# Dupplin Solar

## Glint and Glare (G&G) Assessment

### TRIO Dupplin Solar LLP

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# Acronyms and Abbreviations

| | |
|---|---|
| ARP | Aerodrome Reference Point |
| BRE | Building Research Establishment |
| CAA | Civil Aviation Authority |
| CAST | Combined Aerodrome Safeguarding Team |
| FAA | Federal Aviation Administration |
| G&G | Glint and Glare |
| MW | Megawatt |
| NPF4 | National Planning Framework 4 |
| NPPF | National Planning Policy Framework |
| NPPG | National Planning Practice Guidance |
| NPS | National Policy Statement |
| PV | Photovoltaic |

# 1.0 Introduction

This report undertaken by SLR examines the potential glint and glare (G&G) effects arising from the installation of solar photovoltaic (PV) arrays on Dupplin Solar Development (the 'Proposed Development'). The Site, centred on National Grid Reference (NGR) NO 04810 21645, is located north of the A9 at Dupplin Estate, Tibbermore - approximately 2.7 km west of Perth, within the Perth and Kinross Council (PKC) administrative area.

The Proposed Development would have an installed capacity of up to 97.5 MW (DC) solar PV installation, covering a total area of approximately 126.7 hectares (ha).

This G&G assessment is informed by the latest design performed by SLR and information provided by Trio Dupplin Solar LLP (herein "the Applicant"). **Graphic 1-1** shows the PV area considered for analysis in the G&G software.


**Graphic 1-1: The Proposed Development and surroundings.**

## 1.1 PV Array Details

The Proposed Development has considered fixed PV module with a tilt angle of 20° and south orientation. **Table 1-1** illustrates the module specifications for the Proposed Development, summarising the parameters used within the report.

**Table 1-1: Module Specifications**

| Parameter | Details |
|---|---|
| Mounting details | Fixed tilt (no tracking) |
| Module tilt | 20° |
| Module orientation | 180° (South) |
| Max Height | 2.67 m |

| Parameter | Details |
|---|---|
| PV material category | Category 1. Defined as smooth glass with anti-reflective coating. |
| Slope error value | A value of ‘varies’ to imply that this depends on the PV material selected. In this case, material Category 1 was selected. |
| Reflectivity value | A value of ‘varies’ to imply that this depends on the PV material selected. In this case, material Category 1 was selected. |

## 1.2 Definitions

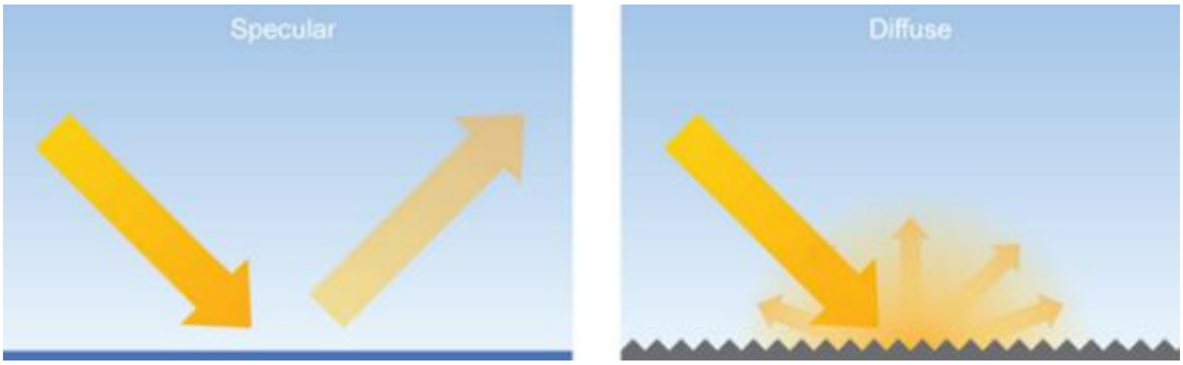
Glint, glare and dazzle are often used interchangeably but are defined in this report as described in **Table 1-2** below.

**Table 1-2: Definition of Glint, Glare and Dazzle**

| Name | Description |
|---|---|
| **Glint** | Glint is a momentary flash of bright light. |
| **Glare** | Glare is a more continuous source of bright light. |
| **Dazzle** | This is an effect caused by intense glint and glare, which can cause distraction, and if strong enough reduce the ability of the receptor (pilot or driver, or otherwise) to distinguish details and objects. |
| **Specular Reflections** | Specular reflections are direct reflections of the sun’s light off smooth surfaces, such as glass, steel, and calm water. |
| **Diffuse Reflections** | Diffuse reflections are scattered reflections of light produced from rougher surfaces such as concrete, tarmac, and vegetation. |

It is noted that different organisations and agencies apply slightly different definitions to these terms, and some refer to the terms glint and glare interchangeably. In this report, in line with the Forge Solar modelling software, the term ‘glare’ is used as an umbrella term to cover glint and glare effects.

**Graphic 1-2** shows the difference between specular reflection, produced as a direct reflection of the sun on to a smooth surface and diffused reflection, which is a scattered reflection of light.




**Graphic 1-2: Types of Reflection: Specular (left) and Diffused (right).**

The perceived intensity of glare will vary depending on the ambient light levels (influenced by the time of the day as well as weather patterns), orientation and inclination of the panels, and the distance to the receptor.

The ForgeSolar software output defines glare under a traffic light system, as 'green glare', 'yellow glare' and 'red glare'. This is explained in **Table 1-3** below.

**Table 1-3: Types of glares**

| Name | Description |
|---|---|
| Green glare | 'Green glare' is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time. |
| Yellow glare | 'Yellow glare' is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time. |
| Red glare | 'Red glare' has potential to cause retinal burn (permanent eye damage). Retinal burn is typically not possible for PV glare since the reflected light is not focused on a concentrated point. |

Temporary after-image is the phenomenon whereby an image remains momentarily visible on the retina after looking away from a bright light source.

