

## MELROSE PARK SOUTH - WEST

NEW SOUTH WALES

### **SOLAR REFLECTION ANALYSIS (SSDA)**

RWDI #2406138

15 April 2025

#### **SUBMITTED TO**

**Wharf and Hughes  
Developments Pty Ltd**

#### **SUBMITTED BY**

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## DOCUMENT CONTROL

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A	Initial	11 April 2025	TYT	RCD/GEL/HK
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## EXECUTIVE SUMMARY

RWDI Australia Pty Ltd. (RWDI) has been engaged by Wharf and Hughes Developments Pty Ltd to investigate the impact of solar reflections emanating from the proposed development at Melrose Park South – West (“the Project”) in support of a Significant State Development Application (SSDA). 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 Atkins Rd, Massie St and Saunders Rd) were predicted to experience reflections emanating from the Project. Based on the detailed analysis results, the predicted reflections falling on receptor D4 (Eastbound driver at the Saunders Rd and Atkins Rd intersection, turning left into Atkins Rd) were above the veiling luminance threshold of 500 cd/m<sup>2</sup>. Mitigation suggestions have been provided in this report. All of the remaining studied driver receptors were predicted to achieve reflections below the veiling luminance threshold of 500 cd/m<sup>2</sup>.

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

Melrose Park South – West is a mixed-use development located at 82 Hughes Avenue, Ermington NSW 2115, on land zoned as R4 high-density residential and RE1 Public Recreation under the Parramatta Local Environmental Plan 2023.

The site is located within the City of Parramatta LGA and is bounded by Atkins Road to the west, industrial properties to the north, Hughes Avenue to the east, and Ermington Bay to the south, and is approximately 5.2ha.

The site is predominantly characterised by industrial development with warehouse like buildings proposed to be demolished under a separate development application (DA/75/2024). The surrounding area is a mix of industrial, recreational, educational infrastructure and low-density residential. There are a number of green spaces within a 1km radius of the site, including Archer Park, George Kendall Riverside Park, and Meadowbank Park, which has several sporting facilities.

The site has been identified for redevelopment as a part of the broader renewal planned for Melrose Park. This renewal will see the redevelopment of the precinct over time into a highly urban mixed use precinct.

This State Significant Development Application seeks consent for:

- Construction of a mixed use development comprising approximately 123,197sqm of Gross Floor Area in Melrose Park South – West;
- Basement carparking and servicing; and
- Landscaping, and construction of one new waterfront park.

A separate Infrastructure DA (DA/75/2024) is under assessment by City of Parramatta Council which seeks consent for:

- Demolition of existing structures and tree removal on site;
- Earthworks to form design levels of the proposed roads and basins and future development lots;
- Infrastructure and servicing to enable the future development sites including trunk stormwater and utilities; and
- Construction of footpaths and roads.

This infrastructure DA is an enabling DA which supports the SSDA. The matters considered under the SSDA works which are the subject of this report have been co-ordinated with the works under the Infrastructure DA.

This Solar Reflectivity Assessment has been prepared in response to the Secretary’s Environmental Assessment Requirements (SEARS) for SSD-71558711. Specifically, this report has been prepared to respond to the SEARS summarised below in Table 1.

**Table 1: Issue and Assessment Requirements**

Item	Description of Requirement	Section Reference (this report)
<b>5. Environmental Amenity</b>	Assess amenity impacts on the surrounding locality, including lighting impacts, <b>reflectivity</b> , solar access, visual privacy, visual amenity, view loss and view sharing, overshadowing and wind impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated.	Section 3

RWDI Australia Pty Ltd. (RWDI) has been engaged by Wharf and Hughes Developments to investigate the impact of solar reflections emanating from the proposed development at Melrose Park South - West (“the Project”) in support of a Significant State Development Application (SSDA). This report provides the computer modelling results of reflected sunlight from the Project, as shown in Figure 1 below. 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 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 visual impacts on people 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.



**Figure 1: Development Site in Yellow (Source: Sixmaps, annotated by the Client)**

## 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.

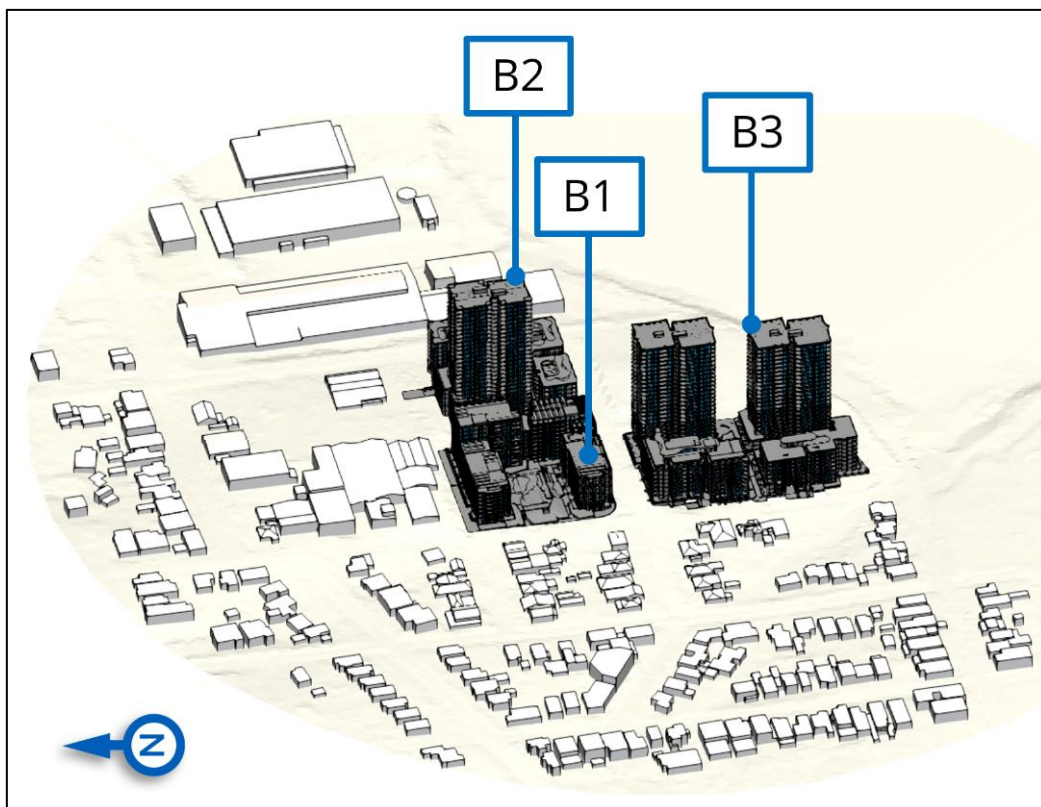
As such, it must be acknowledged that there is an element of uncertainty and subjectivity to any reflection analysis, particularly when it comes to visual glare which is inherently a subjective experience and lacks a universally agreed upon quantifiable definition. The metric and threshold used by RWDI (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.

## 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 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 375 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 Olympic Park AWS 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.

### **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 Project provided by FK to RWDI on March 10, 2025, and any missing elements in the provided 3D model were conservatively assumed to be glazing.

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 assessment 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).

