

GREEN SQUARE STAGE 3

ZETLAND, NSW

SSDA SOLAR REFLECTION SCREENING ANALYSIS

RWDI #2512280

December 16, 2025

SUBMITTED TO

Mirvac
Level 28, 200 George Street
Sydney NSW 2000 Australia

SUBMITTED BY

RWDI Australia Pty Ltd
ABN 86 641 303 871



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EXECUTIVE SUMMARY

RWDI Australia Pty Ltd. (RWDI) has been engaged by Mirvac to investigate the impact of solar reflections emanating from the proposed Sites 7, 17 and 18 of the Green Square Town Centre (GSTC) development in Zetland, NSW ("the Project") in support of a State Significant Development Application (SSDA 2) (SSD-83899206) for Sites 7, 17 and 18 of the Green Square Town Centre HDA Application. The results and conclusions of the study are summarised as follows:

Visual Glare Impact on Drivers

As with any glazed building, drivers travelling in the vicinity of the Project (i.e. along Barker Street, Paul Street, Ebsworth Street, Tweed Place, Zetland Avenue, Geddes Avenue, and Botany Road) were predicted to experience reflections emanating from it. Based on the detailed analysis results, the predicted reflections falling on these receptors:

- **D7: Southbound drivers at the Barker St-Paul St-Ebsworth St intersection, and**
- **D11: Northbound drivers on Paul Street, approaching the Paul St-Zetland Ave intersection.**

were above the veiling luminance threshold of 500 cd/m² in the early morning. Mitigation suggestions have been provided in this report. All remaining drivers were predicted to experience reflections below the veiling luminance threshold of 500 cd/m².

Additional details on when reflections were predicted to occur at the receptors, as well as predicted durations and intensities, can be found in Appendix B.



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1 INTRODUCTION

This report supports one of the detailed State Significant Development Applications (SSDA 2) (SSD-83899206) and concurrent rezoning being lodged with the Department of Planning, Housing and Infrastructure (DPHI) for the construction of three mixed-use Build-to-Rent buildings at 960A Bourke Street (the site). The site is also known collectively as Sites 7, 17 and 18 of the Green Square Town Centre (GSTC) and is legally described as Lot 6, DP 1199427. The proponent for the SSDA is Mirvac Green Square Pty Limited.

The proposal aims to:

- Respond to the housing challenges facing Sydney through the delivery of diverse housing types in a highly accessible location;
- Demonstrate the strategic and site-specific merit of accommodating the proposed height and FSR of development on the site;
- Contribute to the establishment of Green Square as a town centre through a mixed-use approach and use urban design principles to integrate residential and non-residential land uses;
- Improve the pedestrian connectivity throughout the site, while encouraging the direct connections to public transport and the existing street network; and
- Appropriately respond to neighbouring development and public domain within the GSTC through podium and tower forms with appropriate massing, which protect solar access and minimise environmental impacts.

RWDI Australia Pty Ltd. (RWDI) has been engaged by Mirvac to investigate the impact of solar reflections emanating from the proposed Sites 7, 17 and 18 of the GSTC development in Zetland, NSW (“the Project”) in support of a State Significant Development Application (SSDA 2) for Sites 7, 17 and 18 of the Green Square Town Centre HDA Application. This report provides the computer modelling results of reflected sunlight from the Project, as shown in Figure 1. It is RWDI’s understanding that the development will be surrounded by typical urban spaces such as busy roadways and other buildings.

This analysis was conducted in two parts. First, a ‘screening’ simulation estimated peak reflection intensities and the frequency of occurrence of reflections which may cause glare for a broad area around the development. This was done in order to understand the potential for thermal and visual impacts on people and property due to the reflections. Note that the screening analysis intentionally assumed a very conservative direction in which the viewer is facing (horizontal, but directly towards the building).

Since reflections were predicted on sensitive spaces, the ‘detailed’ analysis phase was undertaken. This investigated the potential for glare at select locations in greater temporal detail and also included the effect of the direction viewers are likely to be facing.

1.1 Background – Housing Delivery Authority

On 19 December 2024, the Housing Development Authority (HDA) was established by DPHI to accelerate the delivery of housing across NSW, under the Environmental Planning and Assessment (Housing Delivery Authority) Order 2024. This has provided a new State Significant Development pathway in which the proposed redevelopment can be undertaken through.

The site was declared State Significant Development (SSD) pursuant to State Significant Declaration Order 2025 (No 2) issued on 26 February 2025. The order specifies development in EOI application 232525 dated 17 January

2025, including development for the purposes of mixed use development comprising commercial premises and residential accommodation with the provision for affordable housing and Build to Rent (BTR) at 960A Bourke Street, 6 Geddes Ave and 411 Botany Road, Zetland as identified in Schedule 18, is declared to be SSD.

The HDA SSD pathway has been established to accelerate delivery of housing and requires that the subject SSD is lodged within 9 months from receipt of the Secretary's Environmental Assessment Requirements (SEARs). Current SEARs for the project were issued for Early Works on 15 April 2025 (SSD-82328958) (SSDA 1), Sites 7, 17 and 18 on 15 May 2025 (SSD-83899206) (SSDA 2) and for Sites 8 and 19 on 15 May 2025 (SSD- 84322496) (SSDA 3).

The key features of the Mirvac Green Square HDA proposal are:

- Detailed development consent for the purposes of a mixed use development, with significant residential components comprising build to sell and build to rent dwelling stock and ground floor non-residential uses.
- Delivery of between 1,000 to 1,200 dwellings across 9 buildings in low rise and high rise tower formats.
- Delivery of Affordable Housing dwellings.
- Delivery of the components in two-stage detailed SSDA process.

In conjunction with the SSDA, a State-assessed rezoning process is intended to facilitate the proposed development.

This SSDA forms the second application as part of broader HDA declared development and forms the main works to develop sites 7, 17 and 18 of the GSTC.

1.2 Site Description

The site is located at 960A Bourke Street, Zetland and is located within the GSTC. It is situated within the Sydney Local Government Area (LGA) and is located approximately 3.5km south of the Sydney CBD and within immediate proximity of the Green Square Railway Station. The site forms the northern component of the Mirvac HDA proposal, consisting of one lot which is legally described as Lot 6, DP 1199427. An aerial photo of the site is shown in **Figure 1** below.

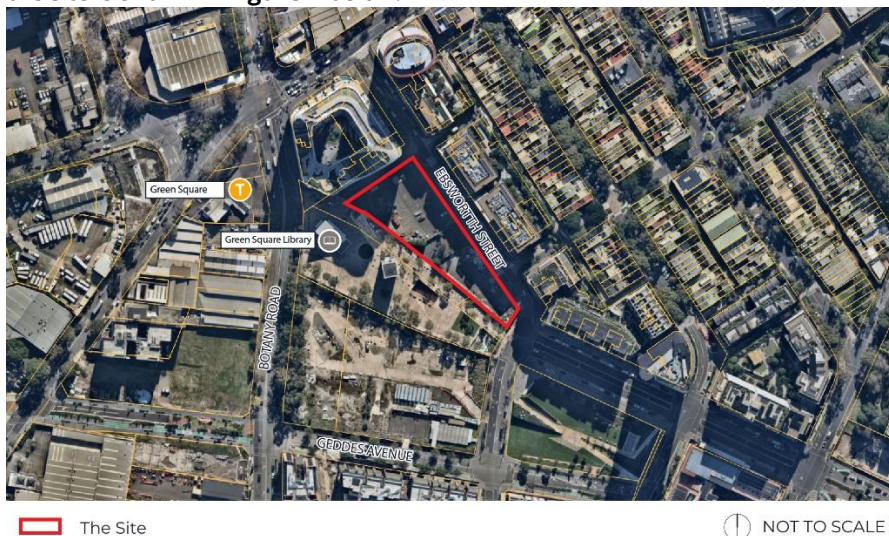


Figure 1: Sites 7, 17 and 18 Site Aerial

Source: Nearmap, Colliers Urban Planning edits.



