LOGOS

Solar Glint and Glare Assessment

263-273 and 273A Coward Street and 76-82 Kent Street, Mascot – QF1 QF2

B – October 2023

PREPARED FOR
PERPETUAL CORPORATE TRUST LIMITED AS THE TRUSTEE OF LMLP 1 AND 2 TRUST

PRESENTED BY
Landrum & Brown Worldwide Australia Pty Ltd

Version and Use Information:

Version	Date	Author(s)	Approver	Comments
A	02 Oct 2023	G Acasio	I Guy	Initial Issue
B	11 Oct 2023	G Acasio	I Guy	Revised Draft

Contents

Page

List of Figures — Page

List of Tables — Page

1 Introduction

1.1 The Development

LOGOS Development Management Pty Ltd (LOGOS) has engaged Landrum & Brown Worldwide (Australia) Pty Ltd to prepare a Solar and Glare assessment for the Photo Voltaic (PV) Solar Array to be installed on the roof of the proposed development at 263-273 and 273A Coward Street and 76-82 Kent Street, Mascot in the vicinity of Sydney Airport. The project is expected to provide be up to 4,900kW of PV power.

The subject site is located between Coward Street and Qantas Drive, Sydney, NSW. It is approximately 2.3km from Sydney Airport reference point (ARP). As shown in Figure 1. The proposed site layout is shown in Figure 2.

Figure 1: Development Site Location (Google Earth)

L&B has carried out a full aeronautical impact assessment report for the development site using the principles set out in the National Airports Safeguarding Framework (NASF). This report should be considered as complementary to that document.

Figure 2: Development Site (LOGOS)

L&B have been provided with design input information that indicates that the solar panels will be laid on the roof and will be provided with an anti-reflective coating. They should also be installed with protective mesh, netting and / or spikes to prevent bird roosting and attractant .

1.2 Report Process

The main potential impact on aviation is likely to be due to reflected glare of a nature that could adversely affect pilot vision, especially at lower altitudes on final approach to a runway. The Civil Aviation Safety Authority (CASA) does not publish specific regulations in relation to solar glare. The only requirement is to present a safety case in the application to the airport owner/operator and to CASA to show that the operation of the solar farm does not cause a hazard or eye damage.

In order to make an objective assessment of the glare risk, the Forge Solar Glare Analysis tool was used. This tool complies with United States Federal Aviation Administration (FAA) Interim Policy 78 FR 63276. CASA has indicated that it accepts the FAA Test.

This report has focused on the aviation specific requirements of the New South Wales Government Large-Scale Solar Energy Guideline. Given the location of the site, elevation of the roof (and hence panels) and complex existing built environment the non-aviation aspects of the guideline have not been considered.

2 Background Information

2.1 Definitions and Criteria

Reflectivity refers to light that is reflected off surfaces. It is reflected at the same angle as the light hits the reflector.

Glint is defined as a momentary flash of bright light, while glare is a continuous source of excessive brightness relative to ambient lighting (Federal Aviation Administration (FAA), 2018).

Larger reflections in the form of glare from many surfaces is present in current aviation operations, road activity and normal human activities whenever the angle of the sun subtends an angle from the reflective surface, directly to an observer. Existing reflective surfaces may include hangar roofs, airport parking, terminal windows, and bodies of water.

Observers that are moving will generally only experience a momentary flash of glare unless they are travelling directly along the reflective angle or directly facing the sun. All roads oriented in an approximate east-west angle will experience varying degrees of direct sun glare at various times throughout the year.

PV Solar energy employs glass panels that are designed to increase electricity production efficiency by maximising absorption and minimise reflection. To limit reflection, PV solar panels are constructed of dark, light-absorbing materials and can be covered with anti-reflective coating.

Aviation impacts are of primary concern to the scope being delivered by L&B. In respect of local property and road traffic impacts L&B would note that the solar panels mounted on the roof would not be visible to residents and road traffic. L&B understands that the building facade has been designed limited reflective materials. On this basis, and L&B expertise in aviation matters, the local property and road traffic impacts have been excluded from this report.

The impacts of solar reflection vary for each type of receptor. NSW Large-Scale Solar Energy Guideline provide the following criteria for glint and glare effects as a guide to assessment. It also includes the glint and glare requirements for aviation as shown in Table 2.

High glare impact	Moderate glare impact	Low glare impact
> 30 minutes per day > 30 hours per year	< 30 minutes & > 10 minutes per day < 30 hours & > 10 hours per day	< 10 minutes per day < 10 hours per year
Significant amount of glare that should be avoided	Implement mitigation measures to reduce impacts as far as practicable	No mitigation required

Table 1:Impact Rating and Performance Objectives for Glare Impacts to Residential Dwellings

	Scope	Methodology	Performance Objective
Aviation	All air traffic control towers and take off/landing approaches to any runway or landing strip within 5km of the proposed solar array.	Solar glare analysis that is worst case in all scenarios accounting for all aircraft using the airport (e.g., gliders, helicopters etc).	Any glint and glare should be avoided unless the aerodrome operator agrees that the impact would not be material (e.g., occurs at times when there are no flights or would not pose a safety risk to airport operations).