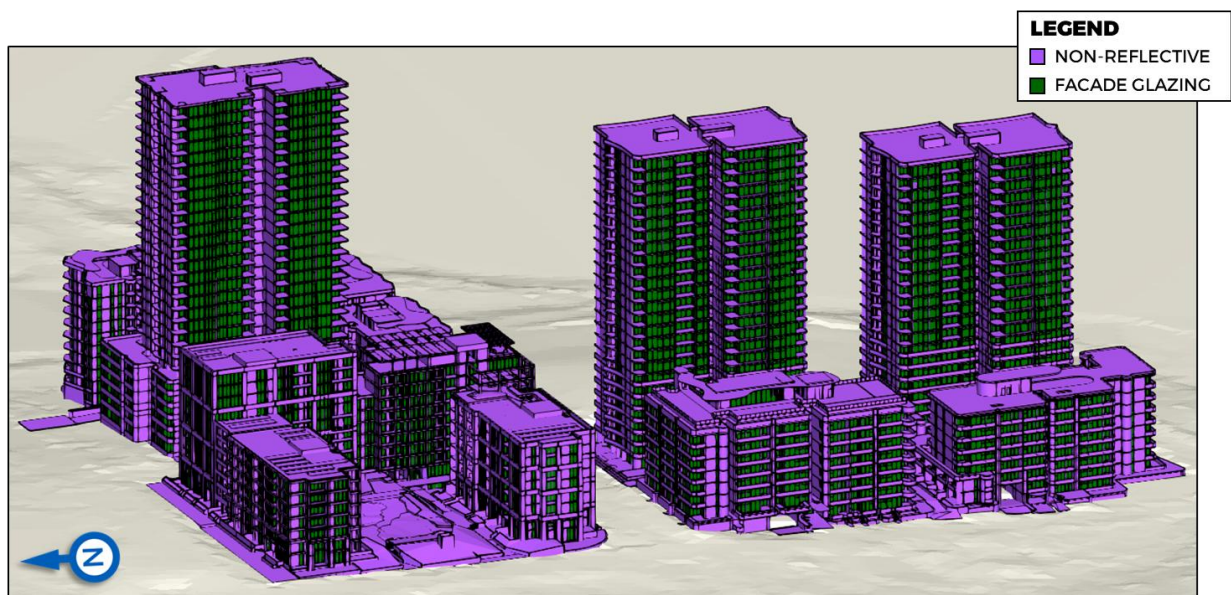
The results presented in this report are highly dependent on both the form and materiality of the Project. Should there be any changes to the design, it is recommended that RWDI be contacted and requested to review their potential effects on the findings of this report.

### 2.3.4 Facade Material Reflectance

All glazing has been assumed to have a nominal 20% reflectivity for visible light which increases with the angle of incidence as the rays approach perpendicular to the surface. Glass balustrades have been assumed to have a nominal visible reflectance and transmittance of 20% and 80%, respectively. 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.

RWDI also notes that only the glazing panels specified through the 3D model received on 10 March 2025 (250310 - MPS Western Precinct Model 1.dwg) have been studied, all other building/facade elements are assumed to be non-reflective. In case of ambiguity due to the 3D model received, RWDI has conservatively assumed the presence of glazed elements. We have also omitted the rain louvres and roof plant screens in the model for conservatism.

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 Presentation of 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/m<sup>2</sup> limit proposed by Hassall. *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 60-year-old viewer. This represents approximately the 80<sup>th</sup> 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.

### 3.1.2 Results

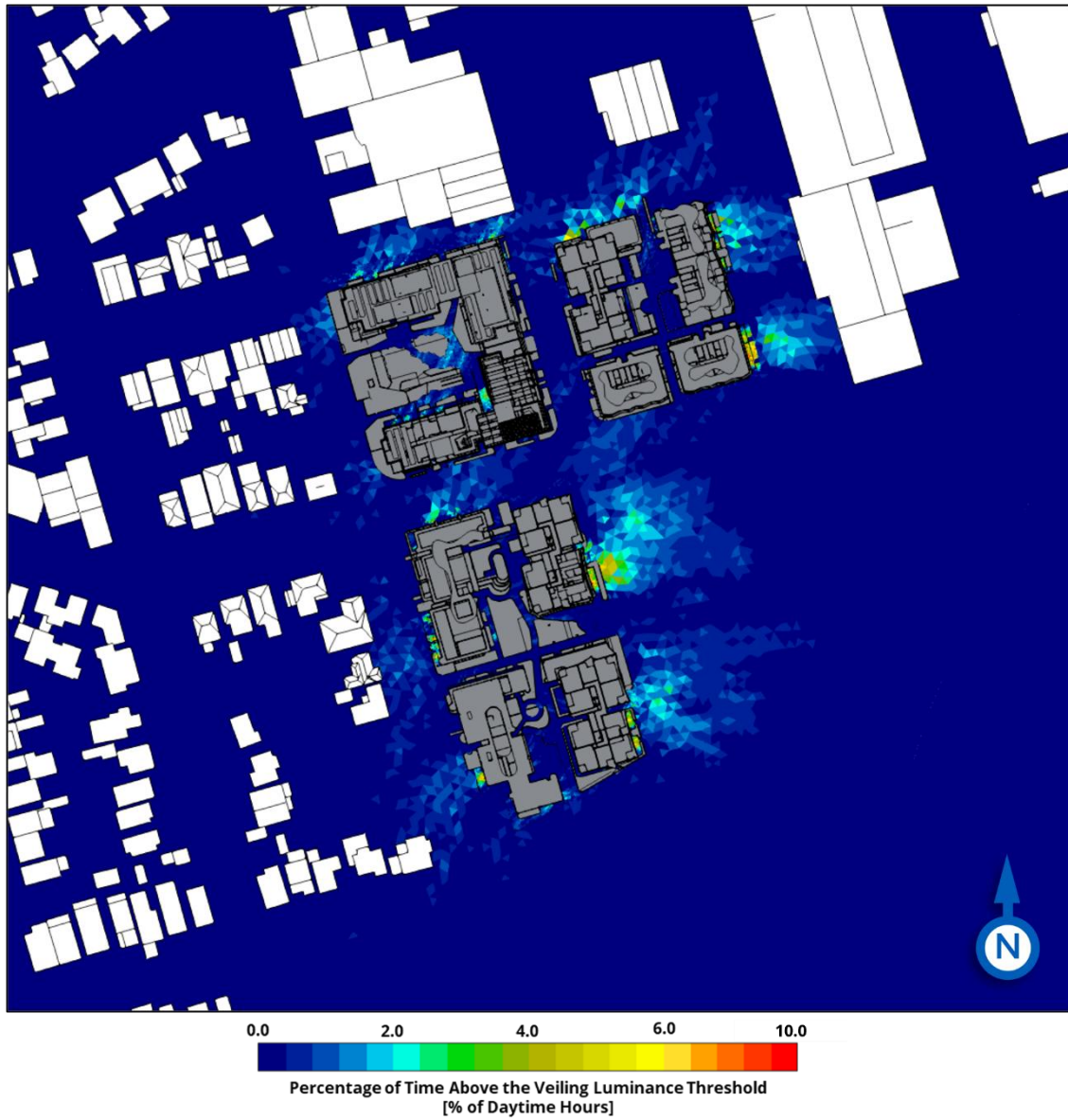


Figure 4: Frequency (% of Daylit Hours) Where Veiling Luminance Above Threshold were Predicted at Pedestrian Height for an 80<sup>th</sup> Percentile Resident (Age 60)

## 3.2 Detailed Analysis

### 3.2.1 Receptor Locations

Based on the findings of the Screening Analysis, 19 representative points were selected for the Detailed Analysis. These points are described in Table 2 and illustrated in Figure 5. Unless otherwise indicated, all points are located at a height of 1.5m above local grade.