1.3 Overview of the Proposed Development

The proposed development seeks to deliver the construction of three BTR buildings which will integrate residential, retail, resident amenity and public domain uses. Specifically, the proposal seeks approval for:

- Excavation and enabling works.
- Construction of 3 mixed use BTR buildings up to 21 storeys in height, comprising:
 - 511 BTR dwellings including a variety of dwelling types including Studio, 1, 2 and 3-bedroom apartments, a portion of which will be affordable housing.
 - Shared internal and external residential amenity space.
 - Non-residential floor space including retail, BTR staff offices and BTR resident lobbies
 - A shared basement level, incorporating loading zones, waste collection and servicing.
 - Car parking and bike parking to service the proposed development.
- Public domain and landscaping improvements, including:
 - External pedestrian laneways, pathways and through-site links.
 - Tree removal, protection, new plantings and landscaping works.
- Utility and stormwater connections to support the new development.
- Concurrent amendments to the Sydney Local Environmental Plan (Green Square Town Centre) 2013 to facilitate the SSDA.

1.4 Secretary’s Environmental Assessment Requirements

In accordance with section 4.39 of the Environmental Planning & Assessment Act 1979 (EP&A Act), Secretary’s Environmental Assessment Requirements (SEARs) (SSD-83899206) have been issued. This report has been prepared to respond to the issued SEARs, as set out in the table below.

Table 1: SSD-83899206 SEARs

| SEAR | | Response / Location Address in Report |
|--|---|---------------------------------------|
| <p>7. Environment Amenity</p> | <p>Assess amenity impacts on the surrounding locality, including solar access, visual privacy, view loss and view sharing, as well as wind, lighting and reflectivity impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated.</p> | <p>Section 3</p> |

1.5 Summary of Mitigation Suggestions

Table 2 provides a summary of the mitigation suggestions based on the predicted results in this report. For detailed information on each mitigation suggestion and its exact location, refer to Figure 6 and Figure 7 in Section 3.

Table 2: Mitigation Suggestions for Solar Reflectivity

| ID | Mitigation Suggestions |
|---------------------------|---|
| Solar Reflectivity | |
| Site 18 | <p>North Elevation (nominated areas of levels 1-4 shown in Figure 6)</p> <ul style="list-style-type: none"> • Changing the reflective element to be non-reflective, or • Modifying the exterior facing surface (i.e. 'frosting' or roughening the surface), or • Constructing physical blockages. <p>East Elevation (nominated areas of levels 3-5 shown in Figure 7)</p> <ul style="list-style-type: none"> • Employing vertical mullion fins with a fin depth that is approximately 23% of their horizontal spacing, or • Utilising a glass with 7% reflectivity or lower, or • Antireflective coating or applying an acid etch to the exterior surface. <p>South Elevation (nominated areas of levels 3-5 shown in Figure 7)</p> <ul style="list-style-type: none"> • Changing to a glass with reflectivity of 19% or lower. |

2 BACKGROUND

2.1 Understanding Urban Reflections

While a common occurrence, solar reflections from buildings can lead to numerous visual issues, including:

- Impair the vision of motorists and others who cannot easily look away from the source;
- Cause nuisance to pedestrians or occupants of nearby buildings; and
- Create undesirable patterns of light throughout the urban fabric.

However, the level of impact of these issues on people and property will be influenced by many other factors that are unique to the reflecting surface(s), the individual(s)/object(s) exposed to reflections and the environment around them. In a complex urban space, these factors are often difficult to reasonably predict, if they can be predicted at all.

As such, it must be acknowledged that there is an element of uncertainty and subjectivity to any reflection analysis, particularly when it comes to visual glare which is inherently a subjective experience and lacks a universally agreed upon quantifiable definition. The metric and threshold used by RWDI (detailed in Appendix A) are based on industry standard approaches in Australia, but as noted above, are subject to a degree of uncertainty/subjectivity. This means that the possibility of reflection impacts from a building can never be completely ruled out through simulation.

RWDI's approach is to instead provide a suitably conservative analysis of the potential effects of reflected sunlight and contextualise how the Project's reflections compare to other projects studied by RWDI, and if any predicted impacts would be considered atypical given the Project's context. Regulation and enforcement of performance requirements is the responsibility of others.

2.2 Methodology

The analysis was conducted using RWDI's in-house proprietary *Eclipse* simulation engine. The first phase was a 'Screening Analysis' which predicted the maximum intensity and frequency of occurrence of reflections from the Project for every hour of a full calendar year. These values were computed on 'presentation surfaces' located approximately 1.5 m above grade-level within an approximately 300 m radius of the Project (Figure 2). Note that this analysis included the existing surrounding context and excluded proposed developments that are currently under assessment or approved (i.e. not yet under construction). Note that the screening analysis intentionally assumed a very conservative direction in which the viewer is facing (horizontal, but directly towards the building).

Should the potential for glare exist on roadways or other sensitive spaces, multiple 'receptor points' are selected to undergo the second 'Detailed Analysis' phase. This analysis works similarly to the screening simulation, except glare is tested at one-minute increments and a direction of view is explicitly prescribed. This yielded detailed predictions at specific locations of when reflections can occur, how long they can occur for and the locations of problematic glare sources. The detailed study also provides the level of reflectivity reduction required to comply with local criteria.

As reflections were predicted on sensitive spaces, the detailed assessment was undertaken for this Project. Note that the detailed analysis was not intended to be an exhaustive investigation of all locations where reflections are possible. It was instead intended to provide an understanding of the range of possible reflection characteristics from the Project.

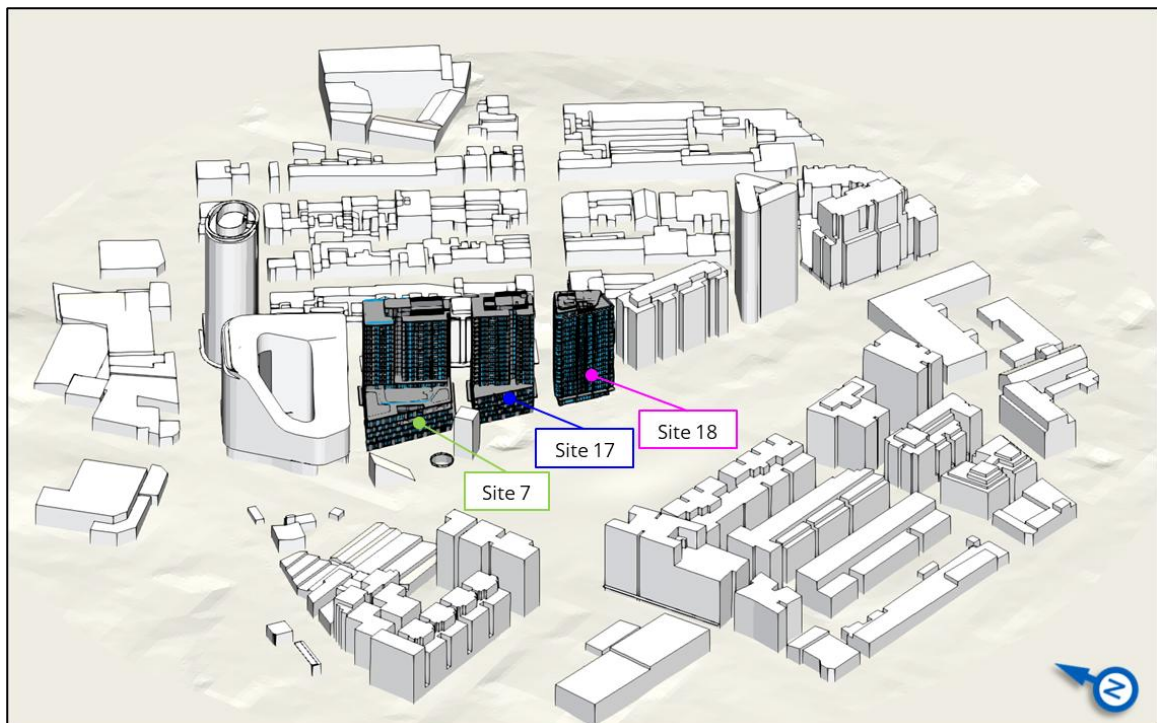


Figure 2: 3D Computer Model of the Project and Surrounding Context

2.3 Assumptions and Limitations

2.3.1 Meteorological Data

This analysis used 'clear sky' solar data computed at the location of Sydney International Airport using the method promulgated by the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE). This approach used mathematical algorithms to derive solar intensity at a given location, ignoring the localised effects of cloud cover. This provides a 'worst case' scenario showing the full extent of when and where glare could ever occur.

2.3.2 Radiation Model

RWDI's analysis is only applicable to the visual impacts of solar radiation (i.e. visible wavelengths only) on people, including drivers in the vicinity of the development. It did not consider the impact of the building related to any other forms of radiation, such as thermal energy, cellular telephone signals, RADAR arrays, etc.

