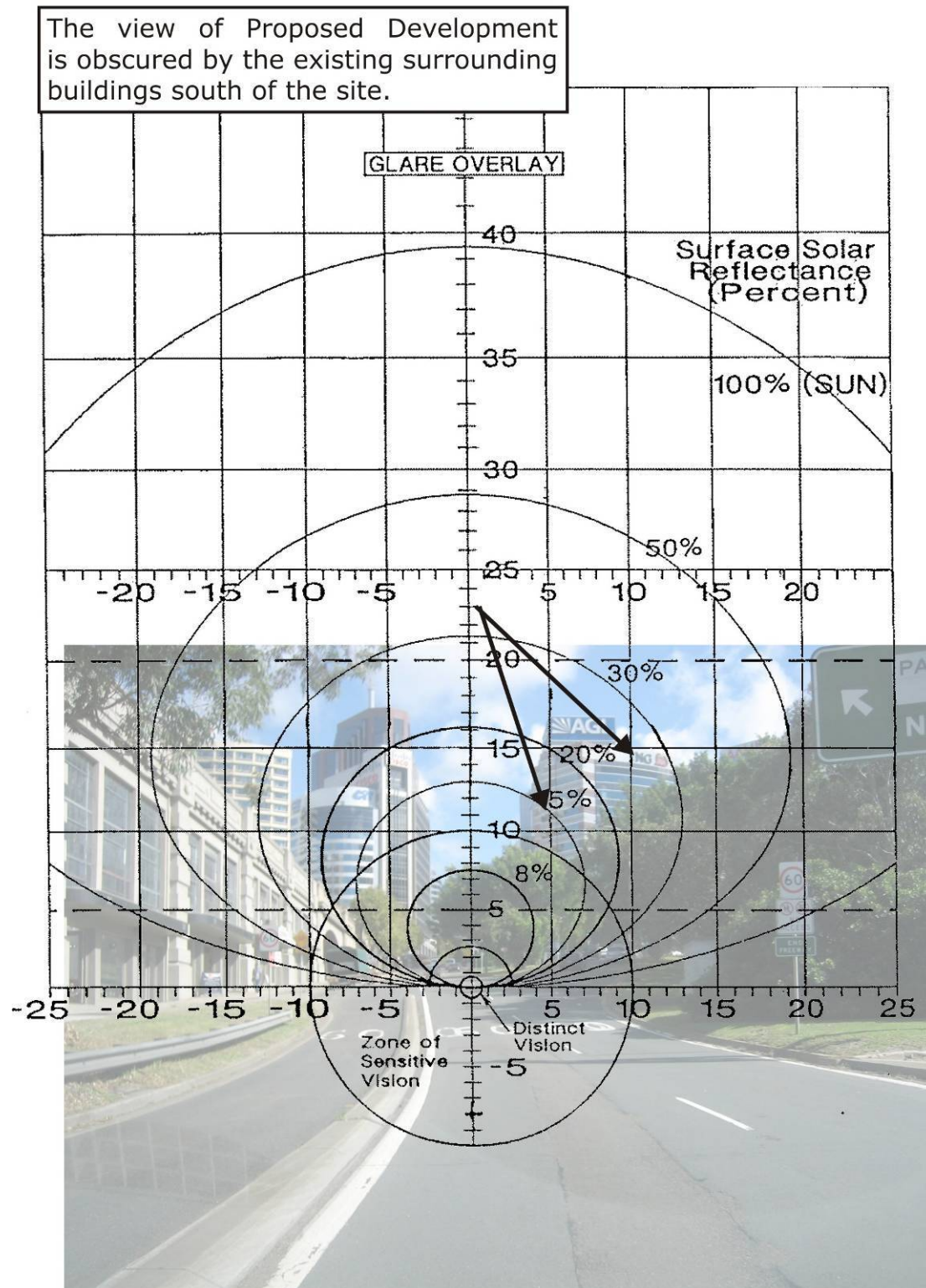


Figure A1: Glare Overlay for Point 1

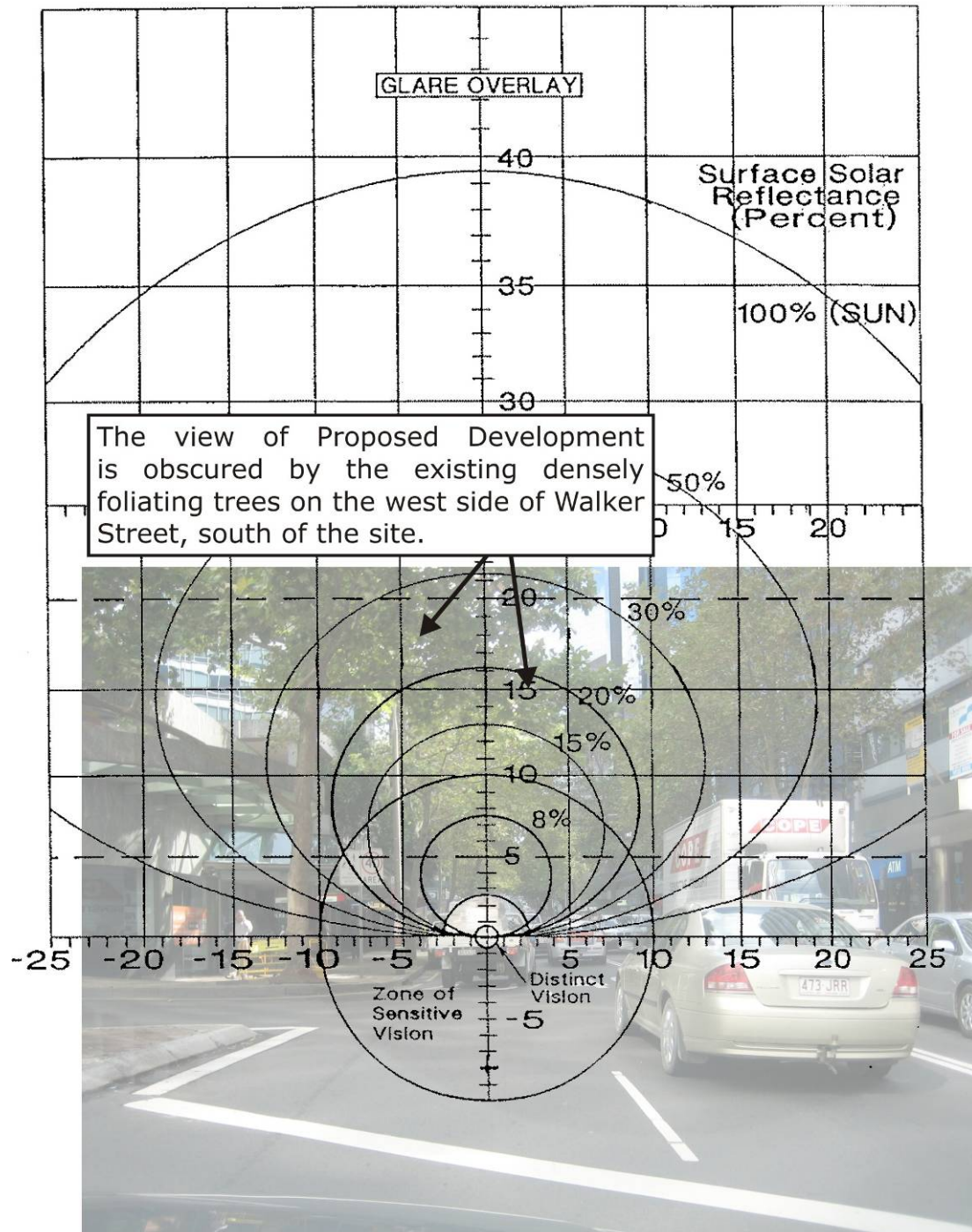


Figure A2: Glare Overlay for Point 2

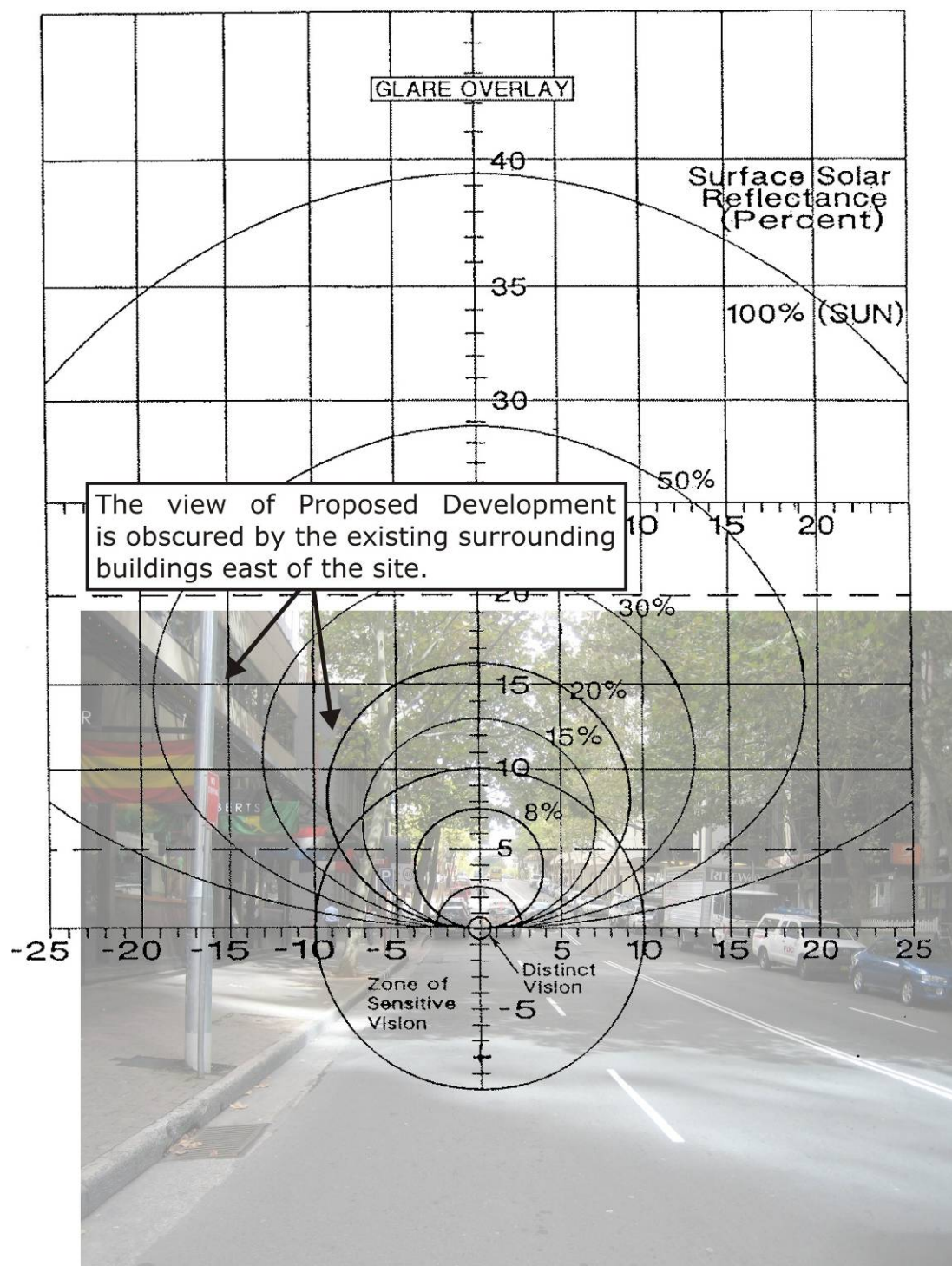


