Lime Down
Solar Park

Environmental Statement

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PAGERPOWER
Urban & Renewables

Appendix 20-4: Solar Photovoltaic Glint and Glare Study

Island Green Power

Lime Down Solar Park

September 2025

EXECUTIVE SUMMARY

Report Purpose

Pager Power has been retained to assess the possible effects of glint and glare from a ground-mounted solar photovoltaic development. The Scheme, located in Wiltshire, comprises a solar photovoltaic (PV) electricity generating station of over 50 megawatts (MW) and 'associated development' comprising up to 500 MW export capacity Battery Energy Storage System (BESS).

It has not yet been determined whether a fixed south facing or single axis tracking layout will be progressed, and therefore both options are assessed in this report. To allow for potential design alterations, this assessment has considered a reasonable worst-case scenario including no embedded mitigation and solar panels in all option areas.

This assessment pertains to the potential impact upon road safety, residential amenity, railway safety, and aviation activity associated with Hullavington Airfield, Badminton Airfield, Langley House Airfield, Charlton Park Airfield, and Bowldown Farm Airfield.

Overall Conclusions

No significant impacts are predicted towards residential amenity, road safety and railway operations, considering the embedded mitigation. No additional mitigation is recommended.

Solar reflections with 'potential for temporary after-image' are predicted towards Hullavington Airfield and Badminton Airfield. The effects have been considered in an operational context (see Sections 6.2.5 and 6.2.6 for results discussion) and a low impact is predicted, with glare considered to be operationally accommodatable.

Guidance and Studies

Guidelines exist in the UK (produced by the Civil Aviation Authority) and in the USA (produced by the Federal Aviation Administration) with respect to solar developments and aviation activity. The UK CAA guidance is relatively high-level and does not prescribe a formal methodology.

A national policy for determining the impact of glint and glare on road safety, residential amenity and railway infrastructure and operations has not been produced to date. Therefore, in the absence of this, Pager Power reviewed more general existing planning guidelines and the available studies in the process of defining its own glint and glare assessment guidance and methodology[1]. This methodology defines the process for determining the impact upon road safety, residential amenity, railway infrastructure and operations, and aviation activity.

Pager Power's approach is to undertake geometric reflection calculations and, where a solar reflection is predicted, consider the screening (existing and/or proposed) between the receptor and the reflecting solar panels. The scenario in which a solar reflection can occur for all receptors

[1] Pager Power Glint and Glare Guidance, Fourth Edition, September 2022.

is then identified and discussed, and a comparison is made against the available solar panel reflection studies to determine the overall impact.

The available studies have measured the intensity of reflections from solar panels with respect to other naturally occurring and manmade surfaces. The results show that the reflections produced are of intensity similar to or less than those produced from still water and significantly less than reflections from glass and steel[2]. Reflections from solar panels are less intense than those from glass or steel because solar panels are designed in order to absorb light, rather than reflect it, as panels are more efficient when they reflect less light.

Assessment Conclusions – Aviation

Hullavington Airfield

Glare with 'potential for temporary after-image' (yellow) is predicted towards the approach paths and visual circuits associated with Hullavington Airfield, for both fixed south facing panels and single axis tracking panels. Flying activities at the airfield ceased in 2016, and therefore the airfield has been assessed for reference only.

Pager Power is not aware of any proposals to resume flying activities at Hullavington Airfield, and therefore no impact is predicted towards this airfield. If flying activities were to resume, that the Applicant will liaise with the airfield operator on the potential for temporary after image ('yellow glare') from the Scheme, so that it can be taken into consideration when reopening the airfield and preparing operational flight plans. Overall, it is expected that the effects can be operationally accommodated if the airfield were to re-open (See Section 6.2.5 for results discussion).

Badminton Airfield

Solar reflections with yellow glare are predicted towards the visual circuits associated with Badminton Airfield, for both fixed south facing panels and single axis tracking panels. Pager Power recommends a pragmatic approach whereby instances of 'yellow' glare are evaluated in a technical and operational context.

Solar reflections with yellow glare are mostly predicted to occur within 2 hours of sunrise and are predicted to coincide with direct sunlight and therefore will occur when the Sun is low in the sky beyond the reflecting panels. This means that a pilot will likely have a view of the Sun within the same viewpoint of the reflecting solar panels. The Sun is a far more significant source of light. Furthermore, the airfield is expected to have low traffic volumes and yellow glare is not predicted towards the approach paths (which are the more sensitive receptors). In addition, the weather would have to be clear and sunny at the specific times when the glare was possible to be experienced. Overall, it is judged that the effects can be operationally accommodated.

Solar reflections are also predicted towards the approach path for runway 07, with an intensity of 'low potential for temporary after-image' (green) and occur within a pilot's primary field-of-view (50° either side of the direction of travel). This is deemed acceptable in line with the

[2] SunPower, 2009, SunPower Solar Module Glare and Reflectance (appendix to Solargen Energy, 2010).

associated guidance (Annex D) and industry standards. A low impact is predicted, and mitigation is not required.

Solar reflections towards the approach path for runway 25 will occur outside of a pilot's primary field-of-view. This is deemed acceptable in line with the associated guidance and industry standards. A low impact is predicted, and mitigation is not required.

Overall, a low impact is predicted towards Badminton Airfield, and beyond liaison with the airfield operator, no physical mitigation is required.

Assessment Conclusions – Roads

Solar reflections are geometrically possible towards all 66 of the assessed road receptors.

For a 0.7km section of Bradfield Cottages road, existing vegetation (approximately 2.2m in 2025) is not currently at a sufficient height to screen views for a typical road user. This vegetation will be allowed to mature at a rate of 0.4m of additional height per year (to a maximum of 4.5m) and will therefore reach a height of at least 3m by the operation phase, when panels will be in situ. The proposed vegetation will reach a height to sufficiently screen views of the panels from a typical road user. Brief, infrequent views may be possible for elevated road users (i.e., HGV drivers); however, the nature and duration of these views are not considered to result in significant effects. A low impact is predicted, and mitigation is not proposed.

For the remaining sections of road, screening in the form of existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels. No significant impacts are predicted, and no mitigation is proposed.

Assessment Conclusions – Dwellings

Solar reflections are geometrically possible towards 200 of the 248 assessed dwellings.

For fixed south-facing panels, solar reflections are predicted to occur for more than three months per year but less than 60 minutes in any given day and the existing vegetation is not currently at a sufficient height to screen views from the ground floor of the dwelling of receptor 24. Existing vegetation is not currently at a sufficient height (approximately 2m in 2025) to screen views from this property. This vegetation will reach approximately 3.2m by the operation and maintenance phase when panels will be in situ, therefore the Applicant has committed to the use of 2.5m fixed panels in field B11 to prevent any significant impacts. No impact is predicted, and no mitigation is proposed.For the remaining dwellings, screening in the form of existing vegetation and/or intervening terrain is predicted to obstruct views of reflecting panels. No significant impacts are predicted, and no mitigation is proposed.

For single axis tracking panels, no significant impacts are predicted, and no mitigation is proposed. Solar reflections either occur for less than three months per year and 60 minutes on any given day, or occur for more than three months per year and are significantly screened by existing vegetation and/or intervening terrain.

Assessment Conclusions – Railway

Solar reflections are geometrically possible towards all 94 of the assessed railway receptors.

For a 0.3km section of railway, solar reflections are predicted to occur within a train driver's primary field-of-view for fixed south facing panels and single axis tracking panels. The applicant has committed not to implement fixed south facing panels in the affected area (see Section 6.5.3) or to impose a restriction on backtracking so that it will not backtrack beyond 5° to the single-axis tracking panels, which would be sufficient to mitigate any impacts. No significant impacts are predicted, and no mitigation is proposed.

For the remaining sections of railway, screening in the form of existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels. No significant impacts are predicted, and no mitigation is proposed.

No railway signals were identified that would have the potential to be affected by glint and glare.

Assessment Conclusions – Sensitive Cotswolds National Landscape (CNL) Viewpoints

Solar reflections are geometrically possible towards 14 of the 15 assessed viewpoint receptors.

For nine of these receptors, screening in the form of intervening terrain and/or existing vegetation is predicted to obstruct views of reflecting panels. No impact is predicted, and no mitigation is proposed.

For the remaining five receptors, partial screening has been identified in the form of intervening terrain and/or existing vegetation, however views of the site cannot be ruled out. A low impact is predicted, and no mitigation is proposed.

High-Level Conclusions – Aviation

No significant impacts are predicted upon aviation activity associated with Langley House Airfield, Charlton Park Airfield and Bowldown Airfield. No mitigation is required.

High-Level Conclusions – Public Rights of Way

No significant impacts are predicted upon public rights of way. No mitigation is required.

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ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 62 countries within Europe, Africa, America, Asia and Oceania.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects;
- Building developments; and
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

1 INTRODUCTION

1.1 Overview

Pager Power has been retained to assess the possible effects of glint and glare from a ground-mounted solar photovoltaic development. The Scheme, located in Wiltshire, comprises a solar photovoltaic (PV) electricity generating station of over 50 megawatts (MW) and 'associated development' comprising up to 500 MW export capacity Battery Energy Storage System (BESS).

It has not yet been determined whether a fixed south facing or single axis tracking layout will be progressed, and therefore both options are assessed in this report. To allow for potential design alterations, this assessment has considered a reasonable worst-case scenario including no embedded mitigation and solar panels in all option areas.

This assessment pertains to the potential impact upon road safety, residential amenity, railway safety, and aviation activity associated with Hullavington Airfield, Badminton Airfield, Langley House Airfield, Charlton Park Airfield, and Bowldown Farm Airfield.

This report contains the following:

- Solar development details;
- Explanation of glint and glare;
- Overview of relevant guidance and relevant studies;
- Overview of Sun movement;
- Assessment methodology;
- Identification of receptors;
- Glint and glare assessment for identified receptors;
- High-level assessment of aviation considerations;
- Results discussion.

The relevant technical analysis is presented in each section. Following the assessment, conclusions and proposed commitments are made.

1.2 Pager Power's Experience

Pager Power has undertaken over 1,600 Glint and Glare assessments in the UK and internationally. The studies have included assessment of civil and military aerodromes, railway infrastructure and other ground-based receptors including roads and dwellings.

1.3 Glint and Glare Definition

The definition[3] of glint and glare is as follows:

- Glint – a momentary flash of bright light typically received by moving receptors or from moving reflectors;
- Glare – a continuous source of bright light typically received by static receptors or from large reflective surfaces.

The term 'solar reflection' is used in this report to refer to both reflection types i.e. glint and glare.

[3] These definitions are aligned with those of the National Policy Statement for Renewable Energy Infrastructure (EN-3) published by the Department for Energy Security & Net Zero, and the Federal Aviation Administration (FAA) in the United States of America.

2 SCHEME LOCATION AND DETAILS

2.1 Solar PV Site Layout

Figure *1* below shows the Solar PV Sites overlaid onto aerial imagery as the blue areas. The labels indicate which of the areas correspond to Lime Down A-E.

Figure 1 *Scheme Sites overlaid onto aerial imagery*

2.2 Solar Panel Technical Information

The Scheme may comprise of either fixed south facing panels or single axis tracking panels. The technical information for both options are outlined in this section, and both options are assessed in this report.

2.2.1 Fixed South Facing Panels

Table 1 on the following page summarises the technical information of the fixed south facing solar panels used in the assessment.

Panel Information	
Azimuth angle[4]	180° (south-facing)
Elevation angle[5]	22.5°[6]
Assessed centre height[7]	1.95m agl[8]
Maximum height	3.5m agl

Table 1 *Solar panel technical information – fixed south facing panels*

2.2.2 Single Axis Tracking Panels

Table 2 below summarises the technical information of the single axis tracking solar panels used in the assessment.

Solar Panel Technical Information	
Assessed centre-height[9]	2.5m agl
Maximum height	4.5m agl
Tracking	Horizontal Single Axis tracks Sun East to West
Tilt of tracking axis (°)	0
Orientation of tracking axis (°)	180
Offset angle of module (°)	0
Tracker Range of Motion (°)	±60.0
Resting angle (°)	0
Backtracking Method	Instant (for modelling purposes). Further discussed in the following subsection and in Annex I

Table 2 *Solar panel technical information – single axis tracking panels*

[4] Relative to true north
[5] Inclination above the horizontal
[6] This is the midpoint of 10° and 35° which is the envelope. Changes to the elevation angle within this range would not be expected to have a significant impact on the report conclusions
[7] This is the midpoint of 0.4m (minimum height) and 3.5m (maximum height)
[8] Above ground level
[9] This is the maximum horizontal height of the panels

2.2.3 Solar Panel Backtracking

Shading considerations dictate the panel tilt of the single-axis tracking panels. This is affected by:

- The elevation angle of the Sun;
- The vertical tilt of the panels; and
- The spacing between the panel rows.

This means that early in the morning and late in the evening, the panels will not be directed exactly towards the Sun, as the loss from shading of the panels (caused by facing the Sun directly when the Sun is low in the horizon), would be greater than the loss from lowering the panels to a less direct angle in order to avoid the shading; Figure 2 below illustrates this.

The graphics in Figure 2 show two lines illustrating the paths of light from the Sun towards the solar panels. In reality, the lines from the Sun to each panel would be effectively parallel due to the large separation distance. The figure is for illustrative purposes only.

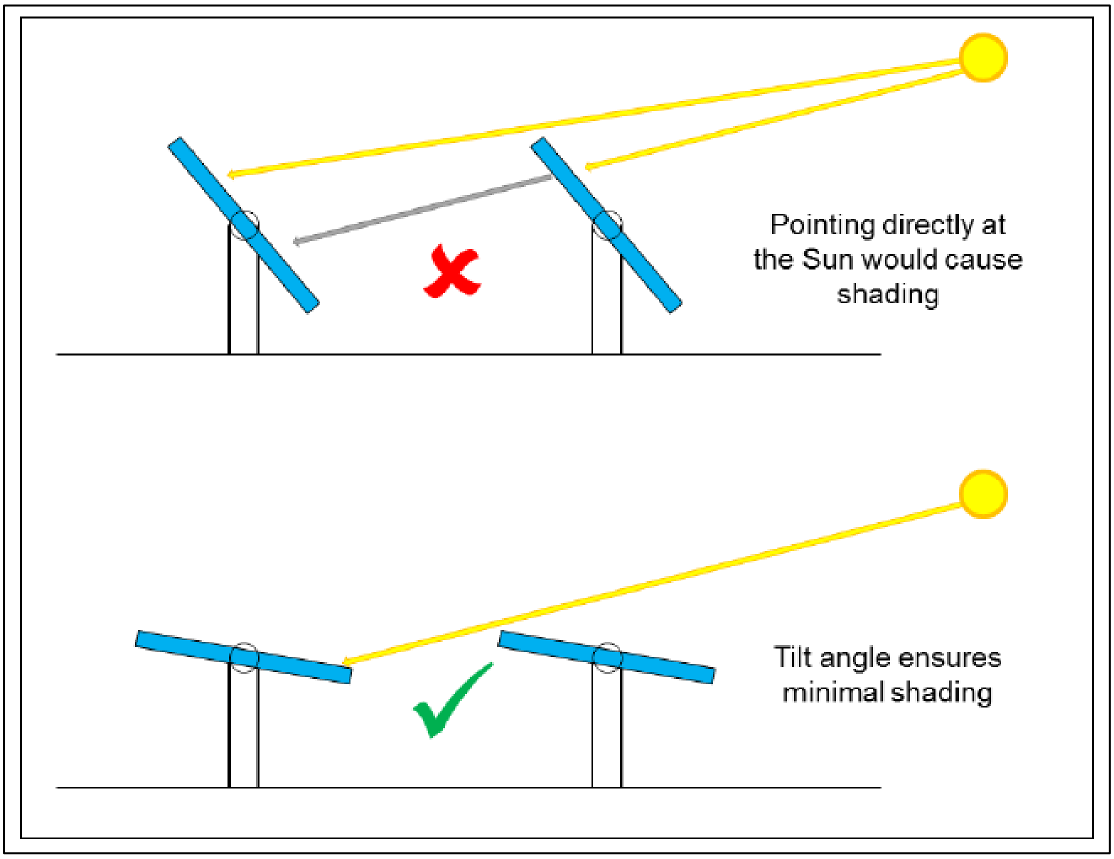

Figure 2 *Shading considerations*

Later in the day, the panels can be directed towards the Sun without any shading issues. This is illustrated in Figure 3 on the following page.

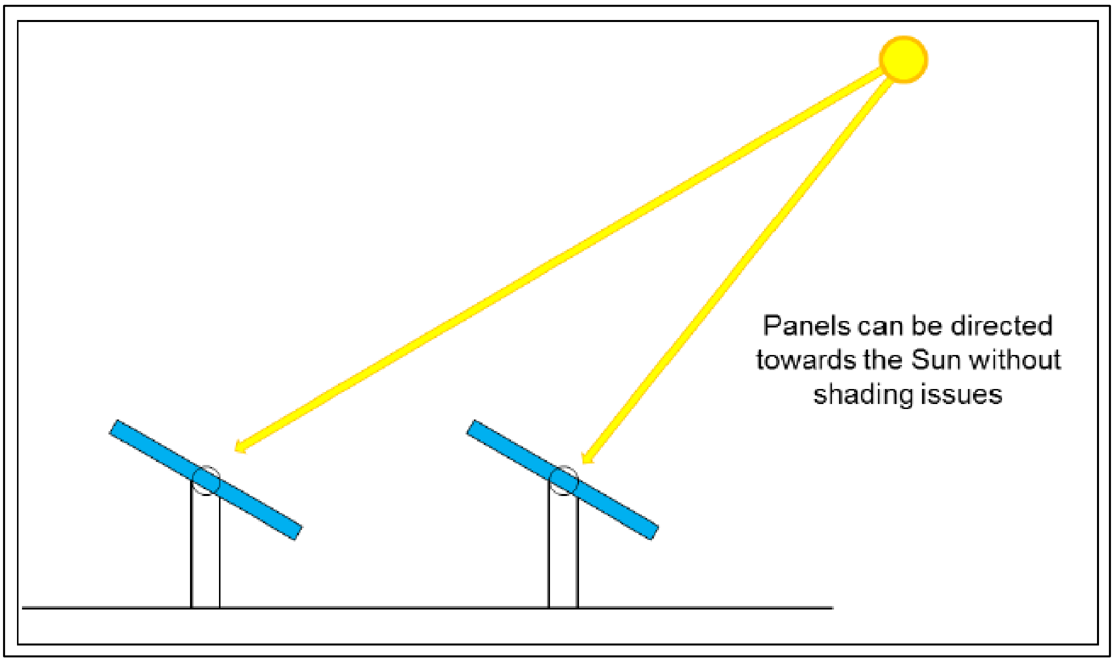

Figure 3 *Panel alignment at high solar angles*

The solar panels backtrack (where the panel angle gradually declines to prevent shading) by reverting to 0 degrees (flat) once the maximum elevation angle of the panels (60 degrees) becomes ineffective due to the low height of the Sun above the horizon and to avoid shading.

2.2.4 Back Tracking Solar Panel Model

Back tracking systems are sensitive to panel length, row spacing, topography and the level of shading which varies throughout the year. The Forge Solar model used in this assessment is a widely accepted model within this area. The model approximates a backtracking system by assuming the panels instantaneously revert to its resting angle of 0 degrees whenever the Sun is outside the rotation range (60 degrees in this instance). Panels with a maximum tracking angle of 60 degrees and resting angle of 0 degrees would therefore lie horizontally from sunrise until the Sun enters the rotation range, and immediately after the Sun leaves the rotation range until sunset daily. This definition is taken from Forge (see Annex E) and by rotation range it is assumed the panels remain at 0 degrees until the Sun reaches 30 degrees above the horizon – when the Sun is at right angles to the panels at 60 degrees. It is understood that this option was created specifically to account for backtracking to the extent possible.

Whilst this model simplifies the backtracking process to be used by the solar panels within the solar development, panels that revert back to their resting angle immediately in many cases present a worst-case scenario for reflectors, and have therefore been used for this assessment. This is because flatter panels can produce solar reflections in a much greater range of azimuth angles at ground level. The results would in most cases be more conservative than modelling a detailed back tracking system.

2.3 Landscape Strategy Plan

The landscape plan confirms[10] that the proposed vegetation will be grown to facilitate screening. The proposed vegetation consists of trees, shelterbelts, and woodland. The whips will be planted at 0.7m and select standards will be planted at 2.2m, in a 90/10 percent split. A uniform growth rate is expected for trees, shelterbelts, and woodland planting of 0.4m every year. At year 15 this will result in new trees, shelterbelts, and woodland planting reaching a minimum height of 7.5m.

[10] Source: email confirmation with Lanpro on 24th June 2025.

3 GLINT AND GLARE ASSESSMENT METHODOLOGY

3.1 Guidance and Studies

Appendices A and B present a review of relevant guidance and independent studies with regard to glint and glare issues from solar panels. The overall conclusions from the available studies are as follows:

- Specular reflections of the Sun from solar panels are possible;
- The measured intensity of a reflection from solar panels can vary from 2% to 30% depending on the angle of incidence; and
- Published guidance shows that the intensity of solar reflections from solar panels are equal to or less than those from water. It also shows that reflections from solar panels are significantly less intense than many other reflective surfaces, which are common in an outdoor environment.

3.2 Background

Details of the Sun's movements and solar reflections are presented in Annex C.

3.3 Methodology

3.3.1 Pager Power's Methodology

The glint and glare assessment methodology has been derived from the information provided to Pager Power through consultation with stakeholders and by reviewing the available guidance and studies. The methodology for this glint and glare assessment is as follows:

- Identify receptors in the area surrounding the Solar PV Sites;
- Consider direct solar reflections from the Solar PV Sites towards the identified receptors by undertaking geometric calculations using a bare-earth terrain model;
- Consider the visibility of the panels from the receptor's location. If the panels are not visible from the receptor then no reflection can occur;
- Based on the results of the geometric calculations, determine whether a reflection can occur, and if so, at what time it will occur;
- Consider both the solar reflection from the Solar PV Sites and the location of the direct sunlight with respect to the receptor's position;
- Consider the solar reflection with respect to the published studies and guidance - including intensity calculations where appropriate; and
- Determine whether a significant detrimental impact is expected in line with the process presented in Annex D; and
- Identify any further mitigation recommendations.

3.3.2 Sandia National Laboratories' Methodology

Sandia National Laboratories developed the Solar Glare Hazard Analysis Tool (SGHAT) which is no longer freely available however it is now developed by Forge Solar. Pager Power uses this model where required for aviation receptors. Whilst strictly applicable in the USA and to solar photovoltaic developments only, the methodology is widely used by aviation stakeholders internationally.

3.4 Assessment Methodology and Limitations

Further technical details regarding the methodology of the geometric calculations and limitations are presented in Annex E and F.

4 IDENTIFICATION OF RECEPTORS

4.1 Aviation Receptors

The following subsections present the relevant data and receptors associated with the assessed airfields. The locations of the airfields relative to the Scheme are shown in Figure 5 on page 28, and summarised below:

- Hullavington Airfield: approximately 1.0km south of the Scheme; and
- Badminton Airfield: approximately 4.6km west of the Scheme.

Three further airfields have been identified to be assessed at a high-level. It is considered due to their distance from the Scheme (over 5km), and their runway configurations, that no more than a low impact is possible. See Section 7 for further details of these airfields.

4.1.1 Hullavington Airfield Information

Hullavington Airfield was an RAF aerodrome which closed in 1993. The site continued to be used for general aviation (GA) flying until 2016, when the site was permanently closed. This airfield has been assessed for completeness. It had one operational runway, the details[11] of which are presented below:

- 05/23 measuring 1,220m by 45m (asphalt).

4.1.2 Badminton Airfield Information

Badminton Airfield is an unlicensed GA aerodrome and is understood not to have an Air Traffic Control (ATC) Tower. It has one operational runway, the details[12] of which are presented below:

- 07/25 measuring 1,300m by 27m (grass).

4.1.3 Runway Approach Paths and Visual Circuits

All of the assessed airfields are GA airfields where aviation activity is dynamic and does not necessarily follow the typical approaches / flight paths of a larger licensed aerodrome or airport. It is not possible to assess every single location of airspace that an aircraft travels in flight around an aerodrome; however, it is possible to assess the most frequently flown flight paths and the most critical stages of flight, which would cover most, or all, of the relevant locations.

As such, Pager Power's methodology is to assess whether a solar reflection can be experienced on a 5-degree splayed approach path based on the extended runway centreline, and the final sections of the visual circuits and joins on approach to the corresponding runway thresholds.

The assessed receptors are based on the following characteristics:

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[11] As determined by available aerial imagery

[12] Pooleys Flight Guide, 62nd Edition

- 1-mile approach paths with a splay angle of 5 degrees, considering 2.5 degrees either side of the extended runway centreline;
- A descent angle of 5 degrees;
- Circuit width of 1 nautical mile from runway centreline; and
- Maximum altitude of 500 feet above the aerodrome threshold altitude.

Figure 4 on the following page illustrates the splayed approach and final sections of the visual circuits.

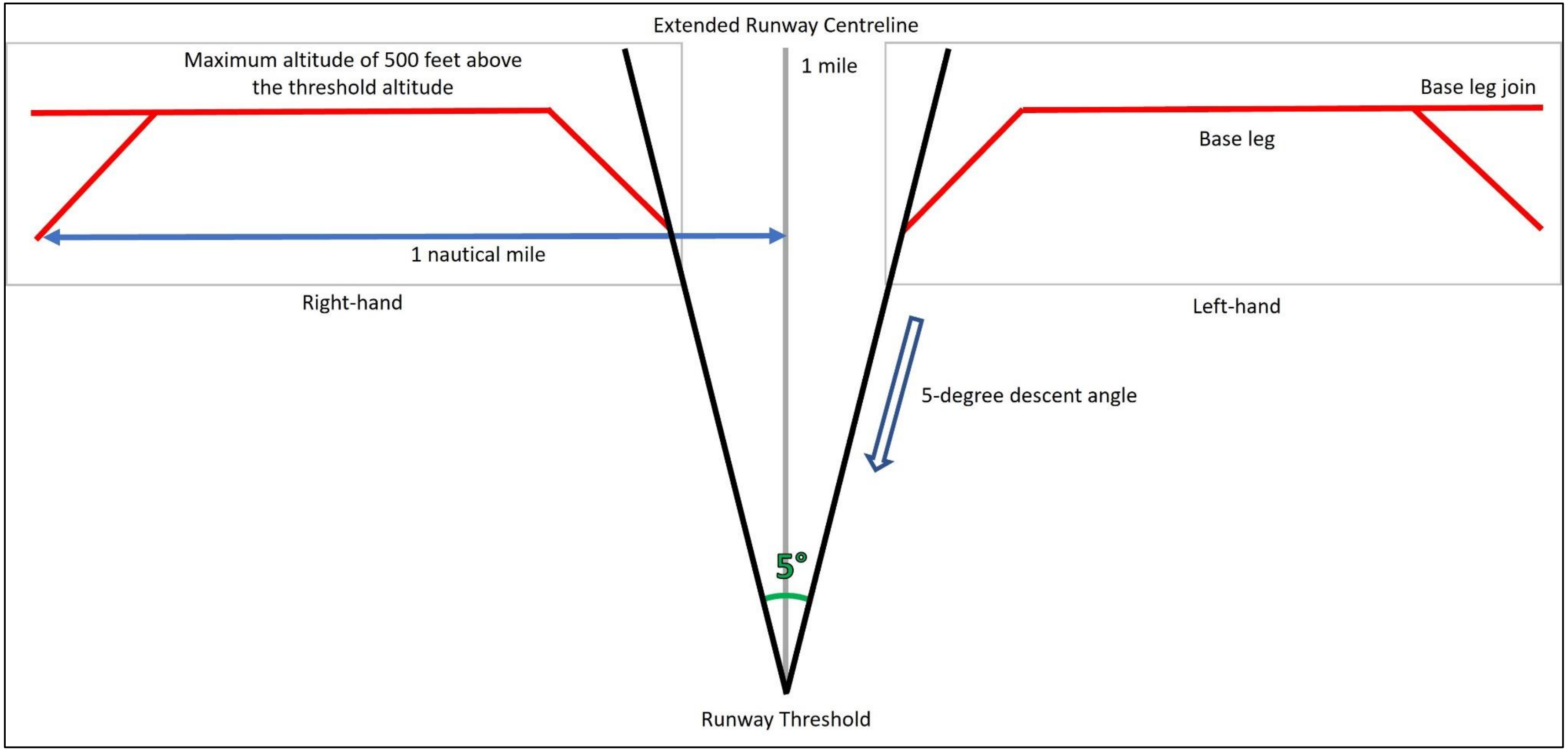

Figure 4 *Splayed approach and final sections of visual circuits*

Figure 5 on the following page shows the assessed aircraft receptor points of the splayed approach and final sections of the visual circuits at the assessed airfields. The receptor points pertaining to runway 25 at Badminton Airfield are labelled.

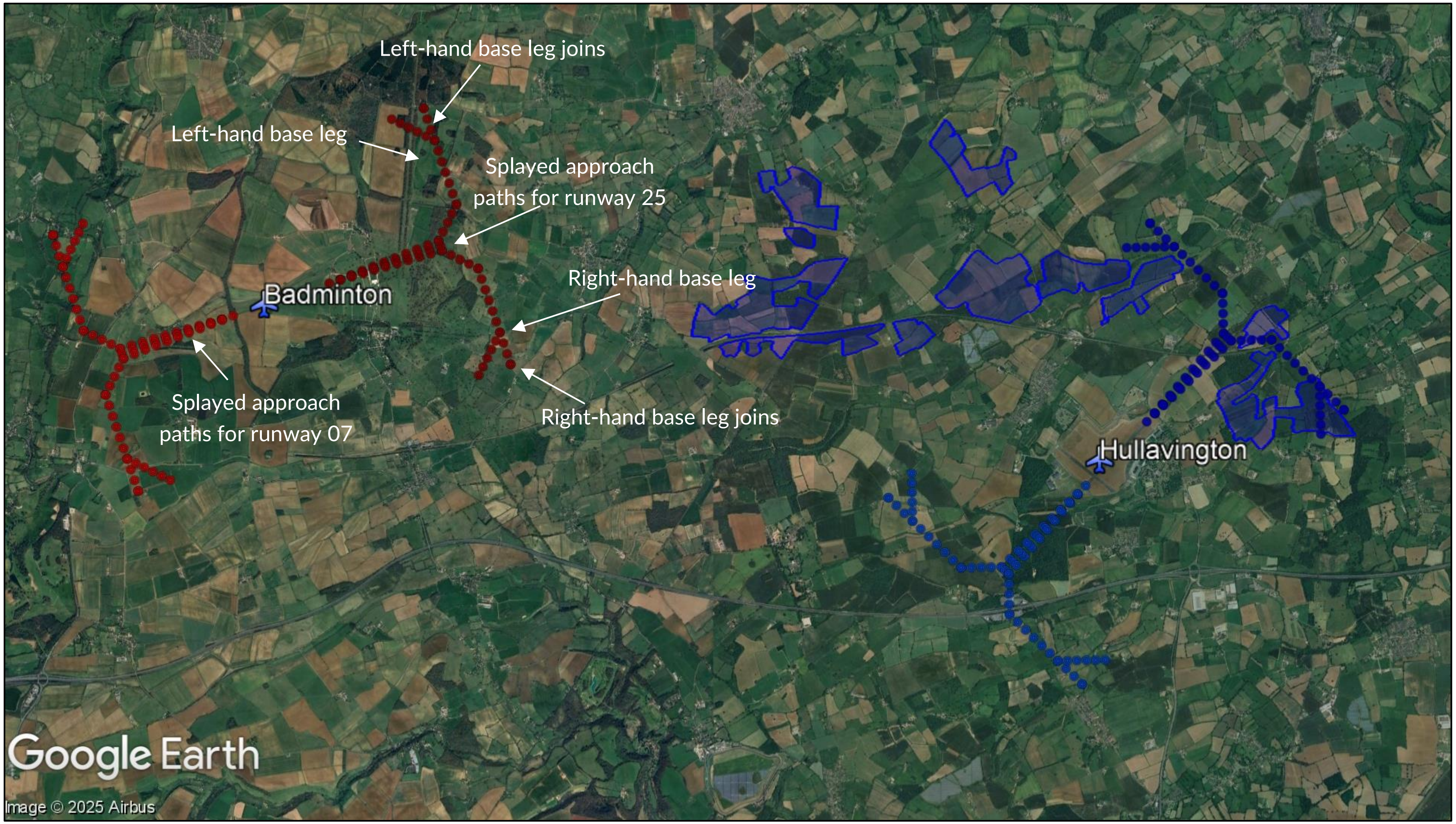

Figure 5 *General aviation splayed approach and visual circuit receptors*

4.2 Ground-Based Receptors Overview

There is no formal guidance with regard to the maximum distance at which glint and glare should be assessed. From a technical perspective, there is no maximum distance for potential reflections. The significance of a reflection however decreases with distance because the proportion of an observer's field of vision that is taken up by the reflecting area diminishes as the separation distance increases. Terrain and shielding by vegetation are also more likely to obstruct an observer's view at longer distances.

A 1km assessment area is considered appropriate for glint and glare effects on ground-based receptors (i.e. residential dwellings and roads). Receptors within this distance are identified based on mapping and aerial photography of the region. The assessment area is bounded by the orange outline in Figure 6 below.

The receptor details are presented in Annex G and the terrain elevations have been interpolated based on OS Terrain 50 DTM[13] and SRTM data.

Figure 6 *Assessment area*

[13] Digital Terrain Model

4.3 Road Receptors

4.3.1 Road Receptors Overview

Road types can generally be categorised as:

- Major National – Typically a road with a minimum of two carriageways with a maximum speed limit of up to 70mph. These roads typically have fast-moving vehicles with busy traffic;
- National – Typically a road with one or more carriageways with a maximum speed limit 60mph or 70mph. These roads typically have fast-moving vehicles with moderate to busy traffic density;
- Regional – Typically a single carriageway with a maximum speed limit of up to 60mph. The speed of vehicles will vary with a typical traffic density of low to moderate; and
- Local – Typically roads and lanes with the lowest traffic densities. Speed limits vary.

Technical modelling is not recommended for local roads, where traffic densities are likely to be relatively low, under Pager Power's Glint and Glare Guidance. Any solar reflections from the Scheme that are experienced by a road user along a local road would be considered low impact in the worst case in accordance with the guidance presented in Annex D, due to the relative traffic densities and potential impacts. The analysis has therefore considered major national, national, and regional roads that:

- Are within the one-kilometre assessment area; and
- Have a potential view of the panels.

4.3.2 Identified Road Receptors

Table 3 below shows a summary of the roads identified within the 1km assessment area. Receptors 1 to 66 are placed circa 100m apart. A height of 1.5 metres above ground level has been taken as the typical eye level of a road user[14]. Figures 7 to 9, on the following pages show the assessed road receptors.

Road	Receptors
A429	1 – 45
Bradfield Cottages	46 – 66

Table 3 *Summary of identified road receptors*

[14] This fixed height for the road receptors is for modelling purposes. Changes to the modelling height by a few metres is not expected to significantly change the modelling results. Views for elevated drivers are also considered in the results discussion, where appropriate.

Figure 7 *Road receptors 1 to 23*

Figure 8 *Road receptors 24 to 45*

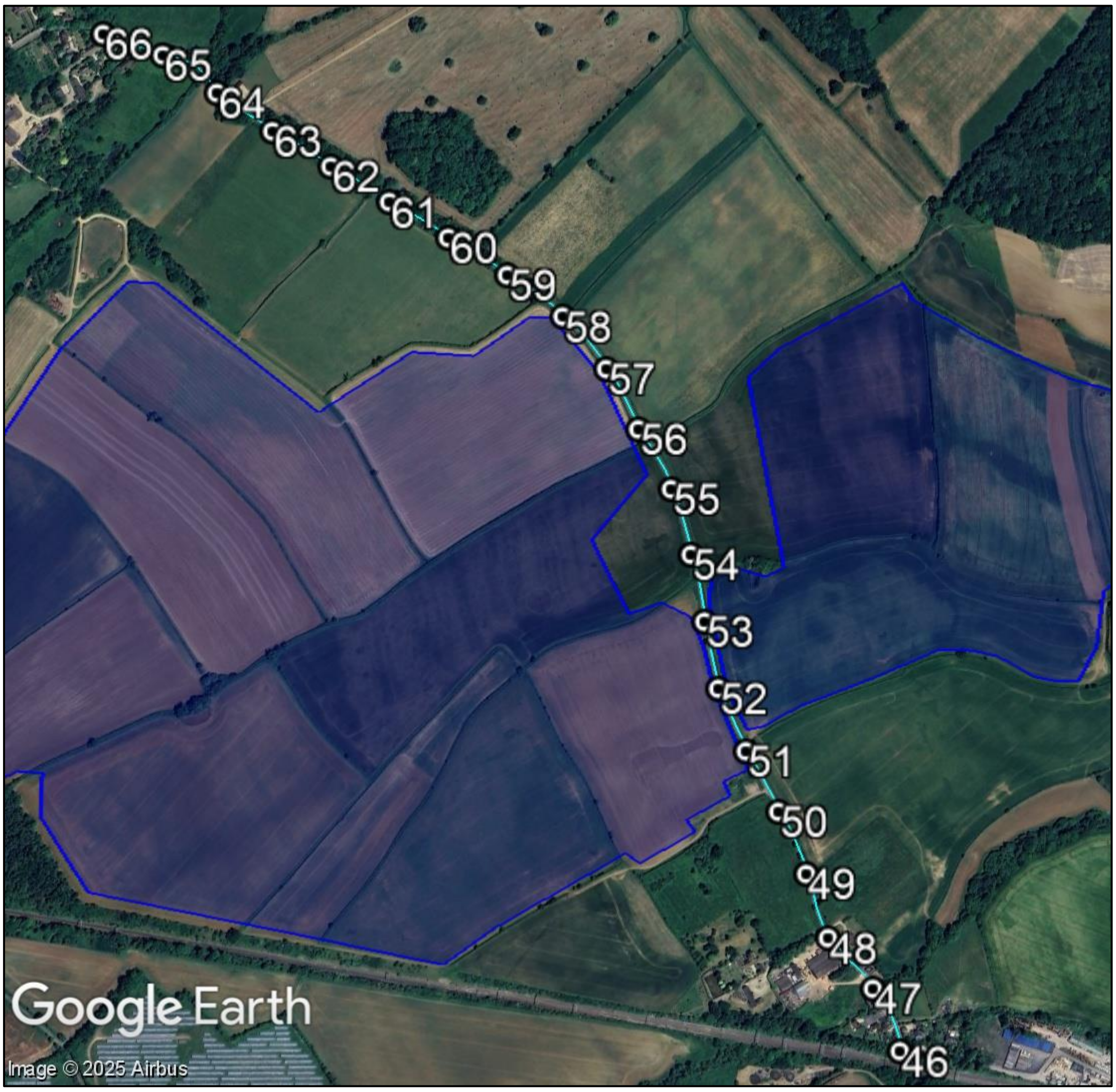

Figure 9 *Road receptors 46 to 66*

4.4 Dwelling Receptors

4.4.1 Dwelling Receptors Overview

The analysis has considered dwellings that:

- Are within the one-kilometre assessment area; and
- Have a potential view of the panels.

In residential areas with multiple layers of dwellings, only the outer dwellings have been considered for assessment. This is because they will mostly obscure views of the Solar PV Panels to the dwellings behind them, which will therefore not be impacted by the Scheme because line of sight will be removed, or they will experience comparable effects to the closest assessed dwelling.

Additionally, in some cases, a single receptor point may be used to represent a small number of separate addresses. In such cases, the results for the receptor will be representative of the adjacent observer locations, such that the overall level of effect in each area is captured reliably.

4.4.2 Identified Dwelling Receptors

The assessed dwelling receptors are shown in Figures 10 to 31, below and on the following pages. In total, 249 dwelling receptors have been assessed. A 1.8m height above ground is used in the modelling to simulate the typical viewing height of an observer on the ground floor[15].

246-248

[15] This fixed height for the dwelling receptors is for modelling purposes. Changes to the modelling height by a few metres is not expected to significantly change the modelling results. Views above ground floor are considered in the results discussion where necessary.