2.3.3 Study and Surrounds Models

The analysis was conducted based on a 3D model of the proposed Sites 7 and 17, provided by Fender Katsalidis, and Site 18, provided by Plus Studio, to RWDI up to November 21, 2025.

The surrounding model was generated based on publicly available data and previous RWDI projects in the area. This analysis included the existing surroundings and excluded buildings currently under construction or approved (i.e. not yet under construction), as this would be conservative on the reflections falling on the public realm. All data sources were cross-checked against LiDAR data published by the NSW Department of Finance, Services, and Innovation. This dataset was also used to generate the ground surface and has a stated vertical and horizontal accuracy of 0.3m and 0.8m, respectively (both at a 95% confidence interval).

Potential reductions of solar reflections due to the presence of vegetation or other non-architectural obstructions (such as railings) were not included, nor were reflections from other buildings, per standard industry practice. Light that has reflected off several surfaces was assumed to have a negligible impact. As such, only a single reflection from the Project was included in the analysis.

This analysis assumed that all reflective elements are in their as-designed condition, (i.e. clean, free from damage, degradation, distortion, etc.) and that the building envelopes of all buildings are complete and uncompromised (i.e. any elements of the walls/roofs that are not designed to be exposed to sun, are shielded).

The results presented in this report are highly dependent on both the form and materiality of the Project. Should there be any changes to the design, it is recommended that RWDI be contacted and requested to review any potential effects on the findings of this report.

2.3.4 Facade Material Reflectance

All glazing has been assumed to have a nominal 20% reflectivity for visible light approaching perpendicular to the surface, which increases with the angle of incidence. While the nominal reflectivity values of the IGUs are noted above, the reflectivity of glass will increase exponentially as light strikes it at increasingly glancing angles. This effect was included in the simulations. We have also omitted the railing in the model for conservatism.

RWDI have also included glazed spandrels as being reflective in the assessment as confirmed by the design team. It is RWDI's understanding that all other materials on the facades have negligible specular reflectivity and, therefore, were not included as reflection sources.

The locations of the reflective materials on the facades are illustrated in Figure 3.

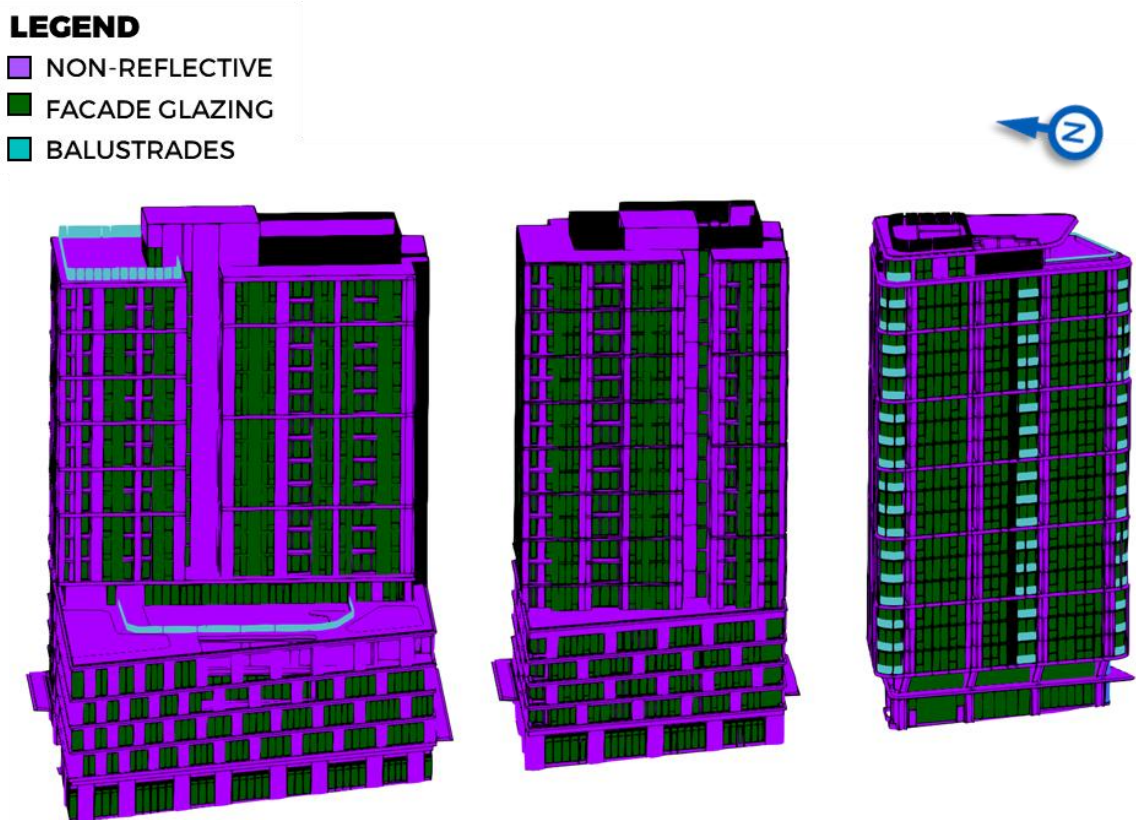


Figure 3: Locations of Reflective Building Elements (Surrounding Context removed for Clarity)

2.3.5 Human Factors

This analysis also assumes reasonable and responsible behaviour on the part of people in the vicinity of the development. A reasonable and responsible person would not purposely look towards a bright reflection, purposely prolong their exposure to reflected light, or otherwise intentionally try to cause discomfort/harm to themselves or others and/or damage to the property.

3 RESULTS AND DISCUSSION

3.1 Screening-Level Analysis

3.1.1 Results

This section presents the screening results pertaining to the solar impacts of the Project on the surrounding urban area.

The **Percentage of Time Above the Veiling Luminance Threshold** plot (Figure 4) identifies the percentage of day-time hours where the veiling luminance was predicted to exceed the 500 cd/m² limit proposed by Hassall¹. *Note that, as a conservative assumption, at each location, it is assumed that the viewer is always facing horizontally towards the source of any reflection that can reach them.*

The veiling luminance-based results present predictions for a 62-year-old viewer. This represents approximately the 80th percentile age of the residents of New South Wales, which means that veiling luminance will be lower than these predictions for 80% of the population.

It is important to understand that the figures do not show a specific moment in time, but rather present aggregated reflection predictions for an entire year.

In order to attain a complete understanding of the impact that reflections may have on people, other factors must be considered, including the duration of the reflections, when they occur and where the viewer is looking. The following plot serves to illustrate the general characteristics of reflections from the Project and informed the locations of the receptor points selected for the detailed phase of work, which analysed these factors in greater detail.

¹Hassall, D., "Reflectivity: Dealing with Rogue Solar Reflections" University of New South Wales, 1991.

