SOLAR LIGHT REFLECTIVITY STUDY

74 EDINBURGH ROAD, MARRICKVILLE

WF588-01F02(REV0)- SR REPORT

AUGUST 4, 2020

Prepared for:

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EXECUTIVE SUMMARY

This report presents the results of a detailed study for the effect of potential solar glare from the proposed office building and warehouse development located at 74 Edinburgh Road, Marrickville. This study identifies any possible adverse reflected solar glare conditions affecting motorists, train drivers, pilots, pedestrians, and to occupants of neighbouring buildings. If necessary, recommendations are made to mitigate any potentially adverse effects.

The results of the study indicate that, to avoid any adverse glare to motorists, train drivers, pilots, pedestrians on the surrounding streets, and occupants of neighbouring buildings, the following limitations to the maximum normal specular reflectance of visible light of the external façade materials is recommended:

- Glazing for the north-eastern aspect of the main office building, on Level 5 and Level 6, should have a maximum normal specular reflectance of visible light of 14%.
- All other glazing used on the external façade of the development should have a maximum normal specular reflectance of visible light of 20%.
- The roof should have a maximum normal specular reflectance of visible light of 20%.

The most reflective surface on the façade of a building is typically 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 limits.

The roofing material of the warehouse component of the development is yet to be confirmed, although it is likely to be Lysaght Klip-Lok. This roofing type features small ridges, which will be effective at providing overshadow/shielding of low-angle glare from the roof to the future occupants of the development to the east. Nonetheless, the abovementioned recommendation of limiting the maximum normal specular reflectance of visible light to 20% for the roofing material should still be maintained. If the roof is to have a painted finish then the reflectance is expected to be significantly less than 20%, as described above. However, if it is to have an exposed metal finish, the reflectance is likely to be higher and the supplier should confirm that reflectance is less than 20% (alternatively, a laboratory test of a sample of the roofing material could be undertaken to verify the reflectivity). Similarly, if a "cool roof" is to be utilised, the reflectance of the roof material should be verified by the supplier (or from a laboratory test), since a feature of a "cool roof" is to increase the reflectance in order to improve cooling within the space below the roof.

Hence, with the incorporation of the abovementioned recommendations, the results of this study indicate that the development will not cause adverse solar glare to motorists, train drivers, pilots, pedestrians in the surrounding area, or to occupants of neighbouring buildings.

CONTENTS

1 GLARE OBSERVED BY MOTORISTS AND TRAIN DRIVERS

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. This has also been applied for train drivers in this assessment.

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 or train drivers are facing the general direction of the subject development (within ±10° 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 or train drivers at each study point location using a calibrated camera. A scaled glare protractor has been superimposed over each viewpoint image.

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 or train drivers.

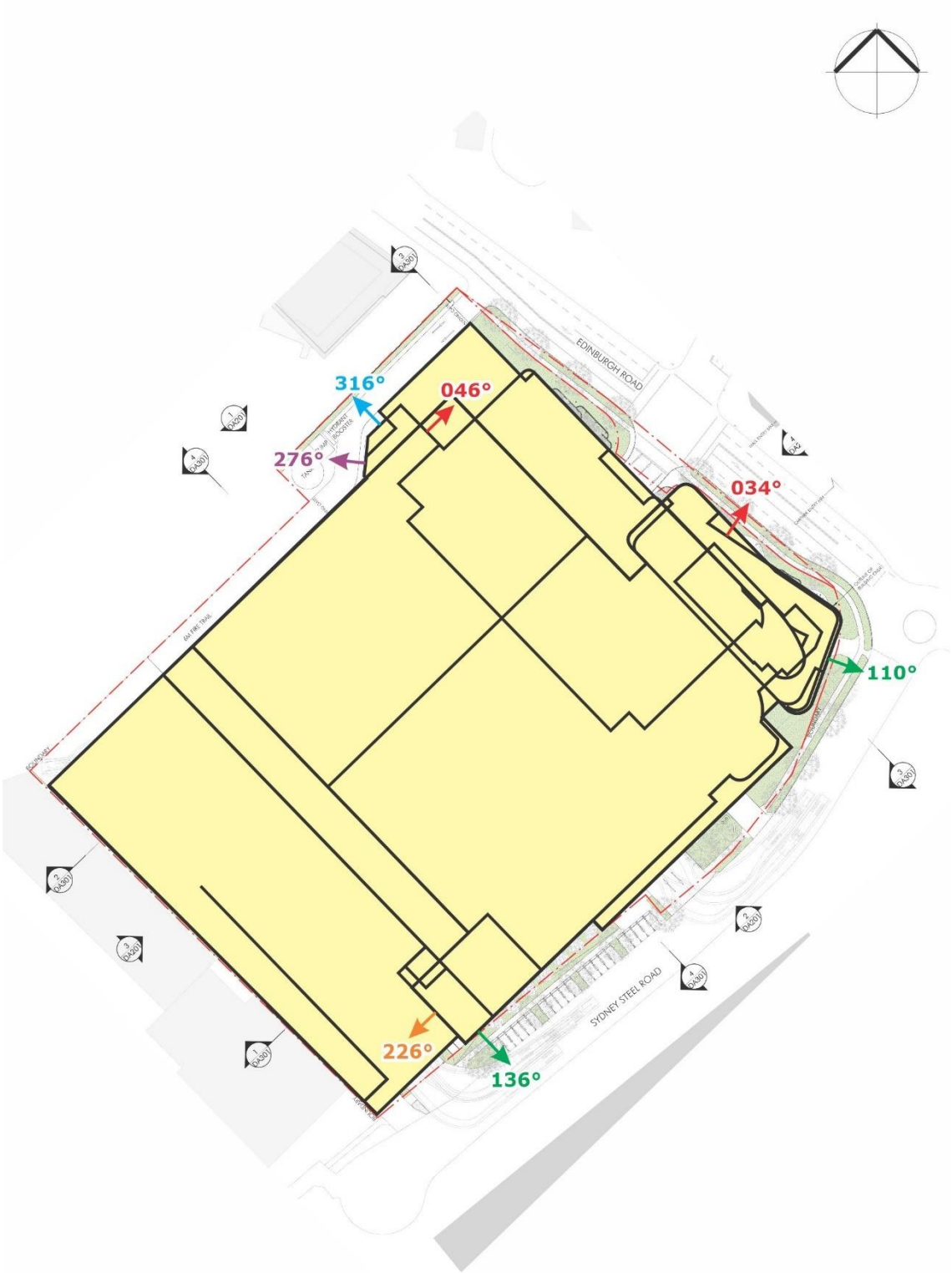

Figure 1: Critical Glazed Aspects of the Development (typical plan shown)

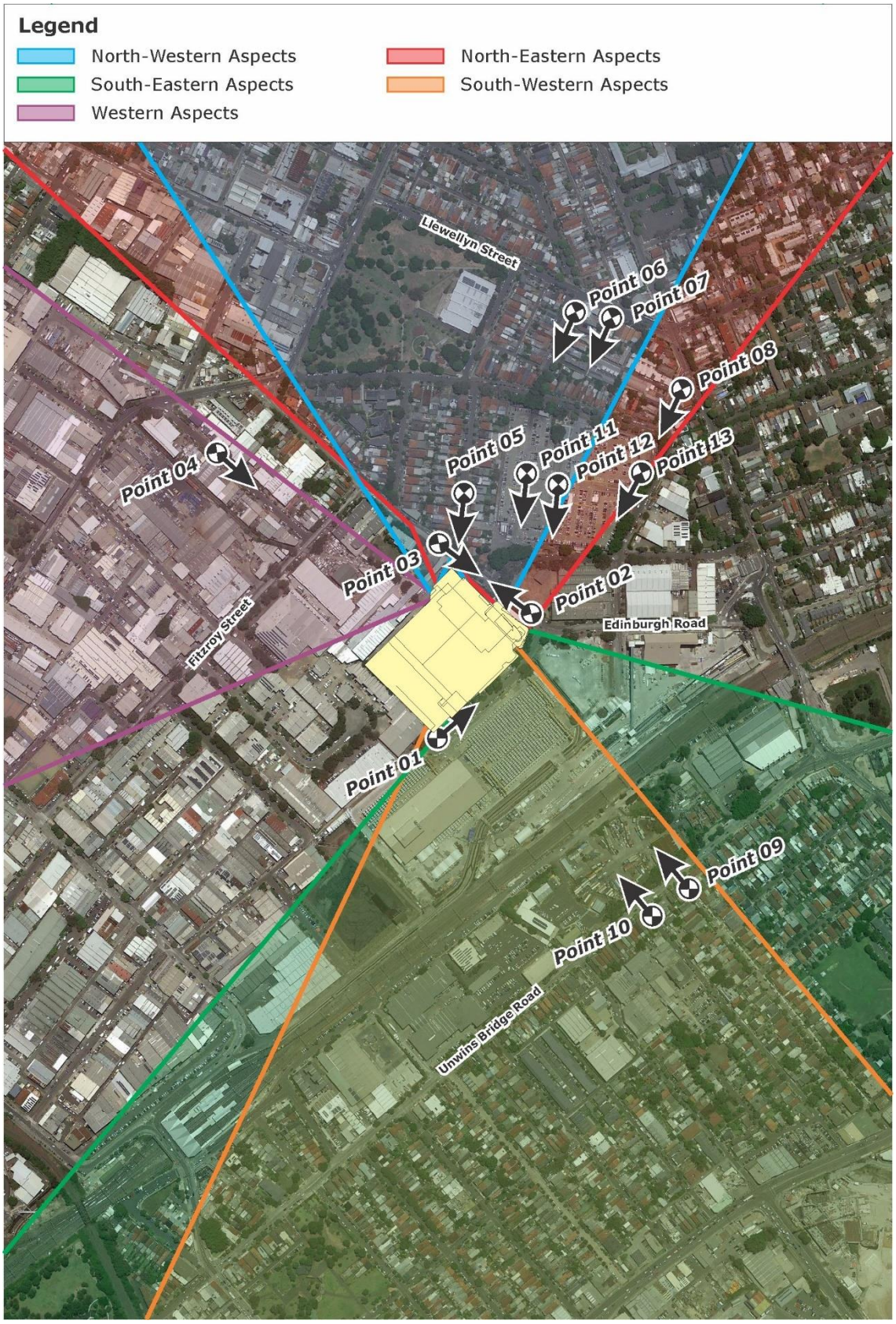

Figure 2: Check Zones and Study Point Locations
(the check zones are the areas where glare could potentially be observed)

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

Study Point	Location and Viewpoint	Aspect(s) of the Development
01	Sydney Steel Road, heading north-east	South-Eastern and South-Western aspects
02	Edinburgh Road, heading north-west	North-Eastern aspect
03	Edinburgh Road, heading south-east	North-Western and North-Eastern aspects
04	Smith Street, heading south-east	Western aspect
05	Bourne Street, heading south	North-Western and North-Eastern aspects
06	Juliett Street, heading south-west	North-Western and North-Eastern aspects
07	Shelleys Lane, heading south-west	North-Western and North-Eastern aspects
08	Victoria Road, heading south-west	North-Eastern aspect
09	Silver Street, heading north-west	South-Eastern and South-Western aspects
10	Edith Street, heading north-west	South-Eastern and South-Western aspects
11	Metro Rooftop Carpark, heading south	North-Western and North-Eastern aspects
12	Metro Rooftop Carpark, heading south	North-Western and North-Eastern aspects
13	Metro Rooftop Carpark, heading south-west	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 north-east along Sydney Steel Road

Point 01 is located along Sydney Steel Road, to the south of the development site. This point represents the critical sightline of motorists heading north-east along Sydney Steel Road at this location. A calibrated image 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 01 indicates that the development will not be visible at this location. Hence there will be no adverse solar glare observed by motorists heading north-east along Sydney Steel Road from the development.

1.2.2 Motorists heading north-west along Edinburgh Road

Point 02 is located along Edinburgh Road, to the north-east of the development site. This point represents the critical sightline of motorists heading north-west along Edinburgh Road at this location. A calibrated image 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 02 indicates that the portion of the north-eastern aspect of the development which is visible within the zone of sensitive vision of motorists is not a glazed surface (refer to Section 5 of this report for a discussion of

glare from non-glazed surfaces). Hence there will be no adverse solar glare observed by motorists heading north-west along Edinburgh Road from the development at Point 02.

1.2.3 Motorists heading south-east along Edinburgh Road

Point 03 is located along Edinburgh Road, to the north of the development site. This point represents the critical sightline of motorists heading south-east along Edinburgh Road at this location. A calibrated image 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 north-eastern aspect will be visible within the zone of sensitive vision of motorists. Point 03 is located within the check zone for this aspect, and hence solar glare can potentially be overserved at Point 03. However, further analysis indicates that the north-eastern aspect will be overshadowed by the proposed sunshade fins on the façade of the development at the times when glare could have otherwise been observed (early summer mornings). Hence no adverse glare will be observed by motorists heading south-east along Edinburgh Road from the development at Point 03.