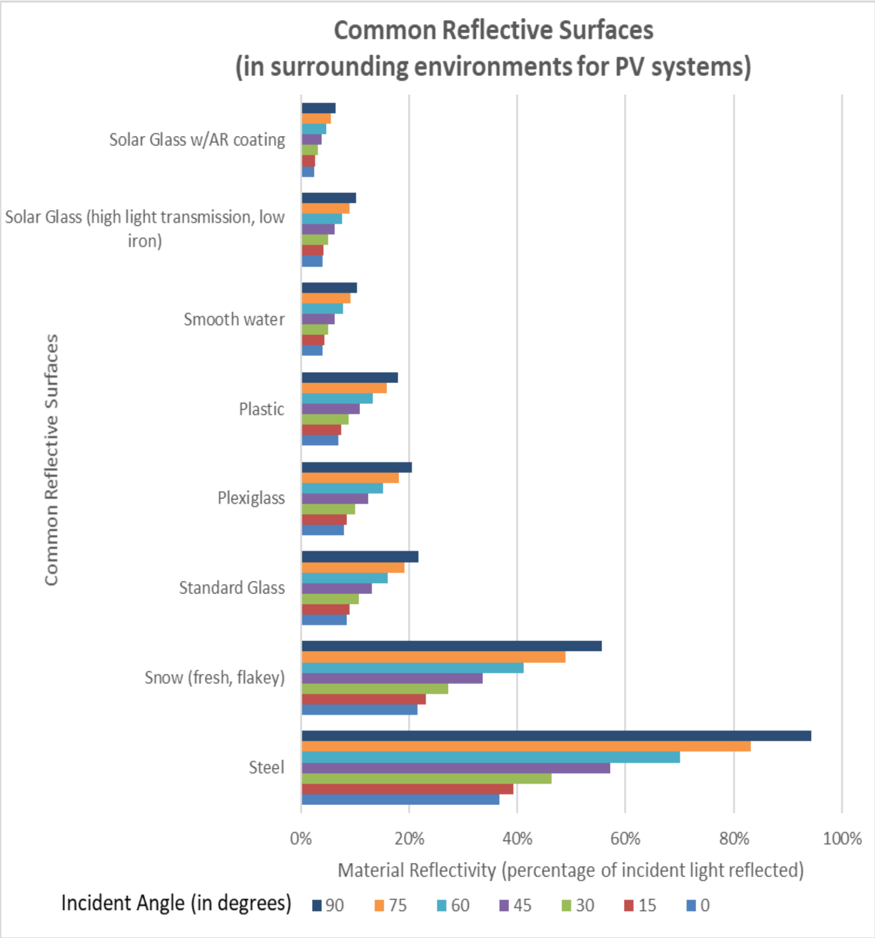
## 1.3 The Reflectivity of Solar Panels

Solar PV panels are designed to absorb sunlight and convert it into electricity; they are not designed to reflect light, although there may still be a small unavoidable reflective component present. The glass which forms the surface layer of solar panels is specifically designed with a low iron content to aid the absorption of daylight and thus has a much lower level of reflectivity than the glass typically seen in conventional windows.

For example, with a 75° angle of incidence, less than 9% of the total incident visible light is reflected, while normal glass reflects approximately 19% of light. If the panels have an anti-reflective coating applied reflectivity drops to about 5%. Thus, reflectance levels from a given solar site will be much lower than the reflectance generated by standard glass and other common reflective surfaces in the surrounding environment, although reflectance characteristics will also vary with the incidence angle, which changes as the sun moves across the sky.

Solar panels have a comparable reflectivity to calm water and are considerably less reflective that other natural materials such as snow. Any glare that may occur would be less intense than that seen when flying over a reservoir on a calm day or a snow-covered landscape on a bright day. As can be seen from **Graphic 1-3**, the reflectivity of light incident on solar glass is considerably less than light reflections from many other materials found in the built and natural environment, and approximately half that of standard glass.

As distance from the G&G source increases, the intensity of the event drops appreciably. This is due to a combination of factors including the diffraction of light after it reflects off the panel, atmospheric weather conditions such as the presence of particulates, haze, or low cloud, and the diminishing subtended viewing angle.




**Graphic 1-3: Reflectivity of common materials at varying angles of incidence.**

(Based on data from SunPower Corporation, 2009)

## 1.4 Occurrence of Glint and Glare

G&G can only occur when direct sunlight can reach the solar panels. Diffused lighting, caused by weather conditions such as cloud, fog, and mist, cannot result in glint due to the low energy intensity of the light incident on the panels.

# 2.0 Planning Policy, Legislation & Guidance

Specific policy, legislation and guidance relating to assessing G&G effects from solar parks have been considered as part of this assessment and are summarised below.

## 2.1 National policy

UK National Policy Statements mentioning solar developments and/or G&G include:

- National Planning Policy Framework (NPPF)[1] – December 2024
- National Planning Practice Guidance (NPPG)[2] – August 2023
- Scotland's National Planning Framework 4 (NPF4)
- Overarching National Policy Statement for Energy (NPS EN-1) - November 2023
- National Policy Statement for Renewable Energy (NPS EN-3) – November 2023

The NPPF and NPPG notes that large scale solar farms 'could have a damaging effect on the landscape, particularly in undulating landscapes´ and that the 'visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively' (Paragraph 007: ID 5-007-20140306 & Paragraph 013: ID 5-013-20150327). There is no explicit guidance on the proximity of receptors to the development that should be considered for assessment.

## 2.2 Local policy

Perth and Kinross Council's Local Development Plan 2 (LDP2) was adopted on 29 November 2019 and, together with the National Planning Framework 4 (NPF4) (adopted February 2023), forms the statutory Development Plan guiding land use and development decisions in the Perth and Kinross Council area. The LDP2 sets out broad planning policies for a range of land use topics, including renewable and low carbon energy, landscape, design, and amenity considerations. Policy 33 of LDP2 supports proposals for renewable and low carbon energy generation, including solar photovoltaic (PV) developments, subject to detailed assessment against environmental and planning criteria such as landscape, natural heritage, residential amenity and other relevant policy considerations.