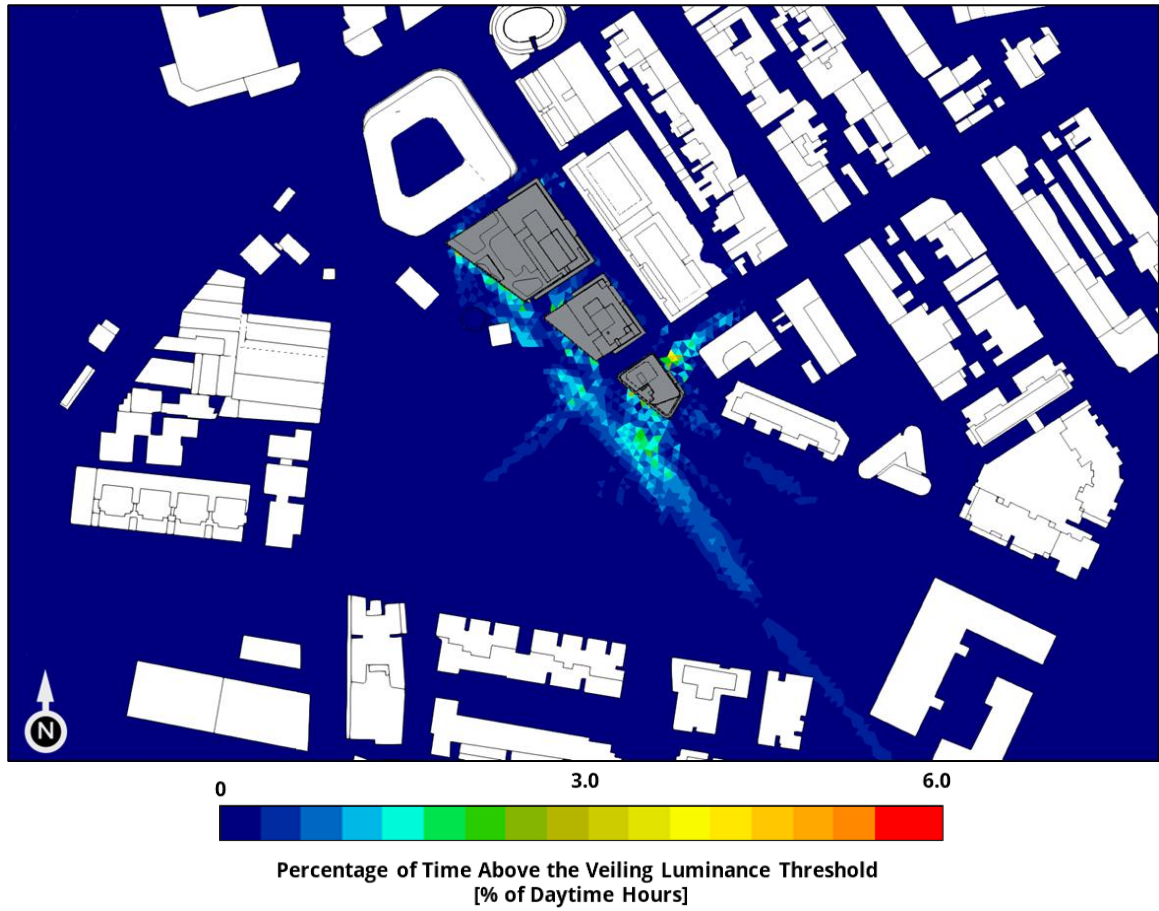


Figure 4: Frequency (% of Daylit Hours) Where Veiling Luminance Above Threshold were Predicted at Pedestrian Height for an 80th Percentile Resident (Age 62)

3.2 Detailed Analysis

3.2.1 Receptor Locations

Based on the findings of the Screening Analysis, 12 representative points were selected for the Detailed Analysis. These points are described in Table 3 and illustrated in Figure 5. Unless otherwise indicated, all points are located at a height of 1.5m above local grade.

Table 3: Receptor Descriptions

| Receptor Number | Receptor Description |
|------------------------|--|
| D1 | Northbound drivers at the Botany Rd-Geddes Ave intersection, turning right onto Geddes Ave |
| D2 | Northbound drivers at the Paul St-Geddes Ave intersection |
| D3 | Westbound drivers at the Geddes Ave-Paul St intersection, turning right onto Paul St |
| D4 | Westbound drivers along Geddes Ave |
| D5 | Westbound drivers along Zetland Ave |
| D6 | Westbound drivers on Paul St, approaching the Paul St-Barker St intersection |
| D7 | Southbound drivers at the Barker St-Paul St-Ebsworth St intersection |
| D8 | Eastbound drivers at the Ebsworth St-Tweed Pl intersection, turning right onto Tweed Pl |
| D9 - D10 | Eastbound drivers on the shared road along Library Plaza |
| D11 | Northbound drivers on Paul St, approaching the Paul St-Zetland Ave intersection |
| D12 | Eastbound drivers along Ebsworth St, near the pedestrian crosswalk |

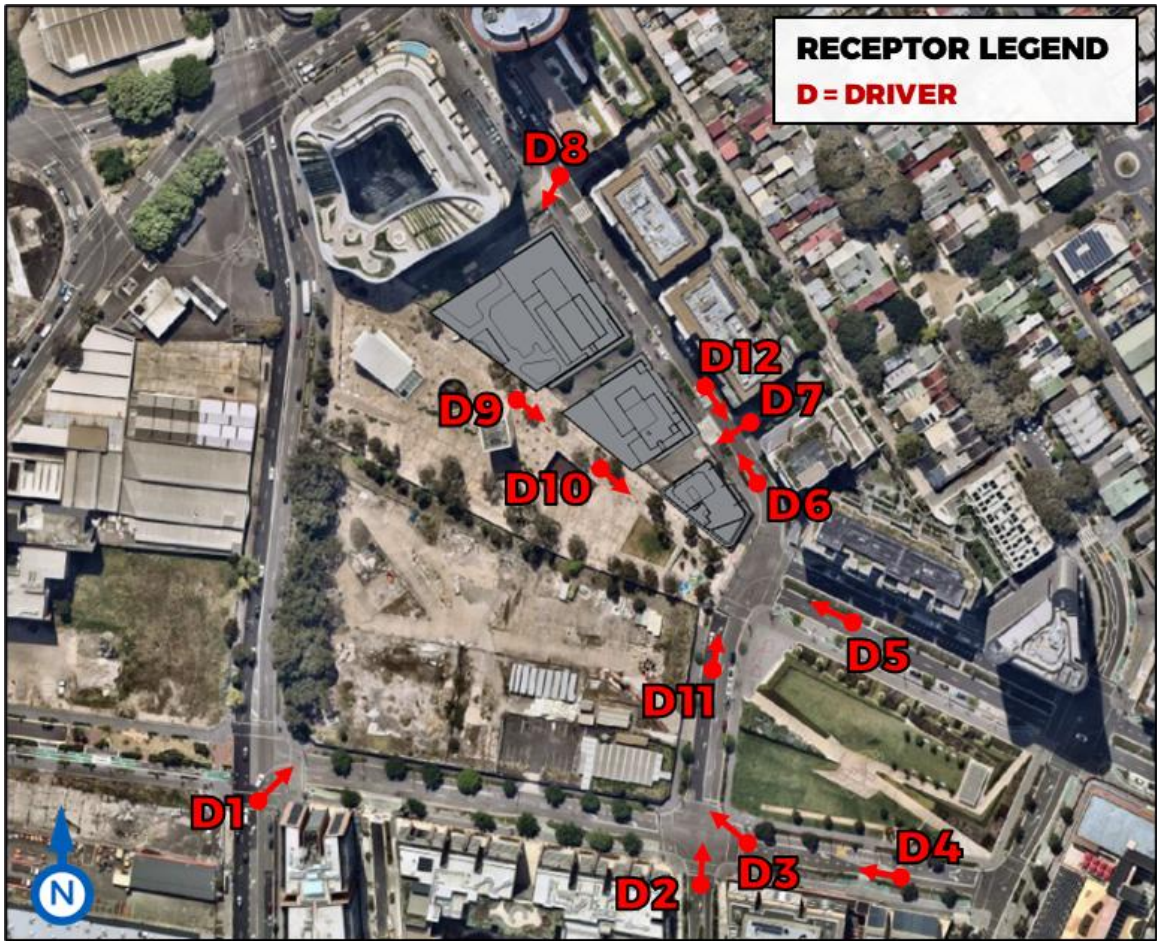


Figure 5: Driver Receptor Locations (Map Underlay Credit: NearMap)

3.2.2 Presentation of Results

Table 4 below summarises the level of visual impact predicted at each of the studied receptors based on the simulation results. The minute-by-minute results for each point are presented as ‘Annual Reflection Impact Diagrams’ which distil an entire year’s worth of data into a single diagram. The diagrams for each receptor, as well as an explanation for how to read the diagrams, are provided in Appendix B. Additional details of RWDI’s criteria are found in Appendix A.