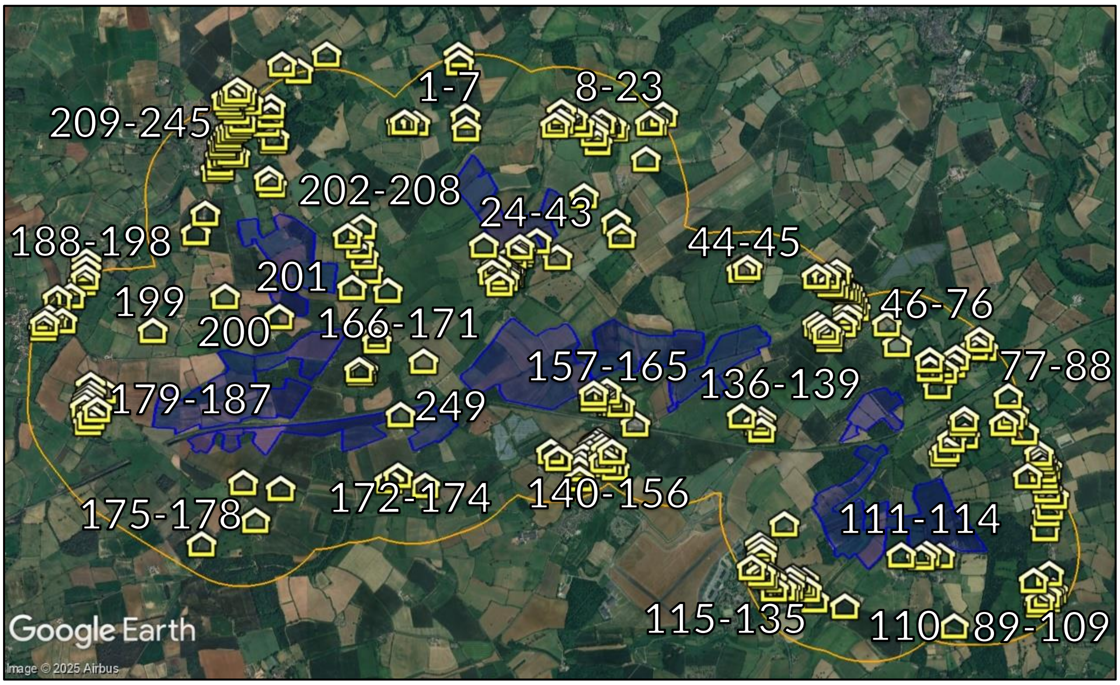

Figure 10 *Overview of all dwellings*

Figure 11 *Dwellings 1 to 7*

Figure 12 *Dwellings 8 to 24*

Figure 13 *Dwellings 25 to 41*

Figure 14 *Dwellings 42 to 45*

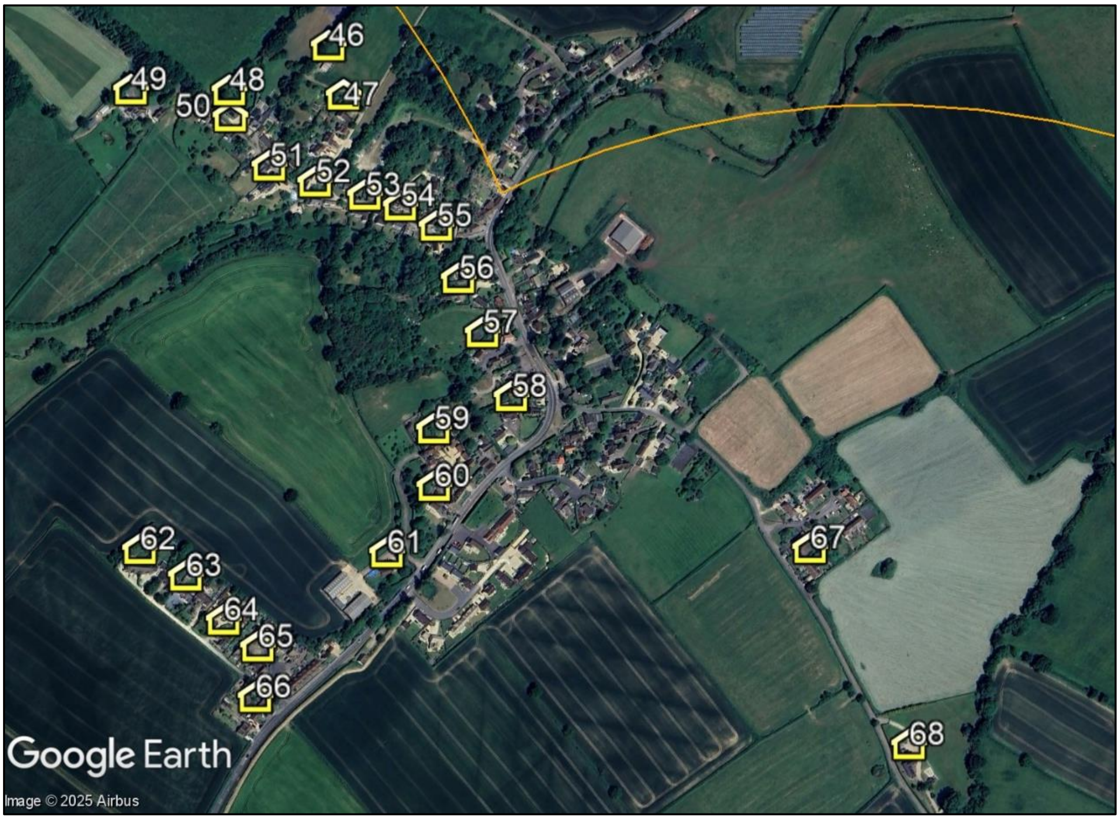

Figure 15 *Dwellings 46 to 68*

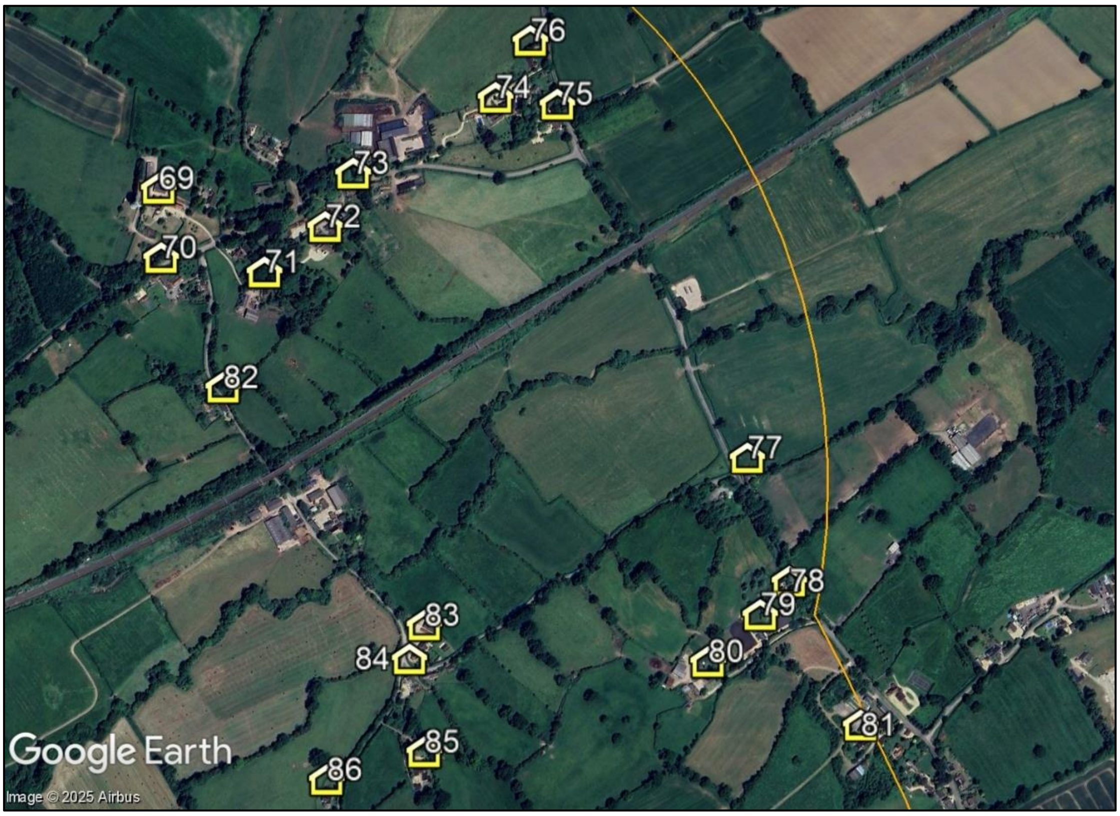

Figure 16 *Dwellings 69 to 86*

Figure 17 *Dwellings 87 to 101*

Figure 18 *Dwellings 102 to 114*

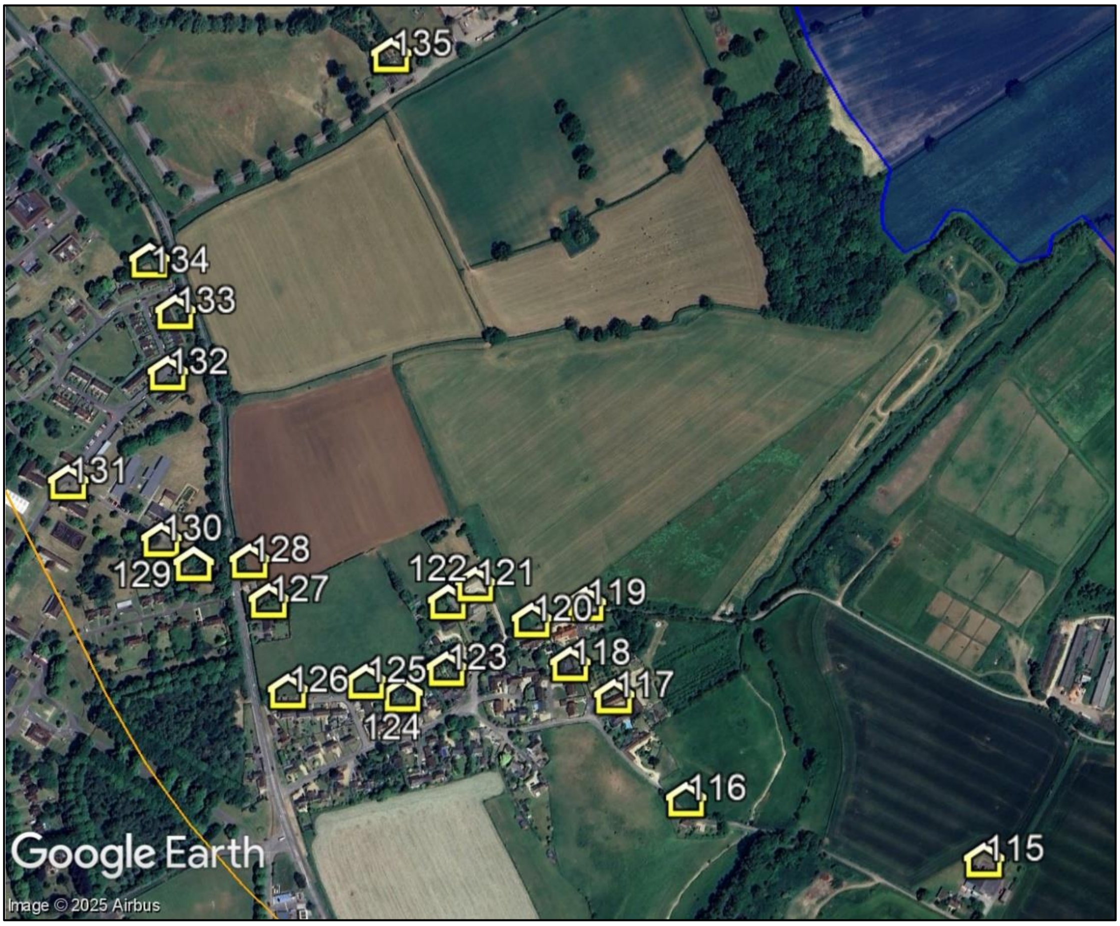

Figure 19 *Dwellings 115 to 135*

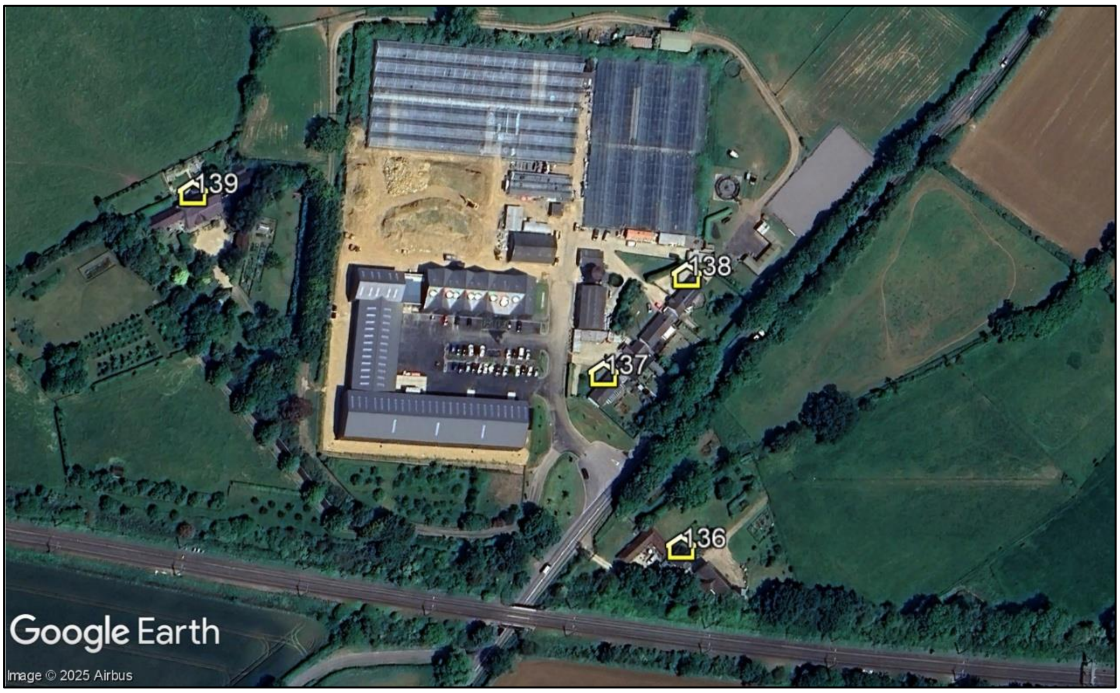

Figure 20 *Dwellings 136 to 139*

Figure 21 *Dwellings 140 to 156*

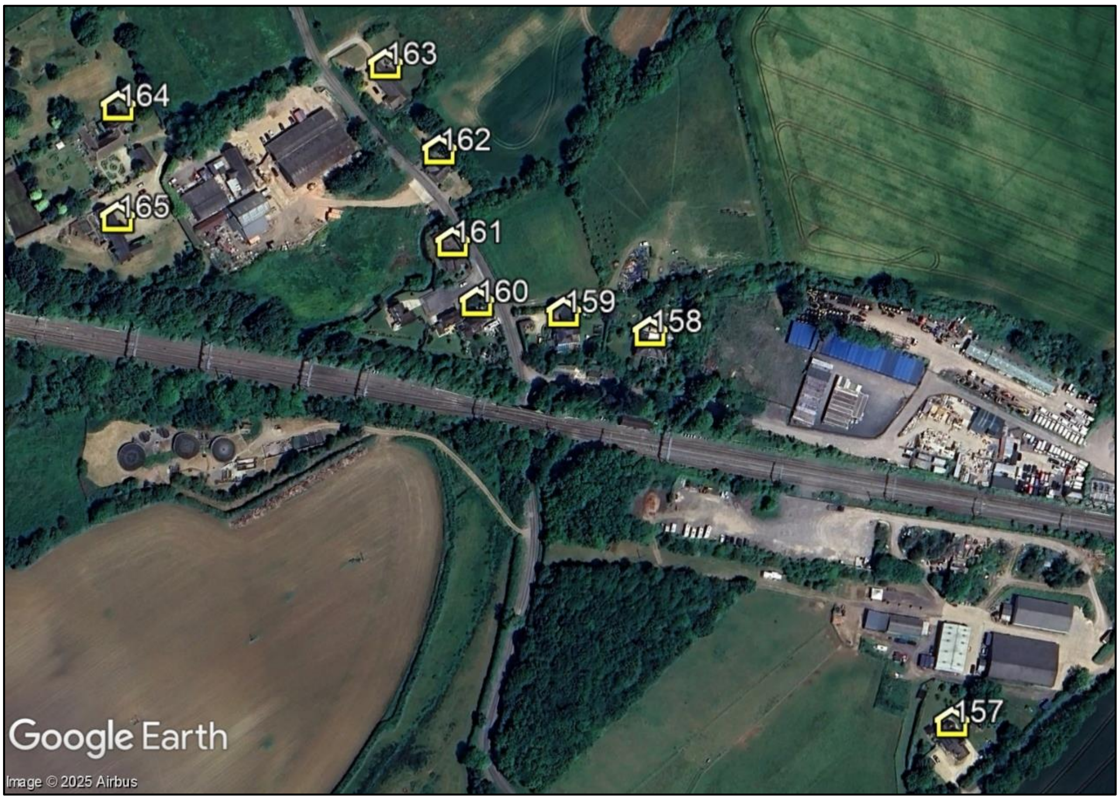

Figure 22 *Dwellings 157 to 165*

Figure 23 *Dwellings 166 to 171*

Figure 24 *Dwellings 172 to 178*

Figure 25 *Dwellings 179 to 187*

Figure 26 *Dwellings 188 to 199*

Figure 27 *Dwellings 200 to 208*

Figure 28 *Dwellings 209 to 220*

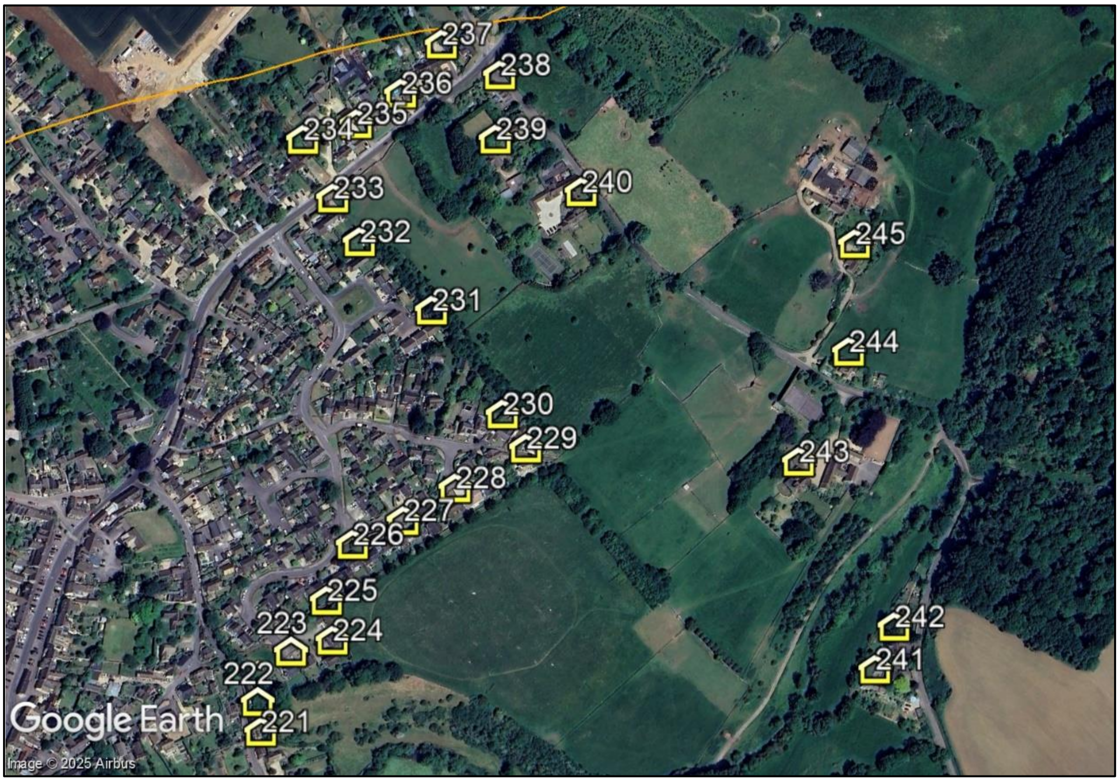

Figure 29 *Dwellings 221 to 245*

Figure 30 *Dwellings 246 to 248*

Figure 31 *Dwelling 249*

4.5 Railway Receptors

4.5.1 Railway Receptors Overview

A railway stakeholder (such as Network Rail) may request further information regarding the potential effects of glint and glare from reflective surfaces when a development is located adjacent to a railway line (typically 50-100m from its infrastructure). The request may depend on the scale, percentage of reflective surfaces and the complexity of the nearby railway, for example. The following section presents details regarding the most common concerns relating to glint and glare.

The analysis has considered railway receptors, in the context of train drivers, that:

- Are within 500 metres of the Scheme; and
- Have a potential view of the panels.

4.5.2 Glint and Glare Definition

As well as the glint and glare definition presented in Section 1.3, glare can also be categorised as causing visual discomfort whereby an observer would instinctively look away, or cause disability whereby objects become difficult to see. The guidance produced by the Commission Internationale de L'Eclairage (CIE)[16] describes disability glare as:

'Disability glare is glare that impairs vision. It is caused by scattering of light inside the eye…The veiling luminance of scattered light will have a significant effect on visibility when intense light sources are present in the peripheral visual field and contrast of objects is seen to be low.'

'Disability glare is most often of importance at night when contrast sensitivity is low and there may well be one or more bright light sources near to the line of sight, such as car headlights, streetlights or floodlights. But even in daylight conditions disability glare may be of practical significance: think of traffic lights when the sun is close to them, or the difficulty viewing paintings hanging next to windows.'

These types of glare are of particular importance in the context of railway operations as they may cause a distraction to a train driver (discomfort) or may cause railway signals to be difficult to see (disability).

4.5.3 Common Concerns and Signal Overview

Typical reasons stated by a railway stakeholder for requesting a glint and glare assessment often relate to the following:

1. The development producing solar reflections towards train drivers;
2. The development producing solar reflections, which causes a train driver to take action; and
3. The development producing solar reflections that affect railway signals.

With respect to point 1, a reflective panel could produce solar reflections towards a train driver. If this reflection occurs where a railway signal, crossing etc., is present, or where the

[16] CIE 146:2002 & CIE 147:2002 Collection on glare (2002).

driver's workload is particularly high, the solar reflection may affect operations. This is deemed to be the most concern with respect to solar reflections.

Following from point 1, point 2 identifies whether a modelled solar reflection could be significant by determining its intensity. Only where a solar reflection occurs under certain conditions and is of a particular intensity may it cause a reaction from a train driver and thus potentially affect safe operations. Therefore intensity calculations are undertaken where a solar reflection is identified and where its presence could potentially affect the safety of operations. Points 1 and 2 are completed in a 2-step approach.

With respect to all points, railway lines use light signals to manage trains on approach towards particular sections of track. If a signal is passed when not permitted, a SPAD (Signal Passed At Danger) is issued. The concerns will relate specifically to the possibility of the reflections appearing to illuminate signals that are not switched on (known as a phantom aspect illusion) or a distraction caused by the glare itself, both of which could lead to a SPAD. The definition is presented below:

'Light emitted from a Signal lens assembly that has originated from an external source (usually the sun) and has been internally reflected within the Signal Head in such a way that the lens assembly gives the appearance of being lit.[17]'

4.5.4 Identified Railway Receptors

An approximate 9.7km section of railway operates within the assessment area and has therefore been assessed, between Bristol Parkway and Swindon. In total, 94 receptors have been placed circa 100m intervals along the railway line, as shown in Figures 32 to 34 below and on the following page.

No signals have been identified and therefore this has not needed to be assessed in this report.

Based on previous consultation[18], an additional 2.75m height above ground is used in the modelling as the typical viewing height of a train operator[19].

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[17] Source: Glossary of Signalling Terms, Railway Group Guidance Note GK/GN0802. Issue One. Date April 2004.
[18] Previous consultation undertaken with Network Rail in the UK.
[19] This height may vary based on driver height however this figure is used as the industry standard.

Figure 32 *Railway receptors 1 to 29*

Figure 33 *Railway receptors 30 to 61*

Figure 34 *Railway receptors 62 to 94*

4.6 Viewpoint Receptors

4.6.1 Viewpoint Receptors Overview

The assessment has considered sensitive viewpoints from the Cotswold National Landscape (CNL) looking towards the site. Viewpoints as requested by CNL have been identified to be modelled for Glint and Glare. These are intended to offer a representative sample of impacts towards surrounding sensitive viewpoints. Modelling results towards these viewpoints are presented within Section 6.6 and a further high-level assessment of PRoW and permissive paths more generally is presented within Section 8.

The impact upon these receptors is considered to be, at most, 'low' when considering the possible impacts on safety and amenity. The worst-case impact is also considered to be less than those possible towards a road user or upon the amenity of surrounding residents within the assessed dwellings.

4.6.2 Identified Viewpoint Receptors

The assessed viewpoint receptors are shown in Figure 35, on the following page. In total, 15 sensitive viewpoints receptors have been identified for geometric modelling. A 1.8m height above ground is used in the modelling to simulate the typical viewing height of an observer[20].

Further consideration of PRoW and permissive paths is presented at a high-level within Section 8.

[20] This fixed height for the receptors is for modelling purposes. Changes to the modelling height by a few metres is not expected to significantly change the modelling results.

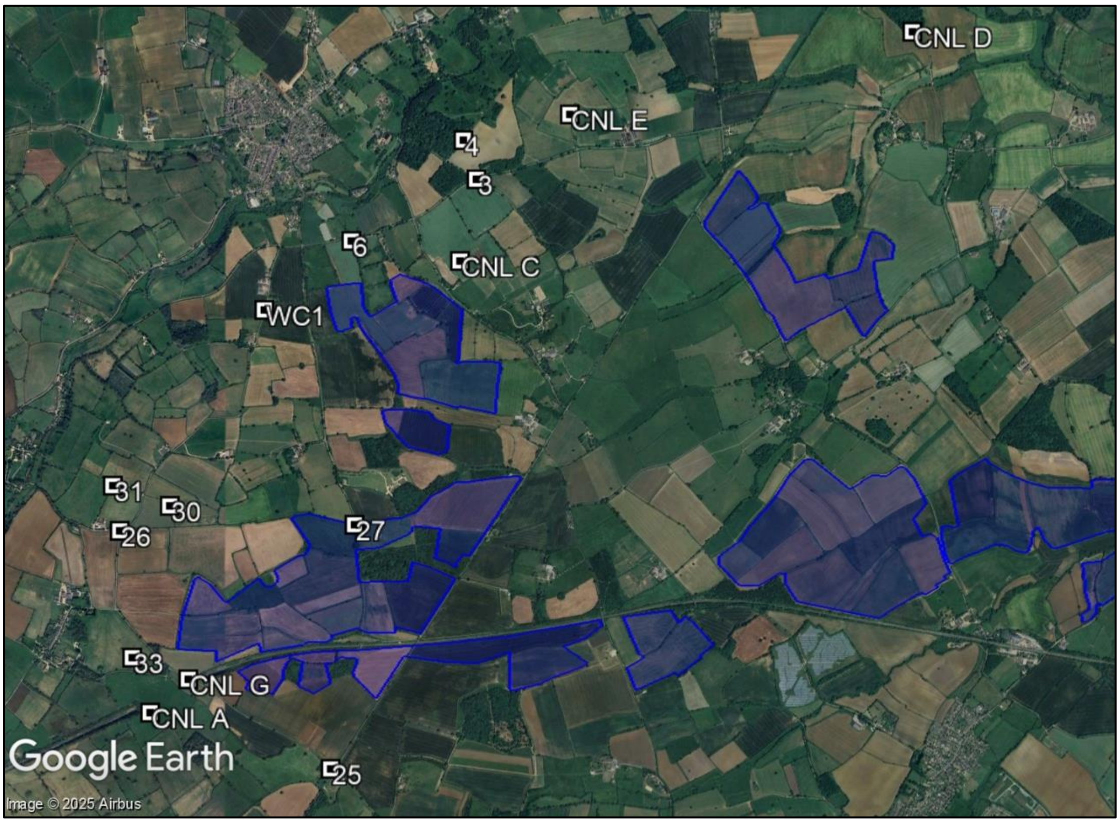

Figure 35 *Viewpoint receptors*

5 ASSESSED REFLECTOR AREAS

5.1 Reflector Areas

The bounding coordinates for the Scheme have been extrapolated from the site plans. The data can be found in Annex G.

The Pager Power model has used a resolution of 100m for this assessment. This means that a geometric calculation is undertaken for each identified receptor every 100m from within the defined areas. This resolution is sufficiently high to maximise the accuracy of the results – increasing the resolution further would not significantly change the modelling output. If a reflection is experienced from an assessed panel location, then it is likely that a reflection will be viewable from similarly located panels within the Solar PV Sites.

6 GEOMETRIC ASSESSMENT RESULTS AND DISCUSSION

6.1 Overview

The following sub-section presents the results of the assessment and the significance of any predicted impact in the context of existing screening and the relevant criteria set out in each sub-section. The criteria are determined by the assessment process for each receptor, which are set out in Annex D.

When determining the visibility of the reflecting panels for an observer, a conservative review of the available imagery has been undertaken, whereby it is assumed views of the panels are possible if it cannot be reliably determined that existing screening will remove effects. This review has comprised using Google Earth Streetview imagery and landscape photography of the site and its surroundings from 2024/2025.

The tables in the following subsections summarise the results of the assessment. The predicted glare times are based solely on bare-earth terrain i.e. without consideration of screening from buildings and vegetation. The final column summarises the predicted impact considering the level of predicted screening based on a desk-based review of the available imagery. The significance of any predicted impact is discussed in the subsequent report sections.

The modelling output showing the precise predicted times are shown in Annex H. Where relevant, desk-based review of imagery is presented in Annex I.

6.2 Aviation Results

6.2.1 Glare Intensity Categorisation

The Pager Power and Forge models will be used to determine whether reflections are possible. Intensity calculations in line with the Sandia National Laboratories methodology will be undertaken for aviation receptors. These calculations are routinely required for solar photovoltaic developments on or near aerodromes. The intensity model calculates the expected intensity of a reflection with respect to the potential for an after-image (or worse) occurring. The designation used by the model is presented in Table 4 below along with the associated colour coding.

Coding Used	Intensity Key
Glare beyond 50°	'Glare outside of a pilot's primary field-of-view (50 degrees horizontally either side of the direction of travel)'
'Green' glare	'Low potential for temporary after-image'
'Yellow' glare	'Potential for temporary after-image'
'Red' glare	'Potential for permanent eye damage'

Table 4 *Glare intensity designation*

This coding will be used in the results tables where a reflection has been calculated and is in accordance with Sandia National Laboratories' methodology. In addition, the intensity model allows for the assessment of a variety of Solar PV Panel surface materials. The modelling in this assessment has used a surface texture of 'smooth glass with an anti-reflective coating' which most closely models for the proposed bifacial Solar PV Panels with anti-reflective coating.

6.2.2 Impact Significance Determination – Approach Paths and Visual Circuits

The process for quantifying impact significance is defined in Annex D. For the runway approach paths and visual circuits, the key considerations are:

- Whether a reflection is predicted to be experienced in practice;
- The location of glare relative to a pilot's primary field-of-view (50 degrees either side of the approach bearing); and
- The intensity of glare for the solar reflections:
    - Glare with 'low potential for temporary after-image' (green glare);
    - Glare with 'potential for temporary after-image' (yellow glare); and
    - Glare with 'potential for permanent eye damage' (red glare).
- Whether a reflection is predicted to be operationally significant in practice or not.

Where no solar reflections are geometrically possible or where solar reflections are predicted to be significantly screened, no impact is predicted, and mitigation is not required.

Where solar reflections are of an intensity of 'low potential for temporary after-image' (green glare) or occur outside of a pilot's primary field of view (50 degrees either side of the approach bearing), the impact significance is low, and mitigation is not required.

Glare with 'potential for a temporary after-image' (yellow glare) was formerly not permissible under the interim guidance provided by the Federal Aviation Administration in the USA[21] for on-airfield solar. Whilst this guidance was never formally applicable outside of the USA, it has been a common point of reference internationally. Pager Power recommends a pragmatic approach whereby instances of 'yellow' glare are evaluated in a technical and operational context. As per Pager Power's glint and glare guidance document[22], where solar reflections are of an intensity of 'potential for temporary after-image' expert assessment of the following relevant factors is required to determine the impact significance[23]:

- The likely traffic volumes and level of safeguarding at the aerodrome – licensed aerodromes typically have higher traffic volumes and are formally safeguarded;
- The time of day at which glare is predicted and whether the aerodrome will be operational such that pilots can be on the approach at these times;

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[21] This FAA guidance from 2013 has since been superseded by the FAA guidance in 2021 whereby airports are tasked with determining safety requirements themselves.

[22] Pager Power Glint and Glare Guidance, Fourth Edition, September 2022.

[23] This approach taken is reflective of the changes made in the 2021 FAA guidance; however, it should be noted that this guidance states that it is up to the airport to determine the safety requirements themselves. Therefore, an airport may not accept any yellow glare towards approach paths.

- The duration of any predicted glare – glare that occurs for low durations throughout the year is less likely to be experienced than glare that occurs for longer durations throughout the year;
- The location and size of the reflecting panel area relative to a pilot's primary field-of-view;
- The location of the source of glare relative to the position of the Sun at the times and dates in which solar reflections are geometrically possible – effects that coincide with direct Sunlight appear less prominent than those that do not; and
- The level of predicted effect relative to existing sources of glare – a solar reflection is less noticeable by pilots when there are existing reflective surfaces in the surrounding environment.

Following consideration of these mitigating factors, where the solar reflection does not remain significant, a low impact is predicted, and mitigation is not required. Where the solar reflection remains significant, the impact significance is moderate, and mitigation has been implemented to reduce this to a non-significant level.

Where solar reflections are of an intensity greater than 'potential for temporary after-image', the impact significance is high, and mitigation is required.

6.2.3 Results Discussion – Hullavington Airfield

The results of the geometric calculation for aviation receptors at Hullavington Airfield are presented in Tables 5 (fixed panels) and Table 6 (tracking panels) below and on the following page.

Receptor/Runway	Geometric Modelling Result	Glare Intensity	Comment	Impact Classification	Mitigation Recommended?
Runway 04 Approach Path	Solar reflections are geometrically possible between the threshold and 1-mile from the threshold	'Yellow'	Solar reflections with intensities of 'potential for temporary after-image' are predicted towards this approach path Hullavington Airfield is inactive, with no flying activity since 2016	No impact (due to airfield closure)	No (see Section 7.2.5)
Runway 22 Approach Path	Solar reflections are geometrically possible between the threshold and 1-mile from the threshold	'Yellow'	Solar reflections with intensities of 'potential for temporary after-image' are predicted towards this approach path Hullavington Airfield is inactive, with no flying activity since 2016	No impact (due to airfield closure)	No (see Section 7.2.5)

Receptor/Runway	Geometric Modelling Result	Glare Intensity	Comment	Impact Classification	Mitigation Recommended?
Runway 04 Visual Circuits	Solar reflections are geometrically possible towards final sections of the visual circuits	'Yellow'	Solar reflections with intensities of 'potential for temporary after-image' are predicted towards these circuits Hullavington Airfield is inactive, with no flying activity since 2016	No impact (due to airfield closure)	No (see Section 7.2.5)
Runway 22 Visual Circuits	Solar reflections are geometrically possible towards final sections of the visual circuits	'Yellow'	Solar reflections with intensities of 'potential for temporary after-image' are predicted towards these circuits Hullavington Airfield is inactive, with no flying activity since 2016	No impact (due to airfield closure)	No (see Section 7.2.5)

Table 5 *Geometric analysis results – Hullavington Airfield – fixed south facing panels*

Receptor/Runway	Geometric Modelling Result	Glare Intensity	Comment	Impact Classification	Mitigation Recommended?
Runway 04 Approach Path	Solar reflections are geometrically possible between the threshold and 1-mile from the threshold	'Green'	Solar reflections with intensities of 'low potential for temporary after-image' are predicted towards this approach path Hullavington Airfield is inactive, with no flying activity since 2016	No impact	No

Receptor/Runway	Geometric Modelling Result	Glare Intensity	Comment	Impact Classification	Mitigation Recommended?
Runway 22 Approach Path	Solar reflections are geometrically possible between the threshold and 1-mile from the threshold	'Outside 50°'	Any solar reflections would be outside of a pilot's primary field-of-view Hullavington Airfield is inactive, with no flying activity since 2016	No impact	No
Runway 04 Visual Circuits	Solar reflections are geometrically possible towards final sections of the visual circuits	'Green'	Solar reflections with intensities of 'low potential for temporary after-image' are predicted towards these circuits Hullavington Airfield is inactive, with no flying activity since 2016	No impact	No
Runway 22 Visual Circuits	Solar reflections are geometrically possible towards final sections of the visual circuits	'Yellow'	Solar reflections with intensities of 'potential for temporary after-image' are predicted towards these circuits Hullavington Airfield is inactive, with no flying activity since 2016	No impact	No (see Section 7.2.5)

Table 6 *Geometric analysis results – Hullavington Airfield – single axis tracking panels*

6.2.4 Results Discussion – Badminton Airfield

The results of the geometric calculation for aviation receptors at Badminton Airfield are presented in Table 7 (fixed panels) and Table 8 (tracking panels) below and on the following page.

Receptor/Runway	Geometric Modelling Result	Glare Intensity	Comment	Impact Classification	Mitigation Recommended?
Runway 07 Approach Path	Solar reflections are geometrically possible between the threshold and 1-mile from the threshold	'Green'	Solar reflections with intensities of 'low potential for temporary after-image' are predicted towards this approach path	Low impact	No
Runway 25 Approach Path	Solar reflections are geometrically possible between the threshold and 1-mile from the threshold	'Outside 50°'	Any solar reflections would be outside of a pilot's primary field-of-view	Low impact	No
Runway 07 Visual Circuits	Solar reflections are geometrically possible towards final sections of the visual circuits	'Yellow'	Solar reflections with intensities of 'potential for temporary after-image' are predicted towards these circuits	Low impact	No (see Section 7.2.6)
Runway 25 Visual Circuits	Solar reflections are geometrically possible towards final sections of the visual circuits	'Yellow'	Solar reflections with intensities of 'potential for temporary after-image' are predicted towards these circuits	Low impact	No (see Section 7.2.6)

Table 7 *Geometric analysis results – Badminton Airfield – fixed south facing panels*

Receptor/Runway	Geometric Modelling Result	Glare Intensity	Comment	Impact Classification	Mitigation Recommended?
Runway 07 Approach Path	Solar reflections are geometrically possible between the threshold and 1-mile from the threshold	'Green'	Solar reflections with intensities of 'low potential for temporary after-image' are predicted towards this approach path	Low impact	No
Runway 25 Approach Path	Solar reflections are geometrically possible between the threshold and 1-mile from the threshold	'Outside 50°'	Any solar reflections would be outside of a pilot's primary field-of-view	Low impact	No
Runway 07 Visual Circuits	Solar reflections are geometrically possible towards final sections of the visual circuits	'Yellow'	Solar reflections with intensities of 'potential for temporary after-image' are predicted towards these circuits	Low impact	No (see Section 7.2.6)
Runway 25 Visual Circuits	Solar reflections are geometrically possible towards final sections of the visual circuits	'Outside 50°'	Any solar reflections would be outside of a pilot's primary field-of-view	Low impact	No

Table 8 *Geometric analysis results – Badminton Airfield – single axis tracking panels*

6.2.5 Further Results Discussion – Hullavington Airfield

Glare with 'potential for temporary after-image' (yellow) is predicted towards the approach paths and visual circuits associated with Hullavington Airfield. Flying activities at the airfield ceased in 2016, and therefore technical modelling has been undertaken for completeness.

Pager Power is not aware of any proposals to resume flying activities at Hullavington Airfield, and therefore no impact is predicted towards this airfield. If flying activities were to resume, the Applicant will liaise with the new operator on the potential for glare from the Lime Down Solar Scheme to generate appropriate flight guidance. Due to the current closure and planned liaison in the event of resumed flying activities, mitigation is not required, as no impact is predicted.

6.2.6 Further Results Discussion – Badminton Airfield

Glare with 'potential for a temporary after-image' (yellow) is predicted towards the visual circuits associated with Badminton Airfield. Yellow glare was formerly not permissible under the interim guidance provided by the Federal Aviation Administration in the USA[24] for on-airfield solar, which applied to approach paths. Whilst this guidance was never formally applicable outside of the USA, it has been a common point of reference internationally and is useful from a technical context. Pager Power recommends a pragmatic approach whereby instances of 'yellow' glare are evaluated in a technical and operational context.

In cases where glare with 'potential for a temporary after-image' is predicted, effects must be evaluated in an operational context. This includes consideration of:

- The type of airfield and the likely air traffic volumes.
- The impact of direct sunlight on pilots approaching the airfield.
- The extent to which glint and glare effects and direct sunlight are similar.
- Whether the measures pilots use to mitigate direct sunlight will also mitigate glint and glare.

There are many measures that pilots regularly employ to counter the effects of direct sunlight. These mitigation measures include:

- Overflying the airfield and inspecting the runway prior to landing.
- Landing on a different runway if wind conditions allow.
- Planning the flight to land at a different time.
- Aborting their landing if uncertain that it is to be successful (known as a missed approach or a go-around).

The suitability of these options is influenced by many factors including the aerodrome type. Badminton Airfield is an aerodrome used for general aviation and has one grass runway. The airfield is therefore expected to be of low air traffic volumes when compared to a licensed airport. Therefore, the likelihood that the glare is to be experienced is reduced.

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[24] This guidance from 2013 has since been superseded by the 2021 FAA guidance whereby airports are tasked with determining safety requirements themselves.

It is known that direct solar reflections from reflective surfaces, including solar panels, can be a distraction to pilots. The mitigation measures pilots use to mitigate the effects of direct sunlight can all be used to mitigate the effects of direct solar reflections from the solar panels.

Solar reflections are predicted to occur for no more than 60 minutes on any given day at a particular location, from February to April and August to November. Solar reflections with yellow glare are predicted to occur within 2 hours of sunrise, and coincide with direct sunlight and therefore will occur when the Sun is low in the sky beyond the reflecting panels. This means that a pilot will likely have a view of the Sun within the same viewpoint of the reflecting solar panels. The Sun is a far more significant source of light. Furthermore, yellow glare is not predicted towards the approach paths (which are the more sensitive receptors).

The weather would have to be clear and sunny at the specific times when the glare was possible to be experienced. A pilot would also have to be on the approach path at the specific times and dates when solar reflections are geometrically possible.

Overall, it is judged that the effects can be operationally accommodated and the Applicant would work with the new operator by sharing the glint and glare model outputs to feed into the operational flight plans. Measures to address glare would be determined by the airfield and may include modifying flying schedules, revising circuit patterns, or briefing pilots on the site's presence.

6.3 Road Results

6.3.1 Impact Significance Determination

The process for quantifying the impact significance concerning road safety is outlined in Annex D. The key considerations for road users along major national, national, and regional roads are:

- Whether a reflection is predicted to be experienced in practice; and
- The location of the reflecting panel relative to a road user's direction of travel.