**Table 2: Receptor Descriptions**

<b>Receptor Number</b>	<b>Receptor Description</b>
<b>D1, D9</b>	Northbound driver on Atkins Rd
<b>D2, D10</b>	Southbound driver on Atkins Rd
<b>D3</b>	Eastbound driver at the Massie St and Atkins Rd intersection, turning right into Atkins Rd
<b>D4</b>	Eastbound driver at the Saunders Rd and Atkins Rd intersection, turning left into Atkins Rd
<b>D5</b>	Eastbound driver at the Saunders Rd and Atkins Rd intersection, turning right into Atkins Rd
<b>D6</b>	Eastbound driver at the Saunders Rd
<b>D7</b>	Northbound drivers on Hughes Ave
<b>D8</b>	Southbound drivers on Hughes Ave
<b>D11</b>	Eastbound driver on Gregory St
<b>D12</b>	Westbound driver on Mary Street
<b>D13</b>	Eastbound driver on Mary Street
<b>D14</b>	Northbound driver on NSR-5A
<b>D15</b>	Southbound drivers turning right at the Mary Street and NSR-5 intersection
<b>D16</b>	Northbound drivers turning right at the Mary Street and NSR-5A intersection
<b>D17</b>	Southbound driver on NSR-5
<b>D18</b>	Eastbound drivers turning left at the Mary Street and NSR-5 intersection
<b>D19</b>	Northbound drivers on EWR-10

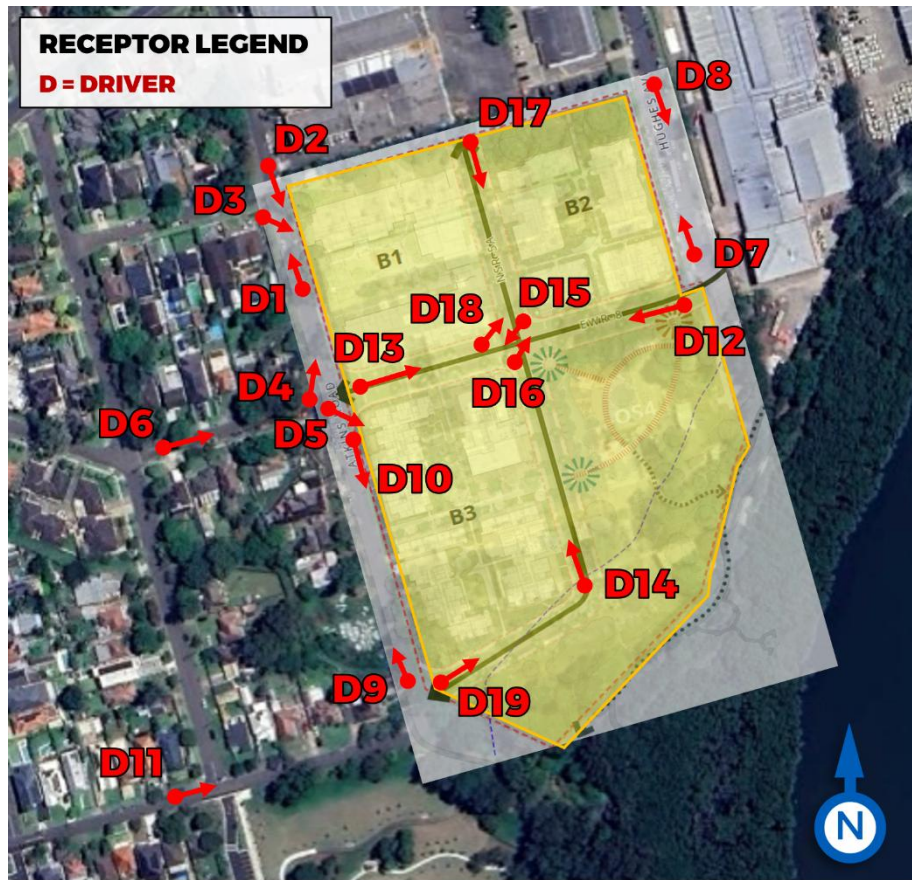


Figure 5: Driver Receptor Locations with Drawing<sup>1</sup> Underlay (Map Underlay Credit: NearMap)

<sup>1</sup>Ref: 23-937\_Melrose Park South\_Landscape SSDA Design Report\_West Site\_Issue A.pdf, page 35



### 3.2.2 Presentation of Results

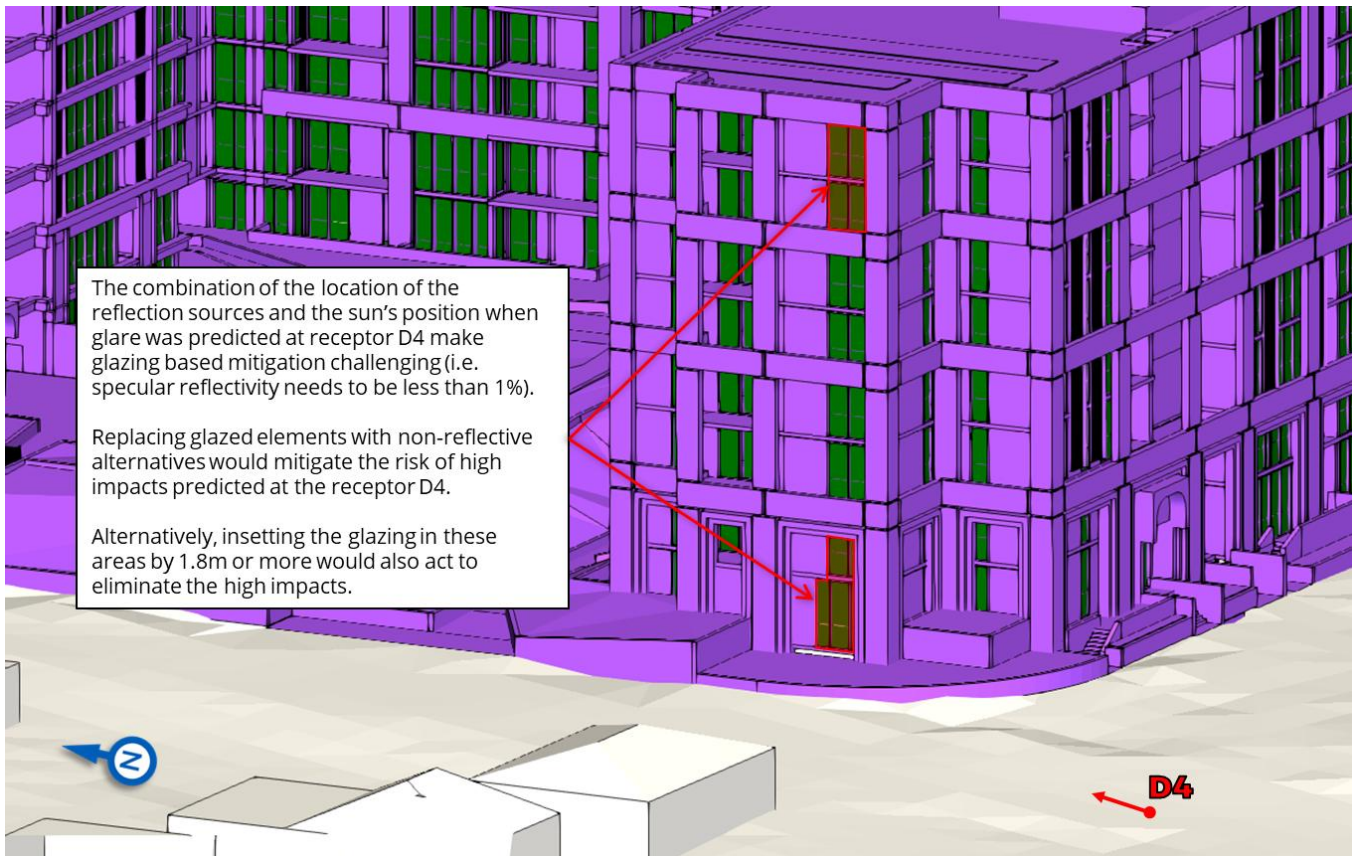
Table 3 below summarises the level of visual impact predicted at each of the studied receptors based on the simulation results. The minute-by-minute results for each point are presented as ‘Annual Reflection Impact Diagrams’ which distil an entire year’s worth of data into a single diagram. The diagrams 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 3: Summary of Overall Predicted Impacts on Receptors**