Table 4: Summary of Overall Predicted Impacts on Receptors

| Receptor Number | Receptor Type | Max Veiling Luminance (cd/m ²) | Duration / Total Number of Minutes with High Impact Reflection (Veiling Luminance > 500 cd/m ²) | % of High Impacts Where the Sun Is Also Visible |
|-----------------|---------------|--|---|---|
| D1 | Driver | 207 | N/A | N/A |
| D2 | Driver | 212 | N/A | N/A |
| D3 | Driver | 55 | N/A | N/A |
| D4 | Driver | 26 | N/A | N/A |
| D5 | Driver | 278 | N/A | N/A |
| D6 | Driver | 249 | N/A | N/A |
| D7 | Driver | 3,165 | Average Duration: 12 minutes Total: 2,889 minutes/year (1.09% of the daytime) | 0% |
| D8 | Driver | 223 | N/A | N/A |
| D9 | Driver | 187 | N/A | N/A |
| D10 | Driver | 190 | N/A | N/A |
| D11 | Driver | 669 | Average Duration: 5 minutes Total: 319 minutes/year (0.12% of the daytime) | 0% |
| D12 | Driver | 78 | N/A | N/A |

3.3 Overall Observations and Conclusions

1. Like any contemporary building, the reflective surfaces of the Project are naturally causing solar reflections in the surrounding area.
2. The screening analysis generally predicted a very low potential for visual glare within the surrounding roads, even with its highly conservative assumption that the viewer would always be looking horizontally towards the source of the reflection. The most frequent reflections on the public roads were predicted to be confined to the area at the Barker Street, Paul Street and Ebsworth Street intersection (up to 3.0% of the daytime hours annually) and at the Paul Street and Zetland Avenue intersection (approximately 1.9% of the daytime hours annually). It is noted that the results are based on a conservative viewing assumption; this frequency of glare potential would only be possible if drivers were unsafely looking toward the source of the reflection (e.g., at the Project) rather than the road ahead.
3. The detailed analysis, which accounted for more realistic view directions and operated at one-minute increments, predicted that drivers at the Barker Street, Paul Street and Ebsworth Street intersection (receptor D7) and drivers on Paul Street (receptor D11) were predicted to have the potential for glare as they approach the Project during the early morning hours between April and August. Receptor D11 was also predicted to have additional potential for glare as they approach the Project during the afternoon hours in February and October. On average, the reflections were predicted to last 12 minutes and 5 minutes, respectively. That said, the frequency at which glare was possible was predicted to be low (1.09% and 0.12% of the daytime annually, respectively).
4. If mitigations are desired for the receptors noted above, the highlighted areas in Figure 6 and Figure 7 illustrate the sources of glare. Design strategies are also proposed in Figure 6 and Figure 7, which can be applied to reduce or eliminate glare impacts, and should be further developed and refined during the detailed design stage.
5. All remaining studied drivers (D1-D6, D8-D10, and D12) have the potential to be exposed to reflections emanating from the Project. However, none of these reflections were predicted to exceed the veiling luminance threshold of 500 cd/m².
6. For further details, refer to the visual impact diagrams for all receptors (D1-D12) as shown in Appendix B.
7. Given the safety risks associated with glare impacts on drivers, RWDI's analysis is intentionally conservative. It assumed clear skies for all daytime hours and ignored the effects of any landscaping, the use of sunglasses, as well as obstructions to reflected light due to the car body.
8. The results presented in this report are highly dependent on both the form and materiality of the Project. Should there be any changes to the design, it is recommended that RWDI be contacted and requested to review any potential effects on the findings of this report.

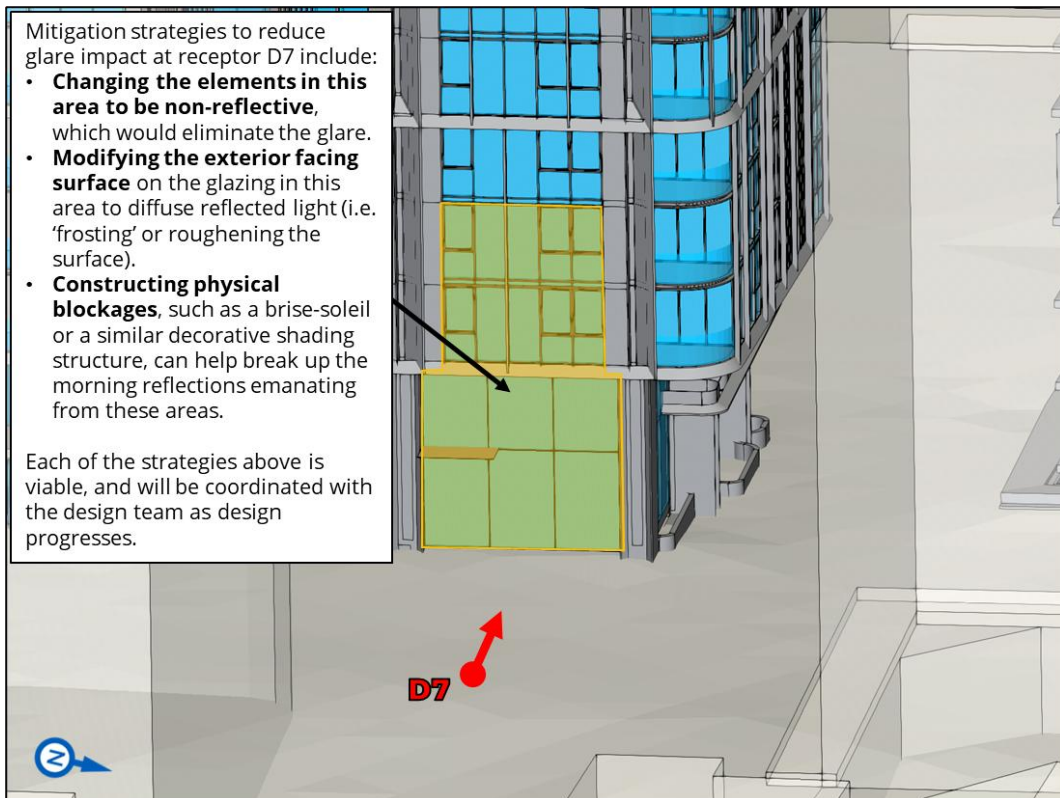


Figure 6: Markup of Facade Locations for Glare Source at Receptor D7

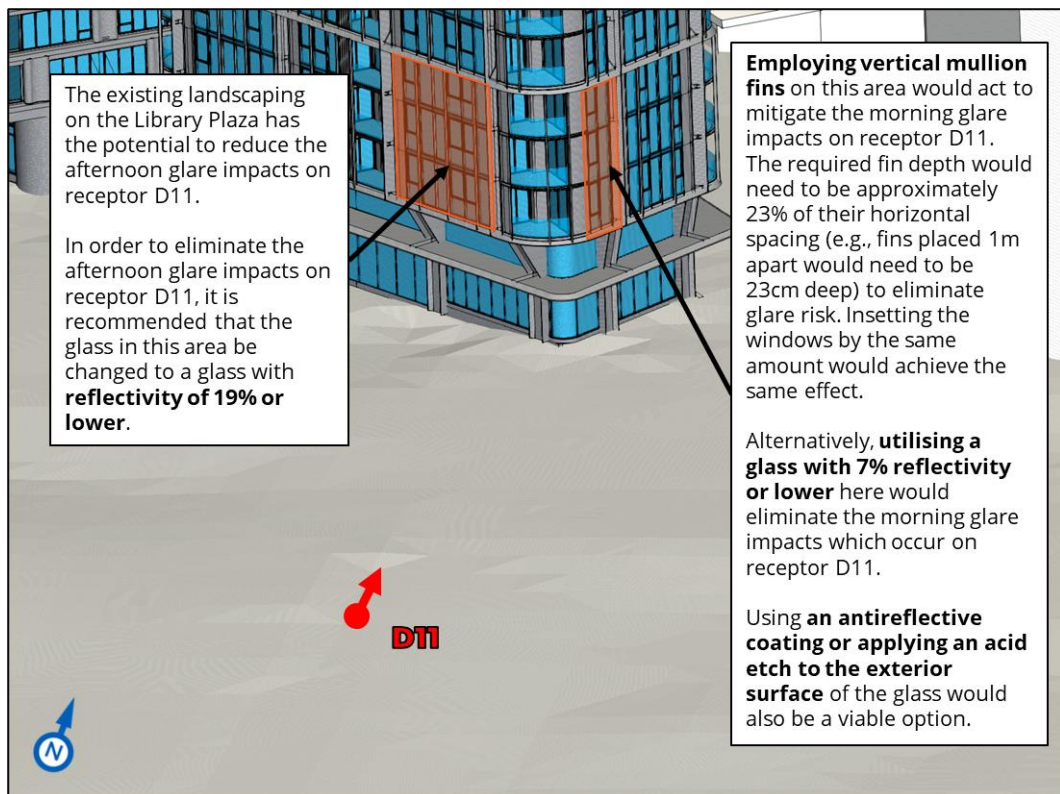


Figure 7: Markup of Facade Locations for Glare Source at Receptor D11

4 CUMULATIVE IMPACT ASSESSMENT

As outlined in the Department of Planning, Housing and Infrastructure's "Cumulative Impact Assessment Guidelines for State Significant Projects" project level cumulative impact assessment is considered for the impacts of the Project in combination with other reasonably foreseeable and wind significant future projects within the vicinity (see Figure 8). This CIA is also proportionate to the scale and significance of the Project and the considered future projects.