Where reflections are geometrically possible but expected to be screened, no impact is predicted, and mitigation is not required.

Where reflections originate from outside of a road user's primary horizontal field-of-view (50 degrees either side of the direction of travel), or the closest reflecting panel is over 1km from the road user, the impact significance is low, and mitigation is not required.

Where reflections are predicted to be experienced from inside of a road user's primary field-of-view, expert assessment of the following relevant factors is required to determine the impact significance and mitigation requirement:

- Whether visibility is likely for elevated drivers (relevant to dual carriageways and motorways[25]);
- Whether the solar reflection originates from directly in front of a road user. Solar reflections that are directly in front of a road user are more hazardous;

[25] There is typically a higher density of elevated drivers (such as HGVs) along dual carriageways and motorways compared to other types of roads.

- The separation distance to the reflecting panel area. Larger separation distances reduce the proportion of an observer's field-of-view that is affected by glare; and
- The position of the Sun. Effects that coincide with direct sunlight appear less prominent than those that do not. The Sun is a far more significant source of light.

Following consideration of these relevant factors, where the solar reflection is not deemed significant, a low impact is predicted, and mitigation is not required. Where the solar reflection is deemed significant, the impact significance is moderate, and mitigation is required. Where reflections originate directly in front of a road user and there are no further mitigating factors, the impact significance is high, and mitigation is required.

6.3.2 Results Discussion

The modelling has shown that solar reflections are geometrically possible towards all 66 of the assessed receptors. Tables 9 and 10 below and on the following pages summarise the predicted impact at these receptors. Results where mitigation is recommended are shown in red.

Results charts are shown in Appendix H and a desk-based review is shown in Appendix I.

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
1 – 26, 30 – 45, 47 – 48, 59 – 66	Solar reflections geometrically possible from **inside** a road user's primary field-of-view[26]	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
27 – 29, 46	Solar reflections geometrically possible from **outside** a road user's primary field-of-view	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No

[26] 50 degrees either side of the direction of travel

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
49 – 50	Solar reflections geometrically possible from **inside** a road user's primary field-of-view	Existing vegetation is predicted to partially obstruct views of reflecting panels	Solar reflections will occur within 2 hours of sunrise/sunset and coincide with direct sunlight Solar reflections will be fleeting, due to partial screening	Low impact	No
51 – 58	Solar reflections geometrically possible from **inside** a road user's primary field-of-view	Existing vegetation is predicted to partially obstruct views of reflecting panels	Vegetation currently exists along the field boundary. This vegetation was recorded as approximately 2.2m in 2025 will be allowed to grow by 0.4m per year, and will therefore be tall enough to screen the receptor from typical road users by the operation phase	Low impact	No

Table 9 *Impact classification – road receptors – fixed south facing panels*

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
1 – 3	No solar reflections geometrically possible	N/A	N/A	No impact	No
4 – 8, 19 – 35, 47, 60 – 66	Solar reflections geometrically possible from **inside** a road user's primary field-of-view	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
9 – 18, 36 – 46	Solar reflections geometrically possible from **outside** a road user's primary field-of-view	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
48 – 51	Solar reflections geometrically possible from **inside** a road user's primary field-of-view	Existing vegetation is predicted to partially obstruct views of reflecting panels Partial screening would result in any remaining reflections being outside a road user's primary field-of-view	N/A	Low impact	No

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
52 – 59	Solar reflections geometrically possible from **inside** a road user's primary field-of-view	Existing vegetation is predicted to partially obstruct views of reflecting panels	Vegetation currently exists along the field boundary. This vegetation was recorded as approximately 2.2m in 2025 and will be allowed to grow by 0.4m per year, and will therefore be tall enough to screen the receptor from typical road users by the operation phase	Low impact	No

Table 10 *Impact classification – road receptors – single axis tracking panels*

6.4 Dwelling Results

6.4.1 Impact Significance Determination

The process for quantifying the impact significance concerning residential amenity is outlined in Annex D. The key considerations for residential dwellings are:

- Whether a reflection is predicted to be experienced in practice; and
- The duration of the predicted effects, relative to thresholds of:
    - 3 months per year; and
    - 60 minutes on any given day.

Where reflections are geometrically possible but expected to be screened, no impact is predicted, and mitigation is not required.

Where effects occur for less than 3 months per year and less than 60 minutes on any given day, or the closest reflecting panel is over 1km from the dwelling, the impact significance is low, and mitigation is not required.

Where reflections are predicted to be experienced for more than 3 months per year **and/or** for more than 60 minutes on any given day, expert assessment of the following relevant factors is required to determine the impact significance and mitigation requirement:

- The separation distance to the reflecting panel area[27]. Larger separation distances reduce the proportion of an observer's field-of-view that is affected by glare;
- The position of the Sun. Effects that coincide with direct sunlight appear less prominent than those that do not. The Sun is a far more significant source of light;
- Whether solar reflections will be experienced from all storeys. The ground floor is typically considered the main living space and therefore has a greater significance with respect to residential amenity; and
- Whether the dwelling appears to have windows facing the reflecting areas. An observer may need to look at an acute angle to observe the reflecting areas.

Following consideration of these relevant factors, where the solar reflection is not deemed significant, a low impact is predicted, and mitigation is not required. Where the solar reflection is deemed significant, the impact significance is moderate, and mitigation is required.

If there are no mitigating factors and the effects last for more than 3 months per year **and** for more than 60 minutes on any given day, the impact significance is high, and mitigation is required.

[27] Which is often greater than the nearest panel boundary, because not all areas of the site cause specular reflections towards particular receptor locations.

6.4.2 Results Discussion

The modelling has shown that solar reflections are geometrically possible towards 242 of the 249 assessed dwellings. Tables 11 and 12, below and on the following pages, summarise the predicted impact at these receptors.

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
1 – 22, 222 – 248	No solar reflections geometrically possible	N/A	N/A	No impact	No
23, 36 – 39, 209 – 211, 214 – 221	Solar reflections geometrically possible for **less** than 3 months per year and **less** than 60 minutes on any given day	Existing vegetation, buildings and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
24	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	Existing vegetation and/or intervening terrain is predicted to partially obstruct views of reflecting panels	Existing vegetation is approximately 2m in 2025. This vegetation will reach approximately 3.2m by the operation and maintenance phase when panels will be in situ, therefore the Applicant has committed to use of 2.5m fixed panels in field B11 to prevent any significant impacts.	No impact	No

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
25 – 35, 40 – 61, 67 – 134, 136 – 165, 169 – 170, 172 – 180, 182 – 202, 204 – 208, 212 – 213	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	Existing vegetation is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
62 – 66, 135, 167 – 168, 181	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	No significant relevant screening identified	The nearest visible reflecting panel area is over 320m from the relevant dwellings and views will be marginal Solar reflections will occur within two hours of sunrise/sunset and coincide with direct sunlight	Low impact	No

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
166, 171, 203, 249	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	Existing vegetation and intervening terrain is predicted to partially obstruct views of reflecting panels Partial screening is predicted to reduce the duration of solar reflections to less than three months per year	N/A	Low impact	No

Table 11 *Impact classification – dwelling receptors – fixed south facing panels*

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
1 – 3, 6 – 7	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
4 – 5, 8 – 12, 14 – 15	Solar reflections geometrically possible for **less** than 3 months per year and **less** than 60 minutes on any given day	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
13, 16 – 23, 51 – 57, 77, 83 – 84, 102 – 110, 115 – 118	No solar reflections geometrically possible	N/A	N/A	No impact	No
24, 39	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	Existing vegetation and/or intervening terrain is predicted to partially obstruct views of reflecting panels Partial screening will reduce the duration of solar reflections to less than three months per year	N/A	Low impact	No
25 – 38, 40 – 45, 48 – 49	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
46 – 47, 50	Solar reflections geometrically possible for **less** than 3 months per year and **less** than 60 minutes on any given day	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
58 – 61, 67 – 68, 82, 96 – 101, 119 – 123	Solar reflections geometrically possible for **less** than 3 months per year and **less** than 60 minutes on any given day	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
62 – 66	Solar reflections geometrically possible for **less** than 3 months per year and **less** than 60 minutes on any given day	No significant relevant screening identified	N/A	Low impact	No

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
69 – 76, 78 – 81, 85 – 95, 111 – 114, 124 – 166, 169 – 177, 179 – 180, 182 – 198, 200, 203 – 204, 206 – 211 214 – 248	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	Existing vegetation, buildings and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
167 – 168, 199, 201 – 202, 205, 249	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	Existing vegetation and/or intervening terrain is predicted to partially obstruct views of reflecting panels Partial screening is predicted to reduce the duration of solar reflections to less than three months per year	N/A	Low impact	No

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Relevant Factors	Impact Classification	Mitigation Recommended?
178, 181, 212 – 213	Solar reflections geometrically possible for **more** than 3 months per year but **less** than 60 minutes on any given day	Existing vegetation and/or intervening terrain is predicted to partially obstruct views of reflecting panels	The nearest visible reflecting panel area is over 320m from the relevant dwelling and views will be marginal Solar reflections will occur within an hour of sunrise/sunset and mostly coincide with direct sunlight	Low impact	No

Table 12 *Impact classification – dwelling receptors – single axis tracking panels*

6.5 Railway Results

6.5.1 Impact Significance Determination

The process for quantifying the impact significance concerning railway infrastructure and operations is outlined in Annex D. The key considerations for quantifying impact significance for train driver receptors are:

- Whether a reflection is predicted to be experienced in practice;
- The location of the reflecting panel relative to a train driver's direction of travel;
- The workload of a train driver experiencing a solar reflection.

Where reflections are geometrically possible but expected to be screened, no impact is predicted, and mitigation is not required.

Where reflections originate from outside of a train driver's primary horizontal field-of-view (30 degrees either side of the direction of travel), or the closest reflecting panel is over 500m from the railway user, the impact significance is low, and mitigation is not required.

Where reflections are predicted to be experienced from inside of a train driver's primary field-of-view, expert assessment of the following relevant factors is required to determine the impact significance and mitigation requirement:

- Whether the solar reflection originates from directly in front of a train driver. Solar reflections that are directly in front of a train driver are more hazardous;
- The separation distance to the reflecting panel area. Larger separation distances reduce the proportion of an observer's field-of-view that is affected by glare;
- The position of the Sun. Effects that coincide with direct sunlight appear less prominent than those that do not. The Sun is a far more significant source of light;
- The complexity of the railway line. Whether a signal, station, level crossing, or switching point is located within the reflection zone.

Following consideration of these relevant factors, where the solar reflection is not deemed significant, a low impact is predicted, and mitigation is not required. Where the solar reflection is deemed significant, the impact significance is moderate, and mitigation is required. Where reflections originate from directly in front of a train driver and there are no further mitigating factors, the impact significance is high, and mitigation is required.

6.5.2 Results Discussion

The modelling has shown that solar reflections are geometrically possible towards all 94 of the assessed receptors. Tables 13 and 14 below and on the following pages summarise the predicted impact at these receptors.

Railway Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Mitigating Factors	Impact Classification	Mitigation Recommended?
1 – 25, 30 – 86, 88 – 94	Solar reflections geometrically possible from **inside** a train driver's primary field-of-view[28]	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
26 – 29	Solar reflections geometrically possible from **inside** a train driver's primary field-of-view	Existing vegetation is predicted to partially obstruct views of reflecting panels	The Applicant has committed to not use fixed panels in the affected area	No impact	No (following removal of fixed panels)
87	Solar reflections geometrically possible from **inside** a train driver's primary field-of-view	Existing vegetation is predicted to partially obstruct views of reflecting panels	Any remaining solar reflections will be fleeting, due to very small gaps in the screening	Low impact	No

Table 13 *Impact classification – railway receptors – fixed south facing panels*

[28] 30 degrees either side of the direction of travel

Railway Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Mitigating Factors	Impact Classification	Mitigation Recommended?
1 – 25, 30 – 86, 88, 91 – 92	Solar reflections geometrically possible from **inside** a train driver's primary field-of-view[29]	Existing vegetation is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
26 – 29	Solar reflections geometrically possible from **inside** a train driver's primary field-of-view	Existing vegetation is predicted to partially obstruct views of reflecting panels	The Applicant has committed to set a resting angle of 5° within the single-axis tracking algorithm for panels within the affected area, which will mitigate any impacts	No impact	No
87	Solar reflections geometrically possible from **inside** a train driver's primary field-of-view	Existing vegetation is predicted to partially obstruct views of reflecting panels	Any remaining solar reflections will be fleeting due to very small gaps in the screening and coincide with the Sun	Low impact	No
89 – 90, 93 – 94	No solar reflections geometrically possible	N/A	N/A	No impact	No

Table 14 *Impact classification – railway receptors – single axis tracking panels*

[29] 30 degrees either side of the direction of travel

6.5.3 Further Results Analysis

A moderate impact was predicted upon one section of railway. Solar reflections are predicted to be geometrically possible for fixed south facing panels.

Figure 35 below shows a train driver's view from railway receptor 27, with views possible towards the circled area of the Solar PV Site.

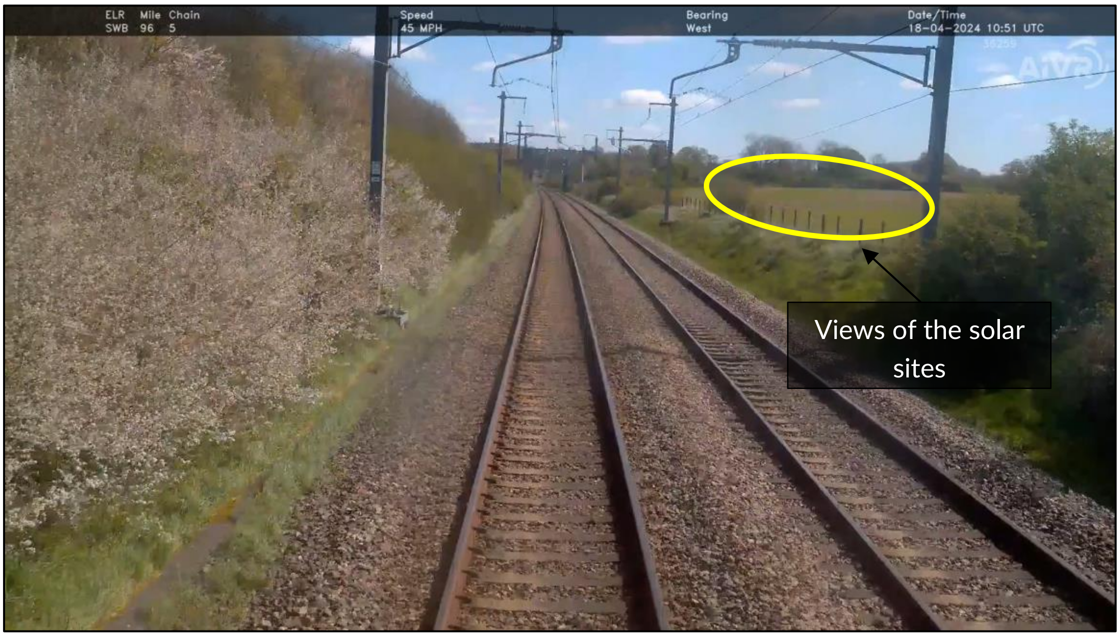

Figure 36 *Train driver view from railway receptor 27, showing views of the Solar PV Site*

The reflecting panel area is shown as the yellow area in Figure 37 on the following page. Fixed south-facing panels will be avoided within this area to prevent significant effects.

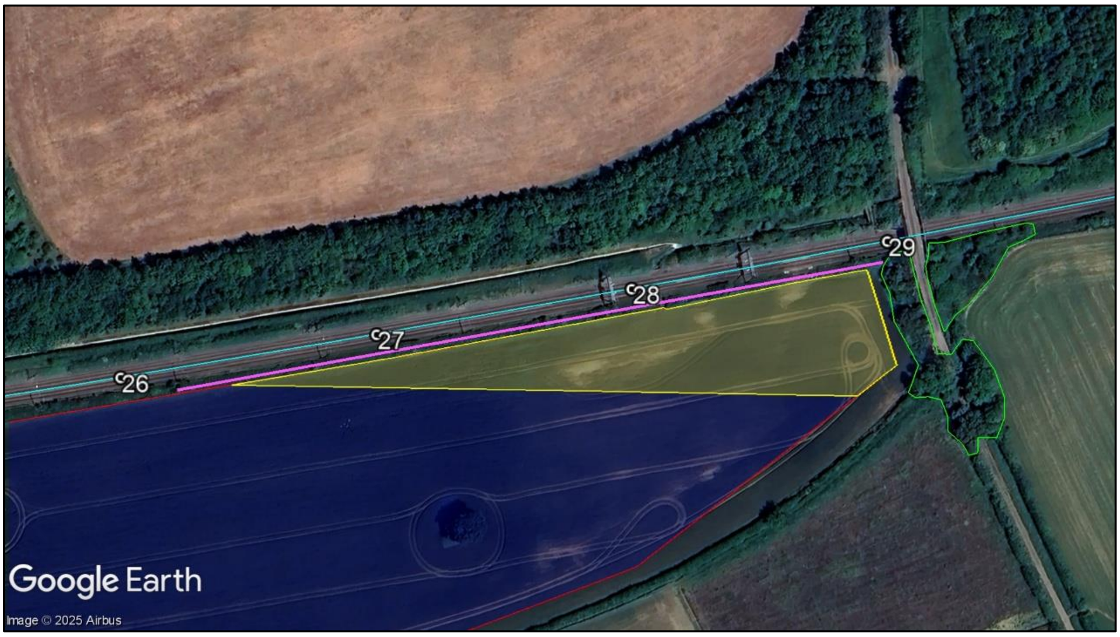

Figure 37 *Reflective panel area for railway receptors 26 to 29 (fixed south facing panels)*

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6.6 Sensitive Viewpoint Results

6.6.1 Impact Significance Determination

The assessment has considered sensitive viewpoints from the Cotswold National Landscape (CNL) looking towards the site. Viewpoints as requested by CNL have been identified to be modelled for Glint and Glare. These are intended to offer a representative sample of impacts towards surrounding sensitive viewpoints.

The key consideration for quantifying impact significance for sensitive CNL viewpoints is:

- Whether a reflection is predicted to be experienced in practice.

Where reflections are geometrically possible but expected to be screened, no impact is predicted, and mitigation is not required.

Where reflections are geometrically possible and views of the reflecting panels are possible, the impact significance is low, and mitigation is not required.

6.6.2 Results Discussion

The modelling has shown that solar reflections are geometrically possible towards 14 of the 15 assessed receptors. Tables 15 and 16 below and on the following page summarise the predicted impact at these receptors.

Further discussion of Public Rights of Way is presented in Section 8.

PRoW/CNL Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Mitigating Factors	Impact Classification	Mitigation Recommended?
3, 6, 25, 30, 31, CNL C, CNL G	Solar reflections geometrically possible	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
4, CNL D, CNL E	No solar reflections geometrically possible	N/A	N/A	No impact	No
26, 27, 33, CNL A, WC 1	Solar reflections geometrically possible	Existing vegetation and/or intervening terrain is predicted to partially obstruct views of reflecting panels	N/A	Low impact	No

Table 15 *Impact classification – viewpoint receptors – fixed south facing panels*

PRoW/CNL Receptor	Geometric Modelling Results (screening not considered)	Identified Screening (desk-based review)	Mitigating Factors	Impact Classification	Mitigation Recommended?
3, 4, 6, 25, 30, 31, CNL C, CNL E, CNL G	Solar reflections geometrically possible	Existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels	N/A	No impact	No
CNL D	No solar reflections geometrically possible	N/A	N/A	No impact	No
26, 27, 33, CNL A, WC 1	Solar reflections geometrically possible	Existing vegetation and/or intervening terrain is predicted to partially obstruct views of reflecting panels	N/A	Low impact	No

Table 16 *Impact classification – viewpoint receptors – single axis tracking panels*

7 HIGH-LEVEL AVIATION CONSIDERATIONS

7.1 Overview

The following section presents an overview of the possible effects of glint and glare concerning aviation activity at a high-level. These airfields have been assessed at a high-level due to their distance from the Scheme (i.e., more than 5km away). Neither Langley House Airfield or Charlton Park Airfield have published circuits that require assessment. There is no technical limit (distance) within which a solar reflection is possible towards pilots, however the significance decreases with distance. This is because the proportion of an observer's field of vision that is taken up by the reflecting area diminishes as the separation distance increase.

The locations of the airfields and their 1-mile splayed approach paths relative to the Scheme are shown in Figures 38 and 39 on the following pages, and summarised below:

- Langley House Airfield: approximately 5.2km south of the Scheme;
- Charlton Park Airfield: approximately 5.7km north-east of the Scheme; and
- Bowldown Farm Airfield: approximately 7.0km north of the Scheme.

7.2 Aerodrome Details

7.2.1 Langley House Airfield Information

Langley House Airfield is an unlicensed GA aerodrome and is understood not to have an ATC Tower. It has two operational runways, the details[30] of which are presented below:

- 04/22 measuring 250m by 4m (grass); and
- 03/21 measuring 215m by 4m (grass).

7.2.2 Charlton Park Airfield Information

Charlton Park Airfield is an unlicensed GA aerodrome and is understood not to have an ATC Tower. It has one operational runway, the details[30] of which are presented below:

- 07/25 measuring 900m by 20m (grass).

7.2.3 Bowldown Airfield Information

Bowldown Airfield is an unlicensed GA aerodrome and is understood not to have an ATC Tower. It has two operational runways, the details[30] of which are presented below:

- 09/27 measuring 750m by 15m (grass); and
- 04/22 measuring 550m by 15m (grass).

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[30] As determined by available imagery

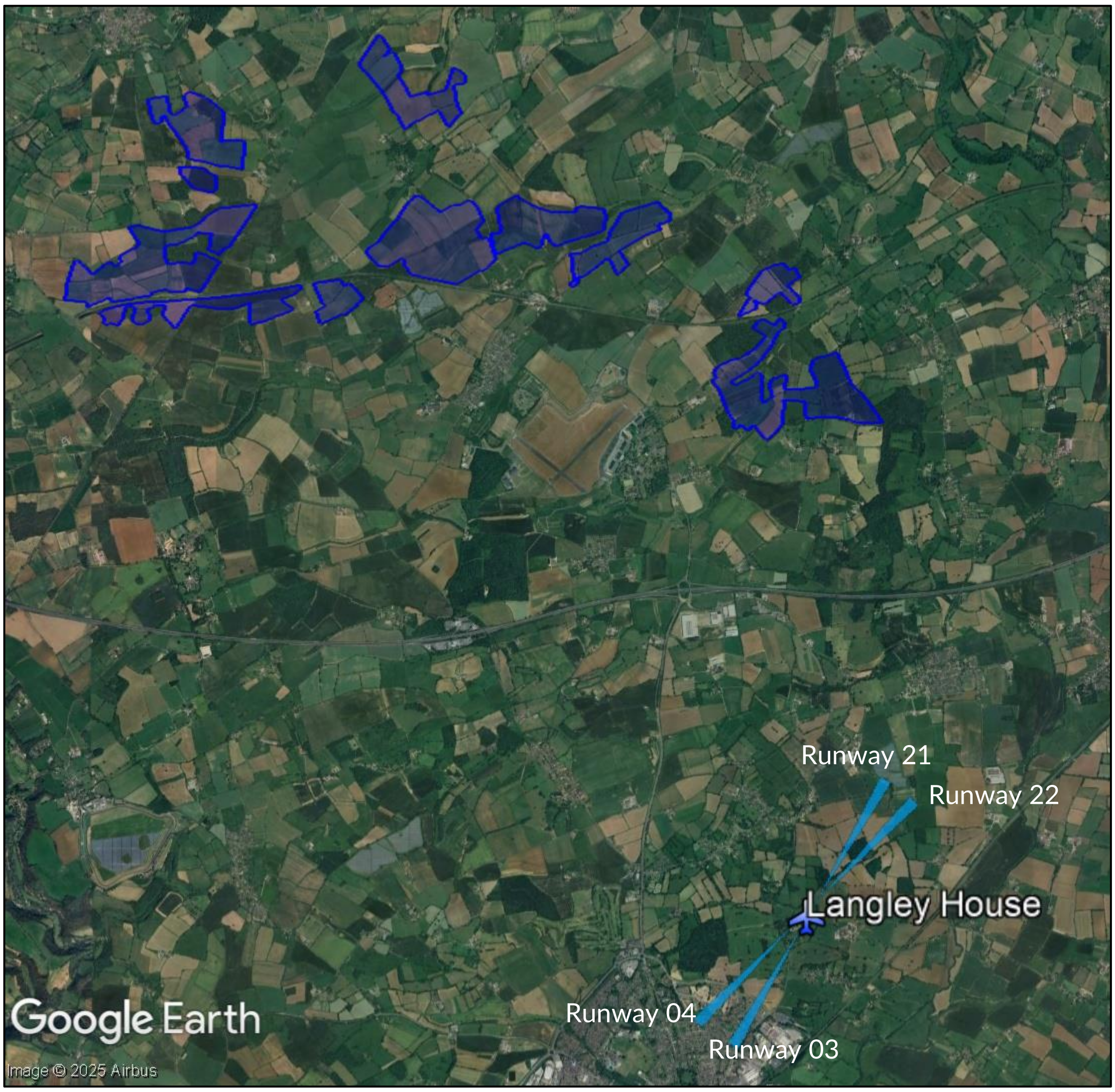

Figure 38 *Location of Langley House Airfield relative to the Scheme*

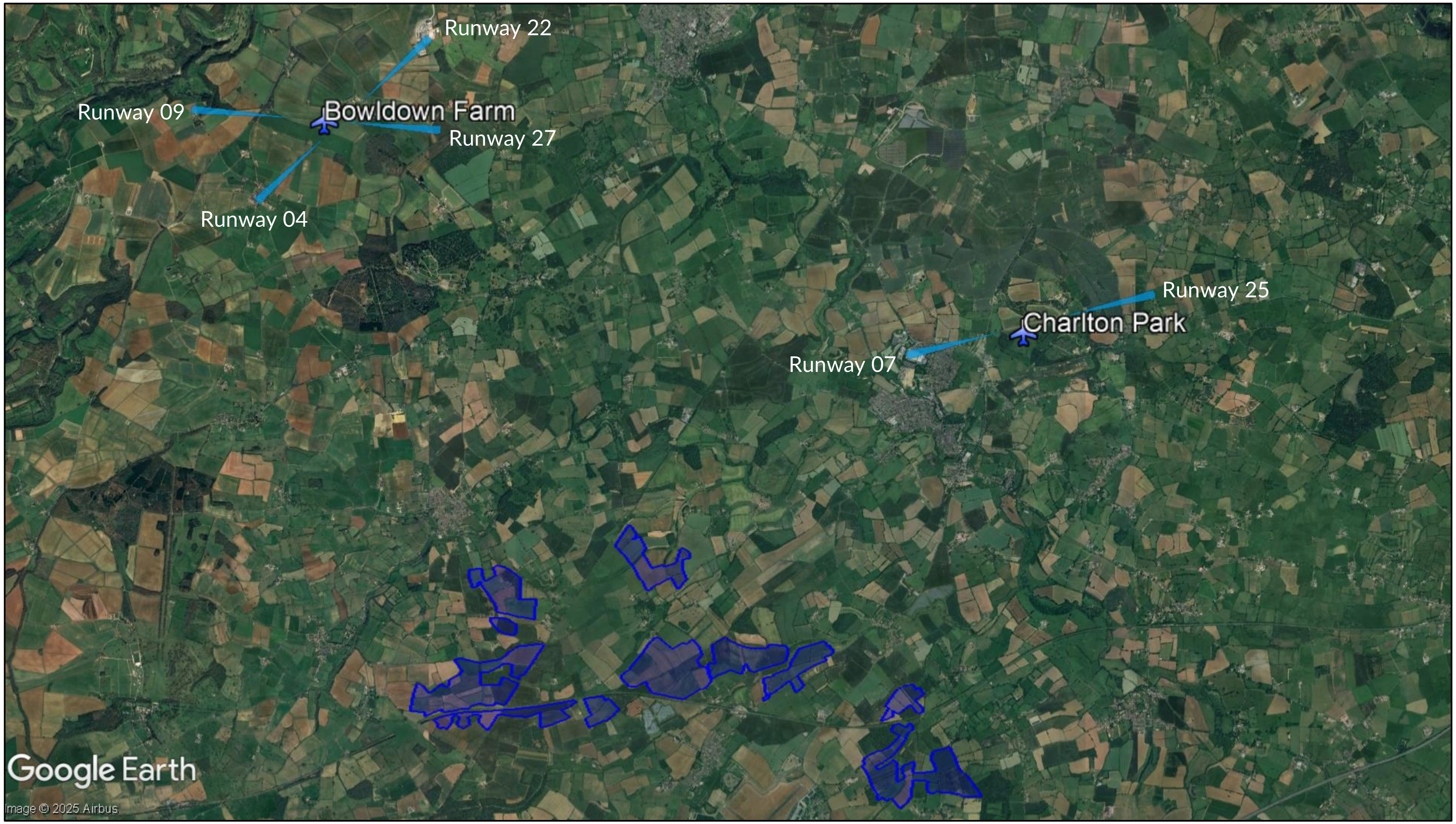

Figure 39 *Locations of Charlton Park Airfield and Bowldown Airfield relative to the Scheme*

7.3 High-Level Assessment Conclusions

Considerations of the Scheme size, distance between the aerodrome and Scheme, and previous project experience are made during the assessment.

Reference to a pilot's primary field-of-view is made when determining the predicted impact significance, which is defined as 50 degrees either side of the 1-mile approach path, relative to the runway threshold.

7.3.1 Langley House Airfield

For aviation activity associated with Langley House Airfield, the following can be concluded:

- Any solar reflections towards pilots approaching runway thresholds 21 and 22 will be outside a pilot's primary field-of-view. This level of glare is acceptable in accordance with the associated guidance and industry best practice; and
- It is also predicted that any solar reflections towards pilots approaching runway thresholds 03 and 04 and pilots on visual circuits for runways 03/21 and 04/22 would have intensities no greater than 'low potential for temporary after-image'. Based upon site size, distance, and previous project experience, this level of glare is acceptable in accordance with the associated guidance and industry good practice. It is considered due to the distance from the Scheme (over 5km), and the runway configurations, that no more than a low impact is predicted.

As a result, no significant impacts are predicted upon aviation activity at Langley House Airfield and detailed modelling is not considered to be required.

7.3.2 Charlton Park Airfield

For aviation activity associated with Charlton Park Airfield, the following can be concluded:

- Any solar reflections towards pilots approaching runway threshold 07 will be outside a pilot's primary field-of-view. This level of glare is acceptable in accordance with the associated guidance and industry best practice; and
- It is also predicted that any solar reflections towards pilots approaching runway threshold 25 and pilots on visual circuits for runway 07/25 would have intensities no greater than 'low potential for temporary after-image'. Based upon site size, distance, and previous project experience, this level of glare is acceptable in accordance with the associated guidance and industry good practice. It is considered due to the distance from the Scheme (over 5km), and the runway configurations, that no more than a low impact is predicted.

As a result, no significant impacts are predicted upon aviation activity at Charlton Park Airfield and detailed modelling is not considered to be required.

7.3.3 Bowldown Airfield

For aviation activity associated with Bowldown Airfield, the following can be concluded:

- Any solar reflections towards pilots approaching runway thresholds 04 and 27 will be outside a pilot's primary field-of-view. This level of glare is acceptable in accordance with the associated guidance and industry good practice; and
- It is also predicted that any solar reflections towards pilots approaching runway thresholds 09 and 22 and pilots on visual circuits for runways 04/22 and 09/27 would have intensities no greater than 'low potential for temporary after-image'. Based upon site size, distance, and previous project experience, this level of glare is acceptable in accordance with the associated guidance and industry good practice.

As a result, no significant impacts are predicted upon aviation activity at Bowldown Airfield and detailed modelling is not considered to be required.

8 HIGH-LEVEL ASSESSMENT OF PUBLIC RIGHTS OF WAY

8.1 Overview

Public Rights of Way (PRoW) run through and around the Scheme. There will also be permissive paths that introduce new access within the Scheme. Reflections towards observers on these paths could therefore be experienced under certain conditions (typically coinciding with sunrise/sunset i.e. when the Sun is low in the sky and beyond the panels).

8.2 Assessment

In Pager Power's experience, significant impacts to pedestrians and other observers along PRoW are not possible due to glint and glare effects from solar developments. The reasoning is due to the sensitivity of the receptors (in terms of amenity and safety) being concluded to be of low significance because:

- Effects would typically coincide with direct sunlight. The Sun is a far more significant source of light;
- The reflection intensity is similar for solar panels and still water (and significantly less than reflections from glass and steel[31]) which is frequently a feature of the outdoor environment surrounding public rights of way. Therefore, the reflections are likely to be comparable to those from common outdoor sources whilst navigating the natural and built environment on a regular basis;
- The typical density of pedestrians on a PRoW is low in a rural environment (such as the location of the Scheme);
- Any resultant effect is much less serious and has far lesser consequences than, for example, solar reflections experienced towards a road network whereby the resultant impacts of a solar reflection can be much more serious to safety;
- Glint and glare effects towards receptors on a PRoW are transient, and time and location sensitive whereby a pedestrian could move beyond the solar reflection zone with ease with little impact upon safety or amenity; and
- There is no safety hazard associated with reflections towards an observer on a footpath.

Horses and horse riders may also use bridleways in the vicinity of the site. Guidance produced by the British Horse Society[32] states with regard to glint and glare that "the incidence of glare or dazzle [from solar panels] is very low compared with glass and will not be uniform throughout a period of sunlight, assuming that the panel is static. Any reflection is unlikely to be a direct problem to horses, riders or carriage-drivers because of the angles and distances involved".

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[31] SunPower, 2009, SunPower Solar Module Glare and Reflectance (appendix to Solargen Energy, 2010).
[32] British Horse Society, April 2024, Advice on solar farms near routes used by equestrians.

8.3 Conclusions

No significant impacts are predicted upon PRoW and therefore detailed assessment is not required. No mitigation is required.

9 OVERALL CONCLUSIONS

9.1 Assessment Conclusions – Aviation

9.1.1 Hullavington Airfield

Glare with 'potential for temporary after-image' (yellow) is predicted towards the approach paths and visual circuits associated with Hullavington Airfield, for both fixed south facing panels and single axis tracking panels. Flying activities at the airfield ceased in 2016, and therefore the airfield has been assessed for reference only.

Pager Power is not aware of any proposals to resume flying activities at Hullavington Airfield, and therefore no impact is predicted towards this airfield. If flying activities were to resume, that the Applicant will liaise with the airfield operator on the potential for temporary after image ('yellow glare') from the Scheme, so that it can be taken into consideration when reopening the airfield and preparing operational flight plans. Overall, it is expected that the effects can be operationally accommodated if the airfield were to re-open (See Section 6.2.5 for results discussion).

9.1.2 Badminton Airfield

Solar reflections with yellow glare are predicted towards the visual circuits associated with Badminton Airfield, for both fixed south facing panels and single axis tracking panels. Pager Power recommends a pragmatic approach whereby instances of 'yellow' glare are evaluated in a technical and operational context.

Solar reflections with yellow glare are mostly predicted to occur within 2 hours of sunrise and therefore will occur when the Sun is low in the sky beyond the reflecting panels. This means that a pilot will likely have a view of the Sun within the same viewpoint of the reflecting solar panels. The Sun is a far more significant source of light. Furthermore, the airfield is expected to have low traffic volumes and yellow glare is not predicted towards the approach paths (which are the more sensitive receptors). In addition, the weather would have to be clear and sunny at the specific times when the glare was possible to be experienced. Overall, it is judged that the effects can be operationally accommodated. Consultation with Badminton Airfield is recommended to understand their position. Measures to address glare would be determined by the airfield and may include modifying flying schedules, revising circuit patterns, or briefing pilots on the site's presence.

Solar reflections are also predicted towards the approach path for runway 07, with an intensity of 'low potential for temporary after-image' (green) and occur within a pilot's primary field-of-view (50° either side of the direction of travel). This is deemed acceptable in line with the associated guidance (Annex D) and industry standards. A low impact is predicted, and mitigation is not required.

Solar reflections towards the approach path for runway 25 will occur outside of a pilot's primary field-of-view. This is deemed acceptable in line with the associated guidance and industry standards. A low impact is predicted, and mitigation is not required.

Overall, a low impact is predicted towards Badminton Airfield, and beyond liaison with the airfield operator, no physical mitigation is required.

9.2 Assessment Conclusions – Roads

Solar reflections are geometrically possible towards all 66 of the assessed road receptors.

For a 0.7km section of Bradfield Cottages road, existing vegetation (approximately 2.2m in 2025) is not currently at a sufficient height to screen views for a typical road user. This vegetation will be allowed to mature at a rate of 0.4m of additional height per year (to a maximum of 4.5m) and will therefore reach a height of at least 3m by the operation phase, when panels will be in situ. The proposed vegetation will reach a height to sufficiently screen views of the panels from a typical road user. Brief, infrequent views may be possible for elevated road users (i.e., HGV drivers); however, the nature and duration of these views are not considered to result in significant effects. A low impact is predicted, and mitigation is not proposed.

For the remaining sections of road, screening in the form of existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels. No significant impacts are predicted, and no mitigation is proposed.

9.3 Assessment Conclusions – Dwellings

Solar reflections are geometrically possible towards 200 of the 249 assessed dwellings.

For fixed south-facing panels, solar reflections are predicted to occur for more than three months per year but less than 60 minutes in any given day and the existing vegetation is not currently at a sufficient height to screen views from the ground floor of the dwelling of receptor 24. Existing vegetation is not currently at a sufficient height (approximately 2m in 2025) to screen views from this property. This vegetation will reach approximately 3.2m by the operation and maintenance phase when panels will be in situ, therefore the Applicant has committed to use of 2.5m fixed panels in field B11 to prevent any significant impacts. No impact is predicted, and no mitigation is proposed.

For the remaining dwellings, screening in the form of existing vegetation and/or intervening terrain is predicted to obstruct views of reflecting panels. No significant impacts are predicted, and no mitigation is proposed.

For single axis tracking panels, no significant impacts are predicted, and no mitigation is proposed. Solar reflections either occur for less than three months per year and 60 minutes on any given day, or occur for more than three months per year and are significantly screened by existing vegetation and/or intervening terrain.

9.4 Assessment Conclusions – Railway

Solar reflections are geometrically possible towards all 94 of the assessed railway receptors.

For a 0.3km section of railway, solar reflections are predicted to occur within a train driver's primary field-of-view for both fixed south facing panels and single axis tracking panels. The applicant has committed not to implement fixed south facing panels in the affected area (see Section 6.5.3). No significant impacts are predicted, and no mitigation is proposed.

For the remaining sections of railway, screening in the form of existing vegetation and/or intervening terrain is predicted to significantly obstruct views of reflecting panels. No significant impacts are predicted, and no mitigation is proposed.

No railway signals were identified that would have the potential to be affected by glint and glare.

9.5 Assessment Conclusions – Sensitive Viewpoints

Solar reflections are geometrically possible towards 14 of the 15 assessed viewpoint receptors.

For nine of these receptors, screening in the form of intervening terrain and/or existing vegetation is predicted to obstruct views of reflecting panels. No impact is predicted, and no mitigation is proposed.

For the remaining five receptors, partial screening has been identified in the form of intervening terrain and/or existing vegetation, however views of the site cannot be ruled out. A low impact is predicted, and no mitigation is proposed.

9.6 High-Level Conclusions – Aviation

No significant impacts are predicted upon aviation activity associated with Langley House Airfield, Charlton Park Airfield and Bowldown Airfield. No mitigation is required.

9.7 High-Level Conclusions – Public Rights of Way

No significant impacts are predicted upon Public Rights of Way. No mitigation is required.

ANNEX A – OVERVIEW OF GLINT AND GLARE GUIDANCE

Overview

This section presents details regarding the relevant guidance and studies with respect to the considerations and effects of solar reflections from solar panels, known as 'Glint and Glare'.

This is not a comprehensive review of the data sources, rather it is intended to give an overview of the important parameters and considerations that have informed this assessment, and is shown for reference.

National Policy Statement for Renewable Energy Infrastructure

The National Policy Statement for Renewable Energy Infrastructure (EN-3)[33] sets out the primary policy for decisions by the Secretary of State for nationally significant renewable energy infrastructure. Sections 2.10.102-106 state:

'2.10.102 Solar panels are specifically designed to absorb, not reflect, irradiation.[34] However, solar panels may reflect the sun's rays at certain angles, causing glint and glare. Glint is defined as a momentary flash of light that may be produced as a direct reflection of the sun in the solar panel. Glare is a continuous source of excessive brightness experienced by a stationary observer located in the path of reflected sunlight from the face of the panel. The effect occurs when the solar panel is stationed between or at an angle of the sun and the receptor.

2.10.103 Applicants should map receptors to qualitatively identify potential glint and glare issues and determine if a glint and glare assessment is necessary as part of the application.

2.10.104 When a quantitative glint and glare assessment is necessary, applicants are expected to consider the geometric possibility of glint and glare affecting nearby receptors and provide an assessment of potential impact and impairment based on the angle and duration of incidence and the intensity of the reflection.

2.10.105 The extent of reflectivity analysis required to assess potential impacts will depend on the specific project site and design. This may need to account for 'tracking' panels if they are proposed as these may cause differential diurnal and/or seasonal impacts.

2.10.106 When a glint and glare assessment is undertaken, the potential for solar PV panels, frames and supports to have a combined reflective quality may need to be assessed, although the glint and glare of the frames and supports is likely to be significantly less than the panels.'

[33] National Policy Statement for Renewable Energy Infrastructure (EN-3), Department for Energy Security & Net Zero, date: November 2023, accessed on: 21/12/2023.