Neither LDP2 nor NPF4 includes policy wording that explicitly refers to glint and glare effects arising from solar PV development. However, potential glint and glare effects are implicitly captured within the Development Plan's wider requirements to protect amenity and public safety and may therefore represent a material consideration where relevant.

## 2.3 Guidance

In the UK, at the domestic level, the closest guidelines regarding glint are the Building Research Establishment (BRE) guidelines on 'Site layout planning for Daylight and Sunlight: A guide to good practice'. Other relevant guidance includes:

- Aviation Guidance from Civil Aviation Authority (CAA);
- The Combined Aerodrome Safeguarding Team (CAST) – July 2023; and
- Federal Aviation Administration (FAA).

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[1] National Planning Policy Framework (2024) available at https://www.gov.uk/government/publications/national-planning-policy-framework--2

[2] National Planning Policy Framework- Planning practice guidance: Renewable and low carbon energy available at https://www.gov.uk/guidance/renewable-and-low-carbon-energy

BRE state that the sensitivities associated with glint and glare, and the landscape/visual impact and the potential impact on aircraft safety, should be a consideration. In some instances, it may be necessary to seek a G&G assessment as part of a planning application[3]. However, the BRE do not define a proximity to the development that receptors should be considered.

Regarding air-based receptors, the UK Civil Aviation Authority (CAA) states 'consideration of glint and glare should be made over a wider area' and indicate a range of up to 5 km from an Aerodrome Reference Point (ARP)[4] as an area of most concern. CAA also developed an interim guidance document published in 2010 and then retracted this in 2012. As a result, no formal copy exists.

[3] BRE (2013) *Planning guidance for the development of large-scale ground-mounted solar PV systems*. Available at https://www.bre.co.uk/filelibrary/pdf/other_pdfs/KN5524_Planning_Guidance_reduced.pdf

[4] UK CAA (2022) *CAST Guidance Note – Safeguarding Guidance to GA Aerodrome Managers and Operators*. Available at: https://www.caa.co.uk/search?query=glint

# 3.0 Methodology

## 3.1 Glint and Glare Analysis

A geometric analysis is conducted to study where and when G&G events may occur. This examines receptors present at ground level, such as dwellings, roads, national waymarked trails, and railway lines. Receptors are identified using available mapping, aerial photography, and street-level imagery.

The G&G analysis is completed in several stages using various methods, software models, and tools to progressively assess the potential for effects, while building an understanding of the local environmental conditions, either existing or proposed, that impact the potential for glare in the local area.

## 3.2 Assessment of Effects

The detailed geometric analysis uses a software model to make a prediction on the dates, times and durations of G&G effects at fixed positions over the course of a year. The software used is the GlareGauge tool that was originally developed in the United States by the Sandia National Laboratory and since improved upon and licensed to ForgeSolar. The times reported as to when G&G may occur are reported in Coordinated Universal Time (UTC) and thus any relevant daylight savings should be considered when observing the results.

The computer model predicts whether glare effects are possible at a 1-minute temporal resolution over the course of a full year. The model accounts for the maximum panel height, the area taken up by the panels and a fixed observer height. Any glare that is predicted is classified as either 'green glare' or 'yellow glare' or 'red glare', as described previously in **Table 1-3.**

### 3.2.1 Modelling Limitations

It is important to understand certain limitations within the model. The model calculates results based on the geometric relationship between the observation point at a fixed height, the reflective plane (panels) at a fixed height, and the position of the sun at each time interval as it progresses across the sky. It therefore takes no account of any screening features whatsoever. It does not account for surface features such as buildings, trees or intervening topography. The software also assumes it is sunny, at the maximum intensity possible, 365 days per year. Since the computer model indicates when glare 'can' happen, not when it 'will' happen, it considerably overstates the realistic glare duration, which is why further interpretation is essential.

- The geometry of the entire system is not considered, such as gaps between panels and heights of the mounting structures and individual panels. Therefore, a module height above of ground of 2.67 m assumes this is the only elevation at which sunlight reflects from the module (i.e. the lower and higher portions of the array are not considered).
- The shape of surrounding obstacles and obstructions (such as trees, electricity poles and fences) are not fully considered. For example, a tree is considered as uniform in its circumference from its tip to the ground as opposed to thinner at the bottom from the trunk and widest in the middle. This can lead to an obstacle's ability to shield a receptor from G&G being both under and overestimated. Further, the precise height of shading obstacles is not known, and estimates are therefore made.
- The model does not consider daily variations in weather conditions (e.g. cloud cover) and instead uses a typical clear day as a default. The software also assumes it is

sunny, at the maximum intensity possible, 365 days per year. Since the computer model indicates when glare 'can' happen, not when it 'will' happen, it considerably overstates the realistic glare duration, which is why further interpretation is essential. This also overestimates the impacts of glint and glare.

- Only twenty (20) obstructions can be modelled. As a result, many existing obstructions such as tree and hedgerows and other buildings may not be present in the model. G&G is therefore overestimated in this instance.
- Only sixty (60) point receptors can be modelled. As a result, a single identified location is considered representative of multiple discrete receptors in close proximity.

The following steps were followed to assess the impacts of G&G arising from the Proposed Development:

- **Identify receptors required for the assessment**: Main roads, railway lines, ground-based receptors, and air-based receptors closest to the Proposed Development.
- **Input receptor and solar PV plant details**: Details such as location and area of coverage were entered into the Forge Solar modelling tool, as well as the three sets of modelling assumptions detailed in **Table 5-1**, **Table 5-2** and **Table 5-3** in **Section 5** below.
- **Assess the results**: The simulation results were analysed to assess the duration, intensity, and potential impact of G&G on all identified receptors. While the model has inherent limitations (e.g., the model does not consider objects such as trees and building), existing and planned screening measures - such as trees and hedgerows - were manually incorporated into the simulation. This allowed for a more realistic representation of the anticipated conditions.

# 4.0 Receptor Identification

The following section highlights the receptors considered for the assessment.

## 4.1 Ground-based Receptors

The study area is determined as a 1 km radius from the Proposed Development for all ground-based receptors (buildings, roads, and trainline).