Table 2: Glint and Glare requirements

A study of the amount of Glint and/or Glare present at specified locations, using the Forge Solar evaluation tool, will determine the quantity and intensity of the reflected sun light and the potential effect on a human retina.

2.2 FAA Standards for Measuring Ocular Impacts

The FAA has published documents to assist in evaluating the effect of solar technologies on airports including:

- Technical Guidance for Evaluating Selected Solar Technologies on Airports, [FAA Solar Guide], FAA-ARP-TR-10-1, November 2010, read in conjunction with;
- Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports, 23 October 2013.

The FAA has determined that glint and glare from solar energy systems could result in an ocular impact to pilots and/or air traffic controllers that could compromise the safety of the aviation system and the health of aircrew and air traffic controllers.

The FAA has adopted the Solar Glare Hazard Analysis Plot[1], shown in Figure 3 below, as the standard for measuring the ocular impact of any proposed solar energy system on an airport.

In the USA, in order to obtain FAA approval to develop a solar installation on the airport, the airport operator is required to demonstrate that the proposed solar energy system meets the following standards:

1. No potential for glint or glare in the existing or planned Air Traffic Control Tower (ATCT) cab; and
2. No potential for glare or ‘‘low potential for after-image’’ (shown in Figure 3) along the final approach path for any existing landing threshold or future landing thresholds. The final approach path is defined as two (2) miles from fifty (50) feet above the landing threshold using a standard three (3) degree glidepath. Ocular impact must be analysed over the entire calendar year in one (1) minute intervals from when the sun rises above the horizon until the sun sets below the horizon.

[1] https://share.sandia.gov/phlux

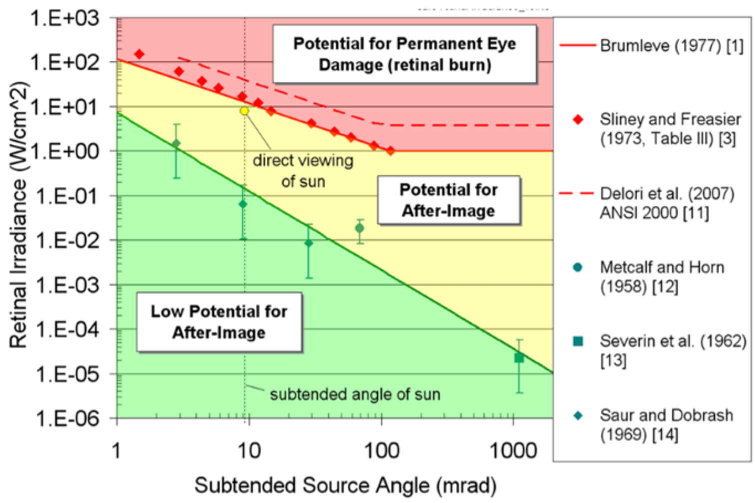


Figure 3 - **Glare hazard plot illustrating the ocular impact as a function of retinal irradiance and subtended source angle [1, 3].**

Figure 3: FAA Solar Glare Ocular Hazard Plot (Source: Sandia National Laboratories)

The Ocular Hazard Plot classifies viewed glare into three levels based on the retinal irradiance and subtended source angle.

The subtended source angle: represents the size of the glare viewed by an observer,

The retinal irradiance: determines the amount of energy impacting the retina of the observer.

Larger source angles can result in glare[2] of high intensity, even if the retinal irradiance is low.

1. **Low Potential Hazard (Green):** Indicates that there is glare present however there is only a low potential for a temporary after-image. Results in the area of the plot **pass** the FAA test for Ocular Hazard as a result of glare.
2. **Medium Potential Hazard (Yellow):** Indicates that there is glare present with the potential to leave a temporary after-image of the glare. Results in this area of the plot **fail** the FAA test for Ocular Hazard as a result of glare.
3. **High Potential Hazard (Red):** Indicates that there is glare present with the potential for permanent eye damage if observed. Results in this area of the plot **fail** the FAA test for Ocular Hazard as a result of glare.

[2] Glint and glare are potential impacts of light being reflected off surfaces. In comparison with Concentrated Solar Power (CSP) systems which use large reflective surfaces to focus the sun's energy onto a single point to produce heat which is converted to electricity, Photo Voltaic (PV) cells are more compatible with airport activities because it is low profile, modular, and designed to absorb sunlight rather than reflect it, minimizing potential impacts of glare. (FAA-ARP-TR-10-1, pp.5-8)

3 Proposed Layout and Technical Information

3.1 Location

The proposed development site is located approximately 818m from the Sydney Airport runway 16R end, 1,137m from runway 25 end and 2,270 m from the airport reference point (ARP), shown on figure below.

