WINDTECH

SOLAR LIGHT REFLECTIVITY STUDY

2 MANDALA PARADE. CASTLE HILL

WF350-02F02(REV1)- SR REPORT

APRIL 22, 2022

Prepared for:

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DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
March 28, 2022	Updated for latest design.	0	TH	SWR	TH
April 22, 2022	Updated for latest design.	1	TH	SWR	TH

EXECUTIVE SUMMARY

This report presents the results of a detailed study for the effect of potential solar glare from proposed development located at 2 Mandala Parade, Castle Hill. This study identifies any possible adverse reflected solar glare conditions affecting motorists, pedestrians, and to occupants of neighbouring buildings. If necessary, recommendations are made to mitigate any potentially adverse effects. This study assesses compliance with the controls for solar glare from the State Environmental Planning Policy No. 65 (SEPP65, Part 04 (Designing the Building) for Amenity), which contains the Apartment Design Guide (ADG).

The results of the study indicate that, to avoid any adverse glare to motorists and pedestrians on the surrounding streets, occupants of neighbouring buildings, and to comply with the abovementioned planning control requirements, the following limitations to the maximum normal specular reflectance of visible light of the external façade glazing and treatment strategies are recommended:

- Building AB – Western aspect main building façade on Levels 01 and above: 11%.
- Building CD – Eastern aspect main building façade on Levels 01 to 04: 11%.
- All other glazing (windows and balustrades) should have a maximum normal specular reflectance of visible light of 20%.
- The proposed metal rail balustrades along the eastern aspect of Building CD on Levels 02 to 04 as indicated in architectural drawings is to have a non-polished surface finish (e.g., powdercoated, painted etc.).
- The inclusion of the proposed solid columns/fins along the building edge on the northern aspect of Buildings AB and CD; in particular the protruding columns/fins proposed at the ends of the glazed systems, as indicated in the architectural drawings.
- The inclusion of the proposed/existing densely foliating trees along the various street frontages of the site as indicated in the architectural drawings.

It should be noted that the most reflective surface on the façade of a building is the glazing. Reflected solar glare from concrete, brickwork, timber, etc. is negligible (i.e. less than 1% normal specular reflectance) and hence will not cause any adverse solar glare effects. Note also that, for any painted or powder-coated metallic surfaces on the exterior façade of the development, the maximum normal specular reflectance of visible light for those types of surfaces is in the range of 1% to 5%, which is well within the abovementioned limit.

Hence, with the incorporation of the abovementioned recommendations, the results of this study indicate that the subject development will not cause adverse solar glare to motorists or pedestrians in the surrounding area, or to occupants of neighbouring buildings, and will comply with the planning controls regarding reflectivity from SEPP65.

CONTENTS

1 GLARE OBSERVED BY MOTORISTS

1.1 Methodology

The reflectivity analysis of the subject development has been carried out using the technique published by Hassall (1991). The limiting veiling luminance of 500 cd/m^2 for the comfort of motorists, as suggested in Hassall (1991), has been adopted as a basis of assessing the glare impact from the subject development.

The various critical glazed aspects of the development were determined and are shown in Figure 1. Solar charts for each of these critical glazed aspects are presented in Appendix B, and these are used to derive the check zones which are shown in Figure 2. The solar chart of each critical aspect is determined from the standard sun chart of the region, provided in Appendix C (Phillips, 1992), using the method detailed in Hassall (1991). The check zones highlight the areas that are potentially affected by solar reflections from each critical glazed aspect. It should be noted that the check zones shown in Figure 2 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 described in Section 1.2 of this report.

Study point locations are selected within the check zone areas where motorists are facing the general direction of the subject development (within ±16° of the direct sight-line). These are shown in Figure 2, and summarised in Table 1. Photographs have been taken from the viewpoint of motorists at each study point location using a calibrated camera, and a scaled glare protractor has been superimposed over each viewpoint image (these are presented in Appendix A).

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 cd/m^2. Alternatively, the glare protractor can be used to determine the maximum acceptable reflectivity index of the façade material of the development for the glare to be within the criterion of 500 cd/m^2, to ensure that solar glare will not cause discomfort or threaten the safety of motorists and hence to enable the subject development to comply with the relevant planning control requirements regarding solar light reflectivity.

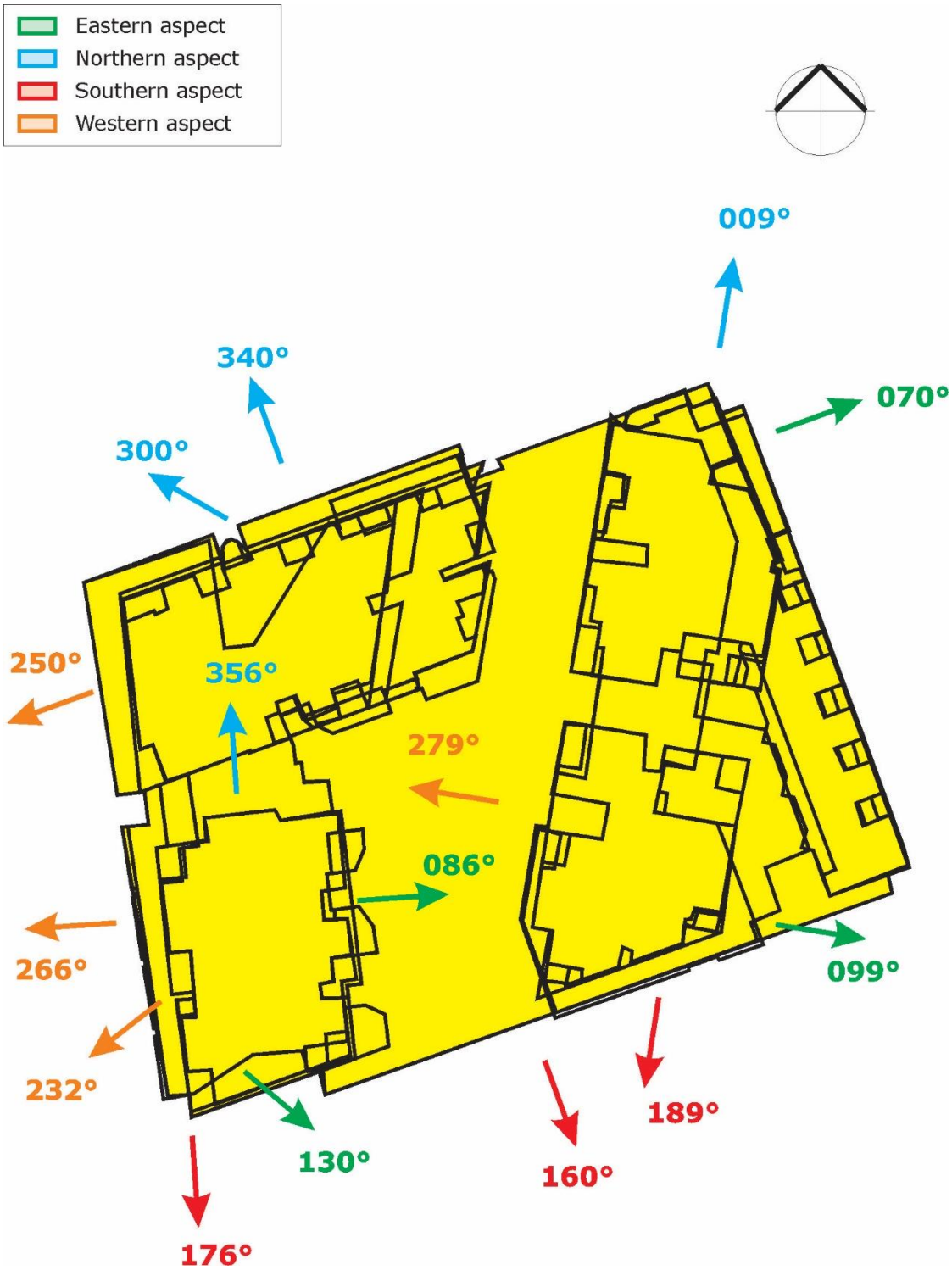

Figure 1: Critical Glazed Aspects of the Development (typical plan shown)

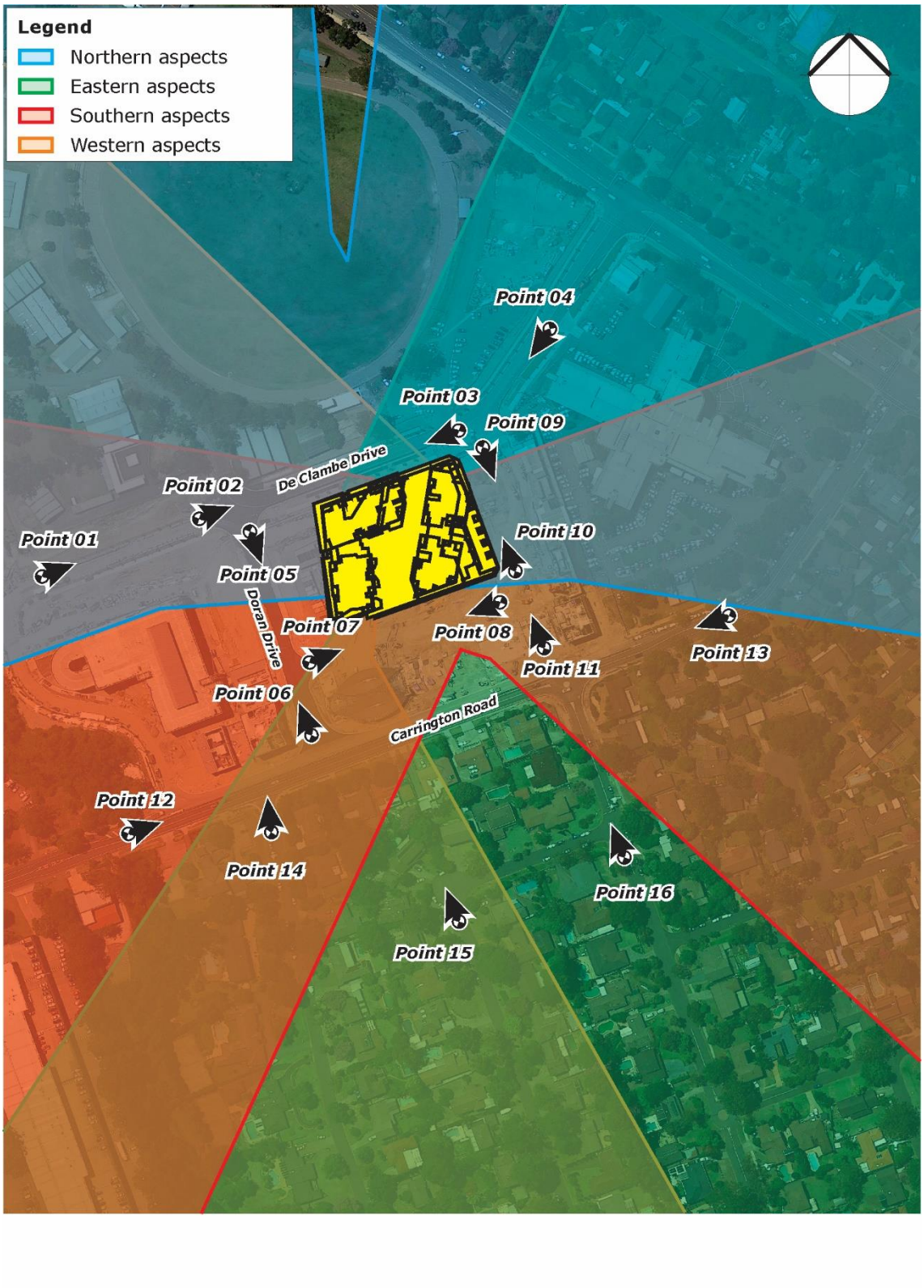

Figure 2: Check Zones and Study Point Locations
(the check zones are the areas where glare could potentially be observed)

Table 1: Aspects of the Development that could reflect Solar Glare to Each Study Point for Motorists

Study Point	Location and Viewpoint	Aspect(s) of the Development
01	De Clambe Drive, heading east.	Northern, western and southern aspects.
02	De Clambe Drive, heading east.	Northern, western and southern aspects.
03	De Clambe Drive, heading west.	Northern, eastern aspects.
04	De Clambe Drive, heading south-west.	Northern, eastern aspects.
05	Doran Drive, heading south.	Northern, western and southern aspects.
06	Doran Drive, heading north.	Western and southern aspects.
07	Mandala Parade, heading east.	Western and southern aspects.
08	Mandala Parade, heading west.	Eastern and southern aspects.
09	Andalusian Way, heading south.	Northern and eastern aspects.
10	Andalusian Way, heading north.	Northern, eastern and southern aspects.
11	Andalusian Way, heading north.	Eastern and southern aspects.
12	Carrington Road, heading east.	Western and southern aspects.
13	Carrington Road, heading west.	Eastern and southern aspects.
14	Ashford Avenue, heading north.	Eastern, western and southern aspects.
15	Partridge Avenue, heading north.	Eastern and western aspects.
16	Middleton Avenue, heading north.	Eastern aspect.

1.2 Analysis and Discussion

The amount of solar glare observed by motorists from the façade of the development at each study point location is presented in this section. Treatment options are provided if excessive solar glare conditions are observed.

1.2.1 Motorists heading east along De Clambe Drive

Points 01 and 02 are located along De Clambe Drive, to the west of the development site. These points represent the critical sightline of motorists heading south-west along De Clambe Drive at these locations. Calibrated images of the viewpoint of motorists at these locations has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 01 indicates that a portion of the northern and western aspects of the development will be visible and within the zone of sensitive vision. Point 01 is located within the check zone for the northern and western aspects, hence solar glare can potentially be observed at this location during the early morning and late afternoon periods respectively. The existing densely foliating trees along De Clambe Drive will provide some form of overshadowing to the lower and upper ground level portions of the visible northern aspect of the development, hence they are recommended to be retained in the design of the development. Furthermore, during the early morning period of the day, the direct sun will also be visible

and within the zone of sensitive vision of motorists at this location. The intensity of the direct view of the sun will be far more severe than any glare reflected from the visible northern aspect of the development. Thus, the solar glare from the direct sun would constitute a major hazard than reflected glare off the northern aspect of the development within the motorist's peripheral vision. To ensure compliance with the glare requirements in SEPP65, it is recommended that a maximum normal specular reflectance of visible light of 20% is applied to the materials and finishes used along the northern aspect of the proposed development. A further analysis indicates the visible western aspect of the tower component of Building CD will be overshadowed by the build-form of Building AB at times when solar glare could have otherwise been observed (late afternoon period)
A review of the architectural drawings indicates a row of densely foliating trees are proposed along the Doran Drive frontage of the site. The proposed trees will be effective in obstructing the view and potential solar glare reflected off the visible western aspect on the lower and upper ground levels, however, they may not provide adequate overshadowing effects to Levels 01 and above of Buildings AB. Hence, to ensure that no adverse solar glare is observed by motorists heading east along De Clambe Drive at Point 01, it is recommended the maximum normal specular reflectance of visible light of the materials and finishes used on the western aspect of the tower components of Buildings AB of the development is 11%.

An analysis of the glare meter overlaid onto the viewpoint at Point 02 indicates that a portion of the northern and western aspects of the development will be visible and within the zone of sensitive vision. Point 02 is located within the check zone for the northern and western aspects, hence solar glare can potentially be observed at this location during the early morning and late afternoon periods respectively. The existing densely foliating trees along De Clambe Drive will provide some form of overshadowing to the lower and upper ground level portions of the visible northern aspect of the development. Similarly, the proposed densely foliating trees along the Doran Drive frontage of the site will provide an overshadowing effect to the visible western aspect of the development. Hence these densely foliating trees are recommended to be retained in the design of the development. During the early morning period of the day, the direct sun will also be visible and within the zone of sensitive vision of motorists at this location. The intensity of the direct view of the sun will be far more severe than any glare reflected from the visible northern aspect of the development. Thus, the solar glare from the direct sun would constitute a major hazard than reflected glare off the northern aspect of the development within the motorist's peripheral vision. To ensure compliance with the glare requirements in SEPP65, it is recommended that a maximum normal specular reflectance of visible light of 20% is applied to the materials and finishes used along the northern aspect of the proposed development.
A further analysis indicates the visible western aspect of the tower component of Building CD will be overshadowed by the build-form of Building AB at times when solar glare could have otherwise been observed (late afternoon period). Hence there will be no adverse solar glare observed by motorists heading east along De Clambe Drive from the visible western aspect of the tower component of Building CD.