Receptor Number	Receptor Type	Max Veiling Luminance (cd/m <sup>2</sup> )	Duration / Total Number of Minutes with High Impact Reflection (Veiling Luminance > 500 cd/m <sup>2</sup> )	% of High Impacts Where the Sun Is Also Visible
D1	Driver	85	N/A	N/A
D2	Driver	122	N/A	N/A
D3	Driver	0	N/A	N/A
D4	Driver	3,146	Average Duration: 7 minutes Total: 679 minutes/year (0.26% of the daytime)	0%
D5	Driver	380	N/A	N/A
D6	Driver	70	N/A	N/A
D7	Driver	190	N/A	N/A
D8	Driver	54	N/A	N/A
D9	Driver	144	N/A	N/A
D10	Driver	0	N/A	N/A
D11	Driver	117	N/A	N/A
D12	Driver	377	N/A	N/A
D13	Driver	227	N/A	N/A
D14	Driver	129	N/A	N/A
D15	Driver	377	N/A	N/A
D16	Driver	275	N/A	N/A
D17	Driver	169	N/A	N/A
D18	Driver	334	N/A	N/A
D19	Driver	173	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 low potential for visual glare within the pedestrian realm and surrounding roads, even with its highly conservative assumption that the viewer would always be looking horizontally or upwards towards the source of the reflection. The most frequent reflections were predicted to be confined within the amenity area to the east of the B2 along Hughes Ave where glare was predicted in at most 21.5% of the daytime hours annually. For roads, the area to the east of B3 along NSR-5A were predicted to have the most frequent reflections up to 8% of the daytime hours annually.
3. While the screening analysis predicted the potential for visual glare at the areas immediately north of B1 and B2, this would only be possible if one chose to look towards the building. It is also important to note that reflections in these locations are unlikely to affect safety critical tasks (i.e., driving). It is RWDI's understanding that the future road north of B1 and B2 would be north bound only.
4. The detailed analysis, which accounted for more realistic view directions and operated at one-minute increments, predicted that receptor D4 (representing an eastbound driver at the Saunders Rd and Atkins Rd intersection, turning left into Atkins Rd) was predicted to have the potential for glare.
5. This potential glare at this location was predicted to exist for at most 7 minutes per day during the afternoons from May through early August. That said, the overall frequency at which glare was predicted to be possible was small (0.26% of the daytime annually).
6. If mitigation is desired for the receptor above, the highlighted areas in Figure 6 on the next page illustrate the sources of the reflections and suggest the means of mitigating the impact.
7. The remaining studied receptors were predicted to 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/m<sup>2</sup>.
8. For further details refer to the visual impact diagrams for all receptors (D1-D19) as shown in Appendix B.
9. 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.
10. 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, including the design of future roads, it is recommended that RWDI be contacted and requested to review their potential effects on the findings of this report.



**Figure 6: Markup of Facade Locations for Glare Sources at Receptors D4.**



## **4 GENERAL STATEMENT OF LIMITATIONS**

This report entitled *Melrose Park South-West - Solar Reflection Analysis (SSDA)*, dated 15 April 2025, was prepared by RWDI Australia Pty Ltd ("RWDI") for Wharf and Hughes Developments Pty Ltd ("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 buildings<sup>1</sup>.

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 lighting impacts, reflectivity, solar access, visual privacy, visual amenity, view loss and view sharing, overshadowing and wind impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated.”***

However, 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 Hassall<sup>2</sup>, which defines glare as occurring when the veiling luminance of a reflection exceeds 500 cd/m<sup>2</sup>.

Veiling luminance was computed using the CIE General Disability Glare Equation<sup>3</sup>. 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 60 years old for this work. Based on the most recent Australian Census, this age represents approximately the 80<sup>th</sup> 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/m<sup>2</sup> 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. 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.
2. Hassall, D., "Reflectivity: Dealing with Rogue Solar Reflections" *University of New South Wales*, 1991.
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

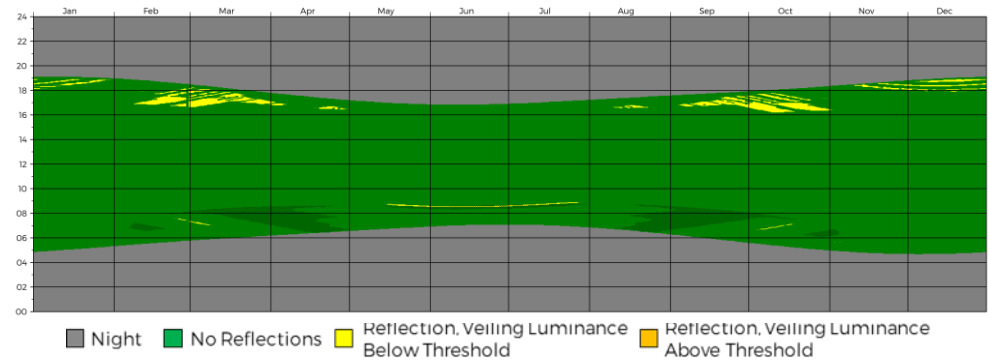


## Presentation of Results

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 Savings 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/m<sup>2</sup>) for an 80<sup>th</sup> percentile resident (60 years old). 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 D6**

# DETAILED ANALYSIS RESULTS



## Driver Receptor D1

Receptor D1 was chosen to assess the visual impact associated with solar reflections affecting northbound driver on Atkins Rd.

The simulations indicated that intermittent reflections may fall on this point from mid-November through January between 6:45 am and 7:45 am AEST, and again from January through December between 3:45 pm and 5:30 pm AEST.

The maximum veiling luminance predicted was 85 cd/m<sup>2</sup>.

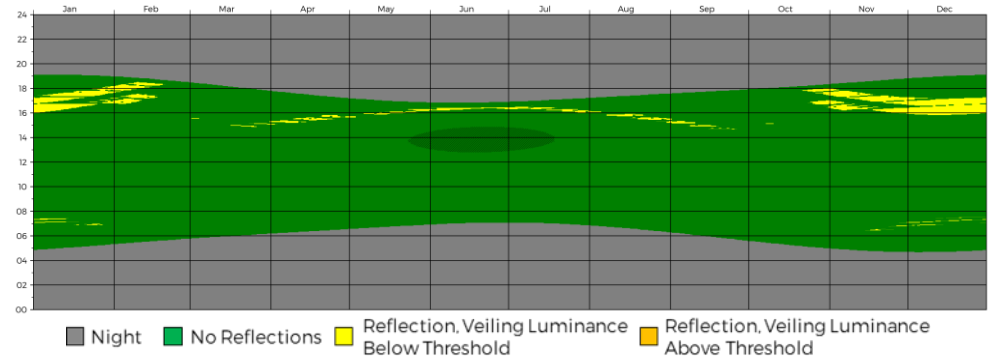


Figure B2: Annual Reflection Impact Diagram for Driver Receptor D1

# DETAILED ANALYSIS RESULTS

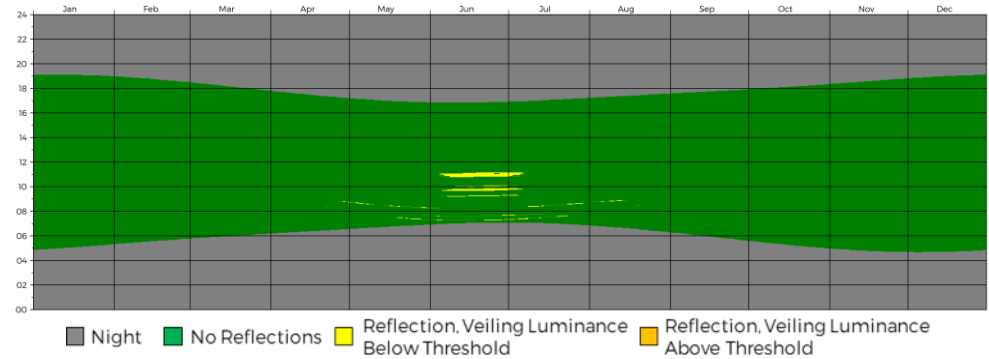


## Driver Receptor D2

Receptor D2 was chosen to assess the visual impact associated with solar reflections affecting southbound driver on Atkins Rd.