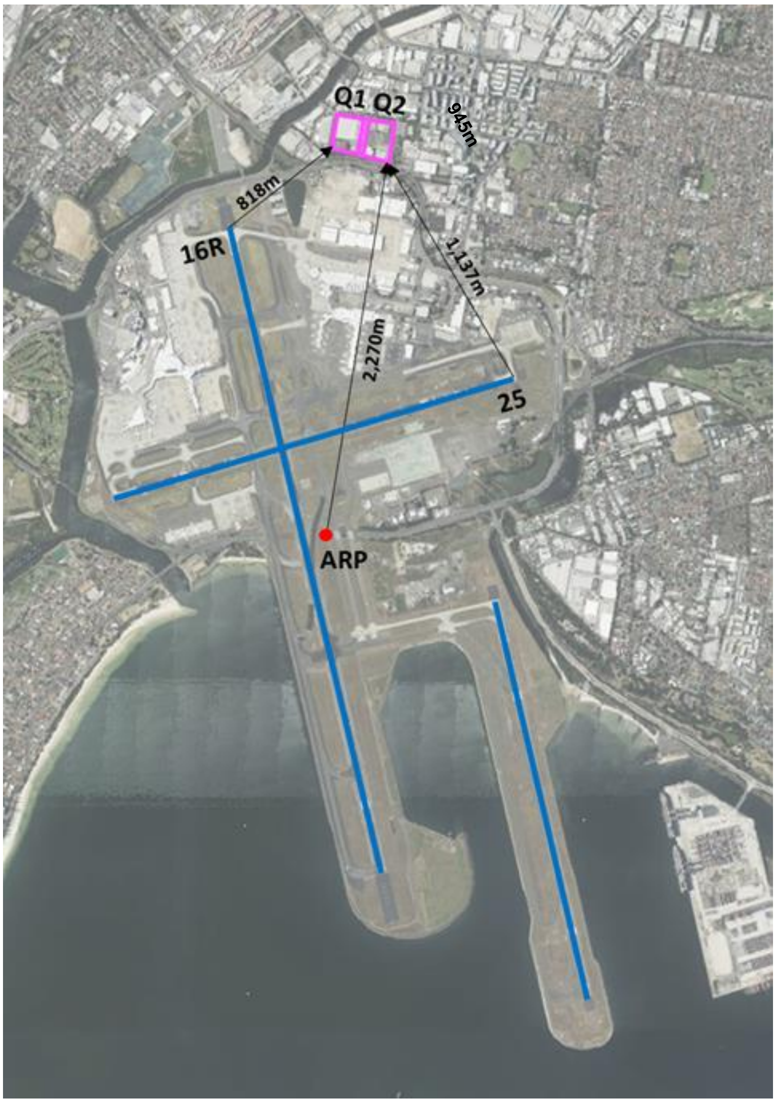


Figure 4: Location in relation to Sydney Airport (L&B Drawing & Google Map)

The physical distance makes it possible that the proposed PV panels on the roof of the development could be a source of glint or glare for pilots on approach or on departure from the airport. Accordingly, it is necessary to perform a specific assessment of aircraft flight paths in this study.

3.2 Input Assumptions from Supplied Data

The proposed PV panel roof layout has been assessed as shown on Figure 5 below.

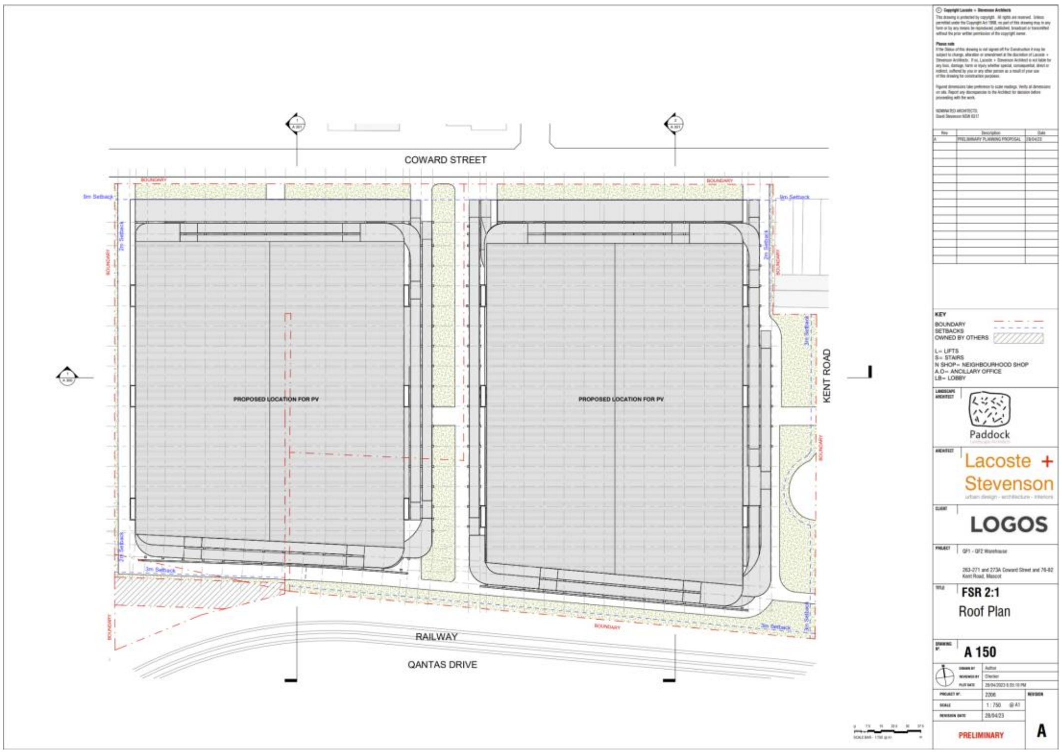


Figure 5: Proposed development site PV Panel Roof Layout (LOGOS)