1.2.2 Motorists heading west along De Clambe Drive

Point 03 is located along De Clambe Drive, to the east of the development site. This point represents the critical sightline of motorists heading west along De Clambe Drive at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 03 indicates that a portion of the northern aspect of the development will be visible and within the zone of sensitive vision. Point 03 is located within the check zone for the northern aspects, hence solar glare can potentially be observed at this location during the

late afternoon period of the day. The existing densely foliating trees along De Clambe Drive will provide some form of overshadowing to the lower and upper ground level portions of the visible northern aspect of the development, hence they are recommended to be retained in the design of the development. Furthermore, during the late afternoon period of the day, the direct sun will also be visible and within the zone of sensitive vision of motorists at this location. The intensity of the direct view of the sun will be far more severe than any glare reflected from the visible northern aspect of the development. Thus, the solar glare from the direct sun would constitute a major hazard than reflected glare off the northern aspect of the development within the motorist's peripheral vision. To ensure compliance with the glare requirements in SEPP65, it is recommended that a maximum normal specular reflectance of visible light of 20% is applied to the materials and finishes used along the northern aspect of the proposed development.

1.2.3 Motorists heading south-west along De Clambe Drive

Point 04 is located along De Clambe Drive, to the north-east of the development site. This point represents the critical sightline of motorists heading west along De Clambe Drive at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 04 indicates that a portion of the northern and eastern aspects of the development will be visible and within the zone of sensitive vision. Point 04 is located within the check zone for the northern and eastern aspects, hence solar glare can potentially be observed at this location during the late afternoon and early morning periods respectively.
A review of the architectural drawings indicates the visible eastern aspect of the tower component of Building AB will be overshadowed by the build-form of Building CD at times when solar glare could have otherwise been observed (early morning period). The proposed densely foliating trees along De Clambe Drive and Andalusian Way frontages of the site will provide some form of overshadowing to the lower and upper ground level portions of the visible northern and eastern aspects of the development, hence they are recommended to be retained in the design of the development. The visible eastern façade of the Building CD from Levels 01 to 04 within the zone of sensitive vision of motorists at this location is predominantly comprised of brickwork or metal rail balustrades with narrow glazed systems along the outer building edge and wider glazed systems deeper within the balconies. Brickwork and powder-coated or non-polished surfaces typically has a low specular reflectance (~5%). Reflected solar glare from these materials are not expected to be have an adverse impact on the motorists. Hence the metal rail balustrades are recommended to have a non-polished surface finish (e.g. powdercoated, painted etc.). Reflected solar glare from the glazed systems deep within the balconies are not expected to be an issue due to the overshadowing effect of the balcony floor slab above and vertical blade walls adjacent to these glazed systems. The view of the glazed systems along the building edge are relatively narrow and subtends an angle that is too small to reflect the full disc of the sun, and glare from the eastern aspect on Levels 05 and above will not exceed the 500cd/m2 criterion for causing interference with a motorist. On the podium Levels 01 and 04 however, the glazed systems along the building façade are wider that have the potential to reflect the full disc of the sun. To ensure there is no adverse glare observed by motorists at this location, it is recommended the maximum normal specular reflectance of visible light of the materials and finishes used on the eastern aspect of the tower components of Building CD on Levels 01 to 04 is 11%.
With regards to the visible northern aspects within the motorists zone of sensitive vision at this location, a review of the architectural drawings indicate solid full-height columns/fins are proposed along the building edge on the northern aspect of Buildings AB and CD. These elements are effective in providing an overshadowing effect to the reflective glazed systems at times when solar glare could have otherwise been observed (late afternoon period) as well as subtending an angle that is too small to reflect the full disc of the sun. In particular are the

protruding columns/fins proposed at the end of the glazed systems. Hence, they are recommended to be retained in the design of the development.

1.2.4 Motorists heading south along Doran Drive

Point 05 is located along Doran Drive, to the west of the development site. This point represents the critical sightline of motorists heading south along Doran Drive at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 05 indicates that the view of the development is visible but it will not be within the zone of sensitive vision. Hence there will be no adverse solar glare observed by motorists heading south along Doran Drive at this location.

1.2.5 Motorists heading north along Doran Drive

Point 06 is located along Doran Drive, to the west of the development site. This point represents the critical sightline of motorists heading north along Doran Drive at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 06 indicates that the view of the development is visible but it will not be within the zone of sensitive vision. Hence there will be no adverse solar glare observed by motorists heading north along Doran Drive at this location.

1.2.6 Motorists heading east along Mandala Parade

Point 07 is located along Mandala Parade, to the south-west of the development site. This point represents the critical sightline of motorists heading east along Mandala Parade at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 07 indicates that a portion of the southern aspect of the development will be visible and within the zone of sensitive vision. Point 07 is located within the check zone for the southern aspect, hence solar glare can potentially be observed at this location during the early morning period of the day. The proposed densely foliating trees along Mandala Parade will provide some form of overshadowing to the ground level portions of the visible southern aspect of the development, hence they are recommended to be retained in the design of the development. Furthermore, during the early morning period of the day, the direct sun will also be visible and within the zone of sensitive vision of motorists at this location. The intensity of the direct view of the sun will be far more severe than any glare reflected from the visible southern aspect of the development. Thus, the solar glare from the direct sun would constitute a major hazard than reflected glare off the southern aspect of the development within the motorist's peripheral vision. To ensure compliance with the glare requirements in SEPP65, it is recommended that a maximum normal specular reflectance of visible light of 20% is applied to the materials and finishes used along the southern aspect of the proposed development.

1.2.7 Motorists heading west along Mandala Parade

Point 08 is located along Mandala Parade, to the south-east of the development site. This point represents the critical sightline of motorists heading west along Mandala Parade at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 08 indicates that a portion of the southern aspect of the development will be visible and within the zone of sensitive vision. Point 08 is located within the check zone for the southern aspect, hence solar glare can potentially be observed at this location during the late afternoon period of the day. The proposed densely foliating trees along Mandala Parade will provide some form of overshadowing to the ground level portions of the visible southern aspect of the development, hence they are recommended to be retained in the design of the development. Furthermore, during the early morning period of the day, the direct sun will also be visible and within the zone of sensitive vision of motorists at this location. The intensity of the direct view of the sun will be far more severe than any glare reflected from the visible southern aspect of the development. Thus, the solar glare from the direct sun would constitute a major hazard than reflected glare off the southern aspect of the development within the motorist's peripheral vision. To ensure compliance with the glare requirements in SEPP65, it is recommended that a maximum normal specular reflectance of visible light of 20% is applied to the materials and finishes used along the southern aspect of the proposed development.

1.2.8 Motorists heading south along Andalusian Way

Point 09 is located along Andalusian Way, to the east of the development site. This point represents the critical sightline of motorists heading south along Andalusian Way at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 09 indicates that a portion of the eastern aspect of the development will be visible and within the zone of sensitive vision. Point 09 is located within the check zone for the eastern aspect, hence solar glare can potentially be observed at this location. A further analysis of the architectural drawings indicates the visible portion of the eastern aspect is comprised of brickwork. Brickwork typically has a low specular reflectance (~1%) and reflected solar glare from brickwork is not expected to be have an adverse impact on motorists. Furthermore, a review of the sun chart for the Sydney region indicates that the sun will not operate at the angular position required for sunlight to be reflected off the western aspect at this location (with the sun located at an acute azimuth angle from the south). Hence there will be no adverse solar glare observed by motorists heading south along Andalusian Way at this location.

1.2.9 Motorists heading north along Andalusian Way

Points 10 and 11 are located along Andalusian Way, to the east of the development site. This point represents the critical sightline of motorists heading north along Andalusian Way at this location. Calibrated images of the viewpoint of motorists at these locations has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Points 10 and 11 indicates that a portion of the eastern aspect of the development will be visible and within the zone of sensitive vision. Points 10 and 11 are located within the check zone for the eastern aspect, hence solar glare can potentially be observed at this

location. A review of the sun chart for the Sydney region indicates that the sun will not operate at the angular position required for sunlight to be reflected off the western aspect at this location (with the sun located at an acute azimuth angle from the north). Hence there will be no adverse solar glare observed by motorists heading north along Andalusian Way at these locations.

1.2.10 Motorists heading east along Carrington Road

Point 12 is located along Carrington Road, to the south-west of the development site. This point represents the critical sightline of motorists heading east along Carrington Road at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 12 indicates that the view of the development will be obstructed by the surrounding buildings and not be visible within the zone of sensitive vision at this location. Hence there will be no adverse solar glare observed by motorists heading east along Carrington Road at this location.

1.2.11 Motorists heading west along Carrington Road

Point 13 is located along Carrington Road, to the south-east of the development site. This point represents the critical sightline of motorists heading west along Carrington Road at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 13 indicates that the view of the development will be obstructed by the surrounding buildings and not be visible within the zone of sensitive vision at this location. Hence there will be no adverse solar glare observed by motorists heading west along Carrington Road at this location.

1.2.12 Motorists heading north along Ashford Avenue

Point 14 is located along Ashford Avenue, to the south-west of the development site. This point represents the critical sightline of motorists heading north along Ashford Avenue at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 14 indicates that the view of the development will be obstructed by the surrounding buildings and not be visible within the zone of sensitive vision at this location. Hence there will be no adverse solar glare observed by motorists heading north along Ashford Avenue at this location.

1.2.13 Motorists heading north along Partridge Avenue

Point 15 is located along Partridge Avenue, to the south of the development site. This point represents the critical sightline of motorists heading north along Partridge Avenue at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 15 indicates that a portion of the eastern and southern aspects of the development will be visible and within the zone of sensitive vision. Point 15 is not located within the check zones for the eastern and southern aspects of the development. Hence there will be no adverse solar glare observed by motorists heading north along Partridge Avenue at this location.

1.2.14 Motorists heading north along Middleton Avenue

Point 16 is located along Middleton Avenue, to the south of the development site. This point represents the critical sightline of motorists heading north along Middleton Avenue at this location. Calibrated images of the viewpoint of motorists at this location has been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Point 16 indicates that a portion of the eastern and southern aspects of the development will be visible and within the zone of sensitive vision. Point 16 is not located within the check zone for the southern aspect, however it is within the check zone for the eastern aspect. Hence solar glare can potentially be observed at this location from the eastern aspect of the development. A review of the sun chart for the Sydney region indicates that the sun will not operate at the angular position required for sunlight to be reflected off the southern aspect at this location (with the sun located at an acute azimuth angle from the north-east). Hence there will be no adverse solar glare observed by motorists heading north along Middleton Avenue at this location.

2 GLARE OBSERVED BY PEDESTRIANS AND OCCUPANTS OF NEIGHBOURING BUILDINGS

Our past experience involving more than 250 projects, and also research by Rofail and Dowdle (2004), tends to indicate that buildings which cause a nuisance to pedestrians and 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. Hence a general recommendation is made that all glazing and other reflective materials used on the façade of the subject development have a maximum normal specular reflectivity of visible light of 20% to avoid adverse solar glare to pedestrians and occupants of neighbouring buildings.

3 TYPICAL REFLECTANCES OF FAÇADE MATERIALS

It should be noted that the most reflective surface on the façade of a building is the glazing. Reflected solar glare from concrete, brickwork, timber, etc, is negligible (ie: less than 1% normal specular reflectance) and hence will not cause any adverse solar glare effects. The following sub-sections provide some general reflectance values of more reflective materials used on building facades.

3.1 Glazed Surfaces

A glazing supplier will be able to provide information on the maximum normal specular reflectance of visible light of different types of glazing. Some typical reflectivity values of different types of glazing are listed as follows:

- Low reflectance glazing, such as Guardian Clarity – less than 5%
- Clear float glass – typically 5% to 8%
- Low-e solar control glazing – typically 8% to 12%
- Other types of compliant performance glazing – up to 20%

3.2 Painted and/or Powder-Coated Metallic Surfaces

In the event that some portions of the external façade of the development feature powder-coated or painted metallic surfaces, it is not expected that adverse glare will be observed from those surfaces since the maximum normal specular reflectance of visible light of these types of façade materials range from 1% to 5%. This is well within the maximum limits specified in previous sections of this report.

4 CONCLUSION

A detailed study has been undertaken for the effect of potential solar glare from the proposed development located at 2 Mandala Parade, Castle Hill. This study identifies any possible adverse reflected solar glare conditions affecting motorists, pedestrians, and to occupants of neighbouring buildings. If necessary, recommendations are made to mitigate any potentially adverse effects. This study assesses compliance with the controls for solar glare from the State Environmental Planning Policy No. 65 (SEPP65, Part 04 (Designing the Building) for Amenity), which contains the Apartment Design Guide (ADG.

The results of the study indicate that, to avoid any adverse glare to motorists and pedestrians on the surrounding streets, occupants of neighbouring buildings, and to comply with the abovementioned planning control requirements, the following limitations to the maximum normal specular reflectance of visible light of the external façade glazing and treatment strategies are recommended:

- Building AB – Western aspect main building façade on Levels 01and above: 11%.
- Building CD – Eastern aspect main building façade on Levels 01 to 04: 11%.
- All other glazing (windows and balustrades) should have a maximum normal specular reflectance of visible light of 20%.
- The proposed metal rail balustrades along the eastern aspect of Building CD on Levels 02 to 04 as indicated in architectural drawings is to have a non-polished surface finish (e.g., powdercoated, painted etc.).
- The inclusion of the proposed solid columns/fins along the building edge on the northern aspect of Buildings AB and CD; in particular the protruding columns/fins proposed at the ends of the glazed systems, as indicated in the architectural drawings.
- The inclusion of the proposed/existing densely foliating trees along the various street frontages of the site as indicated in the architectural drawings.

It should be noted that the most reflective surface on the façade of a building is the glazing. Reflected solar glare from concrete, brickwork, timber, etc. is negligible (i.e. less than 1% normal specular reflectance) and hence will not cause any adverse solar glare effects. Note also that, for any painted or powder-coated metallic surfaces on the exterior façade of the development, the maximum normal specular reflectance of visible light for those types of surfaces is in the range of 1% to 5%, which is well within the abovementioned limit.

Hence, with the incorporation of the abovementioned recommendations, the results of this study indicate that the subject development will not cause adverse solar glare to motorists or pedestrians in the surrounding area, or to occupants of neighbouring buildings, and will comply with the planning controls regarding reflectivity from SEPP65.

5 REFERENCES

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

Phillips, R.O., 1992, "Sunshine and Shade in Australasia", Sixth Edition, CSIRO Publishing.

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

State Environmental Planning Policy No. 65 (SEPP65), 2015, "Apartment Design Guide", NSW Department of Planning and Environment.