### 4.1.1 Fixed Ground Receptors

Several dwellings and farms are located within the study area. In some cases, a single identified location is considered representative of multiple discrete receptors in close proximity (see **Graphic 4-1**). Key locations include:

- Residential buildings within 1 km of the Proposed Development.

A total of 18 ground-based observation points (OPs) represent buildings within the study area. These receptors are all off-site residential properties of one or two storeys.

### 4.1.2 Roads and Trainline

Numerous roads and small country lanes fall within the 1 km study area of the Proposed Development (see **Graphic 4-1**). The assessment has focused on the following key routes:

- Main Road, A9, adjacent to the southern boundary of the Proposed Development.
- Roman Road, south west of the Proposed Development.
- Local rural road to the east of the Proposed Development and connecting to the A9.

There is no railway line within a 1 km radius of the Proposed Development, and therefore, no railway line has been considered in the study.


**Graphic 4-1: The Proposed Development and identified ground-based receptors.**

## 4.2 Air-based Receptors

The closest aviation receptor is Perth airport, which is located 11 km north east of the Proposed Development, and therefore, it is not considered within the study area and not included in this assessment.

# 5.0 G&G Assessment

## 5.1 Modelling Input

Three different solar PV areas have been identified and modelled in the software to estimate the G&G effects.

There are a total of three sets of modelling assumptions required for the simulation, detailed in **Table 5-1**, **Table 5-2** and **Table 5-3** below.

**Table 5-1: Site configuration parameters**

| Parameter | Details |
|---|---|
| Subtended angle of the sun | 9.3mrad (0.5°). This is the default setting given by the software. |
| Direct Normal Irradiance (DNI) | DNI scales with the position of the sun and has a peak value of 1000W/m². |
| Ocular transmission coefficient | This is the radiation absorbed in the eye before reaching the retina. Value of 0.5 (default figure recommended by the software). |
| Pupil diameter | This is the diameter of the pupil when daylight is present. Value of 2mm (default figure recommended by the software). |
| Eye focal length | This is the projected image size on the retina from a given glare source for a given subtended angle. Value of 1.7cm This is the default figure recommended by the software. |
| Time interval | Value of 1 to represent 1 minute |

**Table 5-2: PV array parameters**

| Parameter | Details |
|---|---|
| Mounting details | Fixed tilt (no tracking). |
| Module tilt | 20° |
| Module orientation | 180° (South) |
| PV material category | Category 1. Defined as smooth glass with anti-reflective coating. |
| Slope error value | A value of 'varies' to imply that this depends on the PV material selected. In this case, material category 1 was selected. |
| Reflectivity value | A value of 'varies' to imply that this depends on the PV material selected. In this case, material category 1 was selected. |

**Table 5-3: Receptor parameters**

| Parameter | Details |
|---|---|
| Route receptors | Three routes: A9, C411 Roman Road and the U47 local (rural) Tibbermore road |
| Residential Dwellings - Observation points | 18 OPs, all of them offsite |
| Obstructions | Range of trees and buildings scattered around site. A total of 20 screenings |

## 5.2 Simulation Results

The following section details the results of the G&G simulation, along with implications for the site and limitations of the study. Note that further details can be found in the following G&G simulation reports:

- **Annex A:** Forge Solar Analysis – Dupplin.pdf

**Table 5-4** highlights the total duration and magnitude of G&G experienced by all affected receptors across the day and year. It is worth noting that the remaining receptors are not impacted by G&G from the PV array.

**Table 5-4: Duration and diurnal/seasonal patterns of G&G**

| Receptor | G&G Hazard | Time and Daily G&G Duration |
|---|---|---|
| A9 Road | Yellow | From mid-March to September. From 17.30 to 19.00, for up to 8 minutes per day. Mostly yellow glare. |
| Roman Rd | Yellow | From April to mid-September from 18.00 to 19.00, for up to 25 minutes per day. Mostly yellow magnitude glare. |
| Rural road | Yellow | From April to early September from 18.00 to 19.00, for up to 20 minutes per day. Mostly yellow magnitude glare. |
| OP13 | Green | From mid-March to mid-April and September, between 17.30 and 18.30, for up to 5 minutes per day and only green magnitude glare. |

## 5.3 Discussion and Implication of Results

It is to be noted that existing screening measures, such as trees, hedgerows, have been incorporated into the simulation, as well as proposed new ones, as illustrated in orange and white in **Graphic 5-1**. The screenings are based on information available in Google Earth Pro and the indicative Landscape Management Plan (LMP) produced by SLR.


**Graphic 5-1: Existing (orange) and proposed (white) screenings included in the simulation.**

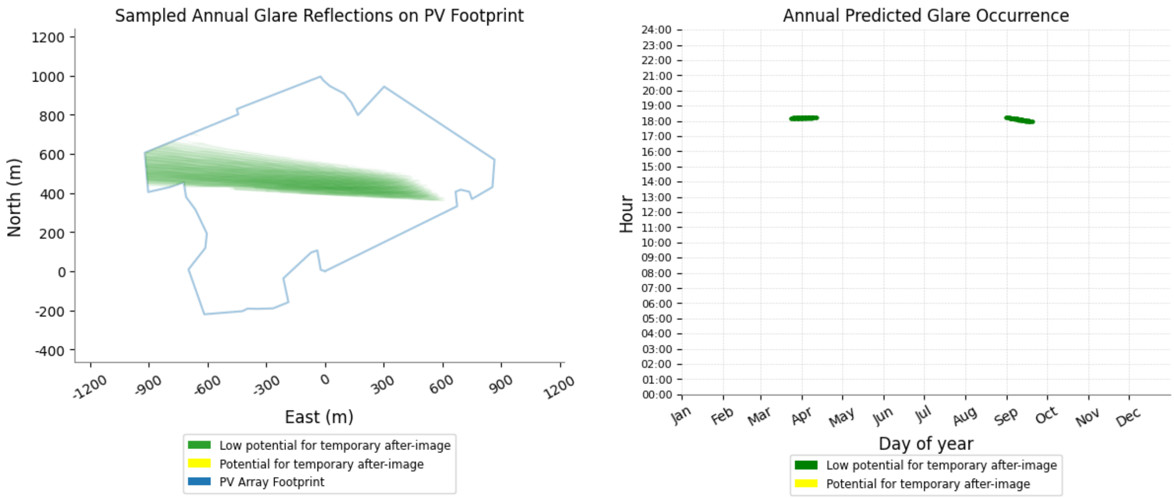
### 5.3.1 Fixed Ground Receptors

Out of the 18 identified ground-based fixed receptors, only one receptor is potentially affected by G&G from the Proposed Development, as indicated in **Table 5-4**.