The indicative concept plans for QF 1 and 2 have ridge heights of 45.80 m AHD and 46.10 m AHD respectively. The solar panel arrays will be fixed on the building roof and have an anti-reflective coating included. Given the nature of the roof slope we have assumed that the highest PV panel will be at 46.10m AHD.

The panels are fixed on the roof with same tilt angle 1° as the roof. The dimension of each panel is 2,024mm in length,1,024mm in width and 40mm in height, shown in Figure 6.

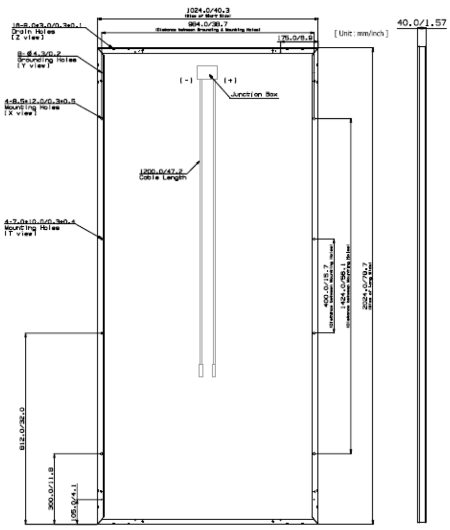


Figure 6: Panel Drawing (LOGOS)

4 Assumptions and Limitations of the Forge Solar Glare Analysis Tool

L&B has made use of a software tool developed by ForgeSolar, which satisfies the FAA standards for glare analysis in aviation contexts.

It also reports glare values that may be present at specified “observation points” such has houses and other buildings as well as vehicle drivers on nearby roads.

Inputs to the software include:

- type of PV surface, i.e., smooth glass without anti reflective coating (ARC) through to deeply textured glass with ARC;
- tilt angle of the solar panels above horizontal and whether they are fixed or rotate to follow the sun;
- azimuth of the solar panels in relation to true north;
- final approach flight paths; and
- location of observation points such as residences and roads.

The software produces a report that indicates whether any “after-image” glare or retinal damage may occur to potential observers.

Some of the assumptions and limitations of the models and methods used in the Forge tool are:

- The software only applies to flat reflective surfaces;
- The tool does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, the models have been validated against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year;
- The tool assesses the worst-case situation with the entire area of the solar farm covered with PV panels, i.e., no gaps between individual PV panels;
- The tool assumes that the PV array is aligned with a plane defined by the total heights of the coordinates outlined in location images provided in our report;
- The tool does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc;
- The variable direct normal irradiance (DNI) feature scales the peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors;
- The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain.

The glare analysis does not account for physical obstructions between reflectors and receptors or cloud cover that limits the amount of glare. This includes buildings, tree cover and geographic obstructions. The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, rather than discrete, spectrum.

As with all modelling tools, certain assumptions are made to represent real-life data. These assumptions also produce limitations on the output of the modelling task.

5 ForgeSolar Software Inputs

The sections below detail the inputs by L&B for analysis in the Forge Solar software. All azimuth values are relative to true north and all angles relative to horizontal.

5.1 PV system parameters

An overview of the input data used for the modelling of the Endeavor Energy substation is shown in Table 3. Site specific inputs are detailed, and boundaries of the system are based on the proposed development areas shown in Figure 7. If any of the development areas change it is recommended that the glare potential be reanalysed.

Input Data	Units	Value	Comments
General Project Parameters			
Reflectivity calculations	-	Varies with incident angle	As incident angle increases, the reflectivity increases.
Reflection diffusion	-	Correlated to module surface type	Calculates the spread of the reflected beam according to the glass texturing and ARC
Time Zone	UTC	+10	NSW time zone
Peak DNI	W/m2	varies	DNI will be scaled each time step based on sun position
Orientation of Array	degrees	9	Rows aligned in North-South direction
Solar panel surface material	-	Tempered glass with Anti-Reflective Coating (ARC)	As tentatively advised by LOGOS
Time interval	mins	1	Model interval throughout the year
Height of panel AHD	m	varies	Height (AHD) to the panel centroid (extracted from LOGOS information)

Table 3: General PV system Inputs for Glare Gauge

5.2 Receptor Components

The Observation Point receptor ("OP") simulates an observer at a single, discrete location, defined by a latitude, longitude, elevation, and height above ground.

The 2-Mile flight path receptor simulates an aircraft following a straight-line approach path toward a runway, by default, including a restricted field-of-view to filter unrealistic glare. In addition, it can be modified to represent a worst-case approach and take off path.