Figure A3: Glare Overlay for Point 3

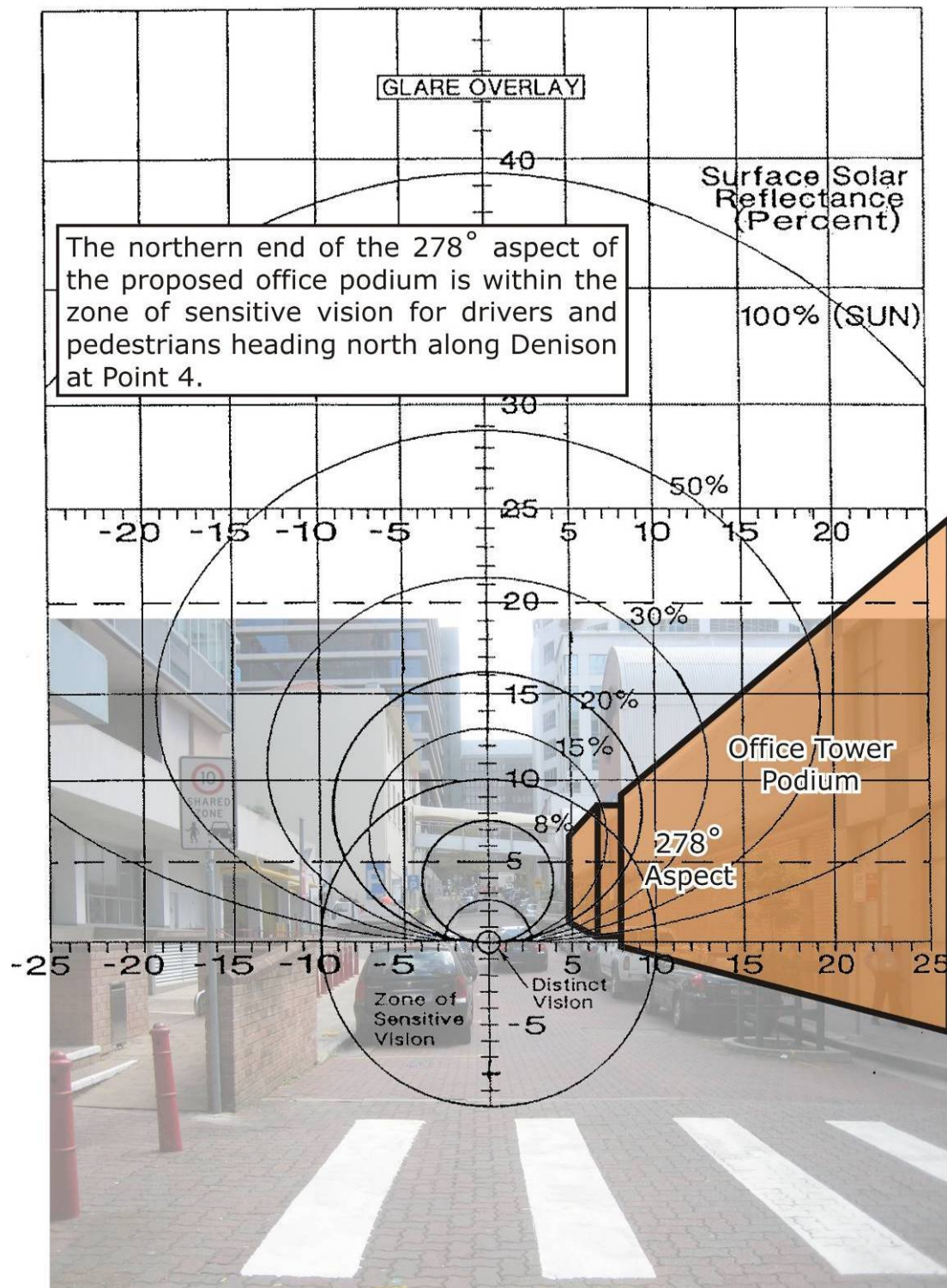


Figure A4: Glare Overlay for Point 4

- Hotel Tower
- Office Tower Including Podium Section