The predicted effect at this receptor is limited to green glare only, which is associated with a low potential for after-image formation and is generally considered to pose **minimal risk** to health and safety.

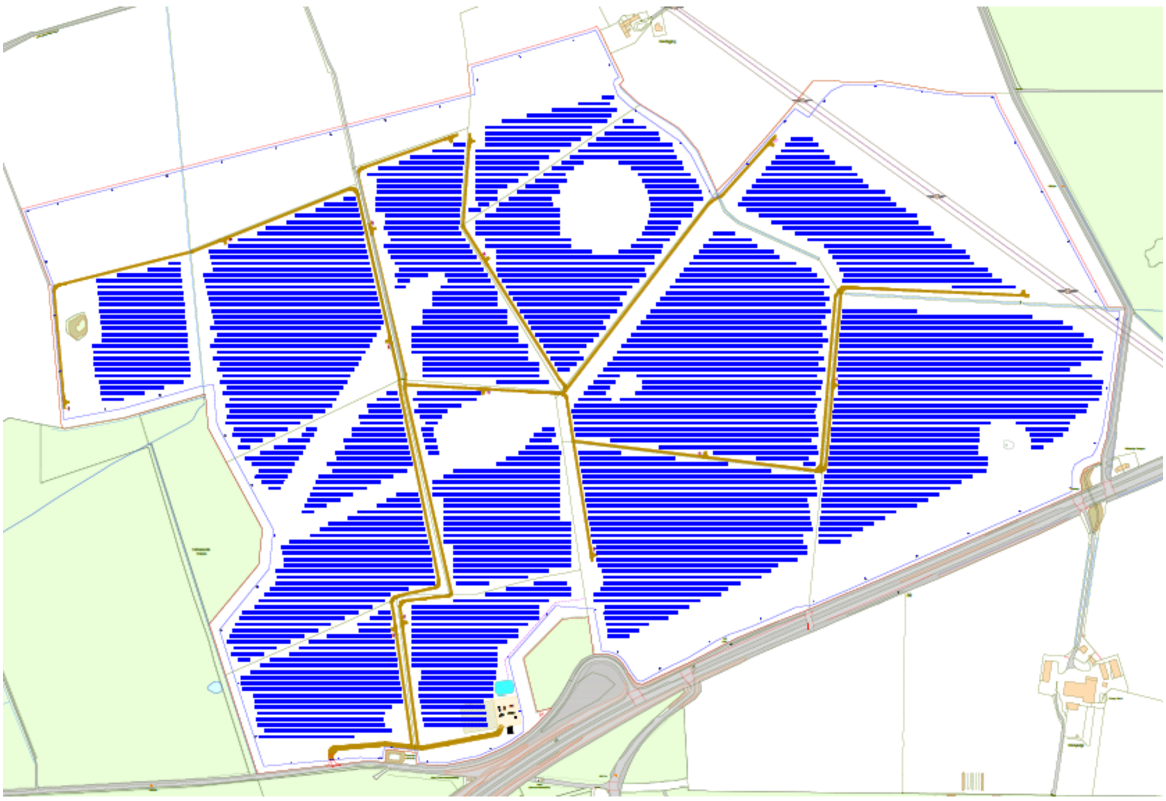
Receptor OP13 could experience up to approximately 5 minutes per day of green glare during mid-March to mid-April and again in September, occurring in the evening period between 17:30 and 18:30. This effect arises when the sun is setting in the west and reflecting eastwards towards the receptor. The total annual duration of glare is limited to a maximum of approximately 2 hours.

In addition, **Graphic 5-2** illustrates the areas of the Proposed Development from which the green glare affecting the fixed receptor emanates.




**Graphic 5-2: Areas from where G&G emanates on affected fixed receptor OP13.**

It is noted that part of the highlighted area shown in **Graphic 5-2** does not account for the gaps between PV module rows and areas within the panel footprint where no modules are installed, as illustrated in **Graphic 5-3** below. When these gaps are considered, the extent and duration of glare would be further reduced. On this basis, and under realistic operational conditions, the potential glint and glare effect on receptor OP13 is considered **negligible**.