As per NSW Government Large-Scale Solar Energy Guideline, any assessment of glint and glare should use an accepted methodology based on best practice and consider aviation impacts on all air traffic control towers and take off / approaches to any runway or landing strip within 5km of the proposed solar array, taking into consideration their height within the landscape. In addition, receptor points on the Sydney Airport terminal were included. Receptors at ground level or in lower level residential properties were not considered.

Figure 7 shows the location of observation points and flight path assessed. The indicative location of the Sydney Airport runways is shown. This runway location information has been added by L&B in a diagrammatic form.

The Solar Glare Analysis Report is attached at Appendix A.

Figure 7: Receptor Locations

6 Results and Conclusions

6.1 Results

This study indicates that proposed solar panels will have glare with low potential for temporary after-image issue on elements of ATCT and flight paths, refer to Table 4.

Components	Green glare (mins)	Yellow glare (mins)	Comments
PV array 1 QF 1			
FP: 07	0	0	No glare found
FP: 16L	0	0	No glare found
FP: 16R	361	0	Low potential to cause temporary after-image
FP: 25	3247	0	Low potential to cause temporary after-image
FP: 34L	0	0	No glare found
FP: 34R	0	0	No glare found
OP: 1- ATCT	0	0	No glare found
OP: OP 2	0	0	No glare found
OP: OP 3	0	0	No glare found
OP: OP 4	0	0	No glare found
PV array 2 QF 2			
FP: 07	0	0	No glare found
FP: 16L	0	0	No glare found
FP: 16R	416	0	Low potential to cause temporary after-image
FP: 25	3290	0	Low potential to cause temporary after-image
FP: 34L	0	0	No glare found
FP: 34R	0	0	No glare found
OP: 1- ATCT	0	0	No glare found
OP: OP 2	0	0	No glare found
OP: OP 3	0	0	No glare found
OP: OP 4	0	0	No glare found

Table 4: Summary of Results

6.2 Aviation Conclusions

There are four critical components of the airport for consideration: the three runways and the Air Traffic Control Tower (ATCT).

The output from the study indicates that the glare for the observers on the flight path of runway 07, 16L, 34L, and 34R will not be subject to any glare.

However, for runways 16R and 25 a low potential to cause temporary after-image could exist.

There is no glare found for the receptor assigned to the ATCT (OP 1) location.

The FAA standards require that an ATCT has no glare risk. This is achieved according to the results of the ForgeSolar analysis.

The FAA standards require that runways are either classed as no glare risk or low potential for after-image. This is achieved according to the results of the ForgeSolar analysis.

We therefore conclude that there is no aviation reason that the solar panels should not be permitted.

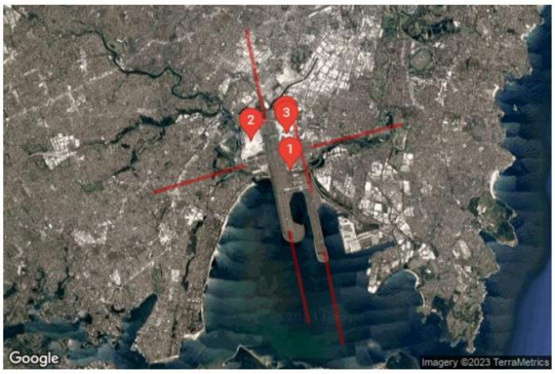
Appendix A – ForgeSolar Glare Analysis Report

Mascot Sites

Mascot QF 1_2

Created Sep 20, 2023
Updated Sep 25, 2023
Time-step 1 minute
Timezone offset UTC10
Minimum sun altitude 0.0 deg
Site ID 100971.15099

Project type Advanced
Project status: active
Category 500 kW to 1 MW



Misc. Analysis Settings

DNI: **varies (1,000.0 W/m^2 peak)**
Ocular transmission coefficient: **0.5**
Pupil diameter: **0.002 m**
Eye focal length: **0.017 m**
Sun subtended angle: **9.3 mrad**

PV Analysis Methodology: **Version 2**
Enhanced subtended angle calculation: **On**

Summary of Results Glare with low potential for temporary after-image predicted

PV Name	Tilt deg	Orientation deg	"Green" Glare min	"Yellow" Glare min	Energy Produced kWh
PV array 1 QF1	1.0	9.0	3,608	0	-
PV array 2 QF2	1.0	9.0	3,706	0	-

Component Data

PV Array(s)

Total PV footprint area: 19,528 m^2

Name: PV array 1 QF1
Footprint area: 10,044 m^2
Axis tracking: Fixed (no rotation)
Tilt: 1.0 deg
Orientation: 9.0 deg

Rated power: -
Panel material: Smooth glass without AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-33.923275	151.178648	2.98	0.00	2.98
2	-33.923396	151.179415	4.12	0.00	4.12
3	-33.924571	151.179184	4.33	0.00	4.33
4	-33.924482	151.178353	3.99	0.00	3.99

Name: PV array 2 QF2
Footprint area: 9,484 m^2
Axis tracking: Fixed (no rotation)
Tilt: 1.0 deg
Orientation: 9.0 deg