- Link Bridge

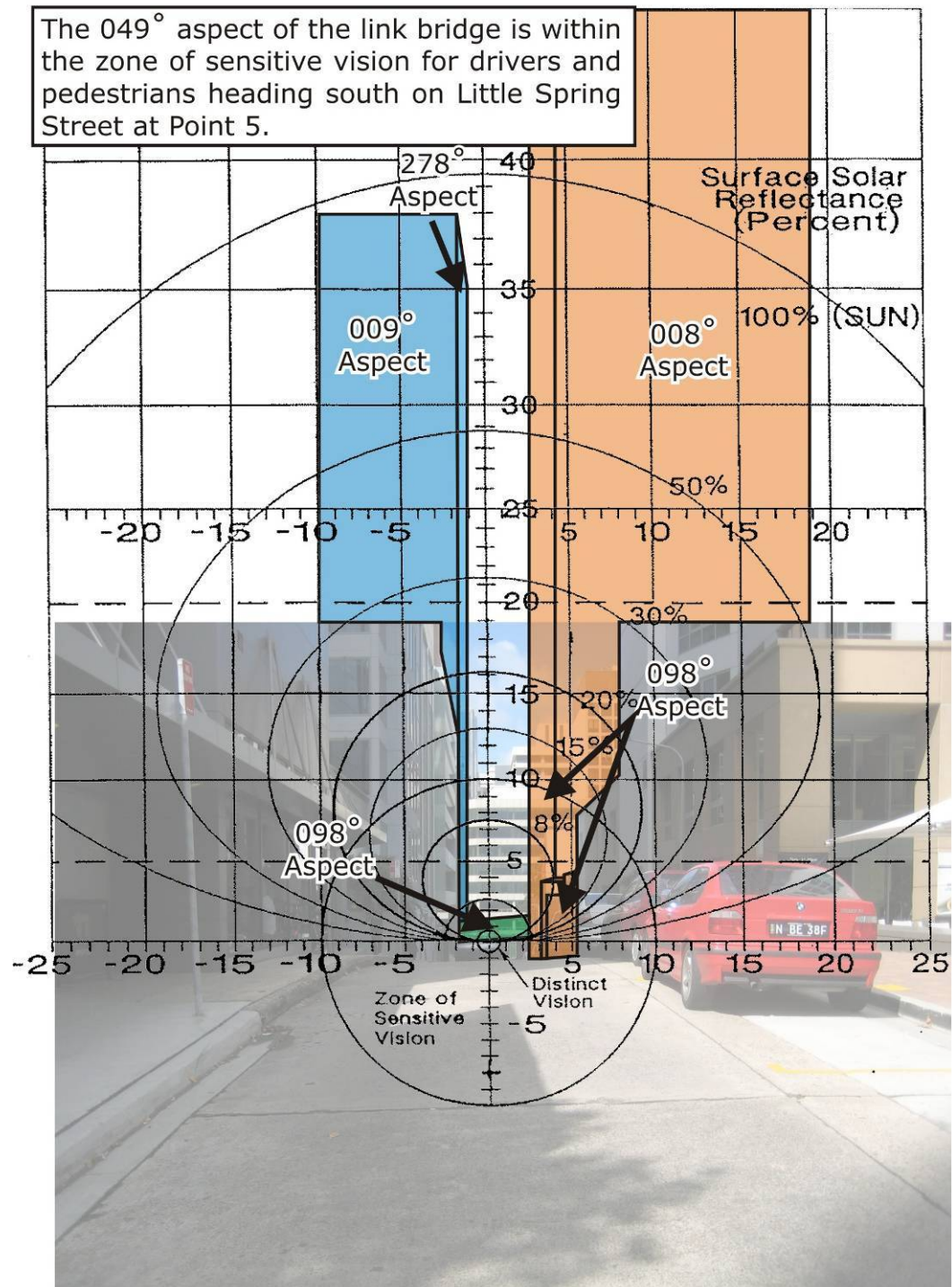


Figure A5: Glare Overlay for Point 5

The view of Proposed Development is obscured by the existing surrounding buildings east of the site.