[34] *'Most commercially available solar panels are designed with anti-reflective glass or are produced with anti-reflective coating and have a reflective capacity that is generally equal to or less hazardous than other objects typically found in the outdoor environment, such as bodies of water or glass buildings.'*

The EN-3 does not state which receptors should be considered as part of a quantitative glint and glare assessment. Based on Pager Power's extensive project experience, typical receptors include residential dwellings, road users, aviation infrastructure, and railway infrastructure.

Sections 2.10.134-136 state:

'2.10.134 Applicants should consider using, and in some cases the Secretary of State may require, solar panels to comprise of (or be covered with) anti-glare/anti-reflective coating with a specified angle of maximum reflection attenuation for the lifetime of the permission.

2.10.135 Applicants may consider using screening between potentially affected receptors and the reflecting panels to mitigate the effects.

2.10.136 Applicants may consider adjusting the azimuth alignment of or changing the elevation tilt angle of a solar panel, within the economically viable range, to alter the angle of incidence. In practice this is unlikely to remove the potential impact altogether but in marginal cases may contribute to a mitigation strategy.'

The mitigation strategies listed within the EN-3 are relevant strategies that are frequently utilised to eliminate or reduce glint and glare effects towards surrounding observers. The most common form of mitigation is the implementation of screening along the site boundary.

Sections 2.10.158-159 state:

'2.10.158 Solar PV panels are designed to absorb, not reflect, irradiation. However, the Secretary of State should assess the potential impact of glint and glare on nearby homes, motorists, public rights of way, and aviation infrastructure (including aircraft departure and arrival flight paths).

2.10.159 Whilst there is some evidence that glint and glare from solar farms can be experienced by pilots and air traffic controllers in certain conditions, there is no evidence that glint and glare from solar farms results in significant impairment on aircraft safety. Therefore, unless a significant impairment can be demonstrated, the Secretary of State is unlikely to give any more than limited weight to claims of aviation interference because of glint and glare from solar farms.'

The EN-3 goes some way in acknowledging that the issue is more complex than presented in the early draft issues; though, this is still unlikely to be welcomed by aviation stakeholders, who will still request a glint and glare assessment on the basis that glare may lead to a potentially significant impact upon aviation safety.

Finally, the EN-3 relates solely to nationally significant renewable energy infrastructure and therefore does not apply to all planning applications for solar farms.

UK Planning Policy

Renewable and Low Carbon Energy

The National Planning Policy Framework under the planning practice guidance for Renewable and Low Carbon Energy[35] (specifically regarding the consideration of solar farms, paragraph 013) states:

'What are the particular planning considerations that relate to large scale ground-mounted solar photovoltaic Farms?

The deployment of large-scale solar farms can have a negative impact on the rural environment, particularly in undulating landscapes. However, the visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively.

Particular factors a local planning authority will need to consider include:

[…]

- *the proposal's visual impact, the effect on landscape of glint and glare (see guidance on landscape assessment) and on **neighbouring uses and aircraft safety**;*
- *the extent to which there may be additional impacts if solar arrays follow the daily movement of the sun;*

[…]

The approach to assessing cumulative landscape and visual impact of large scale solar farms is likely to be the same as assessing the impact of wind turbines. However, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography the area of a zone of visual influence could be zero.'

Assessment Process – Ground-Based Receptors

No process for determining and contextualising the effects of glint and glare is provided for assessing the impact of solar reflections upon surrounding roads and dwellings. Therefore, the Pager Power approach is to determine whether a reflection from the Scheme is geometrically possible and then to compare the results against the relevant guidance/studies to determine whether the reflection is significant.

The Pager Power approach has been informed by the policy presented above, current studies (presented in Annex B) and stakeholder consultation. Further information can be found in Pager Power's Glint and Glare Guidance document[36] which was produced due to the absence of existing guidance and a specific standardised assessment methodology.

[35] Renewable and low carbon energy, Ministry of Housing, Communities & Local Government, date: 18 June 2015, accessed on: 01/11/2021
[36] Pager Power Glint and Glare Guidance, Fourth Edition (4.0), August 2022.

Assessment Process – Railways

Railway operations are not mentioned specifically within the Planning Policy Guidance however it is stated that a developer will need to consider *'the proposal's visual impact, the effect on landscape of glint and glare and on neighbouring uses…'*. Network Rail is a statutory consultee when a development is located in close proximity to its infrastructure.

No process for determining and contextualising the effects of glint and glare are, however, provided. Therefore, the Pager Power approach is to determine whether a reflection from a development is geometrically possible and then to compare the results against the relevant guidance/studies to determine whether the reflection is significant.

Railway Assessment Guidelines

The following section provides an overview of the relevant railway guidance with respect to the siting of signals on railway lines. Network Rail is the stakeholder of the UK's railway infrastructure.

A railway operator's concerns would likely to relate to the following:

1. The Scheme producing solar glare that affects train drivers; and
2. The Scheme producing solar reflections that affect railway signals and create a risk of a phantom aspect signal.

Railway guidelines are presented below. These relate specifically to the sighting distance for railway signals.

Reflections and Glare

The extract below is taken from Section A5 – Reflections and glare (pages 64-65) of the 'Signal Sighting Assessment Requirements'[37] which details the requirement for assessing glare towards railway signals.

Reflections and glare

Rationale

Reflections can alter the appearance of a display so that it appears to be something else.

Guidance

A5 is present if direct glare or reflected light is directed into the eyes or into the lineside signalling asset that could make the asset appear to show a different aspect or indication to the one presented.

A5 is relevant to any lineside signalling asset that is capable of presenting a lit signal aspect or indication.

The extent to which excessive illumination could make an asset appear to show a different signal aspect or indication to the one being presented can be influenced by the product being used.

[37] Source: Signal Sighting Assessment Requirements, June 2016. Railway Group Guidance Note. Last accessed 18.10.2016.

Requirements for assessing the phantom display performance of signalling products are set out in GKRT0057 section 4.1.

Problems arising from reflection and glare occur when there is a very large range of luminance, that is, where there are some objects that are far brighter than others. The following types of glare are relevant:

- *a) Disability glare, caused by scattering of light in the eye, can make it difficult to read a lit display.*
- *b) Discomfort glare, which is often associated with disability glare. While being unpleasant, it does not affect the signal reading time directly, but may lead to distraction and fatigue.*

Examples of the adverse effect of disability glare include:

- *a) When a colour light signal presenting a lit yellow aspect is viewed at night but the driver is unable to determine whether the aspect is a single yellow or a double yellow.*
- *b) Where a colour light signal is positioned beneath a platform roof painted white and the light reflecting off the roof can make the signal difficult to read.*

Options for militating against A5 include:

- *a) Using a product that is specified to achieve high light source: phantom ratio values.*
- *b) Alteration to the features causing the glare or reflection.*
- *c) Provision of screening.*

Glare is possible and should be assessed when the luminance is much brighter than other light sources. Glare may be unpleasant and therefore cause distraction and fatigue, or may make the signal difficult to read and increase the reading time.

Determining the Field of Focus

The extract below is taken from Annex F - Guidance on Field of Vision (pages 98-101) of the 'Signal Sighting Assessment Requirements'[38] which details the visibility of signals, train drivers' field of vision and the implications with regard to signal positioning.

Asset visibility

The effectiveness of an observer's visual system in detecting the existence of a target asset will depend upon its:

- *a) Position in the observer's visual field.*
- *b) Contrast with its background.*
- *c) Luminance properties.*
- *d) The observer's adaptation to the illumination level of the environment.*

It is also influenced by the processes relating to colour vision, visual accommodation, and visual acuity. Each of these issues is described in the following sections.

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[38] Source: Signal Sighting Assessment Requirements, June 2016. Railway Group Guidance Note. Last accessed 28.08.2020.

Field of vision

The field of vision, or visual field, is the area of the visual environment that is registered by the eyes when both eyes and head are held still. The normal extent of the visual field is approximately 135o in the vertical plane and 200o in the horizontal plane.

The visual field is usually described in terms of central and peripheral regions: the central field being the area that provides detailed information. This extends from the central point (0^{o}) to approximately 30^{o} at each eye. The peripheral field extends from 30o out to the edge of the visual field.

F.6.3 Objects positioned towards the centre of the observer's field of vision are seen more quickly and identified more accurately because this is where our sensitivity to contrast is the highest. Peripheral vision is particularly sensitive to movement and light.

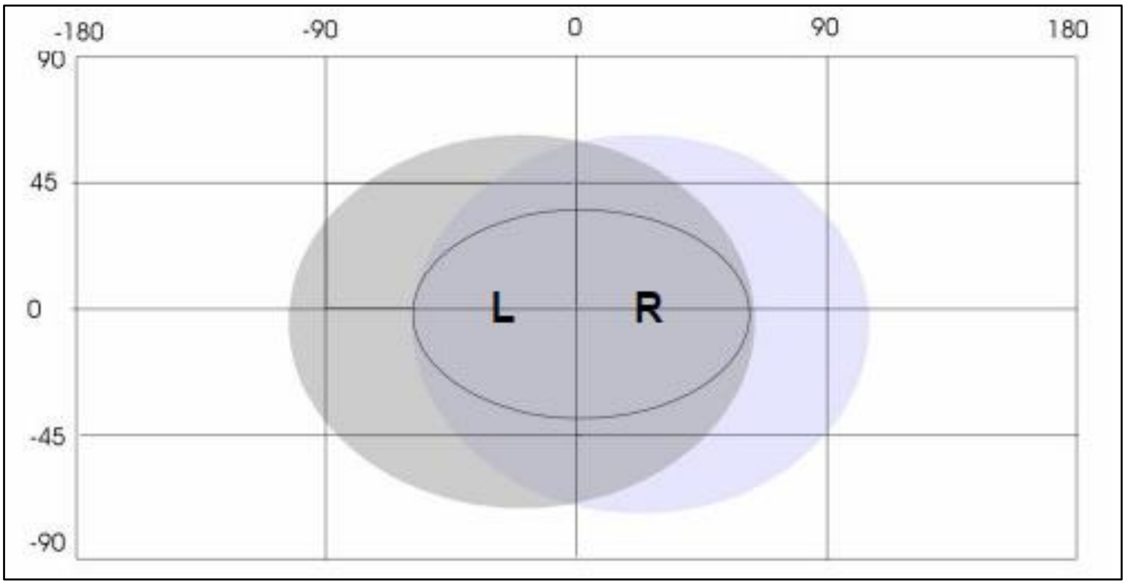

Figure G 21 - Field-of-view

In Figure G 21, the two shaded regions represent the view from the left eye (L) and the right eye (R) respectively. The darker shaded region represents the region of binocular overlap. The oval in the centre represents the central field of vision.

Research has shown that drivers search for signs or signals towards the centre of the field of vision. Signals, indicators and signs should be positioned at a height and distance from the running line that permits them to be viewed towards the centre of the field of vision. This is because:

- *a) As train speed increases, drivers become increasingly dependent on central vision for asset detection. At high speeds, drivers demonstrate a tunnel vision effect and focus only on objects in a field of + 8^{o} from the direction of travel.*
- *b) Sensitivity to movement in the peripheral field, even minor distractions can reduce the visibility of the asset if it is viewed towards the peripheral field of vision. The presence of clutter to the sides of the running line can be highly distracting (for example, fence posts, lamp-posts, traffic, or non-signal lights, such as house, compatibility factors or security lights).*

Figure G 22 and Table G 5 identify the radius of an 8o cone at a range of close-up viewing distances from the driver's eye. This shows that, depending on the lateral position of a stop signal, the optimal (normal) train stopping point could be as far as 25 m back from the signal to ensure that it is sufficiently prominent.

The dimensions quoted in Table G 5 assume that the driver is looking straight ahead. Where driver-only operation (DOO) applies, the drivers' line of sight at the time of starting the train is influenced by the location of DOO monitors and mirrors. In this case it may be appropriate to provide supplementary information alongside the monitors or mirrors using one of the following:

- *a) A co-acting signal.*
- *b) A miniature banner repeater indicator.*
- *c) A right away indicator.*
- *d) A sign to remind the driver to check the signal aspect.*

In order to prevent misreading by trains on adjacent lines, the co-acting signal or miniature banner repeater may be configured so that the aspect or indication is presented only when a train is at the platform to which it applies.

'Car stop' signs should be positioned so that the relevant platform starting signals and / or indicators can be seen in the driver's central field of vision.

If possible, clutter and non-signal lights in a driver's field-of-view should be screened off or removed so that they do not cause distraction.

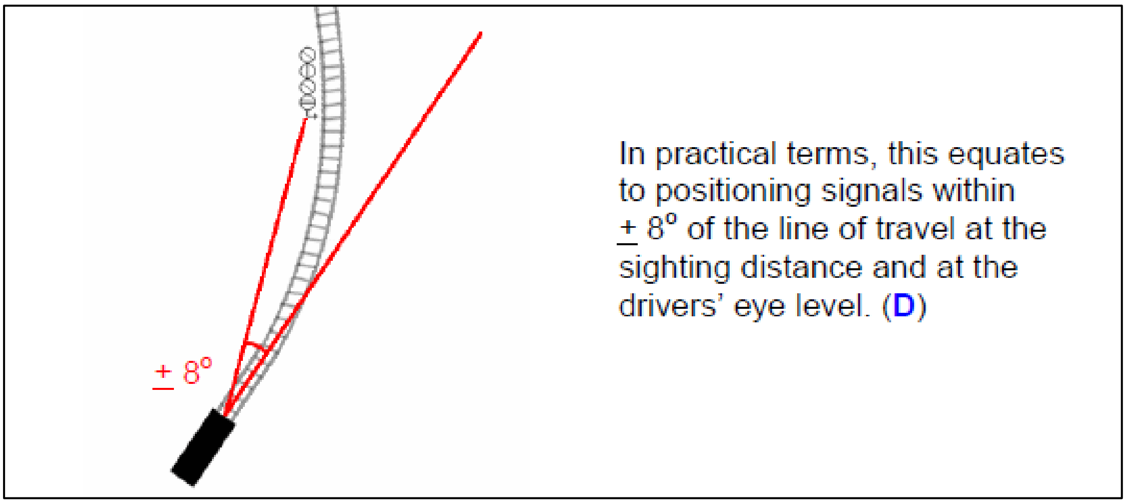

Figure G 22 - Signal positioning

'A' (m)	'B' (m)	Typical display positions
5	*0.70*	-
6	*0.84*	-
7	*0.98*	-
8	*1.12*	-
9	*1.26*	-
10	*1.41*	-
11	*1.55*	-
12	*1.69*	-
13	*1.83*	-
14	*1.97*	-
15	*2.11*	*A stop aspect positioned 3.3 m above rail level and 2.1 m from the left hand rail is within the 8° cone at 15.44 m in front of the driver*
16	*2.25*	-
17	*2.39*	-
18	*2.53*	*A stop aspect positioned 5.1 m above rail level and 0.9 m from the left hand rail is within the 8° cone at 17.93 m in front of the driver*
19	*2.67*	-
20	*2.81*	-
21	*2.95*	-
22	*3.09*	-
23	*3.23*	-
24	*3.37*	-
25	*3.51*	*A stop aspect positioned 3.3 m above rail level and 2.1 m from the right hand rail is within the 8° cone at 25.46 m in front of the driver*

Table G 5 – 8° cone angle co-ordinates for close-up viewing

The distance at which the 8° cone along the track is initiated is dependent on the minimum reading time and distance which is associated to the speed of trains along the track. This is discussed below.

Determining the Assessed Minimum Reading Time

The extracts below are taken from the RIS-0737-CCS-1 of the 'Signal Sighting Assessment Requirements'[39] which details the required minimum reading time for a train driver when approaching a signal.

The following abbreviations are defined within the 'Definitions and Abbreviations':

'Baseline response time

The minimum time value that can be used by the SSC to specify the MRT for a particular signalling asset type.

Supplementary response time

The assessed amount of extra time that the SSC adds to the BRT to determine the MRT value for a specific lineside signalling asset.'

The following extract is taken from page 114 of the RIS-0737-CCS-1:

'Minimum response time (MRT)

The assessed minimum time needed by a driver (or other authorised user) to respond to the information presented by a specific lineside signalling asset, taking account of the following human tasks:

a) Read the display or display combination.

a) Interpret the display or display combination

b) Assimilate all of the available information

c) Decide what action to take (if any), and when it needs to be taken

d) Take the action, where necessary, before the train passes the asset.

MRT = BRT + SRT'

The distance at which a signal should be clearly viewable is determined by the maximum speed of the trains along the track. If there are multiple signals present at a location then an additional 0.2 seconds reading time is added to the overall viewing time.

Signal Design and Lighting System

Many railway signals are now LED lights and not filament (incandescent) bulbs. The benefits of an LED signal over a filament bulb signal with respect to possible phantom aspect illuminations are as follows:

- An LED railway signal produces a more intense light making them more visible to approaching trains when compared to the traditional filament bulb technology[40]; and

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[39] Source: Signal Sighting Assessment Requirements, June 2016. Railway Group Guidance Note. Last accessed 28.08.2020.
[40] Source: Wayside LED Signals – Why it's Harder than it Looks, Bill Petit.

- Most LED signals do not have a reflective mirror present within the signal itself, unlike a filament bulb. The presence of the reflective surfaces greatly increases the likelihood of incoming light being reflecting out making the signal appear illuminated.

Many LED signal manufacturers[41,42,43] claim that LED signal lights significantly reduce the likelihood of a phantom aspect illumination occurring.

Aviation Assessment Guidance

The UK Civil Aviation Authority (CAA) issued interim guidance relating to Solar Photovoltaic Systems (SPV) on 17 December 2010 and was subject to a CAA information alert 2010/53[44]. The formal policy was cancelled on September 7th, 2012[45] however the advice is still applicable[46] until a formal policy is developed. The relevant aviation guidance from the CAA is presented in the section below.

CAA Interim Guidance

This interim guidance makes the following recommendations (p.2-3):

'8. It is recommended that, as part of a planning application, the SPV developer provide safety assurance documentation (including risk assessment) regarding the full potential impact of the SPV installation on aviation interests.

9. Guidance on safeguarding procedures at CAA licensed aerodromes is published within CAP 738 Safeguarding of Aerodromes and advice for unlicensed aerodromes is contained within CAP 793 Safe Operating Practices at Unlicensed Aerodromes.

10. Where proposed developments in the vicinity of aerodromes require an application for planning permission the relevant LPA normally consults aerodrome operators or NATS when aeronautical interests might be affected. This consultation procedure is a statutory obligation in the case of certain major airports, and may include military establishments and certain air traffic surveillance technical sites. These arrangements are explained in Department for Transport Circular 1/2003 and for Scotland, Scottish Government Circular 2/2003.

11. In the event of SPV developments proposed under the Electricity Act, the relevant government department should routinely consult with the CAA. There is therefore no requirement for the CAA to be separately consulted for such proposed SPV installations or developments.

12. If an installation of SPV systems is planned on-aerodrome (i.e. within its licensed boundary) then it is recommended that data on the reflectivity of the solar panel material should be included in any assessment before installation approval can be granted. Although approval for installation is the responsibility of the ALH[47], as part of a condition of a CAA Aerodrome Licence, the ALH is required

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[41] Source: [redacted] (Last accessed 21.02.18).
[42] Source: [redacted] pdf. (Last accessed 21.02.18).
[43] Source: Siemens, Sigmaguard LED Tri-Colour L Signal – LED Signal Technology at Incandescent Prices. Datasheet 1A-23. (Last accessed 22.02.18).
[44] CAA INFO ALERT 2010/53 : 2010 Interim CAA Guidance
[45] Archived at Pager Power
[46] Reference email from the CAA dated 19/05/2014.
[47] Aerodrome Licence Holder.

to obtain prior consent from CAA Aerodrome Standards Department before any work is begun or approval to the developer or LPA is granted, in accordance with the procedures set out in CAP 791 Procedures for Changes to Aerodrome Infrastructure.

13. During the installation and associated construction of SPV systems there may also be a need to liaise with nearby aerodromes if cranes are to be used; CAA notification and permission is not required.

14. The CAA aims to replace this informal guidance with formal policy in due course and reserves the right to cancel, amend or alter the guidance provided in this document at its discretion upon receipt of new information.

15. Further guidance may be obtained from CAA's Aerodrome Standards Department via aerodromes@caa.co.uk.'

FAA Guidance

The most comprehensive guidelines available for the assessment of solar developments near aerodromes has been produced by the United States Federal Aviation Administration (FAA). The first guidelines were produced initially in November 2010 and updated in 2013. A final policy was released in 2021, which superseded the interim guidance.

The 2010 document is entitled 'Technical Guidance for Evaluating Selected Solar Technologies on Airports'[48], the 2013 update is entitled 'Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports'[49], and the 2021 final policy is entitled 'Federal Aviation Administration Policy: Review of Solar Energy System Projects on Federally-Obligated Airports'[50].

Key excerpts from the final policy are presented below:

'Initially, FAA believed that solar energy systems could introduce a novel glint and glare effect to pilots on final approach. FAA has subsequently concluded that in most cases, the glint and glare from solar energy systems to pilots on final approach is similar to glint and glare pilots routinely experience from water bodies, glass-façade buildings, parking lots, and similar features. However, FAA has continued to receive reports of potential glint and glare from on-airport solar energy systems on personnel working in ATCT cabs. Therefore, FAA has determined the scope of agency policy should be focused on the impact of on-airport solar energy systems to federally-obligated towered airports, specifically the airport's ATCT cab.

The policy in this document updates and replaces the previous policy by encouraging airport sponsors to conduct an ocular analysis of potential impacts to ATCT cabs prior to submittal of a Notice of Proposed Construction or Alteration Form 7460-1 (hereinafter Form 7460-1). Airport sponsors are no longer required to submit the results of an ocular analysis to FAA. Instead, to

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[48] Archived at Pager Power

[49] Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports, Department of Transportation, Federal Aviation Administration (FAA), date: 10/2013, accessed on: 08/12/2021.

[50] Federal Aviation Administration Policy: Review of Solar Energy System Projects on Federally-Obligated Airports, Federal Aviation Administration, date: May 2021, accessed on: 08/12/2021.

demonstrate compliance with 14 CFR 77.5(c), FAA will rely on the submittal of Form 7460-1 in which the sponsor confirms that it has analyzed the potential for glint and glare and determined there is no potential for ocular impact to the airport's ATCT cab. This process will enable FAA to evaluate the solar energy system project, with assurance that the system will not impact the ATCT cab.

FAA encourages airport sponsors of federally-obligated towered airports to conduct a sufficient analysis to support their assertion that a proposed solar energy system will not result in ocular impacts. There are several tools available on the open market to airport sponsors that can analyze potential glint and glare to an ATCT cab. For proposed systems that will clearly not impact ATCT cabs (e.g., on-airport solar energy systems that are blocked from the ATCT cab's view by another structure), the use of such tools may not be necessary to support the assertion that a proposed solar energy system will not result in ocular impacts.'

The excerpt above states where a Solar PV development is to be located on a federally obligated aerodrome with an ATC Tower, it will require a glint and glare assessment to accompany its application. It states that pilots on approach are no longer a specific assessment requirement due to effects from solar energy systems being similar to glint and glare pilots routinely experience from water bodies, glass-façade buildings, parking lots, and similar features. Ultimately it comes down to the specific aerodrome to ensure it is adequately safeguarded, and it is on this basis that glint and glare assessments are routinely still requested.

The policy also states that several different tools and methodologies can be used to assess the impacts of glint and glare, which was previously required to be undertaken by the Solar Glare Hazard Analysis Tool (SGHAT) using the Sandia National Laboratories methodology.

In 2018, the FAA released the latest version (Version 1.1) of the 'Technical Guidance for Evaluating Selected Solar Technologies on Airports'[51]. Whilst the 2021 final policy also supersedes this guidance, many of the points are still relevant because aerodromes are still safeguarding against glint and glare irrespective of the FAA guidance. The key points are presented below for reference:

- Reflectivity refers to light that is reflected off surfaces. The potential effects of reflectivity are glint (a momentary flash of bright light) and glare (a continuous source of bright light). These two effects are referred to hereinafter as "glare," which can cause a brief loss of vision, also known as flash blindness[52].
- The amount of light reflected off a solar panel surface depends on the amount of sunlight hitting the surface, its surface reflectivity, geographic location, time of year, cloud cover, and solar panel orientation.

[51] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 08/12/2021.

[52] Flash Blindness, as described in the FAA guidelines, can be described as a temporary visual interference effect that persists after the source of illumination has ceased. This occurs from many reflective materials in the ambient environment.

- As illustrated on Figure 16[53], flat, smooth surfaces reflect a more concentrated amount of sunlight back to the receiver, which is referred to as specular reflection. The more a surface is polished, the more it shines. Rough or uneven surfaces reflect light in a diffused or scattered manner and, therefore, the light will not be received as bright.
- Because the FAA has no specific standards for airport solar facilities and potential glare, the type of glare analysis may vary. Depending on site specifics (e.g., existing land uses, location and size of the project) an acceptable evaluation could involve one or more of the following levels of assessment:
    - A qualitative analysis of potential impact in consultation with the Control Tower, pilots and airport officials;
    - A demonstration field test with solar panels at the proposed site in coordination with FAA Tower personnel;
    - A geometric analysis to determine days and times when an impact is predicted.
- The extent of reflectivity analysis required to assess potential impacts will depend on the specific project site and system design.
- **1. Assessing Baseline Reflectivity Conditions** – Reflection in the form of glare is present in current aviation operations. The existing sources of glare come from glass windows, auto surface parking, rooftops, and water bodies. At airports, existing reflecting surfaces may include hangar roofs, surface parking, and glassy office buildings. To minimize unexpected glare, windows of air traffic control towers and airplane cockpits are coated with anti-reflective glazing. Operators also wear polarized eye wear. Potential glare from solar panels should be viewed in this context. Any airport considering a solar PV project should first review existing sources of glare at the airport and the effectiveness of measures used to mitigate that glare.
- **2. Tests in the Field** – Potential glare from solar panels can easily be viewed at the airport through a field test. A few airports have coordinated these tests with FAA Air Traffic Controllers to assess the significance of glare impacts. To conduct such a test, a sponsor can take a solar panel out to proposed location of the solar project, and tilt the panel in different directions to evaluate the potential for glare onto the air traffic control tower. For the two known cases where a field test was conducted, tower personnel determined the glare was not significant. If there is a significant glare impact, the project can be modified by ensuring panels are not directed in that direction.
- **3. Geometric Analysis** – Geometric studies are the most technical approach for reflectivity issues. They are conducted when glare is difficult to assess through other methods. Studies of glare can employ geometry and the known path of the sun to predict when sunlight will reflect off of a fixed surface (like a solar panel) and contact a fixed receptor (e.g., control tower). At any given site, the sun moves across the sky every day and its path in the sky changes throughout year. This in turn alters the destination of the resultant reflections since the angle of reflection for the solar panels

[53] First figure in Appendix B.

will be the same as the angle at which the sun hits the panels. The larger the reflective surface, the greater the likelihood of glare impacts.

- Facilities placed in remote locations, like the desert, will be far from receptors and therefore potential impacts are limited to passing aircraft. Because the intensity of the light reflected from the solar panel decreases with increasing distance, an appropriate question is how far you need to be from a solar reflected surface to avoid flash blindness. It is known that this distance is directly proportional to the size of the array in question[54] but still requires further research to definitively answer.
- **Experiences of Existing Airport Solar Projects** – Solar installations are presently operating at a number of airports, including megawatt-sized solar facilities covering multiple acres. Air traffic control towers have expressed concern about glint and glare from a small number of solar installations. These were often instances when solar installations were sited between the tower and airfield, or for installations with inadequate or no reflectivity analysis. Adequate reflectivity analysis and alternative siting addressed initial issues at those installations.

Air Navigation Order (ANO) 2016

In some instances, an aviation stakeholder can refer to the ANO 2016[55] with regard to safeguarding. Key points from the document are presented below.

'Lights liable to endanger

224. (1) A person must not exhibit in the United Kingdom any light which—

(a) by reason of its glare is liable to endanger aircraft taking off from or landing at an aerodrome; or

(b) by reason of its liability to be mistaken for an aeronautical ground light is liable to endanger aircraft.

(2) If any light which appears to the CAA to be a light described in paragraph (1) is exhibited, the CAA may direct the person who is the occupier of the place where the light is exhibited or who has charge of the light, to take such steps within a reasonable time as are specified in the direction—

(a) to extinguish or screen the light; and

(b) to prevent in the future the exhibition of any other light which may similarly endanger aircraft.

(3) The direction may be served either personally or by post, or by affixing it in some conspicuous place near to the light to which it relates.

(4) In the case of a light which is or may be visible from any waters within the area of a general lighthouse authority, the power of the CAA under this article must not be exercised except with the consent of that authority.

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[54] Ho, Clifford, Cheryl Ghanbari, and Richard Diver. 2009. Hazard Analysis of Glint and Glare From Concentrating Solar Power Plants. SolarPACES 2009, Berlin Germany. Sandia National Laboratories.
[55] The Air Navigation Order 2016. [online] Available at: <https://www.legislation.gov.uk/uksi/2016/765/contents/made> [Accessed 4 February 2022].

Lights which dazzle or distract

225. A person must not in the United Kingdom direct or shine any light at any aircraft in flight so as to dazzle or distract the pilot of the aircraft.'

The Order states that no 'light', 'dazzle' or 'glare' should be produced which will create a detrimental impact upon aircraft safety.

Endangering safety of an aircraft

240. A person must not recklessly or negligently act in a manner likely to endanger an aircraft, or any person in an aircraft.

Endangering safety of any person or property

241. A person must not recklessly or negligently cause or permit an aircraft to endanger any person or property'

ANNEX B – OVERVIEW OF GLINT AND GLARE STUDIES

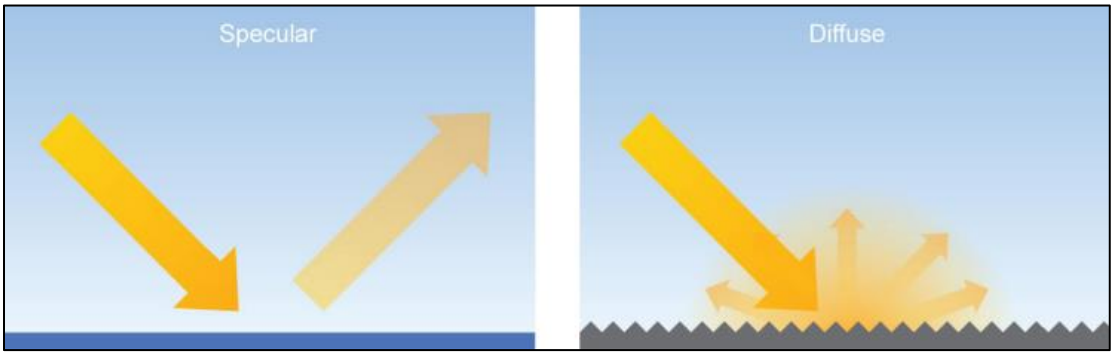
Overview

Studies have been undertaken assessing the type and intensity of solar reflections from various surfaces including solar panels and glass. An overview of these studies is presented below.

The guidelines presented are related to aviation safety. The results are applicable for the purpose of this analysis.

Reflection Type from Solar Panels

Based on the surface conditions reflections from light can be specular and diffuse. A specular reflection has a reflection characteristic similar to that of a mirror; a diffuse will reflect the incoming light and scatter it in many directions. The figure below, taken from the FAA guidance[56], illustrates the difference between the two types of reflections. Because solar panels are flat and have a smooth surface most of the light reflected is specular, which means that incident light from a specific direction is reradiated in a specific direction.



Specular and diffuse reflections

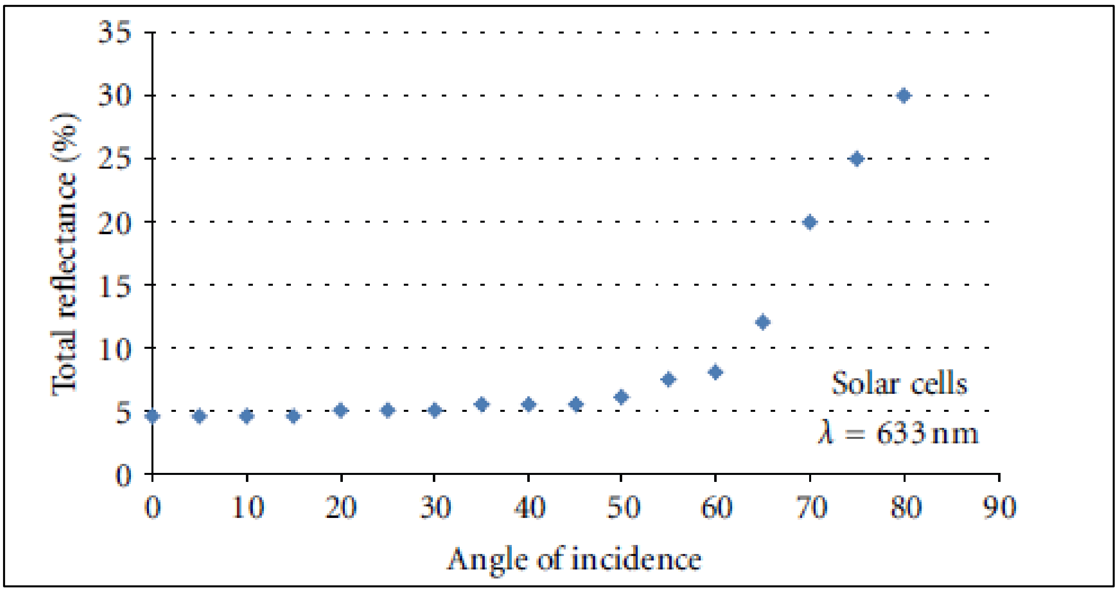
[56] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 20/03/2019.

Solar Reflection Studies

An overview of content from identified solar panel reflectivity studies is presented in the subsections below.

Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems"

Evan Riley and Scott Olson published in 2011 their study titled: A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems[57]". They researched the potential glare that a pilot could experience from a 25 degree fixed tilt PV system located outside of Las Vegas, Nevada. The theoretical glare was estimated using published ocular safety metrics which quantify the potential for a postflash glare after-image. This was then compared to the postflash glare after-image caused by smooth water. The study demonstrated that the reflectance of the solar cell varied with angle of incidence, with maximum values occurring at angles close to 90 degrees. The reflectance values varied from approximately 5% to 30%. This is shown on the figure below.



Total reflectance % when compared to angle of incidence

The conclusions of the research study were:

- The potential for hazardous glare from flat-plate PV systems is similar to that of smooth water; and
- Portland white cement concrete (which is a common concrete for runways), snow, and structural glass all have a reflectivity greater than water and flat plate PV modules.

[57] Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems," ISRN Renewable Energy, vol. 2011, Article ID 651857, 6 pages, 2011. doi:10.5402/2011/651857

FAA Guidance – "Technical Guidance for Evaluating Selected Solar Technologies on Airports"[58]

The 2010 FAA Guidance included a diagram which illustrates the relative reflectance of solar panels compared to other surfaces. The figure shows the relative reflectance of solar panels compared to other surfaces. Surfaces in this figure produce reflections which are specular and diffuse. A specular reflection (those made by most solar panels) has a reflection characteristic similar to that of a mirror. A diffuse reflection will reflect the incoming light and scatter it in many directions. A table of reflectivity values, sourced from the figure within the FAA guidance, is presented below.

Surface	Approximate Percentage of Light Reflected[59]
Snow	80
White Concrete	77
Bare Aluminium	74
Vegetation	50
Bare Soil	30
Wood Shingle	17
Water	5
Solar Panels	5
Black Asphalt	2

Relative reflectivity of various surfaces

Note that the data above does not appear to consider the reflection type (specular or diffuse).

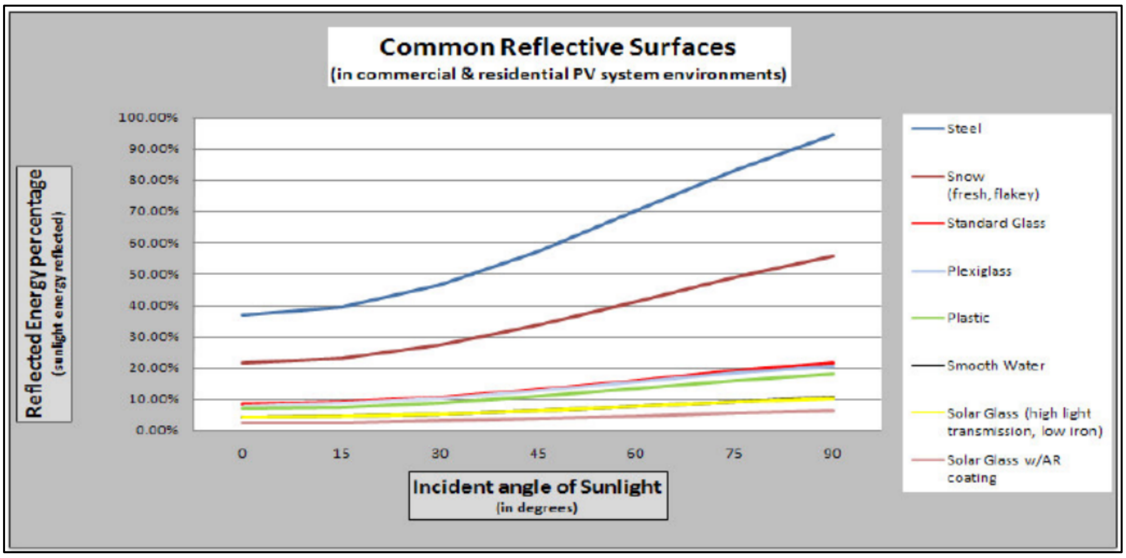
An important comparison in this table is the reflectivity compared to water which will produce a reflection of very similar intensity when compared to that from a solar panel. The study by Riley and Olsen study (2011) also concludes that still water has a very similar reflectivity to solar panels.

SunPower Technical Notification (2009)

[58] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 20/03/2019.
[59] Extrapolated data, baseline of 1,000 W/m^2 for incoming sunlight.

SunPower published a technical notification[60] to *'increase awareness concerning the possible glare and reflectance impact of PV Systems on their surrounding environment'*.

The figure presented below shows the relative reflectivity of solar panels compared to other natural and manmade materials including smooth water, standard glass and steel.



Common reflective surfaces

The results, similarly to those from Riley and Olsen study (2011) and the FAA (2010), show that solar panels produce a reflection that is less intense than those of *'standard glass and other common reflective surfaces'*.

With respect to aviation and solar reflections observed from the air, SunPower has developed several large installations near airports or on Air Force bases. It is stated that these developments have all passed FAA or Air Force standards with all developments considered "No Hazard to Air Navigation". The note suggests that developers discuss any possible concerns with stakeholders near proposed solar farms.

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[60] Source: Technical Support, 2009. SunPower Technical Notification – Solar Module Glare and Reflectance.

ANNEX C – OVERVIEW OF SUN MOVEMENTS AND RELATIVE REFLECTIONS

The Sun's position in the sky can be accurately described by its azimuth and elevation. Azimuth is a direction relative to true north (horizontal angle i.e. from left to right) and elevation describes the Sun's angle relative to the horizon (vertical angle i.e. up and down).

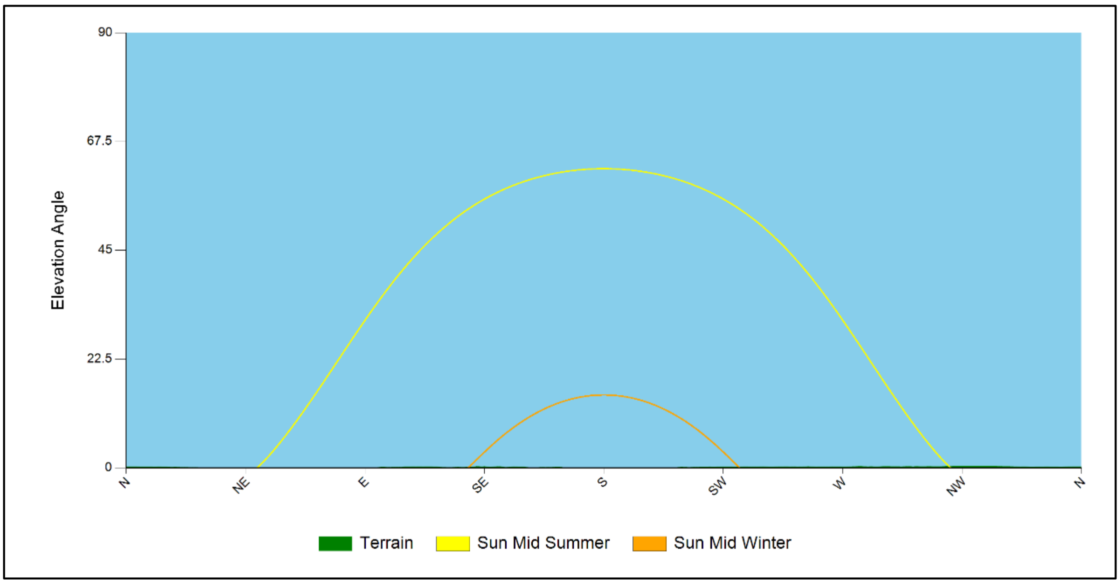
The Sun's position can be accurately calculated for a specific location. The following data being used for the calculation:

- Time;
- Date;
- Latitude; and
- Longitude.

The following is true at the location of the solar development:

- The Sun is at its highest around midday and is to the south at this time;
- The Sun rises highest on 21 June (longest day); and
- On 21 December, the maximum elevation reached by the Sun is at its lowest (shortest day).

The combination of the Sun's azimuth angle and vertical elevation will affect the direction and angle of the reflection from a reflector. The figure below shows terrain at the horizon from the Scheme's location as well as the sunrise and sunset curves throughout the year.



Sunrise and sunset curves

ANNEX D – GLINT AND GLARE IMPACT SIGNIFICANCE

Overview

The significance of glint and glare will vary for different receptors. The following section presents a general overview of the significance criteria with respect to experiencing a solar reflection.