**Graphic 5-3: Dupplin solar layout**

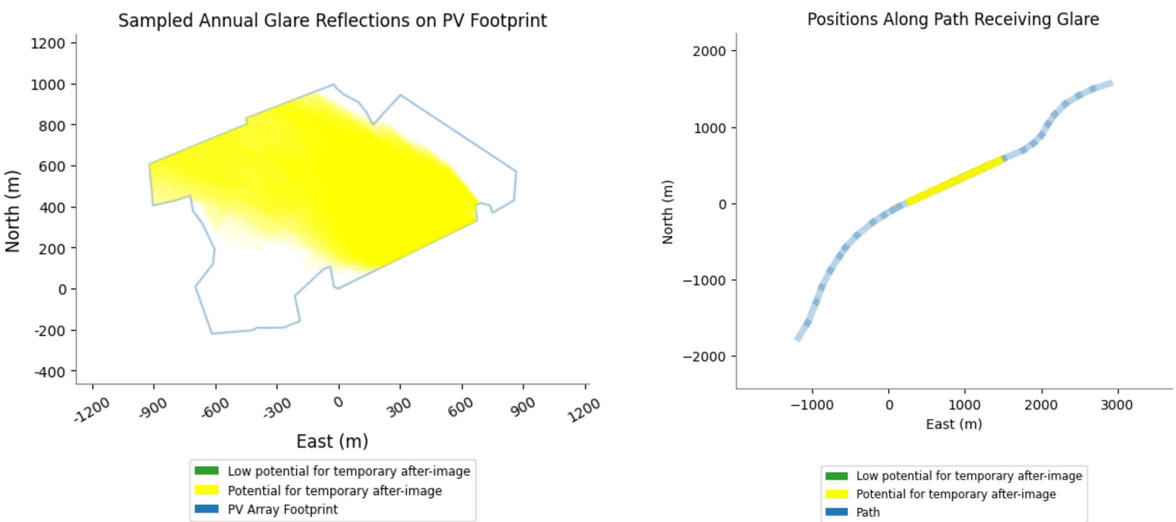
### 5.3.2 Roads

The G&G assessment evaluated three routes: three roads (the A9, C411 Roman Road and the U47 local (rural) Tibbermore road). Existing screening measures, such as trees and hedgerows, as well as proposed vegetation (discussed above), have been incorporated in the simulation. However, due to modelling limitations, it was not possible to include all the screening vegetation, obstructions, and intervening topography in the model. As a result, the predicted outcomes may represent a conservative scenario, and the actual level of impact in real-life conditions is likely to be lower once all mitigation measures are in place.

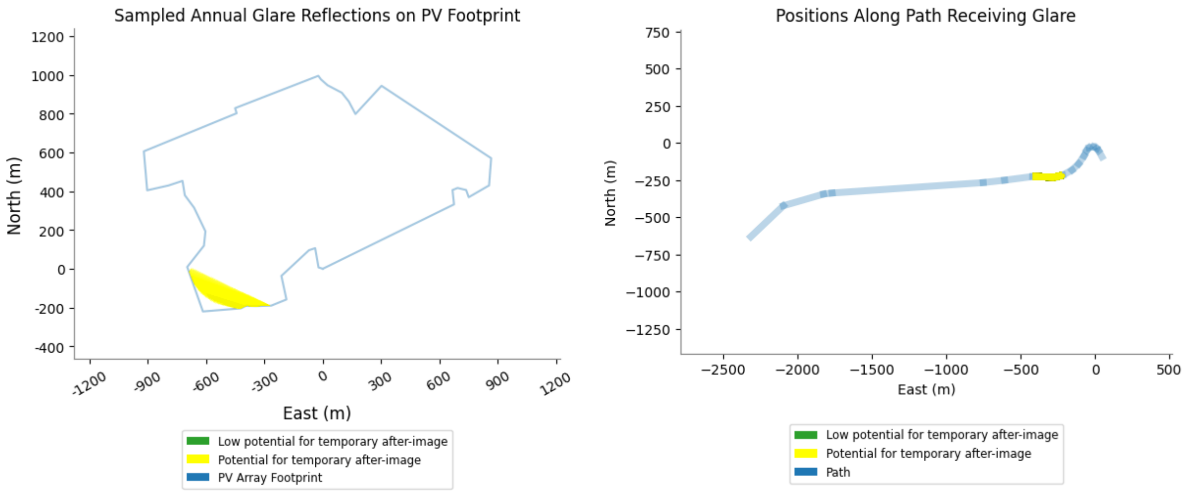
All three routes are predicted to experience periods of green and yellow glare. According to the Forge Solar analysis:

- A9: Potential glare of up to 8 minutes per day may occur between mid-March and September, during the evening period (approximately 17:30–19:00), when the sun is at a low western angle. The total annual duration is approximately 1,000 minutes.
- Roman Road: Potential glare of up to 25 minutes per day may occur between March and mid-September, during the evening period (approximately 18:00–19:00). The total annual duration is approximately 3,000 minutes.
- Rural road: Potential glare of up to 205 minutes per day may occur between April and September, during the evening period (approximately 18:00–19:00). The total annual duration is less than 3,000 minutes.

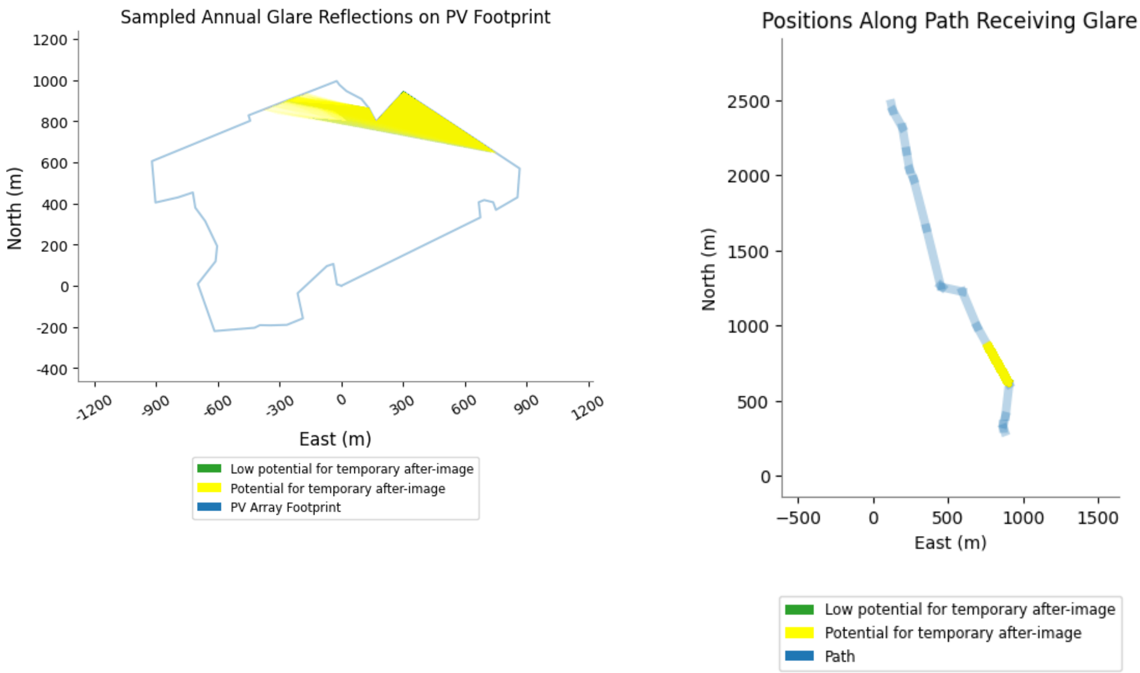
Additionally, **Graphic 5-4**, **Graphic 5-5** and **Graphic 5-6** illustrate the areas of the Proposed Development from which glare originates and the corresponding sections of each road that may be affected.