APPENDIX A SIGHT-LINES WITH GLARE OVERLAYS

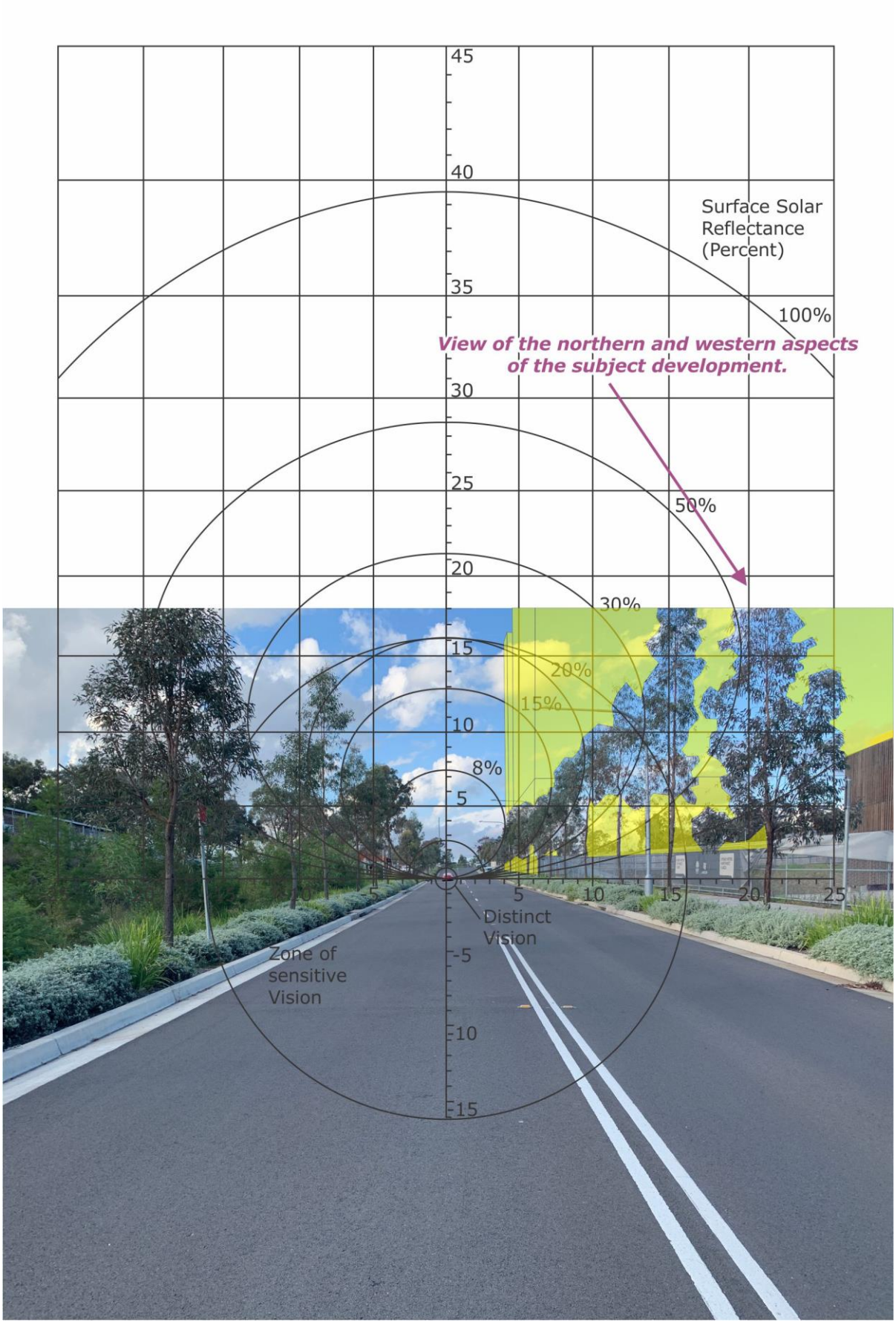

Figure A.1: Glare Overlay of the Viewpoint at Point 01

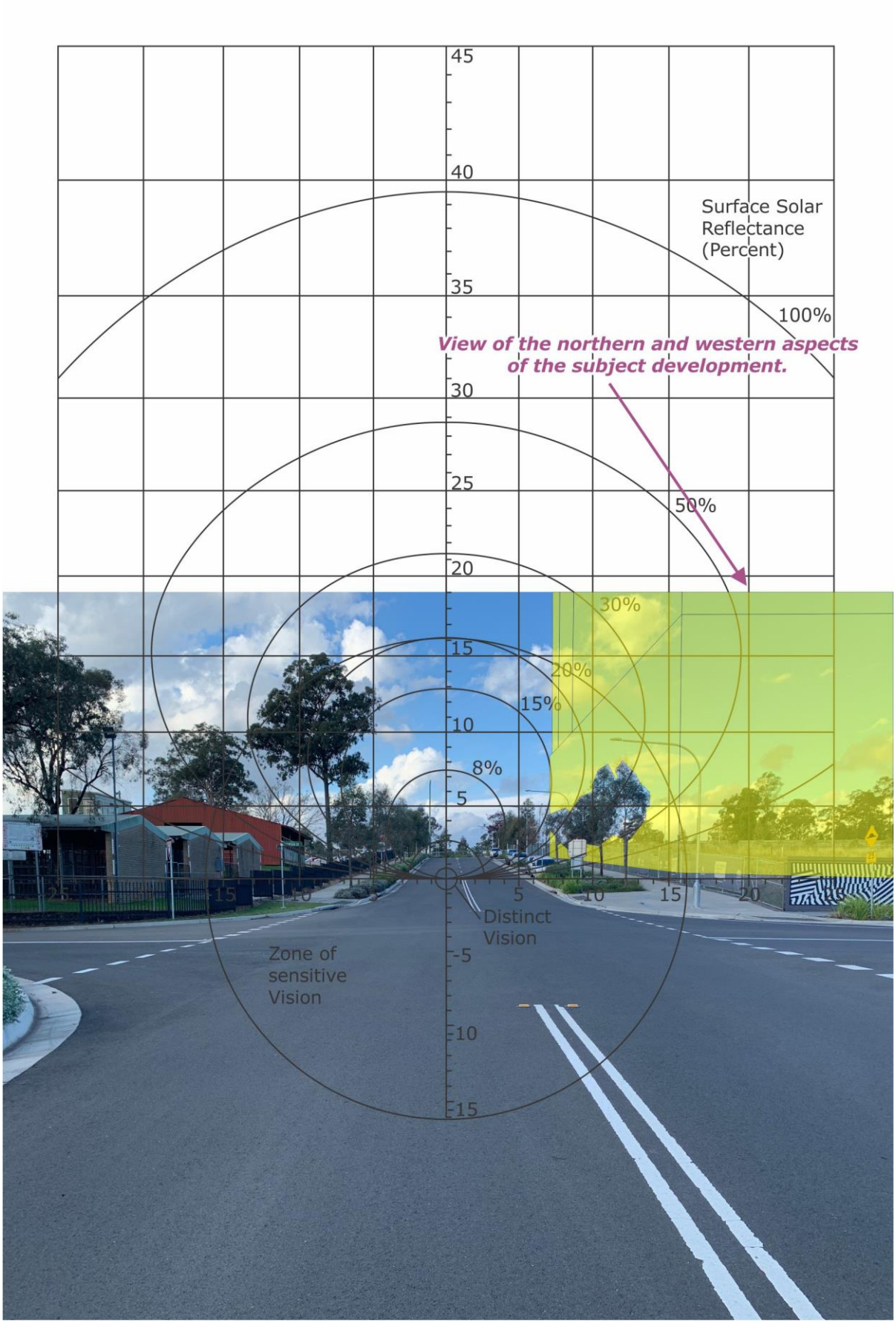

Figure A.2: Glare Overlay of the Viewpoint at Point 02

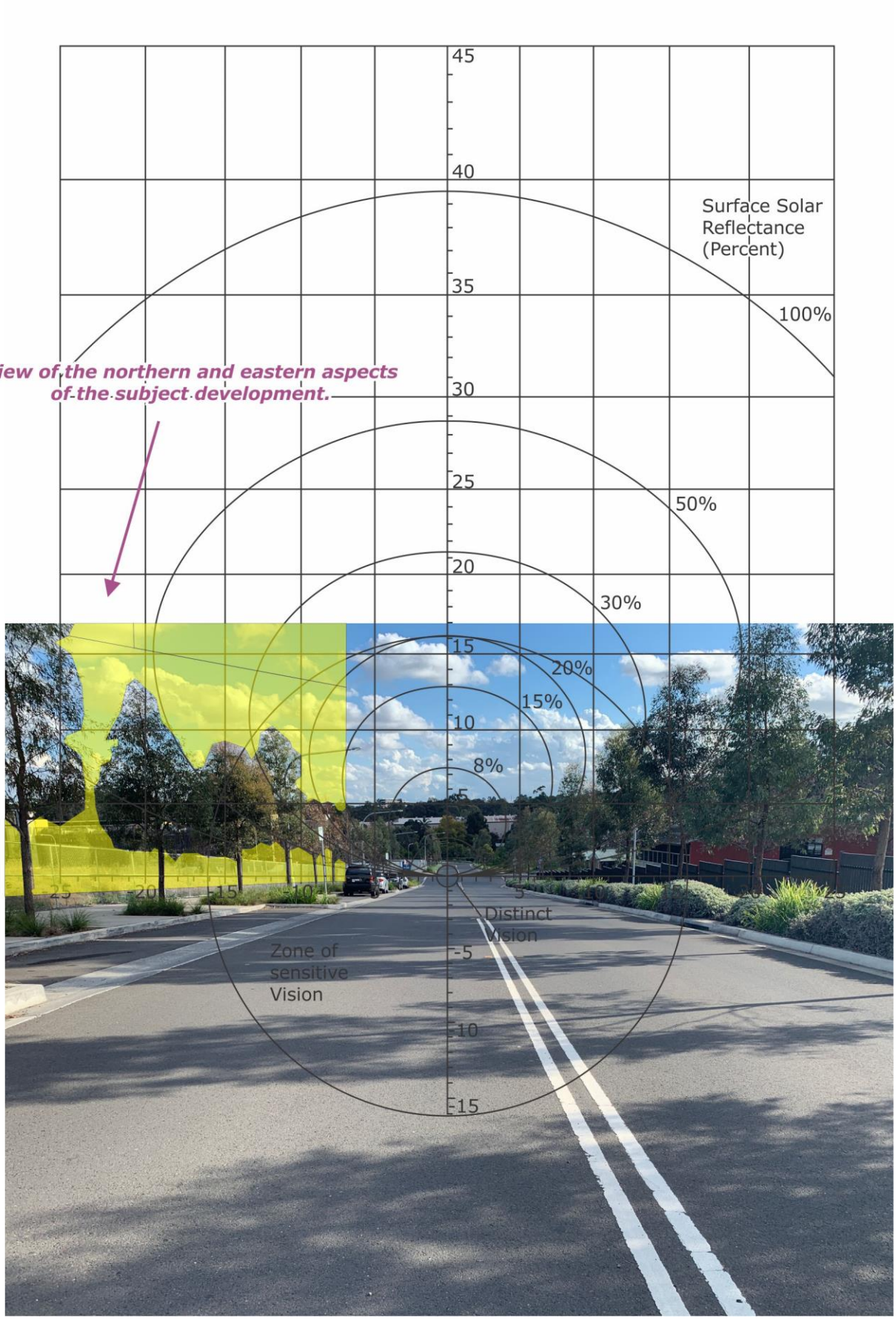

Figure A.3: Glare Overlay of the Viewpoint at Point 03

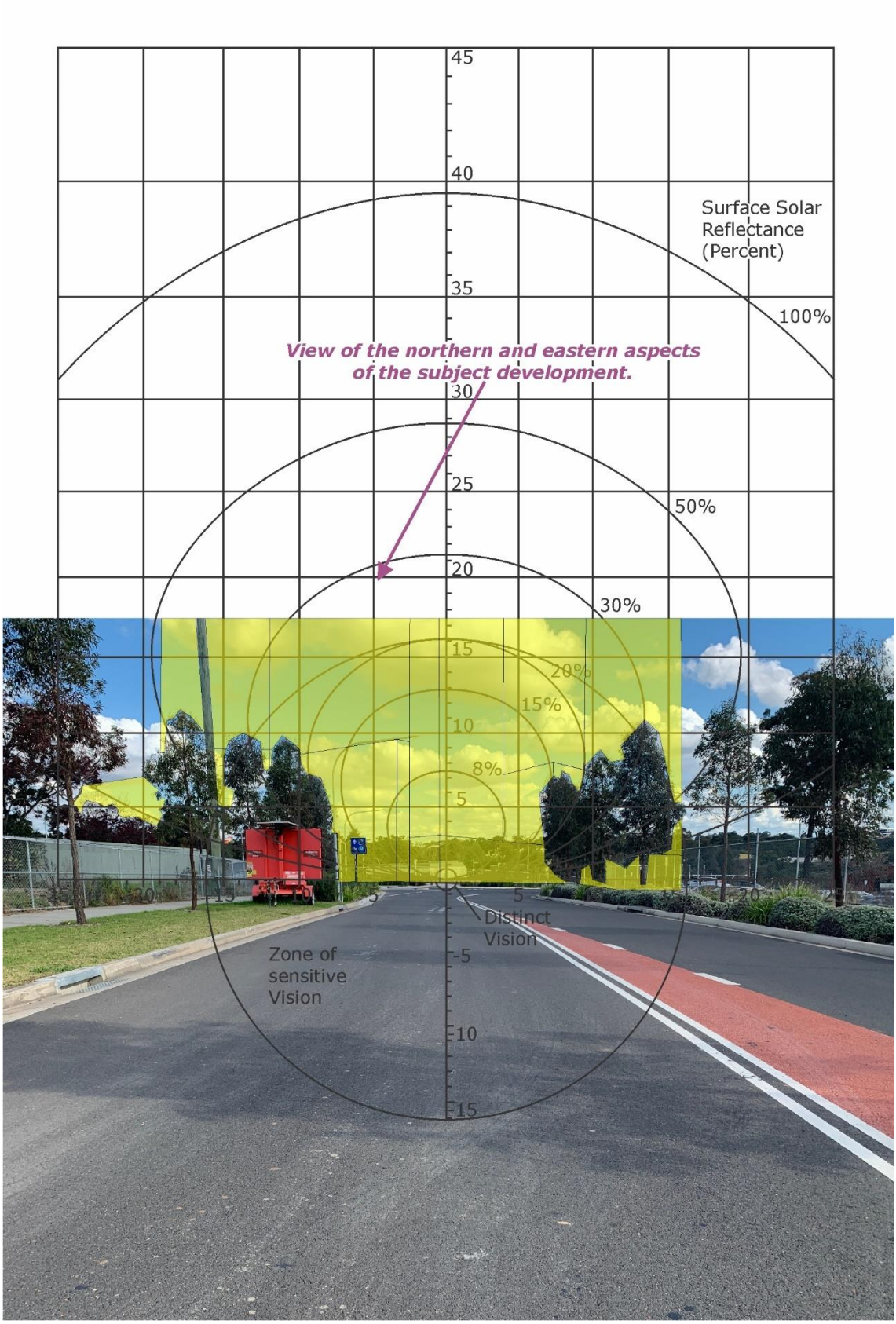

Figure A.4: Glare Overlay of the Viewpoint at Point 04

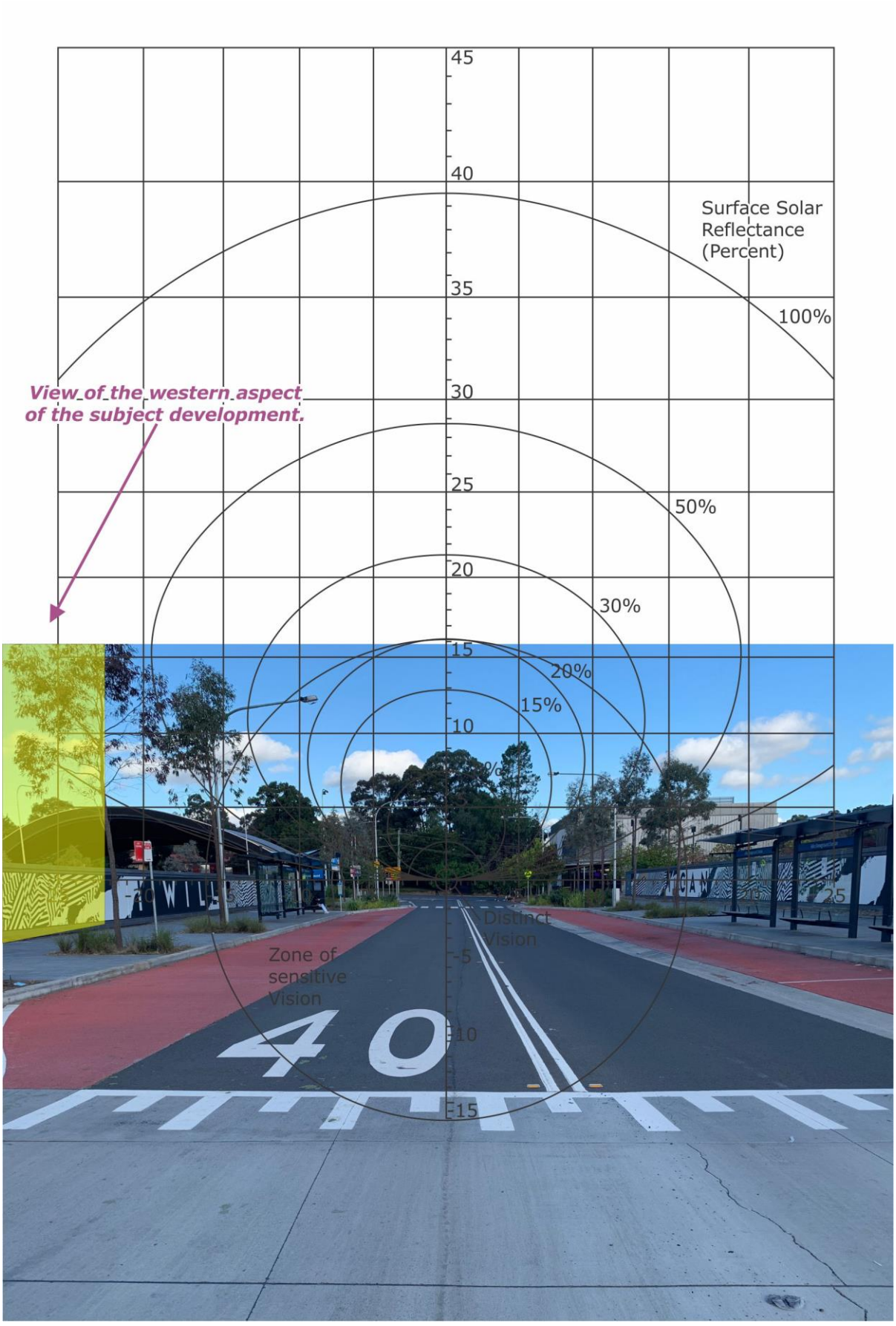

Figure A.5: Glare Overlay of the Viewpoint at Point 05

