WINDTECH

SOLAR LIGHT REFLECTIVITY STUDY

12-20 BERRY ROAD & 11-19 HOLDSWORTH AVENUE, ST LEONARDS NSW, 2065

WG715-01F05(REV1)- SR REPORT

JUNE 2, 2022

Prepared for:

Aqualand St Leonard Development 3 PTY LTD

Level 37, Australia Square, 264 George St
Sydney NSW, 2000

DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
March 4, 2022	Initial.	0	AS	SWR	EV
June 02, 2022	Minor updates.	1	AS	SWR	EV

EXECUTIVE SUMMARY

This report presents the results of a solar glare analysis from the proposed 12-20 Berry Road & 11-19 Holdsworth Avenue development, located in St Leonards. The study identifies possible adverse reflected solar glare conditions affecting motorists, pedestrians, and 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), and the Lane Cove Development Control Plan.

The results of the study indicate that to comply with the controls for reflectivity from the State Environmental Planning Policy No. 65 and the Lane Cove Development Control Plan, and to avoid any adverse glare to motorists and pedestrians on the surrounding streets, and occupants of neighbouring buildings, it is recommended that all glazing and materials used on the external façade of the development should have a maximum normal specular reflectance of visible light of 20%.

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.

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)

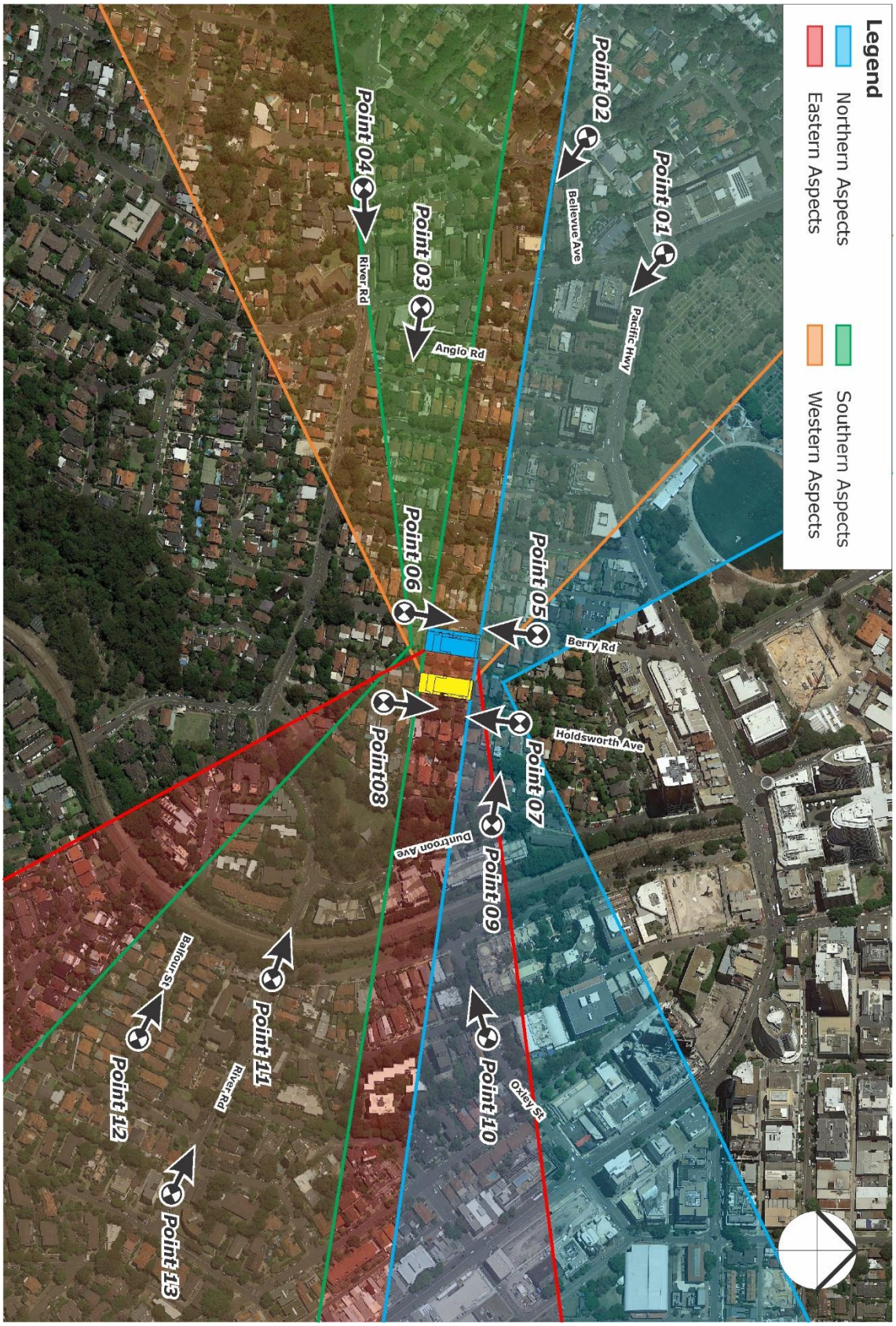

Figure 2: Check Zones and Study Point Locations
(the check zones are the areas where glare could potentially be observed)

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	Pacific Highway, heading south-east	Northern and Western aspects
02	Bellevue Avenue, heading south-east	Northern and Western aspects
03	Anglo Road, heading east	Southern and Western aspects
04	River Road, heading east	Southern and Western aspects
05	Berry Road, heading south	Northern aspect
06	Berry Road, heading north	Western aspect
07	Holdsworth Avenue, heading south	Northern aspect
08	Holdsworth Avenue, heading north	Southern and Eastern aspects
09	Duntroon Avenue, heading west	Northern and Eastern aspects
10	Oxley St, heading west	Northern and Eastern aspects
11	River Road, heading west	Southern and Eastern aspects
12	Balfour Street, heading west	Southern and Eastern aspects
13	River Road, heading west	Southern and Eastern aspects

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 South-East along Pacific Highway

Point 01 is located along Pacific Highway, to the west of the development site. This point represents the critical sightline of motorists heading south-east along Pacific Highway 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 view of the development will not be visible within the zone of sensitive vision at this location. Hence there will be no adverse solar glare observed by motorists heading south-east along Pacific Highway at this location.

1.2.2 Motorists Heading South-East along Bellevue Avenue

Point 02 is located along Bellevue Avenue, to the west of the development site. This point represents the critical sightline of motorists heading south-east along Bellevue Avenue 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 view of the development will not be visible within the zone of sensitive vision at this location. Hence there will be no adverse solar glare observed by motorists heading south-east along Bellevue Avenue at this location.

1.2.3 Motorists Heading East along Anglo Road

Point 03 is located along Anglo Road, to the west of the development site. This point represents the critical sightline of motorists heading east along Anglo 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 the view of the development will 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 Anglo Road at this location.

1.2.4 Motorists Heading East along River Road

Point 04 is located along River Road, to the west of the development site. This point represents the critical sightline of motorists heading east along River 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 04 indicates that the view of the development will 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 River Road at this location.

1.2.5 Motorists Heading South along Berry Road

Point 05 is located along Berry Road, to the west of the development site. This point represents the critical sightline of motorists heading south along Berry 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 05 indicates that the western aspect of the development will be visible within the zone of sensitive vision. However, further analysis indicates that the study point will not be within the check zone for this aspect. Hence there will be no adverse solar glare observed by motorists heading south along Berry Road at this location.

1.2.6 Motorists Heading North along Berry Road

Point 06 is located along Berry Road, to the west of the development site. This point represents the critical sightline of motorists heading north along Berry 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 06 indicates that the western aspect of the development will be visible within the zone of sensitive vision. However, further analysis indicates that the study point will not be within the check zone for this aspect. Hence there will be no adverse solar glare observed by motorists heading north along Berry Road at this location.

1.2.7 Motorists Heading South along Holdsworth Avenue

Point 07 is located along Holdsworth Avenue, to the east of the development site. This point represents the critical sightline of motorists heading south along Holdsworth Avenue 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 view of the development will be significantly obstructed by densely foliating trees and other planting. Hence there will be no adverse solar glare observed by motorists heading south along Holdsworth Avenue at this location.

1.2.8 Motorists Heading North along Holdsworth Avenue

Point 08 is located along Holdsworth Avenue, to the east of the development site. This point represents the critical sightline of motorists heading north along Holdsworth Avenue 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 view of the development will be significantly obstructed by densely foliating trees and other planting. Hence there will be no adverse solar glare observed by motorists heading north along Holdsworth Avenue at this location.

1.2.9 Motorists Heading West aong Duntroon Avenue

Point 09 is located along Duntroon Avenue, to the east of the development site. This point represents the critical sightline of motorists heading west along Duntroon Avenue 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 view of the development will 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 Duntroon Avenue at this location.

1.2.10 Motorists Heading West along Oxley St

Point 10 is located along Oxley St, to the east of the development site. This point represents the critical sightline of motorists heading west along Oxley St 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 view of the development will 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 Oxley St at this location.