The simulations indicated that intermittent reflections may fall on this point from late April through August between 7:00 am and 11:15 am AEST.

The maximum veiling luminance predicted was 122 cd/m<sup>2</sup>.



**Figure B3: Annual Reflection Impact Diagram for Driver Receptor D2**

# DETAILED ANALYSIS RESULTS



## Driver Receptor D3

Receptor D3 was chosen to assess the visual impact associated with solar reflections affecting eastbound driver at the Massie St and Atkins Rd intersection, turning right into Atkins Rd.

The simulations indicated that reflections emanating from the proposed panels may not fall on this point.

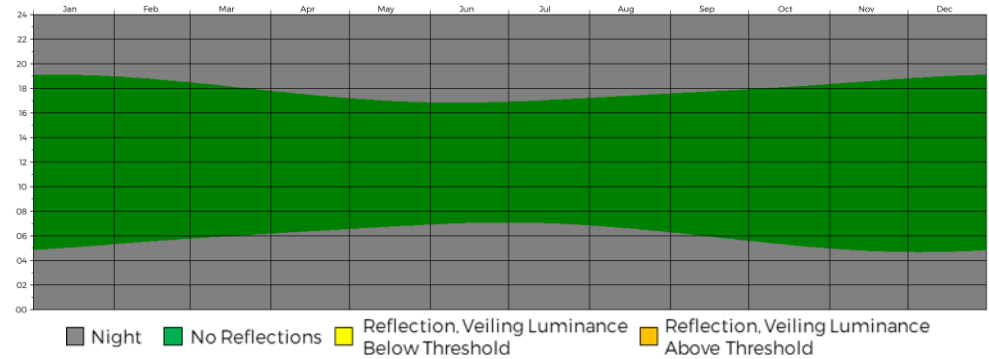


Figure B4: Annual Reflection Impact Diagram for Driver Receptor D3

# DETAILED ANALYSIS RESULTS

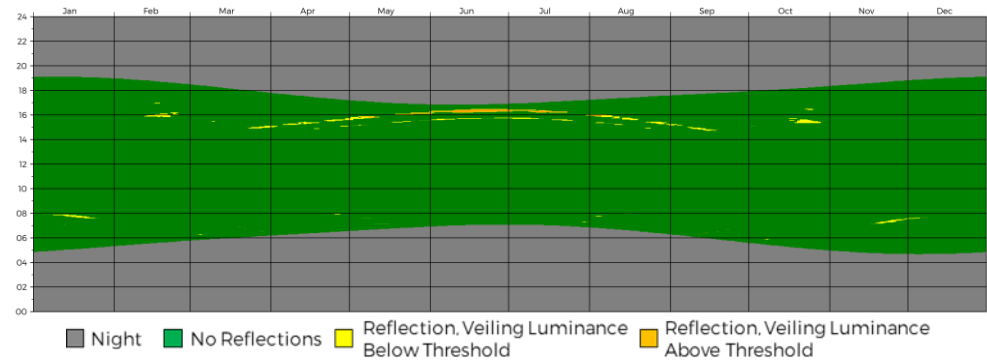


## Driver Receptor D4

Receptor D4 was chosen to assess the visual impact associated with solar reflections affecting eastbound driver at the Saunders Rd and Atkins Rd intersection, turning left into Atkins Rd.

The simulations indicated that intermittent reflections may fall on this point from late July through January and from March through May between 5:30 am and 8:15 am AEST, and again on from February through October between 2:30 pm and 5:00 pm AEST.

Brief instances where veiling luminance exceeded 500 cd/m<sup>2</sup> (maximum predicted value was 3,146 cd/m<sup>2</sup>) were predicted from May through early August. On average these reflections lasted 7 minutes and were predicted to occur between 3:45 pm and 4:30 pm AEST, totalling 679 minutes per year of potential glare, or 0.26% of the daytime.



**Figure B5: Annual Reflection Impact Diagram for Driver Receptor D4**

# DETAILED ANALYSIS RESULTS

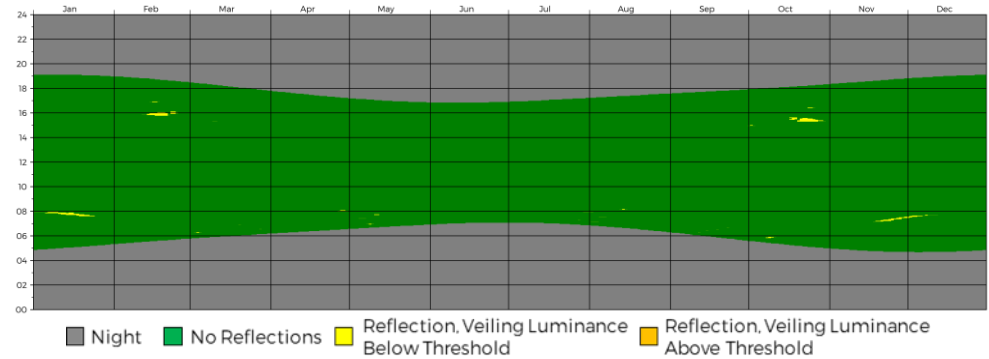


## Driver Receptor D5

Receptor D5 was chosen to assess the visual impact associated with solar reflections affecting eastbound driver at the Saunders Rd and Atkins Rd intersection, turning right into Atkins Rd.

The simulations indicated that intermittent reflections may fall on this point from late July through January and from March through May between 5:45 am and 8:30 am AEST, and again on October and from February through mid-March between 2:45 pm and 5:00 pm AEST.

The maximum veiling luminance predicted was 380 cd/m<sup>2</sup>.



**Figure B6: Annual Reflection Impact Diagram for Driver Receptor D5**

# DETAILED ANALYSIS RESULTS

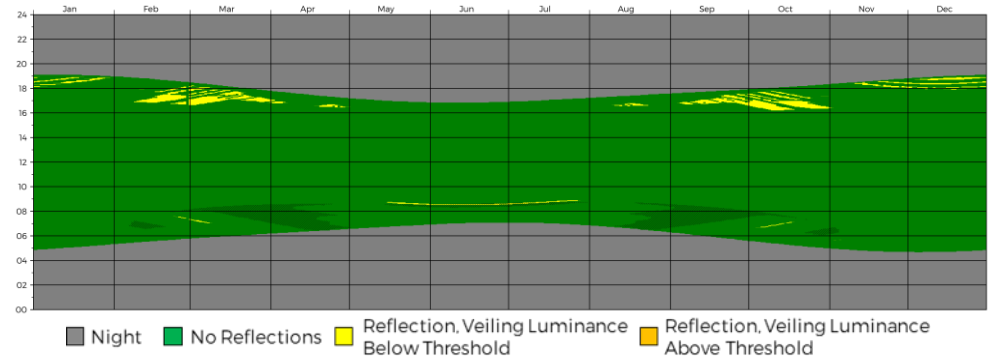


## Driver Receptor D6

Receptor D6 was chosen to assess the visual impact associated with solar reflections affecting eastbound driver at the Saunders Rd.