1.2.4 Motorists heading south-east along Smith Street

Point 04 is located along Smith Street, to the north-west of the development site. This point represents the critical sightline of motorists heading south-east along Smith Street at this location. A calibrated image 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 the portion of the north-western aspect of the development which is visible within the zone of sensitive vision of motorists is not a glazed surface (refer to Section 5 of this report for a discussion of glare from non-glazed surfaces). Hence there will be no adverse solar glare observed by motorists heading south-east along Smith Street from the development at Point 04.

1.2.5 Motorists heading south along Bourne Street

Point 05 is located along Bourne Street, to the north of the development site. This point represents the critical sightline of motorists heading south along Bourne Street at this location. A calibrated image 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 north-eastern and north-western aspects will be visible within the zone of sensitive vision of motorists. Further analysis indicates that the north-western aspect, and a portion of the north-eastern aspect, are part of the warehouse and are not glazed surfaces (refer to Section 5 of this report for a discussion of glare from non-glazed surfaces). The portion of the north-eastern aspect which is a part of the Spec Office 1 component is glazed, however this aspect will be overshadowed by the warehouse component of the proposed development at the times when

glare could have otherwise been observed (early autumn and summer mornings). Hence no adverse glare will be observed by motorists heading south along Bourne Street from the development at Point 05.

1.2.6 Motorists heading south-west along Juliett Street

Point 06 is located along Juliett Street, to the north of the development site. This point represents the critical sightline of motorists heading south-west along Juliett Street at this location. A calibrated image 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 development will not be visible at this location. Hence there will be no adverse solar glare observed by motorists heading south-west along Juliett Street from the development.

1.2.7 Motorists heading south-west along Shelleys Lane

Point 07 is located along Shelleys Lane, to the north of the development site. This point represents the critical sightline of motorists heading south-west along Shelleys Lane at this location. A calibrated image 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 the development will not be visible at this location. Hence there will be no adverse solar glare observed by motorists heading south-west along Shelleys Lane from the development.

1.2.8 Motorists heading south-west along Victoria Road

Point 08 is located along Victoria Road, to the north-east of the development site. This point represents the critical sightline of motorists heading south-west along Victoria Road at this location. A calibrated image 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 the development will not be visible at this location. Hence there will be no adverse solar glare observed by motorists heading south-west along Victoria Road from the development.

1.2.9 Motorists heading north-west along Silver Street

Point 09 is located along Silver Street, to the south-east of the development site. This point represents the critical sightline of motorists heading north-west along Silver Street at this location. A calibrated image 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 the development will not be visible at this location. Hence there will be no adverse solar glare observed by motorists heading north-west along Silver Street from the development.

1.2.10 Motorists heading north-west along Edith Street

Point 10 is located along Edith Street, to the south-east of the development site. This point represents the critical sightline of motorists heading north-west along Edith Street at this location. A calibrated image 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 10 indicates that the portions of the south-eastern and south-western aspects of the development which are visible within the zone of sensitive vision of motorists are not glazed surfaces (refer to Section 5 of this report for a discussion of glare from non-glazed surfaces). Hence there will be no adverse solar glare observed by motorists heading north-west along Edith Street from the development at Point 10.

1.2.11 Motorists heading south along the Metro Rooftop Carpark

Points 11 and 12 are located along the Metro rooftop carpark, to the north of the development site. These points represent the critical sightline of motorists heading south along the Metro rooftop carpark 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 11 indicates that portions of the north-eastern aspects (034° and 046°) and the north-western aspect will be visible within the zone of sensitive vision. Point 11 is located within the check zones for these aspects, and hence solar glare can potentially be observed from those aspects at Point 11. Further analysis indicates that the glazed portions of the north-western aspect will be overshadowed by the warehouse component of the development at the times when glare could have otherwise been observed. Furthermore, the Level 7 balustrade will have an angular width of less than 0.5deg arc when viewed from Point 11, and hence the intensity of glare observed from that section of glazing will be less than 500cd/m^2 (providing that the maximum normal specular reflectance of visible light of the glazing is 20%). Nonetheless, to ensure that no adverse glare is observed by motorists heading south along the Metro rooftop carpark at Point 11 from the north-eastern aspect, it is recommended to limit the normal specular reflectance of visible light of the glazing used on the north-eastern aspect of the main office building to a maximum value of 14%, for Levels 5 and 6.

An analysis of the glare meter overlaid onto the viewpoint at Point 12 indicates that portions of the northern-eastern aspects (034° and 046°) will be visible and within the zone of sensitive vision. Point 12 is located within the check zones of these north-eastern aspects, and hence solar glare can potentially be overserved at Point 12. Further analysis of the view of the north-eastern aspects indicates that the Level 7 balustrade will have an angular width of less than 0.5deg arc when viewed from Point 12, and hence the intensity of glare observed from that section of glazing will be less than 500cd/m^2 (providing that the maximum normal specular reflectance of visible light of the glazing is 20%). Nonetheless, to ensure that no adverse glare is observed by motorists heading south along the Metro rooftop carpark at Point 12 from the

034° aspect, it is recommended to limit the normal specular reflectance of visible light of the glazing used on the 036° aspect to a maximum value of 15%, for Levels 5 and 6.

1.2.12 Motorists heading south-west along the Metro Rooftop Carpark

Point 13 is located along the Metro rooftop carpark, to the north-east of the development site. This point represents the critical sightline of motorists heading south-west along the Metro rooftop carpark at this location. A calibrated image 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 portions of the north-eastern and south-eastern aspects will be visible within the zone of sensitive vision of motorists. Further analysis indicates that Point 13 is not located within the check zones for the south-eastern aspect. In addition, analysis of the view of the north-eastern aspect indicates that it will have an angular width of less than 0.5deg arc, and hence the intensity of glare observed from that section of glazing will be less than 500cd/m^2 (providing that the maximum normal specular reflectance of visible light of the glazing is 20%). Hence there will be no adverse solar glare observed by motorists heading south-west along the Metro rooftop carpark from the development at Point 13.

1.2.13 Train Drivers

An analysis of the viewpoint of train drivers on the nearby railway line indicates that, when train drivers are within the check zones indicated in Figure 2, the view of the development will either be blocked or not within the zone of sensitive vision. Hence there will be no adverse solar glare observed by train drivers from the development.

2 GLARE OBSERVED BY AIRCRAFT PILOTS

The development site is located approximately 2.4km to the north of the northern end of the main north/south runway of Sydney airport, and hence consideration to pilots using that runway must be made with regards to potential adverse solar glare.

The view of the glazed surfaces of the external façade of the development will appear very small when viewed from an aircraft (less than 0.5deg arc), and hence the intensity of glare observed from the glazed surfaces of the external façade will be less than 500cd/m^2 (providing that the maximum normal specular reflectance of visible light of the glazing is 20%). Furthermore, it should be noted that sunshade fins are located across much of the glazed façade, which will overshadow the glazing or block glare being observed from the glazing.

The roof surface of the of the warehouse component of the development will be much more visible from an aircraft than the glazed surfaces on the façade, due to the relatively large footprint of the development. The roofing material is yet to be confirmed, although it is likely to be Lysaght Klip-Lok. This roofing type features small ridges, which will be effective at providing overshadow/shielding of low-angle glare from the roof. Furthermore, as detailed in Section 5, the maximum normal specular reflectance of visible light for painted or powder-coated metallic surfaces on a building facade will be significantly less than the 20% reflectivity requirement described in Section 4. However, if the roof is to have an exposed metal finish, the reflectance is likely to be higher and the supplier should confirm that reflectance is less than 20% (alternatively, a laboratory test of a sample of the roofing material could be undertaken to verify the reflectivity).

Further analysis has been undertaken for the potential check zones for solar glare from the warehouse roof surfaces, which are presented in Figure 3 (these check zones account for the pitch of the roofs, as well as their orientation). This indicates that glare from the warehouse roofs could only be observed from the east and west of the development. Since the runway has a north/south alignment, aircraft will only approach the development from the north or south at lower altitudes, and hence at no point will a pilot at lower altitudes have a direct view of the development within their zone of sensitive vision whilst they are also within a check zone of the roofs. At higher altitudes the view of the development will not be within the zone of sensitive vision of pilots as well as appearing large enough to be beyond 0.5deg arc angular width described above.

Hence, provided that the maximum normal specular reflectance of visible light of the roofing material is 20%, the development is not expected to cause adverse glare effects to pilots.

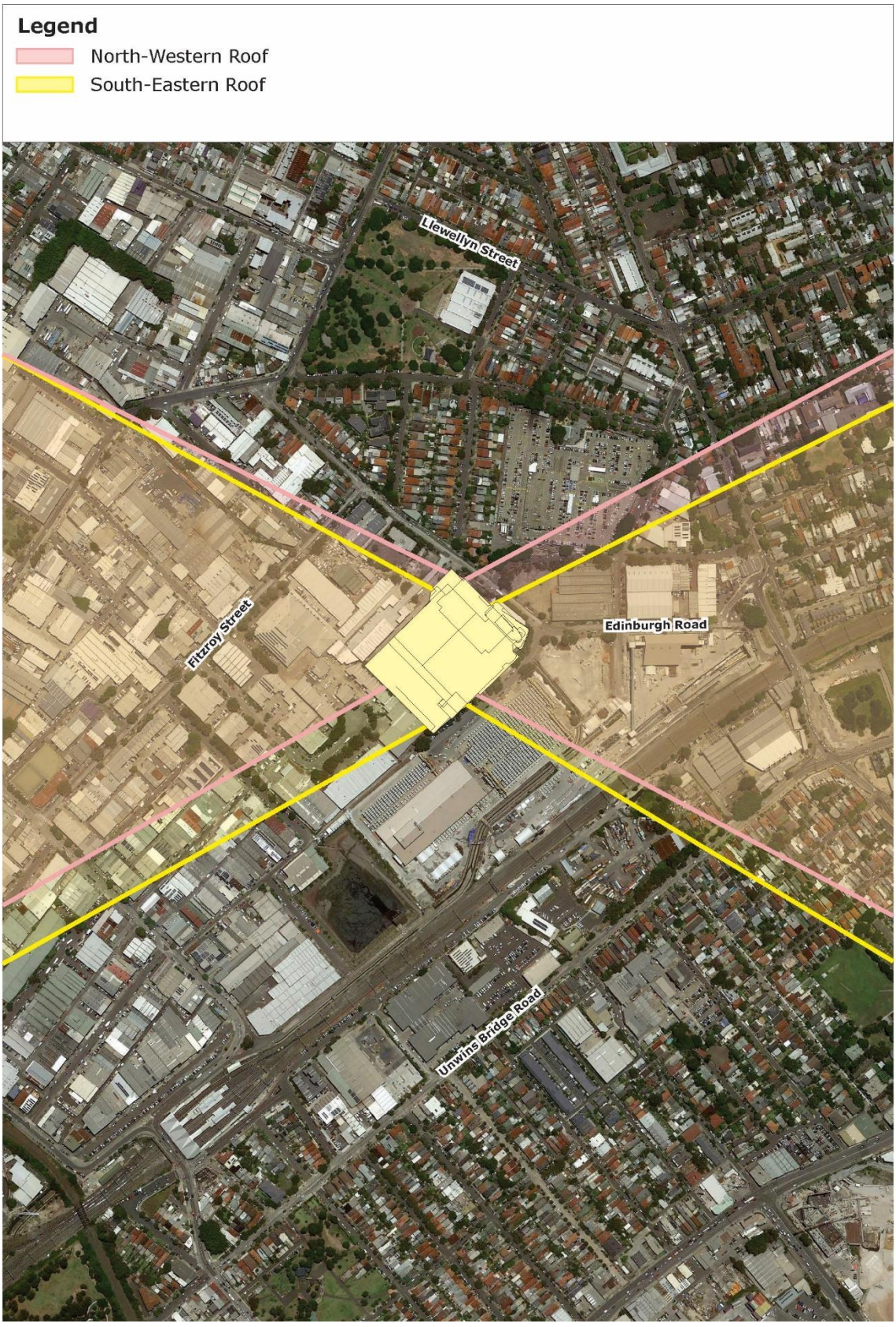

Figure 3: Check Zones for the Warehouse Roofs
(the check zones are the areas where glare could potentially be observed)

3 GLARE FROM ROOFTOP SOLAR PANELS

Rooftop solar panels are presently not indicated on the drawings of the proposed development, and hence solar glare caused by rooftop solar panels has not been accounted for in this assessment of this development. Further assessment should be undertaken to assess potential adverse solar glare from rooftop solar panels if they are to be added to the development at a later date. The potential for adverse solar glare to affect motorists, train drivers, pilots, pedestrians, or occupants of neighbouring buildings, will depend on the orientation and pitch angle of the solar panels.

4 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.