1.2.11 Motorists Heading West along River Road

Points 11 and 13 are located along River Road, to the east of the development site. These points represent the critical sightline of motorists heading west along River Road at these locations. Calibrated images of the viewpoint of motorists at these locations have been overlaid with a scaled glare meter, as shown in Appendix A.

An analysis of the glare meter overlaid onto the viewpoint at Points 11 and 13 indicates that the view of the development will not be visible within the zone of sensitive vision at these locations. Hence there will be no adverse solar glare observed by motorists heading west along River Road at these locations.

1.2.12 Motorists Heading West along Balfour Street

Point 12 is located along Balfour Street, to the east of the development site. This point represents the critical sightline of motorists heading west along Balfour 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 12 indicates that the view of the development will 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 Balfour Street 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 (generally used for smaller windows in domestic housing) – 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 12-20 Berry Road & 11-19 Holdsworth Avenue development, located in St Leonards. The study identifies possible adverse reflected solar glare conditions affecting motorists, pedestrians, and 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), and the Lane Cove Development Control Plan.

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5 REFERENCES

Lane Cove Council, 2010, "Lane Cove Development Control Plan".

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

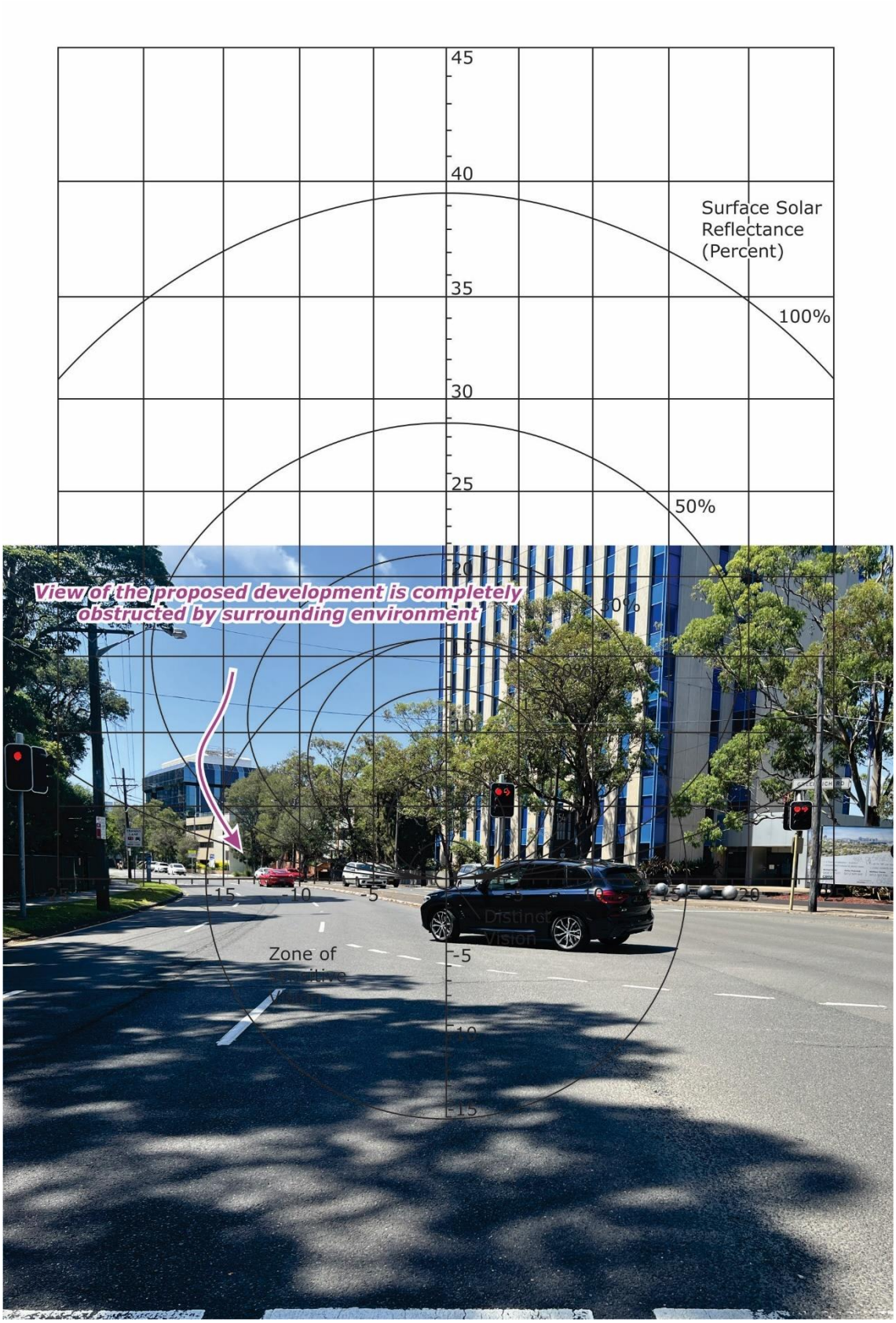

Figure A.1: Glare Overlay of the Viewpoint at Point 01

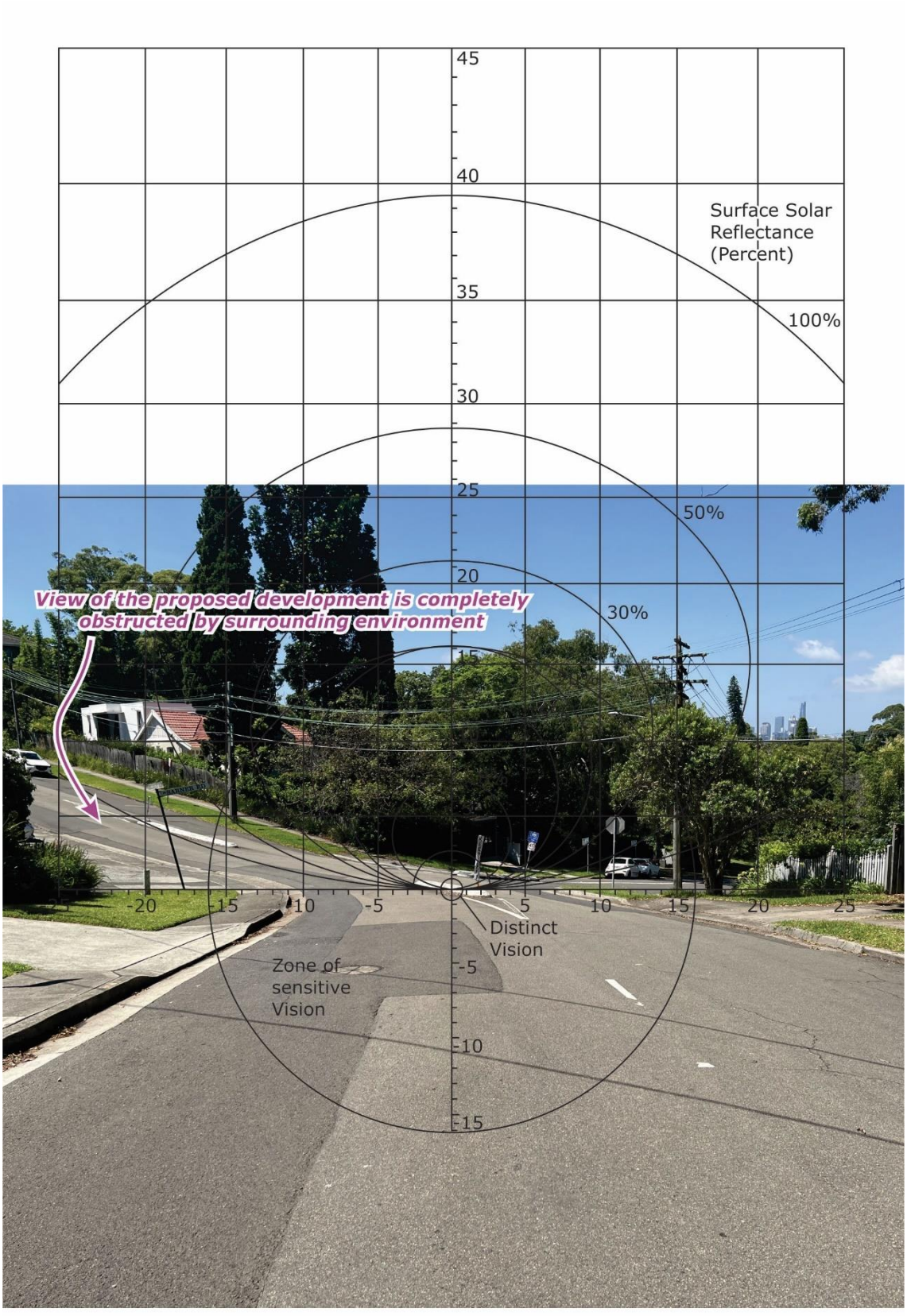

Figure A.2: Glare Overlay of the Viewpoint at Point 02

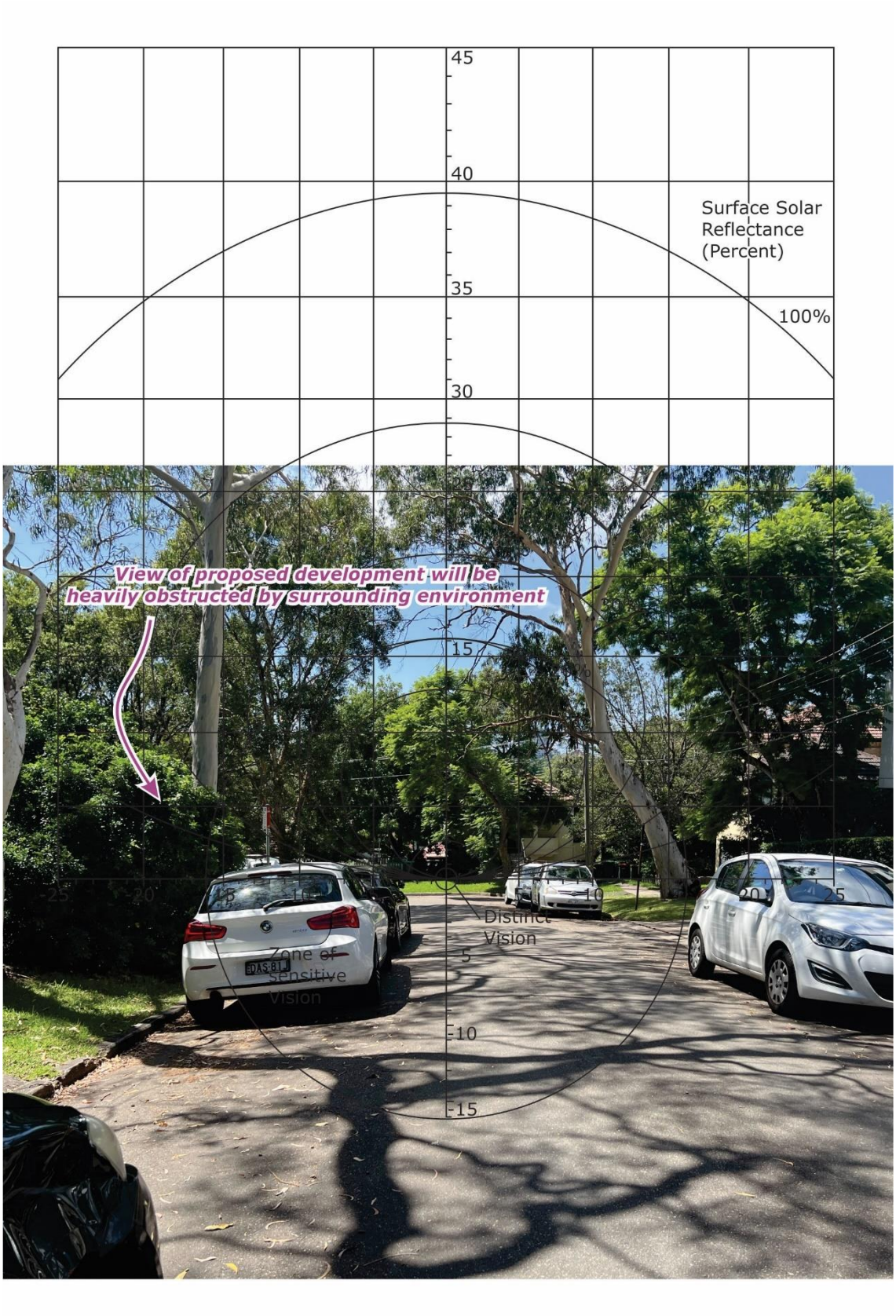

Figure A.3: Glare Overlay of the Viewpoint at Point 03