With regards to solar reflectivity, the future development of Green Square Stages 4 and 5, located approximately 50 meters south of the Project, is not expected to significantly alter the reflections emanating from the Project majority of the time, due to the relative position to the sun path. Some potential reduction of solar reflectivity, especially in the afternoons during the summer months, is anticipated, thus further reducing the potential implications to drivers along Botany Road and Geddes Avenue.



Figure 8: Nearby Future Development (in Magenta)



5 GENERAL STATEMENT OF LIMITATIONS

This report, entitled "*Green Square Stage 3 BTR - Solar Reflection Screening Analysis*", was prepared by RWDI Australia Pty Ltd ("RWDI") for Mirvac ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared.

Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilise the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

APPENDIX A

RWDI REFLECTION CRITERIA

APPENDIX A: RWDI REFLECTION CRITERIA



Visual Glare

RWDI has extensive experience in the analysis and assessment of the impacts of sunlight and solar energy reflected from buildings².

This assessment was conducted in response to the requirements outlined in the Secretary's Environmental Assessment Requirements (SEARs) under Environmental Amenity as reproduced below:

"Assess amenity impacts on the surrounding locality, including solar access, visual privacy, view loss and view sharing, as well as wind, lighting and reflectivity impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated."

However, the SEARs does not provide a description around what constitutes a reflectivity impact or what would be considered a dangerous level of glare from the Project.

In light of the context described above, we have adopted the typical Australian criteria put forth by Hassall¹, which defines glare as occurring when the veiling luminance of a reflection exceeds 500 cd/m².

Veiling luminance was computed using the CIE General Disability Glare Equation³. This equation is a more robust formulation of the classical Stiles-Holladay glare equation that accounts for the effects of age and eye colour when predicting veiling luminance. This formulation remains valid for light sources between 0.1° and 100° away from the direction of view.

RWDI conservatively assumed a light-blue eye colour (pigmentation factor of 1.2) and an observer age of 62 years old for this work. Based on the most recent Australian Census, this age represents approximately the 80th percentile age for the residents of New South Wales. This means that in reality, veiling luminance would be lower than these predictions for 80% of the population.

It should be noted that the 500 cd/m² limit assumes an adaptation luminance corresponding to a dawn or dusk time frame and may be overly conservative during brighter parts of the day.

APPENDIX A: RWDI REFLECTION CRITERIA



References

1. Hassall, D., "Reflectivity: Dealing with Rogue Solar Reflections" *University of New South Wales, 1991.*
2. Danks, R., Good, J., & Sinclair, R., "Assessing reflected sunlight from building facades: A literature review and proposed criteria." *Building and Environment*, 103, 193-202, 2016.
3. Vos, J., et al. "CIE equations for disability glare." *CIE TC Report CIE 146 (2002): 2002.*

APPENDIX B

ANNUAL REFLECTION IMPACT DIAGRAMS

APPENDIX B: ANNUAL REFLECTION IMPACT DIAGRAMS



Presentation of Results

Results are illustrated using “annual impact diagrams”. These plots condense the minute-by-minute annual dataset into a single image. The vertical axis represents the time of the day, and the horizontal axis indicates the day of the year. A sample of such a diagram is shown in Figure B1.

Please note that the referenced times are in local standard time. When Daylight Saving Time is observed, the time should be shifted by an hour when appropriate.

The colours on this plot indicate when all reflections falling on a specific point were predicted and if the predicted veiling luminance exceeds the disability glare threshold (500 cd/m²) for an 80th percentile resident (62 years old) for New South Wales. Hatching (i.e., dark green areas) indicates when the sun would be within 30° of a motorist’s direction of view.

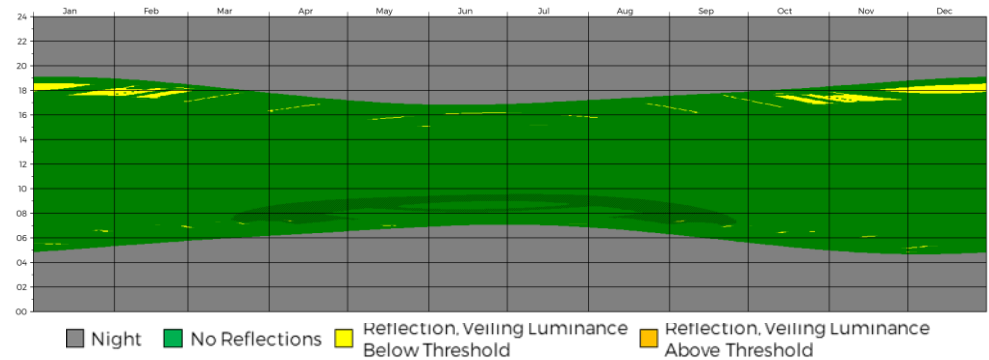


Figure B1: Annual Reflection Impact Diagram for Driver Receptor D1

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Driver Receptor D1

Receptor D1 was chosen to assess the visual impact associated with solar reflections affecting drivers travelling north at the Botany Road and Geddes Avenue intersection, turning right onto Geddes Avenue.

The simulations indicated that reflections may fall on this point more frequently during the following periods:

Between 4:30 pm and 6:45 pm AEST

- October through February

The maximum veiling luminance predicted was 207 cd/m².

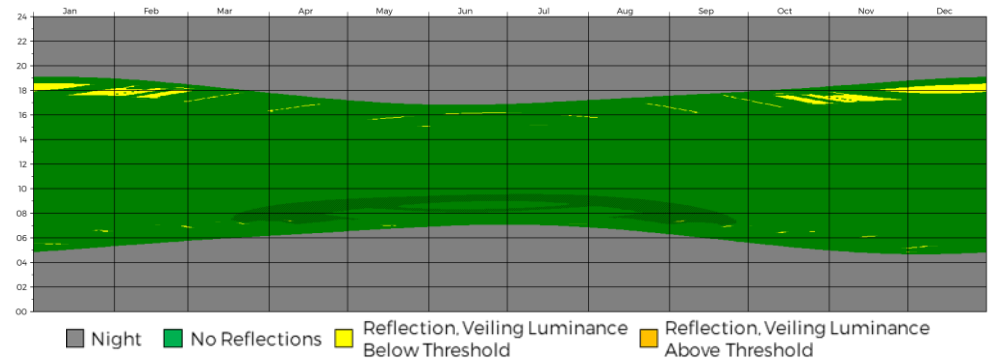


Figure B2: Annual Reflection Impact Diagram for Driver Receptor D1

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Driver Receptor D2

Receptor D2 was chosen to assess the visual impact associated with solar reflections affecting northbound drivers at the Paul Street and Geddes Avenue intersection.

The simulations predicted that reflections may fall on this point during the following periods:

Between 2:30 pm and 7:00 pm AEST

- Throughout the year

Between 7:30 am and 8:45 am AEST

- April through August

The maximum veiling luminance predicted was 212 cd/m².

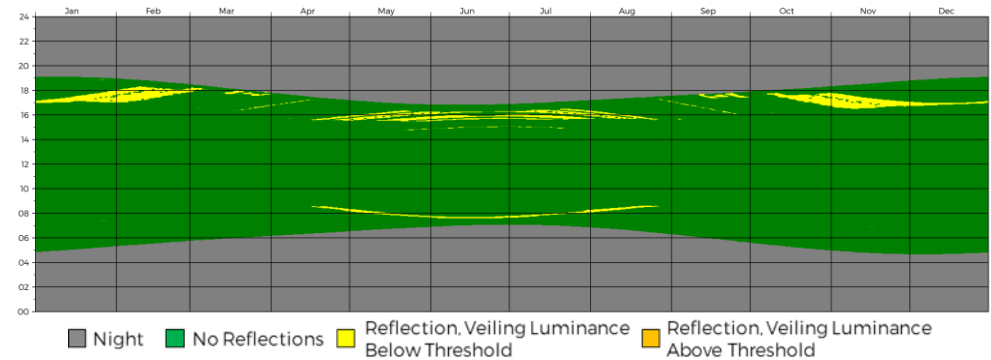


Figure B3: Annual Reflection Impact Diagram for Driver Receptor D2

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Driver Receptor D3

Receptor D3 was chosen to assess the visual impact associated with solar reflections affecting drivers travelling west at the Geddes Avenue and Paul Street intersection, turning right onto Paul Street.