Rated power: -
Panel material: Smooth glass without AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-33.923529	151.180241	4.33	0.00	4.33
2	-33.924660	151.180000	4.25	0.00	4.25
3	-33.924571	151.179222	4.37	0.00	4.37
4	-33.923405	151.179453	4.15	0.00	4.15

2-Mile Flight Path Receptor(s)

Name: 07
Description:
Threshold height : 15 m
Direction: 73.6 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	-33.943732	151.163630	5.81	15.24	21.05
2-mile point	-33.951895	151.130157	40.40	149.34	189.74

Name: 16L
Description:
Threshold height : 15 m
Direction: 166.0 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	-33.951623	151.188845	3.49	15.00	18.49
2-mile point	-33.923569	151.180403	5.25	181.92	187.17

Name: 16R
Description:
Threshold height : 15 m
Direction: 168.0 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	-33.930099	151.171787	2.83	15.24	18.07
2-mile point	-33.901818	151.164534	15.18	171.57	186.75

Name: 25
Description:
Threshold height : 15 m
Direction: 256.0 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	-33.937771	151.188900	5.55	15.24	20.79
2-mile point	-33.930776	151.222754	21.52	167.95	189.47

Name: 34L
Description:
Threshold height : 15 m
Direction: 348.0 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	-33.964256	151.180651	3.37	15.24	18.61
2-mile point	-33.992537	151.187907	-1.62	188.91	187.30

Name: 34R
Description:
Threshold height : 15 m
Direction: 348.8 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	-33.970739	151.193819	2.71	15.24	17.95
2-mile point	-33.999101	151.200599	-1.45	188.08	186.63

Discrete Observation Receptors

Number	Latitude deg	Longitude deg	Ground elevation m	Height above ground m	Total Elevation m
1-ATCT	-33.945440	151.181130	3.42	50.00	53.42
OP 2	-33.936190	151.166520	4.00	36.00	40.00
OP 3	-33.934100	151.179840	5.00	25.00	30.00
OP 4	-33.932430	151.179410	4.00	36.00	40.00

1-ATCT map image

Summary of PV Glare Analysis

PV configuration and total predicted glare

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced	Data File
	deg	deg	min	min	kWh	
PV array 1 QF1	1.0	9.0	3,608	0	-	-
PV array 2 QF2	1.0	9.0	3,706	0	-	-

Distinct glare per month

Excludes overlapping glare from PV array for multiple receptors at matching time(s)

PV	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
pv-array-1-q (green)	49	0	0	582	630	594	619	648	174	0	0	312
pv-array-1-q (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-2-q (green)	64	0	0	596	635	600	625	654	180	0	1	351
pv-array-2-q (yellow)	0	0	0	0	0	0	0	0	0	0	0	0

PV & Receptor Analysis Results

Results for each PV array and receptor

PV array 1 QF1 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: 07	0	0
FP: 16L	0	0
FP: 16R	361	0
FP: 25	3247	0
FP: 34L	0	0
FP: 34R	0	0
OP: 1-ATCT	0	0
OP: OP 2	0	0
OP: OP 3	0	0
OP: OP 4	0	0