The simulations indicated that intermittent reflections may fall on this point from mid-February through mid-March, mid-May through July and again from October through early November between 5:30 am and 9:00 am AEST, and again from mid-August through early May between 4:00 pm and 7:00 pm AEST.

The maximum veiling luminance predicted was 70 cd/m<sup>2</sup>.



**Figure B7: Annual Reflection Impact Diagram for Driver Receptor D6**

# DETAILED ANALYSIS RESULTS

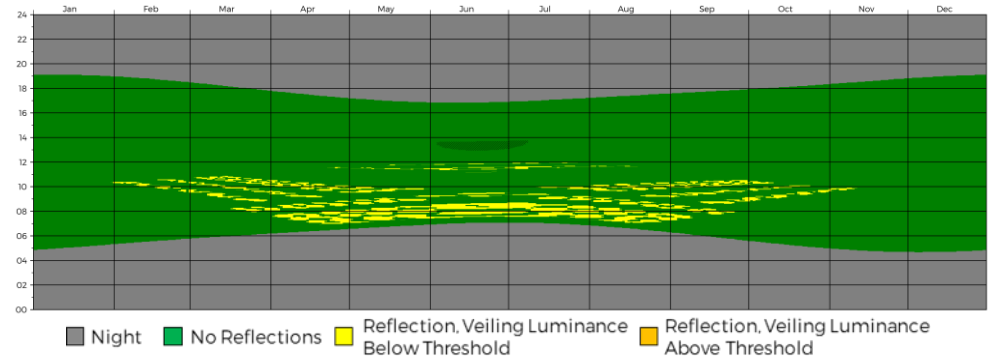


## Driver Receptor D7

Receptor D7 was chosen to assess the visual impact associated with solar reflections affecting northbound driver on Hughes Ave.

The simulations indicated that intermittent reflections may fall on this point from late January through mid-November between 6:45 am and 12:00 pm AEST.

The maximum veiling luminance predicted was 190 cd/m<sup>2</sup>.



**Figure B8: Annual Reflection Impact Diagram for Driver Receptor D7**

# DETAILED ANALYSIS RESULTS

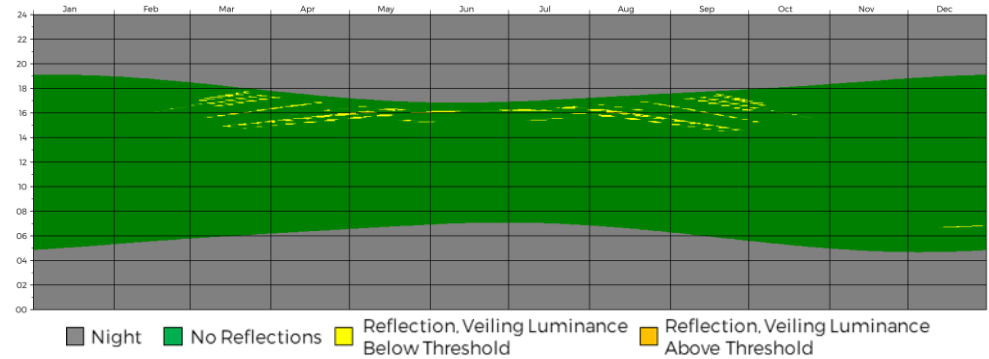


## Driver Receptor D8

Receptor D8 was chosen to assess the visual impact associated with solar reflections affecting southbound driver on Hughes Ave.

The simulations indicated that intermittent reflections may fall on this point on December between 6:30am and 7:00 am AEST, and again from mid-February through October between 2:30 pm and 6:00 pm AEST.

The maximum veiling luminance predicted was 54 cd/m<sup>2</sup>.



**Figure B9: Annual Reflection Impact Diagram for Driver Receptor D8**

# DETAILED ANALYSIS RESULTS



## Driver Receptor D9

Receptor D9 was chosen to assess the visual impact associated with solar reflections affecting northbound driver on Atkins Rd.

The simulations indicated that intermittent reflections may fall on this point from October through mid-March between 5:00 am and 8:00 am, and again from late January through mid-November between 2:15 pm and 5:15 pm AEST.

The maximum veiling luminance predicted was 144 cd/m<sup>2</sup>.

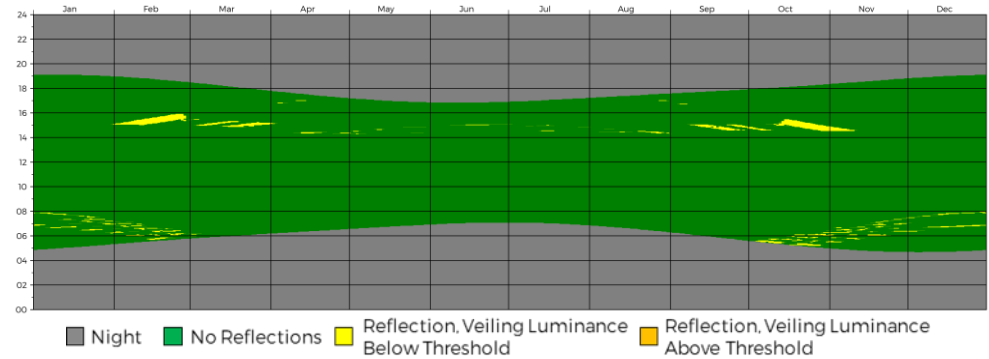


Figure B10: Annual Reflection Impact Diagram for Driver Receptor D9

# DETAILED ANALYSIS RESULTS



## Driver Receptor D10

Receptor D10 was chosen to assess the visual impact associated with solar reflections affecting southbound driver on Atkins Rd.

The simulations indicated that reflections emanating from the proposed panels may not fall on this point.

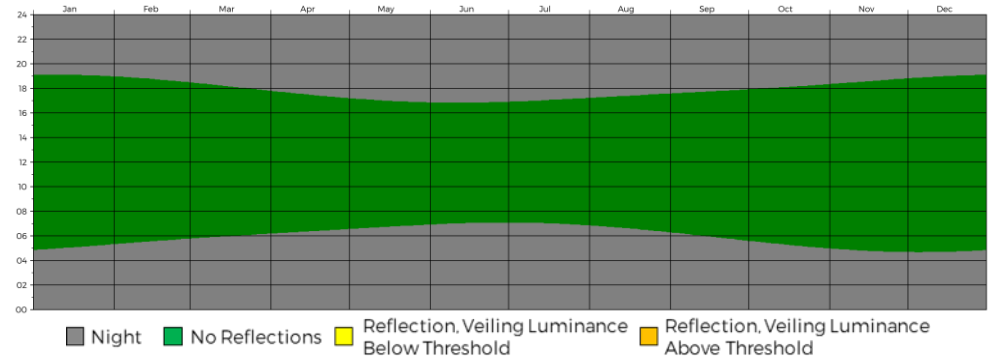


Figure B11: Annual Reflection Impact Diagram for Driver Receptor D10

# DETAILED ANALYSIS RESULTS



## Driver Receptor D11

Receptor D11 was chosen to assess the visual impact associated with solar reflections affecting eastbound driver on Gregory St.