Impact Significance Definition

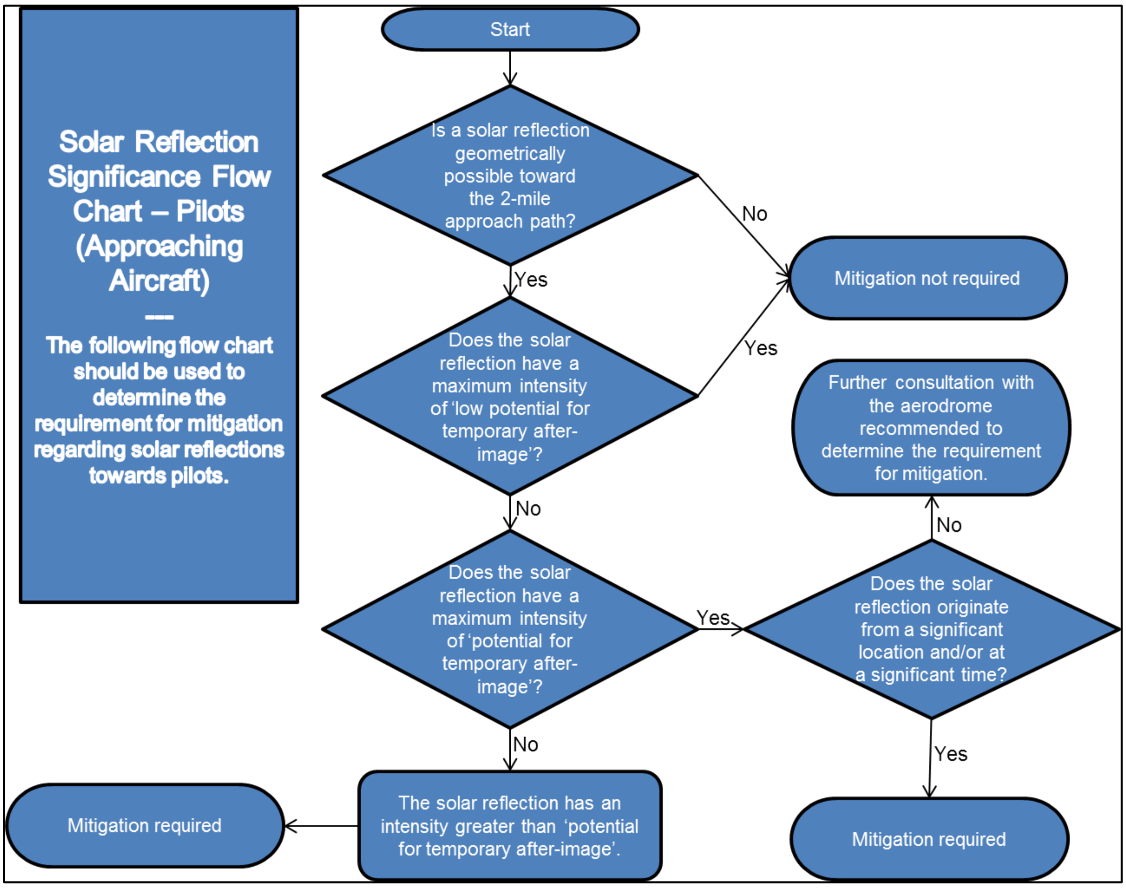
The table below presents the recommended definition of 'impact significance' in glint and glare terms and the requirement for mitigation under each.

Impact Significance	Definition	Mitigation
No Impact	A solar reflection is not geometrically possible or will not be visible from the assessed receptor.	No mitigation required.
Low	A solar reflection is geometrically possible however any impact is considered to be small such that mitigation is not required e.g. intervening screening will limit the view of the reflecting solar panels significantly.	No mitigation recommended.
Moderate	A solar reflection is geometrically possible and visible however it occurs under conditions that do not represent a worst-case given individual receptor criteria.	Mitigation recommended.
High	A solar reflection is geometrically possible and visible under worst-case conditions that will produce a significant impact given individual receptor criteria	Mitigation will be required if the Scheme is to proceed.

Impact significance definition

Impact Significance Determination for Approaching Aircraft

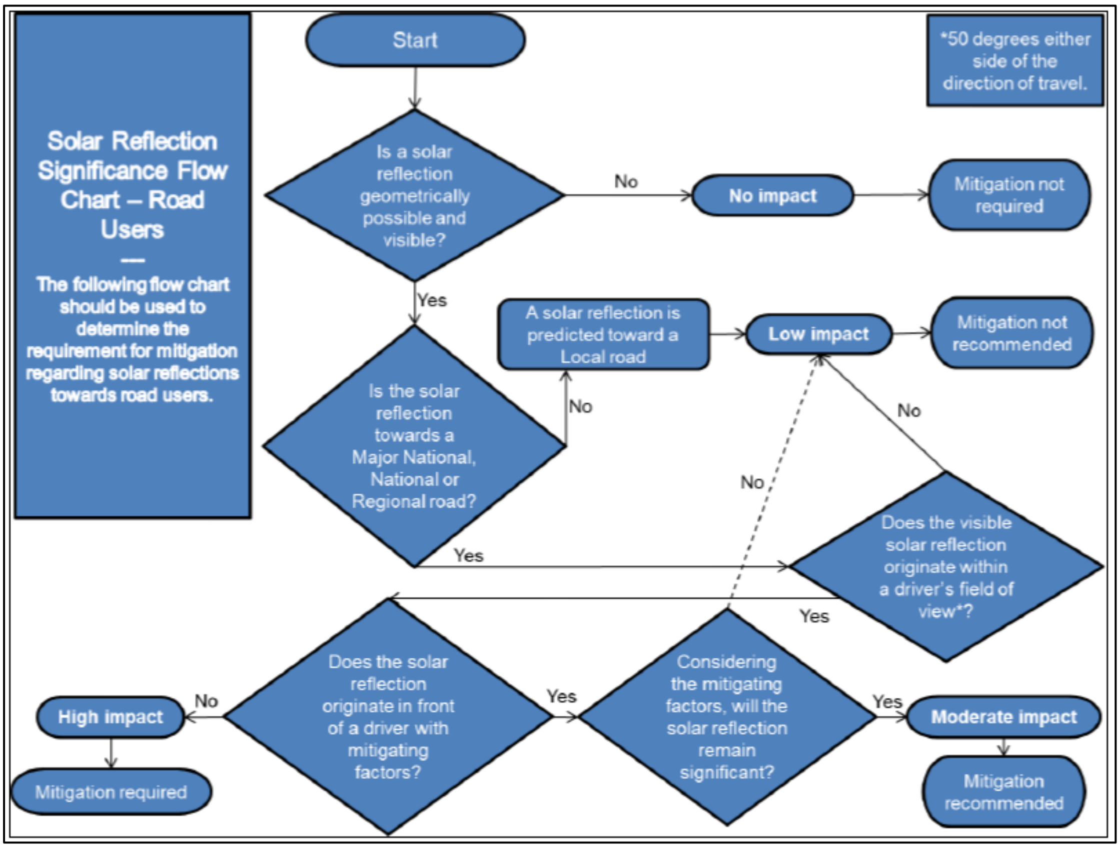
The flow chart presented below has been followed when determining the mitigation requirement for approaching aircraft.



Approaching aircraft receptor mitigation requirement flow chart

Impact Significance Determination for Road Receptors

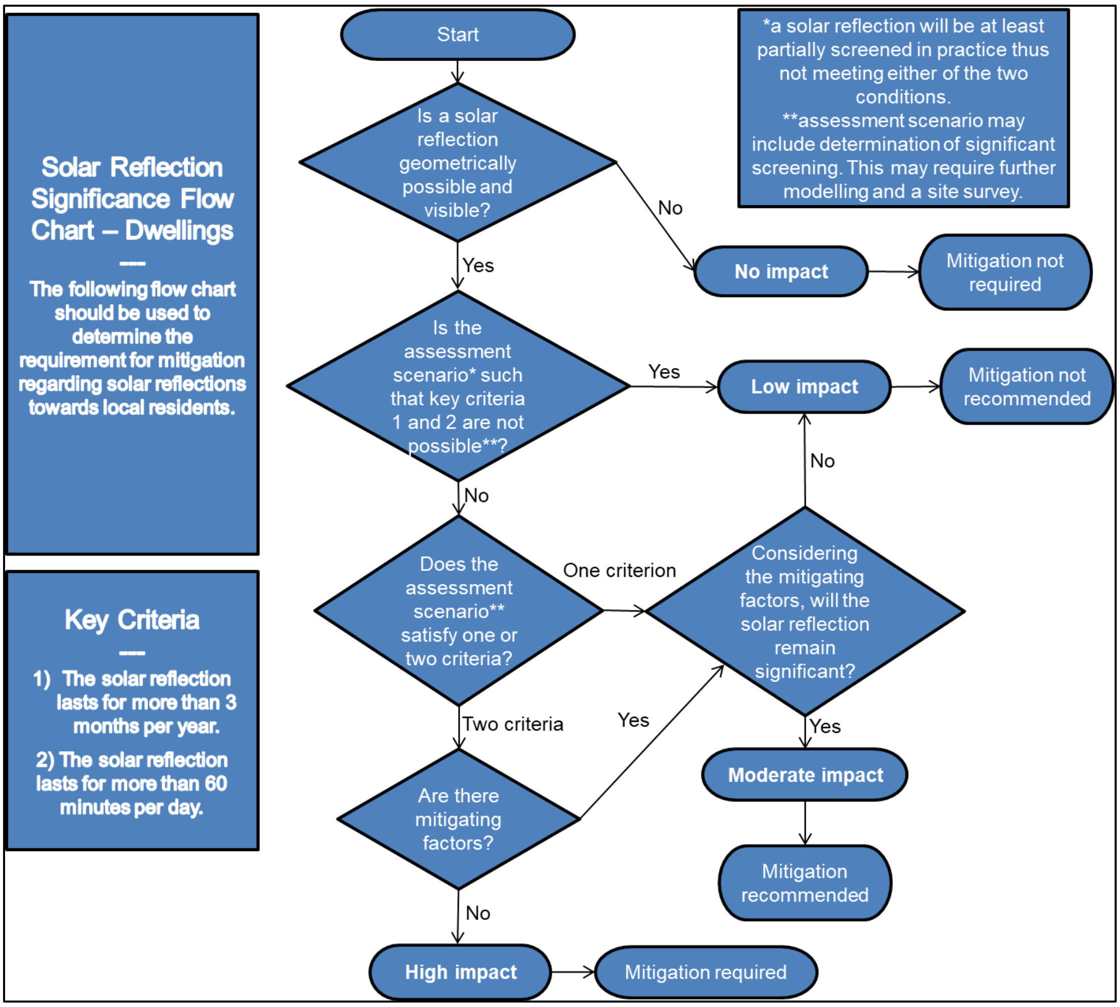
The flow chart presented below has been followed when determining the mitigation requirement for road receptors.



Road receptor impact significance flow chart

Impact Significance Determination for Dwelling Receptors

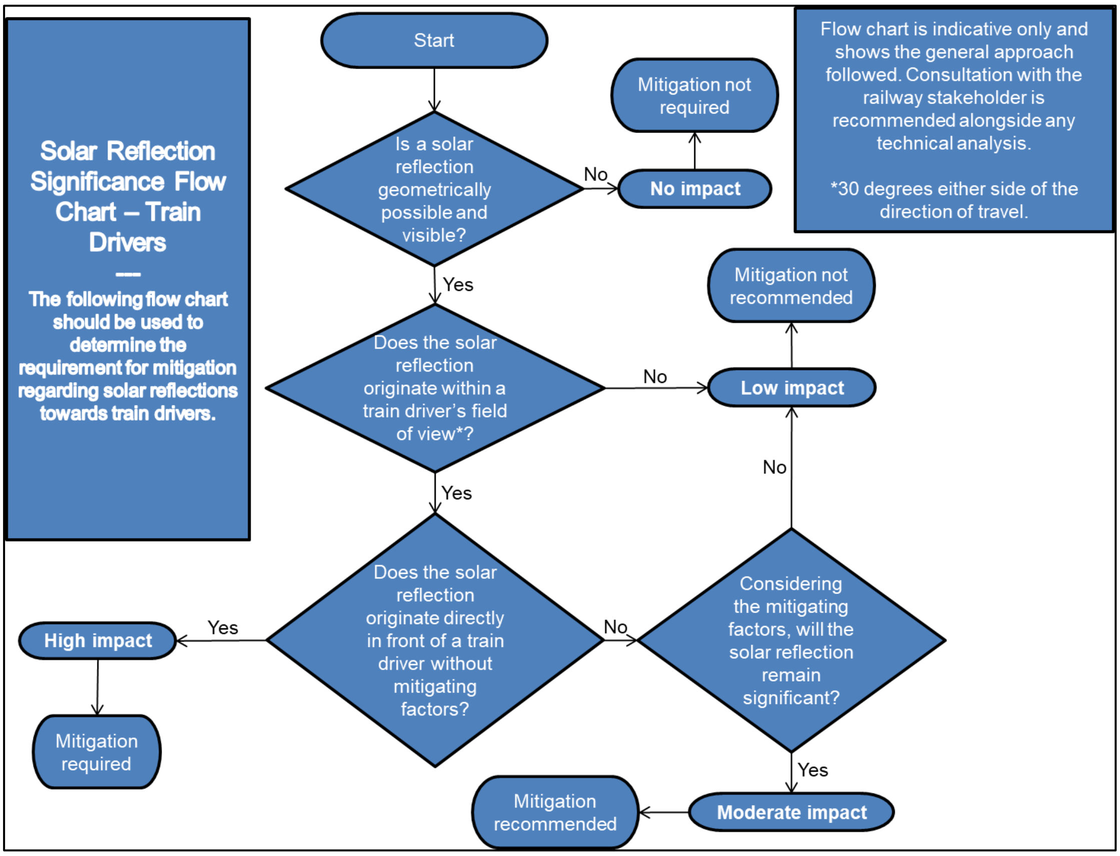
The flow chart presented below has been followed when determining the mitigation requirement for dwelling receptors.



Dwelling receptor impact significance flow chart

Impact Significance Determination for Railway Receptors

The flow chart presented below has been followed when determining the mitigation requirement for railway receptors.



Train driver impact significance flow chart

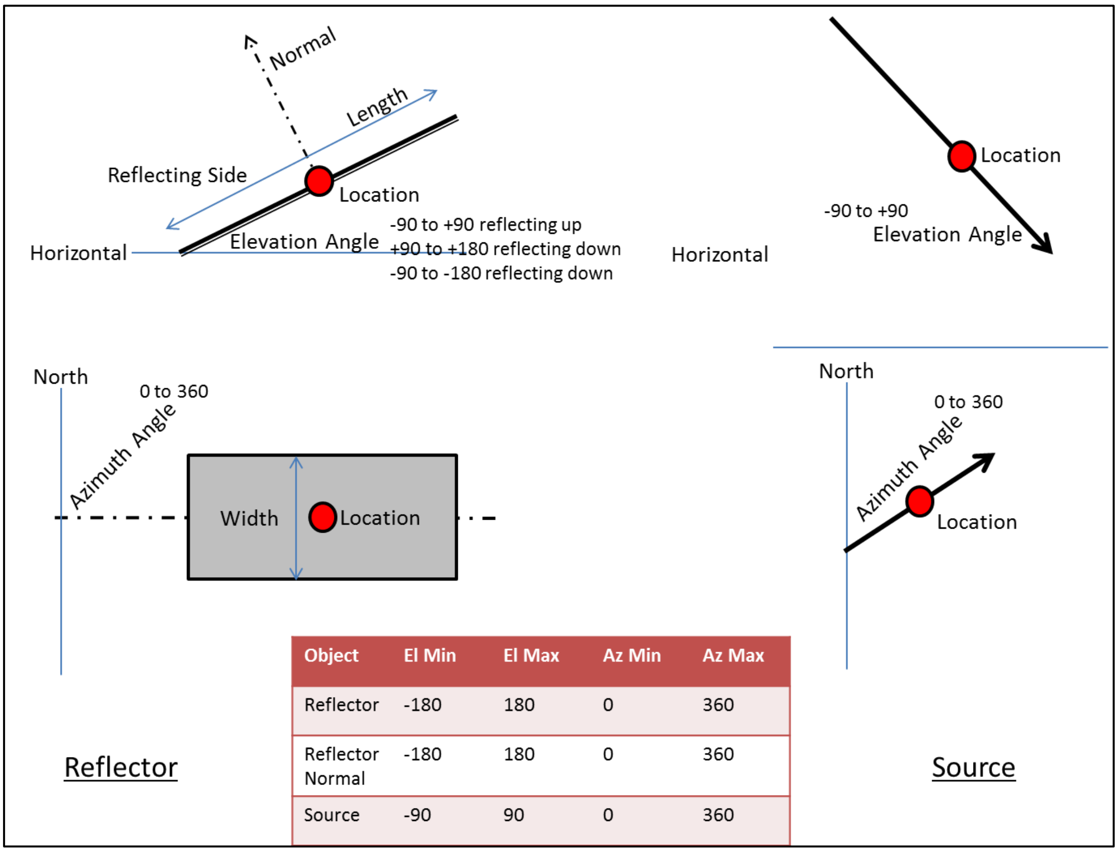
ANNEX E – REFLECTION CALCULATIONS METHODOLOGY

Pager Power Methodology

The calculations are three dimensional and complex, accounting for:

- The Earth's orbit around the Sun;
- The Earth's rotation;
- The Earth's orientation;
- The reflector's location; and
- The reflector's 3D Orientation.

Reflections from a flat reflector are calculated by considering the normal which is an imaginary line that is perpendicular to the reflective surface and originates from it. The diagram below may be used to aid understanding of the reflection calculation process.



Object	El Min	El Max	Az Min	Az Max
Reflector	-180	180	0	360
Reflector Normal	-180	180	0	360
Source	-90	90	0	360

Reflection calculation process

The following process is used to determine the 3D Azimuth and Elevation of a reflection:

- Use the Latitude and Longitude of reflector as the reference for calculation purposes;
- Calculate the Azimuth and Elevation of the normal to the reflector;
- Calculate the 3D angle between the source and the normal;
- If this angle is less than 90 degrees a reflection will occur. If it is greater than 90 degrees no reflection will occur because the source is behind the reflector; and
- Calculate the Azimuth and Elevation of the reflection in accordance with the following:
    - The angle between source and normal is equal to angle between normal and reflection;
    - Source, Normal and Reflection are in the same plane.

ANNEX F – ASSESSMENT LIMITATIONS AND ASSUMPTIONS

Pager Power's Model

The model considers 100% sunlight during daylight hours which is highly conservative.

The model does not account for terrain between the reflecting solar panels and the assessed receptor where a solar reflection is geometrically possible.

The model considers terrain between the reflecting solar panels and the visible horizon (where the Sun may be obstructed from view of the panels)[61].

It is assumed that the panel elevation angle assessed represents the elevation angle for all of the panels within each solar panel area defined.

It is assumed that the panel azimuth angle assessed represents the azimuth angle for all of the panels within each solar panel area defined.

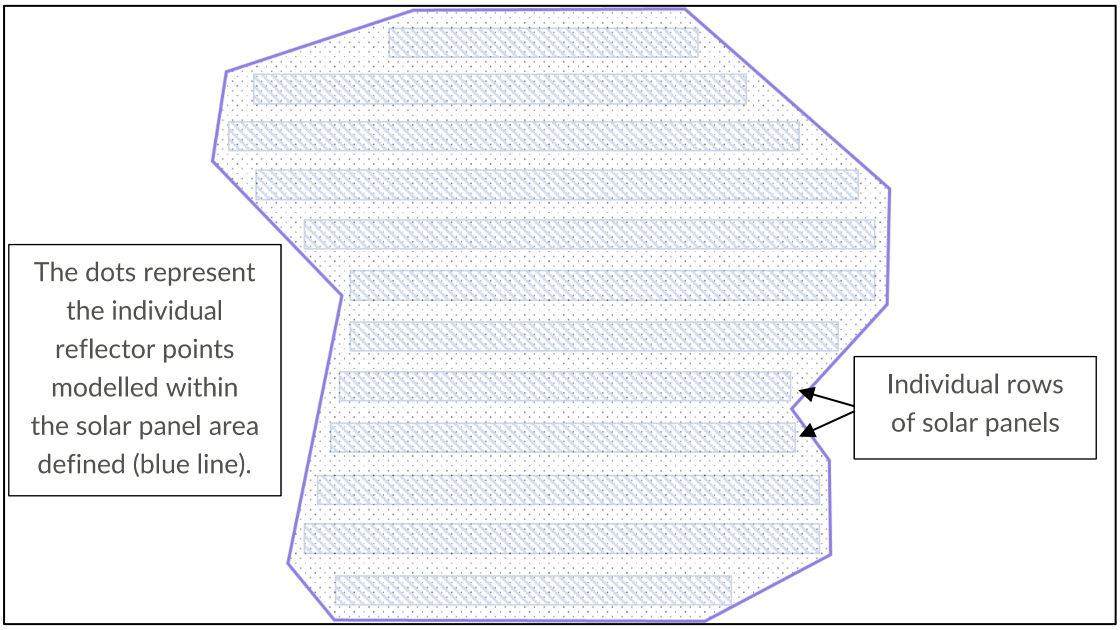
Only a reflection from the face of the panel has been considered. The frame or the reverse or frame of the solar panel has not been considered.

The model assumes that a receptor can view the face of every panel (point, defined in the following paragraph) within the Solar PV Sites whilst in reality this, in the majority of cases, will not occur. Therefore any predicted solar reflection from the face of a solar panel that is not visible to a receptor will not occur in practice.

The model considers all areas of the Solar PV Sites, and assumes that the entire areas are covered with Solar PV Panels.

A finite number of points within each Solar PV Area is chosen based on an assessment resolution so that a comprehensive understanding of the entire development can be formed. This determines whether a solar reflection could ever occur at a chosen receptor. The model does not consider the specific panel rows or the entire face of the solar panel within the development outline, rather a single point is defined every 'x' metres (based on the assessment resolution) with the geometric characteristics of the panel. A panel area is however defined to encapsulate all possible panel locations. See the figure below which illustrates this process.

[61] UK only.



Solar panel area modelling overview

A single reflection point is chosen for the geometric calculations. This suitably determines whether a solar reflection can be experienced at a receptor location and the time of year and duration of the solar reflection. Increased accuracy could be achieved by increasing the number of heights assessed however this would only marginally change the results and is not considered significant.

The available street view imagery, satellite mapping, terrain and any site imagery provided by the Applicant has been used to assess line of sight from the assessed receptors to the modelled Solar PV Sites, unless stated otherwise. In some cases, this imagery may not be up to date and may not give the full perspective of the installation from the location of the assessed receptor.

Any screening in the form of trees, buildings etc. that may obstruct the Sun from view of the solar panels is not within the modelling unless stated otherwise. The terrain profile at the horizon is considered if stated.

Forge's Sandia National Laboratories' (SGHAT) Model

The following text is taken from Forge[62] and is presented for reference.

Summary of assumptions and abstractions required by the SGHAT/ForgeSolar analysis methodology

1. Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
2. Result data files and plots are now retained for two years after analysis completion. Files should be downloaded and saved if additional persistence is required.
3. The algorithm 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, we have validated our models 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.
4. Several 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. This primarily affects analyses of path receptors.
5. Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
6. 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.)
7. The algorithm assumes that the PV array is aligned with a plane defined by the total heights of the coordinates outlined in the Google map. For more accuracy, the user should perform runs using minimum and maximum values for the vertex heights to bound the height of the plane containing the solar array. Doing so will expand the range of observed solar glare when compared to results using a single height value.
8. The algorithm 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.
9. The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed 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.
10. The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
11. 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.
12. 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.
13. Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
14. Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
15. PV array tracking assumes the modules move instantly when tracking the sun, and when reverting to the rest position.

62 [redacted]

ANNEX G – RECEPTOR AND REFLECTOR AREA DETAILS

Aerodrome Details

The table below presents the data for the assessed airfields, including runway details. The receptor locations are based on the methodology set out in Section 5.1.

Aerodrome	Threshold	Longitude (°)	Latitude (°)	Threshold Height (m) (amsl)
Hullavington Airfield	04	-2.14331	51.52569	102
	22	-2.13112	51.53358	92
Badminton Airfield	07	-2.31236	51.54661	162
	25	-2.29341	51.55063	143

Assessed aerodrome information

Road Receptor Data

The road receptor data is presented in the tables below. An additional 1.5m height has been added to the elevation to account for the eye-level of a road user.

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
1	-2.11031	51.55658	71.50	34	-2.12722	51.53311	90.03
2	-2.11056	51.55575	71.50	35	-2.12632	51.53240	89.50
3	-2.11002	51.55492	73.57	36	-2.12552	51.53165	89.84
4	-2.10979	51.55409	75.50	37	-2.12502	51.53081	89.67
5	-2.11085	51.55348	77.50	38	-2.12459	51.52995	89.58
6	-2.11168	51.55274	78.50	39	-2.12447	51.52906	91.50
7	-2.11262	51.55206	78.50	40	-2.12431	51.52816	91.50
8	-2.11366	51.55143	79.23	41	-2.12407	51.52728	91.50
9	-2.11464	51.55077	80.36	42	-2.12381	51.52639	91.59

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
10	-2.11535	51.54999	80.16	43	-2.12346	51.52552	91.50
11	-2.11606	51.54921	79.50	44	-2.12293	51.52468	93.54
12	-2.11702	51.54854	79.50	45	-2.12234	51.52386	96.20
13	-2.11804	51.54790	79.50	46	-2.14877	51.54465	85.80
14	-2.11919	51.54736	79.98	47	-2.14934	51.54546	84.77
15	-2.12021	51.54672	81.50	48	-2.15029	51.54614	90.23
16	-2.12119	51.54605	81.50	49	-2.15074	51.54699	91.50
17	-2.12205	51.54533	81.77	50	-2.15133	51.54781	91.50
18	-2.12289	51.54460	85.57	51	-2.15201	51.54860	91.50
19	-2.12381	51.54391	87.50	52	-2.15260	51.54943	91.75
20	-2.12479	51.54325	88.50	53	-2.15289	51.55031	92.37
21	-2.12574	51.54257	90.08	54	-2.15318	51.55119	92.09
22	-2.12663	51.54186	90.50	55	-2.15359	51.55205	92.46
23	-2.12747	51.54113	91.50	56	-2.15428	51.55284	91.58
24	-2.12828	51.54038	91.50	57	-2.15496	51.55363	91.50
25	-2.12909	51.53963	91.50	58	-2.15588	51.55432	91.50
26	-2.12983	51.53886	91.50	59	-2.15704	51.55486	94.50
27	-2.13041	51.53804	91.50	60	-2.15827	51.55534	97.18
28	-2.13087	51.53719	91.50	61	-2.15950	51.55581	100.50
29	-2.13107	51.53630	91.50	62	-2.16074	51.55628	101.08
30	-2.13132	51.53562	91.50	63	-2.16198	51.55674	97.77

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
31	-2.13020	51.53506	91.50	64	-2.16316	51.55725	91.86
32	-2.12916	51.53444	91.34	65	-2.16431	51.55775	91.50
33	-2.12817	51.53378	90.50	66	-2.16556	51.55803	91.50

Road receptor data

Dwelling Receptor Data

The dwelling receptor data is presented in the tables below. An additional 1.8m height has been added to the elevation to account for the eye-level of an observer at these dwellings.

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
1	-2.18242	51.57252	101.80	126	-2.12341	51.52661	91.80
2	-2.18182	51.57259	101.80	127	-2.12372	51.52752	91.80
3	-2.18012	51.57248	101.80	128	-2.12402	51.52792	91.80
4	-2.17333	51.57924	102.80	129	-2.12492	51.52789	92.16
5	-2.17320	51.57844	101.80	130	-2.12544	51.52813	92.80
6	-2.17224	51.57322	95.60	131	-2.12694	51.52871	93.72
7	-2.17209	51.57194	96.36	132	-2.12535	51.52980	91.29
8	-2.15801	51.57231	91.80	133	-2.12523	51.53042	90.80
9	-2.15719	51.57270	91.80	134	-2.12565	51.53094	90.34
10	-2.15698	51.57367	91.11	135	-2.12173	51.53300	87.80
11	-2.15513	51.57306	88.80	136	-2.12536	51.54225	90.73
12	-2.15409	51.57238	86.19	137	-2.12586	51.54294	90.39
13	-2.15127	51.57060	82.80	138	-2.12532	51.54334	89.80

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
14	-2.15186	51.57146	83.49	139	-2.12846	51.54366	91.53
15	-2.15190	51.57208	83.80	140	-2.14859	51.53857	101.80
16	-2.15064	51.57271	82.80	141	-2.14959	51.53890	100.91
17	-2.15043	51.57243	82.80	142	-2.15041	51.53930	99.19
18	-2.14905	51.57229	81.80	143	-2.15042	51.53980	98.08
19	-2.14850	51.57196	81.80	144	-2.14901	51.54014	99.33
20	-2.14300	51.57252	80.23	145	-2.15004	51.54037	97.79
21	-2.14236	51.57256	79.96	146	-2.15061	51.54067	96.06
22	-2.14087	51.57340	77.80	147	-2.15123	51.54119	96.97
23	-2.14361	51.56898	82.80	148	-2.15162	51.54097	97.83
24	-2.15345	51.56535	89.80	149	-2.15203	51.54062	99.24
25	-2.16929	51.56049	101.41	150	-2.15254	51.54000	100.54
26	-2.16798	51.55780	92.91	151	-2.15352	51.53967	100.80
27	-2.16680	51.55670	94.41	152	-2.15388	51.53896	100.80
28	-2.16601	51.55722	91.80	153	-2.15424	51.53845	101.01
29	-2.16593	51.55753	91.80	154	-2.15418	51.53748	101.80
30	-2.16512	51.55760	91.80	155	-2.15754	51.53949	102.66
31	-2.16544	51.55776	91.80	156	-2.15870	51.54016	99.73
32	-2.16589	51.55777	91.80	157	-2.14532	51.54286	90.29
33	-2.16638	51.55796	92.62	158	-2.14772	51.54479	85.08
34	-2.16636	51.55820	92.07	159	-2.14841	51.54489	85.75

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
35	-2.16734	51.55843	91.80	160	-2.14912	51.54494	84.80
36	-2.16464	51.55943	91.80	161	-2.14931	51.54524	84.80
37	-2.16368	51.55958	91.80	162	-2.14942	51.54570	85.61
38	-2.16344	51.55996	92.19	163	-2.14984	51.54612	89.56
39	-2.16362	51.56032	92.80	164	-2.15193	51.54590	93.80
40	-2.16091	51.56091	91.80	165	-2.15194	51.54535	92.11
41	-2.15765	51.55929	91.80	166	-2.17886	51.54907	102.18
42	-2.14836	51.56281	89.80	167	-2.18638	51.55159	107.67
43	-2.14749	51.56142	91.80	168	-2.18623	51.55109	107.80
44	-2.12851	51.55799	93.80	169	-2.18840	51.54823	109.80
45	-2.12752	51.55827	93.80	170	-2.18903	51.54823	109.80
46	-2.11334	51.55784	76.65	171	-2.18881	51.54793	109.80
47	-2.11310	51.55733	75.53	172	-2.17860	51.53684	104.50
48	-2.11497	51.55738	77.78	173	-2.18286	51.53784	112.27
49	-2.11658	51.55738	80.56	174	-2.18426	51.53730	112.09
50	-2.11496	51.55711	77.13	175	-2.20139	51.53657	123.22
51	-2.11433	51.55661	74.75	176	-2.20539	51.53344	124.72
52	-2.11357	51.55644	73.45	177	-2.21392	51.53112	117.17
53	-2.11275	51.55631	73.23	178	-2.20729	51.53716	126.28
54	-2.11217	51.55620	72.52	179	-2.23183	51.54305	124.80
55	-2.11158	51.55600	71.80	180	-2.23128	51.54361	124.80

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
56	-2.11121	51.55546	71.80	181	-2.23032	51.54432	124.80
57	-2.11082	51.55490	74.70	182	-2.23232	51.54454	124.80
58	-2.11034	51.55425	75.87	183	-2.23197	51.54505	124.80
59	-2.11162	51.55391	79.80	184	-2.23174	51.54547	124.80
60	-2.11162	51.55332	79.63	185	-2.23131	51.54591	124.13
61	-2.11239	51.55264	79.01	186	-2.22947	51.54616	123.60
62	-2.11645	51.55268	80.18	187	-2.23141	51.54676	123.28
63	-2.11570	51.55241	80.33	188	-2.23892	51.55232	118.96
64	-2.11505	51.55196	79.47	189	-2.23870	51.55282	117.78
65	-2.11452	51.55168	78.91	190	-2.23807	51.55336	113.80
66	-2.11456	51.55116	78.89	191	-2.23739	51.55320	111.80
67	-2.10541	51.55269	76.80	192	-2.23601	51.55306	108.28
68	-2.10378	51.55068	78.80	193	-2.23678	51.55529	110.01
69	-2.09869	51.54915	94.13	194	-2.23471	51.55550	102.64
70	-2.09865	51.54823	92.09	195	-2.23283	51.55679	101.65
71	-2.09643	51.54804	94.79	196	-2.23238	51.55734	99.68
72	-2.09512	51.54864	96.00	197	-2.23226	51.55816	100.80
73	-2.09453	51.54935	95.90	198	-2.23224	51.55892	100.80
74	-2.09149	51.55036	92.73	199	-2.22163	51.55209	121.80
75	-2.09017	51.55027	93.80	200	-2.21018	51.55544	117.10
76	-2.09076	51.55113	86.31	201	-2.20163	51.55345	111.99

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
77	-2.08610	51.54556	69.95	202	-2.18450	51.55603	103.86
78	-2.08520	51.54392	83.99	203	-2.19012	51.55632	108.80
79	-2.08583	51.54347	84.97	204	-2.18759	51.55793	105.80
80	-2.08695	51.54285	86.97	205	-2.18828	51.55940	105.80
81	-2.08368	51.54201	88.76	206	-2.18904	51.56041	106.80
82	-2.09738	51.54651	80.87	207	-2.19085	51.56140	108.46
83	-2.09309	51.54331	69.40	208	-2.18855	51.56231	105.24
84	-2.09340	51.54286	71.17	209	-2.20279	51.56643	115.71
85	-2.09305	51.54164	82.05	210	-2.20279	51.56643	115.71
86	-2.09515	51.54127	79.86	211	-2.20331	51.56704	114.15
87	-2.09599	51.54029	88.52	212	-2.21481	51.56171	122.61
88	-2.09651	51.53986	92.23	213	-2.21329	51.56360	122.80
89	-2.08316	51.53768	87.55	214	-2.21171	51.56793	114.20
90	-2.08137	51.53992	91.60	215	-2.21096	51.56814	112.26
91	-2.08120	51.53948	89.61	216	-2.21100	51.56855	107.55
92	-2.08091	51.53908	87.07	217	-2.21105	51.56928	97.81
93	-2.08004	51.53859	84.77	218	-2.21013	51.56951	98.96
94	-2.08064	51.53828	84.94	219	-2.20866	51.56939	100.85
95	-2.08043	51.53768	83.17	220	-2.20946	51.56967	97.93
96	-2.08030	51.53719	82.10	221	-2.21063	51.57024	99.62
97	-2.08002	51.53630	80.80	222	-2.21066	51.57049	101.64

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
98	-2.07892	51.53567	80.25	223	-2.21020	51.57091	110.31
99	-2.07958	51.53463	79.80	224	-2.20966	51.57100	111.97
100	-2.08010	51.53398	79.54	225	-2.20973	51.57132	111.93
101	-2.08034	51.53247	78.18	226	-2.20940	51.57176	113.68
102	-2.07970	51.52805	73.80	227	-2.20875	51.57195	114.09
103	-2.08218	51.52737	71.80	228	-2.20809	51.57221	114.67
104	-2.07909	51.52638	72.80	229	-2.20719	51.57253	113.80
105	-2.08014	51.52605	72.80	230	-2.20749	51.57280	113.22
106	-2.08014	51.52605	72.80	231	-2.20839	51.57362	113.80
107	-2.08003	51.52549	72.66	232	-2.20931	51.57416	114.80
108	-2.08115	51.52539	72.03	233	-2.20964	51.57450	115.41
109	-2.08132	51.52495	71.80	234	-2.21003	51.57496	115.80
110	-2.09481	51.52289	75.33	235	-2.20935	51.57509	114.80
111	-2.09709	51.52986	93.80	236	-2.20879	51.57533	114.71
112	-2.09926	51.53007	92.91	237	-2.20828	51.57573	113.97
113	-2.10010	51.52969	92.80	238	-2.20753	51.57548	113.45
114	-2.10322	51.52992	91.80	239	-2.20758	51.57497	114.61
115	-2.11217	51.52489	86.33	240	-2.20649	51.57456	112.80
116	-2.11699	51.52550	82.76	241	-2.20270	51.57075	96.14
117	-2.11815	51.52654	84.75	242	-2.20245	51.57109	94.63
118	-2.11886	51.52687	85.80	243	-2.20370	51.57242	104.62

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
119	-2.11861	51.52747	85.03	244	-2.20306	51.57330	102.52
120	-2.11948	51.52731	86.80	245	-2.20299	51.57416	105.02
121	-2.12039	51.52768	87.80	246	-2.20123	51.57829	103.57
122	-2.12084	51.52750	87.80	247	-2.19864	51.57763	102.60
123	-2.12086	51.52682	88.80	248	-2.19420	51.57928	101.08
124	-2.12157	51.52657	89.80	249	-2.18248	51.54382	111.80
125	-2.12216	51.52670	90.29				

Dwelling receptor data

Railway Receptor Data

The railway receptor data is presented in the table below. An additional 2.75m height has been added to the elevation to account for the eye-level of a train operator.

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
1	-2.22779	51.54001	126.75	48	-2.15630	51.54528	97.83
2	-2.22648	51.54039	126.75	49	-2.15487	51.54513	95.46
3	-2.22524	51.54075	127.30	50	-2.15345	51.54498	93.36
4	-2.21910	51.54253	126.75	51	-2.15202	51.54483	90.48
5	-2.21777	51.54289	125.75	52	-2.15060	51.54467	86.25
6	-2.21642	51.54320	124.75	53	-2.14917	51.54451	87.48
7	-2.21504	51.54348	123.58	54	-2.14775	51.54434	87.91
8	-2.21365	51.54372	122.15	55	-2.14633	51.54418	88.33
9	-2.21223	51.54391	121.01	56	-2.14490	51.54402	88.73

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
10	-2.21080	51.54404	120.75	57	-2.14348	51.54386	87.94
11	-2.20936	51.54414	119.94	58	-2.14205	51.54371	88.37
12	-2.20792	51.54421	119.75	59	-2.14063	51.54356	88.70
13	-2.20647	51.54425	119.30	60	-2.13920	51.54340	88.75
14	-2.20503	51.54428	117.39	61	-2.13778	51.54325	89.75
15	-2.20358	51.54432	114.62	62	-2.13635	51.54310	90.75
16	-2.20214	51.54437	113.15	63	-2.13492	51.54295	90.75
17	-2.20069	51.54443	112.75	64	-2.13350	51.54279	92.75
18	-2.19925	51.54449	112.75	65	-2.13207	51.54264	92.75
19	-2.19781	51.54457	112.75	66	-2.13064	51.54249	92.75
20	-2.19637	51.54466	112.75	67	-2.12922	51.54234	92.75
21	-2.19493	51.54475	112.75	68	-2.12779	51.54218	92.75
22	-2.19349	51.54485	112.75	69	-2.12636	51.54204	91.75
23	-2.19206	51.54497	112.75	70	-2.12493	51.54192	90.75
24	-2.19062	51.54509	112.75	71	-2.12349	51.54183	90.49
25	-2.18919	51.54522	111.75	72	-2.12205	51.54177	90.59
26	-2.18776	51.54536	111.75	73	-2.12060	51.54174	90.89
27	-2.18634	51.54551	111.75	74	-2.11915	51.54174	91.63
28	-2.18491	51.54567	111.56	75	-2.11771	51.54176	92.62
29	-2.18349	51.54583	111.43	76	-2.11626	51.54179	92.75
30	-2.18207	51.54600	111.16	77	-2.11482	51.54188	93.75

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
31	-2.18065	51.54617	109.40	78	-2.11338	51.54198	92.19
32	-2.17922	51.54634	108.56	79	-2.11195	51.54212	91.13
33	-2.17780	51.54649	109.98	80	-2.11053	51.54229	83.71
34	-2.17636	51.54661	113.35	81	-2.10912	51.54248	84.11
35	-2.17492	51.54669	113.50	82	-2.10771	51.54269	91.31
36	-2.17348	51.54673	112.75	83	-2.10632	51.54293	94.74
37	-2.17203	51.54673	110.50	84	-2.10494	51.54319	93.35
38	-2.17059	51.54669	110.33	85	-2.10357	51.54350	88.70
39	-2.16914	51.54662	109.13	86	-2.10222	51.54382	83.40
40	-2.16771	51.54651	108.20	87	-2.10089	51.54416	80.51
41	-2.16628	51.54636	106.95	88	-2.09956	51.54453	77.96
42	-2.16486	51.54620	106.75	89	-2.09827	51.54493	75.70
43	-2.16343	51.54605	104.63	90	-2.09699	51.54536	76.13
44	-2.16201	51.54589	104.69	91	-2.09574	51.54581	79.25
45	-2.16058	51.54573	102.86	92	-2.09450	51.54627	79.84
46	-2.15916	51.54557	102.75	93	-2.09328	51.54676	77.17
47	-2.15773	51.54542	101.75	94	-2.09209	51.54723	76.45

Railway receptor data

Viewpoint Receptor Data

The viewpoint receptor data is presented in the table below. An additional 1.8m height has been added to the elevation to account for the eye-level of an observer.