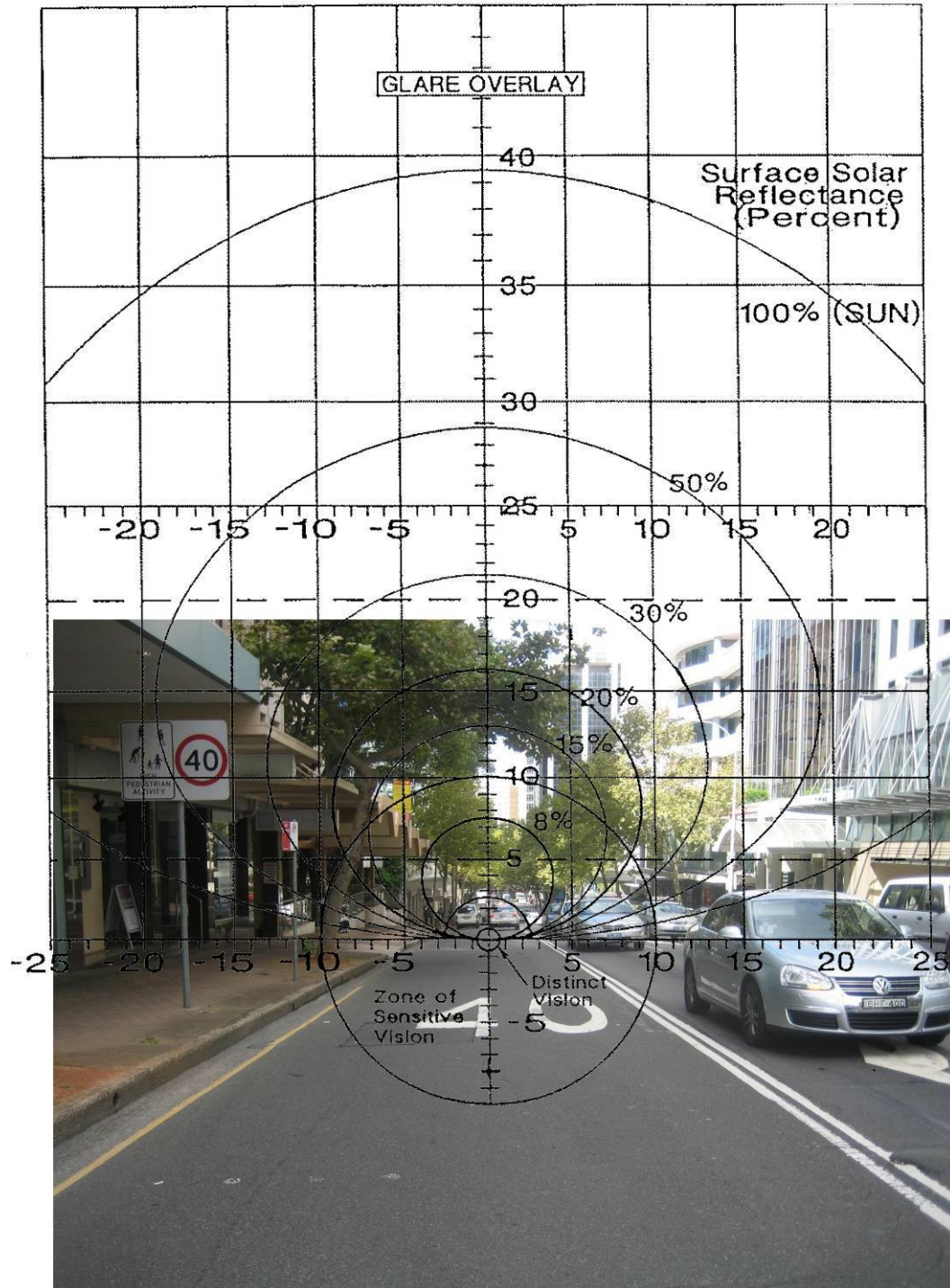


Figure A6: Glare Overlay for Point 6

Appendix B

Solar Charts for the Various Aspects of the Proposal