The simulations indicated that intermittent reflections may fall on this point from mid-January through April and from mid-September through November between 5:30 am and 7:15 am AEST. Again, from February through early June and from July through October between 3:45 pm and 6:30 pm AEST.

The maximum veiling luminance predicted was 117 cd/m<sup>2</sup>.

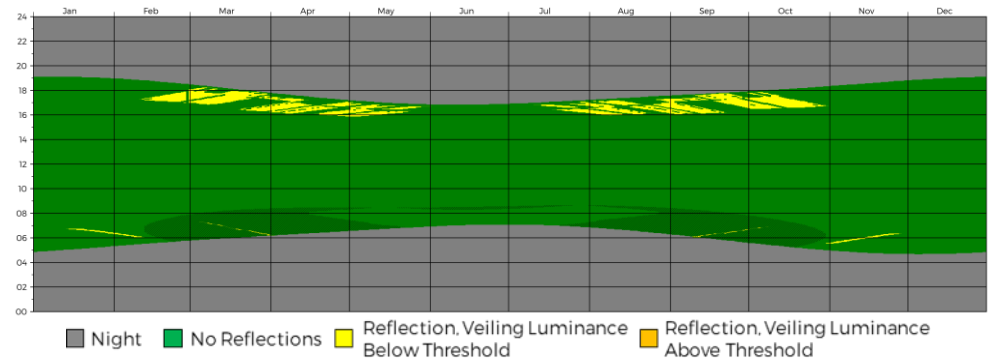


Figure B12: Annual Reflection Impact Diagram for Driver Receptor D11

# DETAILED ANALYSIS RESULTS

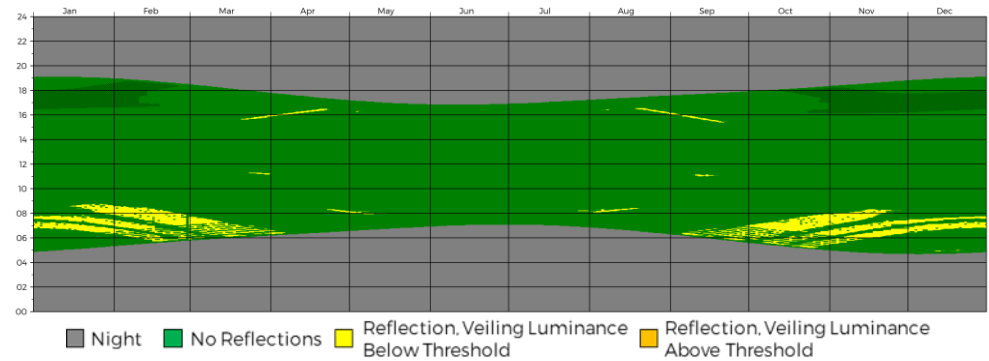


## Driver Receptor D12

Receptor D12 was chosen to assess the visual impact associated with solar reflections affecting westbound driver on Mary Street.

The simulations indicated that intermittent reflections may fall on this point from late July through mid-May between 4:45 am and 9:00 am AEST, and again on September and from late March through early April between 11:00 am and 11:30 am AEST. Again, from late March through early May and from August through September between 3:15 pm and 4:45 pm AEST.

The maximum veiling luminance predicted was 377 cd/m<sup>2</sup>.



**Figure B13: Annual Reflection Impact Diagram for Driver Receptor D12**

# DETAILED ANALYSIS RESULTS



## Driver Receptor D13

Receptor D13 was chosen to assess the visual impact associated with solar reflections affecting eastbound driver on Mary Street.

The simulations indicated that intermittent reflections may fall on this point from late February through mid-October between 6:00 am and 1:00 pm AEST and again on late January and mid-November between 3:45 pm and 4:30 pm AEST.

The maximum veiling luminance predicted was 227 cd/m<sup>2</sup>.

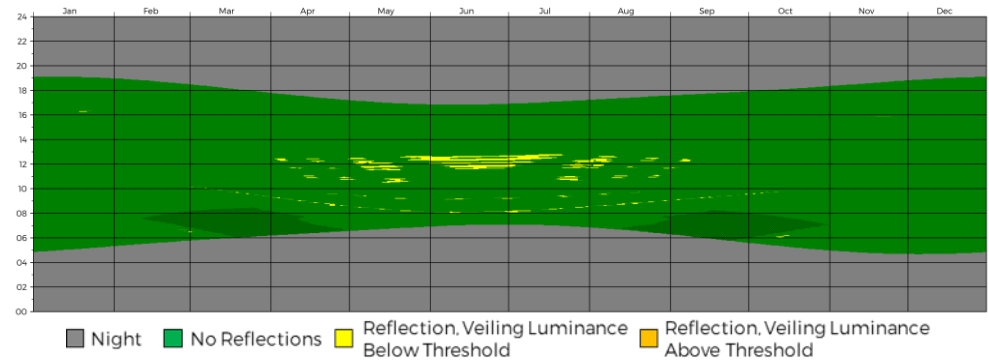


Figure B14: Annual Reflection Impact Diagram for Driver Receptor D13

# DETAILED ANALYSIS RESULTS



## Driver Receptor D14

Receptor D14 was chosen to assess the visual impact associated with solar reflections affecting northbound driver on NSR-5A.

The simulations indicated that intermittent reflections may fall on this point from March through early October between 6:30 am and 10:00 am AEST.

The maximum veiling luminance predicted was 129 cd/m<sup>2</sup>.

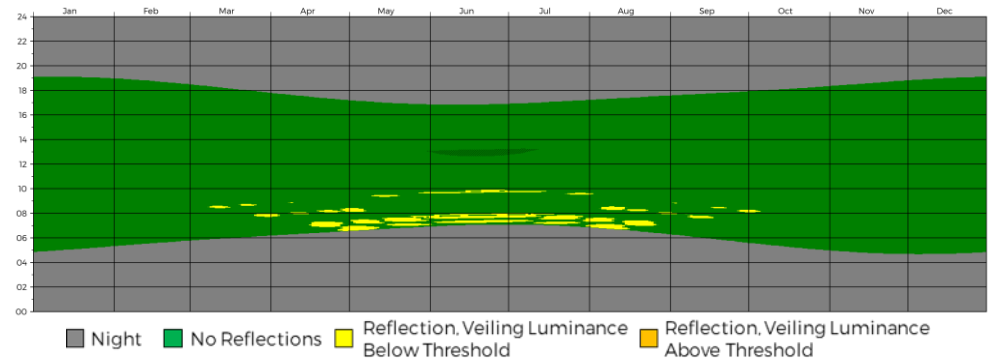


Figure B15: Annual Reflection Impact Diagram for Driver Receptor D14

# DETAILED ANALYSIS RESULTS

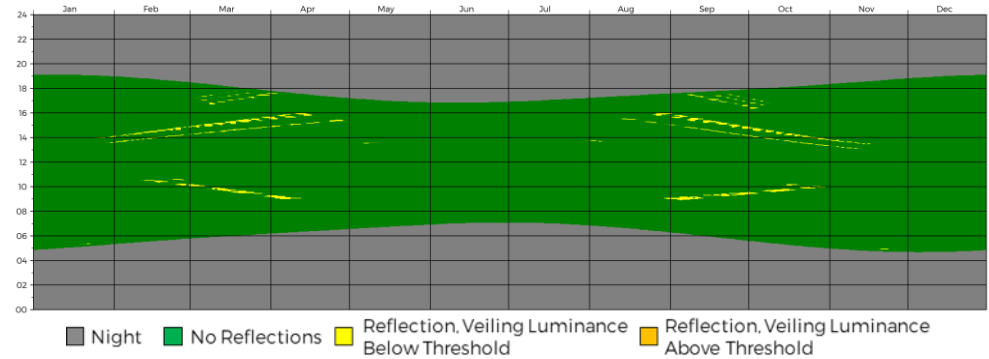


## Driver Receptor D15

Receptor D15 was chosen to assess the visual impact associated with solar reflections affecting southbound drivers at the Mary Street and NSR-5A intersection.