PV array 1 QF1: 07

No glare found

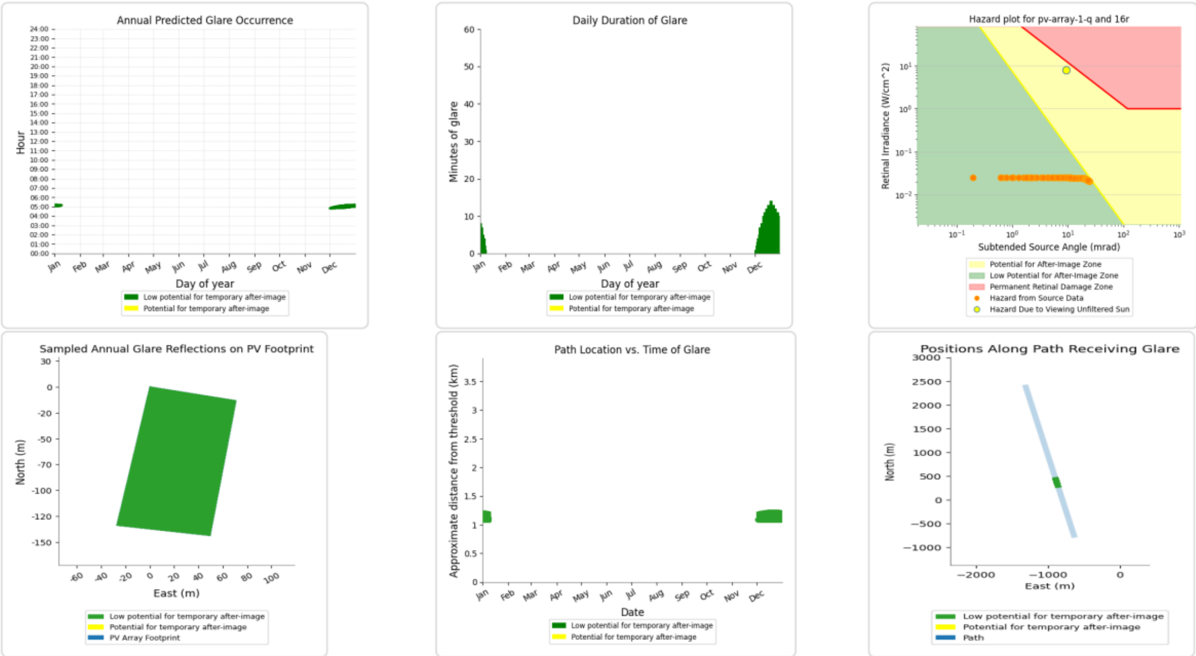
PV array 1 QF1: 16L

No glare found

PV array 1 QF1: 16R

PV array is expected to produce the following glare for this receptor:

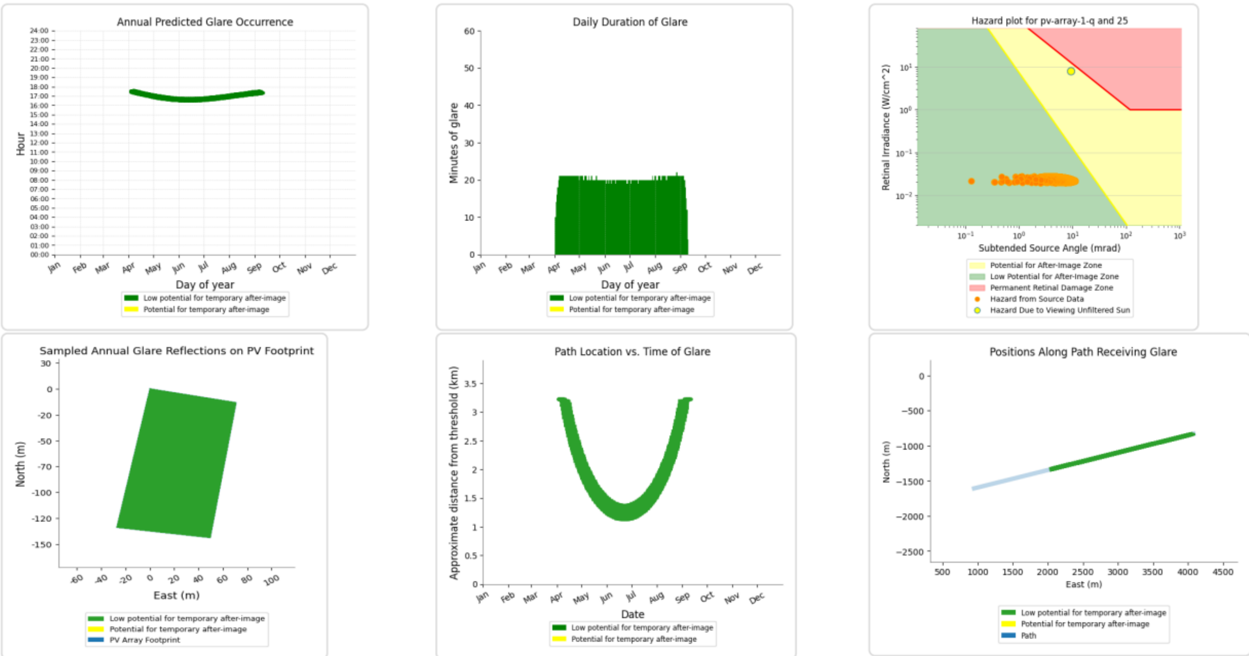
- 361 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 1 QF1: 25

PV array is expected to produce the following glare for this receptor:

- 3,247 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 1 QF1: 34L

No glare found

PV array 1 QF1: 34R

No glare found

PV array 1 QF1: 1-ATCT

No glare found

PV array 1 QF1: OP 2

No glare found

PV array 1 QF1: OP 3

No glare found

PV array 1 QF1: OP 4

No glare found

PV array 2 QF2 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: 07	0	0
FP: 16L	0	0
FP: 16R	416	0
FP: 25	3290	0
FP: 34L	0	0
FP: 34R	0	0
OP: 1-ATCT	0	0
OP: OP 2	0	0
OP: OP 3	0	0
OP: OP 4	0	0