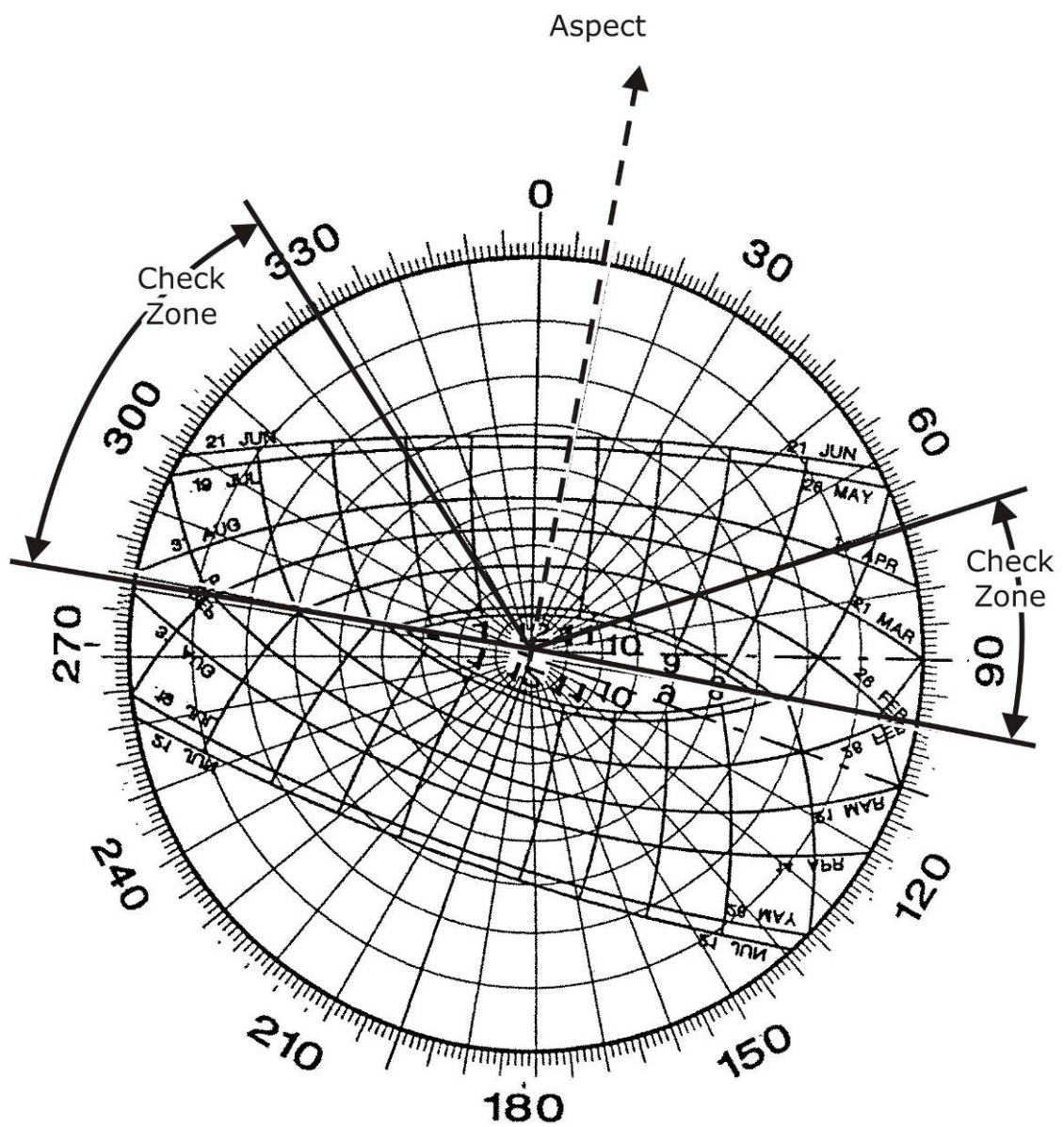


Figure B2: Sun Chart for Aspect 009°

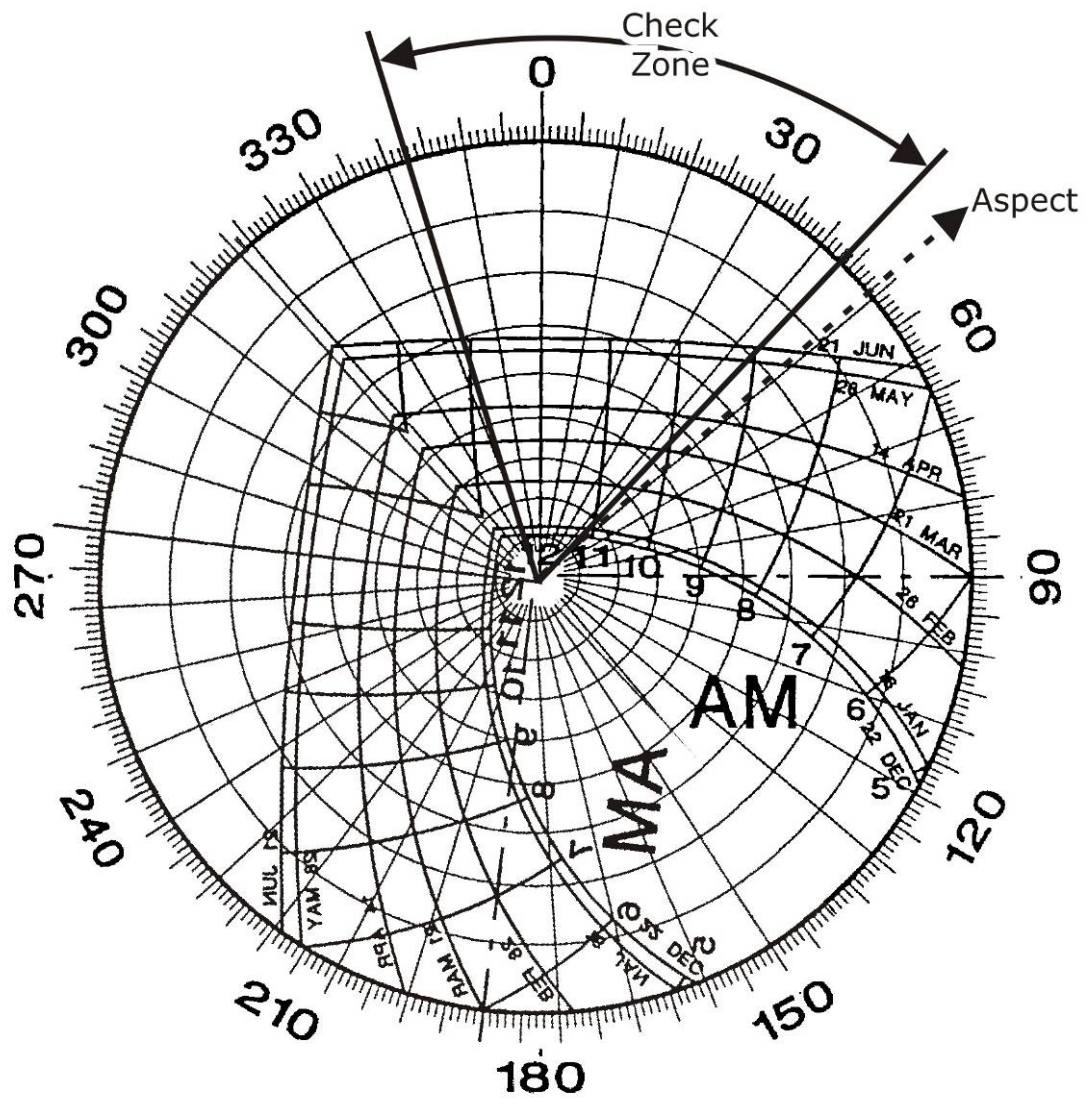