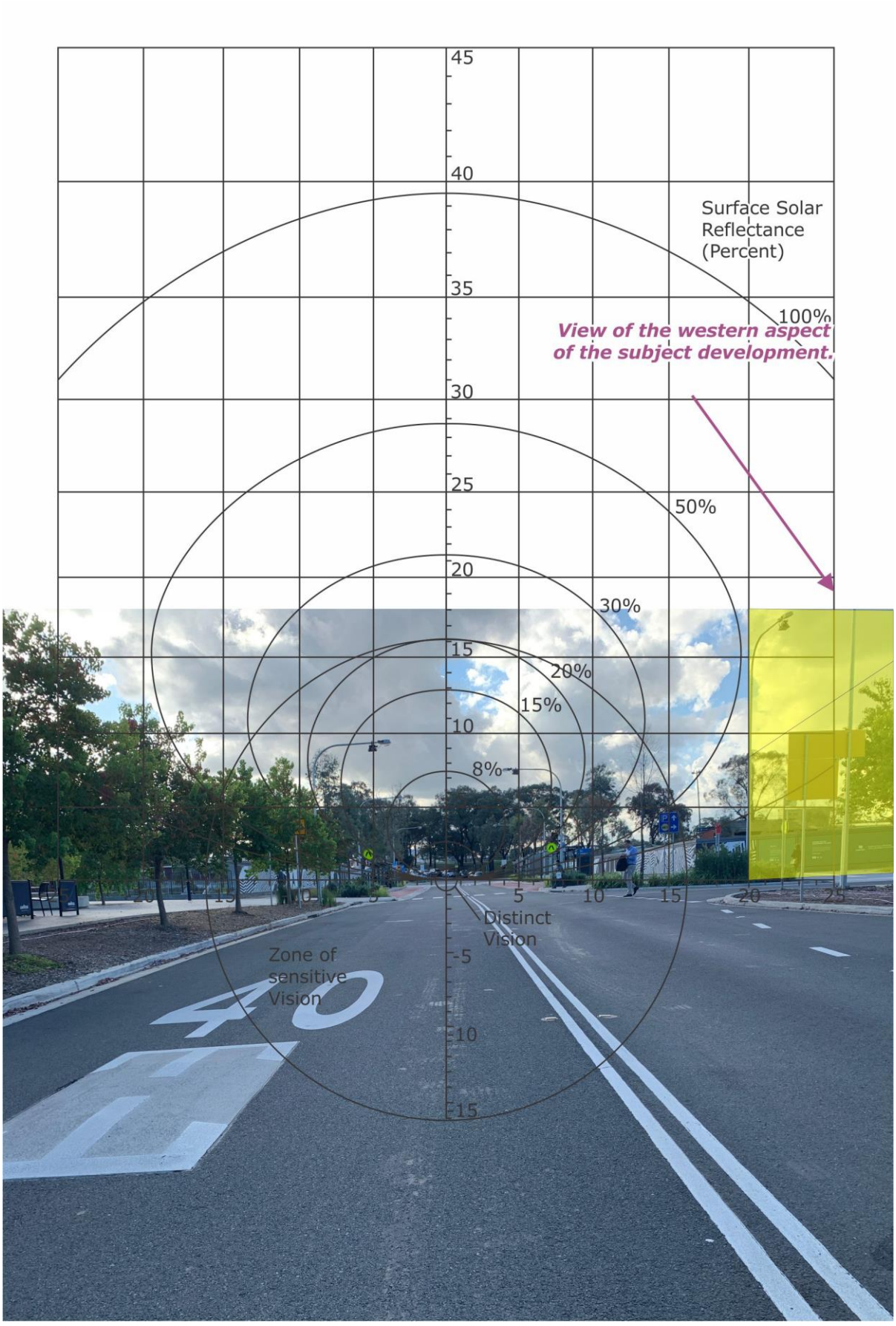

Figure A.6: Glare Overlay of the Viewpoint at Point 06

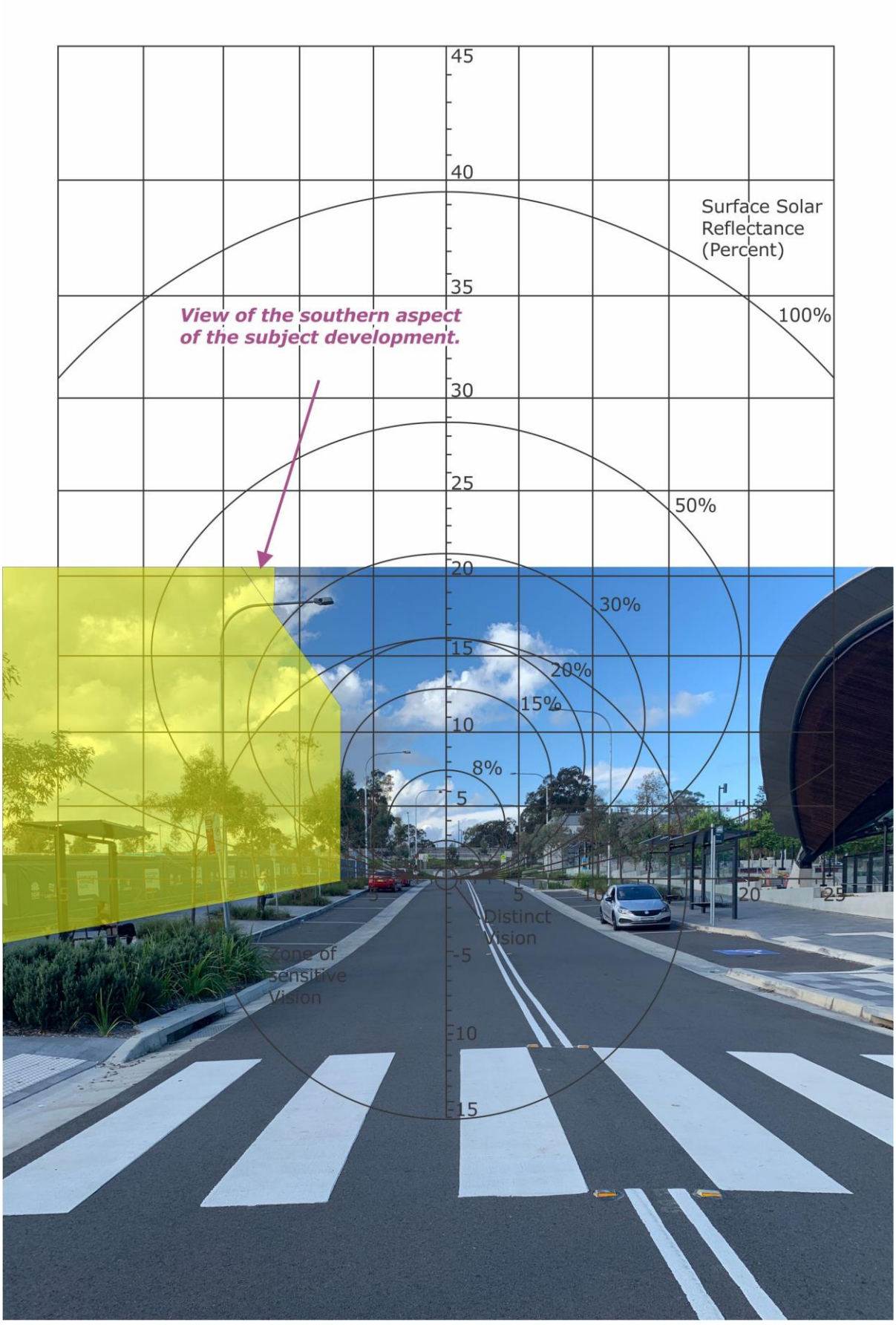

Figure A.7: Glare Overlay of the Viewpoint at Point 07

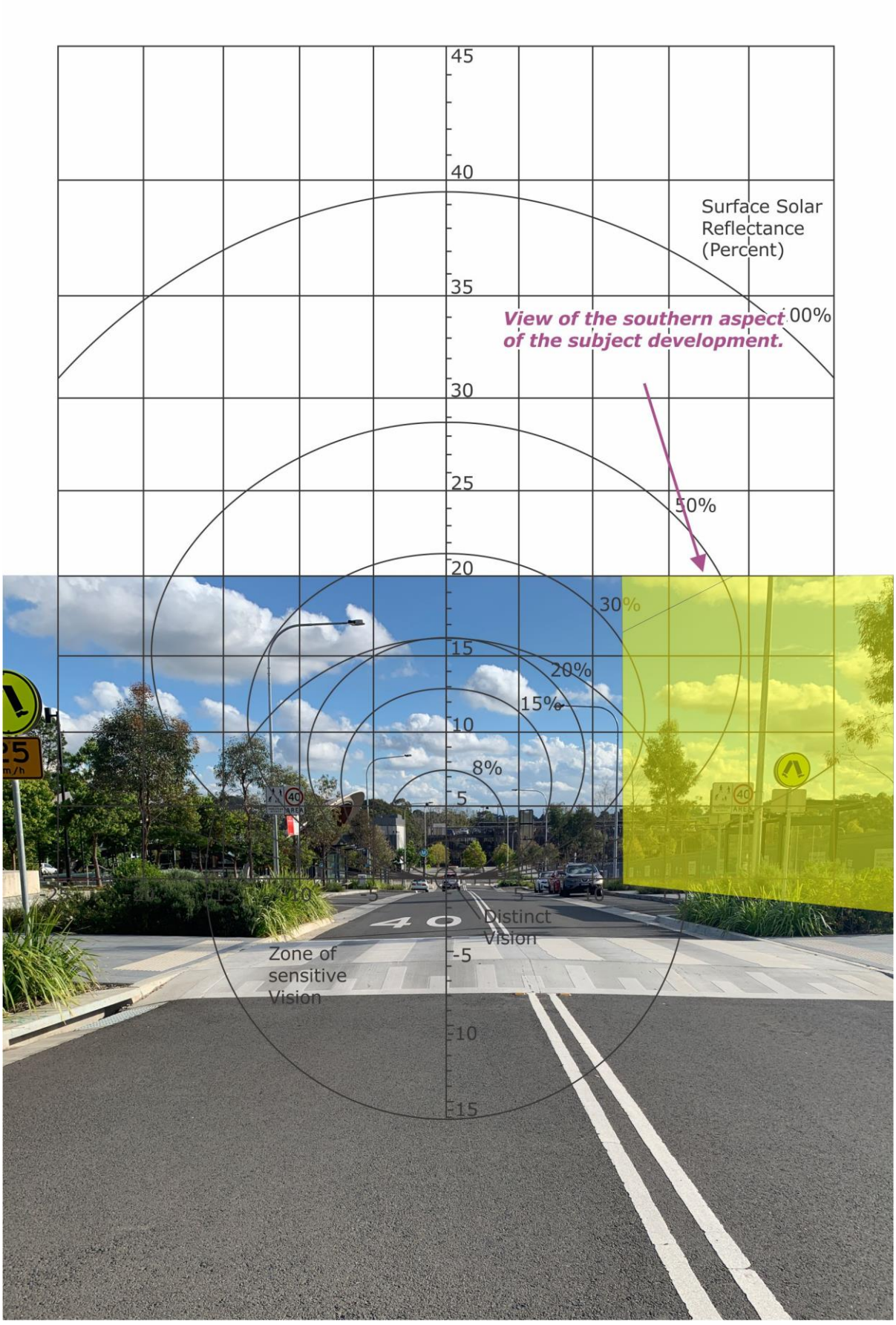

Figure A.8: Glare Overlay of the Viewpoint at Point 08

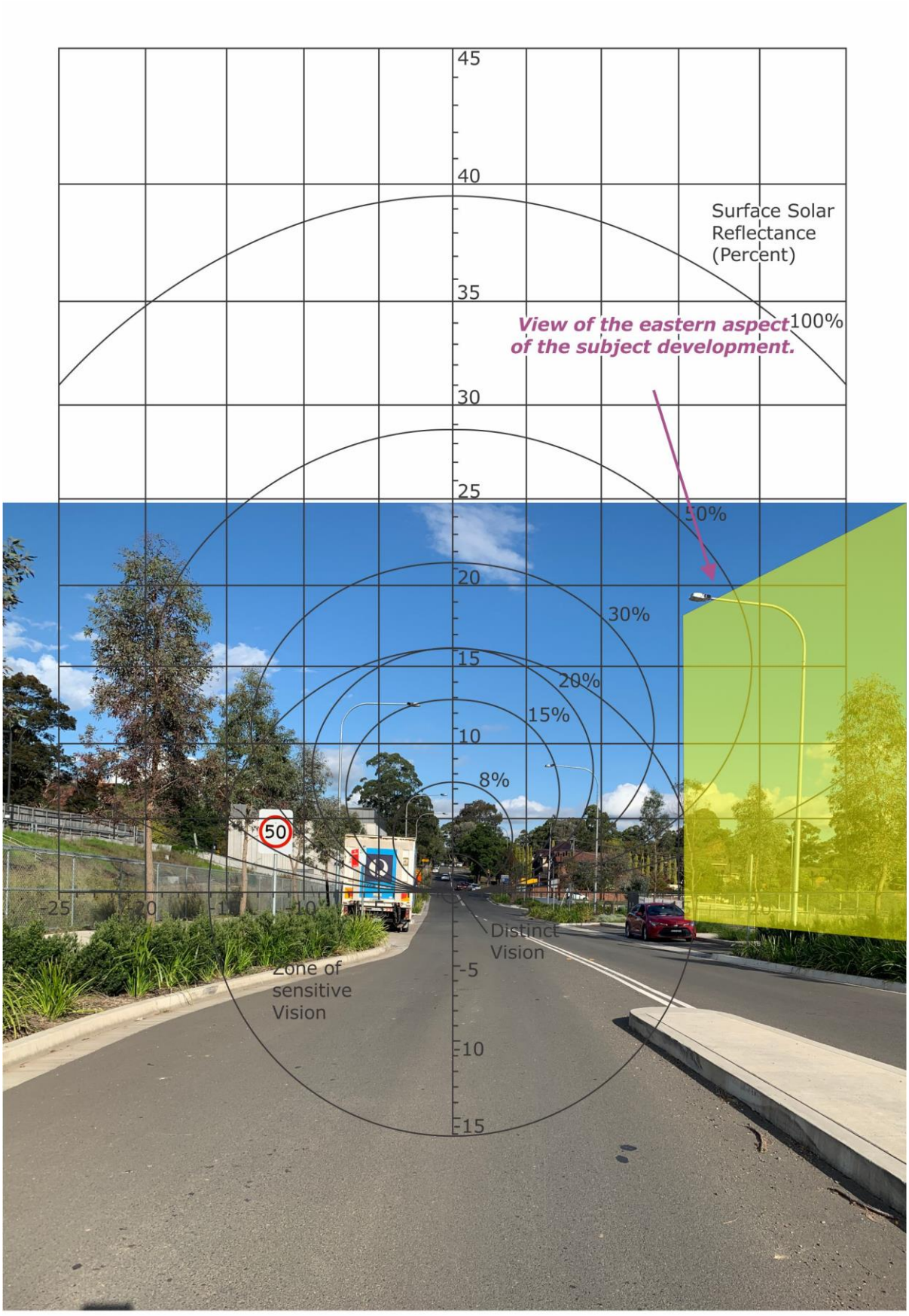

Figure A.9: Glare Overlay of the Viewpoint at Point 09

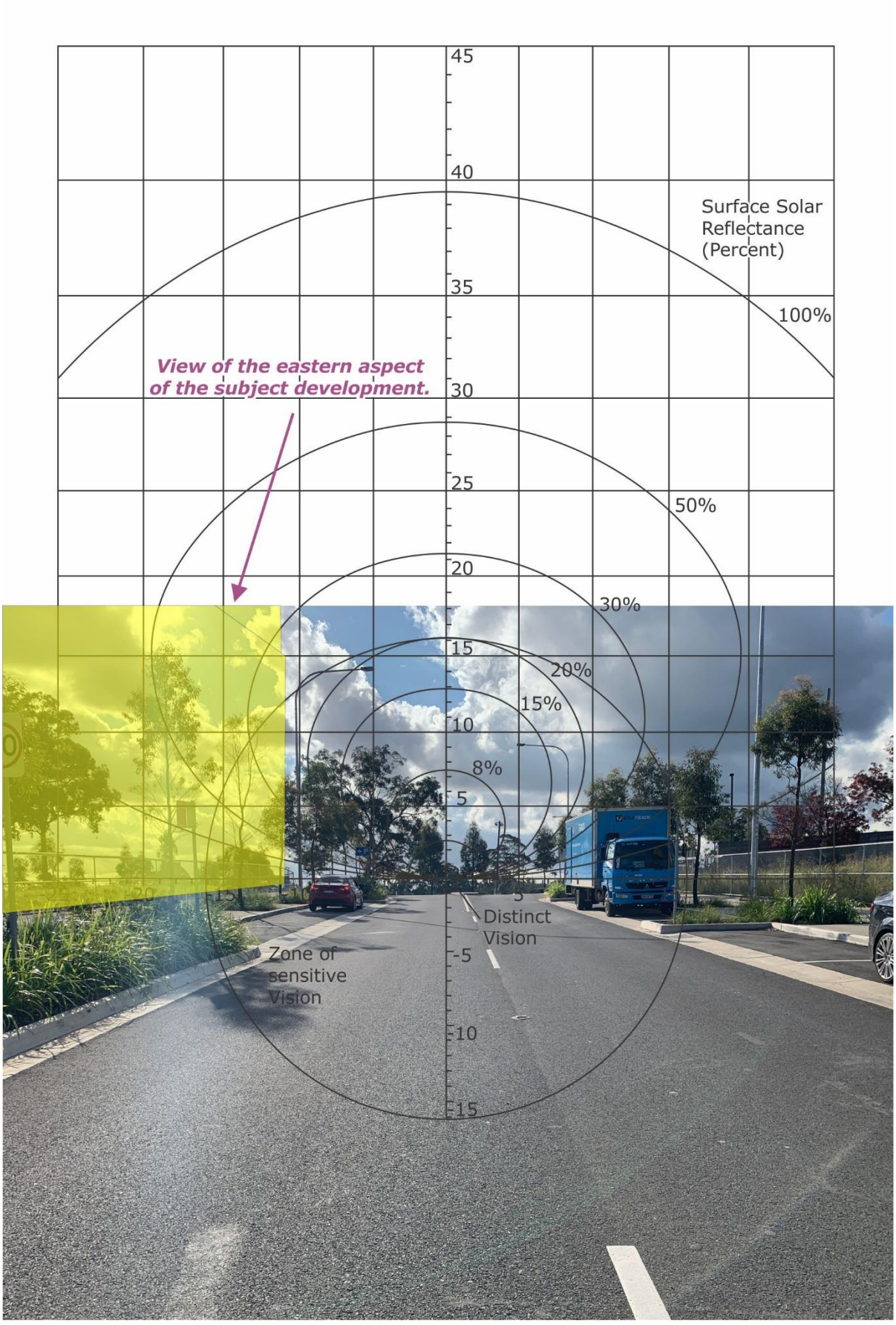

Figure A.10: Glare Overlay of the Viewpoint at Point 10