No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)	No.	Longitude (°)	Latitude (°)	Assessed Height (m amsl)
3	-2.19462	51.57051	109.97	33	-2.22551	51.54372	124.97
4	-2.19577	51.57269	113.69	CNL A	-2.22388	51.54066	126.80
6	-2.20587	51.56704	113.34	CNL C	-2.19608	51.56592	112.80
25	-2.20767	51.53751	125.92	CNL D	-2.15527	51.57880	92.29
26	-2.22668	51.55081	120.86	CNL E	-2.18621	51.57416	100.80
27	-2.20558	51.55115	111.89	CNL G	-2.22046	51.54252	125.80
30	-2.22218	51.55221	121.80	WC1	-2.21365	51.56317	122.80
31	-2.22729	51.55334	122.80				

Viewpoint receptor data

Modelled Reflector Areas

The modelled reflector areas are presented in the tables below and on the following pages.

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-2.19768	51.56483	29	-2.19241	51.56957
2	-2.19716	51.56456	30	-2.19264	51.56969
3	-2.19676	51.56437	31	-2.19435	51.57033
4	-2.19662	51.56452	32	-2.19454	51.57042
5	-2.19648	51.56464	33	-2.19483	51.57038
6	-2.19632	51.56476	34	-2.19493	51.57038
7	-2.19626	51.56474	35	-2.19508	51.57035
8	-2.19585	51.56457	36	-2.19573	51.57019
9	-2.19579	51.56456	37	-2.19613	51.57004

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
10	-2.19572	51.56459	38	-2.19664	51.56981
11	-2.19547	51.56473	39	-2.19710	51.56957
12	-2.19472	51.56506	40	-2.19786	51.56913
13	-2.19370	51.56546	41	-2.19882	51.56864
14	-2.19359	51.56542	42	-2.19956	51.56839
15	-2.19243	51.56589	43	-2.19995	51.56829
16	-2.19213	51.56603	44	-2.20027	51.56817
17	-2.19209	51.56619	45	-2.19990	51.56757
18	-2.19204	51.56630	46	-2.19956	51.56672
19	-2.19217	51.56642	47	-2.19951	51.56652
20	-2.19342	51.56737	48	-2.19943	51.56641
21	-2.19367	51.56755	49	-2.19921	51.56618
22	-2.19348	51.56760	50	-2.19865	51.56576
23	-2.19315	51.56774	51	-2.19818	51.56552
24	-2.19260	51.56800	52	-2.19827	51.56546
25	-2.19215	51.56824	53	-2.19827	51.56541
26	-2.19176	51.56849	54	-2.19802	51.56509
27	-2.19135	51.56879	55	-2.19768	51.56483
28	-2.19156	51.56905			

Panel area (Lime Down A1)

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-2.20583	51.56203	84	-2.19391	51.55649
2	-2.20585	51.56207	85	-2.19385	51.55648
3	-2.20575	51.56209	86	-2.19328	51.55641

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
4	-2.20577	51.56226	87	-2.19304	51.55637
5	-2.20584	51.56243	88	-2.19290	51.55748
6	-2.20584	51.56249	89	-2.19273	51.55880
7	-2.20580	51.56255	90	-2.19263	51.55911
8	-2.20574	51.56259	91	-2.19249	51.55947
9	-2.20569	51.56262	92	-2.19245	51.55966
10	-2.20563	51.56264	93	-2.19245	51.56025
11	-2.20559	51.56264	94	-2.19322	51.56025
12	-2.20527	51.56221	95	-2.19450	51.56030
13	-2.20504	51.56196	96	-2.19469	51.56032
14	-2.20477	51.56169	97	-2.19490	51.56036
15	-2.20453	51.56148	98	-2.19569	51.56025
16	-2.20442	51.56139	99	-2.19625	51.56019
17	-2.20416	51.56122	100	-2.19624	51.56037
18	-2.20392	51.56102	101	-2.19585	51.56316
19	-2.20370	51.56081	102	-2.19660	51.56353
20	-2.20353	51.56063	103	-2.19696	51.56374
21	-2.20323	51.56036	104	-2.19720	51.56394
22	-2.20235	51.55962	105	-2.19788	51.56440
23	-2.20214	51.55943	106	-2.19788	51.56440
24	-2.20201	51.55922	107	-2.19808	51.56450
25	-2.20199	51.55912	108	-2.19839	51.56458
26	-2.20185	51.55889	109	-2.19933	51.56472
27	-2.20182	51.55878	110	-2.20052	51.56494

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
28	-2.20184	51.55855	111	-2.20088	51.56503
29	-2.20192	51.55827	112	-2.20119	51.56514
30	-2.20174	51.55815	113	-2.20155	51.56534
31	-2.20162	51.55802	114	-2.20177	51.56549
32	-2.20155	51.55790	115	-2.20222	51.56590
33	-2.20148	51.55782	116	-2.20243	51.56581
34	-2.20135	51.55770	117	-2.20261	51.56596
35	-2.20133	51.55767	118	-2.20318	51.56582
36	-2.20133	51.55764	119	-2.20319	51.56580
37	-2.20140	51.55765	120	-2.20317	51.56579
38	-2.20179	51.55763	121	-2.20313	51.56568
39	-2.20214	51.55762	122	-2.20311	51.56563
40	-2.20224	51.55755	123	-2.20310	51.56561
41	-2.20255	51.55757	124	-2.20303	51.56559
42	-2.20279	51.55757	125	-2.20251	51.56464
43	-2.20333	51.55760	126	-2.20204	51.56373
44	-2.20326	51.55731	127	-2.20197	51.56364
45	-2.20316	51.55709	128	-2.20262	51.56335
46	-2.20297	51.55669	129	-2.20307	51.56321
47	-2.20286	51.55642	130	-2.20401	51.56285
48	-2.20271	51.55616	131	-2.20411	51.56280
49	-2.20263	51.55619	132	-2.20420	51.56276
50	-2.20246	51.55622	133	-2.20456	51.56313
51	-2.20238	51.55623	134	-2.20457	51.56315

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
52	-2.20176	51.55576	135	-2.20466	51.56311
53	-2.20169	51.55572	136	-2.20490	51.56393
54	-2.20162	51.55559	137	-2.20495	51.56431
55	-2.20160	51.55554	138	-2.20502	51.56463
56	-2.20161	51.55548	139	-2.20519	51.56520
57	-2.20160	51.55534	140	-2.20553	51.56647
58	-2.20109	51.55531	141	-2.20559	51.56660
59	-2.20084	51.55533	142	-2.20577	51.56690
60	-2.20074	51.55534	143	-2.20589	51.56704
61	-2.20071	51.55534	144	-2.20597	51.56704
62	-2.20061	51.55531	145	-2.20602	51.56714
63	-2.20047	51.55528	146	-2.20699	51.56701
64	-2.20040	51.55527	147	-2.20698	51.56695
65	-2.20008	51.55523	148	-2.20737	51.56691
66	-2.19796	51.55491	149	-2.20771	51.56686
67	-2.19793	51.55493	150	-2.20825	51.56679
68	-2.19788	51.55495	151	-2.20845	51.56676
69	-2.19784	51.55495	152	-2.20845	51.56674
70	-2.19775	51.55494	153	-2.20819	51.56636
71	-2.19769	51.55493	154	-2.20761	51.56557
72	-2.19762	51.55492	155	-2.20721	51.56502
73	-2.19755	51.55493	156	-2.20695	51.56455
74	-2.19754	51.55494	157	-2.20733	51.56451
75	-2.19717	51.55529	158	-2.20766	51.56447

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
76	-2.19709	51.55535	159	-2.20799	51.56441
77	-2.19708	51.55541	160	-2.20830	51.56433
78	-2.19708	51.55623	161	-2.20791	51.56311
79	-2.19695	51.55670	162	-2.20776	51.56274
80	-2.19628	51.55666	163	-2.20723	51.56170
81	-2.19496	51.55661	164	-2.20713	51.56172
82	-2.19475	51.55658	165	-2.20699	51.56178
83	-2.19443	51.55655	166	-2.20583	51.56203

Panel Area (Lime Down A2)

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-2.17877	51.56508	127	-2.16601	51.56167
2	-2.17912	51.56478	128	-2.16602	51.56169
3	-2.18032	51.56360	129	-2.16602	51.56172
4	-2.18065	51.56321	130	-2.16599	51.56174
5	-2.18127	51.56260	131	-2.16597	51.56176
6	-2.18141	51.56242	132	-2.16593	51.56177
7	-2.18198	51.56182	133	-2.16592	51.56179
8	-2.18354	51.56039	134	-2.16586	51.56181
9	-2.18420	51.55973	135	-2.16580	51.56181
10	-2.18456	51.55935	136	-2.16577	51.56181
11	-2.18588	51.55813	137	-2.16574	51.56180
12	-2.18601	51.55799	138	-2.16572	51.56178
13	-2.18621	51.55778	139	-2.16570	51.56178
14	-2.18645	51.55759	140	-2.16566	51.56178

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
15	-2.18649	51.55753	141	-2.16564	51.56179
16	-2.18643	51.55750	142	-2.16564	51.56181
17	-2.18632	51.55746	143	-2.16566	51.56182
18	-2.18609	51.55736	144	-2.16568	51.56183
19	-2.18555	51.55701	145	-2.16569	51.56185
20	-2.18540	51.55693	146	-2.16568	51.56188
21	-2.18517	51.55682	147	-2.16566	51.56189
22	-2.18481	51.55658	148	-2.16556	51.56193
23	-2.18469	51.55652	149	-2.16524	51.56207
24	-2.18416	51.55609	150	-2.16522	51.56208
25	-2.18405	51.55599	151	-2.16518	51.56208
26	-2.18391	51.55590	152	-2.16516	51.56207
27	-2.18367	51.55576	153	-2.15998	51.56156
28	-2.18360	51.55570	154	-2.15995	51.56162
29	-2.18356	51.55569	155	-2.15980	51.56159
30	-2.18331	51.55578	156	-2.15975	51.56157
31	-2.18316	51.55585	157	-2.15938	51.56174
32	-2.18303	51.55590	158	-2.15921	51.56185
33	-2.18290	51.55596	159	-2.15910	51.56194
34	-2.18283	51.55601	160	-2.15873	51.56234
35	-2.18279	51.55603	161	-2.15852	51.56247
36	-2.18274	51.55604	162	-2.15823	51.56260
37	-2.18268	51.55606	163	-2.15784	51.56282
38	-2.18264	51.55609	164	-2.15744	51.56307

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
39	-2.18261	51.55610	165	-2.15754	51.56311
40	-2.18258	51.55611	166	-2.15779	51.56326
41	-2.18253	51.55613	167	-2.15798	51.56344
42	-2.18250	51.55612	168	-2.15811	51.56361
43	-2.18244	51.55612	169	-2.15820	51.56377
44	-2.18242	51.55613	170	-2.15832	51.56399
45	-2.18240	51.55614	171	-2.15839	51.56414
46	-2.18237	51.55614	172	-2.15848	51.56429
47	-2.18225	51.55627	173	-2.15857	51.56448
48	-2.18221	51.55631	174	-2.15865	51.56510
49	-2.18213	51.55634	175	-2.15879	51.56579
50	-2.18196	51.55632	176	-2.15876	51.56581
51	-2.18187	51.55647	177	-2.15750	51.56587
52	-2.18180	51.55650	178	-2.15179	51.56605
53	-2.18162	51.55658	179	-2.15142	51.56620
54	-2.18106	51.55689	180	-2.15140	51.56625
55	-2.18061	51.55718	181	-2.15142	51.56639
56	-2.18051	51.55723	182	-2.15153	51.56680
57	-2.18023	51.55734	183	-2.15204	51.56771
58	-2.17977	51.55750	184	-2.15209	51.56784
59	-2.18002	51.55768	185	-2.15226	51.56812
60	-2.18101	51.55860	186	-2.15231	51.56818
61	-2.18156	51.55899	187	-2.15253	51.56853
62	-2.17853	51.56037	188	-2.15272	51.56892

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
63	-2.17870	51.56061	189	-2.15283	51.56893
64	-2.17878	51.56081	190	-2.15298	51.56893
65	-2.17886	51.56113	191	-2.15311	51.56894
66	-2.17889	51.56143	192	-2.15329	51.56897
67	-2.17897	51.56172	193	-2.15353	51.56906
68	-2.17913	51.56215	194	-2.15403	51.56942
69	-2.17928	51.56230	195	-2.15489	51.57030
70	-2.17864	51.56245	196	-2.15500	51.57032
71	-2.17830	51.56256	197	-2.15581	51.57034
72	-2.17829	51.56261	198	-2.15603	51.57032
73	-2.17828	51.56268	199	-2.15615	51.57030
74	-2.17837	51.56311	200	-2.15626	51.57030
75	-2.17834	51.56313	201	-2.15671	51.57040
76	-2.17815	51.56316	202	-2.15721	51.57060
77	-2.17752	51.56323	203	-2.15907	51.56760
78	-2.17710	51.56330	204	-2.16026	51.56538
79	-2.17533	51.56367	205	-2.16302	51.56494
80	-2.17544	51.56384	206	-2.16312	51.56522
81	-2.17553	51.56384	207	-2.16575	51.56470
82	-2.17558	51.56379	208	-2.16623	51.56525
83	-2.17563	51.56379	209	-2.16623	51.56525
84	-2.17565	51.56381	210	-2.16740	51.56640
85	-2.17566	51.56392	211	-2.16751	51.56654
86	-2.17562	51.56397	212	-2.16778	51.56684

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
87	-2.17524	51.56412	213	-2.16721	51.56719
88	-2.17510	51.56395	214	-2.16727	51.56729
89	-2.17499	51.56375	215	-2.16727	51.56743
90	-2.17470	51.56381	216	-2.16721	51.56750
91	-2.17444	51.56388	217	-2.16718	51.56755
92	-2.17401	51.56401	218	-2.16719	51.56761
93	-2.17370	51.56413	219	-2.16715	51.56763
94	-2.17265	51.56458	220	-2.16745	51.56791
95	-2.17219	51.56478	221	-2.16860	51.56924
96	-2.17201	51.56485	222	-2.16901	51.56915
97	-2.17116	51.56509	223	-2.16941	51.56906
98	-2.17093	51.56513	224	-2.16952	51.56902
99	-2.17085	51.56514	225	-2.16920	51.56947
100	-2.17073	51.56518	226	-2.16908	51.56951
101	-2.17045	51.56487	227	-2.16985	51.57183
102	-2.17011	51.56460	228	-2.17028	51.57182
103	-2.16959	51.56408	229	-2.17034	51.57184
104	-2.16932	51.56376	230	-2.17064	51.57175
105	-2.16932	51.56376	231	-2.17106	51.57150
106	-2.16860	51.56296	232	-2.17137	51.57135
107	-2.16843	51.56282	233	-2.17182	51.57112
108	-2.16754	51.56197	234	-2.17183	51.57108
109	-2.16722	51.56166	235	-2.17188	51.57103
110	-2.16708	51.56148	236	-2.17194	51.57101

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
111	-2.16696	51.56132	237	-2.17220	51.57091
112	-2.16687	51.56114	238	-2.17227	51.57081
113	-2.16668	51.56122	239	-2.17247	51.57051
114	-2.16668	51.56125	240	-2.17268	51.57030
115	-2.16667	51.56128	241	-2.17298	51.57006
116	-2.16664	51.56131	242	-2.17332	51.56979
117	-2.16613	51.56155	243	-2.17412	51.56924
118	-2.16611	51.56158	244	-2.17478	51.56866
119	-2.16608	51.56159	245	-2.17481	51.56862
120	-2.16596	51.56159	246	-2.17500	51.56855
121	-2.16593	51.56160	247	-2.17627	51.56735
122	-2.16591	51.56162	248	-2.17718	51.56634
123	-2.16590	51.56164	249	-2.17739	51.56615
124	-2.16593	51.56165	250	-2.17808	51.56557
125	-2.16595	51.56165	251	-2.17877	51.56508
126	-2.16598	51.56165			

Panel Area (Lime Down B)

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-2.18662	51.55738	228	-2.17918	51.54205
2	-2.18697	51.55702	229	-2.17908	51.54206
3	-2.18728	51.55675	230	-2.17893	51.54212
4	-2.18785	51.55617	231	-2.17845	51.54227
5	-2.18825	51.55574	232	-2.17759	51.54249
6	-2.18846	51.55545	233	-2.17716	51.54259

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
7	-2.18852	51.55539	234	-2.17690	51.54267
8	-2.18863	51.55528	235	-2.17687	51.54268
9	-2.18863	51.55525	236	-2.17685	51.54267
10	-2.18859	51.55523	237	-2.17676	51.54255
11	-2.18823	51.55505	238	-2.17668	51.54247
12	-2.18798	51.55491	239	-2.17662	51.54246
13	-2.18767	51.55472	240	-2.17650	51.54251
14	-2.18738	51.55452	241	-2.17616	51.54264
15	-2.18724	51.55441	242	-2.17594	51.54275
16	-2.18714	51.55431	243	-2.17570	51.54288
17	-2.18708	51.55424	244	-2.17549	51.54301
18	-2.18729	51.55418	245	-2.17543	51.54306
19	-2.18739	51.55417	246	-2.17522	51.54316
20	-2.18748	51.55419	247	-2.17463	51.54341
21	-2.18758	51.55419	248	-2.17443	51.54350
22	-2.18784	51.55416	249	-2.17425	51.54360
23	-2.18813	51.55408	250	-2.17440	51.54371
24	-2.18833	51.55404	251	-2.17322	51.54432
25	-2.18868	51.55400	252	-2.17431	51.54510
26	-2.18891	51.55396	253	-2.17443	51.54521
27	-2.18915	51.55391	254	-2.17503	51.54562
28	-2.18924	51.55389	255	-2.17536	51.54579
29	-2.18936	51.55387	256	-2.17579	51.54598
30	-2.18944	51.55387	257	-2.17601	51.54607

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
31	-2.18949	51.55388	258	-2.17636	51.54577
32	-2.18954	51.55389	259	-2.17650	51.54566
33	-2.18960	51.55392	260	-2.17679	51.54599
34	-2.18967	51.55395	261	-2.17710	51.54632
35	-2.18971	51.55397	262	-2.17721	51.54631
36	-2.18976	51.55401	263	-2.17734	51.54626
37	-2.18980	51.55405	264	-2.18000	51.54604
38	-2.18996	51.55393	265	-2.18168	51.54592
39	-2.19015	51.55375	266	-2.18329	51.54576
40	-2.19021	51.55366	267	-2.18348	51.54574
41	-2.19038	51.55348	268	-2.18360	51.54573
42	-2.19095	51.55379	269	-2.18401	51.54569
43	-2.19101	51.55380	270	-2.18473	51.54559
44	-2.19192	51.55375	271	-2.18473	51.54560
45	-2.19219	51.55374	272	-2.18614	51.54544
46	-2.19470	51.55354	273	-2.18980	51.54505
47	-2.19498	51.55350	274	-2.19102	51.54490
48	-2.19607	51.55343	275	-2.19212	51.54480
49	-2.19614	51.55370	276	-2.19717	51.54446
50	-2.19625	51.55366	277	-2.20068	51.54428
51	-2.19674	51.55350	278	-2.20520	51.54406
52	-2.19711	51.55334	279	-2.20726	51.54402
53	-2.19730	51.55323	280	-2.20734	51.54327
54	-2.19739	51.55318	281	-2.20715	51.54328

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
55	-2.19812	51.55293	282	-2.20651	51.54337
56	-2.19876	51.55275	283	-2.20647	51.54331
57	-2.19913	51.55256	284	-2.20596	51.54346
58	-2.19957	51.55221	285	-2.20551	51.54336
59	-2.20002	51.55189	286	-2.20595	51.54277
60	-2.20054	51.55173	287	-2.20656	51.54262
61	-2.20080	51.55168	288	-2.20721	51.54255
62	-2.20154	51.55149	289	-2.20790	51.54243
63	-2.20159	51.55149	290	-2.20809	51.54314
64	-2.20162	51.55154	291	-2.20826	51.54314
65	-2.20167	51.55166	292	-2.20828	51.54321
66	-2.20166	51.55179	293	-2.21050	51.54326
67	-2.20214	51.55225	294	-2.21073	51.54214
68	-2.20252	51.55264	295	-2.21075	51.54213
69	-2.20258	51.55269	296	-2.21133	51.54236
70	-2.20267	51.55275	297	-2.21198	51.54254
71	-2.20267	51.55276	298	-2.21206	51.54258
72	-2.20282	51.55276	299	-2.21209	51.54264
73	-2.20288	51.55277	300	-2.21208	51.54267
74	-2.20360	51.55293	301	-2.21160	51.54331
75	-2.20424	51.55306	302	-2.21138	51.54357
76	-2.20447	51.55310	303	-2.21113	51.54352
77	-2.20465	51.55313	304	-2.21089	51.54344
78	-2.20492	51.55315	305	-2.21048	51.54333

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
79	-2.20576	51.55318	306	-2.20943	51.54332
80	-2.20622	51.55319	307	-2.20824	51.54328
81	-2.20644	51.55321	308	-2.20819	51.54326
82	-2.20677	51.55325	309	-2.20817	51.54324
83	-2.20678	51.55319	310	-2.20816	51.54321
84	-2.20678	51.55314	311	-2.20809	51.54321
85	-2.20664	51.55311	312	-2.20778	51.54323
86	-2.20611	51.55233	313	-2.20778	51.54323
87	-2.20562	51.55151	314	-2.20743	51.54326
88	-2.20554	51.55132	315	-2.20735	51.54401
89	-2.20552	51.55124	316	-2.20792	51.54400
90	-2.20549	51.55123	317	-2.20883	51.54396
91	-2.20548	51.55119	318	-2.20913	51.54396
92	-2.20584	51.55117	319	-2.20950	51.54393
93	-2.20617	51.55122	320	-2.21042	51.54385
94	-2.20715	51.55134	321	-2.21136	51.54376
95	-2.20884	51.55157	322	-2.21208	51.54368
96	-2.20913	51.55163	323	-2.21310	51.54354
97	-2.20931	51.55164	324	-2.21405	51.54339
98	-2.20983	51.55173	325	-2.21492	51.54323
99	-2.20999	51.55174	326	-2.21600	51.54298
100	-2.21004	51.55174	327	-2.21761	51.54258
101	-2.21051	51.55167	328	-2.21824	51.54242
102	-2.21113	51.55160	329	-2.21915	51.54216

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
103	-2.21149	51.55155	330	-2.21929	51.54222
104	-2.21151	51.55151	331	-2.21954	51.54255
105	-2.21168	51.55151	332	-2.21968	51.54252
106	-2.21168	51.55151	333	-2.21980	51.54266
107	-2.21182	51.55146	334	-2.21838	51.54307
108	-2.21285	51.55133	335	-2.21660	51.54345
109	-2.21391	51.55123	336	-2.21478	51.54379
110	-2.21441	51.55116	337	-2.21254	51.54411
111	-2.21447	51.55116	338	-2.20994	51.54435
112	-2.21450	51.55119	339	-2.20889	51.54440
113	-2.21456	51.55127	340	-2.20502	51.54449
114	-2.21459	51.55130	341	-2.20004	51.54463
115	-2.21466	51.55129	342	-2.19985	51.54482
116	-2.21482	51.55125	343	-2.19953	51.54507
117	-2.21555	51.55114	344	-2.19771	51.54683
118	-2.21587	51.55112	345	-2.19702	51.54749
119	-2.21712	51.55107	346	-2.19653	51.54799
120	-2.21761	51.55106	347	-2.19634	51.54817
121	-2.21797	51.55108	348	-2.19619	51.54829
122	-2.21975	51.55100	349	-2.19600	51.54842
123	-2.22190	51.55093	350	-2.19596	51.54848
124	-2.22281	51.55088	351	-2.19580	51.54861
125	-2.22587	51.55082	352	-2.19586	51.54864
126	-2.22636	51.55080	353	-2.19591	51.54865

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
127	-2.22650	51.55077	354	-2.19594	51.54868
128	-2.22656	51.55074	355	-2.19595	51.54871
129	-2.22675	51.55036	356	-2.19590	51.54877
130	-2.22687	51.54996	357	-2.19573	51.54898
131	-2.22691	51.54971	358	-2.19567	51.54901
132	-2.22693	51.54938	359	-2.19558	51.54901
133	-2.22703	51.54895	360	-2.19555	51.54899
134	-2.22705	51.54874	361	-2.19554	51.54897
135	-2.22700	51.54832	362	-2.19554	51.54895
136	-2.22696	51.54828	363	-2.19532	51.54890
137	-2.22701	51.54738	364	-2.19544	51.54873
138	-2.22705	51.54706	365	-2.19552	51.54863
139	-2.22703	51.54691	366	-2.19511	51.54852
140	-2.22702	51.54672	367	-2.19485	51.54844
141	-2.22707	51.54655	368	-2.19405	51.54817
142	-2.22704	51.54643	369	-2.19377	51.54810
143	-2.22691	51.54625	370	-2.19365	51.54808
144	-2.22430	51.54439	371	-2.19338	51.54806
145	-2.22302	51.54426	372	-2.19318	51.54805
146	-2.22336	51.54363	373	-2.19303	51.54806
147	-2.22322	51.54349	374	-2.19281	51.54811
148	-2.22300	51.54336	375	-2.19219	51.54830
149	-2.22180	51.54293	376	-2.19202	51.54834
150	-2.22055	51.54253	377	-2.19188	51.54837

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
151	-2.22047	51.54250	378	-2.19175	51.54839
152	-2.21937	51.54218	379	-2.19169	51.54838
153	-2.21915	51.54211	380	-2.19166	51.54837
154	-2.21859	51.54189	381	-2.19163	51.54838
155	-2.21767	51.54148	382	-2.19161	51.54838
156	-2.21750	51.54138	383	-2.19159	51.54850
157	-2.21659	51.54092	384	-2.19127	51.54979
158	-2.21626	51.54076	385	-2.18912	51.54962
159	-2.21526	51.54037	386	-2.18852	51.54956
160	-2.21457	51.54015	387	-2.18846	51.54965
161	-2.21292	51.53968	388	-2.18837	51.55005
162	-2.21139	51.53917	389	-2.18826	51.55085
163	-2.21059	51.53894	390	-2.18825	51.55124
164	-2.21002	51.53874	391	-2.18829	51.55126
165	-2.20954	51.53856	392	-2.18827	51.55128
166	-2.20925	51.53842	393	-2.18823	51.55131
167	-2.20886	51.53820	394	-2.18787	51.55186
168	-2.20832	51.53786	395	-2.18768	51.55213
169	-2.20809	51.53774	396	-2.18764	51.55227
170	-2.20752	51.53750	397	-2.18749	51.55261
171	-2.20740	51.53758	398	-2.18737	51.55280
172	-2.20728	51.53765	399	-2.18725	51.55298
173	-2.20698	51.53791	400	-2.18700	51.55323
174	-2.20617	51.53866	401	-2.18703	51.55325

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
175	-2.20607	51.53878	402	-2.18709	51.55327
176	-2.20549	51.53936	403	-2.18713	51.55328
177	-2.20510	51.53978	404	-2.18715	51.55329
178	-2.20360	51.54116	405	-2.18714	51.55333
179	-2.20319	51.54157	406	-2.18713	51.55335
180	-2.19610	51.54111	407	-2.18709	51.55338
181	-2.19539	51.54132	408	-2.18706	51.55338
182	-2.19487	51.54146	409	-2.18704	51.55337
183	-2.19364	51.54175	410	-2.18702	51.55334
184	-2.19366	51.54177	411	-2.18695	51.55334
185	-2.19350	51.54188	412	-2.18692	51.55335
186	-2.19347	51.54187	413	-2.18683	51.55347
187	-2.19338	51.54188	414	-2.18668	51.55353
188	-2.19303	51.54190	415	-2.18667	51.55342
189	-2.19284	51.54188	416	-2.18658	51.55302
190	-2.19252	51.54184	417	-2.18658	51.55302
191	-2.19212	51.54178	418	-2.18646	51.55264
192	-2.19207	51.54183	419	-2.18627	51.55218
193	-2.19200	51.54182	420	-2.18624	51.55217
194	-2.19194	51.54187	421	-2.18591	51.55221
195	-2.19188	51.54182	422	-2.18574	51.55223
196	-2.19165	51.54178	423	-2.18550	51.55225
197	-2.19141	51.54177	424	-2.18526	51.55228
198	-2.19126	51.54177	425	-2.18377	51.55232

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
199	-2.19111	51.54180	426	-2.18371	51.55233
200	-2.19102	51.54184	427	-2.18266	51.55261
201	-2.19094	51.54185	428	-2.18242	51.55273
202	-2.19078	51.54185	429	-2.18228	51.55281
203	-2.19067	51.54182	430	-2.18195	51.55296
204	-2.19068	51.54178	431	-2.18156	51.55318
205	-2.18881	51.54209	432	-2.18155	51.55319
206	-2.18787	51.54232	433	-2.18161	51.55324
207	-2.18793	51.54248	434	-2.18177	51.55336
208	-2.18779	51.54252	435	-2.18193	51.55353
209	-2.18779	51.54252	436	-2.18209	51.55379
210	-2.18761	51.54256	437	-2.18225	51.55403
211	-2.18735	51.54259	438	-2.18232	51.55409
212	-2.18676	51.54268	439	-2.18241	51.55428
213	-2.18618	51.54280	440	-2.18305	51.55516
214	-2.18588	51.54287	441	-2.18324	51.55537
215	-2.18519	51.54307	442	-2.18349	51.55558
216	-2.18466	51.54321	443	-2.18469	51.55509
217	-2.18391	51.54338	444	-2.18555	51.55588
218	-2.18461	51.54446	445	-2.18557	51.55592
219	-2.18118	51.54510	446	-2.18549	51.55600
220	-2.18009	51.54361	447	-2.18520	51.55616
221	-2.18141	51.54324	448	-2.18501	51.55621
222	-2.18136	51.54318	449	-2.18467	51.55639

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
223	-2.18141	51.54315	450	-2.18512	51.55670
224	-2.18084	51.54225	451	-2.18563	51.55698
225	-2.18056	51.54175	452	-2.18624	51.55734
226	-2.18052	51.54164	453	-2.18655	51.55747
227	-2.18022	51.54173	454	-2.18662	51.55738

Panel Area (Lime Down C)

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-2.16924	51.54739	14	-2.15492	51.55349
2	-2.16760	51.54808	15	-2.15583	51.55421
3	-2.16595	51.54657	16	-2.15636	51.55449
4	-2.15839	51.54573	17	-2.15648	51.55449
5	-2.15367	51.54721	18	-2.15790	51.55388
6	-2.15171	51.54807	19	-2.15915	51.55394
7	-2.15205	51.54849	20	-2.16097	51.55322
8	-2.15261	51.54922	21	-2.16481	51.55517
9	-2.15278	51.54953	22	-2.17167	51.54993
10	-2.15293	51.54994	23	-2.17367	51.54922
11	-2.15314	51.55081	24	-2.17103	51.54736
12	-2.15380	51.55219	25	-2.16924	51.54739
13	-2.15423	51.55264			

Panel Area (Lime Down D1)

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-2.15190	51.54855	225	-2.12645	51.55112
2	-2.15190	51.54865	226	-2.12550	51.55133
3	-2.15188	51.54870	227	-2.12576	51.55181

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
4	-2.15184	51.54876	228	-2.12510	51.55189
5	-2.15152	51.54889	229	-2.12493	51.55192
6	-2.15079	51.54913	230	-2.12450	51.55202
7	-2.15039	51.54924	231	-2.12432	51.55207
8	-2.15018	51.54929	232	-2.12398	51.55212
9	-2.14872	51.54957	233	-2.12396	51.55214
10	-2.14875	51.54964	234	-2.12396	51.55224
11	-2.14804	51.54982	235	-2.12394	51.55224
12	-2.14766	51.54984	236	-2.12394	51.55240
13	-2.14734	51.54981	237	-2.12385	51.55280
14	-2.14697	51.54977	238	-2.12378	51.55294
15	-2.14673	51.54970	239	-2.12383	51.55297
16	-2.14630	51.54954	240	-2.12383	51.55304
17	-2.14612	51.54949	241	-2.12381	51.55310
18	-2.14604	51.54947	242	-2.12385	51.55313
19	-2.14582	51.54944	243	-2.12389	51.55314
20	-2.14553	51.54942	244	-2.12392	51.55313
21	-2.14512	51.54939	245	-2.12401	51.55308
22	-2.14472	51.54938	246	-2.12405	51.55307
23	-2.14411	51.54954	247	-2.12415	51.55305
24	-2.14413	51.54960	248	-2.12420	51.55304
25	-2.14418	51.54965	249	-2.12427	51.55301
26	-2.14430	51.54978	250	-2.12431	51.55300
27	-2.14442	51.54993	251	-2.12434	51.55300

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
28	-2.14435	51.55046	252	-2.12438	51.55300
29	-2.14432	51.55046	253	-2.12442	51.55302
30	-2.14415	51.55040	254	-2.12444	51.55303
31	-2.14391	51.55030	255	-2.12444	51.55305
32	-2.14331	51.54995	256	-2.12441	51.55310
33	-2.14325	51.54993	257	-2.12439	51.55312
34	-2.14318	51.54987	258	-2.12425	51.55316
35	-2.14297	51.54970	259	-2.12427	51.55319
36	-2.14288	51.54964	260	-2.12435	51.55325
37	-2.14272	51.54954	261	-2.12441	51.55329
38	-2.14216	51.54965	262	-2.12442	51.55331
39	-2.14175	51.54974	263	-2.12443	51.55334
40	-2.14137	51.54983	264	-2.12443	51.55339
41	-2.14105	51.54991	265	-2.12450	51.55350
42	-2.14075	51.54998	266	-2.12453	51.55353
43	-2.14067	51.54999	267	-2.12471	51.55347
44	-2.14053	51.54997	268	-2.12487	51.55342
45	-2.14027	51.55002	269	-2.12504	51.55341
46	-2.13972	51.55012	270	-2.12510	51.55346
47	-2.13929	51.55021	271	-2.12503	51.55352
48	-2.13851	51.55035	272	-2.12491	51.55356
49	-2.13789	51.55050	273	-2.12487	51.55361
50	-2.13752	51.55059	274	-2.12487	51.55364
51	-2.13715	51.55059	275	-2.12491	51.55366

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
52	-2.13643	51.55077	276	-2.12509	51.55361
53	-2.13558	51.55097	277	-2.12513	51.55362
54	-2.13548	51.55102	278	-2.12521	51.55370
55	-2.13535	51.55107	279	-2.12536	51.55372
56	-2.13490	51.55121	280	-2.12538	51.55375
57	-2.13475	51.55124	281	-2.12538	51.55380
58	-2.13455	51.55107	282	-2.12535	51.55386
59	-2.13454	51.55105	283	-2.12529	51.55390
60	-2.13454	51.55104	284	-2.12522	51.55391
61	-2.13457	51.55101	285	-2.12528	51.55401
62	-2.13465	51.55097	286	-2.12530	51.55402
63	-2.13468	51.55093	287	-2.12538	51.55403
64	-2.13470	51.55091	288	-2.12550	51.55407
65	-2.13471	51.55088	289	-2.12552	51.55406
66	-2.13471	51.55084	290	-2.12555	51.55403
67	-2.13468	51.55070	291	-2.12555	51.55402
68	-2.13466	51.55062	292	-2.12552	51.55397
69	-2.13468	51.55060	293	-2.12551	51.55397
70	-2.13471	51.55058	294	-2.12553	51.55394
71	-2.13474	51.55057	295	-2.12559	51.55391
72	-2.13477	51.55057	296	-2.12570	51.55390
73	-2.13480	51.55057	297	-2.12572	51.55391
74	-2.13486	51.55058	298	-2.12574	51.55392
75	-2.13500	51.55059	299	-2.12581	51.55401

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
76	-2.13501	51.55059	300	-2.12581	51.55403
77	-2.13502	51.55057	301	-2.12578	51.55410
78	-2.13503	51.55056	302	-2.12578	51.55411
79	-2.13502	51.55054	303	-2.12580	51.55412
80	-2.13492	51.55044	304	-2.12585	51.55413
81	-2.13492	51.55043	305	-2.12594	51.55416
82	-2.13493	51.55041	306	-2.12602	51.55424
83	-2.13509	51.55033	307	-2.12633	51.55415
84	-2.13512	51.55032	308	-2.12637	51.55415
85	-2.13514	51.55032	309	-2.12639	51.55416
86	-2.13515	51.55032	310	-2.12647	51.55423
87	-2.13517	51.55033	311	-2.12659	51.55431
88	-2.13526	51.55040	312	-2.12663	51.55434
89	-2.13529	51.55041	313	-2.12670	51.55436
90	-2.13533	51.55041	314	-2.12670	51.55436
91	-2.13544	51.55039	315	-2.12674	51.55436
92	-2.13548	51.55039	316	-2.12677	51.55436
93	-2.13559	51.55038	317	-2.12681	51.55433
94	-2.13561	51.55037	318	-2.12681	51.55432
95	-2.13563	51.55036	319	-2.12680	51.55431
96	-2.13565	51.55033	320	-2.12672	51.55426
97	-2.13565	51.55026	321	-2.12669	51.55420
98	-2.13565	51.55025	322	-2.12669	51.55417
99	-2.13566	51.55025	323	-2.12671	51.55415

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
100	-2.13568	51.55025	324	-2.12675	51.55412
101	-2.13570	51.55026	325	-2.12678	51.55412
102	-2.13575	51.55030	326	-2.12681	51.55412
103	-2.13578	51.55030	327	-2.12687	51.55415
104	-2.13588	51.55032	328	-2.12689	51.55416
105	-2.13593	51.55033	329	-2.12690	51.55416
106	-2.13593	51.55033	330	-2.12693	51.55413
107	-2.13597	51.55033	331	-2.12695	51.55412
108	-2.13603	51.55033	332	-2.12705	51.55409
109	-2.13612	51.55032	333	-2.12706	51.55408
110	-2.13619	51.55030	334	-2.12706	51.55407
111	-2.13645	51.55019	335	-2.12706	51.55402
112	-2.13652	51.55015	336	-2.12708	51.55400
113	-2.13658	51.55012	337	-2.12709	51.55399
114	-2.13669	51.55008	338	-2.12712	51.55398
115	-2.13673	51.55006	339	-2.12720	51.55399
116	-2.13674	51.55004	340	-2.12729	51.55398
117	-2.13673	51.55002	341	-2.12756	51.55404
118	-2.13668	51.54994	342	-2.12759	51.55404
119	-2.13668	51.54992	343	-2.12762	51.55404
120	-2.13669	51.54991	344	-2.12771	51.55399
121	-2.13675	51.54989	345	-2.12778	51.55396
122	-2.13677	51.54987	346	-2.12790	51.55395
123	-2.13682	51.54982	347	-2.12815	51.55393

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
124	-2.13685	51.54980	348	-2.12822	51.55393
125	-2.13687	51.54979	349	-2.12824	51.55393
126	-2.13700	51.54975	350	-2.12824	51.55393
127	-2.13711	51.54973	351	-2.12823	51.55390
128	-2.13714	51.54973	352	-2.12823	51.55388
129	-2.13726	51.54975	353	-2.12823	51.55386
130	-2.13732	51.54975	354	-2.12825	51.55385
131	-2.13734	51.54974	355	-2.12835	51.55382
132	-2.13736	51.54974	356	-2.12849	51.55379
133	-2.13738	51.54972	357	-2.12854	51.55378
134	-2.13742	51.54968	358	-2.12857	51.55379
135	-2.13749	51.54959	359	-2.12859	51.55380
136	-2.13755	51.54953	360	-2.12861	51.55383
137	-2.13757	51.54951	361	-2.12864	51.55387
138	-2.13760	51.54949	362	-2.12867	51.55388
139	-2.13767	51.54944	363	-2.12869	51.55389
140	-2.13771	51.54943	364	-2.12879	51.55388
141	-2.13791	51.54942	365	-2.12880	51.55388
142	-2.13794	51.54943	366	-2.12885	51.55396
143	-2.13797	51.54941	367	-2.12888	51.55400
144	-2.13798	51.54941	368	-2.12897	51.55411
145	-2.13810	51.54950	369	-2.12902	51.55424
146	-2.13812	51.54950	370	-2.12912	51.55424
147	-2.13829	51.54948	371	-2.12948	51.55422

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
148	-2.13845	51.54947	372	-2.13026	51.55413
149	-2.13886	51.54937	373	-2.13041	51.55412
150	-2.13910	51.54930	374	-2.13049	51.55413
151	-2.13923	51.54927	375	-2.13057	51.55414
152	-2.13935	51.54923	376	-2.13067	51.55417
153	-2.13941	51.54922	377	-2.13079	51.55424
154	-2.13945	51.54922	378	-2.13090	51.55428
155	-2.13952	51.54923	379	-2.13100	51.55430
156	-2.13978	51.54931	380	-2.13107	51.55430
157	-2.13985	51.54931	381	-2.13111	51.55429
158	-2.13990	51.54929	382	-2.13122	51.55427
159	-2.13993	51.54928	383	-2.13150	51.55434
160	-2.13996	51.54926	384	-2.13159	51.55433
161	-2.13998	51.54924	385	-2.13211	51.55421
162	-2.13999	51.54921	386	-2.13283	51.55399
163	-2.14002	51.54909	387	-2.13311	51.55393
164	-2.14004	51.54907	388	-2.13499	51.55366
165	-2.14007	51.54905	389	-2.13520	51.55363
166	-2.14009	51.54904	390	-2.13536	51.55358
167	-2.14011	51.54904	391	-2.13554	51.55352
168	-2.14013	51.54904	392	-2.13557	51.55358
169	-2.14018	51.54905	393	-2.13586	51.55353
170	-2.14025	51.54906	394	-2.13692	51.55355
171	-2.14026	51.54906	395	-2.13774	51.55359