PV array 2 QF2: 07

No glare found

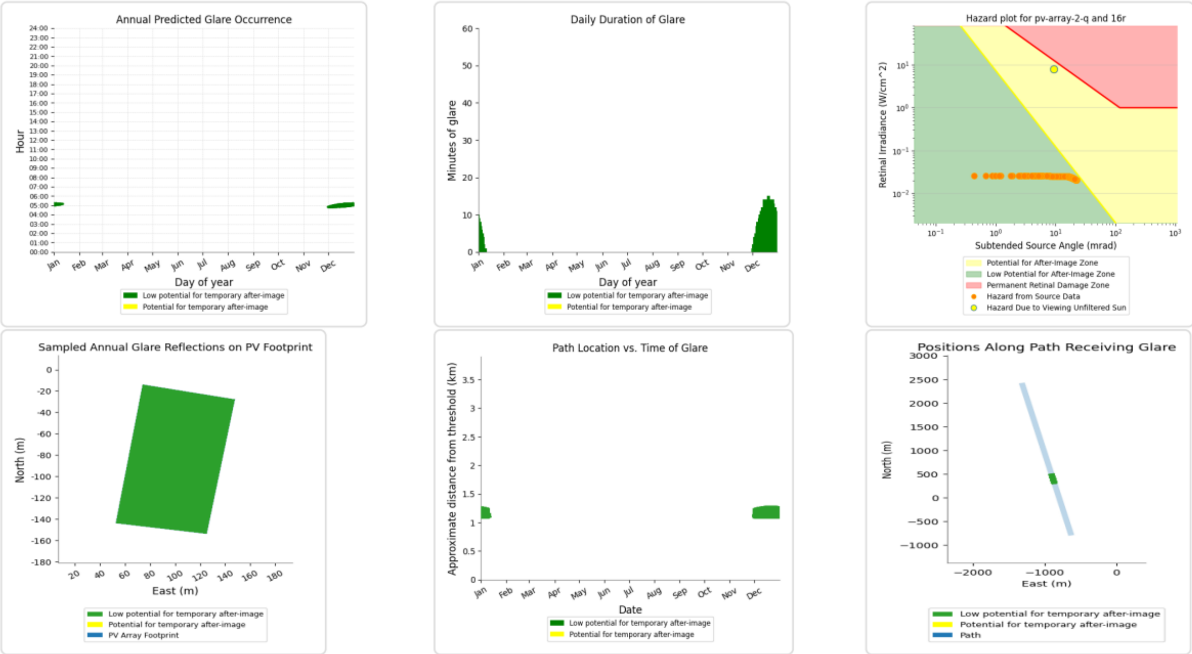
PV array 2 QF2: 16L

No glare found

PV array 2 QF2: 16R

PV array is expected to produce the following glare for this receptor:

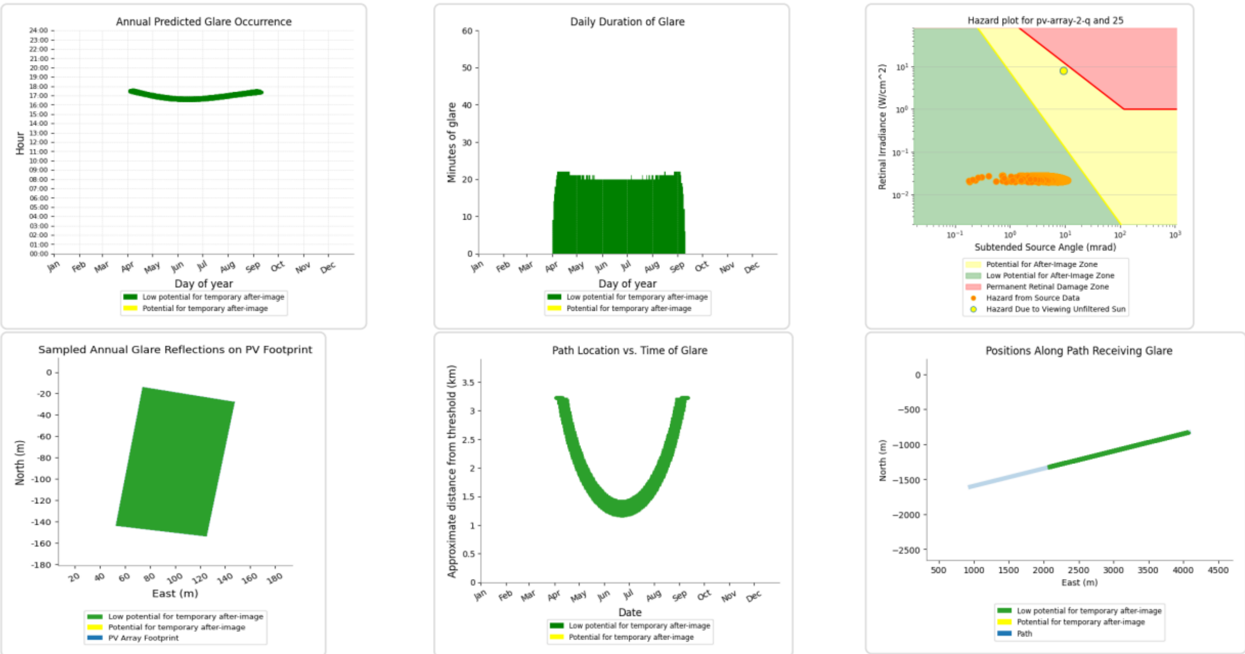
- 416 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 2 QF2: 25

PV array is expected to produce the following glare for this receptor:

- 3,290 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 2 QF2: 34L

No glare found

PV array 2 QF2: 34R

No glare found

PV array 2 QF2: 1-ATCT

No glare found

PV array 2 QF2: OP 2

No glare found

PV array 2 QF2: OP 3

No glare found

PV array 2 QF2: OP 4

No glare found

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not automatically account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
- Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
- The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.