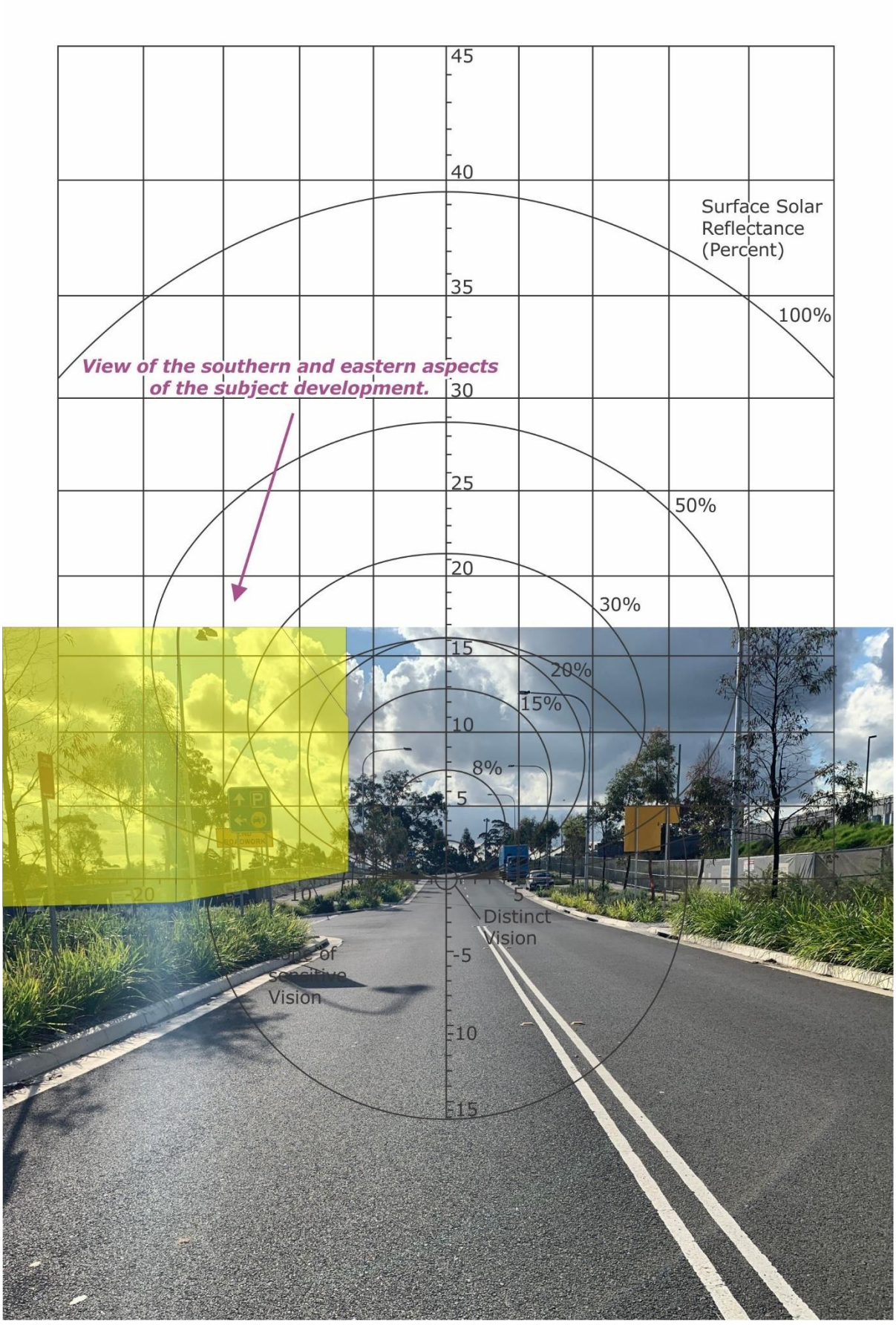

Figure A.11: Glare Overlay of the Viewpoint at Point 11

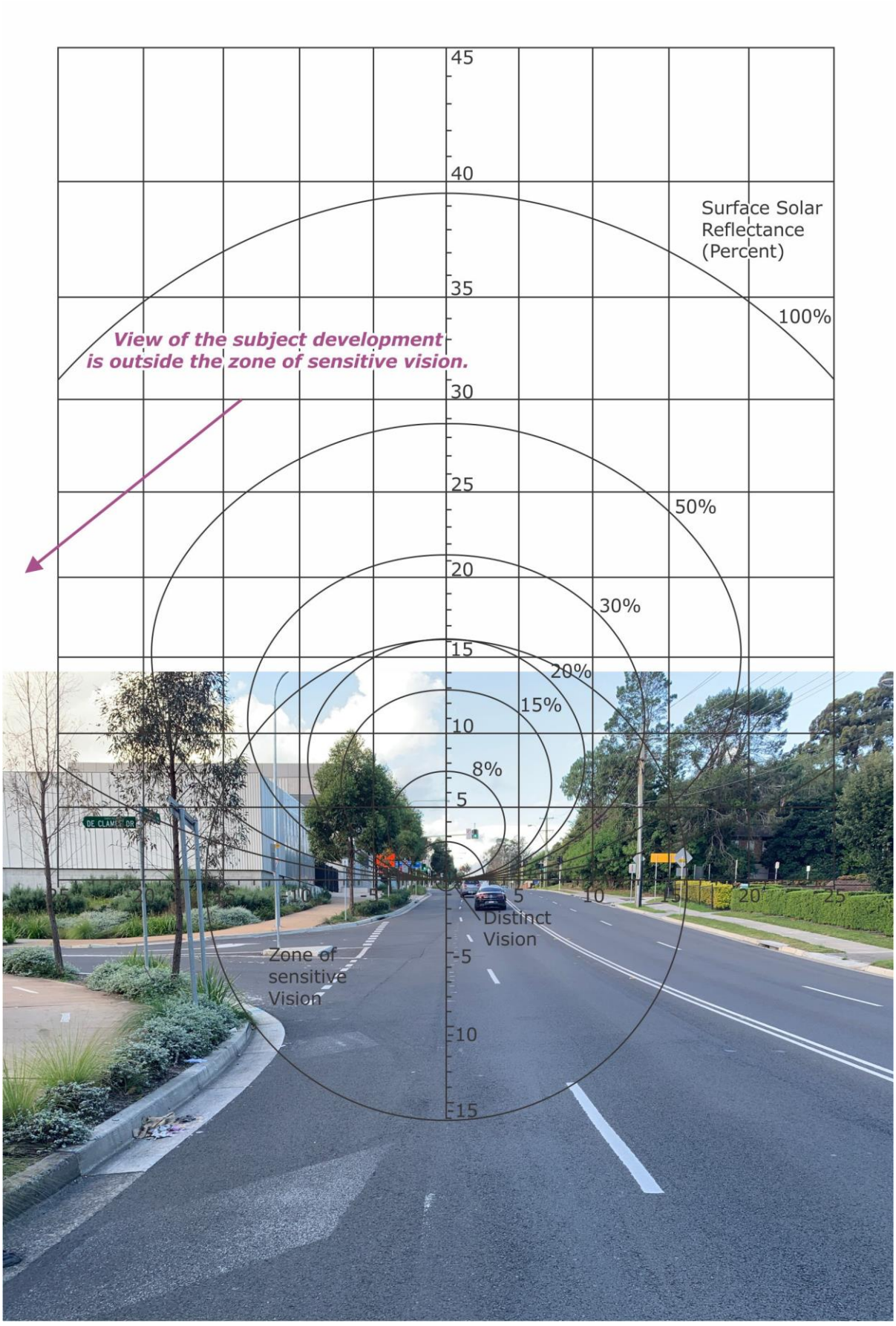

Figure A.12: Glare Overlay of the Viewpoint at Point 12

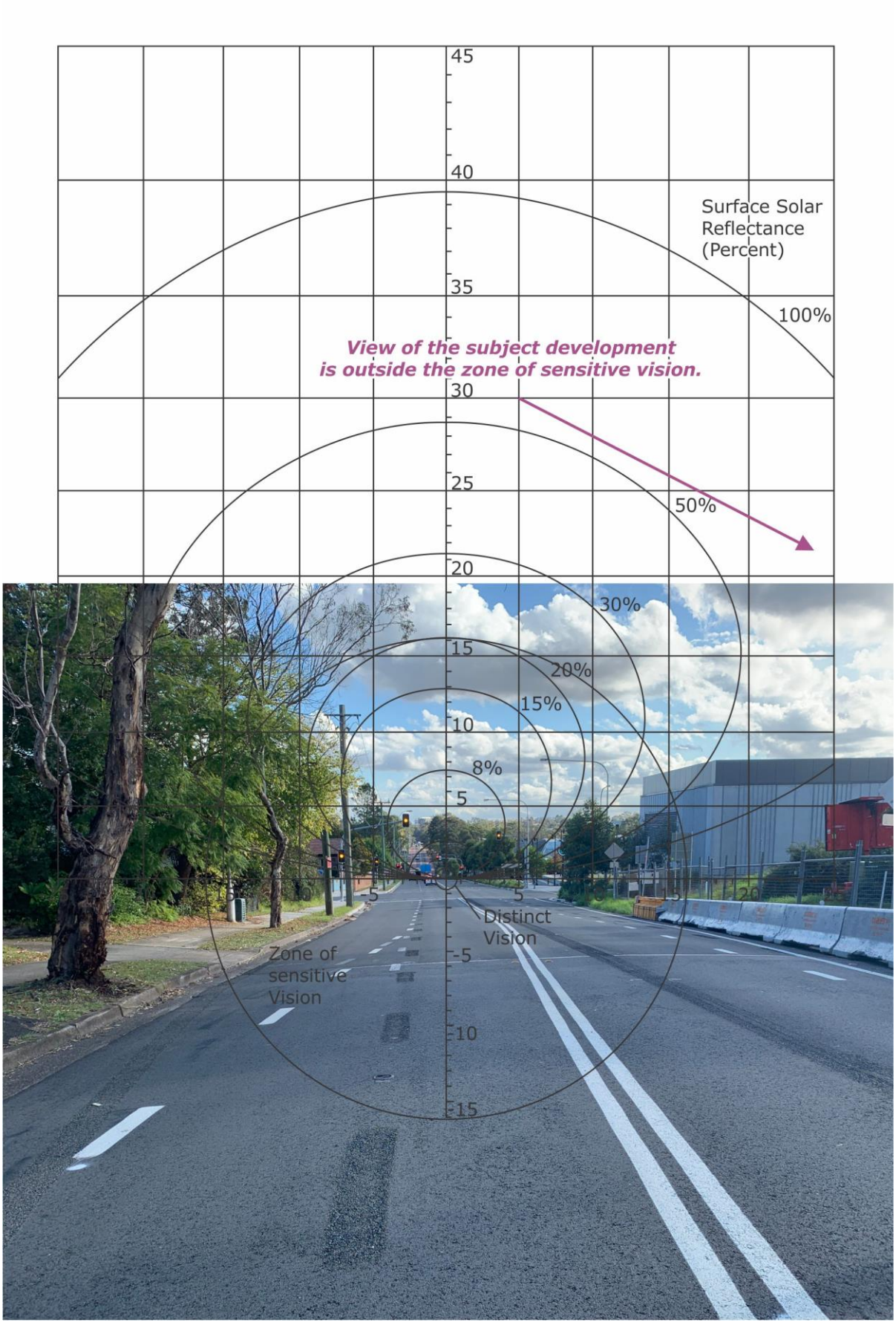

Figure A.13: Glare Overlay of the Viewpoint at Point 13

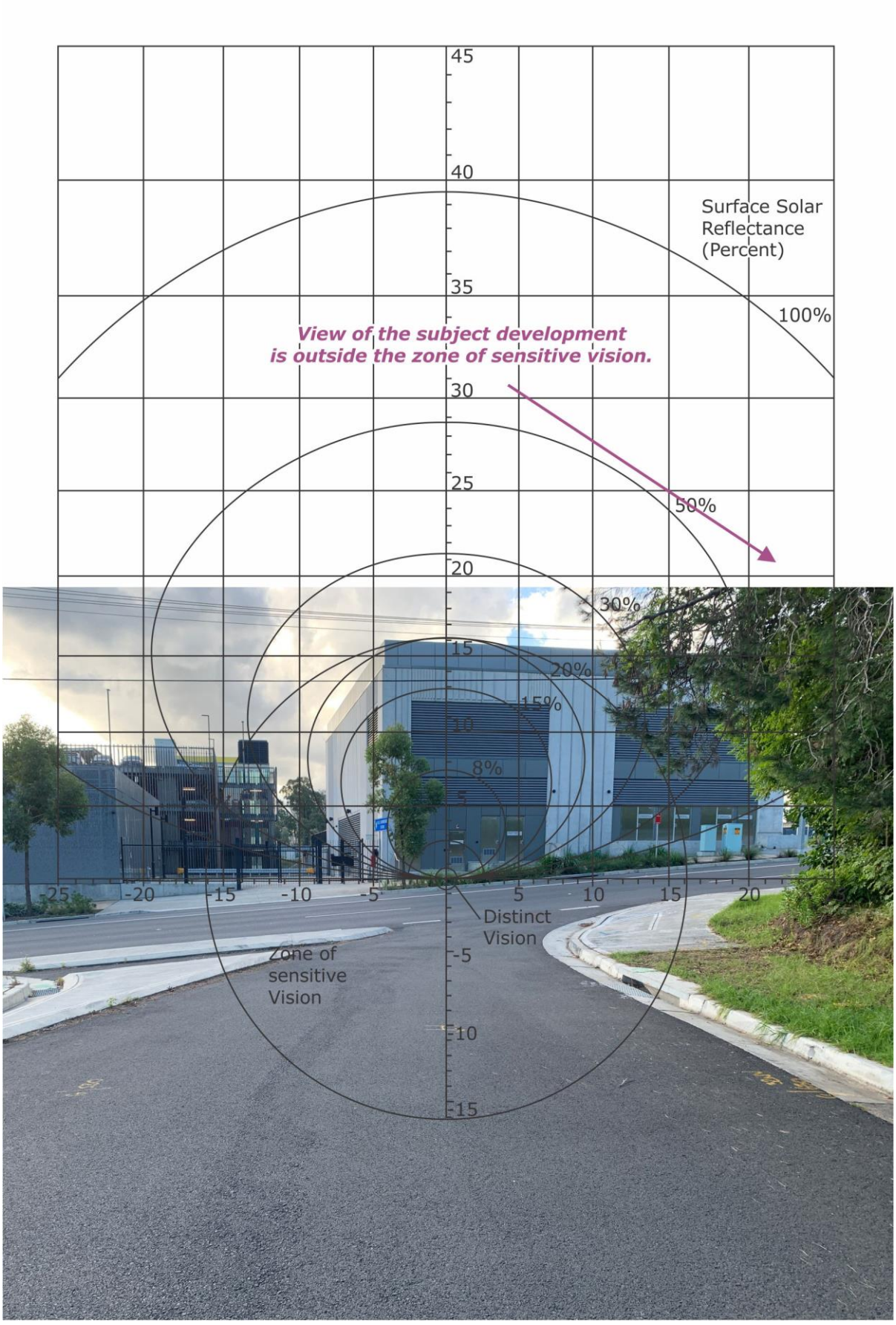

Figure A.14: Glare Overlay of the Viewpoint at Point 14

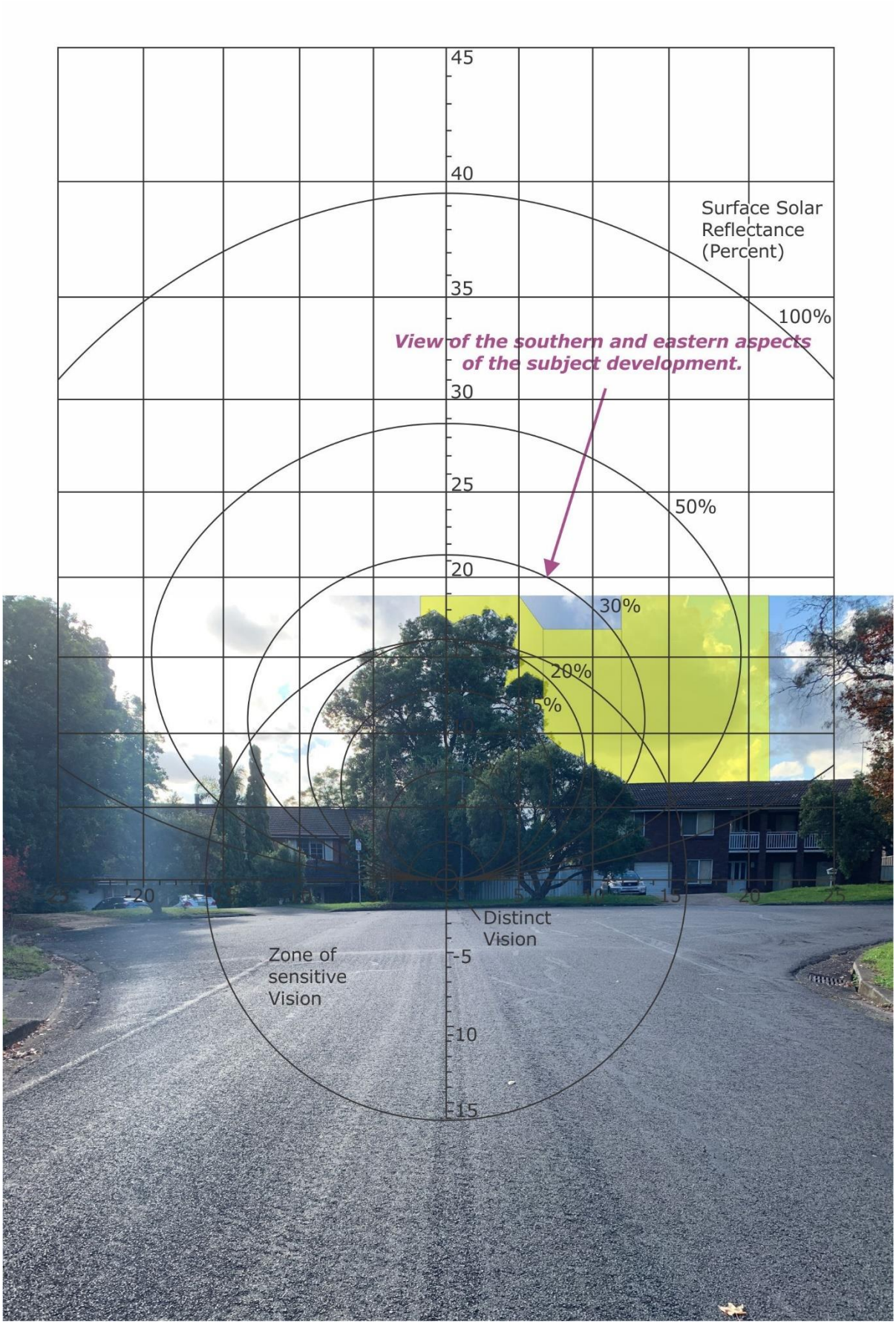

Figure A.15: Glare Overlay of the Viewpoint at Point 15