The simulations predicted that reflections may fall on this point during the following periods:

Between 2:45 pm and 7:00 pm AEST

- January through November

Between 7:00 am and 9:45 am AEST

- March through May
- July through September

The maximum veiling luminance predicted was 55 cd/m².

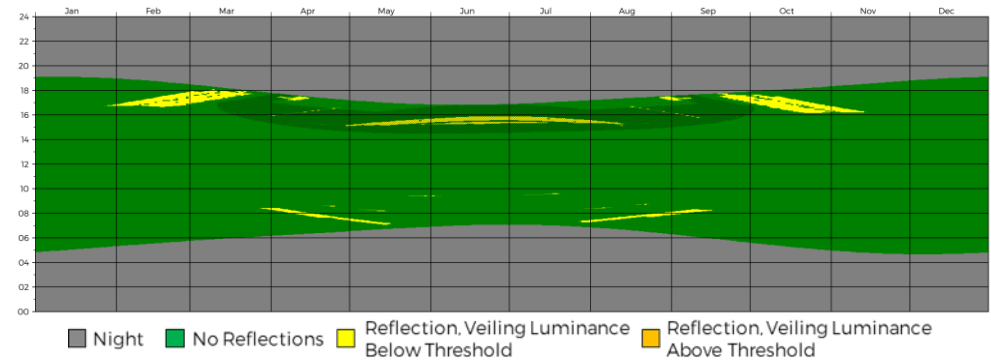


Figure B4: Annual Reflection Impact Diagram for Driver Receptor D3

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Driver Receptor D4

Receptor D4 was chosen to assess the visual impact associated with solar reflections affecting drivers travelling west along Gebbes Avenue.

The simulations predicted that reflections may fall on this point during the following periods:

Between 3:45 pm and 5:30 pm AEST

- March through May
- July through September

Between 6:15 am and 8:00 am AEST

- February through March
- October

The maximum veiling luminance predicted was 26 cd/m².

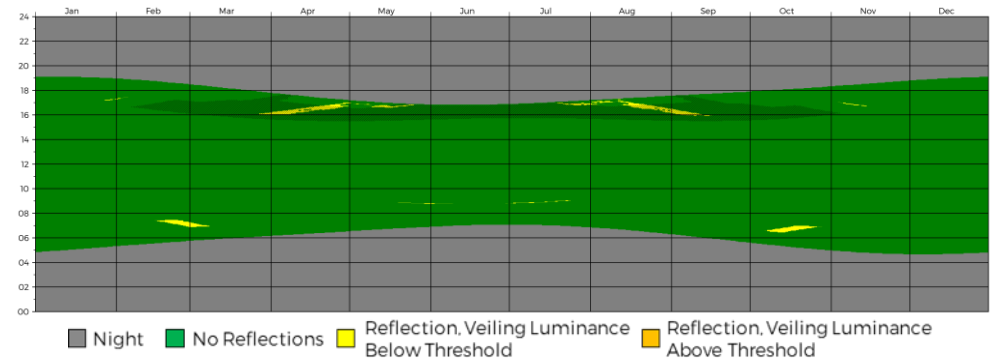


Figure B5: Annual Reflection Impact Diagram for Driver Receptor D4

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Driver Receptor D5

Receptor D5 was chosen to assess the visual impact associated with solar reflections affecting westbound drivers along Zetland Avenue.

The simulations indicated that intermittent reflections fall on this point throughout the year and may fall on this point more frequently during the following periods:

Between 4:30 am and 5:30 am AEST

- November through January

The maximum veiling luminance predicted was 278 cd/m².

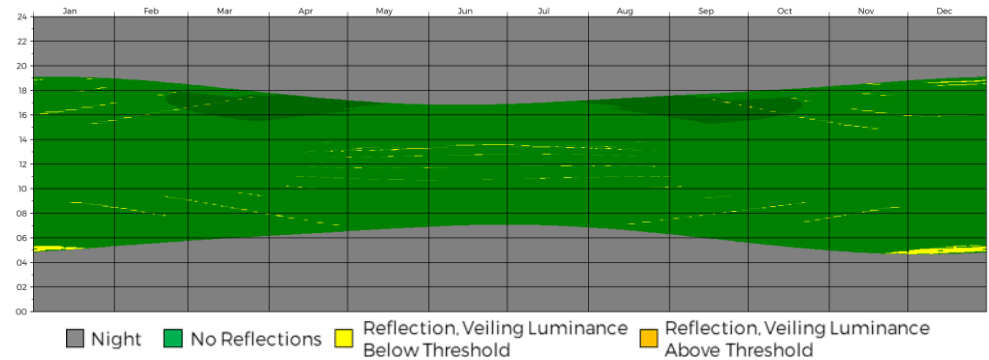


Figure B6: Annual Reflection Impact Diagram for Driver Receptor D5

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Driver Receptor D6

Receptor D6 was chosen to assess the visual impact associated with solar reflections affecting drivers travelling west along Paul Street, approaching the Paul Street and Barker Street intersection.

The simulations predicted that intermittent reflections may fall on this point during the following periods:

Between 9:00 am and 2:00 pm AEST

- Throughout the year

The maximum veiling luminance predicted was 249 cd/m².

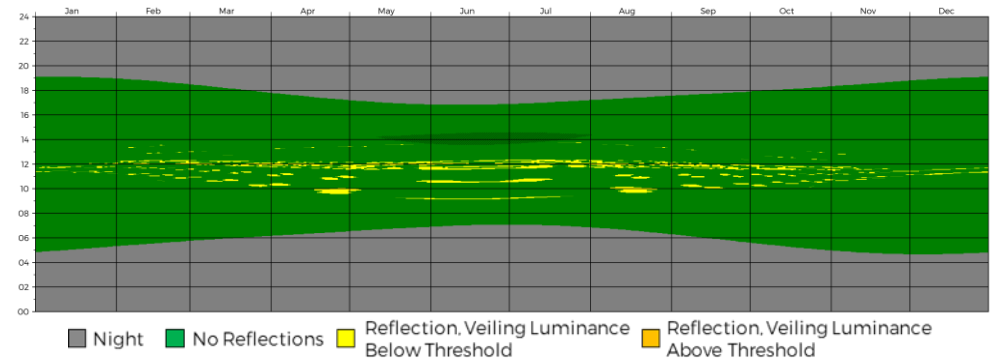


Figure B7: Annual Reflection Impact Diagram for Driver Receptor D6

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Driver Receptor D7

Receptor D7 was chosen to assess the visual impact associated with solar reflections affecting southbound drivers at the Barker Street, Paul Street and Ebsworth Street intersection.

The simulations indicated that reflections may fall on this point more frequently during the following periods:

Between 7:00 am and 11:00 am AEST

- Throughout the year

Instances where veiling luminance exceeded 500 cd/m² (the maximum predicted value was 3,165 cd/m²) were predicted from April through August. On average, these reflections lasted 12 minutes and were predicted to occur between **7:15 am and 8:45 am AEST**, totalling 2,889 minutes per year of potential glare, or 1.09% of the daytime.

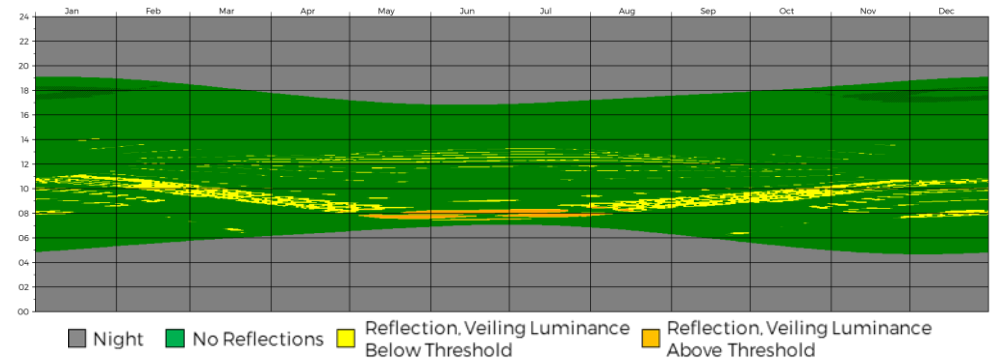


Figure B8: Annual Reflection Impact Diagram for Driver Receptor D7

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Driver Receptor D8

Receptor D8 was chosen to assess the visual impact associated with solar reflections affecting eastbound drivers at the Ebsworth Street and Tweed Place intersection, turning right onto Tweed Place.