The roofing material of the warehouse component of the development is yet to be confirmed, although it is likely to be Lysaght Klip-Lok. This roofing type features small ridges, which will be effective at providing overshadow/shielding of low-angle glare from the roof to the future occupants of the development to the east. Nonetheless, the abovementioned recommendation of limiting the maximum normal specular reflectance of visible light to 20% for the roofing material should still be maintained. If the roof is to have a painted finish then the reflectance is expected to be significantly less than 20%, as detailed in Section 5. However, if it is to have an exposed metal finish, the reflectance is likely to be higher and the supplier should confirm that reflectance is less than 20% (alternatively, a laboratory test of a sample of the roofing material could be undertaken to verify the reflectivity).

5 TYPICAL NORMAL SPECULAR REFLECTANCE OF BUILDING SURFACES

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.

5.1 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:

- 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%

5.2 Metallic Surfaces

It is not expected that adverse glare will be observed from powder-coated or painted metallic surfaces of the building façade, 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.

The roofing material of the warehouse component of the development is yet to be confirmed, although it is likely to be Lysaght Klip-Lok. This roofing type features small ridges, which will be effective at providing overshadow/shielding of low-angle glare from the roof. If the roof is to have a painted finish then the reflectance is expected to be significantly less than 20%, as described above. However, if it is to have an exposed metal finish, the reflectance is likely to be higher and the supplier should confirm that reflectance is less than 20% (alternatively, a laboratory test of a sample of the roofing material could be undertaken to verify the reflectivity). Similarly, if a "cool roof" is to be utilised, the reflectance of the roof material should be verified by the supplier (or from a laboratory test), since a feature of a "cool roof" is to increase the reflectance in order to improve cooling within the space below the roof.

5.3 Glare from Curved Building Façades

It is noted that convex curved façades are proposed at several locations of the proposed development. Glare from these types of façades are dispersed by the convex curvature, which reduces the intensity of glare observed. Furthermore, any glare that is observed will appear very small at any given point in time, since it is not possible for glare from the entire curved surface to be observed at once. Hence there will not be any adverse solar glare observed from the curved façade surfaces of the subject development.

6 SUGGESTED TREATMENTS

The suggested treatments described in this report for ensuring the development does not cause adverse glare conditions are summarised as follows:

- Glazing for the north-eastern aspect of the main office building, on Level 5 and Level 6, should have a maximum normal specular reflectance of visible light of 14%.
- All other glazing used on the external façade of the development should have a maximum normal specular reflectance of visible light of 20%.
- The roof should have a maximum normal specular reflectance of visible light of 20%.

7 CONCLUSION

A detailed study has been undertaken for the effect of potential solar glare from the proposed office building and warehouse development located at 74 Edinburgh Road, Marrickville. This study identifies any possible adverse reflected solar glare conditions affecting motorists, train drivers, pilots, pedestrians, and to occupants of neighbouring buildings. If necessary, recommendations are made to mitigate any potentially adverse effects.

The results of the study indicate that, to avoid any adverse glare to motorists, train drivers, pilots, pedestrians on the surrounding streets, and occupants of neighbouring buildings, the following limitations to the maximum normal specular reflectance of visible light of the external façade materials is recommended:

- Glazing for the north-eastern aspect of the main office building, on Level 5 and Level 6, should have a maximum normal specular reflectance of visible light of 14%.
- All other glazing used on the external façade of the development should have a maximum normal specular reflectance of visible light of 20%.
- The roof should have a maximum normal specular reflectance of visible light of 20%.

The most reflective surface on the façade of a building is typically 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 limits.

The roofing material of the warehouse component of the development is yet to be confirmed, although it is likely to be Lysaght Klip-Lok. This roofing type features small ridges, which will be effective at providing overshadow/shielding of low-angle glare from the roof to the future occupants of the development to the east. Nonetheless, the abovementioned recommendation of limiting the maximum normal specular reflectance of visible light to 20% for the roofing material should still be maintained. If the roof is to have a painted finish then the reflectance is expected to be significantly less than 20%, as described above. However, if it is to have an exposed metal finish, the reflectance is likely to be higher and the supplier should confirm that reflectance is less than 20% (alternatively, a laboratory test of a sample of the roofing material could be undertaken to verify the reflectivity). Similarly, if a "cool roof" is to be utilised, the reflectance of the roof material should be verified by the supplier (or from a laboratory test), since a feature of a "cool roof" is to increase the reflectance in order to improve cooling within the space below the roof.

Hence, with the incorporation of the abovementioned recommendations, the results of this study indicate that the development will not cause adverse solar glare to motorists, train drivers, pilots, pedestrians in the surrounding area, or to occupants of neighbouring buildings.