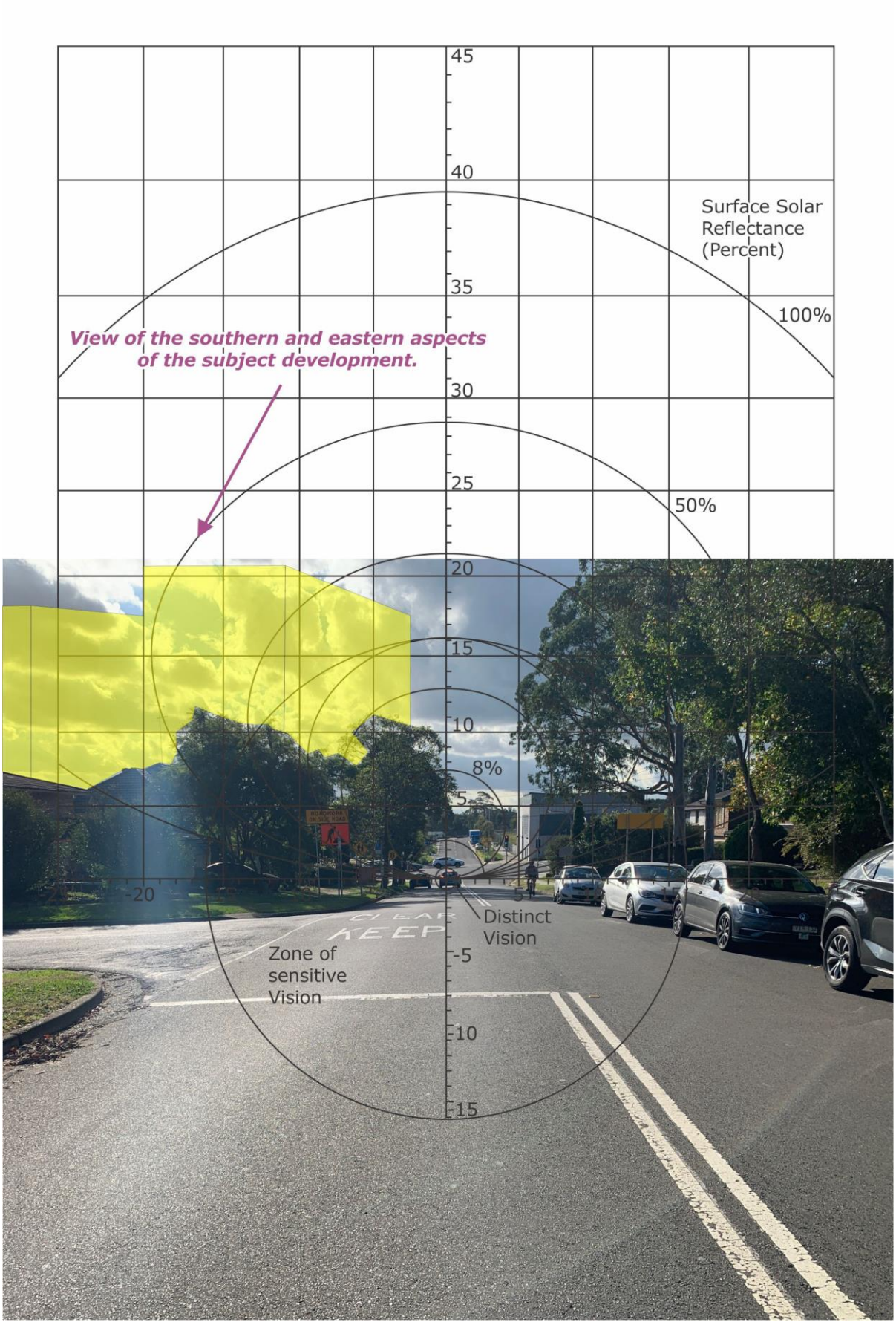

Figure A.16: Glare Overlay of the Viewpoint at Point 16

APPENDIX B CRITICAL ASPECT SOLAR CHARTS

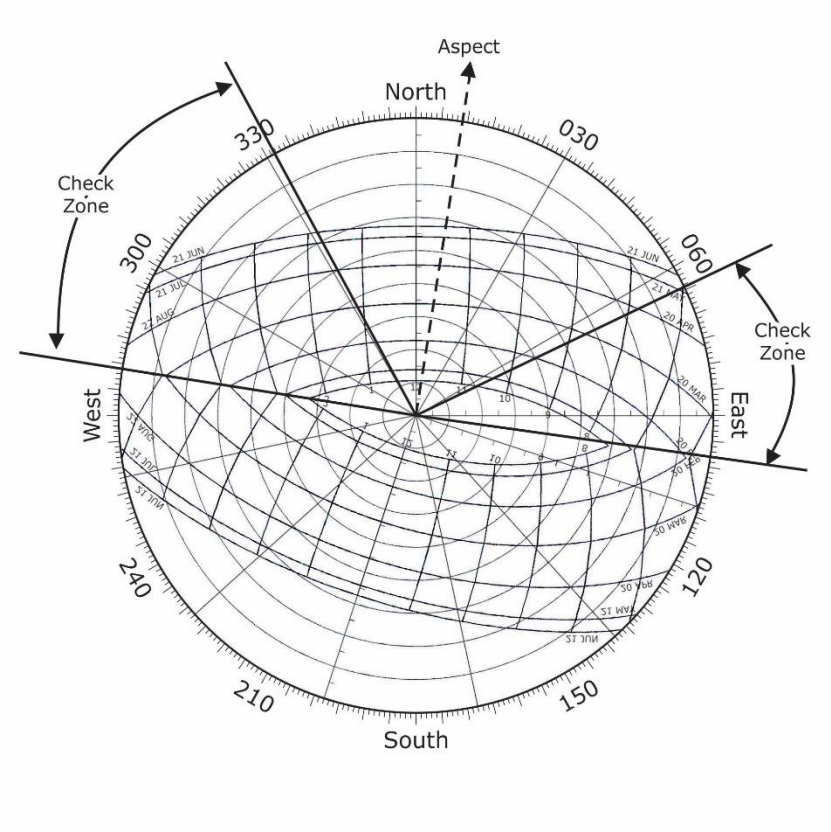

Figure B.1: Sun Chart for the 009° Aspect

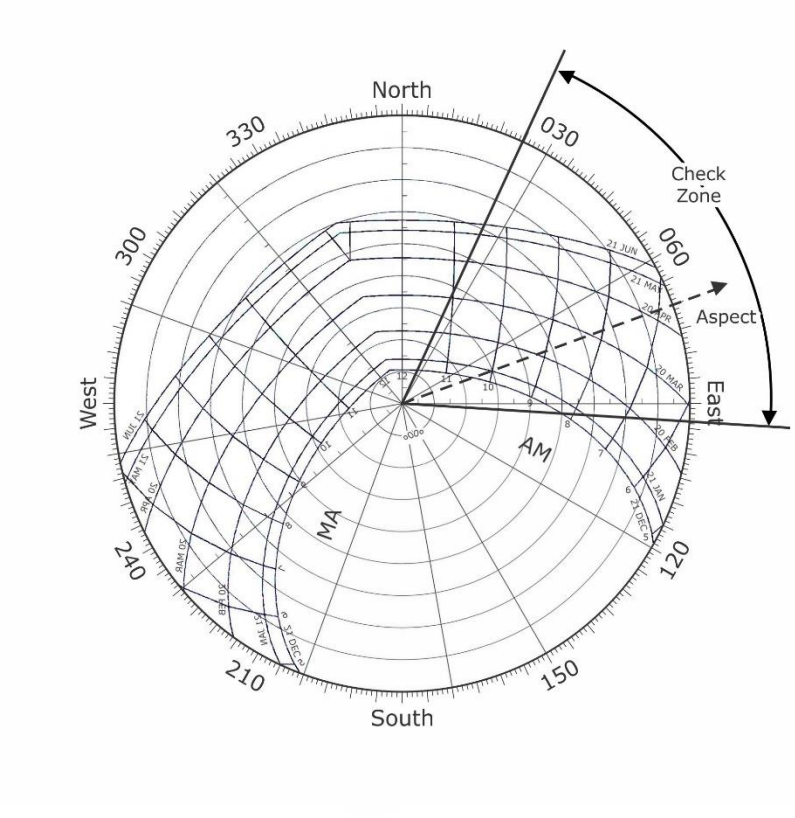

Figure B.2: Sun Chart for the 070° Aspect

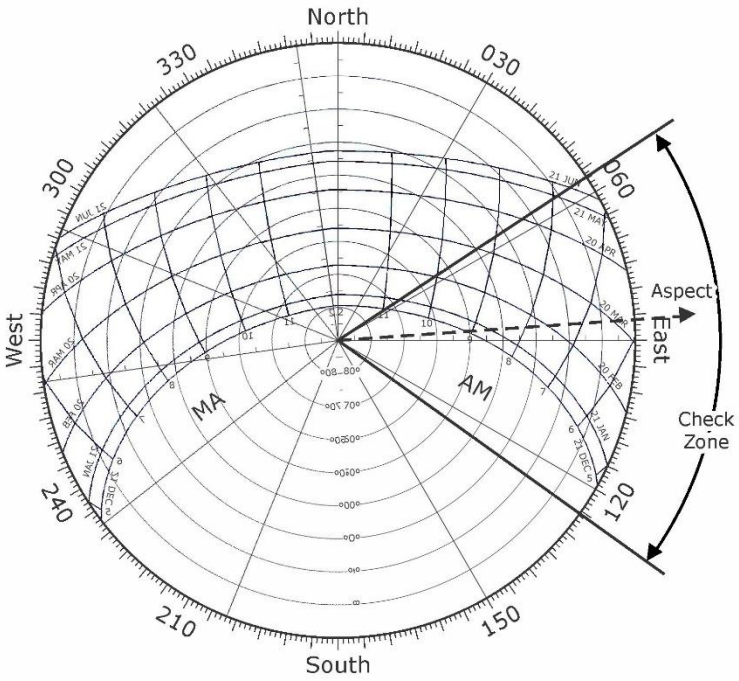

Figure B.3: Sun Chart for the 086° Aspect

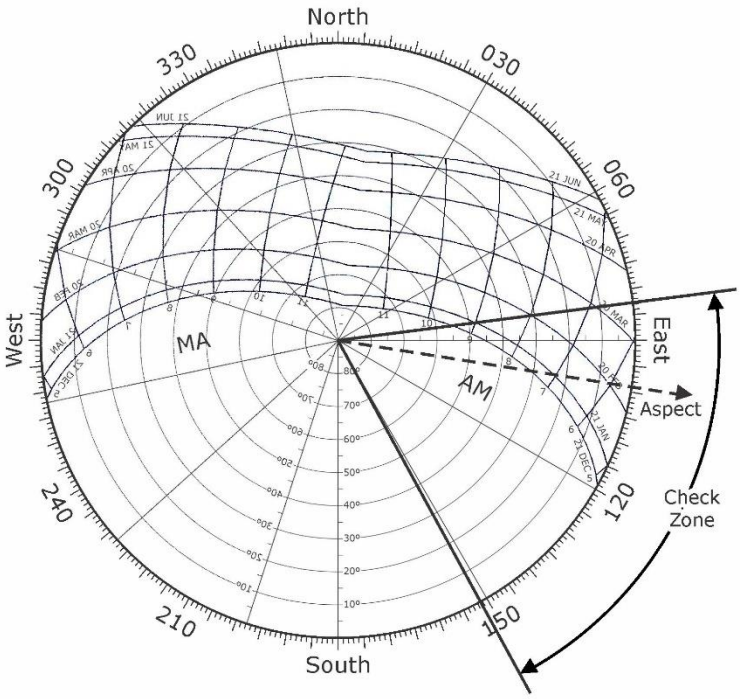

Figure B.4: Sun Chart for the 099° Aspect

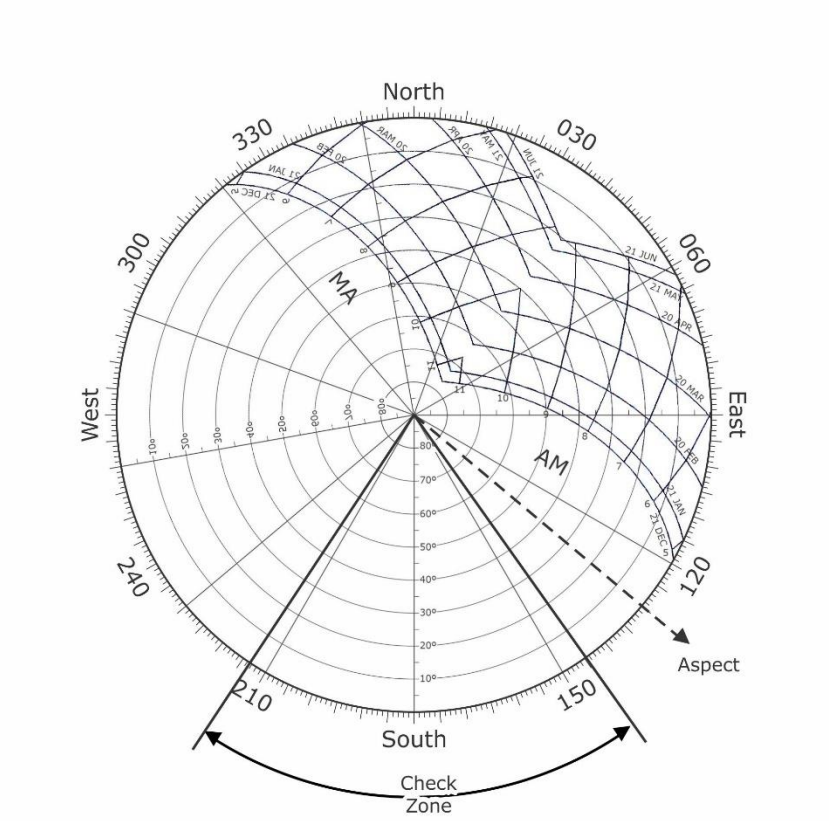