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
172	-2.14027	51.54905	396	-2.13851	51.55360
173	-2.14028	51.54901	397	-2.13910	51.55354
174	-2.14030	51.54898	398	-2.13928	51.55358
175	-2.14034	51.54894	399	-2.13933	51.55377
176	-2.14027	51.54882	400	-2.13931	51.55389
177	-2.14005	51.54837	401	-2.13942	51.55415
178	-2.14002	51.54811	402	-2.13956	51.55438
179	-2.13999	51.54768	403	-2.13963	51.55444
180	-2.13987	51.54717	404	-2.13968	51.55447
181	-2.13978	51.54691	405	-2.13987	51.55454
182	-2.13947	51.54637	406	-2.14039	51.55471
183	-2.13947	51.54634	407	-2.14088	51.55513
184	-2.13951	51.54628	408	-2.14189	51.55520
185	-2.14035	51.54601	409	-2.14270	51.55518
186	-2.14008	51.54534	410	-2.14287	51.55518
187	-2.13940	51.54557	411	-2.14305	51.55520
188	-2.13920	51.54566	412	-2.14404	51.55531
189	-2.13898	51.54576	413	-2.14459	51.55532
190	-2.13878	51.54587	414	-2.14496	51.55526
191	-2.13875	51.54590	415	-2.14504	51.55525
192	-2.13881	51.54603	416	-2.14514	51.55525
193	-2.13878	51.54617	417	-2.14514	51.55525
194	-2.13880	51.54625	418	-2.14525	51.55526
195	-2.13882	51.54631	419	-2.14593	51.55539

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
196	-2.13883	51.54636	420	-2.14667	51.55553
197	-2.13882	51.54638	421	-2.14689	51.55560
198	-2.13874	51.54648	422	-2.14720	51.55568
199	-2.13873	51.54650	423	-2.14733	51.55572
200	-2.13870	51.54652	424	-2.14754	51.55584
201	-2.13866	51.54652	425	-2.14774	51.55589
202	-2.13859	51.54653	426	-2.14774	51.55588
203	-2.13839	51.54624	427	-2.14810	51.55559
204	-2.13837	51.54623	428	-2.14825	51.55545
205	-2.13827	51.54630	429	-2.14842	51.55519
206	-2.13796	51.54649	430	-2.14891	51.55494
207	-2.13769	51.54663	431	-2.14924	51.55483
208	-2.13686	51.54696	432	-2.14927	51.55479
209	-2.13599	51.54737	433	-2.15017	51.55447
210	-2.13599	51.54737	434	-2.15050	51.55437
211	-2.13405	51.54835	435	-2.15167	51.55395
212	-2.13398	51.54829	436	-2.15229	51.55360
213	-2.13317	51.54743	437	-2.15247	51.55345
214	-2.13329	51.54737	438	-2.15261	51.55326
215	-2.13252	51.54656	439	-2.15271	51.55317
216	-2.13139	51.54723	440	-2.15281	51.55311
217	-2.13136	51.54723	441	-2.15369	51.55278
218	-2.13115	51.54736	442	-2.15398	51.55272

Panel Area (Lime Down D2)

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-2.10424	51.54360	77	-2.10706	51.54774
2	-2.10351	51.54369	78	-2.10735	51.54768
3	-2.10327	51.54374	79	-2.10753	51.54762
4	-2.10318	51.54379	80	-2.10757	51.54761
5	-2.10230	51.54396	81	-2.10760	51.54760
6	-2.10202	51.54402	82	-2.10764	51.54760
7	-2.10162	51.54413	83	-2.10776	51.54758
8	-2.09976	51.54472	84	-2.10785	51.54755
9	-2.10001	51.54490	85	-2.10795	51.54750
10	-2.10002	51.54496	86	-2.10802	51.54747
11	-2.09997	51.54502	87	-2.10811	51.54746
12	-2.09970	51.54516	88	-2.10826	51.54742
13	-2.09941	51.54529	89	-2.10850	51.54739
14	-2.09903	51.54544	90	-2.10877	51.54731
15	-2.09883	51.54550	91	-2.10904	51.54720
16	-2.09879	51.54551	92	-2.10910	51.54717
17	-2.09881	51.54560	93	-2.10945	51.54692
18	-2.09887	51.54559	94	-2.10984	51.54658
19	-2.09893	51.54561	95	-2.11010	51.54638
20	-2.09903	51.54567	96	-2.11013	51.54633
21	-2.09935	51.54596	97	-2.11021	51.54623
22	-2.09946	51.54604	98	-2.11060	51.54587
23	-2.09954	51.54611	99	-2.11064	51.54583
24	-2.09989	51.54642	100	-2.11068	51.54582

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
25	-2.09994	51.54649	101	-2.11089	51.54567
26	-2.09995	51.54649	102	-2.11106	51.54553
27	-2.09997	51.54650	103	-2.11127	51.54534
28	-2.10024	51.54667	104	-2.11136	51.54525
29	-2.10041	51.54677	105	-2.11190	51.54478
30	-2.10060	51.54690	106	-2.11190	51.54478
31	-2.10066	51.54694	107	-2.11191	51.54469
32	-2.10091	51.54680	108	-2.11184	51.54467
33	-2.10095	51.54677	109	-2.11150	51.54455
34	-2.10100	51.54675	110	-2.11128	51.54446
35	-2.10103	51.54674	111	-2.11129	51.54440
36	-2.10112	51.54672	112	-2.11132	51.54435
37	-2.10122	51.54670	113	-2.11146	51.54426
38	-2.10131	51.54667	114	-2.11160	51.54416
39	-2.10135	51.54666	115	-2.11170	51.54405
40	-2.10145	51.54662	116	-2.11197	51.54377
41	-2.10155	51.54659	117	-2.11211	51.54357
42	-2.10183	51.54649	118	-2.11218	51.54350
43	-2.10207	51.54638	119	-2.11232	51.54339
44	-2.10228	51.54626	120	-2.11258	51.54315
45	-2.10234	51.54622	121	-2.11275	51.54303
46	-2.10241	51.54616	122	-2.11310	51.54270
47	-2.10247	51.54609	123	-2.11280	51.54242
48	-2.10259	51.54599	124	-2.11275	51.54239

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
49	-2.10265	51.54593	125	-2.11233	51.54243
50	-2.10267	51.54591	126	-2.11196	51.54244
51	-2.10289	51.54581	127	-2.11189	51.54245
52	-2.10288	51.54593	128	-2.11185	51.54245
53	-2.10290	51.54626	129	-2.11181	51.54245
54	-2.10301	51.54636	130	-2.11121	51.54248
55	-2.10297	51.54638	131	-2.11058	51.54250
56	-2.10286	51.54641	132	-2.11056	51.54250
57	-2.10282	51.54645	133	-2.11055	51.54249
58	-2.10285	51.54647	134	-2.10922	51.54266
59	-2.10393	51.54752	135	-2.10845	51.54275
60	-2.10414	51.54743	136	-2.10831	51.54277
61	-2.10468	51.54719	137	-2.10825	51.54279
62	-2.10471	51.54719	138	-2.10813	51.54283
63	-2.10496	51.54741	139	-2.10764	51.54301
64	-2.10536	51.54773	140	-2.10792	51.54308
65	-2.10559	51.54793	141	-2.10821	51.54316
66	-2.10579	51.54791	142	-2.10849	51.54326
67	-2.10587	51.54789	143	-2.10836	51.54340
68	-2.10601	51.54786	144	-2.10886	51.54358
69	-2.10628	51.54788	145	-2.10773	51.54412
70	-2.10631	51.54786	146	-2.10692	51.54449
71	-2.10632	51.54785	147	-2.10628	51.54479
72	-2.10650	51.54780	148	-2.10575	51.54445

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
73	-2.10655	51.54779	149	-2.10459	51.54370
74	-2.10665	51.54778	150	-2.10437	51.54360
75	-2.10680	51.54778	151	-2.10424	51.54360
76	-2.10698	51.54775			

Panel Area (Lime Down E1)

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-2.10234	51.53319	201	-2.11385	51.53575
2	-2.10231	51.53272	202	-2.11419	51.53597
3	-2.10215	51.53196	203	-2.11276	51.53640
4	-2.10194	51.53200	204	-2.11224	51.53663
5	-2.10153	51.53205	205	-2.11174	51.53687
6	-2.10068	51.53222	206	-2.11116	51.53717
7	-2.10045	51.53227	207	-2.11089	51.53732
8	-2.10013	51.53232	208	-2.11067	51.53741
9	-2.09983	51.53234	209	-2.11017	51.53768
10	-2.09957	51.53234	210	-2.11017	51.53768
11	-2.09920	51.53230	211	-2.10993	51.53780
12	-2.09828	51.53231	212	-2.10933	51.53821
13	-2.09768	51.53229	213	-2.10876	51.53864
14	-2.09664	51.53216	214	-2.10778	51.53944
15	-2.09604	51.53210	215	-2.10728	51.53990
16	-2.09575	51.53207	216	-2.10725	51.53998
17	-2.09564	51.53206	217	-2.10724	51.54010
18	-2.09557	51.53205	218	-2.10714	51.54007

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
19	-2.09547	51.53203	219	-2.10666	51.54070
20	-2.09539	51.53203	220	-2.10648	51.54085
21	-2.09535	51.53202	221	-2.10627	51.54096
22	-2.09529	51.53200	222	-2.10602	51.54105
23	-2.09504	51.53192	223	-2.10486	51.54130
24	-2.09445	51.53176	224	-2.10523	51.54166
25	-2.09410	51.53167	225	-2.10526	51.54165
26	-2.09370	51.53159	226	-2.10529	51.54164
27	-2.09357	51.53157	227	-2.10531	51.54164
28	-2.09342	51.53158	228	-2.10526	51.54170
29	-2.09264	51.53163	229	-2.10553	51.54194
30	-2.09205	51.53160	230	-2.10490	51.54217
31	-2.09166	51.53160	231	-2.10474	51.54221
32	-2.09157	51.53160	232	-2.10445	51.54225
33	-2.09147	51.53160	233	-2.10434	51.54225
34	-2.09109	51.53158	234	-2.10424	51.54241
35	-2.09045	51.53151	235	-2.10419	51.54250
36	-2.09026	51.53154	236	-2.10412	51.54258
37	-2.09005	51.53155	237	-2.10401	51.54272
38	-2.08968	51.53157	238	-2.10403	51.54274
39	-2.08952	51.53160	239	-2.10351	51.54340
40	-2.08940	51.53163	240	-2.10493	51.54299
41	-2.08954	51.53189	241	-2.10516	51.54292
42	-2.08959	51.53195	242	-2.10589	51.54273

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
43	-2.08981	51.53210	243	-2.10637	51.54263
44	-2.08997	51.53217	244	-2.10790	51.54257
45	-2.09013	51.53227	245	-2.10871	51.54225
46	-2.09023	51.53239	246	-2.10891	51.54225
47	-2.09034	51.53255	247	-2.10962	51.54216
48	-2.09048	51.53268	248	-2.10967	51.54215
49	-2.09053	51.53275	249	-2.10975	51.54211
50	-2.09064	51.53281	250	-2.10984	51.54210
51	-2.09085	51.53293	251	-2.10997	51.54201
52	-2.09099	51.53305	252	-2.10997	51.54195
53	-2.09105	51.53308	253	-2.11017	51.54176
54	-2.09111	51.53312	254	-2.11037	51.54160
55	-2.09135	51.53339	255	-2.11042	51.54153
56	-2.09146	51.53351	256	-2.11052	51.54147
57	-2.09178	51.53378	257	-2.11065	51.54141
58	-2.09185	51.53388	258	-2.11051	51.54133
59	-2.09198	51.53397	259	-2.11039	51.54128
60	-2.09213	51.53407	260	-2.11000	51.54112
61	-2.09219	51.53413	261	-2.10853	51.54057
62	-2.09234	51.53423	262	-2.10851	51.54059
63	-2.09265	51.53454	263	-2.10848	51.54056
64	-2.09286	51.53468	264	-2.10853	51.54051
65	-2.09324	51.53492	265	-2.10940	51.53989
66	-2.09338	51.53500	266	-2.10994	51.53954

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
67	-2.09352	51.53505	267	-2.11054	51.53922
68	-2.09368	51.53514	268	-2.11117	51.53890
69	-2.09392	51.53523	269	-2.11110	51.53883
70	-2.09410	51.53533	270	-2.11116	51.53879
71	-2.09425	51.53543	271	-2.11117	51.53875
72	-2.09433	51.53548	272	-2.11122	51.53871
73	-2.09439	51.53556	273	-2.11126	51.53872
74	-2.09449	51.53562	274	-2.11139	51.53881
75	-2.09462	51.53571	275	-2.11250	51.53844
76	-2.09480	51.53589	276	-2.11309	51.53820
77	-2.09486	51.53600	277	-2.11376	51.53861
78	-2.09493	51.53617	278	-2.11406	51.53879
79	-2.09499	51.53627	279	-2.11497	51.53944
80	-2.09514	51.53624	280	-2.11532	51.53960
81	-2.09515	51.53632	281	-2.11544	51.53919
82	-2.09520	51.53642	282	-2.11563	51.53892
83	-2.09536	51.53668	283	-2.11578	51.53873
84	-2.09549	51.53689	284	-2.11585	51.53864
85	-2.09559	51.53715	285	-2.11588	51.53856
86	-2.09572	51.53732	286	-2.11626	51.53817
87	-2.09585	51.53753	287	-2.11655	51.53790
88	-2.09598	51.53766	288	-2.11640	51.53782
89	-2.09618	51.53791	289	-2.11664	51.53747
90	-2.09646	51.53822	290	-2.11684	51.53719

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
91	-2.09670	51.53853	291	-2.11698	51.53704
92	-2.09674	51.53861	292	-2.11703	51.53696
93	-2.09700	51.53902	293	-2.11708	51.53692
94	-2.09701	51.53908	294	-2.11721	51.53685
95	-2.09699	51.53911	295	-2.11718	51.53679
96	-2.09711	51.53921	296	-2.11714	51.53673
97	-2.09713	51.53915	297	-2.11700	51.53660
98	-2.09718	51.53912	298	-2.11684	51.53646
99	-2.09893	51.53862	299	-2.11675	51.53639
100	-2.09968	51.53845	300	-2.11677	51.53638
101	-2.09983	51.53845	301	-2.11701	51.53636
102	-2.09999	51.53841	302	-2.11705	51.53636
103	-2.10042	51.53835	303	-2.11712	51.53633
104	-2.10055	51.53832	304	-2.11717	51.53629
105	-2.10071	51.53832	305	-2.11721	51.53627
106	-2.10071	51.53832	306	-2.11730	51.53625
107	-2.10086	51.53833	307	-2.11740	51.53622
108	-2.10093	51.53834	308	-2.11751	51.53621
109	-2.10106	51.53806	309	-2.11753	51.53620
110	-2.10148	51.53724	310	-2.11752	51.53617
111	-2.10149	51.53712	311	-2.11750	51.53614
112	-2.10145	51.53699	312	-2.11748	51.53612
113	-2.10089	51.53638	313	-2.11741	51.53608
114	-2.10082	51.53627	314	-2.11741	51.53608

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
115	-2.10048	51.53555	315	-2.11733	51.53602
116	-2.10071	51.53547	316	-2.11723	51.53591
117	-2.10130	51.53539	317	-2.11725	51.53590
118	-2.10283	51.53526	318	-2.11724	51.53589
119	-2.10549	51.53526	319	-2.11716	51.53585
120	-2.10538	51.53566	320	-2.11674	51.53545
121	-2.10528	51.53634	321	-2.11671	51.53543
122	-2.10513	51.53684	322	-2.11663	51.53535
123	-2.10526	51.53684	323	-2.11621	51.53497
124	-2.10767	51.53626	324	-2.11614	51.53491
125	-2.10802	51.53615	325	-2.11613	51.53488
126	-2.10790	51.53607	326	-2.11583	51.53451
127	-2.10789	51.53602	327	-2.11564	51.53420
128	-2.10804	51.53591	328	-2.11535	51.53356
129	-2.10804	51.53581	329	-2.11524	51.53335
130	-2.10808	51.53577	330	-2.11484	51.53281
131	-2.10819	51.53575	331	-2.11493	51.53269
132	-2.10830	51.53574	332	-2.11475	51.53235
133	-2.10836	51.53572	333	-2.11468	51.53236
134	-2.10836	51.53570	334	-2.11460	51.53234
135	-2.10822	51.53554	335	-2.11452	51.53230
136	-2.10800	51.53534	336	-2.11445	51.53218
137	-2.10794	51.53531	337	-2.11443	51.53218
138	-2.10795	51.53529	338	-2.11440	51.53217

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
139	-2.10798	51.53527	339	-2.11437	51.53215
140	-2.10804	51.53526	340	-2.11438	51.53213
141	-2.10805	51.53524	341	-2.11441	51.53211
142	-2.10803	51.53518	342	-2.11422	51.53178
143	-2.10903	51.53493	343	-2.11426	51.53177
144	-2.10900	51.53515	344	-2.11419	51.53175
145	-2.10897	51.53594	345	-2.11415	51.53172
146	-2.10899	51.53598	346	-2.11416	51.53171
147	-2.10895	51.53600	347	-2.11429	51.53165
148	-2.10908	51.53637	348	-2.11416	51.53153
149	-2.10915	51.53653	349	-2.11413	51.53149
150	-2.10920	51.53661	350	-2.11411	51.53143
151	-2.10926	51.53668	351	-2.11408	51.53139
152	-2.10942	51.53684	352	-2.11372	51.53109
153	-2.10997	51.53719	353	-2.11351	51.53094
154	-2.11003	51.53711	354	-2.11291	51.53129
155	-2.11006	51.53709	355	-2.11261	51.53149
156	-2.11011	51.53708	356	-2.11189	51.53106
157	-2.11020	51.53710	357	-2.11174	51.53098
158	-2.11027	51.53710	358	-2.11158	51.53090
159	-2.11033	51.53707	359	-2.11156	51.53092
160	-2.11037	51.53699	360	-2.11153	51.53094
161	-2.11044	51.53693	361	-2.11132	51.53102
162	-2.11052	51.53689	362	-2.11129	51.53102

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
163	-2.11061	51.53687	363	-2.11116	51.53102
164	-2.11072	51.53688	364	-2.11112	51.53102
165	-2.11078	51.53687	365	-2.11109	51.53102
166	-2.11082	51.53679	366	-2.11107	51.53103
167	-2.11087	51.53676	367	-2.11106	51.53105
168	-2.11098	51.53674	368	-2.11104	51.53115
169	-2.11101	51.53671	369	-2.11105	51.53117
170	-2.11103	51.53667	370	-2.11102	51.53120
171	-2.11111	51.53664	371	-2.11100	51.53123
172	-2.11118	51.53656	372	-2.11095	51.53126
173	-2.11127	51.53652	373	-2.11087	51.53128
174	-2.11130	51.53640	374	-2.11082	51.53130
175	-2.11134	51.53639	375	-2.11074	51.53131
176	-2.11142	51.53639	376	-2.11066	51.53133
177	-2.11153	51.53636	377	-2.11055	51.53138
178	-2.11169	51.53630	378	-2.11023	51.53113
179	-2.11174	51.53629	379	-2.11015	51.53111
180	-2.11191	51.53630	380	-2.10897	51.53021
181	-2.11195	51.53626	381	-2.10868	51.53004
182	-2.11207	51.53620	382	-2.10838	51.52993
183	-2.11215	51.53618	383	-2.10782	51.53031
184	-2.11222	51.53618	384	-2.10758	51.53046
185	-2.11227	51.53616	385	-2.10733	51.53059
186	-2.11231	51.53610	386	-2.10710	51.53069

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
187	-2.11234	51.53608	387	-2.10689	51.53080
188	-2.11249	51.53601	388	-2.10598	51.53158
189	-2.11266	51.53595	389	-2.10591	51.53169
190	-2.11272	51.53594	390	-2.10574	51.53168
191	-2.11284	51.53595	391	-2.10560	51.53230
192	-2.11298	51.53597	392	-2.10543	51.53321
193	-2.11307	51.53600	393	-2.10548	51.53402
194	-2.11319	51.53601	394	-2.10547	51.53407
195	-2.11324	51.53600	395	-2.10431	51.53399
196	-2.11337	51.53594	396	-2.10332	51.53393
197	-2.11347	51.53586	397	-2.10276	51.53391
198	-2.11353	51.53583	398	-2.10231	51.53387
199	-2.11362	51.53580	399	-2.10234	51.53319
200	-2.11368	51.53578			

Panel Area (Lime Down E2)

ANNEX H – DETAILED MODELLING RESULTS

Overview

The Pager Power and Forge charts for receptors are shown on the following pages. Further modelling charts can be provided upon request. Each Pager Power chart shows:

- The receptor (observer) location – top right image. This also shows the azimuth range of the Sun itself at times when reflections are possible. If sunlight is experienced from the same direction as the reflecting panels, the overall impact of the reflection is reduced as discussed within the body of the report;
- The reflection date/time graph – left hand side of image. The blue line indicates the dates and times at which geometric reflections are possible. This relates to reflections from the yellow areas;
- The sunrise and sunset curves throughout the year (red and yellow lines).

The Forge charts for the receptors are shown on the following pages. Each chart shows:

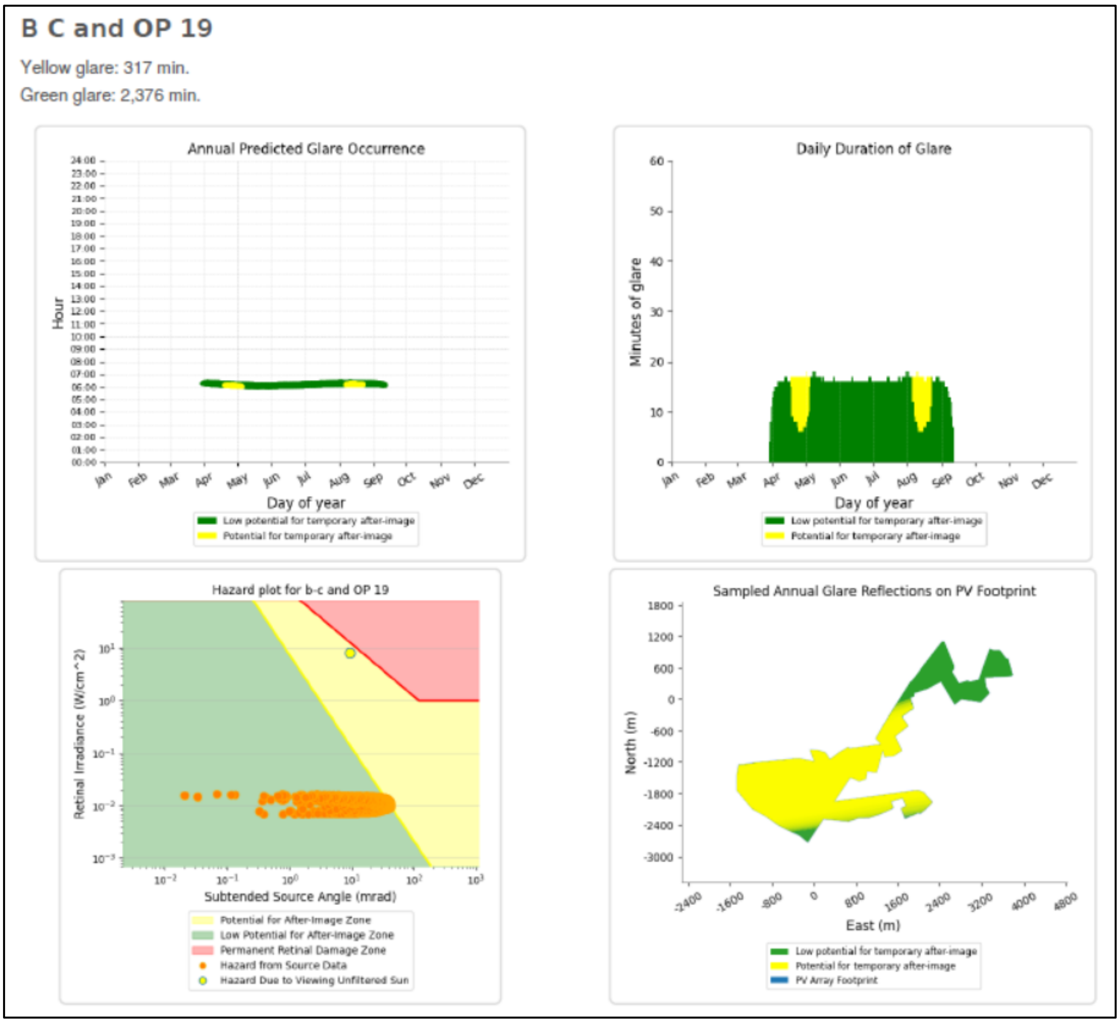
- The annual predicted solar reflections.
- The daily duration of the solar reflections.
- The location of the proposed development where glare will originate.
- The calculated intensity of the predicted solar reflections.

Full modelling results can be provided upon request.

Aviation Receptors

Selected results have been included to show a range of representative results.

Fixed South Facing Panels



Single Axis Tracking Panels

E and OP 38

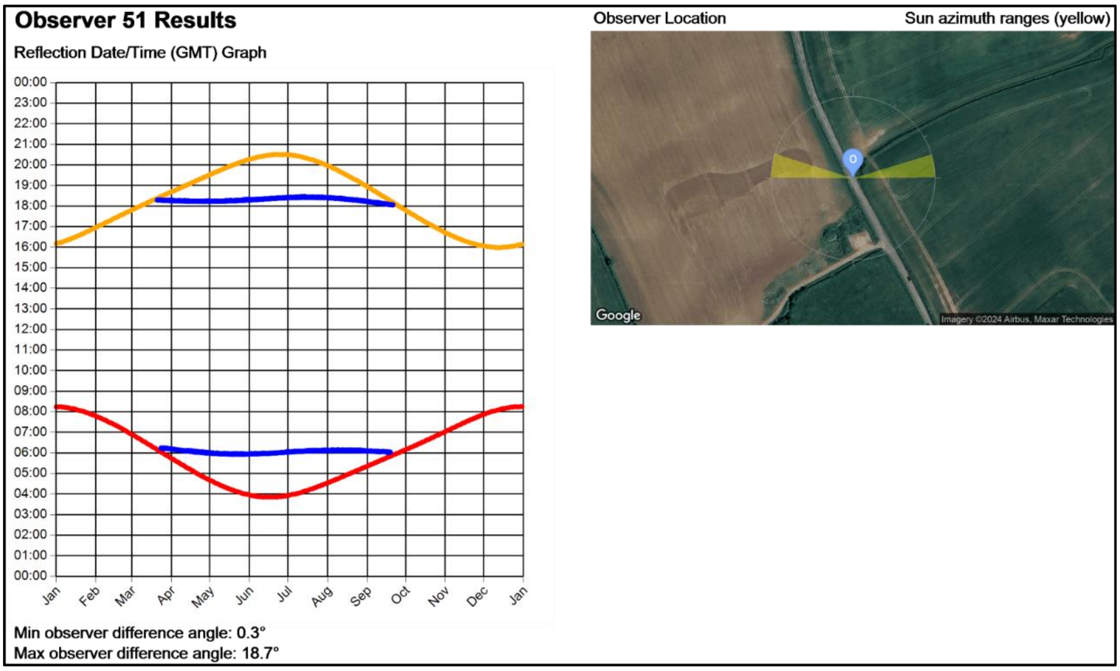
Yellow glare: none

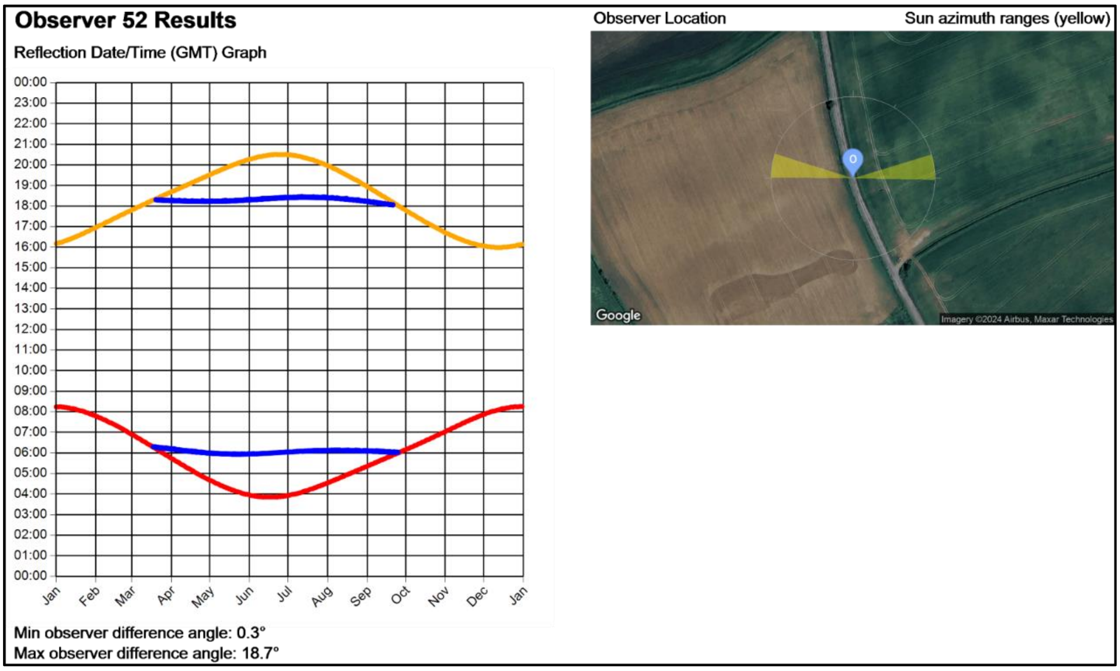
Green glare: 699 min.

Road Receptors

Fixed South Facing Panels

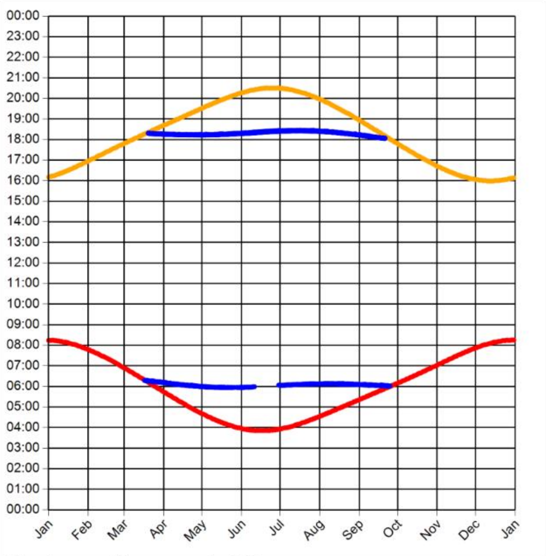
Results have been included where mitigation has been recommended.





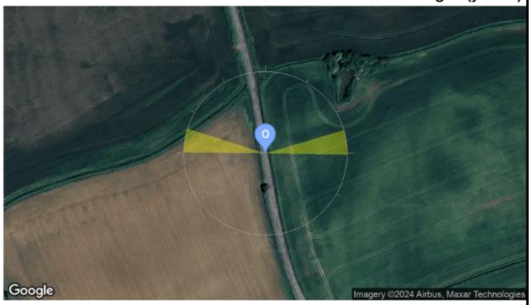
Observer 53 Results

Reflection Date/Time (GMT) Graph



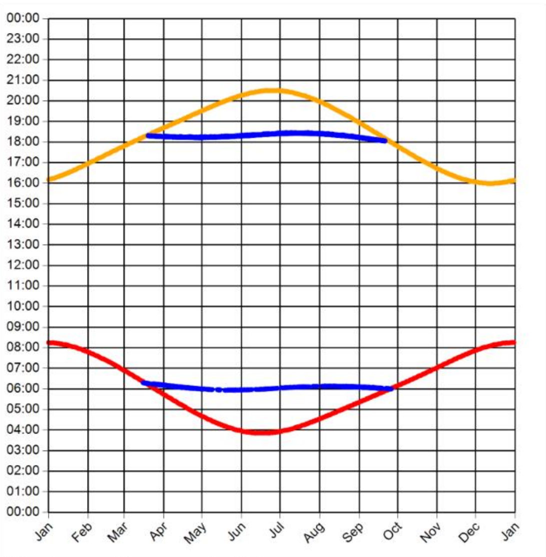
Min observer difference angle: 0.3°
Max observer difference angle: 18.6°

Observer Location — Sun azimuth ranges (yellow)



Observer 54 Results

Reflection Date/Time (GMT) Graph

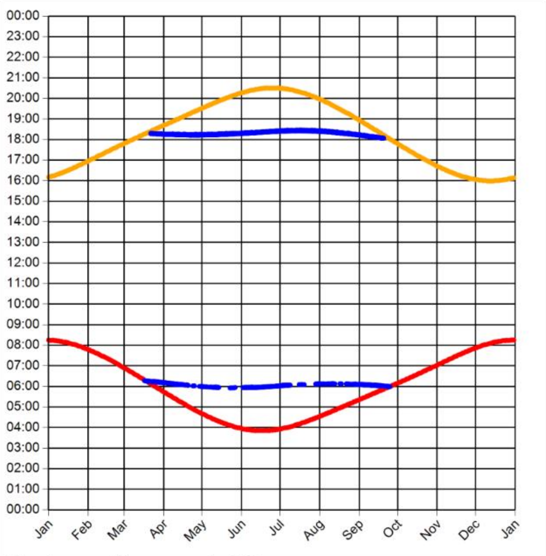


Min observer difference angle: 0.2°
Max observer difference angle: 18.6°

Observer Location — Sun azimuth ranges (yellow)

Observer 55 Results

Reflection Date/Time (GMT) Graph

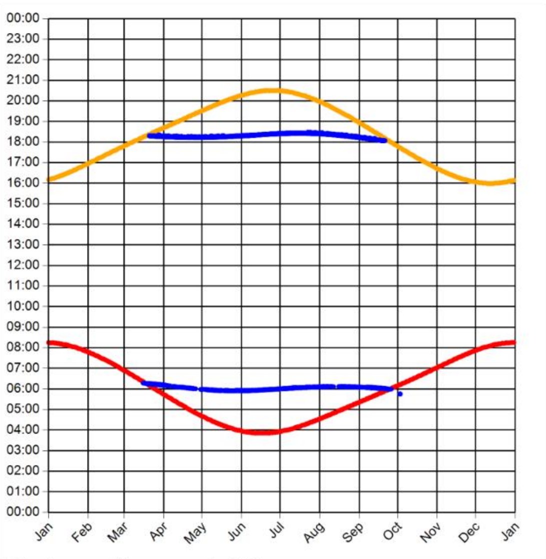


Min observer difference angle: 0.2°
Max observer difference angle: 18.3°

Observer Location | Sun azimuth ranges (yellow)

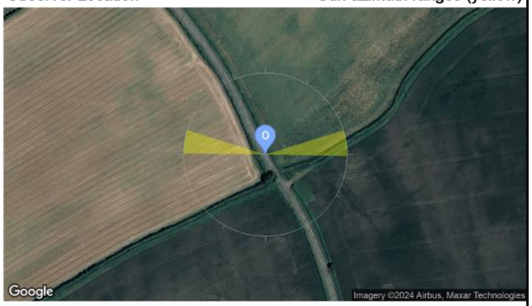
Observer 56 Results

Reflection Date/Time (GMT) Graph



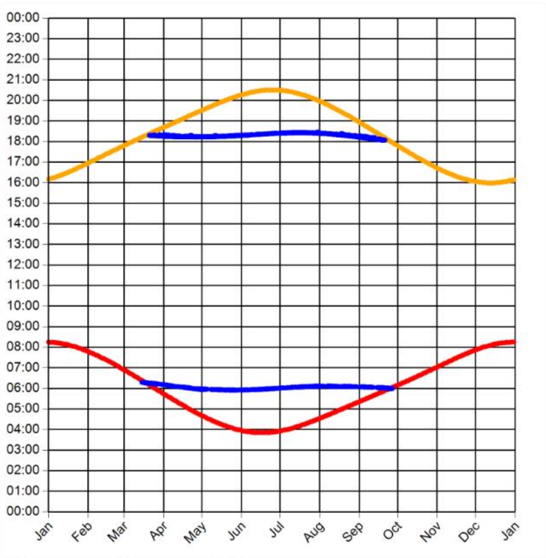
Min observer difference angle: 0.1°
Max observer difference angle: 17.7°

Observer Location | Sun azimuth ranges (yellow)



Observer 57 Results

Reflection Date/Time (GMT) Graph



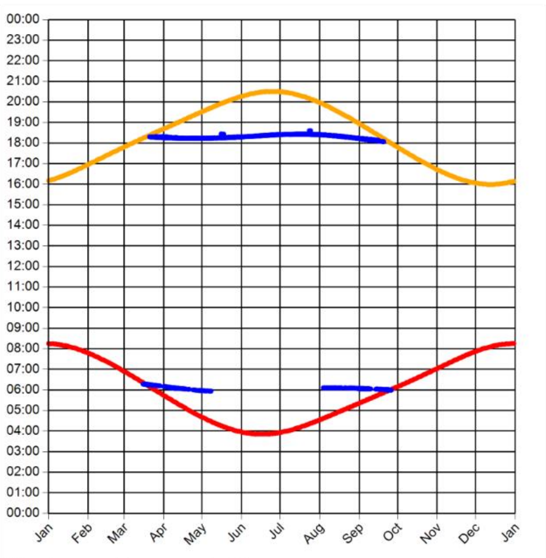
Min observer difference angle: 0°
Max observer difference angle: 17.9°

Observer Location

Sun azimuth ranges (yellow)

Observer 58 Results

Reflection Date/Time (GMT) Graph



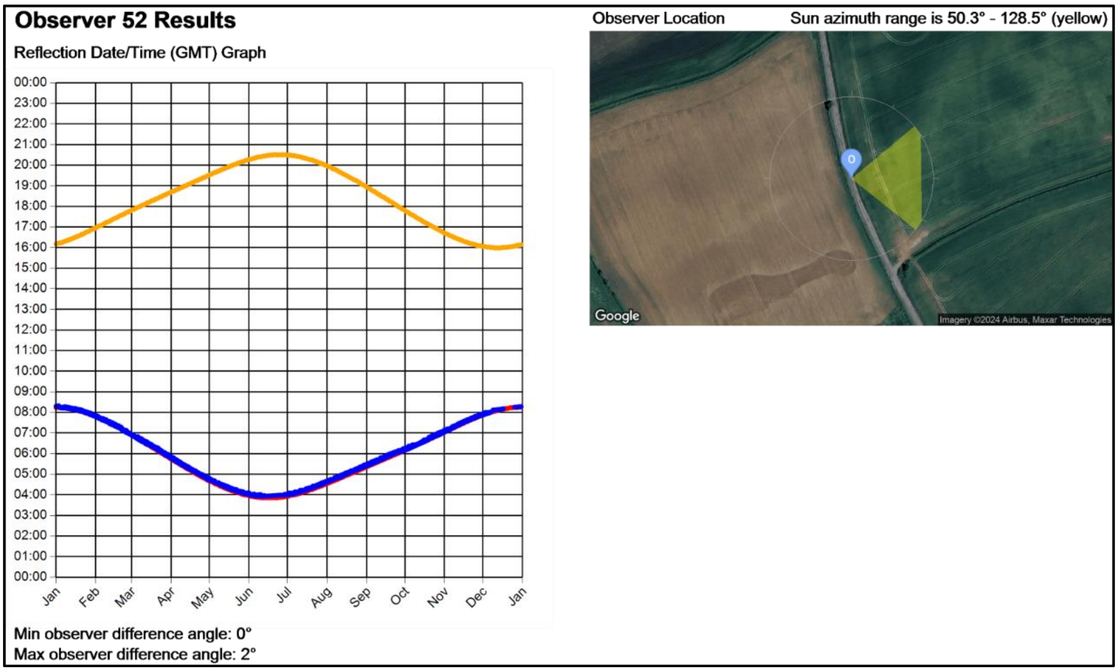
Min observer difference angle: 0°
Max observer difference angle: 17.4°

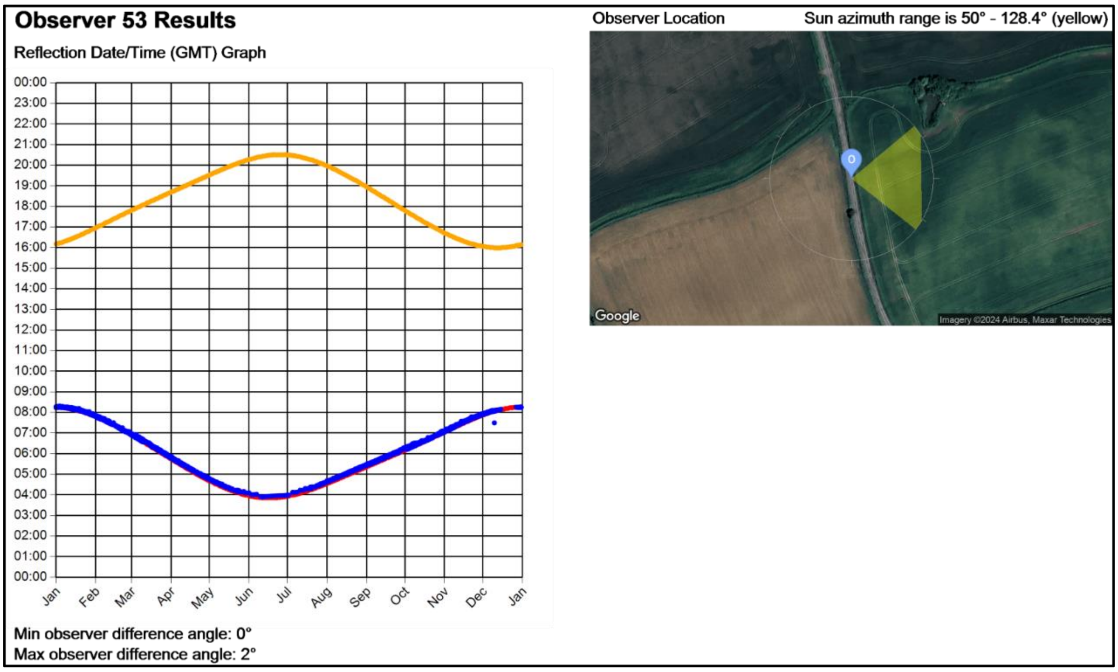
Observer Location

Sun azimuth ranges (yellow)

Single Axis Tracking Panels

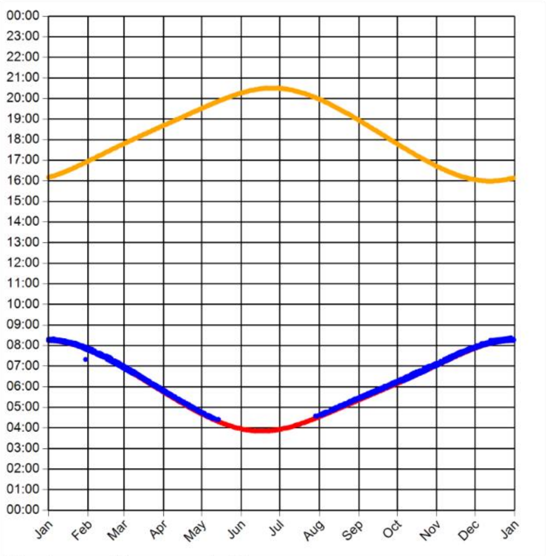
Results have been included where mitigation has been recommended.