8 REFERENCES

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APPENDIX A GLARE OVERLAYS FOR THE CRITICAL SIGHT-LINES

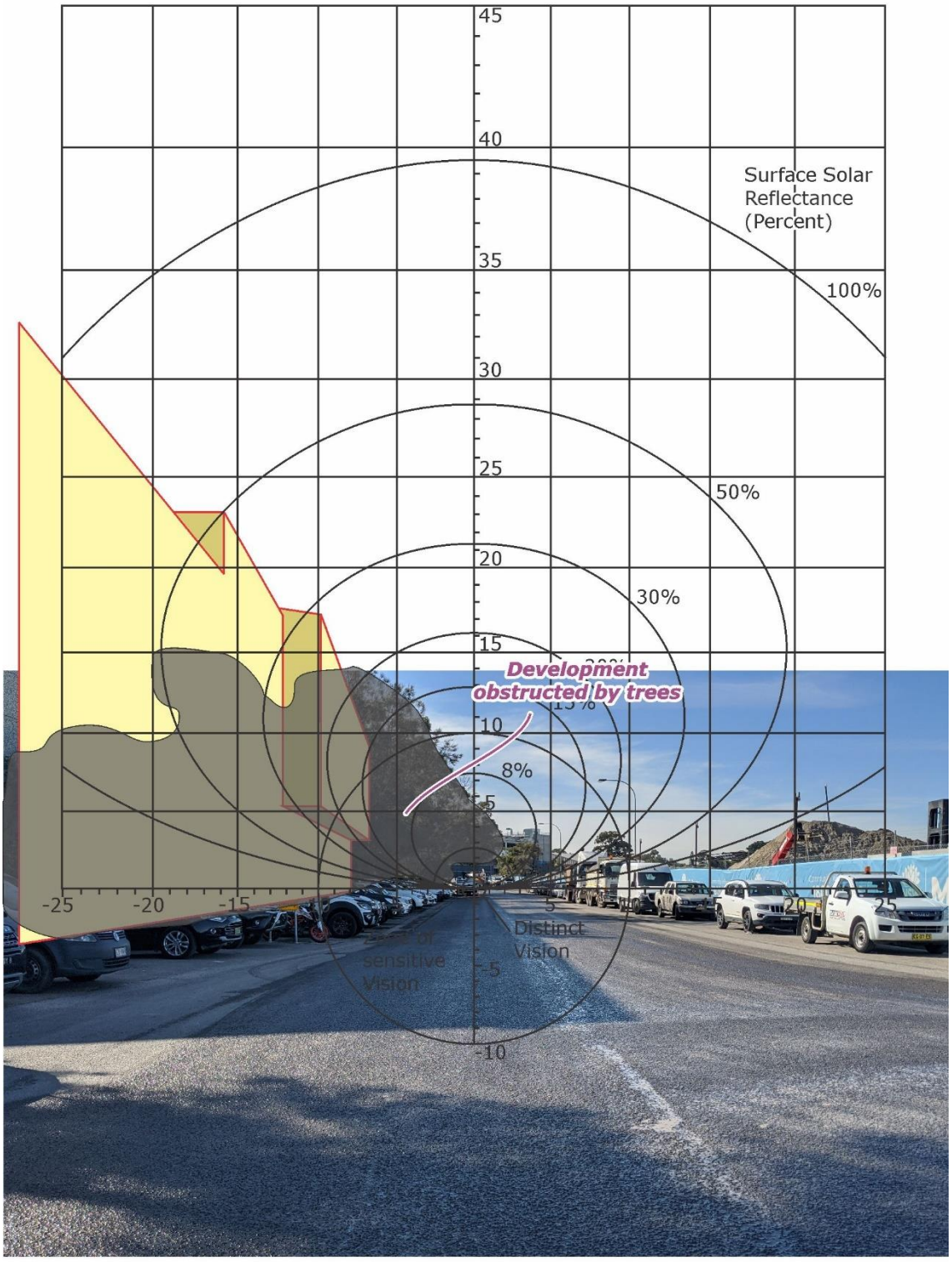

Figure A.1: Glare Overlay of the Viewpoint at Point 01

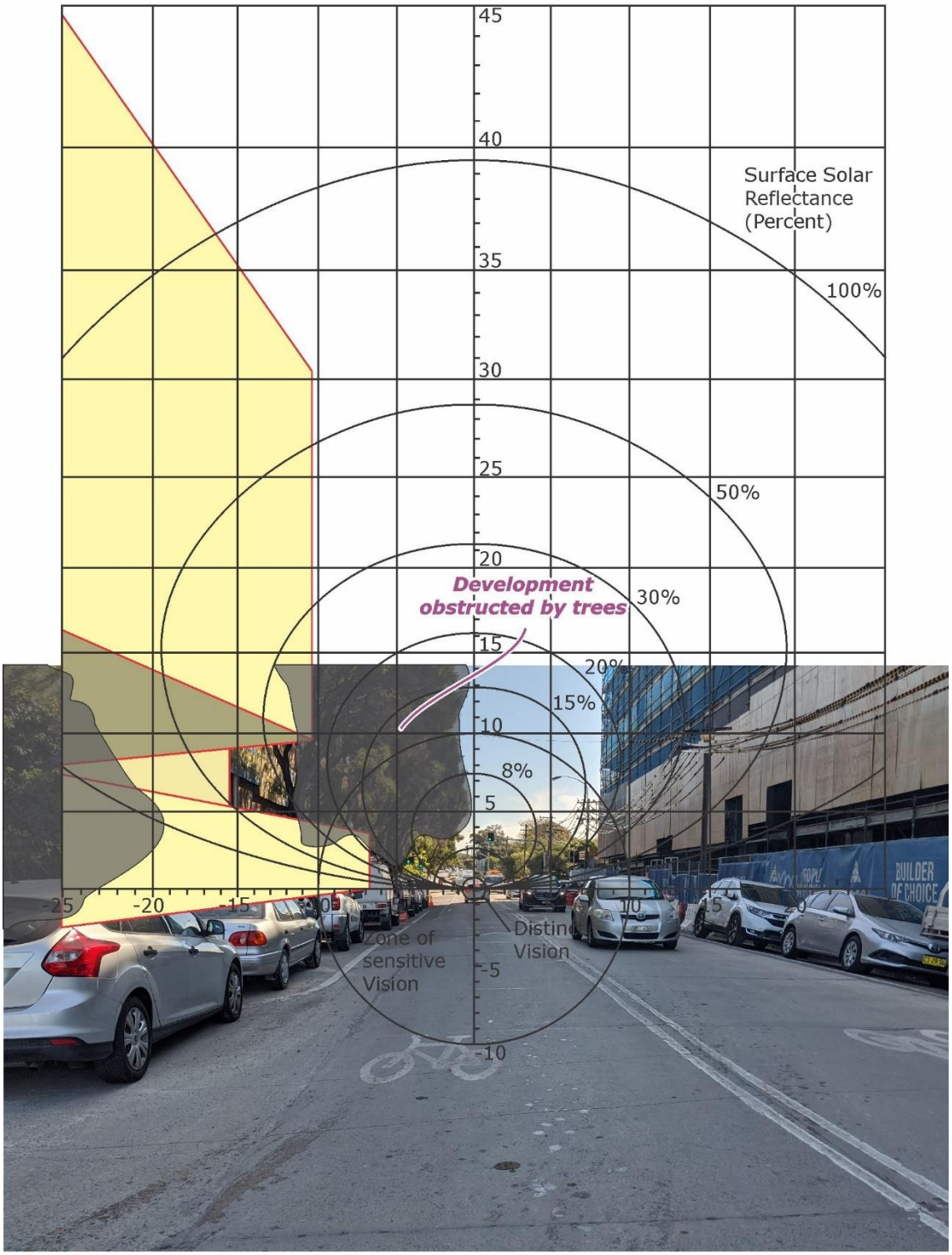

Figure A.2: Glare Overlay of the Viewpoint at Point 02

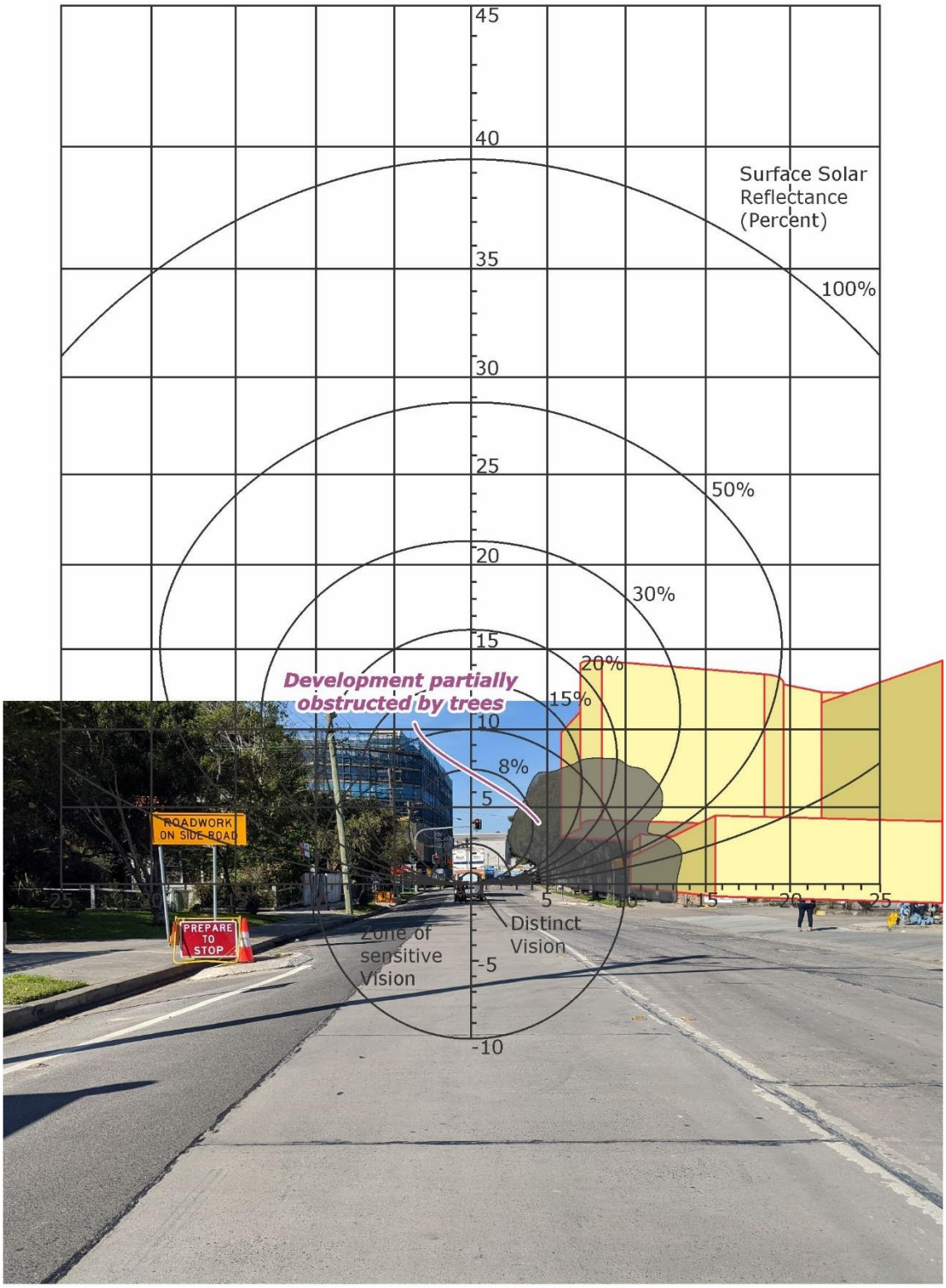

Figure A.3: Glare Overlay of the Viewpoint at Point 03

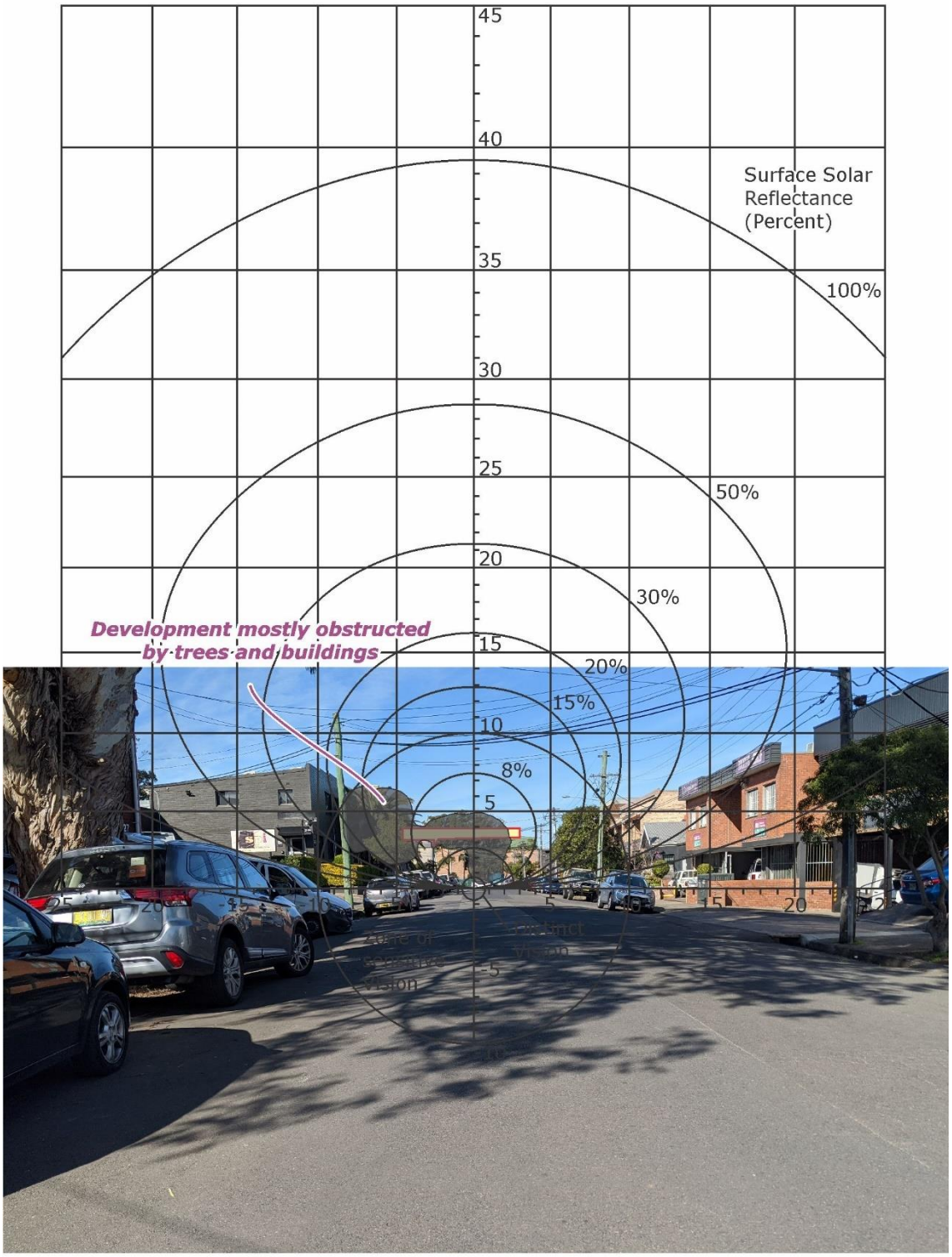

Figure A.4: Glare Overlay of the Viewpoint at Point 04