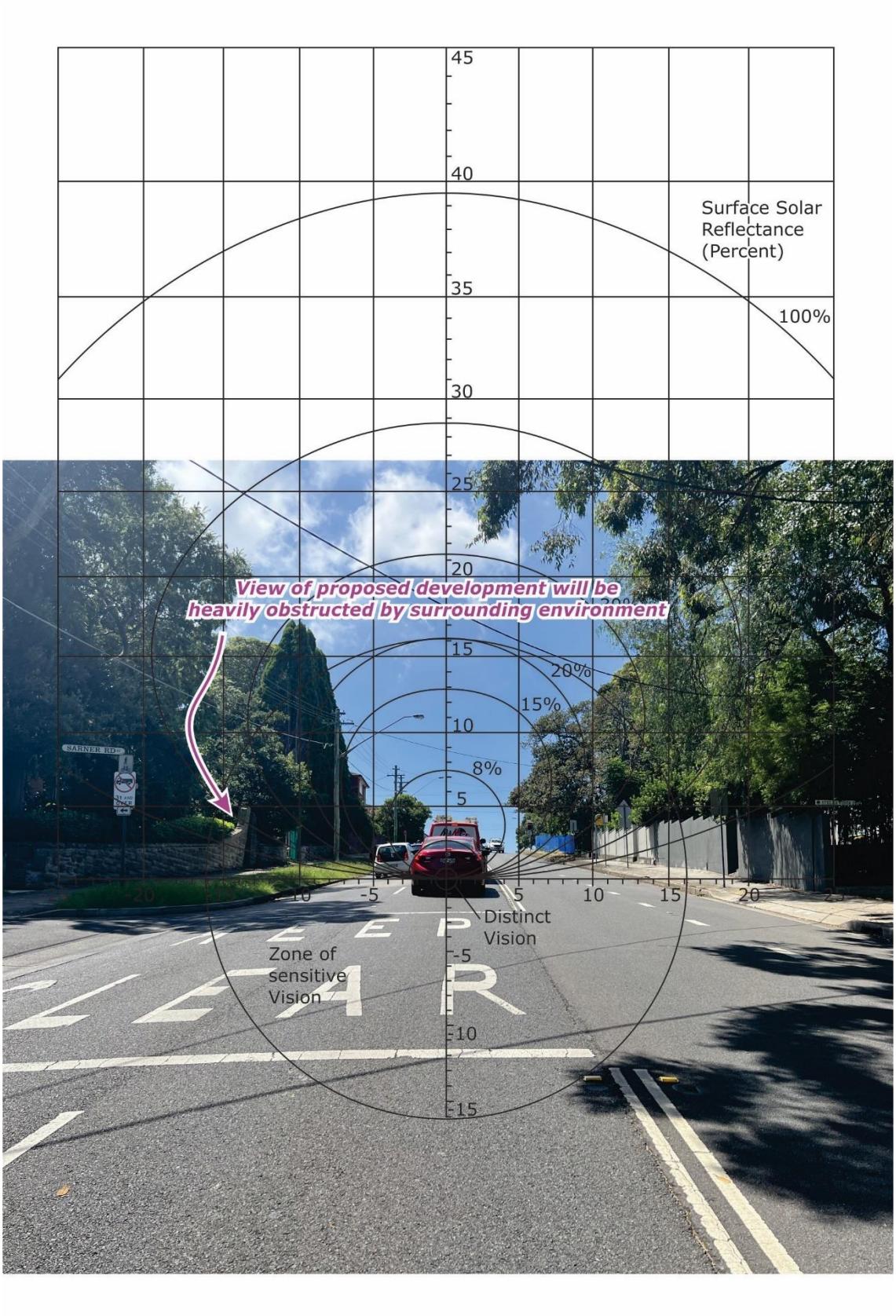

Figure A.4: Glare Overlay of the Viewpoint at Point 04

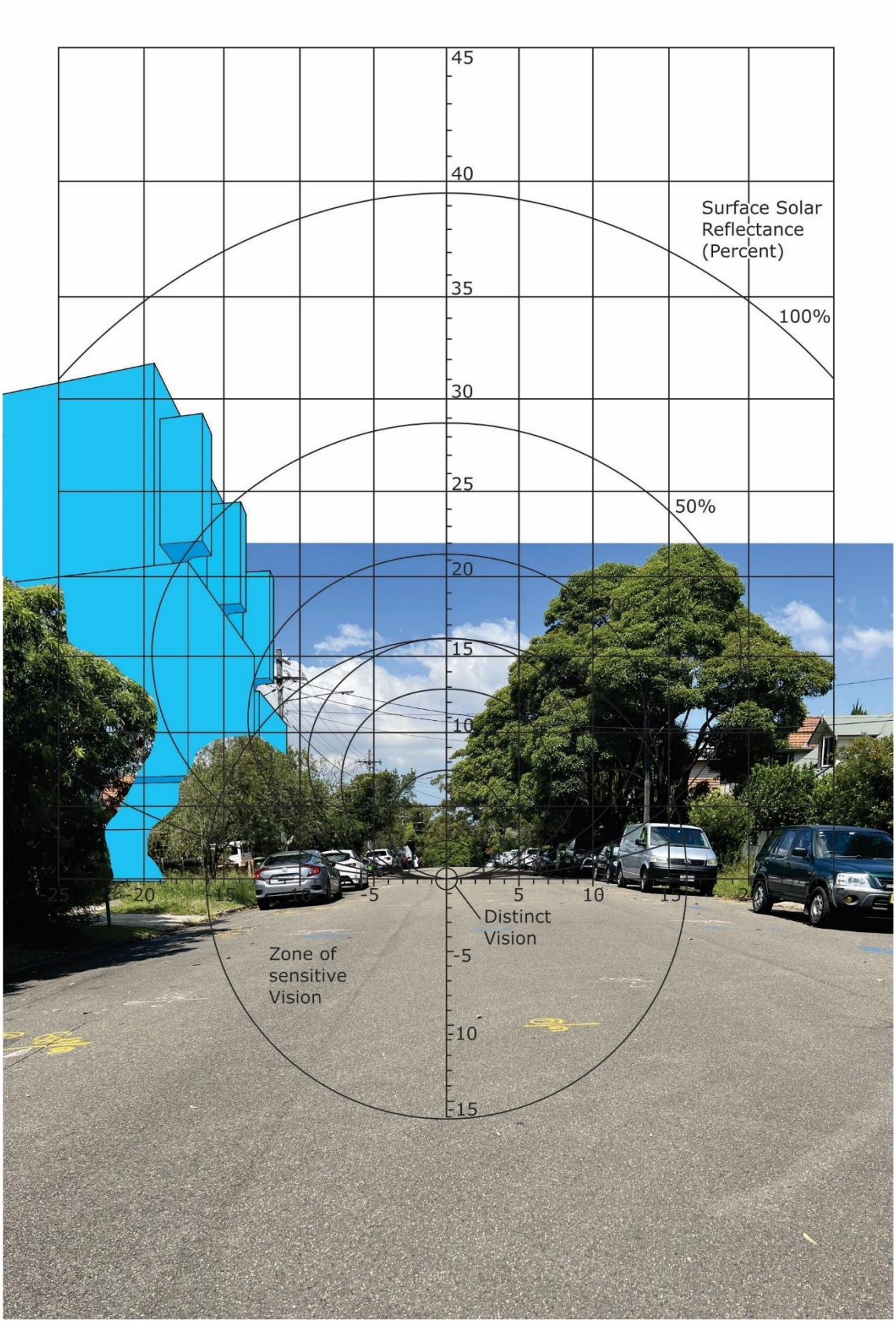

Figure A.5: Glare Overlay of the Viewpoint at Point 05

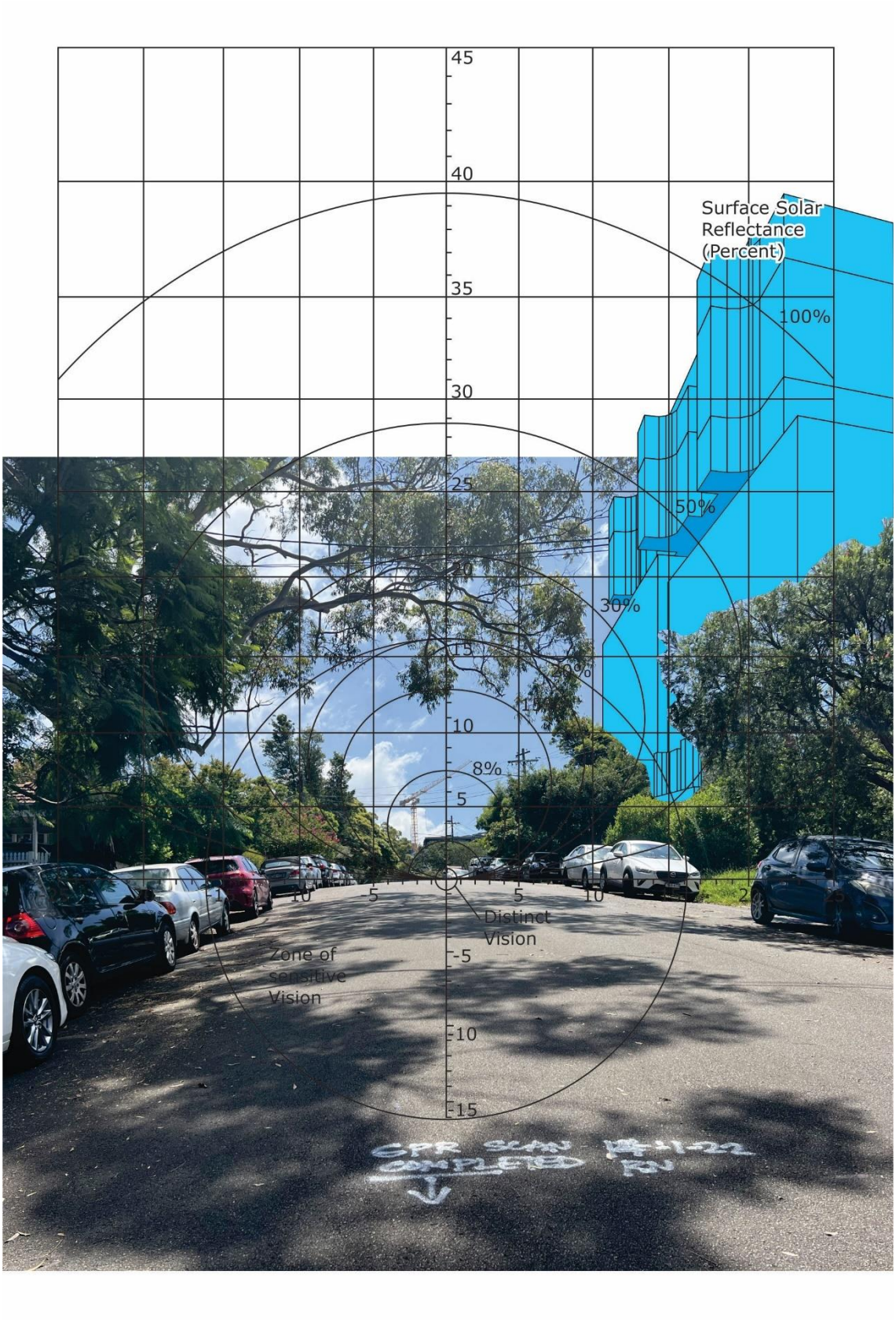

Figure A.6: Glare Overlay of the Viewpoint at Point 06

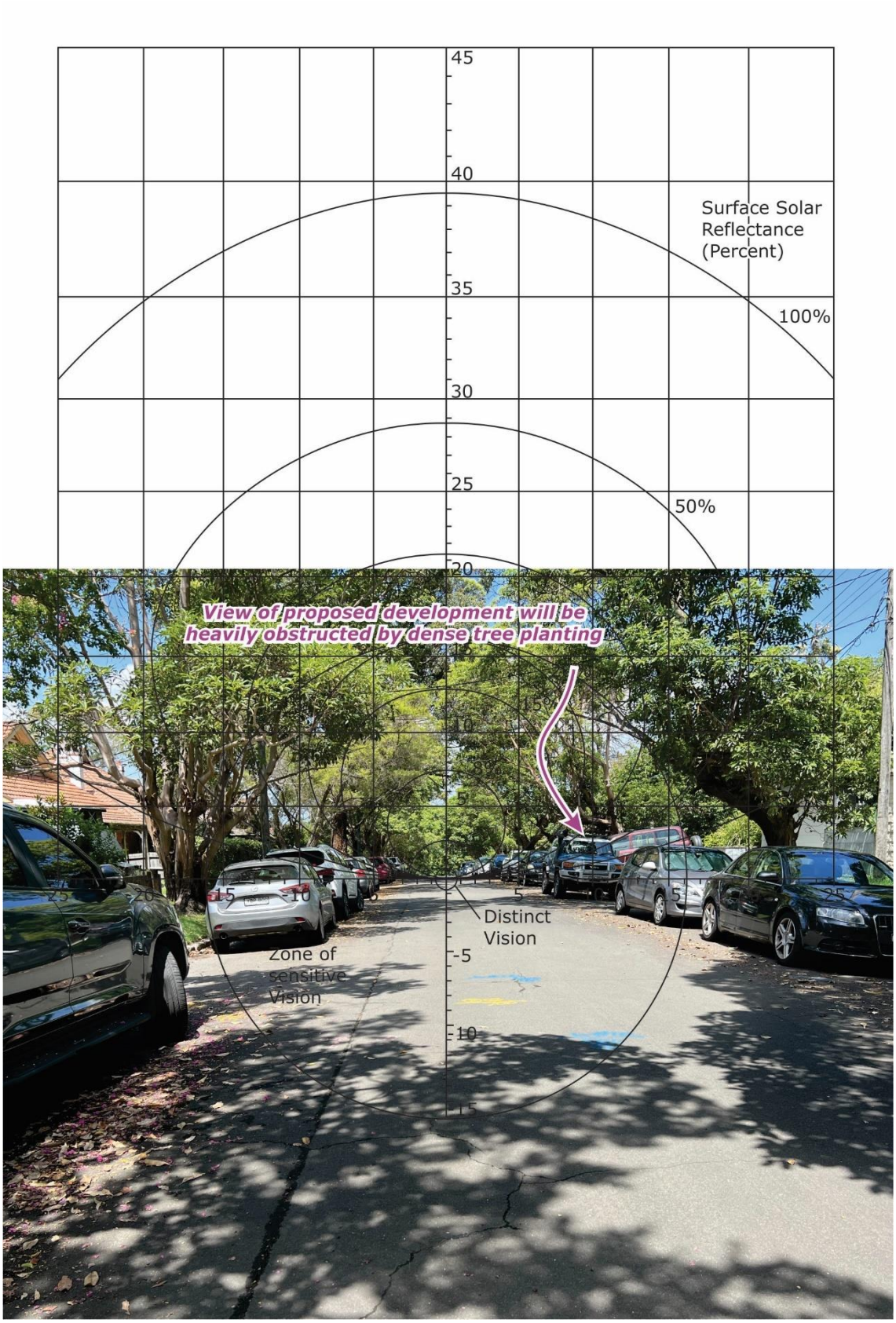

Figure A.7: Glare Overlay of the Viewpoint at Point 07

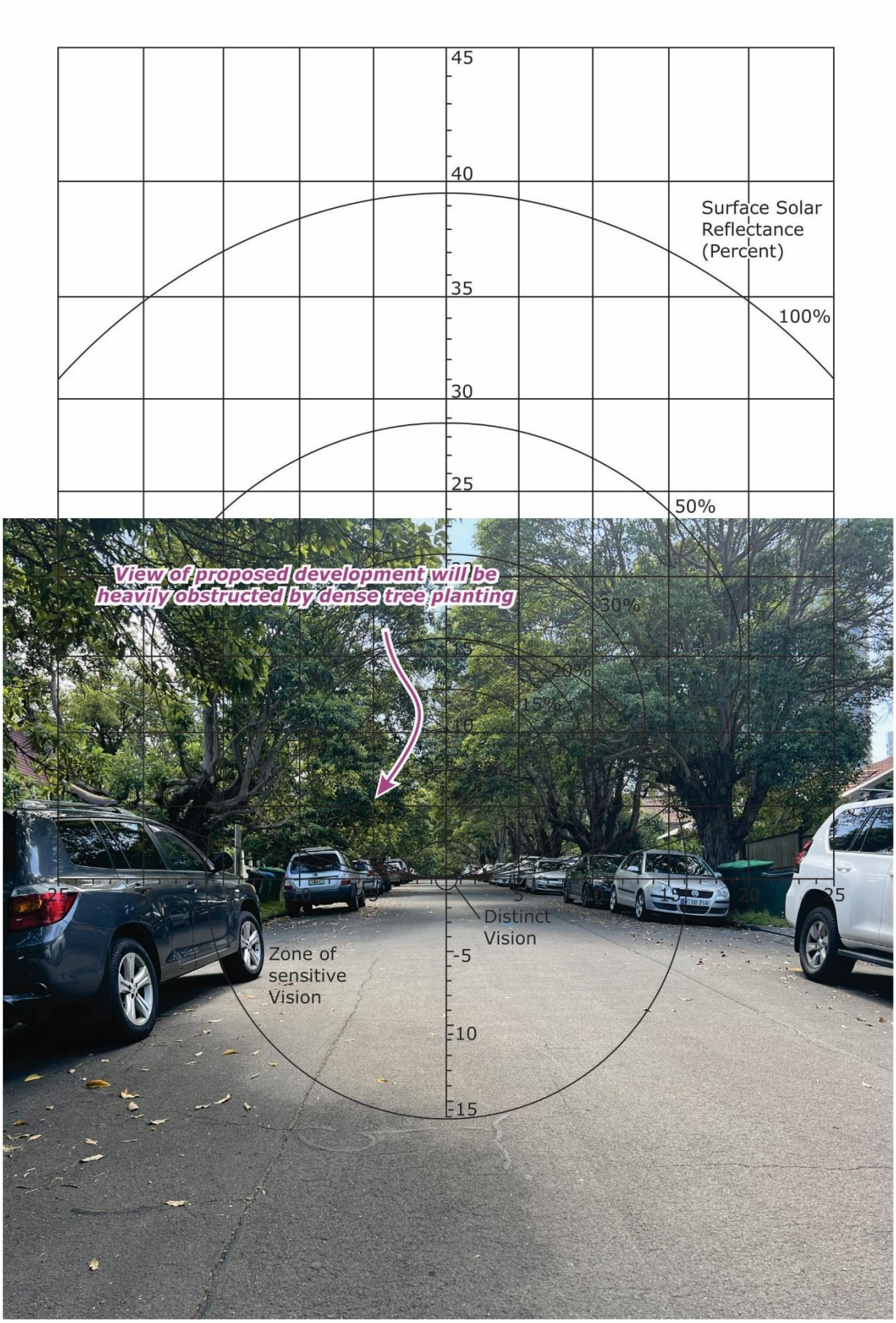

Figure A.8: Glare Overlay of the Viewpoint at Point 08