Figure B.5: Sun Chart for the 130° Aspect

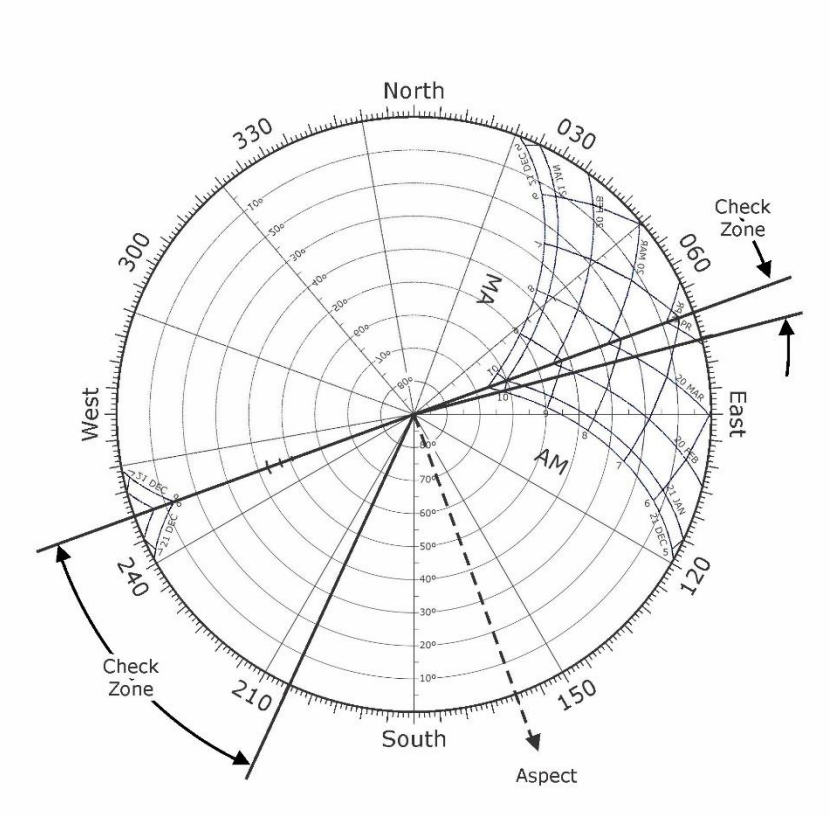

Figure B.6: Sun Chart for the 160° Aspect

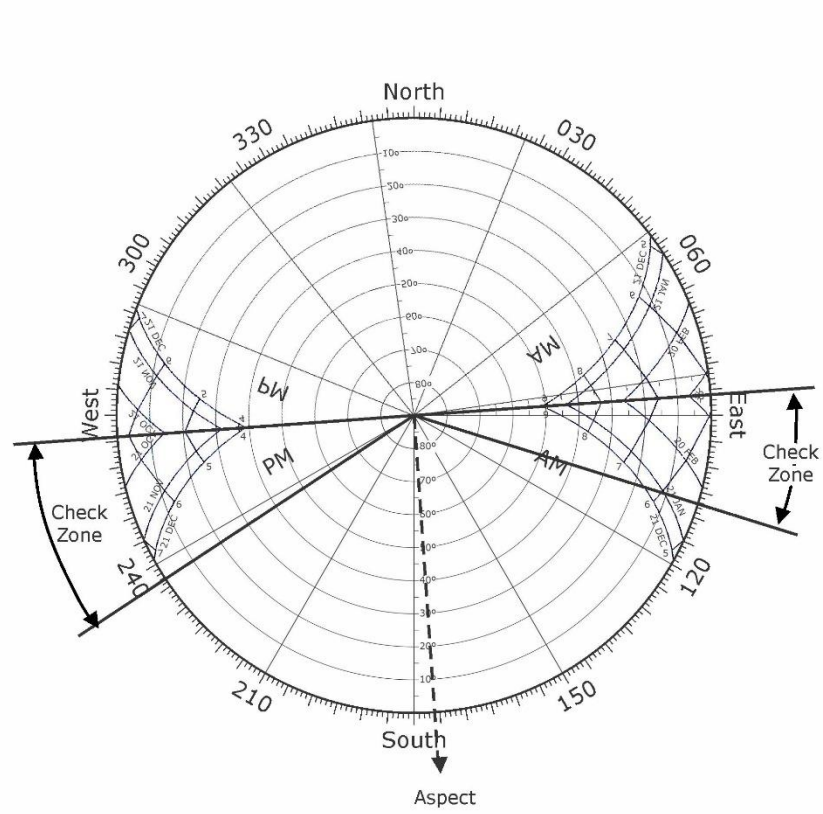

Figure B.7: Sun Chart for the 176° Aspect

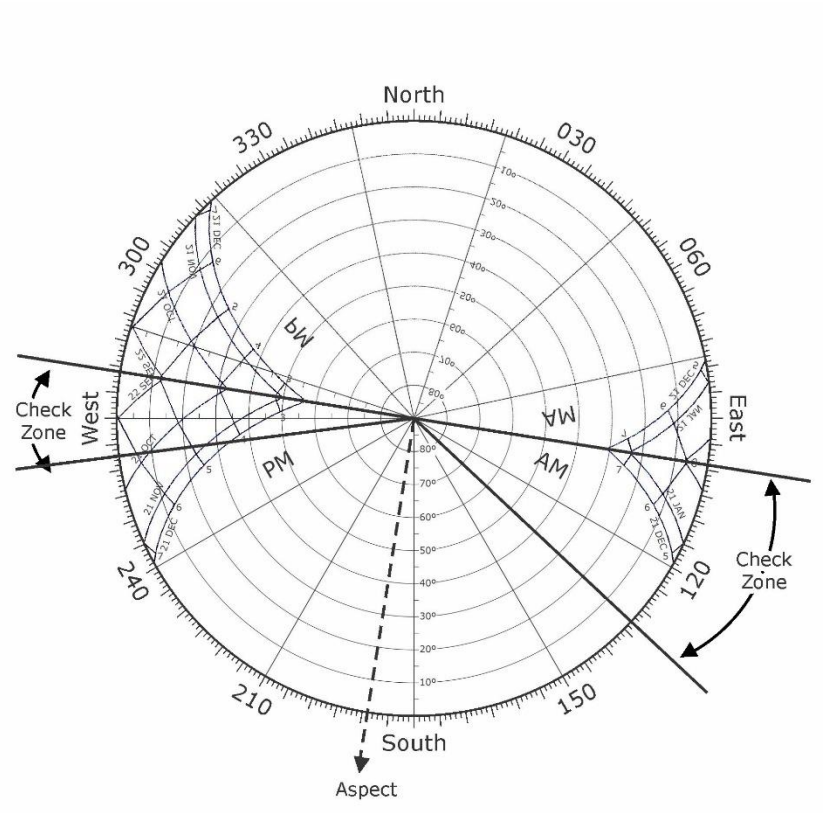

Figure B.8: Sun Chart for the 189° Aspect

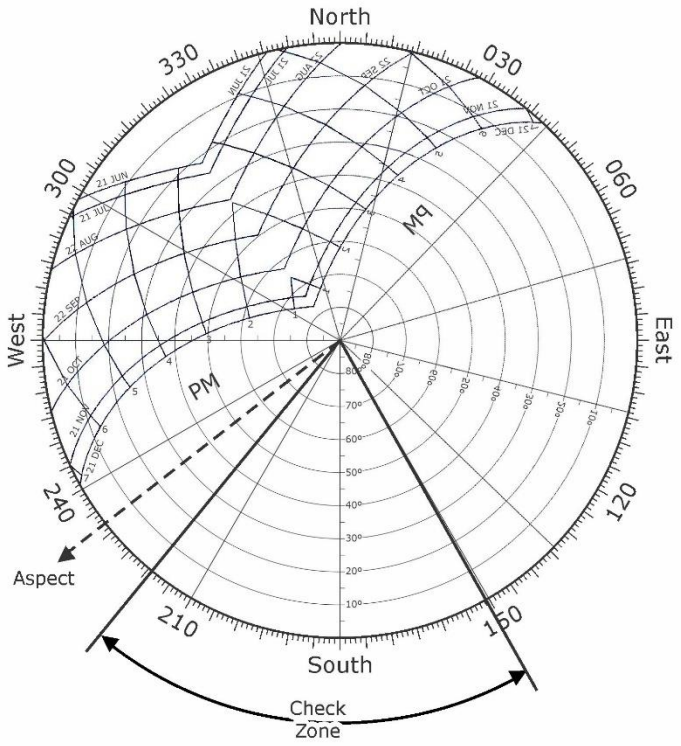

Figure B.9: Sun Chart for the 232° Aspect

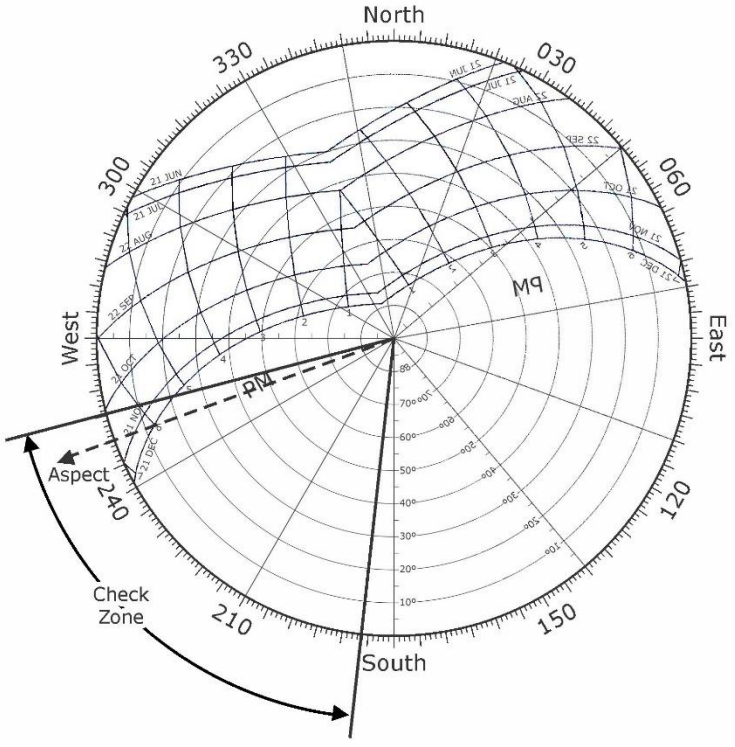

Figure B.10: Sun Chart for the 250° Aspect

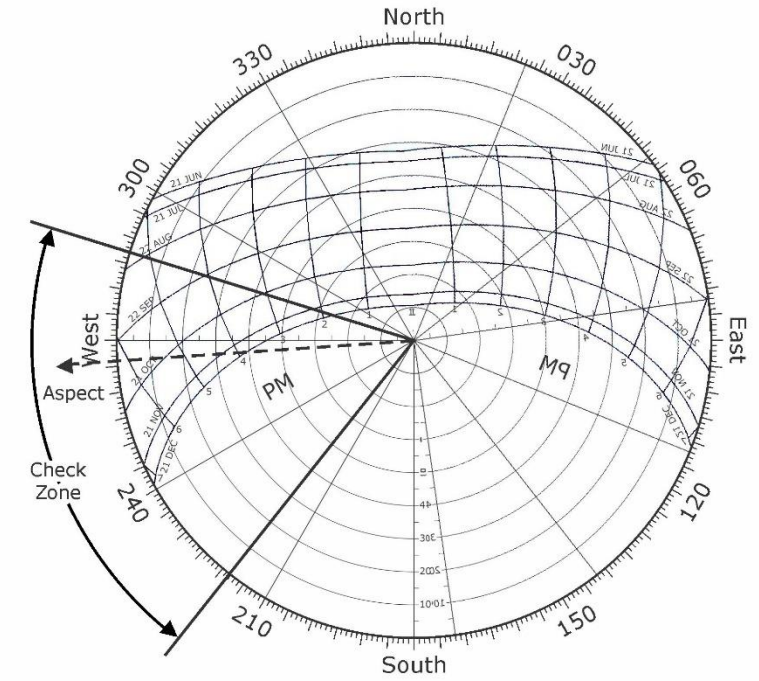