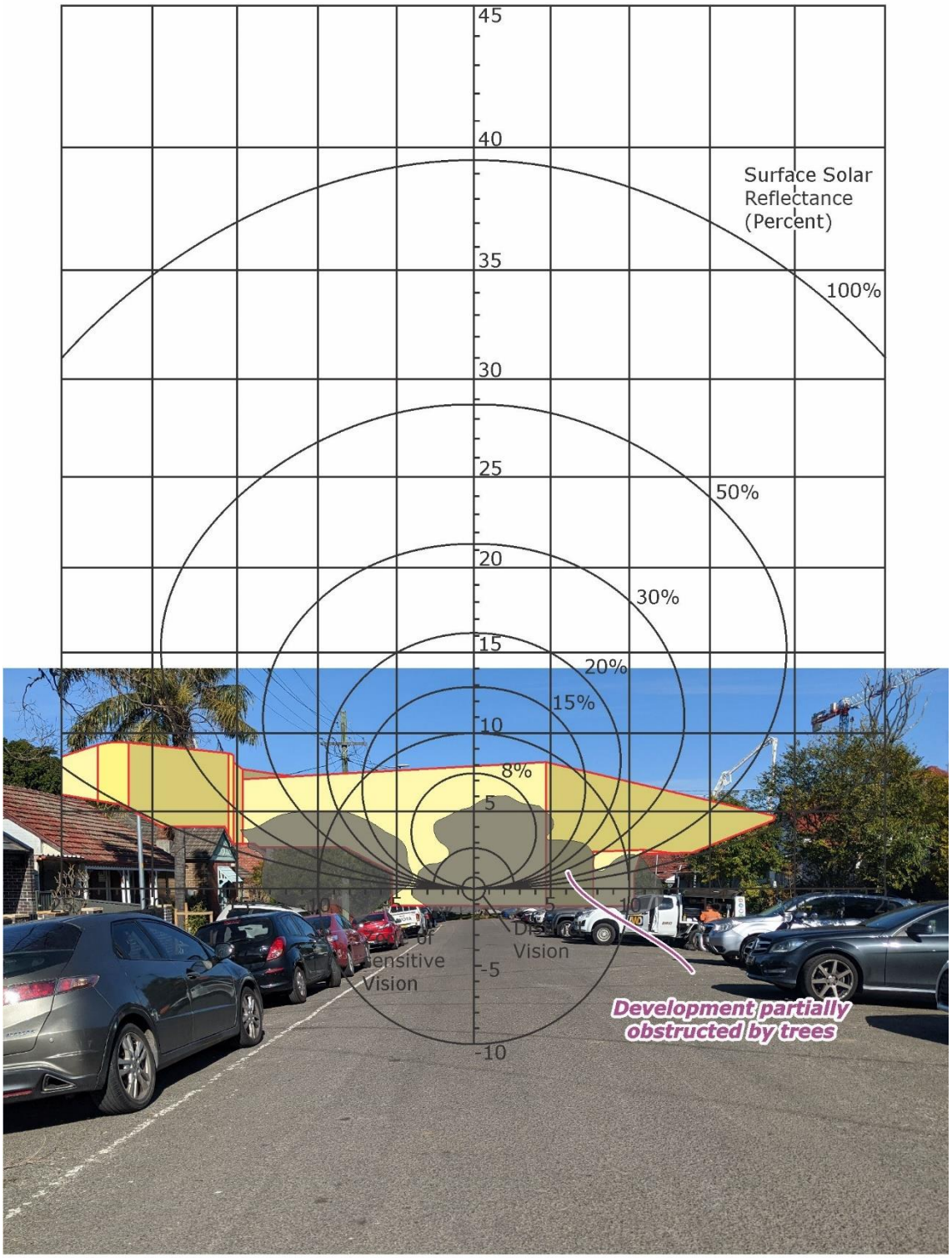

Figure A.5: Glare Overlay of the Viewpoint at Point 05

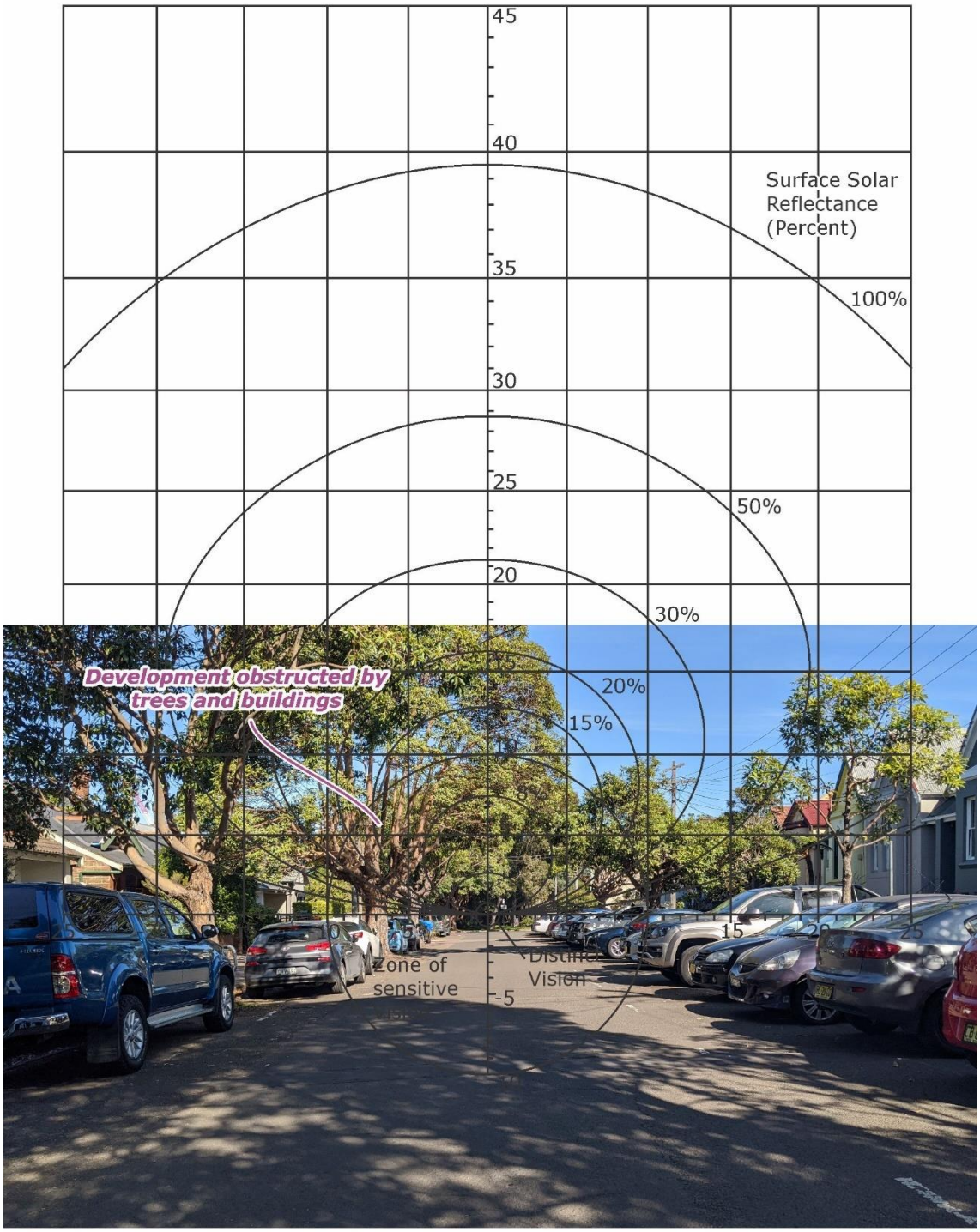

Figure A.6: Glare Overlay of the Viewpoint at Point 06

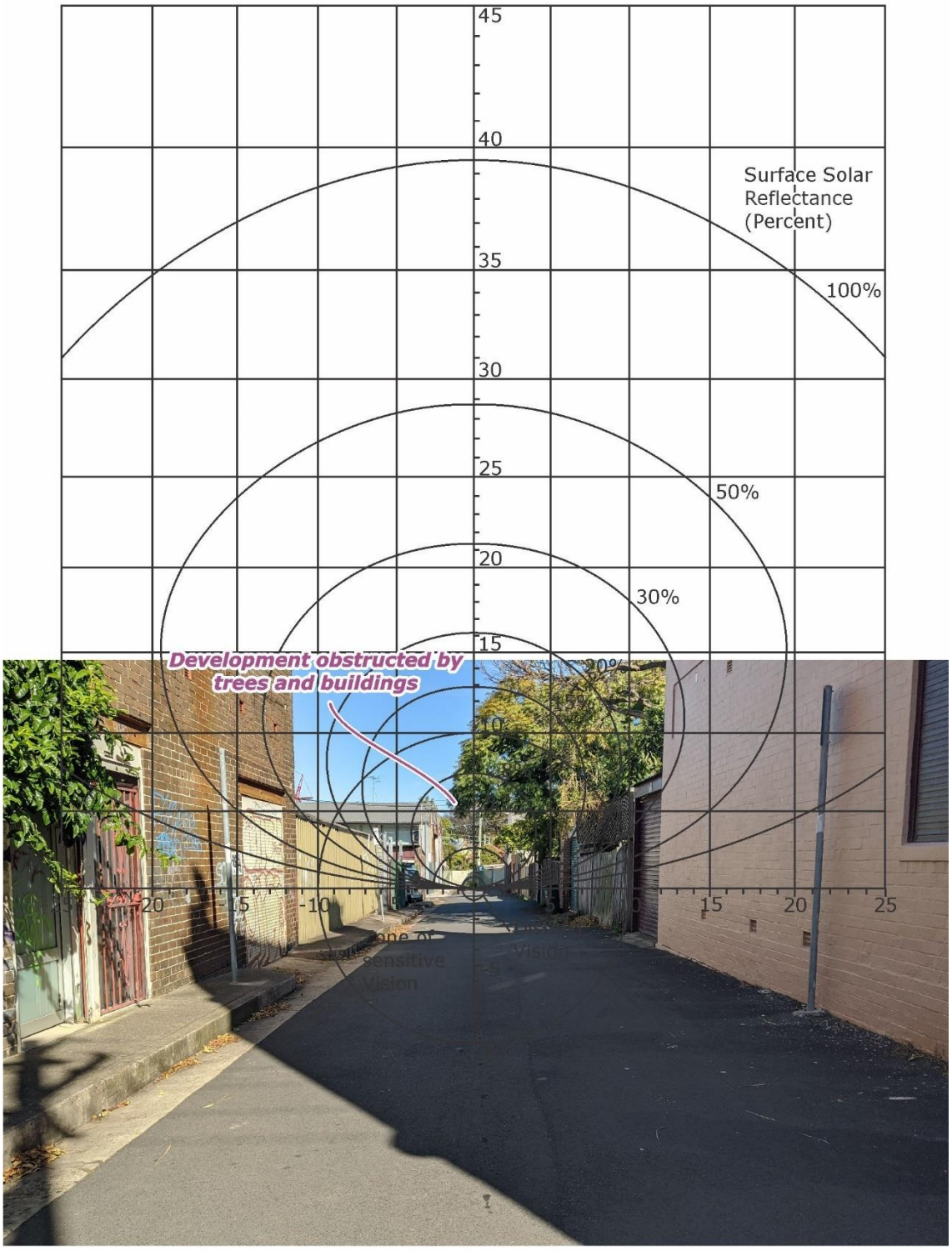

Figure A.7: Glare Overlay of the Viewpoint at Point 07

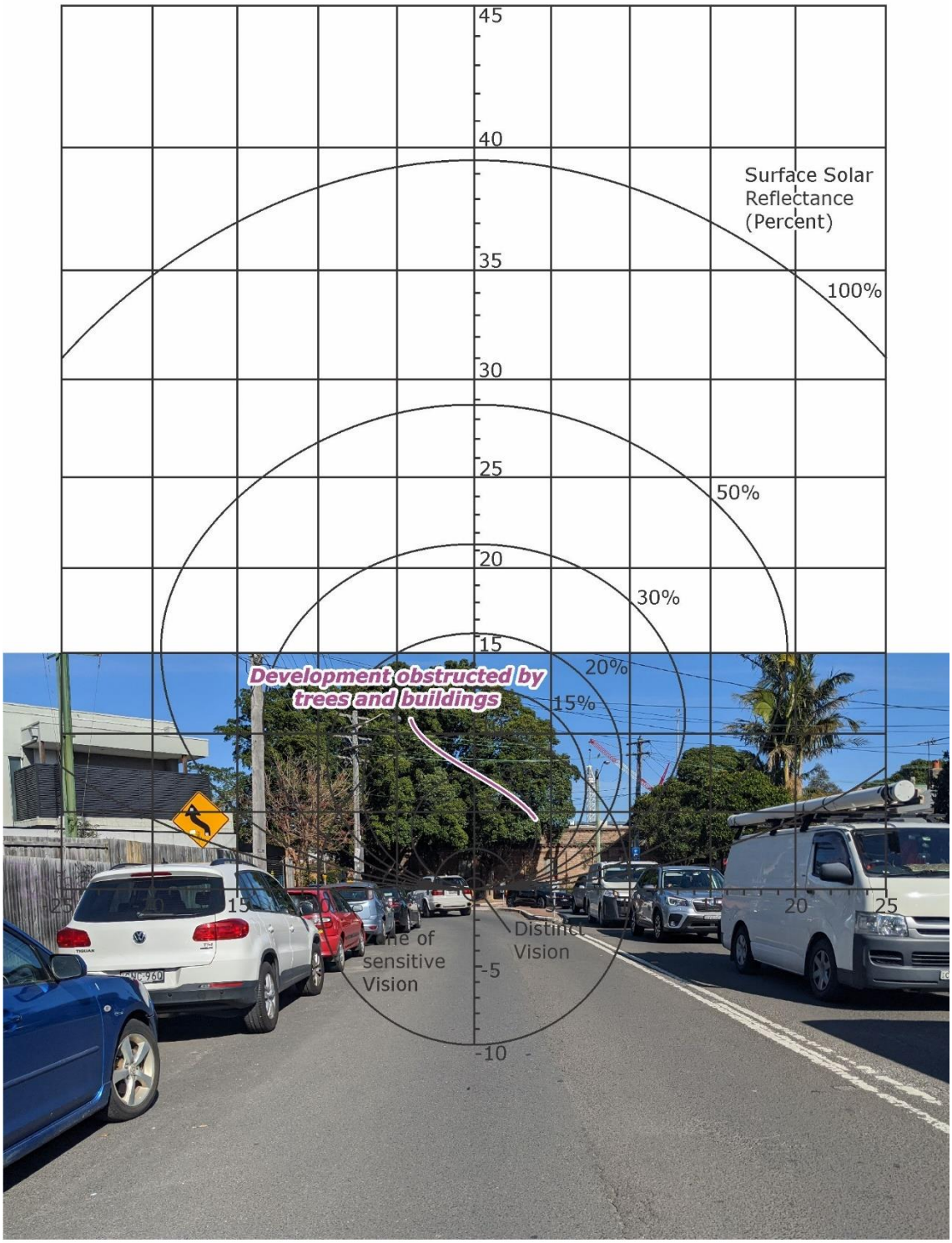

Figure A.8: Glare Overlay of the Viewpoint at Point 08

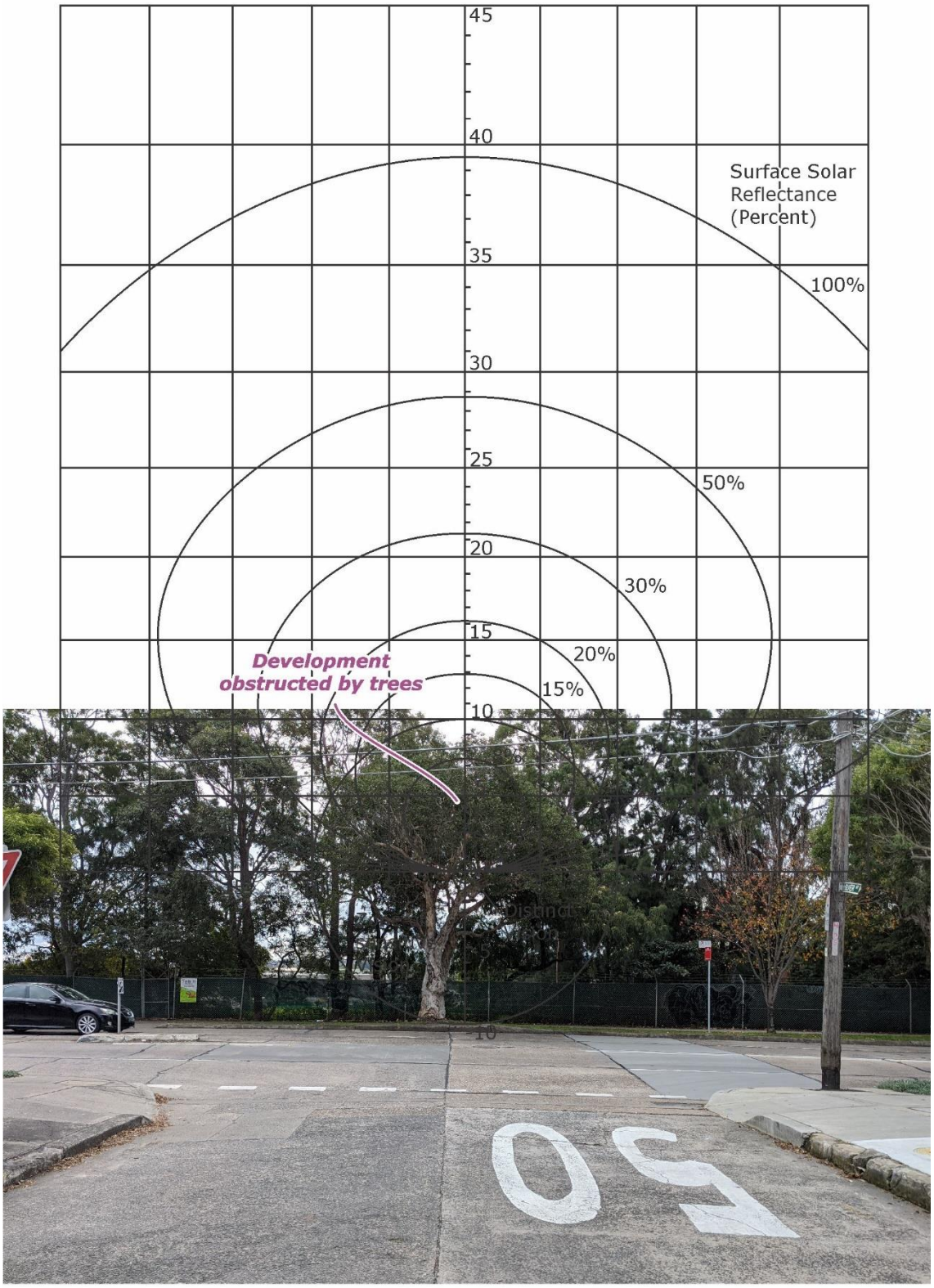

Figure A.9: Glare Overlay of the Viewpoint at Point 09