**Graphic 5-4: Glare emanating from the PV Area (left) and impacting on the A9 (right).**




**Graphic 5-5: Glare emanating from the PV Areas (left) and impacting on Roman Rd. (right).**



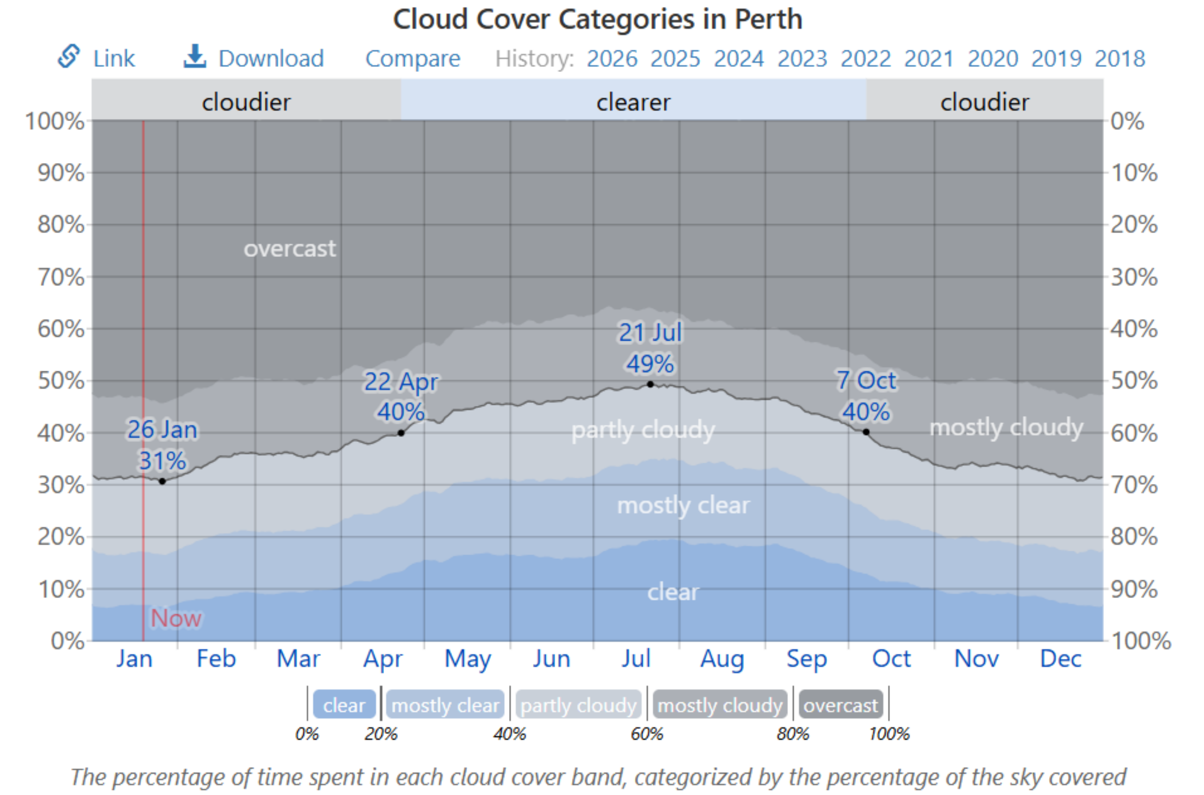

**Graphic 5-6: Glare emanating from the PV Areas (left) and impacting on the rural road. (right).**

In the case of the A9, the simulation does not fully account for gaps within the PV array footprint where no modules are installed, as discussed previously for fixed ground-based receptors. Inclusion of these gaps would be expected to result in a modest reduction in predicted glare. The model does, however, account for both existing and proposed hedgerows, assumed to reach a height of approximately 3 m, and glare is still predicted at a yellow level. Yellow glare is comparable to reflections commonly experienced from windows, water bodies, or metallic surfaces and is not generally associated with significant safety risk.

As an additional precautionary measure, hedgerow screening, including along the south A9 boundary would be commenced sufficiently in advance of construction and operation of the Project.

An estimated time period of c.5 years would allow for sufficient hedgerow growth to establish prior to the installation of arrays. If at time of construction, hedgerow is deemed too low, then this will be supplemented by other means until required height is achieved – potentially incorporating a screen barrier or screen netting, which could be secured by planning condition.

It is also important to note that the glare model assumes 365 days of clear-sky conditions, which represents a worst-case scenario. In practice, this assumption does not reflect local climatic conditions. As illustrated in **Graphic 5-7** below, the Perth area experiences a high frequency of cloud cover.




**Graphic 5-7: Annual cloud cover percentage in Perth.**

(Source: Weather Spark[5])

The proportion of sky covered by cloud in Perth shows marked seasonal variation. The clearer period of the year typically extends from late April to early October, with July being the clearest month, during which the sky is clear approximately 49% of the time. Conversely, January is the cloudiest month, with overcast or mostly cloudy conditions occurring on average 69% of the time.

Given the high frequency of cloud cover in the area, the occurrence of glare from the Proposed Development is expected to be substantially lower than the modelled worst-case scenario. In practical terms, glare events are likely to occur at least 50% less frequently than predicted under clear-sky assumptions, further reducing the overall impact of the Proposed Development.