Figure B.11: Sun Chart for the 266° Aspect

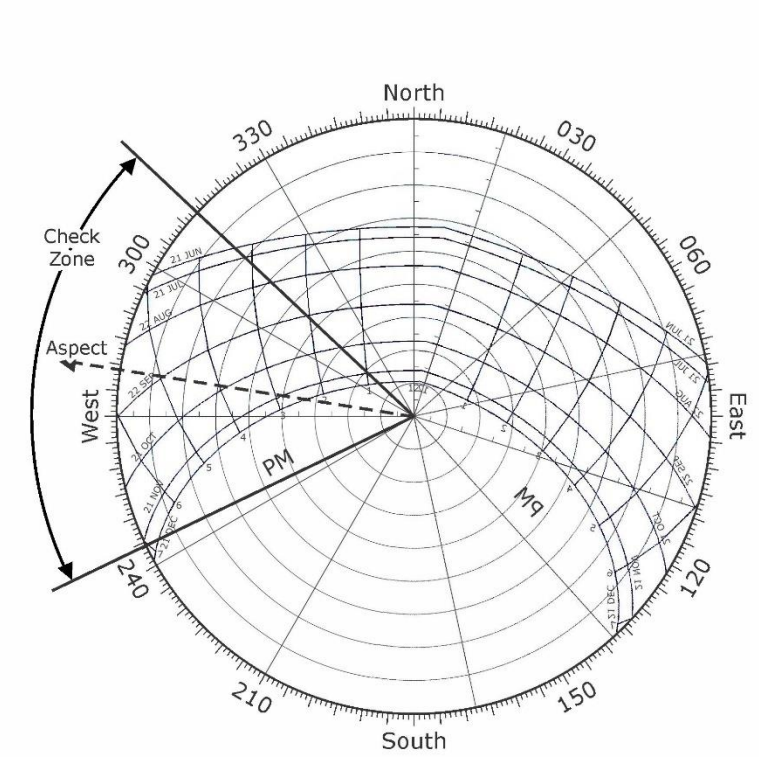

Figure B.12: Sun Chart for the 279° Aspect

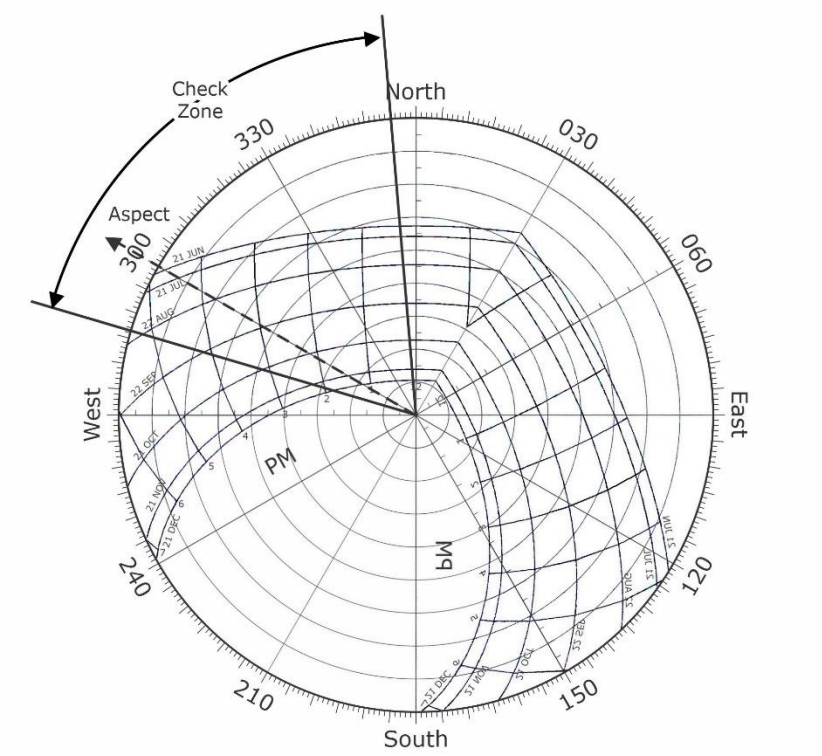

Figure B.13: Sun Chart for the 300° Aspect

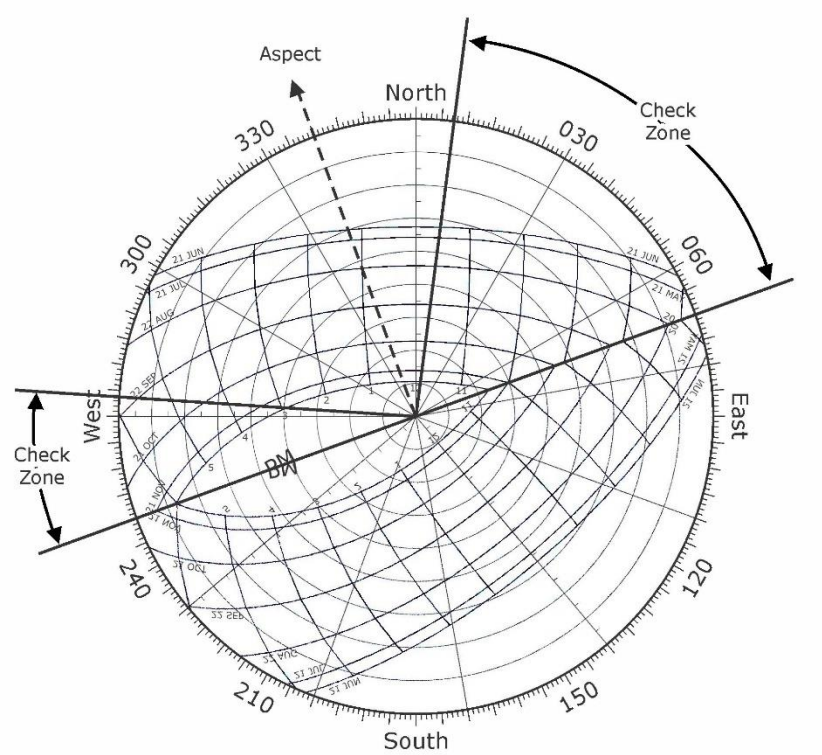

Figure B.14: Sun Chart for the 340° Aspect

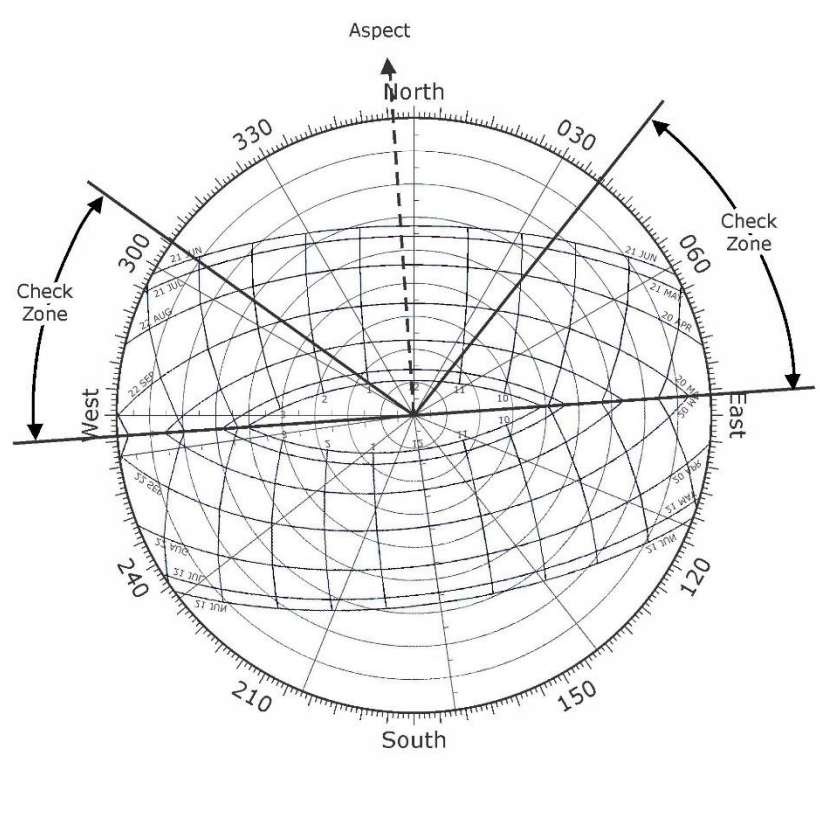

Figure B.15: Sun Chart for the 356° Aspect

APPENDIX C STANDARD SUN CHART FOR THE REGION

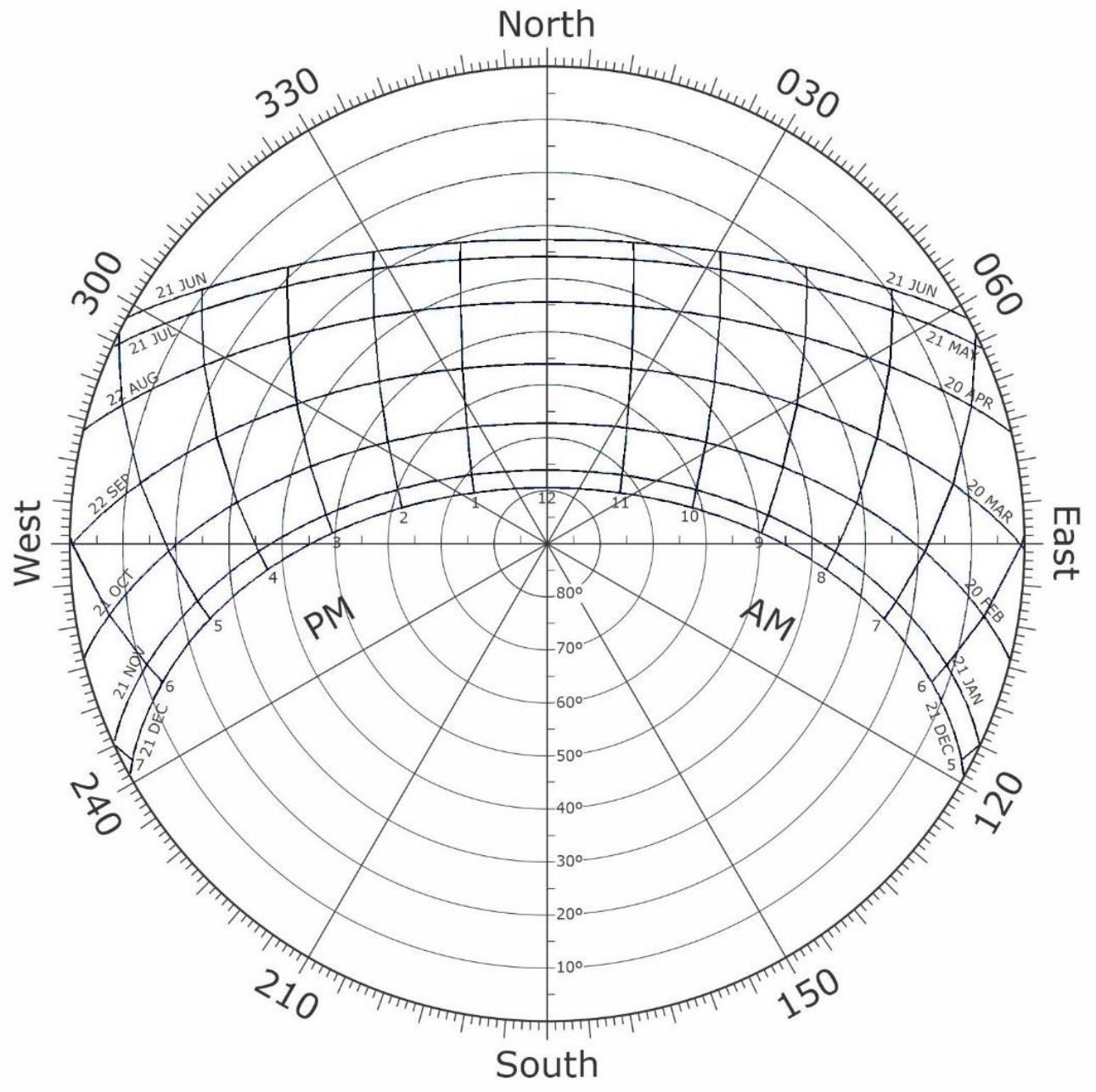

Figure C.1: Standard Sun Chart for the Sydney Region