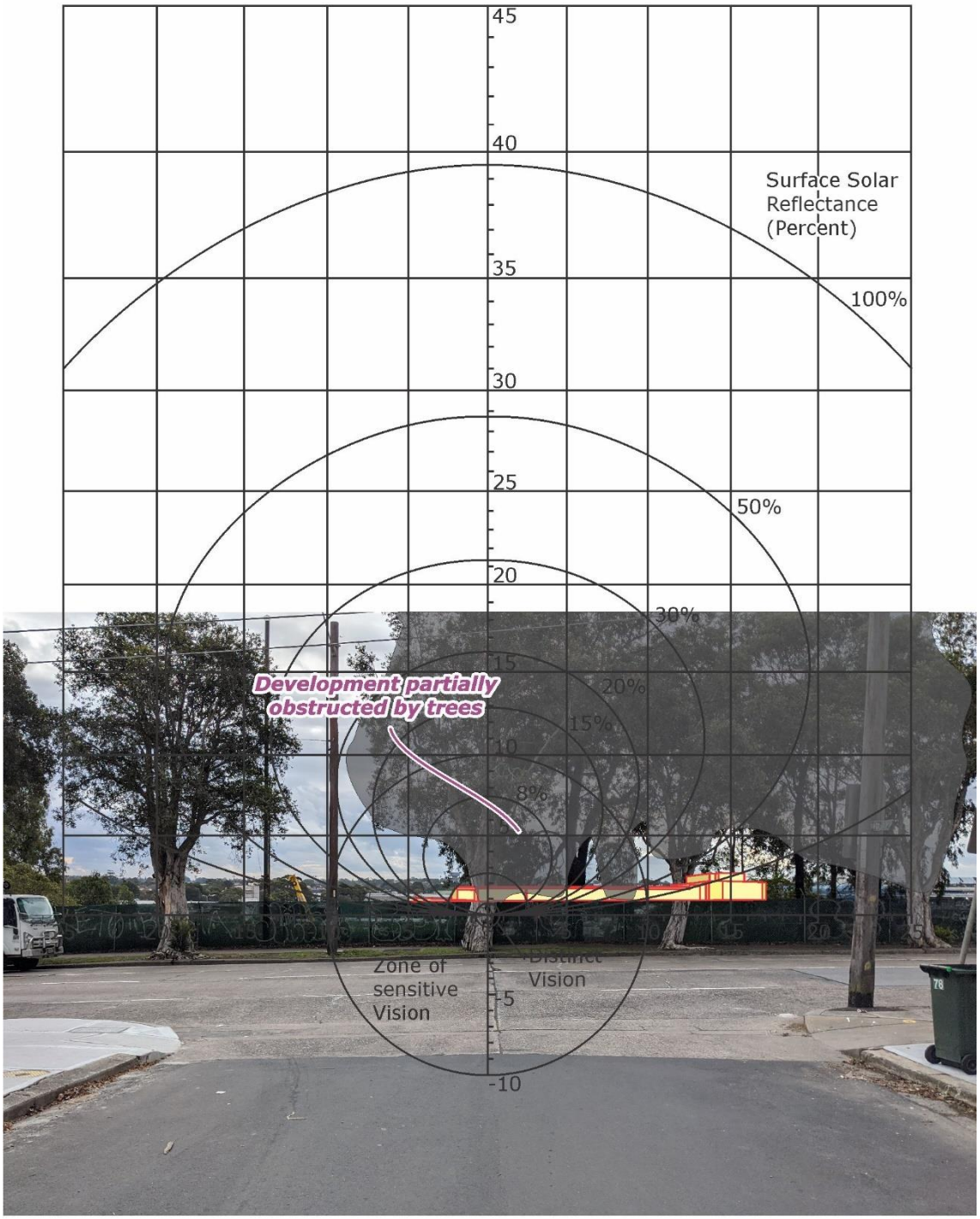

Figure A.10: Glare Overlay of the Viewpoint at Point 10

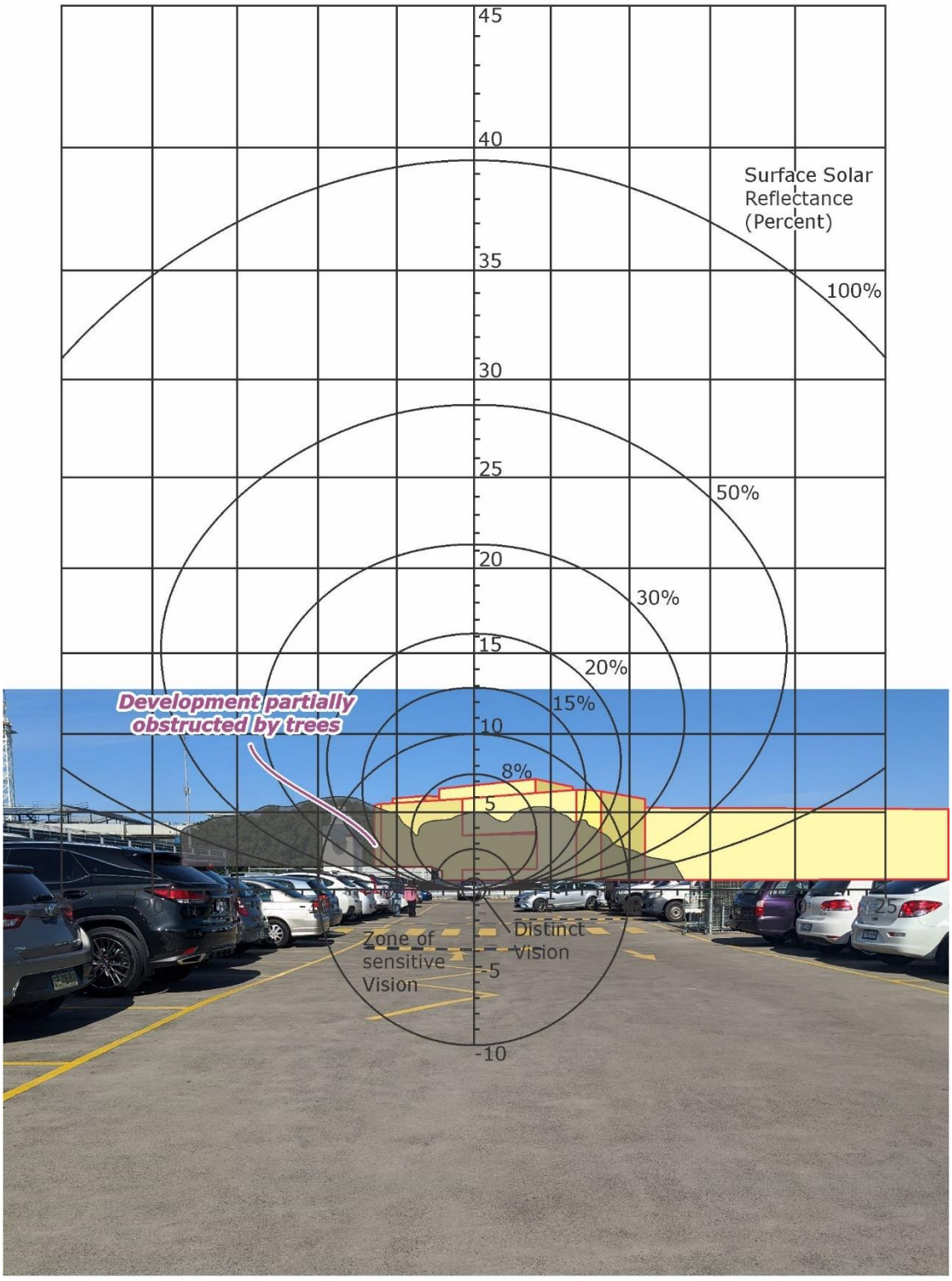

Figure A.11: Glare Overlay of the Viewpoint at Point 11

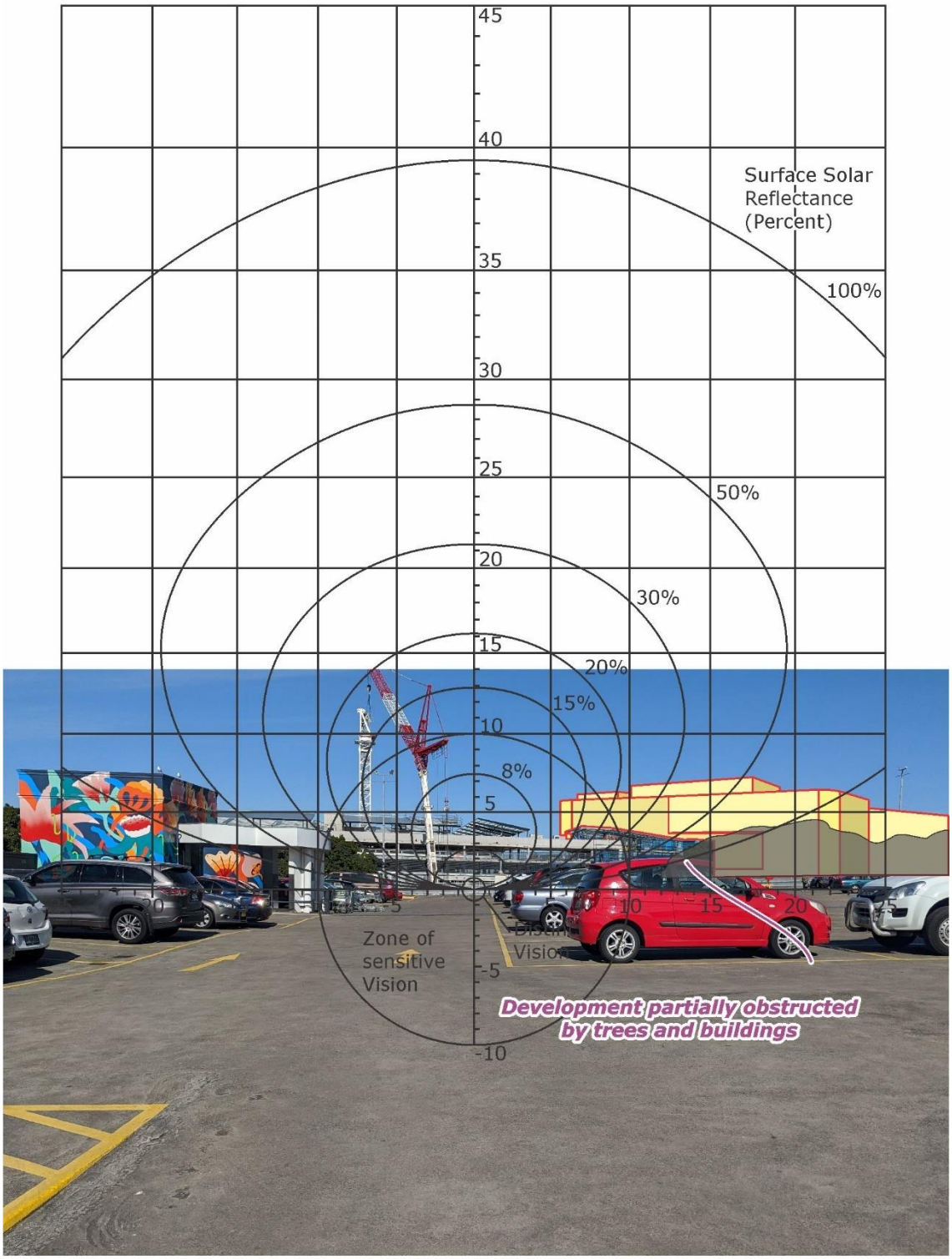

Figure A.12: Glare Overlay of the Viewpoint at Point 12

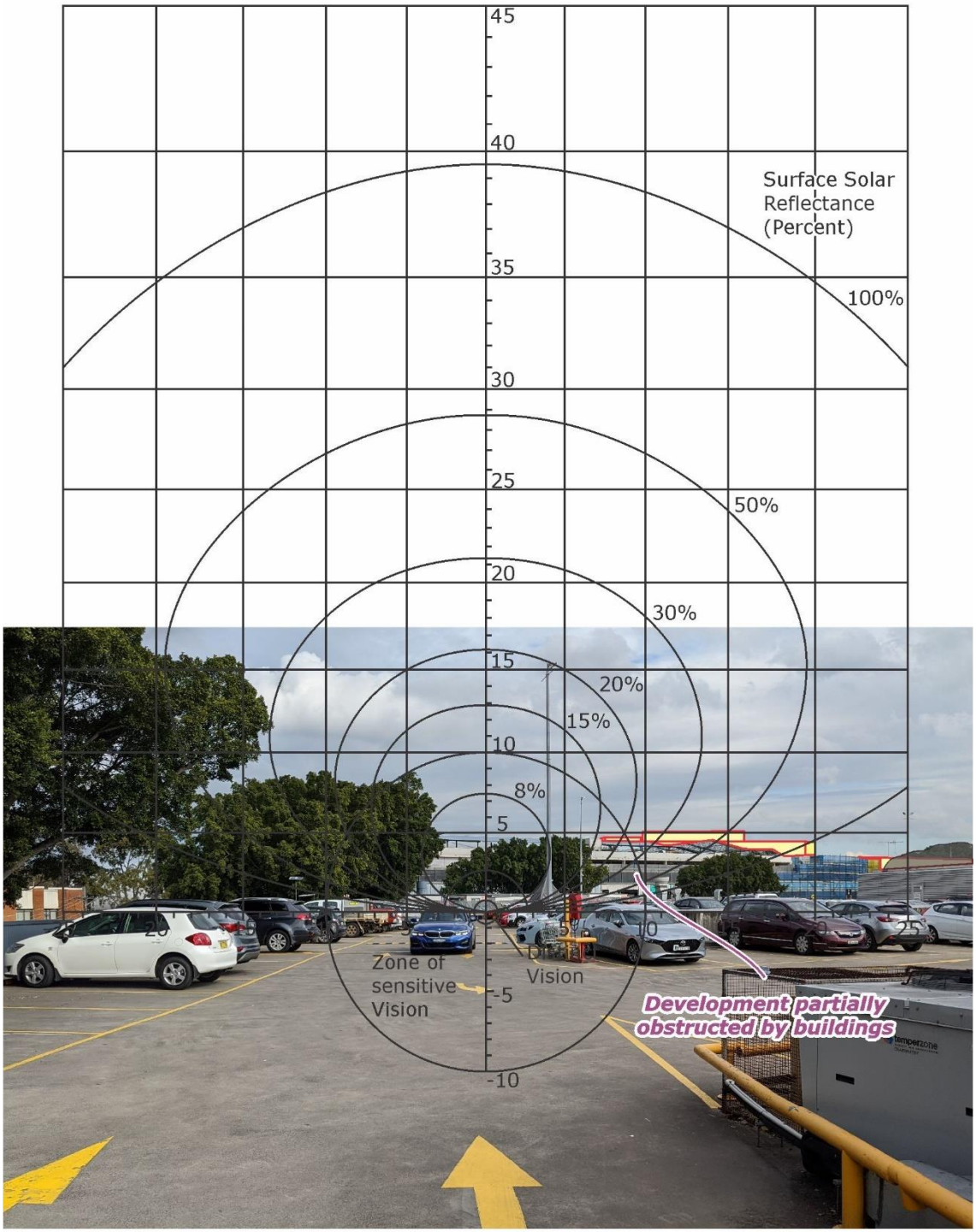

Figure A.13: Glare Overlay of the Viewpoint at Point 13

APPENDIX B SOLAR CHARTS FOR THE VARIOUS CRITICAL ASPECTS

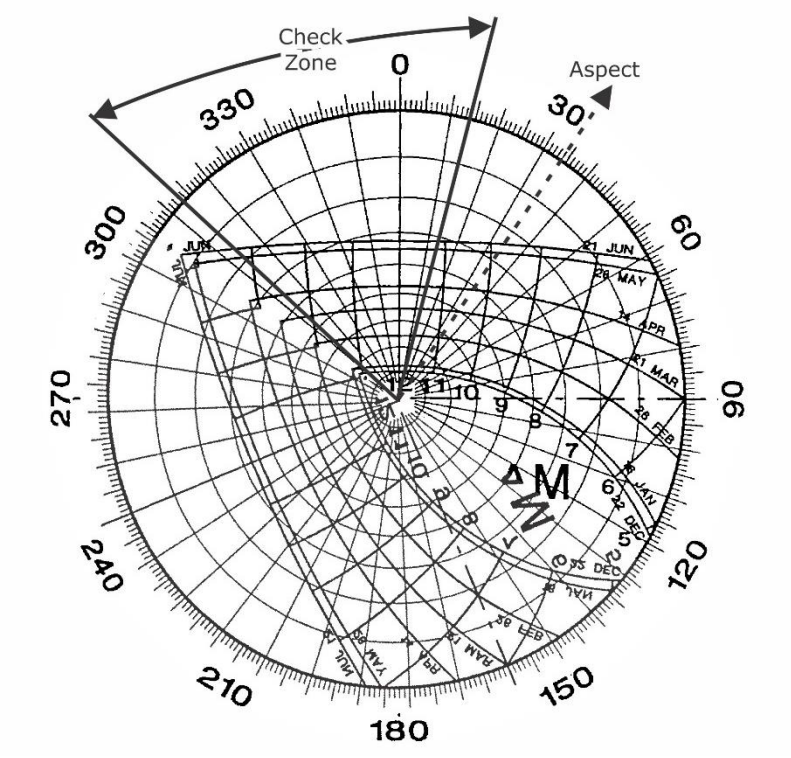