Figure B3: Sun Chart for Aspect 049°

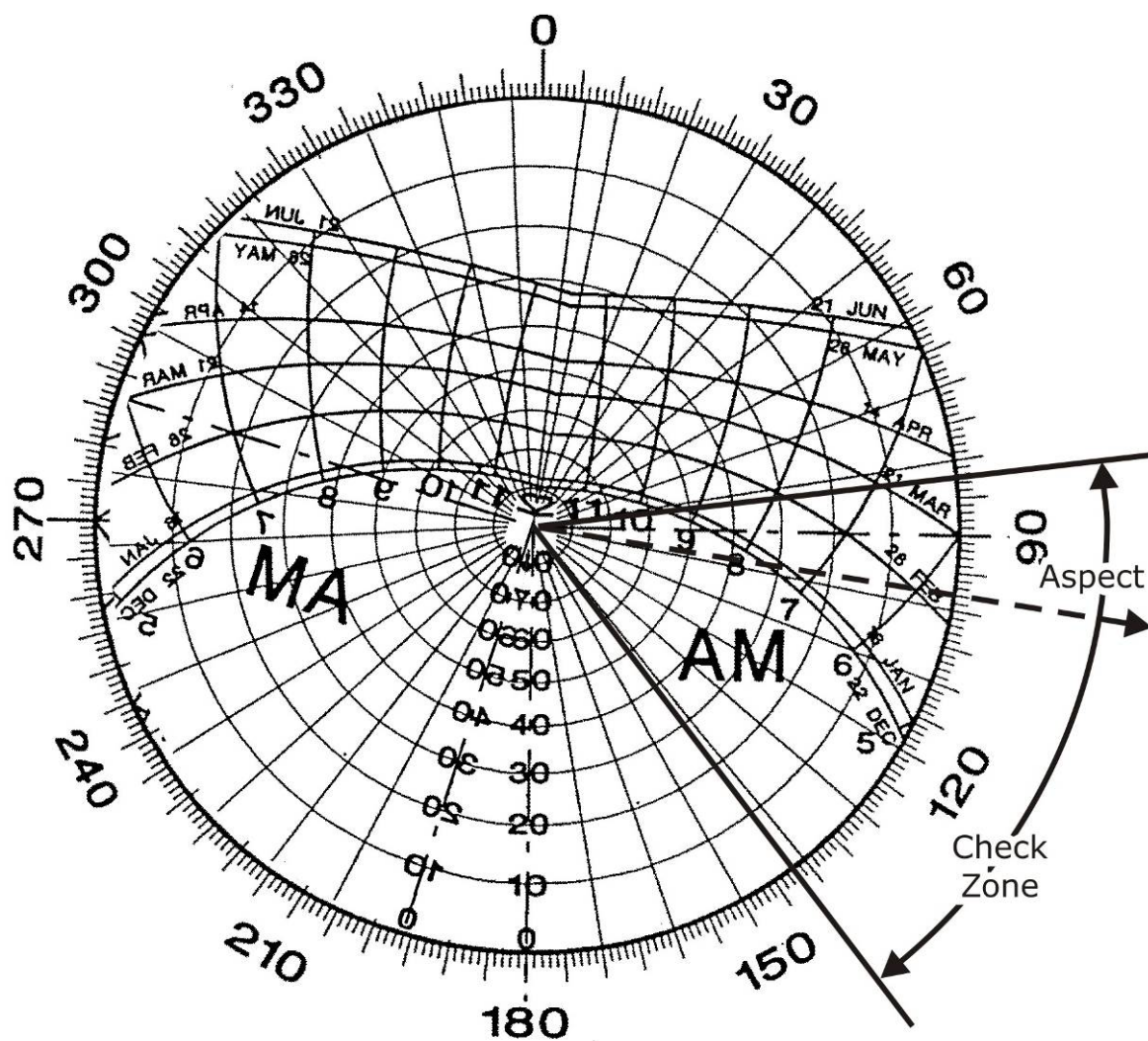


Figure B4: Sun Chart for Aspect 098°

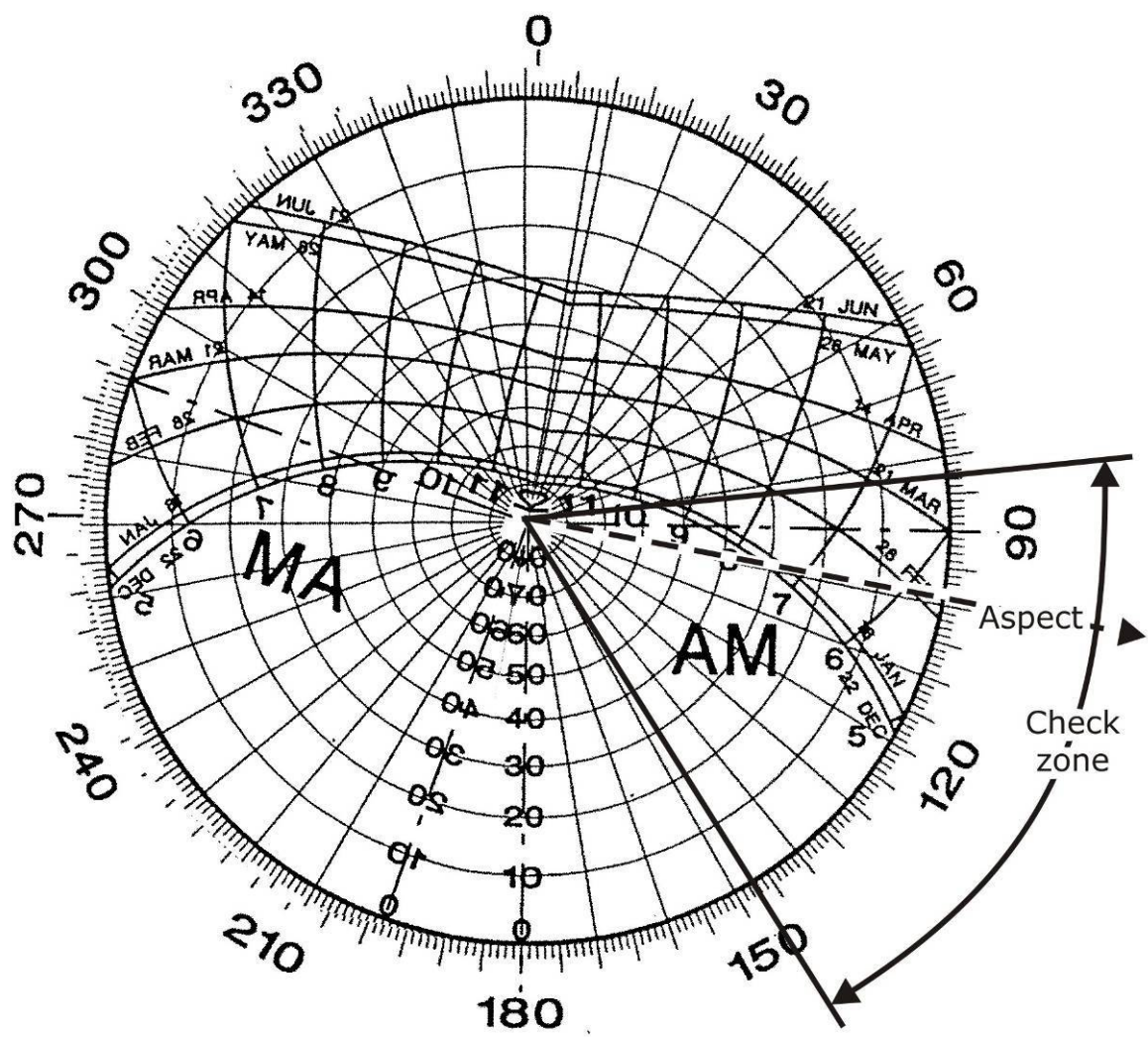