Observer 54 Results

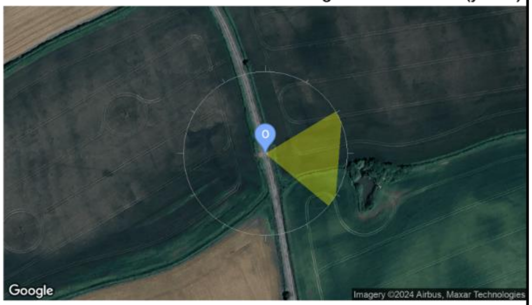
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 1.8°

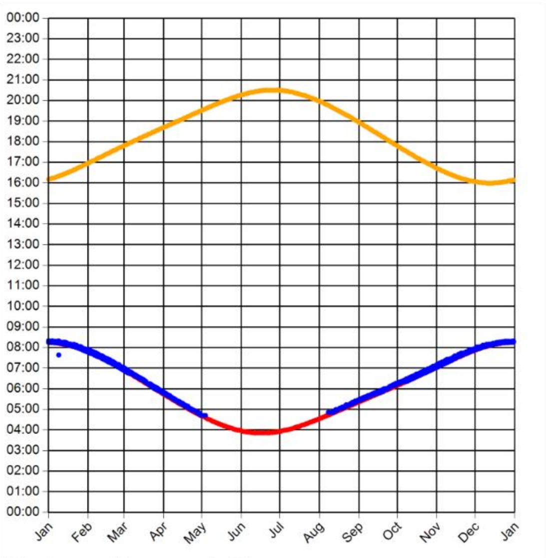
Observer Location

Sun azimuth range is 59.1° - 129.7° (yellow)



Observer 55 Results

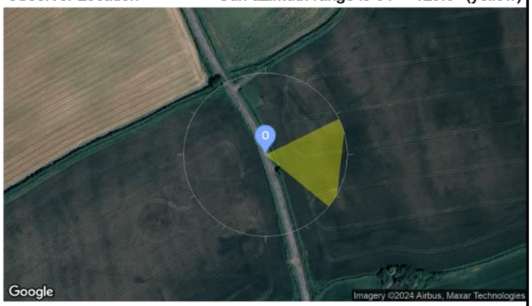
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 1.7°

Observer Location

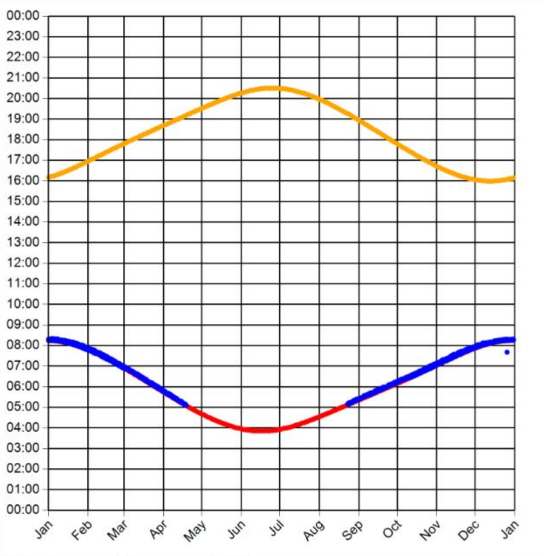
Sun azimuth range is 64° - 129.3° (yellow)



Observer 56 Results

Observer Location — Sun azimuth range is 70.9° - 129.3° (yellow)

Reflection Date/Time (GMT) Graph

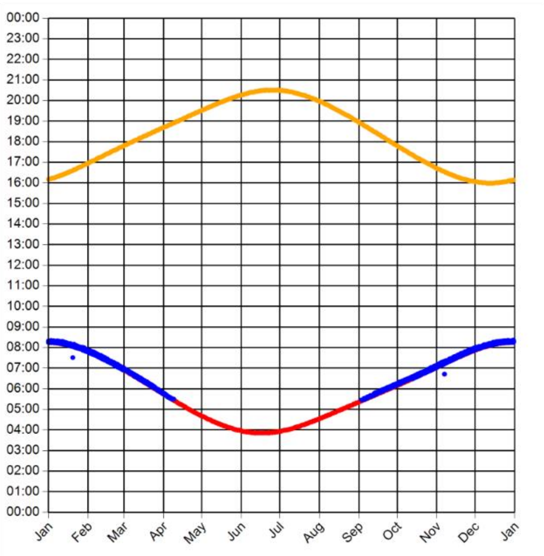


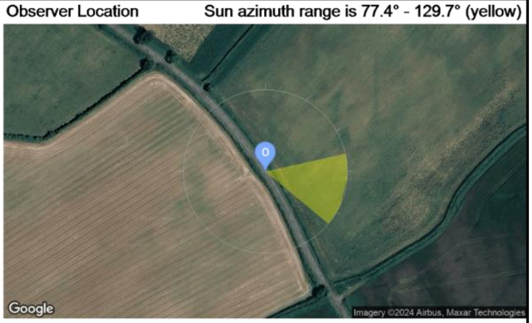
Min observer difference angle: 0°
Max observer difference angle: 1.5°

Observer 57 Results

Observer Location — Sun azimuth range is 77.4° - 129.7° (yellow)

Reflection Date/Time (GMT) Graph

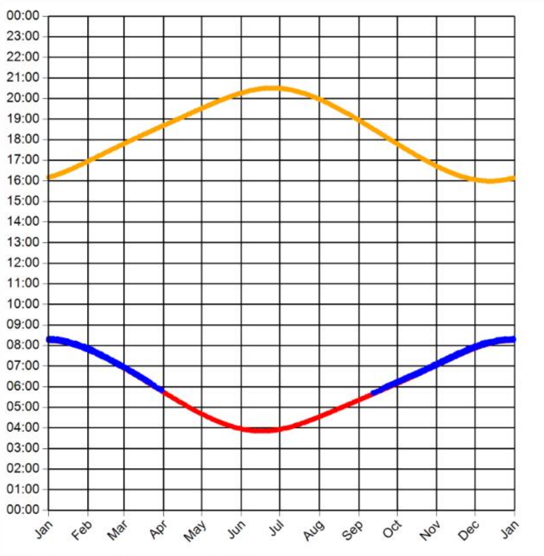




Min observer difference angle: 0°
Max observer difference angle: 1.3°

Observer 58 Results

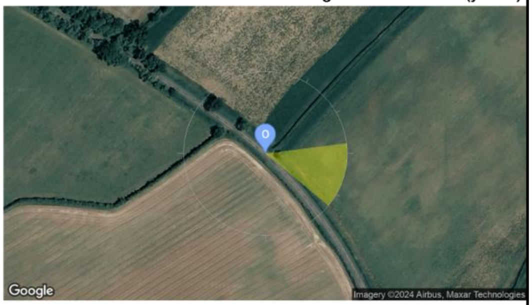
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 1.3°

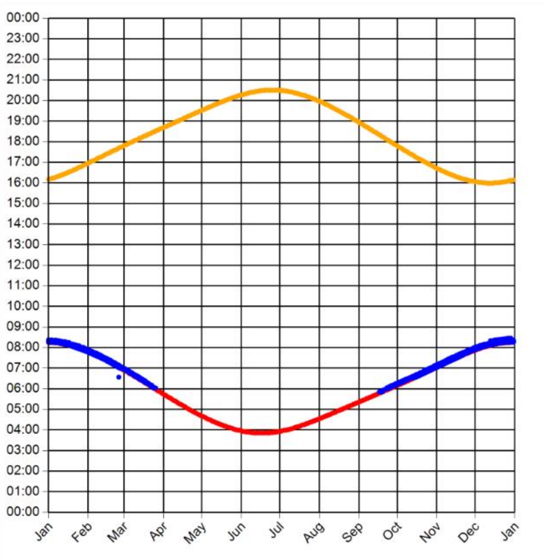
Observer Location

Sun azimuth range is 82.8° - 129.6° (yellow)



Observer 59 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 2.2°

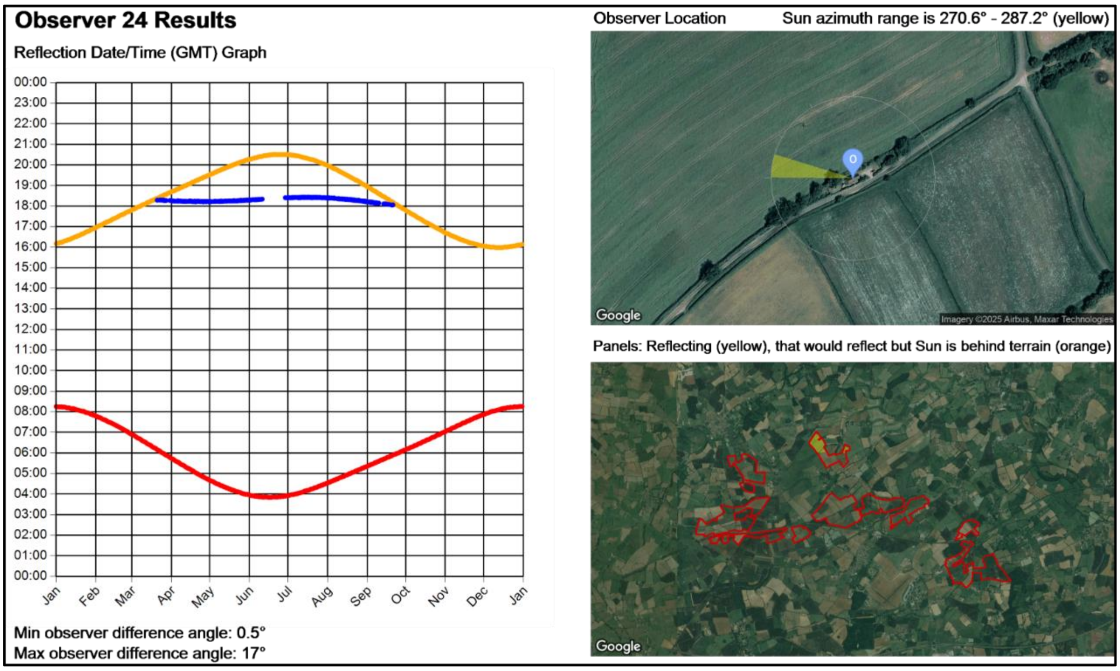
Observer Location

Sun azimuth range is 86.2° - 130.8° (yellow)

Dwelling Receptors

Fixed South Facing Panels

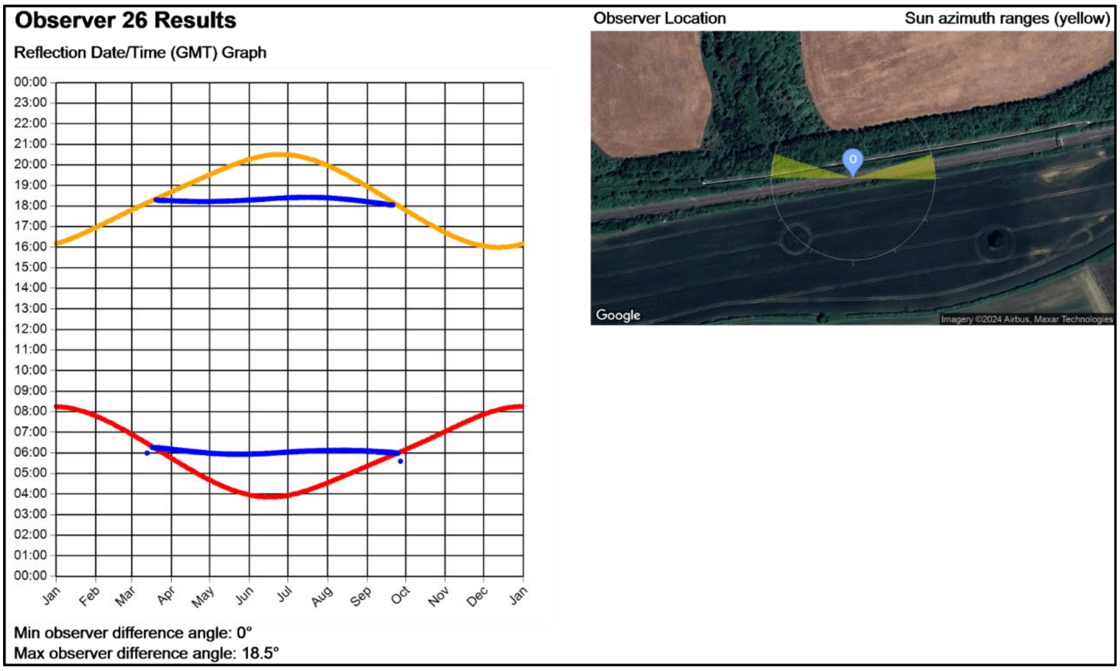
Results have been included where mitigation has been recommended.



Railway Receptors

Fixed South Facing Panels

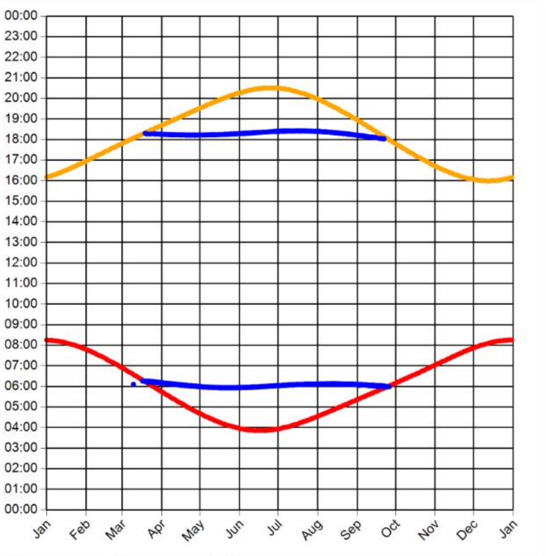
Results have been included where mitigation has been recommended.



Observer 27 Results

Observer Location — Sun azimuth ranges (yellow)

Reflection Date/Time (GMT) Graph

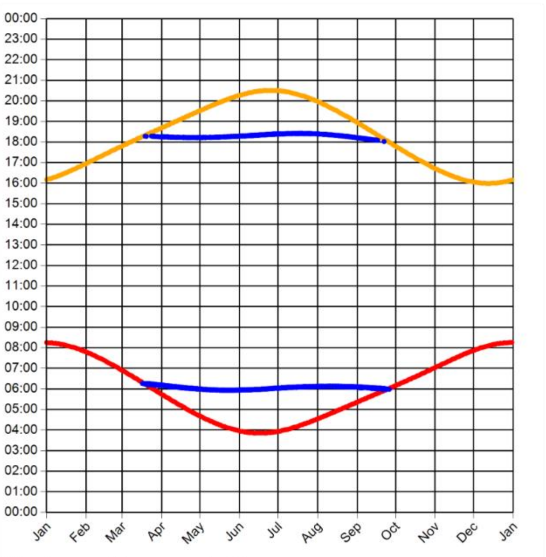


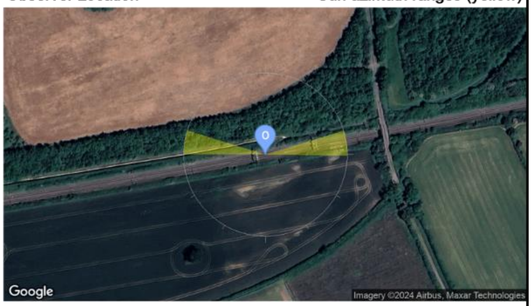
Min observer difference angle: 0°
Max observer difference angle: 18.5°

Observer 28 Results

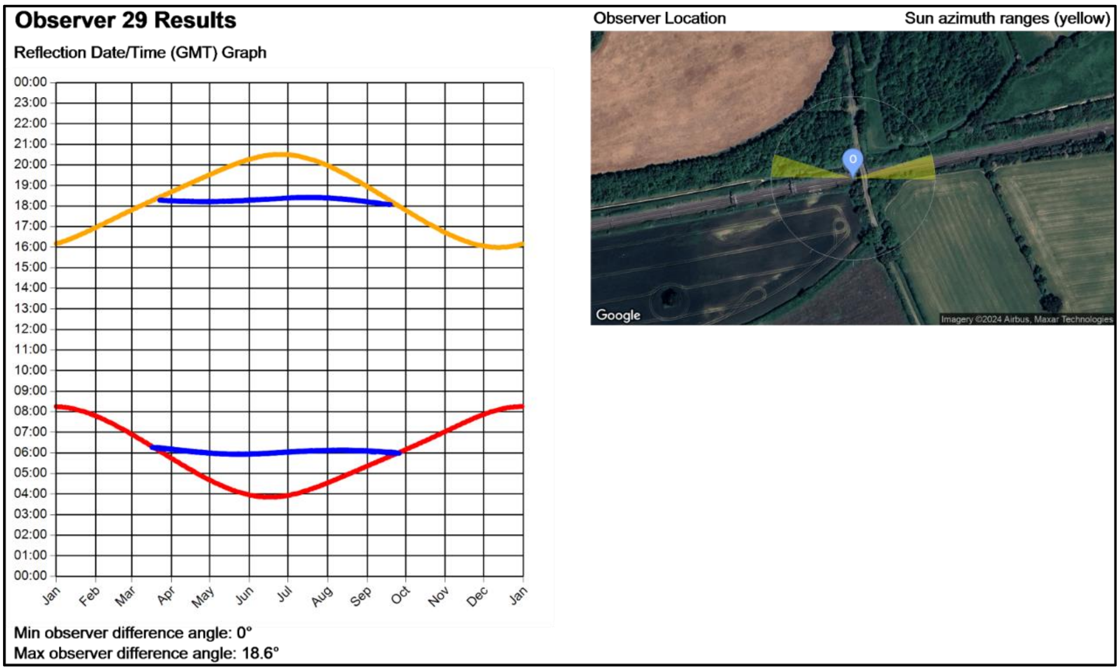
Observer Location — Sun azimuth ranges (yellow)

Reflection Date/Time (GMT) Graph



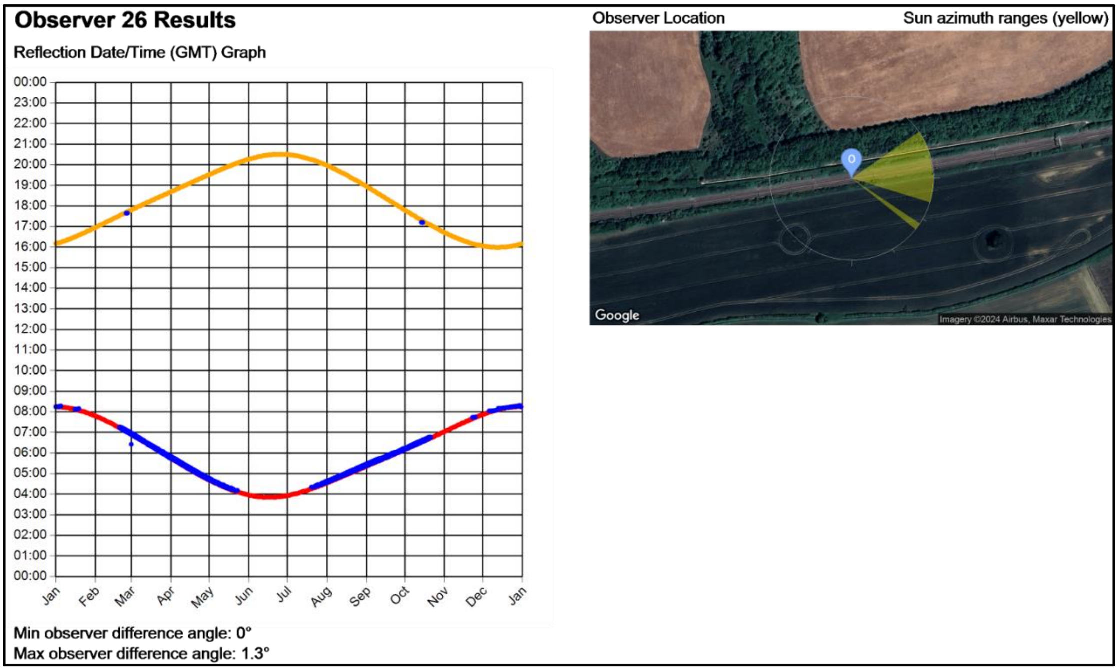


Min observer difference angle: 0°
Max observer difference angle: 18.4°



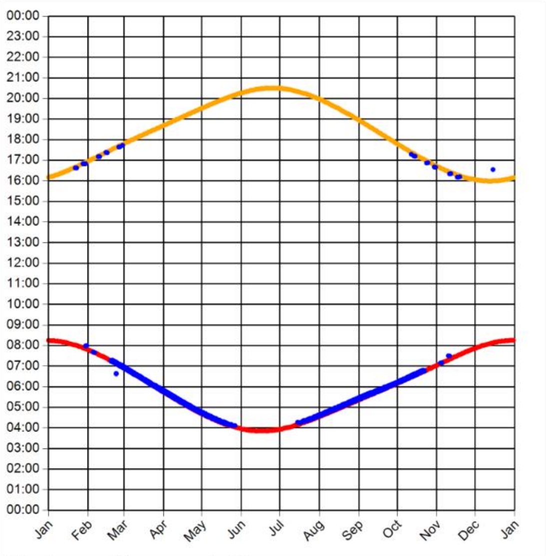
Fixed South Facing Panels

Results have been included where mitigation has been recommended.



Observer 27 Results

Reflection Date/Time (GMT) Graph

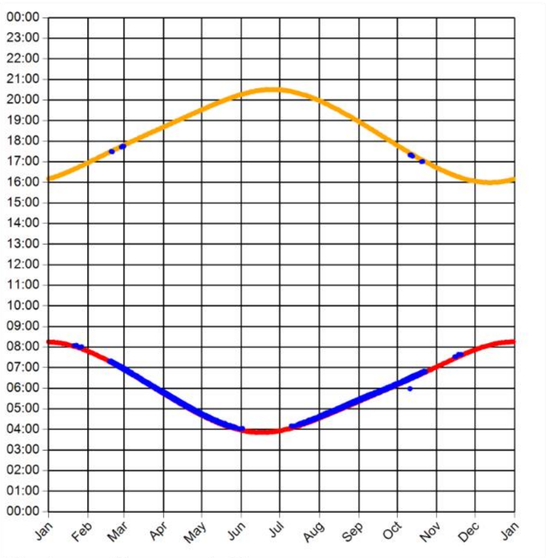


Min observer difference angle: 0°
Max observer difference angle: 2.3°

Observer Location | Sun azimuth ranges (yellow)

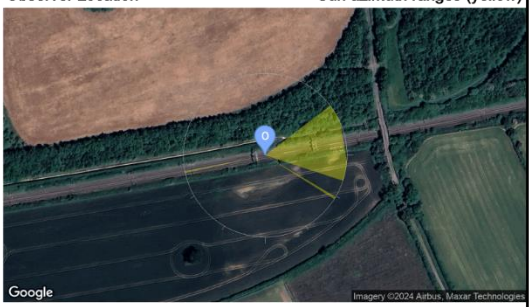
Observer 28 Results

Reflection Date/Time (GMT) Graph



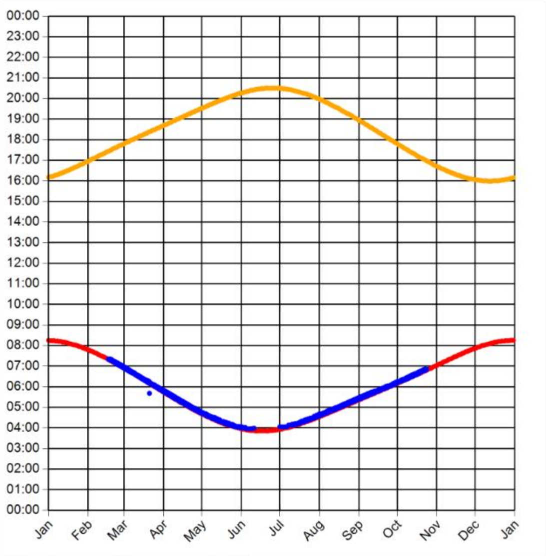
Min observer difference angle: 0°
Max observer difference angle: 1.3°

Observer Location | Sun azimuth ranges (yellow)



Observer 29 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 1.4°

Observer Location

Sun azimuth range is 51° - 108.7° (yellow)

ANNEX I – DESK-BASED ANALYSIS

Road Receptors

An example of desk-based analysis for road receptors is shown on the following page, including the identification of relevant screening and reflecting panel areas. Further desk-based analysis images can be provided upon request. The figure shows:

- The receptor (observer) location(s);
- The reflecting panels (shaded in yellow);
- Identified terrain screening (shaded in green).

Figure 40 *Reflective panel areas and screening for road receptors 9 to 13, including terrain mapping from receptor 11*

Railway Receptors

Figures on the following pages show still images from train cab video on the relevant section of railway line. These figures are representative and show the presence of terrain and vegetation screening between the solar sites and the railway.

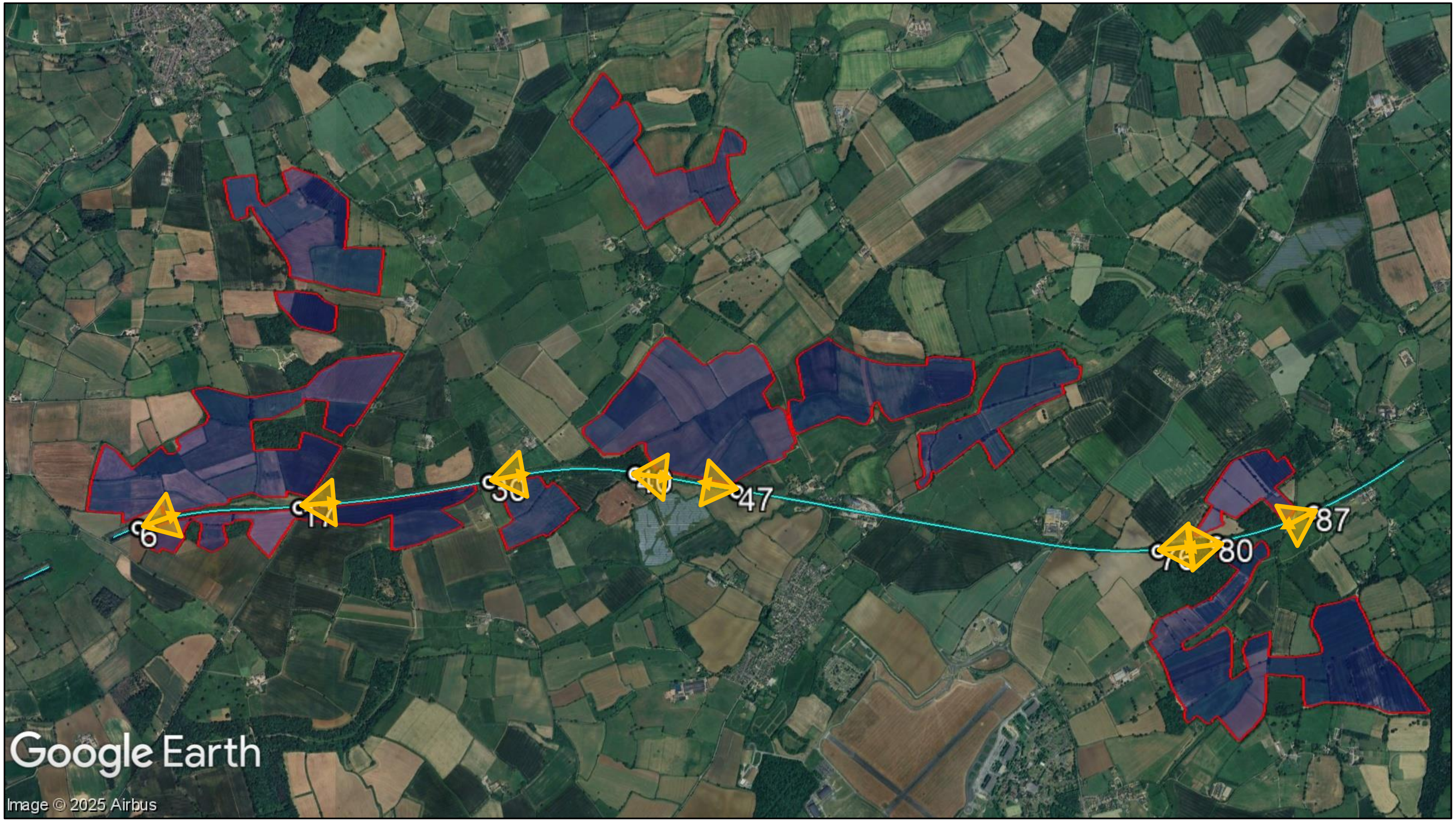


Figure 41 *Overview of railway receptor viewpoint locations*

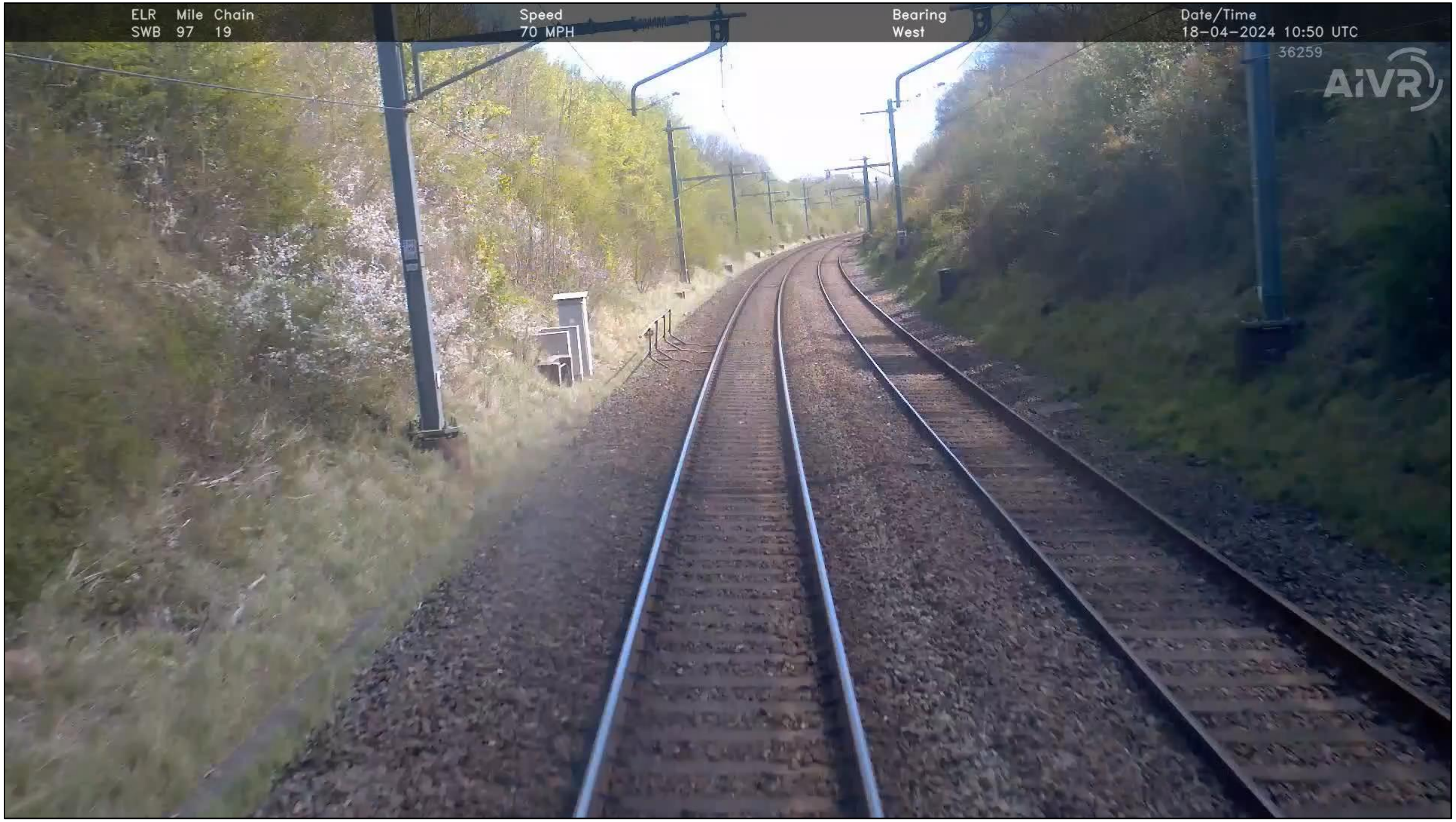


Figure 42 *Train driver view from railway receptor 6*

Figure 43 *Train driver view from railway receptor 17*

Figure 44 *Train driver view from railway receptor 30*

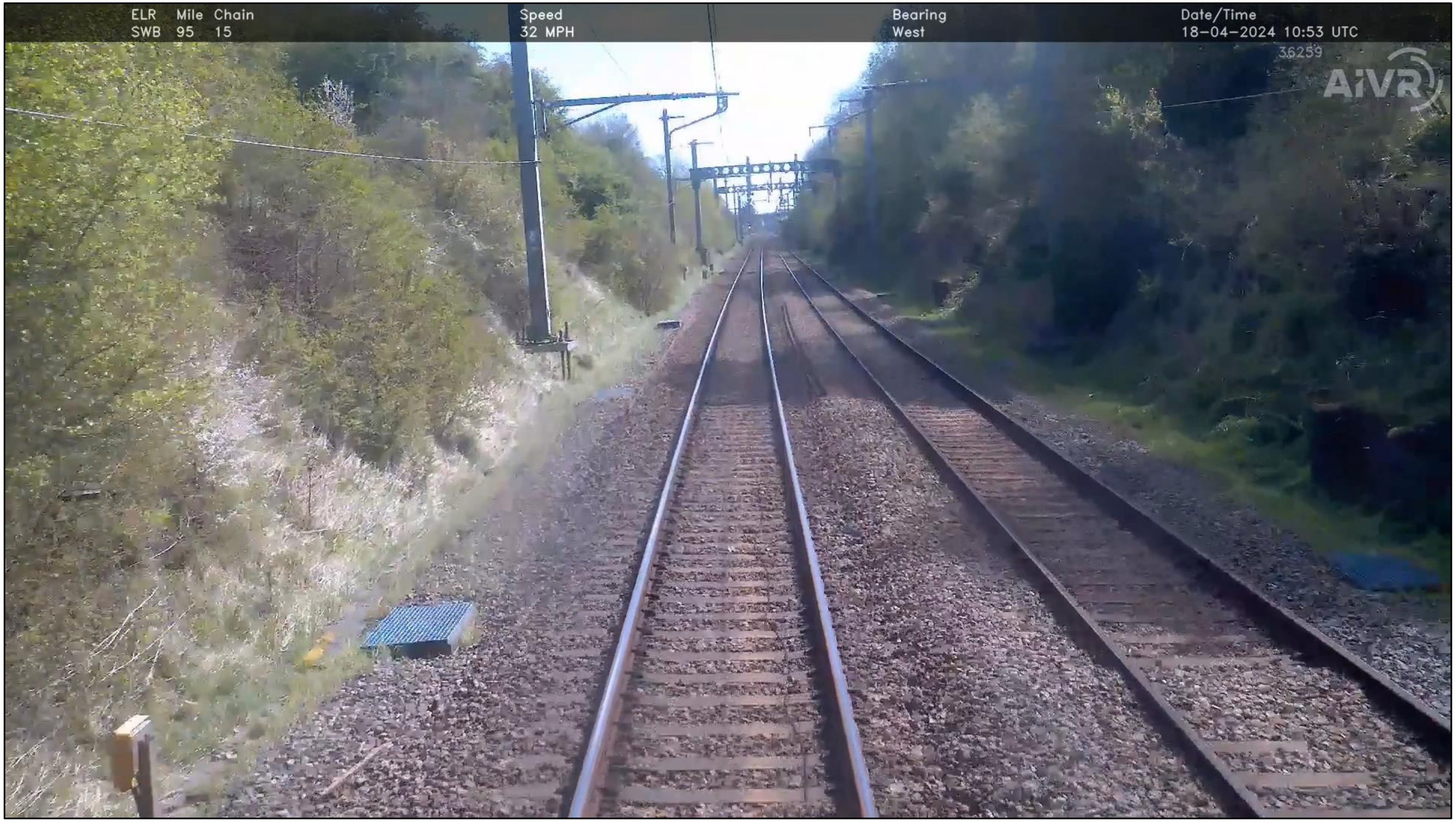


Figure 45 *Train driver view from railway receptor 40*

Figure 46 *Train driver view from railway receptor 47*

Figure 47 *Train driver view from railway receptor 76*

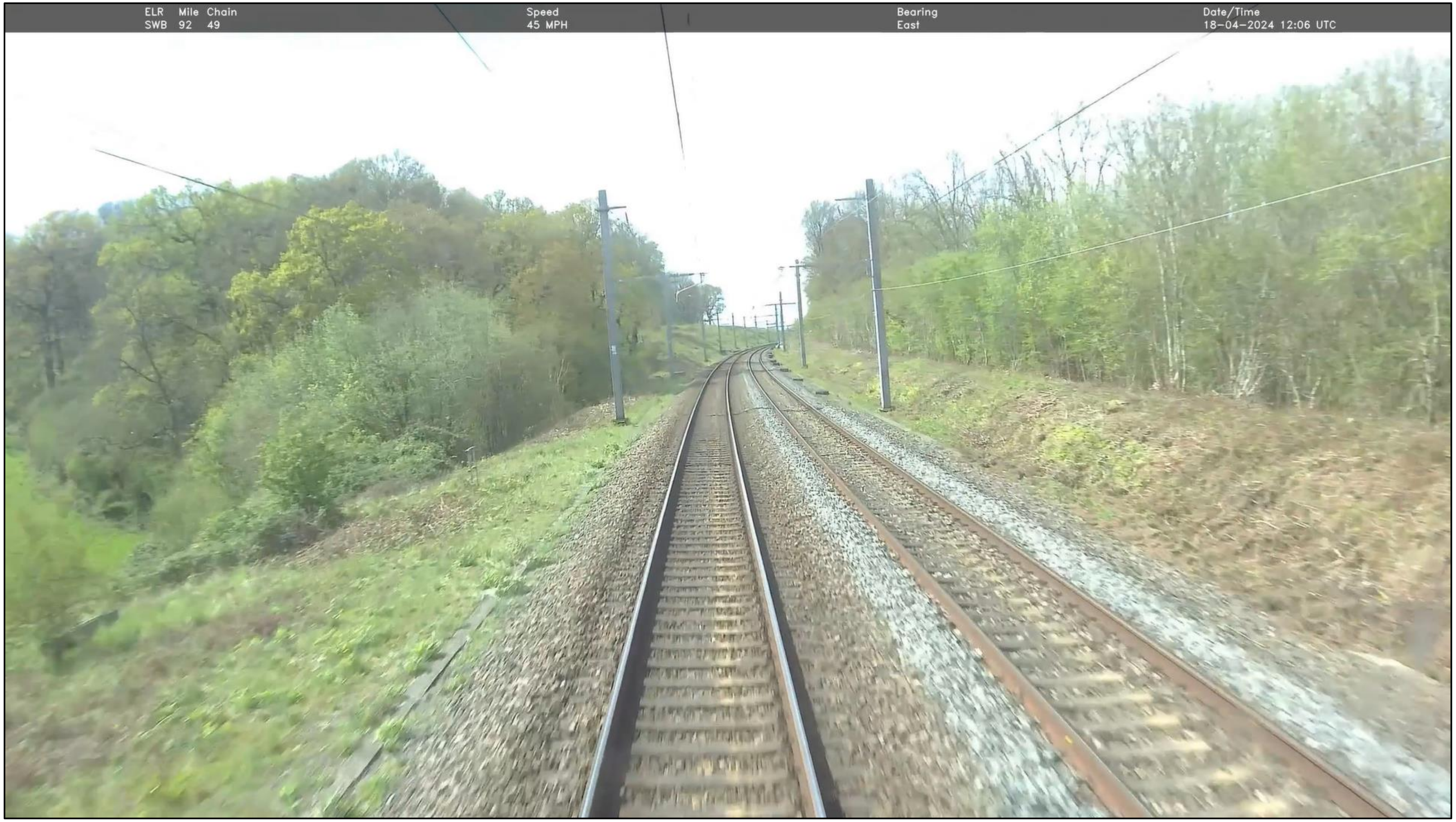


Figure 48 *Train driver view from railway receptor 80*

Figure 49 *Train driver view from railway receptor 87, showing fleeting views of the solar site*

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