Figure B.1: Sun Chart for the 034° Vertical Aspect

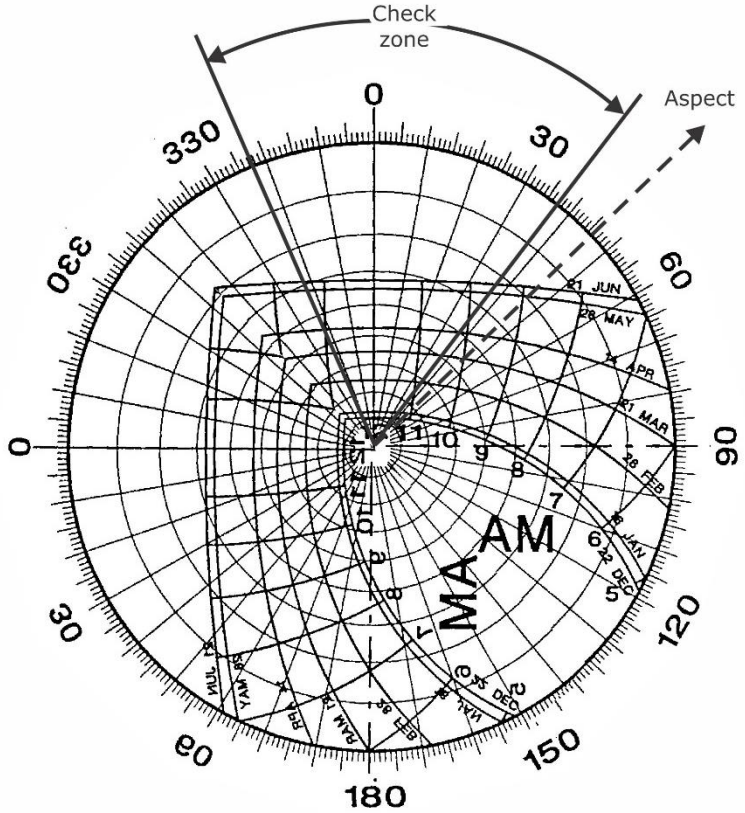

Figure B.2: Sun Chart for the 046° Vertical Aspect

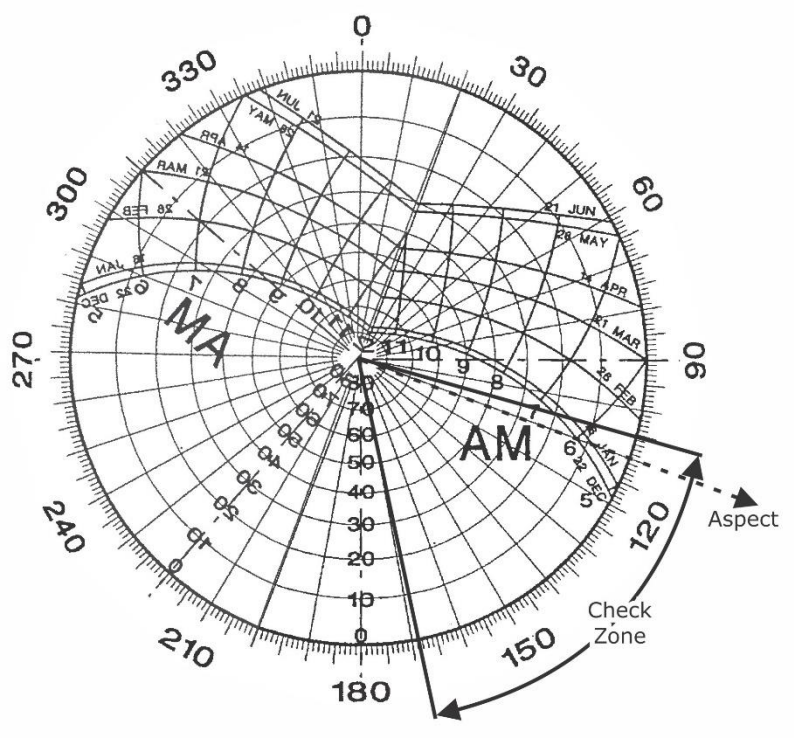

Figure B.3: Sun Chart for the 110° Vertical Aspect

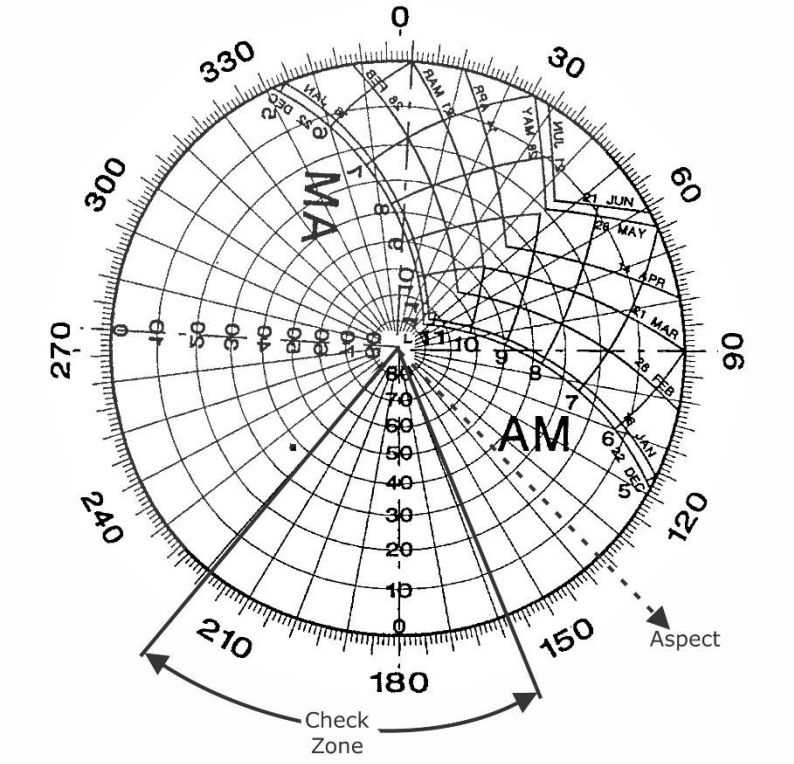

Figure B.4: Sun Chart for the 136° Vertical Aspect

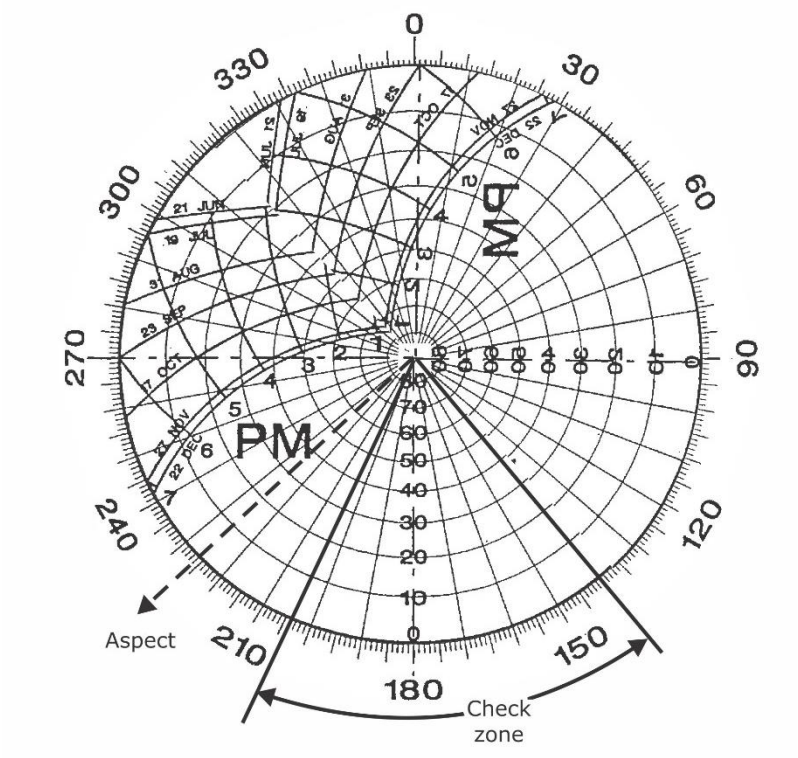

Figure B.5: Sun Chart for the 226° Vertical Aspect

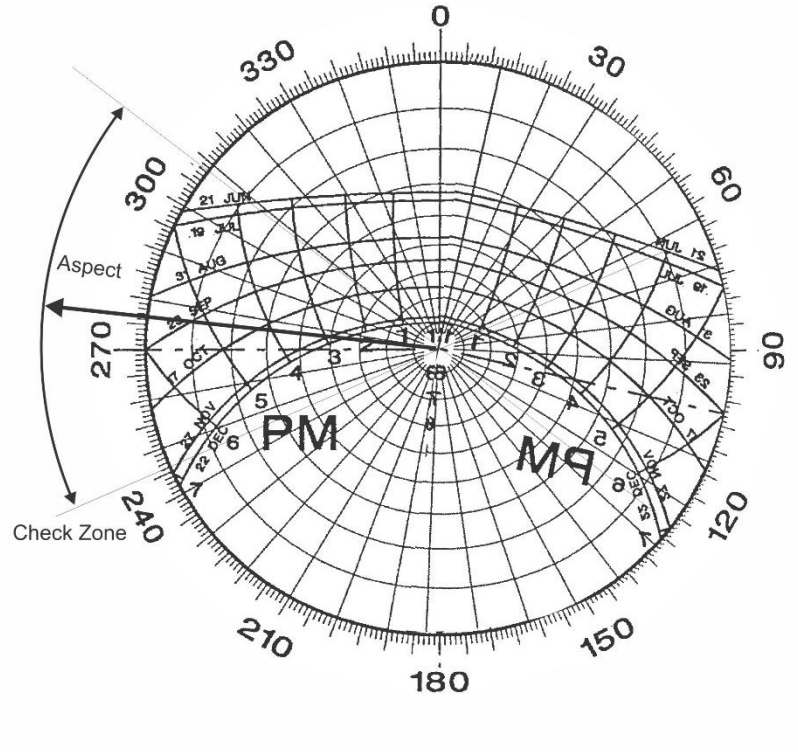