Figure B5: Sun Chart for Aspect 099°

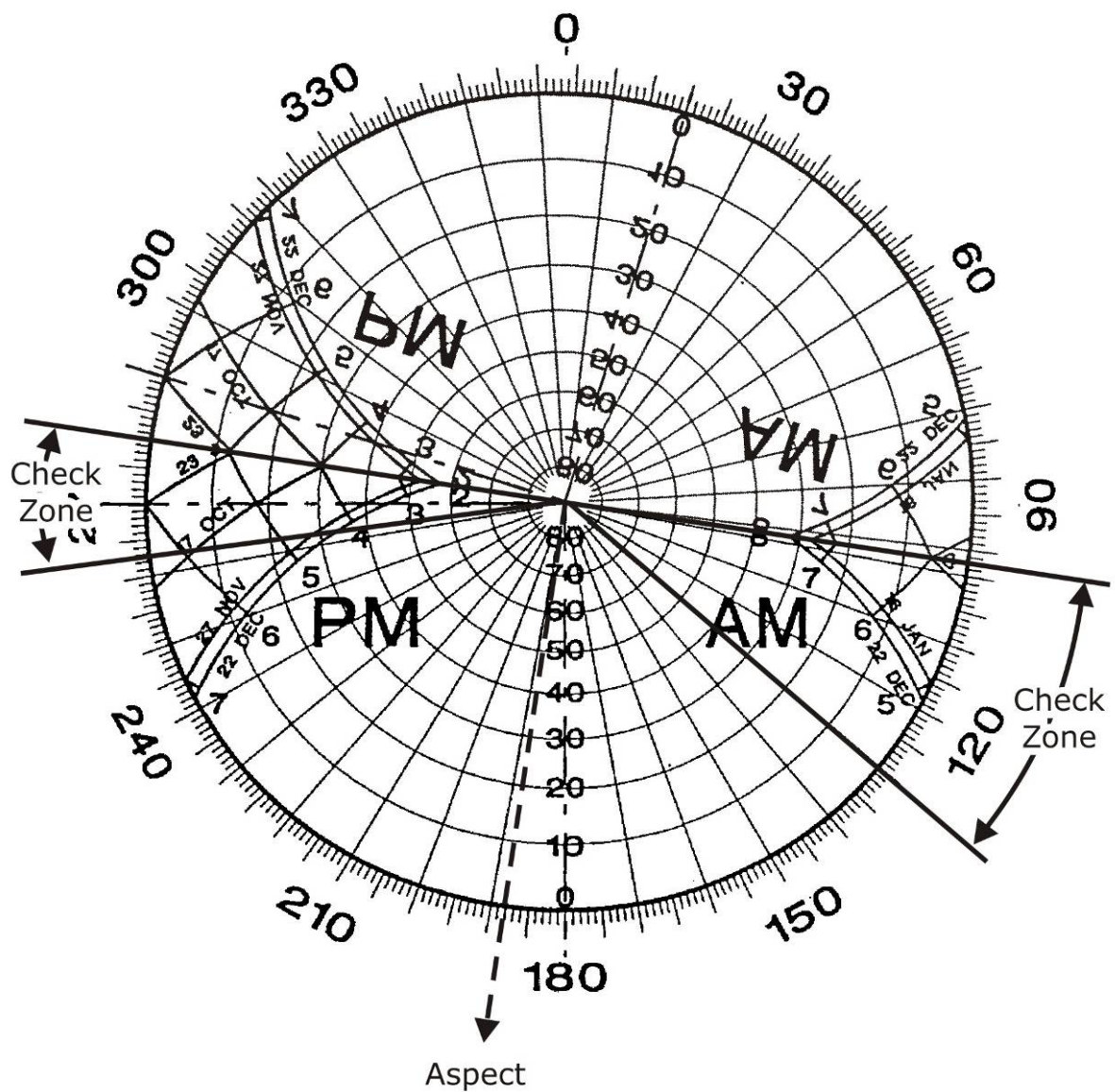


Figure B6: Sun Chart for Aspect 188°