[5] https://weatherspark.com/y/38063/Average-Weather-in-Perth-United-Kingdom-Year-Round

Despite the inherent limitations of the glint and glare modelling, the predicted impacts on the A9 are limited in both extent and duration. Even under the worst-case clear-sky scenario, the maximum predicted glare duration is up to 8 minutes per day, affecting only a short section of the carriageway and occurring during a restricted evening time window. In real-world conditions, where cloud cover, atmospheric conditions and additional screening are present, the actual occurrence and duration of glare would be expected to be lower than modelled.

Furthermore, the A9 is a transient receptor, with drivers exposed to potential glare for only a brief period while travelling through the affected section of road. When considered alongside the short duration, limited spatial extent, and the predominance of yellow glare, which is comparable to reflections commonly experienced from windows, water bodies or metallic surfaces, the overall effect is considered to be **low** and unlikely to give rise to a material road safety risk.

As an additional precautionary measure, hedgerow screening, including along the south A9 boundary would be commenced sufficiently in advance of construction and operation of the Project. An estimated time period of c.5 years would allow for sufficient hedgerow growth to establish prior to the installation of arrays. If at time of construction, hedgerow is deemed too low, then this will be supplemented by other means until required height is achieved – potentially incorporating a screen barrier or screen netting, which could be secured by planning condition.

Regarding C411 Roman Road and the U47 local (rural) Tibbermore road, while longer theoretical durations of glare are predicted by the model (up to 25 minutes per day), these routes are characterised by significantly lower traffic volumes compared to the A9. As a result, the likelihood of drivers being present during the specific, time-limited glare periods is substantially reduced. Combined with the transient nature of road users, the very short sections of road affected, existing and proposed screening, and the conservative modelling assumptions applied, the potential risk to road users on these routes is considered **low**.

# 6.0 Cumulative

A cumulative glint and glare assessment has been undertaken to consider the potential combined effects of the Proposed Development in conjunction with the Kinnon Park Solar Development, which is located approximately 2.5 km to the north, as illustrated in **Graphic 6-1**.


**Graphic 6-1: Kinnon Park Solar and the Proposed Development (Dupplin Solar).**

The cumulative assessment indicates that only the A9 and a local rural road are subject to any potential cumulative glint and glare effects. In both cases, the predicted effects are limited to small, discrete sections of the road network, which are different from those affected by the Proposed Development alone. The predicted glare is predominantly green glare, which is associated with a low potential for after-image formation and minimal risk to driver safety.

Given the separation distance between the two developments, the limited spatial extent of the affected road sections, and the short duration of predicted glare events, the potential cumulative effect on these receptors is considered **negligible**. This conclusion is further supported by the transient nature of road users, the conservative assumptions applied within the modelling, and the climatic conditions at the site.

It is also noted that the glare modelling incorporated existing and proposed screening measures associated with the Proposed Development only. No additional existing obstructions or screening associated with the Kinnon Park Solar Development were included in the simulation. As such, the cumulative results represent a worst-case scenario, with actual effects in practice expected to be lower than modelled.

No other ground-based or road receptors are predicted to experience cumulative glint and glare effects.

# 7.0 Conclusion

The purpose of this G&G assessment is to consider the effects of G&G arising from the proposed solar farm on receptors around the Proposed Development. For glare to occur there must be viable weather conditions, the geometrical alignment for glint (i.e. reflected light must physically arrive at the receptor, given the relative position of the sun in the sky and the panels), and there must be visibility of the panels (i.e. no intervening landform, or surface features (buildings/trees/hedgerows etc).

The software used for the simulation (GlareGauge tool by ForgeSolar) has some limitations (which are discussed in the report) such as treating the circumference of trees at ground and tip height as uniform, despite the trunk of tree being much smaller than the body of the tree. Additionally, G&G can only occur under sunny conditions, which the software does not explicitly account for, potentially leading to overestimations of its occurrence and impact. This can also affect the assessment of how obstacles mitigate G&G on sensitive receptors.

The assessment demonstrates that only one fixed ground receptor (OP13) is predicted to experience any potential glint and glare effects. These effects are limited to green glare only, occur for a very short duration during restricted seasonal and evening time periods, and result in a maximum annual duration of approximately two hours. When account is taken of gaps within the PV array footprint, existing and proposed screening, and local climatic conditions, the potential effect on this receptor is considered negligible.

For road receptors, the A9, Roman Road and a local rural road were assessed. Even under worst-case modelling assumptions, predicted glare effects are limited in duration, spatial extent and severity, with the A9 experiencing a maximum of up to 8 minutes per day of glare affecting only a short section of carriageway. Road users are transient receptors and exposure would be brief. The predicted glare is predominantly yellow glare, comparable to reflections from common roadside features. The lower traffic volumes on Roman Road and the rural road further reduce the likelihood of exposure.

A cumulative assessment considering the Kinnon Park Solar Development, located approximately 2.5 km to the north, indicates that cumulative effects are limited to small, discrete sections of the A9 and a rural road, distinct from those affected by the Proposed Development alone. Predicted cumulative glare is predominantly green glare and of limited duration. No additional receptors are affected, and cumulative effects are assessed as minimal to negligible.

It is noted that the glare modelling assumes 365 days of clear-sky conditions, which does not reflect the high frequency of cloud cover experienced in the Perth area. In practice, glare events are expected to occur significantly less frequently than modelled (50% less), further reducing the potential for effect under operational conditions.

No aviation receptors (including aerodromes or airfields) are located within the vicinity of the Proposed Development, and as such no aviation-related glint and glare effects are anticipated.

With the inclusion of existing and proposed landscape screening, the residual glint and glare effects of the Proposed Development are considered **low**. On this basis, the Proposed Development is not expected to result in any significant or unacceptable glint and glare impacts and is considered to be **acceptable** in glint and glare terms.

# Annex A Forge Solar Analysis

**Glint and Glare (G&G) Assessment**

**TRIO Dupplin Solar LLP**

SLR Project No.: 405.065787.00001

19 January 2026

The simulation results from the ForgeSolar software are provided separately in PDF format, under the document name ‘*Forge Solar Analysis – Dupplin’.*

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