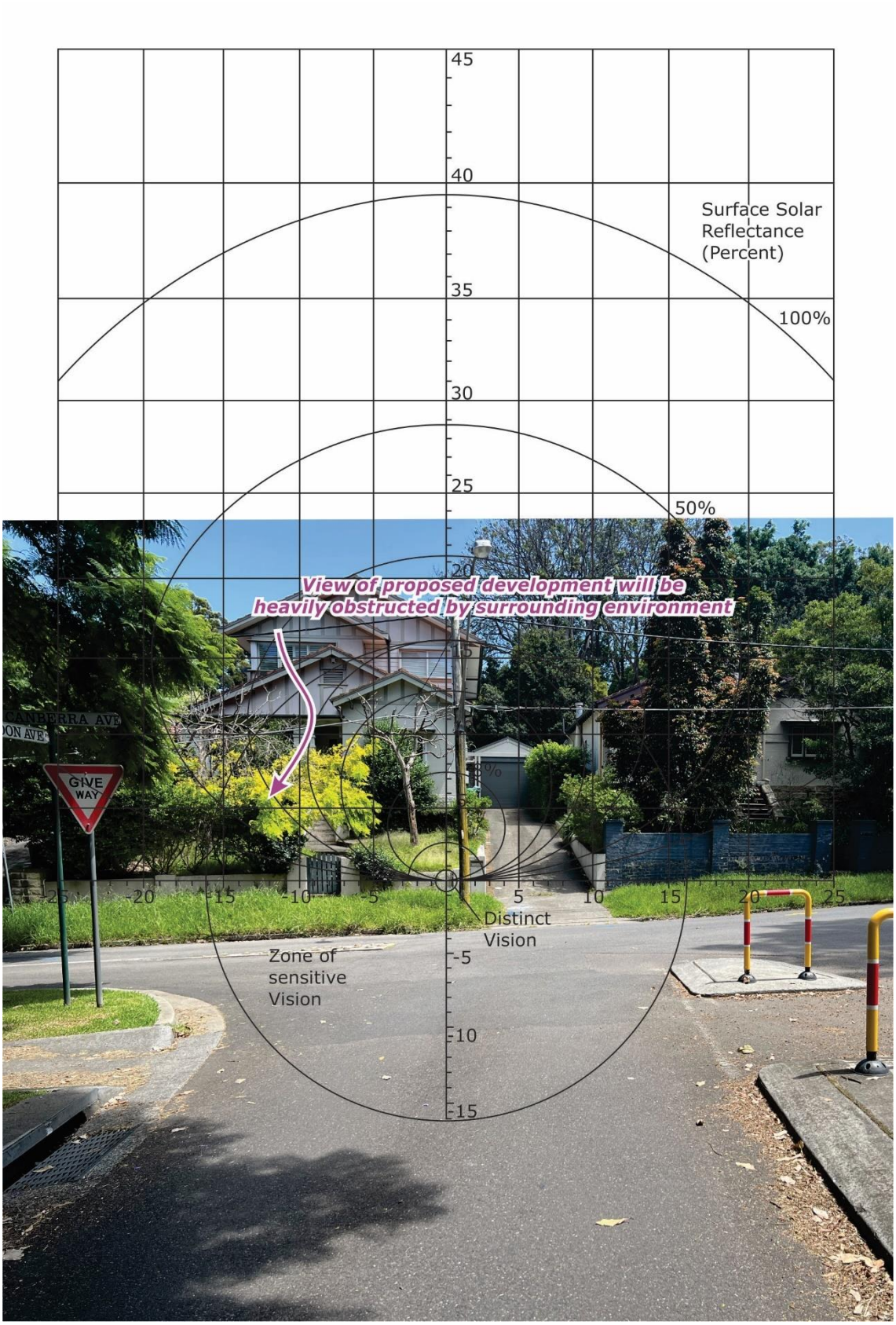

Figure A.9: Glare Overlay of the Viewpoint at Point 09

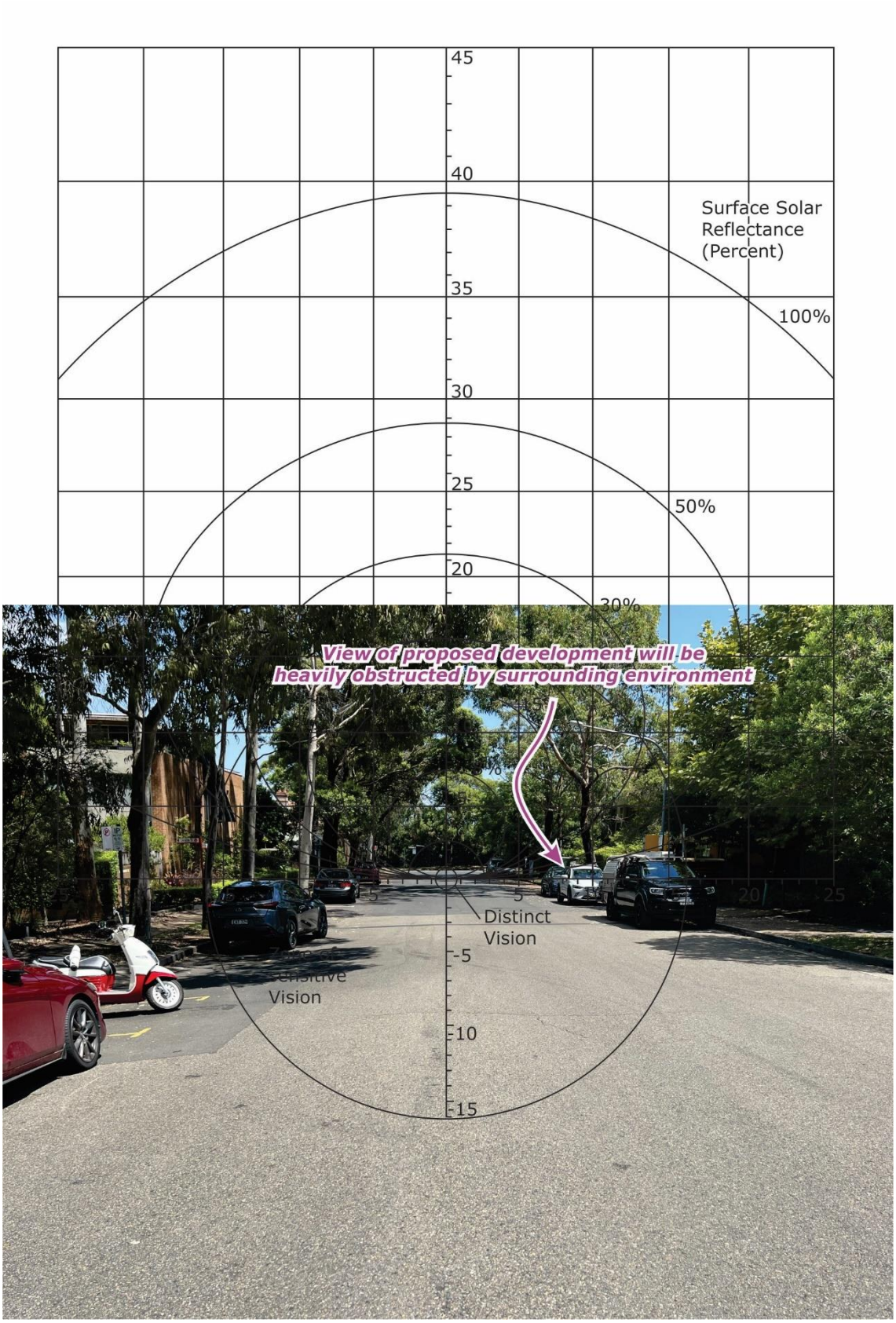

Figure A.10: Glare Overlay of the Viewpoint at Point 10

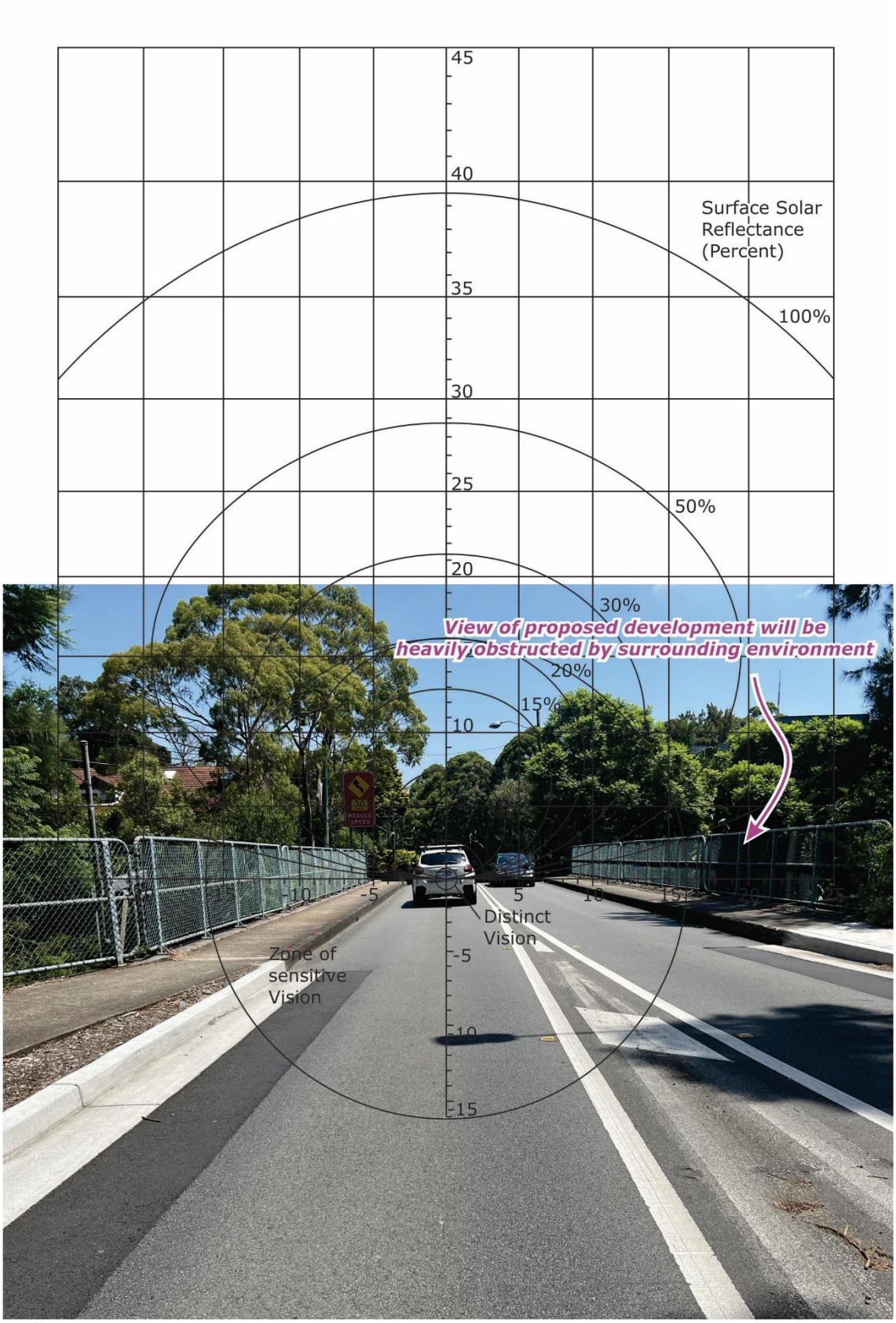

Figure A.11: Glare Overlay of the Viewpoint at Point 11

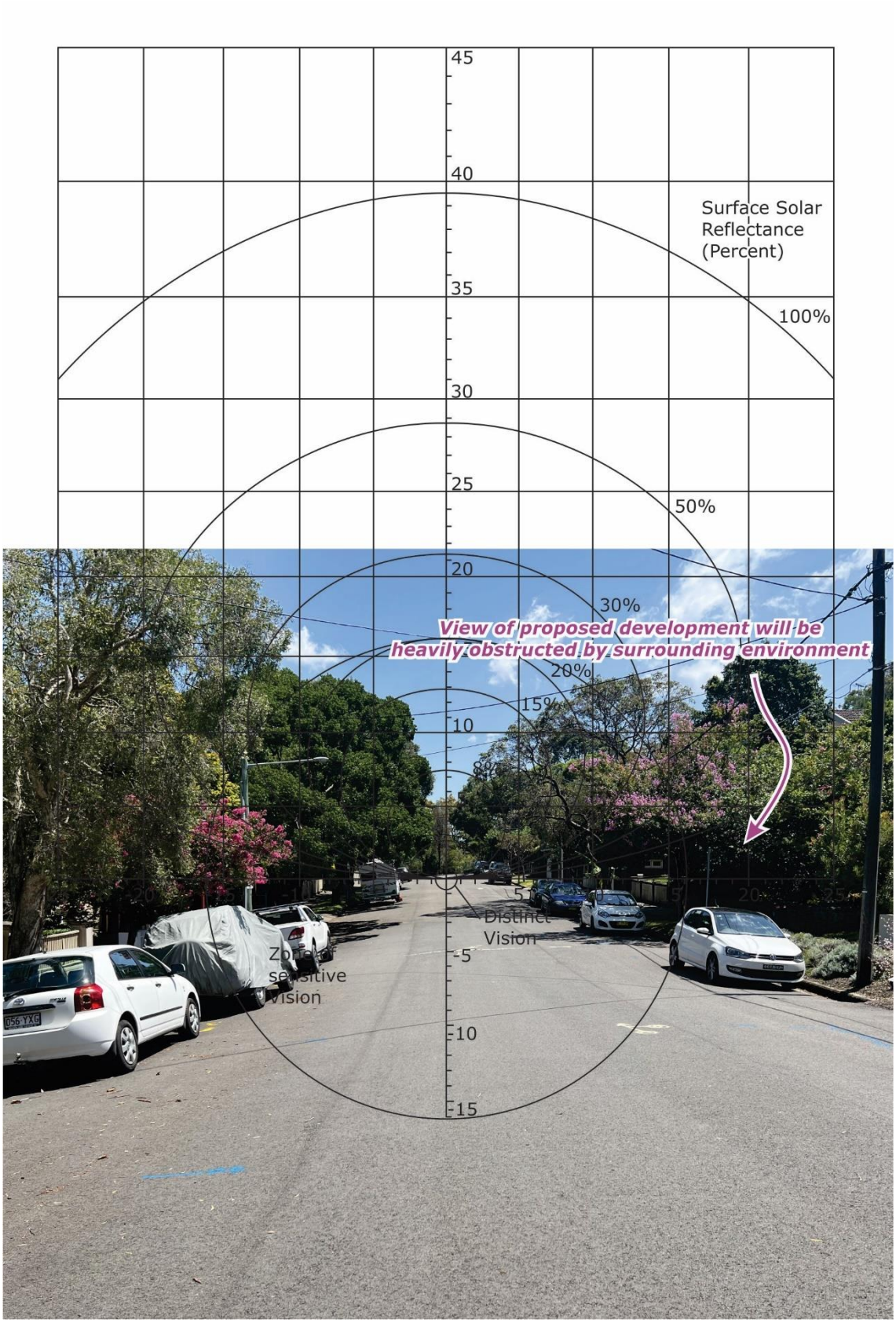

Figure A.12: Glare Overlay of the Viewpoint at Point 12

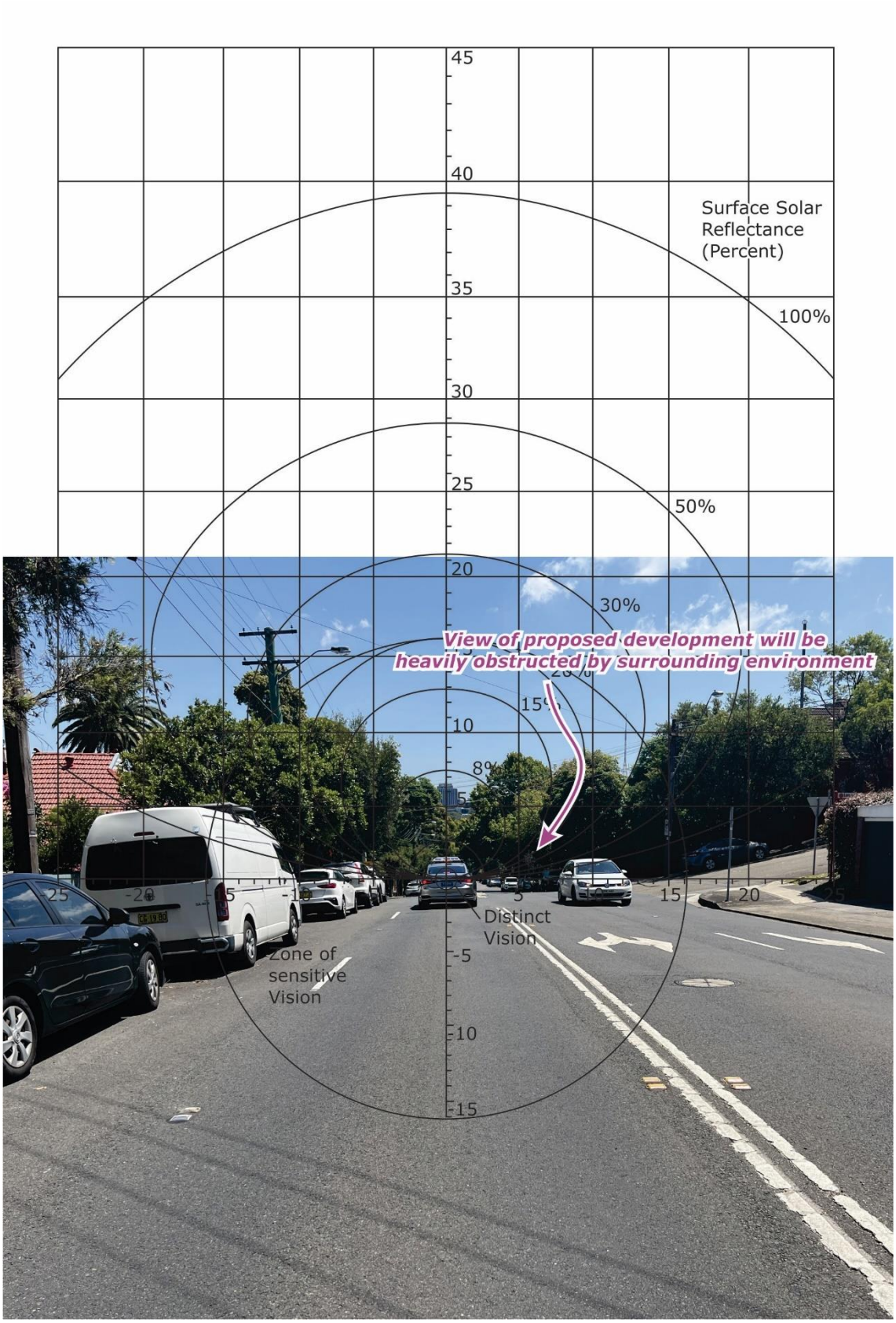

Figure A.13: Glare Overlay of the Viewpoint at Point 13