The simulations indicated that intermittent reflections may fall on this point from late January through mid-May and from late July through November between 8:45 am and 10:45 am, and again between 1:00 pm and 6:00 pm AEST.

The maximum veiling luminance predicted was 377 cd/m<sup>2</sup>.



**Figure B16: Annual Reflection Impact Diagram for Driver Receptor D15**

# DETAILED ANALYSIS RESULTS

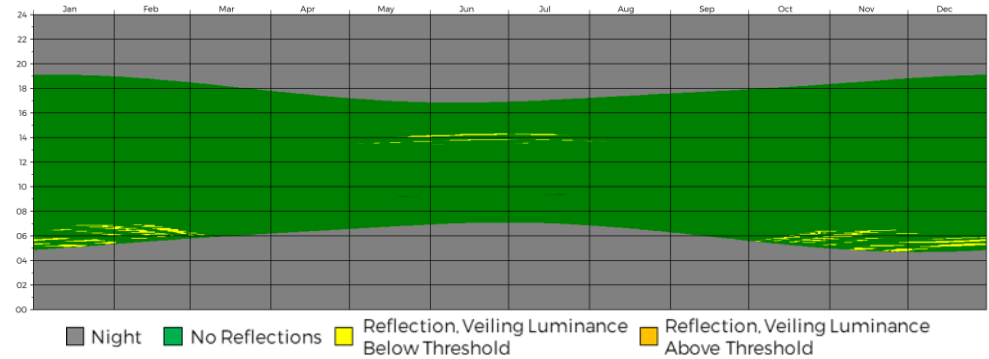


## Driver Receptor D16

Receptor D16 was chosen to assess the visual impact associated with solar reflections affecting northbound drivers at the Mary Street and NSR-5A intersection.

The simulations indicated that intermittent reflections may fall on this point from October through mid-March between 4:30 am and 7:00 am AEST, and again from May through early August between 1:15 pm and 2:30 pm AEST.

The maximum veiling luminance predicted was 275 cd/m<sup>2</sup>.



**Figure B17: Annual Reflection Impact Diagram for Driver Receptor D16**

# DETAILED ANALYSIS RESULTS

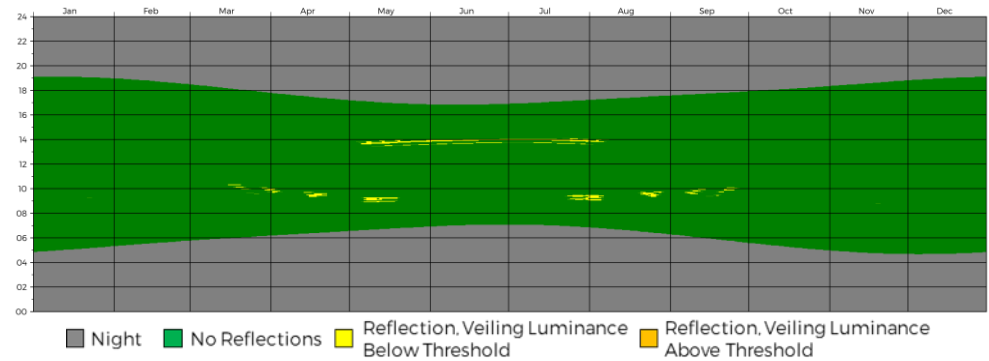


## Driver Receptor D17

Receptor D17 was chosen to assess the visual impact associated with solar reflections affecting southbound driver on NSR-5.

The simulations indicated that intermittent reflections may fall on this point on late March, mid-November, and from mid-March through September between 8:45 am and 10:30 am AEST, and again from May through early August between 1:15 pm and 2:15 pm AEST.

The maximum veiling luminance predicted was 169 cd/m<sup>2</sup>.



**Figure B18: Annual Reflection Impact Diagram for Driver Receptor D17**

# DETAILED ANALYSIS RESULTS

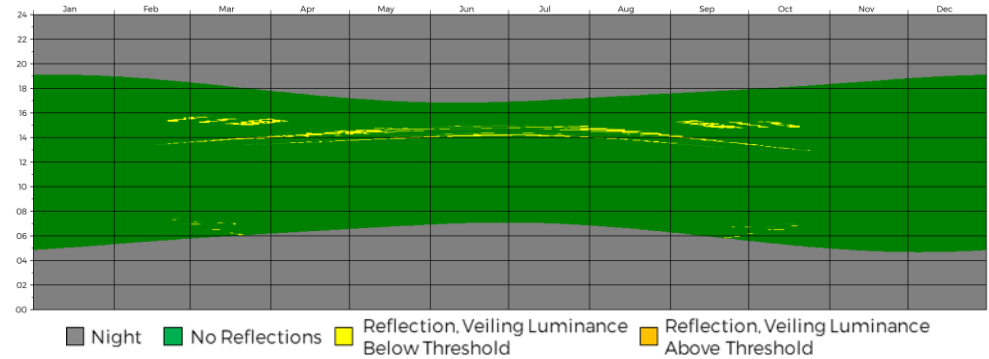


## Driver Receptor D18

Receptor D18 was chosen to assess the visual impact associated with solar reflections affecting eastbound drivers turning left at the Mary Street and NSR-5 intersection.

The simulations indicated that intermittent reflections may fall on this point from late February and mid-March, and from late September through mid-October between 5:45 am and 7:30 am AEST. Again, from mid-February through October between 12:45 pm and 4:00 pm AEST.

The maximum veiling luminance predicted was 334 cd/m<sup>2</sup>.



**Figure B19: Annual Reflection Impact Diagram for Driver Receptor D18**

# DETAILED ANALYSIS RESULTS

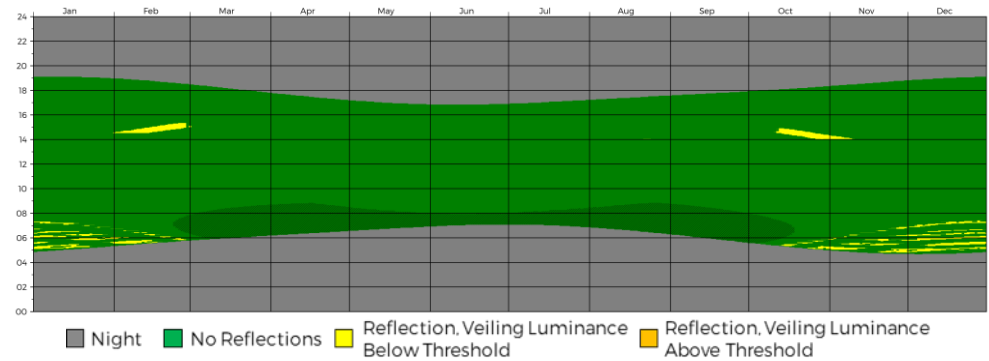


## Driver Receptor D19

Receptor D19 was chosen to assess the visual impact associated with solar reflections affecting northbound drivers on EWR-10.

The simulations indicated that intermittent reflections may fall on this point from October through February between 4:45 am and 7:30 am AEST. Again on mid-April, late August, from February through early March, and from October through mid-November between 1:45 pm and 3:30 pm AEST.

The maximum veiling luminance predicted was 173 cd/m<sup>2</sup>.



**Figure 20: Annual Reflection Impact Diagram for Driver Receptor D19**