The simulations indicated that intermittent reflections fall on this point throughout the year and may fall on this point more frequently during the following periods:

Between 5:45 pm and 6:45 pm AEST

- November through January

The maximum veiling luminance predicted was 223 cd/m².

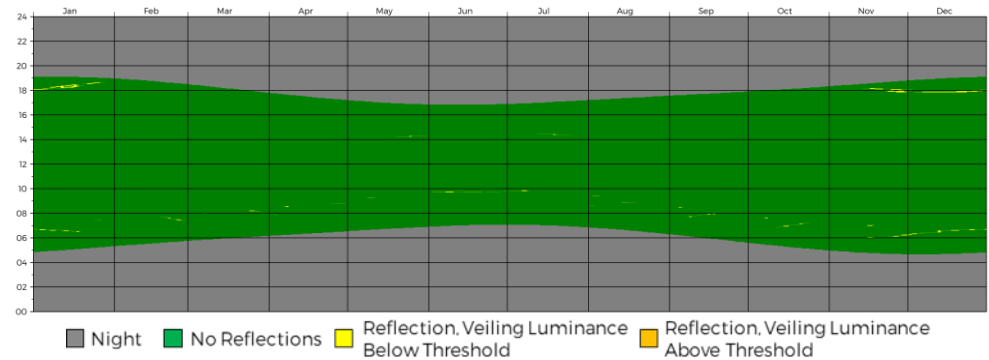


Figure B9: Annual Reflection Impact Diagram for Driver Receptor D8

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Driver Receptor D9

Receptor D9 was chosen to assess the visual impact associated with solar reflections affecting drivers travelling east on the shared road along Library Plaza, approaching Site 17.

The simulations indicated that intermittent reflections fall on this point throughout the year and may fall on this point more frequently during the following periods:

Between 9:00 am and 12:00 pm AEST

- February through May
- July through October

The maximum veiling luminance predicted was 187 cd/m².

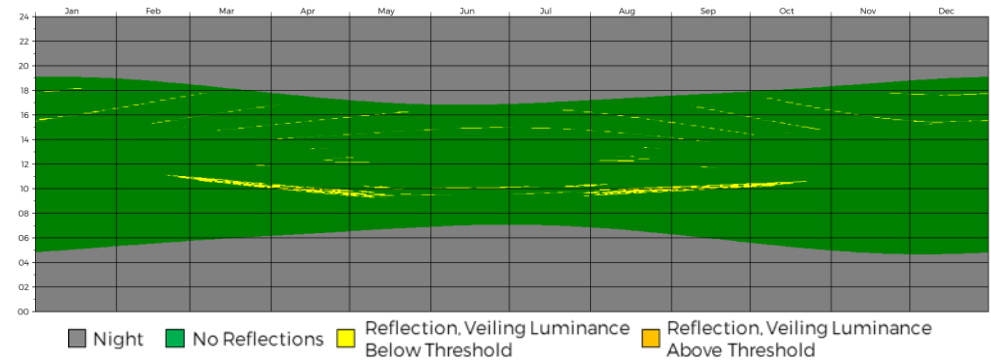


Figure B10: Annual Reflection Impact Diagram for Driver Receptor D9

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Driver Receptor D10

Receptor D10 was chosen to assess the visual impact associated with solar reflections affecting drivers travelling east on the shared road along Library Plaza, approaching Site 18.

The simulations indicated that intermittent reflections fall on this point throughout the year and may fall on this point more frequently during the following periods:

Between 9:00 am and 12:00 pm AEST

- February through May
- July through November

The maximum veiling luminance predicted was 190 cd/m².

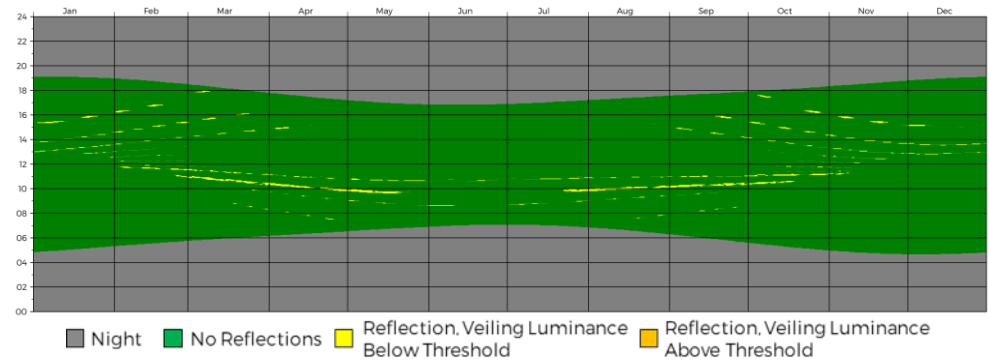


Figure B11: Annual Reflection Impact Diagram for Driver Receptor D10

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Driver Receptor D11

Receptor D11 was chosen to assess the visual impact associated with solar reflections affecting northbound drivers on Paul Street, approaching the Paul Street and Zetland Avenue intersection.

The simulations indicated that intermittent reflections fall on this point throughout the year and may fall on this point more frequently during the following periods:

Between 2:45 pm and 6:15 pm AEST

- September through April

Very brief instances where veiling luminance exceeded 500 cd/m² (the maximum predicted value was 669 cd/m²) were predicted from May through July, and in February and October. On average, these reflections lasted 5 minutes and were predicted to occur between **7:45 am and 8:15 am AEST** and between **5:15 pm and 6:00 pm AEST**, totalling 319 minutes per year of potential glare, or approximately 0.12% of the daytime.

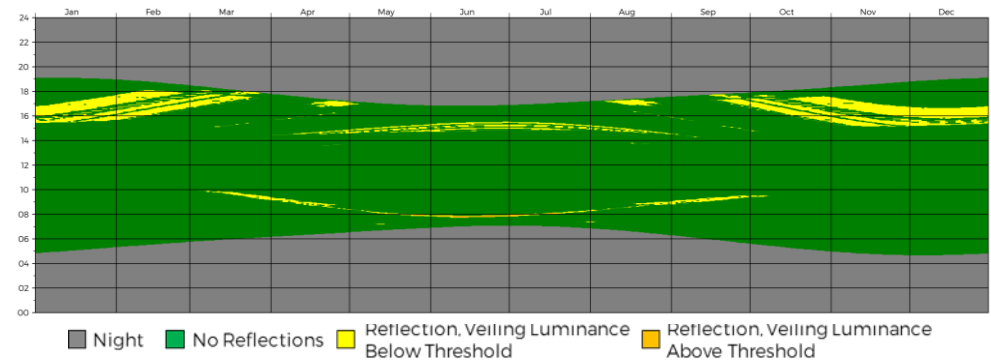


Figure B12: Annual Reflection Impact Diagram for Driver Receptor D11

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Driver Receptor D12

Receptor D12 was chosen to assess the visual impact associated with solar reflections affecting drivers travelling east along Ebsworth Street, near the pedestrian crosswalk.

The simulations indicated that intermittent reflections fall on this point throughout the year and may fall on this point more frequently during the following periods:

Between 9:00 am and 11:00 am AEST

- February through March
- September through October

The maximum veiling luminance predicted was 78 cd/m².

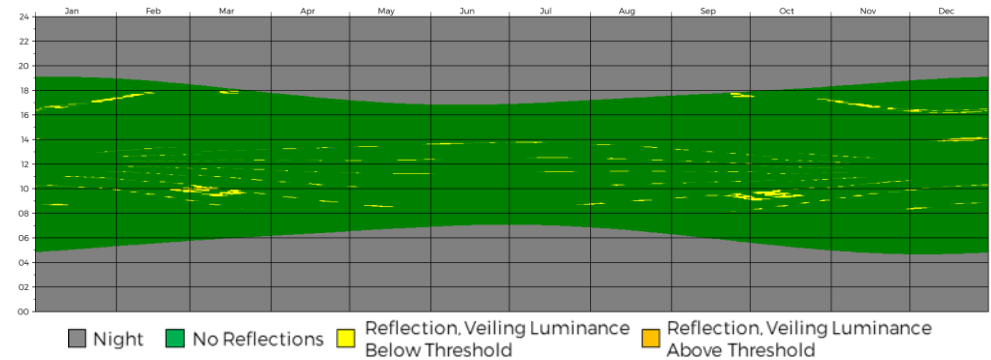


Figure B13: Annual Reflection Impact Diagram for Driver Receptor D12