APPENDIX B CRITICAL ASPECT SOLAR CHARTS

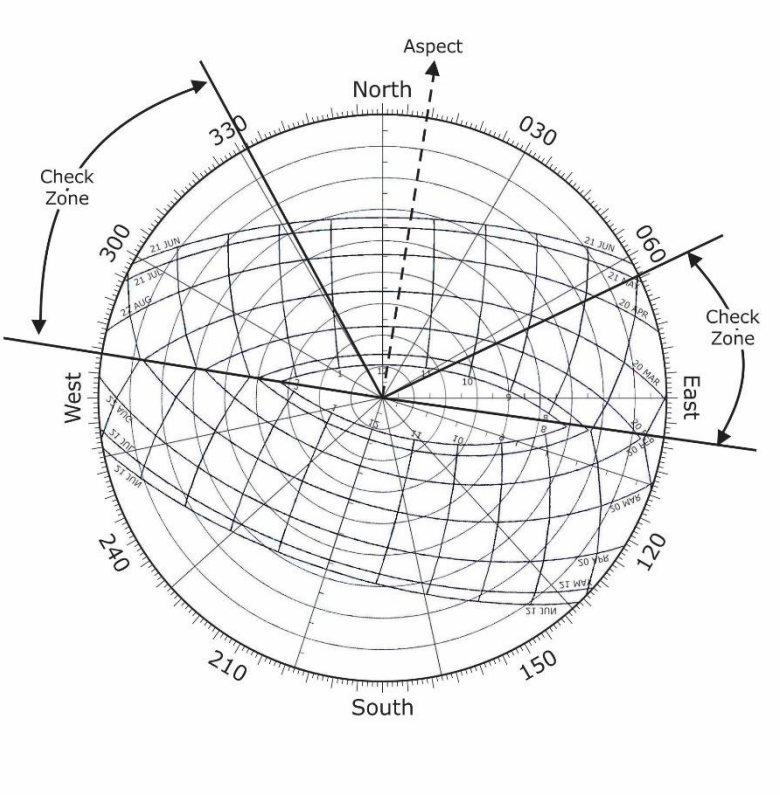

Figure B.1: Sun Chart for the 009° Aspect

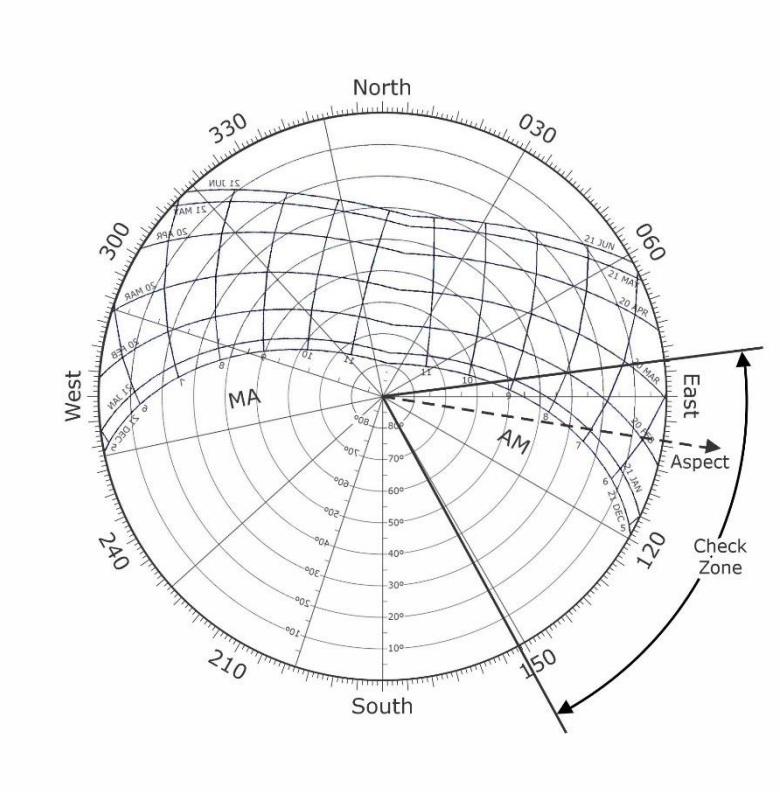

Figure B.2: Sun Chart for the 099° Aspect

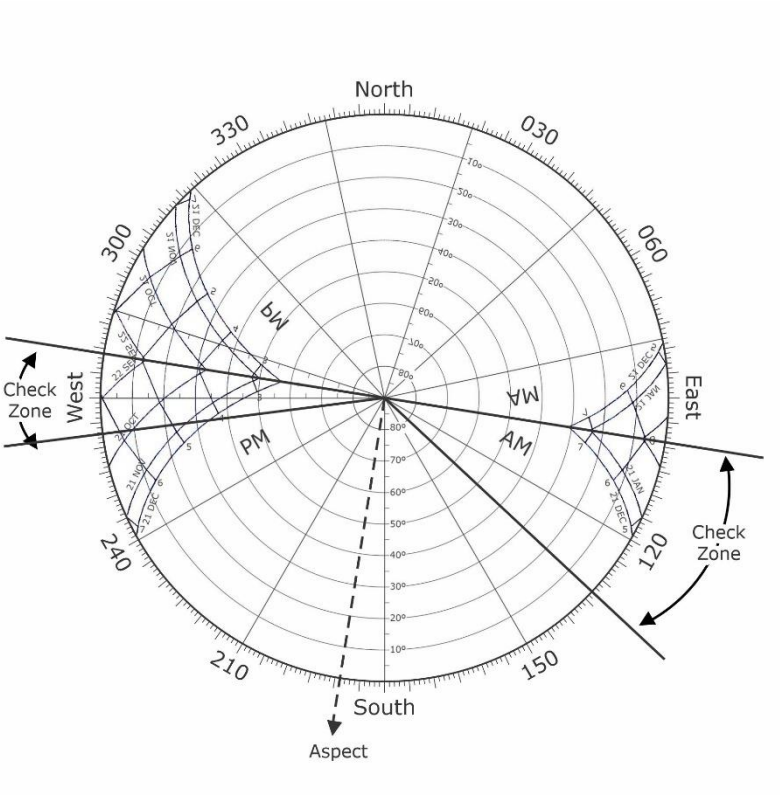

Figure B.3: Sun Chart for the 189° Aspect

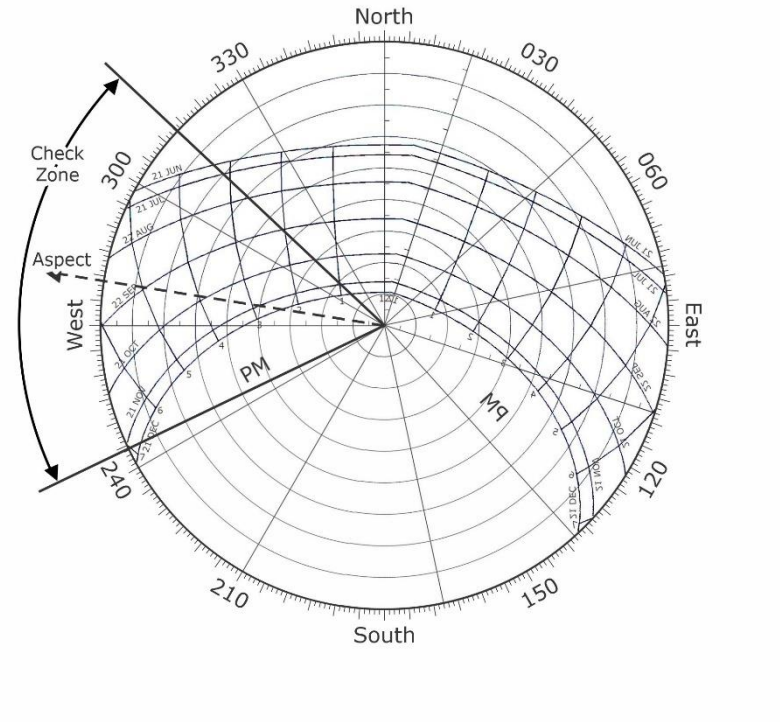

Figure B.4: Sun Chart for the 279° Aspect

APPENDIX C STANDARD SUN CHART FOR THE REGION

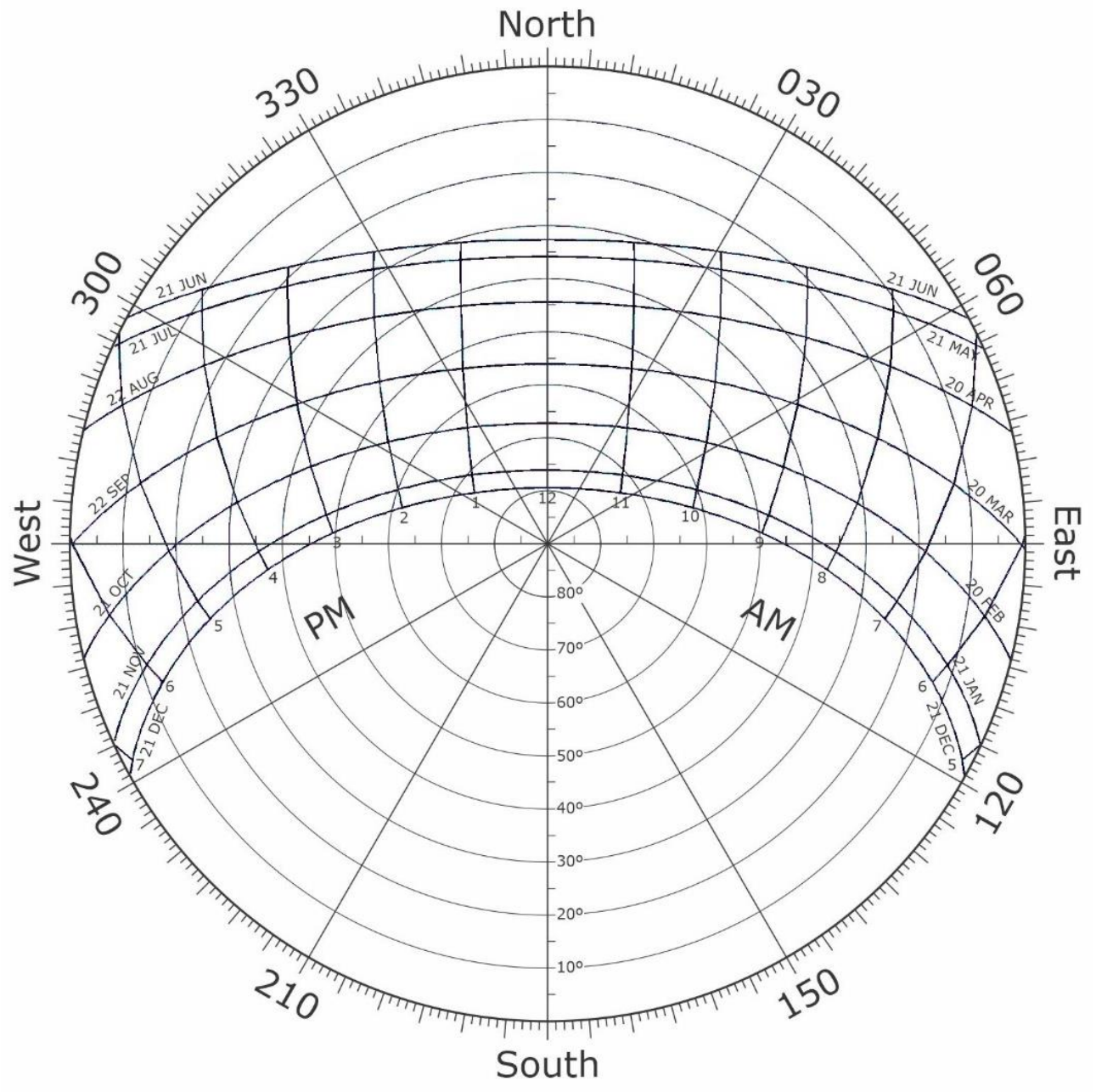

Figure C.1: Standard Sun Chart for the Sydney Region