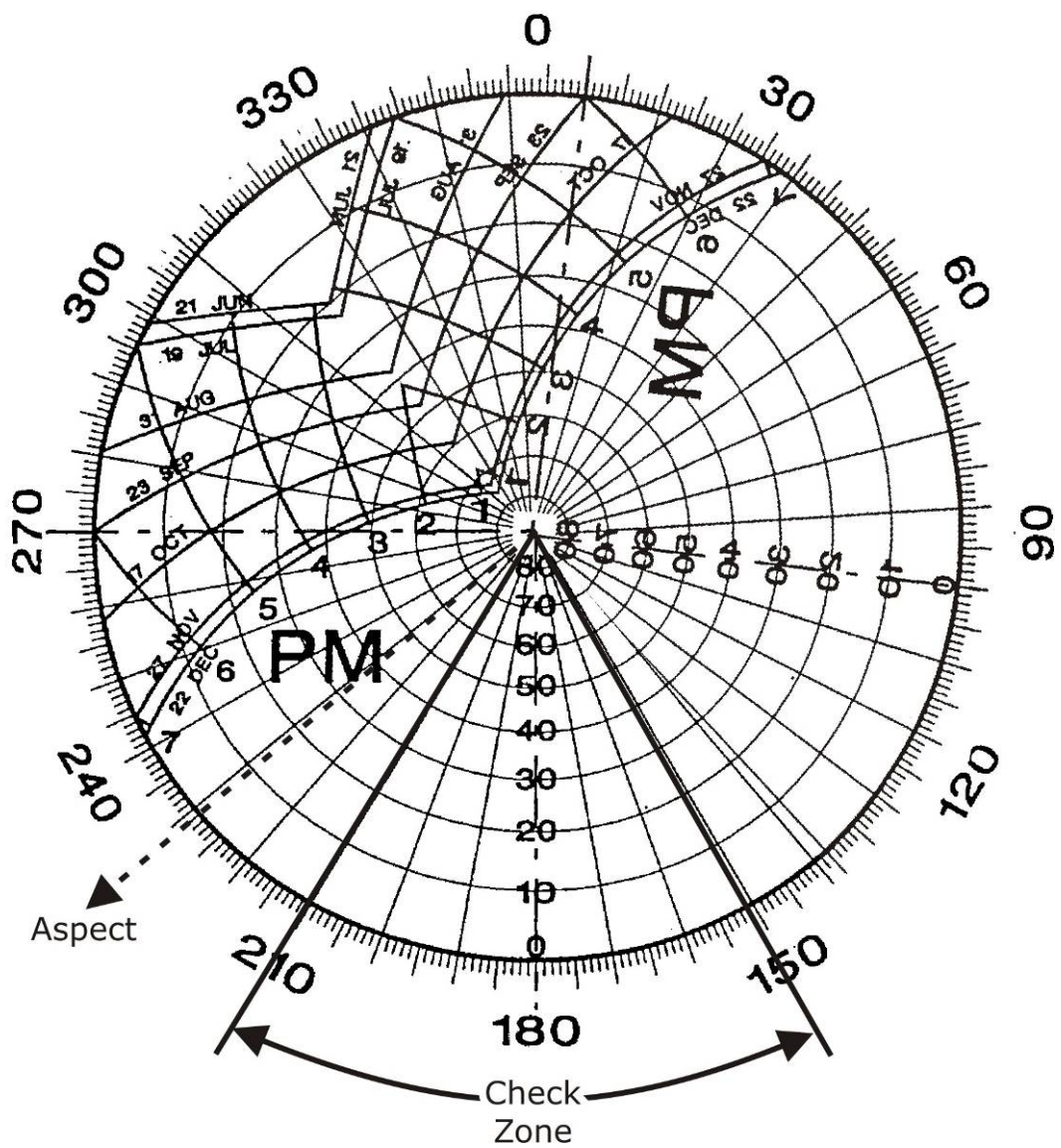


Figure B7: Sun Chart for Aspect 229°

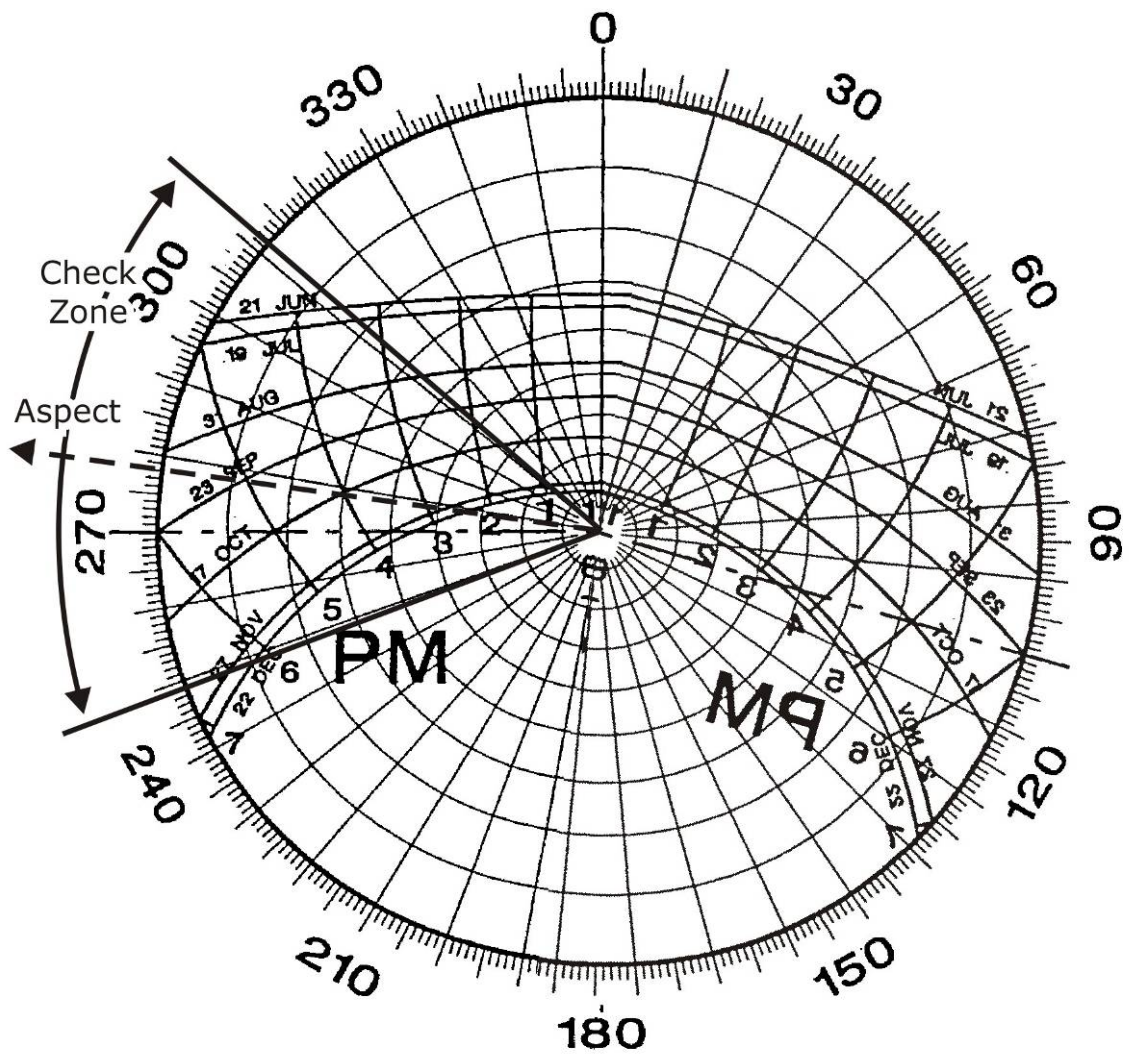


Figure B8: Sun Chart for Aspect 278°