Figure B.6: Sun Chart for the 276° Vertical Aspect

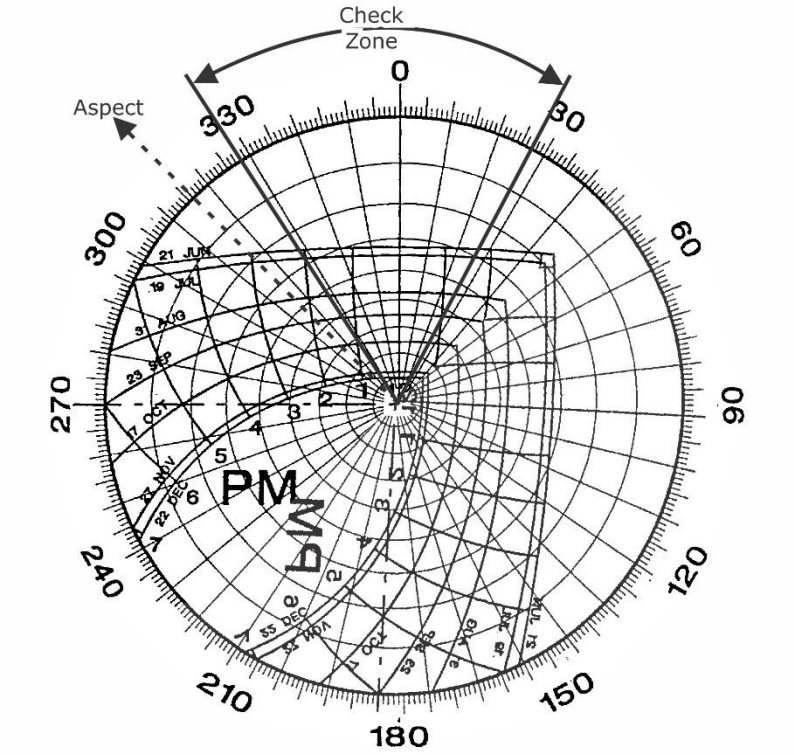

Figure B.7: Sun Chart for the 316° Vertical Aspect

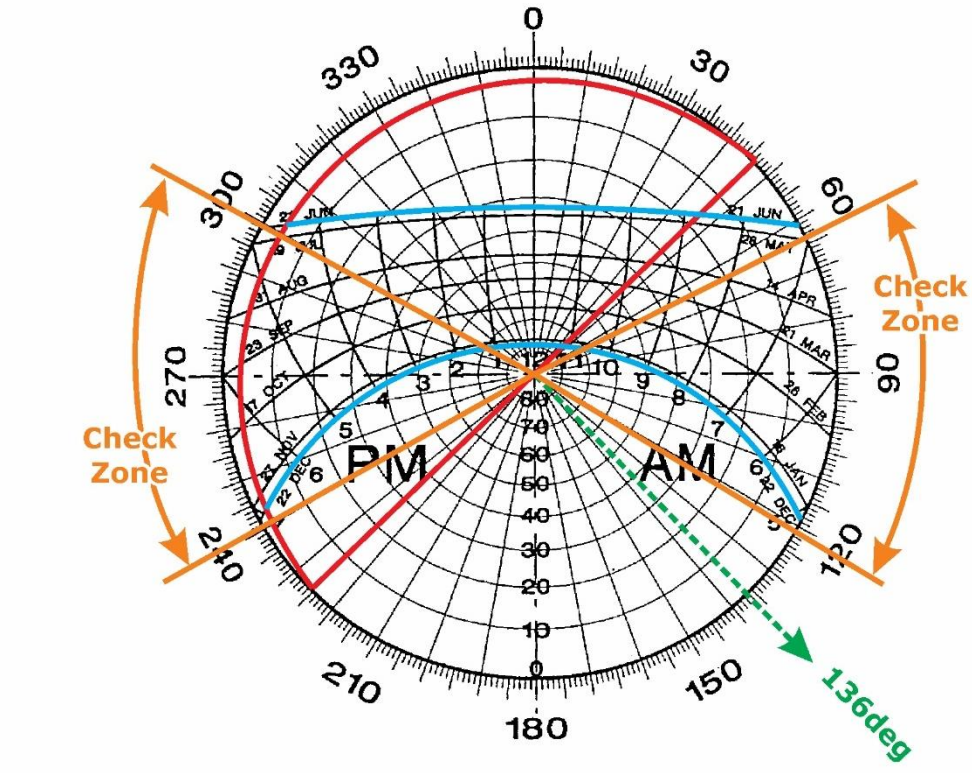

Figure B.8: Sun Chart for the 136° Roof Aspect (with 3° fall)

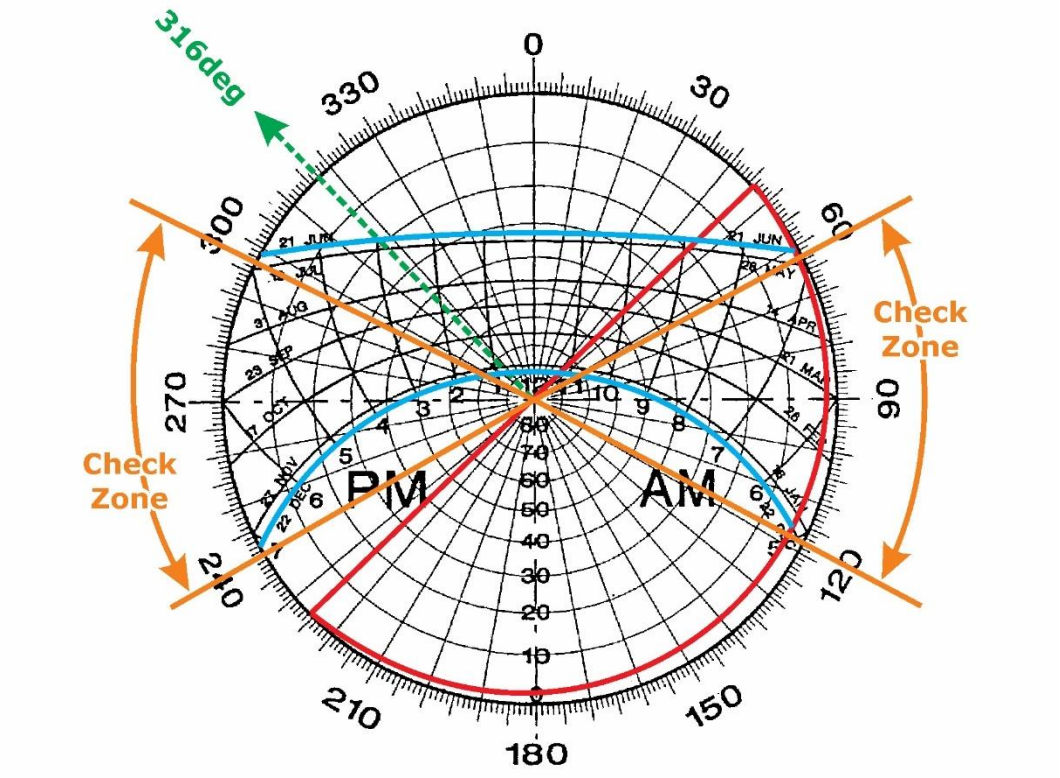

Figure B.9: Sun Chart for the 316° Roof Aspect (with 3° fall)

APPENDIX C STANDARD SUN CHART FOR THE REGION

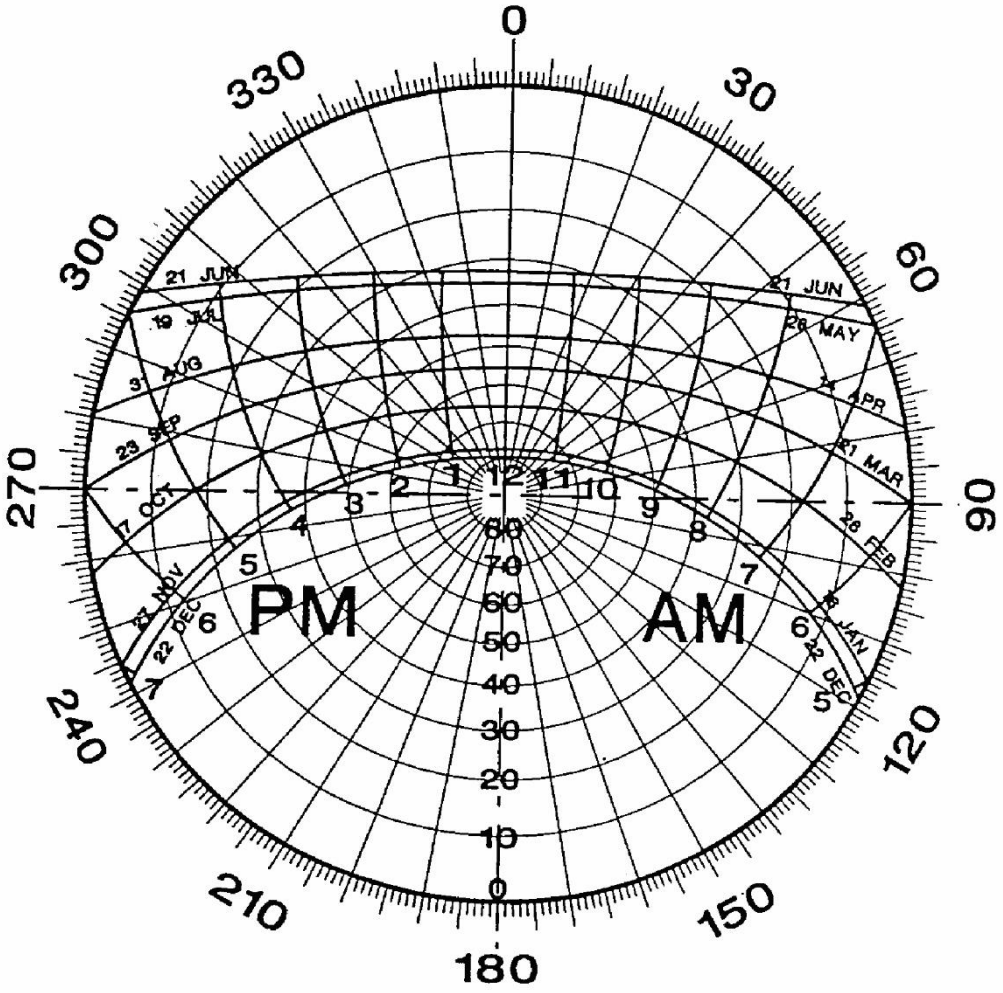

Figure C.1: Standard Sun Chart for the Sydney Region