PAGERPOWER
Urban & Renewables

Solar Photovoltaic Glint and Glare Addendum

Magheralin SF

RPS Group PLC

February 2025





PLANNING SOLUTIONS FOR:

- Solar
- Telecoms
- Railways
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ADMINISTRATION PAGE

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1	10th February 2025	Initial issue
2	28th February 2025	Administrative amendments

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EXECUTIVE SUMMARY

Report Purpose

Pager Power has been retained to assess the possible effects of glint and glare from a proposed solar photovoltaic (PV) farm comprising four land parcels located south-west of Magheralin, County Down, Northern Ireland. A glint and glare assessment[1] was produced concerning the potential impact on surrounding road safety, residential amenity, and aviation activity, which in this instance comprise the potential sensitive receptors surrounding the site of the proposed development. This assessment formed part of the planning application pack presented for consideration to Armagh, Banbridge and Craigavon Borough Council, the local planning authority (the LPA) for the project.

Discussions with the LPA have led to reductions to the solar panel layout, notably to Parcel 4 of the project, which comprises the southern-most land parcel located south of the B2 Dromore Road and east of the B9 Drumlin Road. This report (the Addendum) considers the layout changes at Parcel 4 only to identify any changes to the glint and glare results and conclusions, at the southern-most land parcel.

The minor reductions to proposed solar panel areas across Land Parcels 1-3 would not significantly affect the glint and glare assessment and conclusions previously presented, which confirm there are no predicted significant effects on surrounding road safety, residential amenity, and aviation activity.

Scope of Work

The panels are fixed south facing and solar reflections at ground level towards the north at this latitude are highly unlikely. Therefore, re-modelling has only been undertaken for selected receptors which have the potential to experience glint and glare effects from the infrastructure proposed on Parcel 4:

- Road receptors 35 to 49, and 73 to 88;
- Dwelling receptors 130 to 162, and 218 to 245.

An additional dwelling receptor 246 has been added to represent a consented development.

Updating landscaping proposals form an inherent part of the overall project. Where landscaping is proposed at Land Parcel 4, this has been considered within this Addendum.

All remaining receptors are to the north of parcel 4 and have been excluded from the remodelling as they will not be significantly affected by the change in the panel layout.

The potential effects on the high-level aviation assessment have also been considered.

[1] Latest version is issue 4 (12090A - Magheralin SF - Solar Photovoltaic Glint and Glare Study - 09Jan24)

Overall Conclusions

No impacts requiring further mitigation are predicted on surrounding road safety, residential amenity, and aviation activity.

The are no additional impacts introduced by the change in solar panel layout.

An overview of the assessment results is presented in the subsections below.

Assessment Results – Roads

A low impact is predicted on the road section from receptor 75 to 76 along the B9 (Drumlin Road) under baseline conditions. With the consideration of proposed landscape planting[2], no impact is predicted on this road section.

No impacts are predicted on any of the remaining re-modelled road sections under baseline conditions.

Assessment Results - Dwellings

A moderate impact is predicted on dwellings 218 to 220 under baseline conditions. With the consideration of proposed landscape planting, no impact is predicted on dwellings 218 to 220.

No impacts are predicted on the remaining re-modelled dwelling receptors under baseline conditions.

High-Level Aviation Assessment Conclusions

The changes in the solar panel layout are not significant such that the two airfields within 10km of the proposed development (Tarsan Lane Microlights Airfield and Tandagree Airstrip) need be reconsidered. The previously stated conclusions still apply.

No significant impacts are predicted, and further assessment is not recommended for either of the above aerodromes.

[2] Landscape proposals at Parcel 4 comprise planting of semi-mature trees with a minimum height of 6m, augmented with mitigation planting which will sit under the canopies of the semi-mature trees. Collectively this will form an immediately effective visual screen all year round, given the presence of evergreen species within the planting mix.

LIST OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 60 countries.

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.
- 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 proposed solar photovoltaic (PV) farm comprising four land parcels located south-west of Magheralin, County Down, Northern Ireland. A glint and glare assessment[3] was produced concerning the potential impact on surrounding road safety, residential amenity, and aviation activity, which in this instance comprise the potential sensitive receptors surrounding the site of the proposed development. This assessment formed part of the planning application pack presented for consideration to Armagh, Banbridge and Craigavon Borough Council, the local planning authority (the LPA) for the project.

Discussions with the LPA have led to reductions to the solar panel layout, notably to Parcel 4 of the project, which comprises the southern-most land parcel located south of the B2 Dromore Road and east of the B9 Drumlin Road. This report (the Addendum) considers the layout changes at Parcel 4 only to identify any changes to the glint and glare results and conclusions, at the southern-most land parcel.

The minor reductions to proposed solar panel areas across Land Parcels 1-3 would not significantly affect the glint and glare assessment and conclusions previously presented, which confirm there are no predicted significant effects on surrounding road safety, residential amenity, and aviation activity.

1.2 Pager Power's Experience

Pager Power has undertaken over 1,500 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 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.

[3] Latest version is issue 4 (12090A - Magheralin SF - Solar Photovoltaic Glint and Glare Study - 09Jan24)

These definitions are aligned with those presented within the National Policy Statement for Renewable Energy Infrastructure (EN-3)[5] and the Federal Aviation Administration in the USA. The term 'solar reflection' is used in this report to refer to both reflection types.

1.4 Background and Studies

As confirmed above, this Addendum should be read alongside the previous Glint and Glare report that formed part of the planning submission to the LPA for the project. It is worth noting:

- The original report[3] did not predict any significant effects in terms of glint and glare on any of the relevant roads, residential or aviation receptors as a result of the panel layout within Parcel 4 of the development;
- Layout reductions referred to previously in this Addendum only lessen the potential for impacts. Alongside layout reductions, through discussions with the LPA, landscaping proposals which are inherent parts of the overall project, have been enhanced to further limit the potential for visibility of the project, especially the solar panels located within Land Parcel 4.
- The assessment represents a worst-case scenario approach which assumes the sun is visible during all daylight hours throughout the year.
- Simply because a view of solar panels is theoretically possible, this should not be confused with the potential for glint and glare effects. Solar panels are opaque and designed to absorb rather than reflect sunlight. The intensity of reflections from solar panels, where they do exist, are understood to be equal to or less than those from still water and significantly less than many other outdoor reflective surfaces;
- The assessment considers the face of the panel rather than the frame or the reverse of the panels. The potential for Glint and Glare effects from frames is significantly less than from the panel surface and therefore the assessment of panels only is a robust approach. Furthermore whilst panels are bi-facial, the reverse face would be directed downwards and away from the sun, therefore there is no potential for glint and glare effects from the reverse panel surface on sensitive receptors.
- Pager Power has undertaken over 1,500 Glint and Glare assessments in the UK and internationally in accordance with a methodology that has been assessed and withstood scrutiny. The studies have included assessment of civil and military aerodromes, railway infrastructure and other ground-based receptors including roads and dwellings.

[5] Published by the Department for Energy Security and Net Zero in November 2023 and came into force on 17 January 2024

2 PROPOSED SOLAR DEVELOPMENT LOCATION AND DETAILS

2.1 Proposed Development Site Layout

The latest proposed development layout[6] is shown in Figure 1 below.

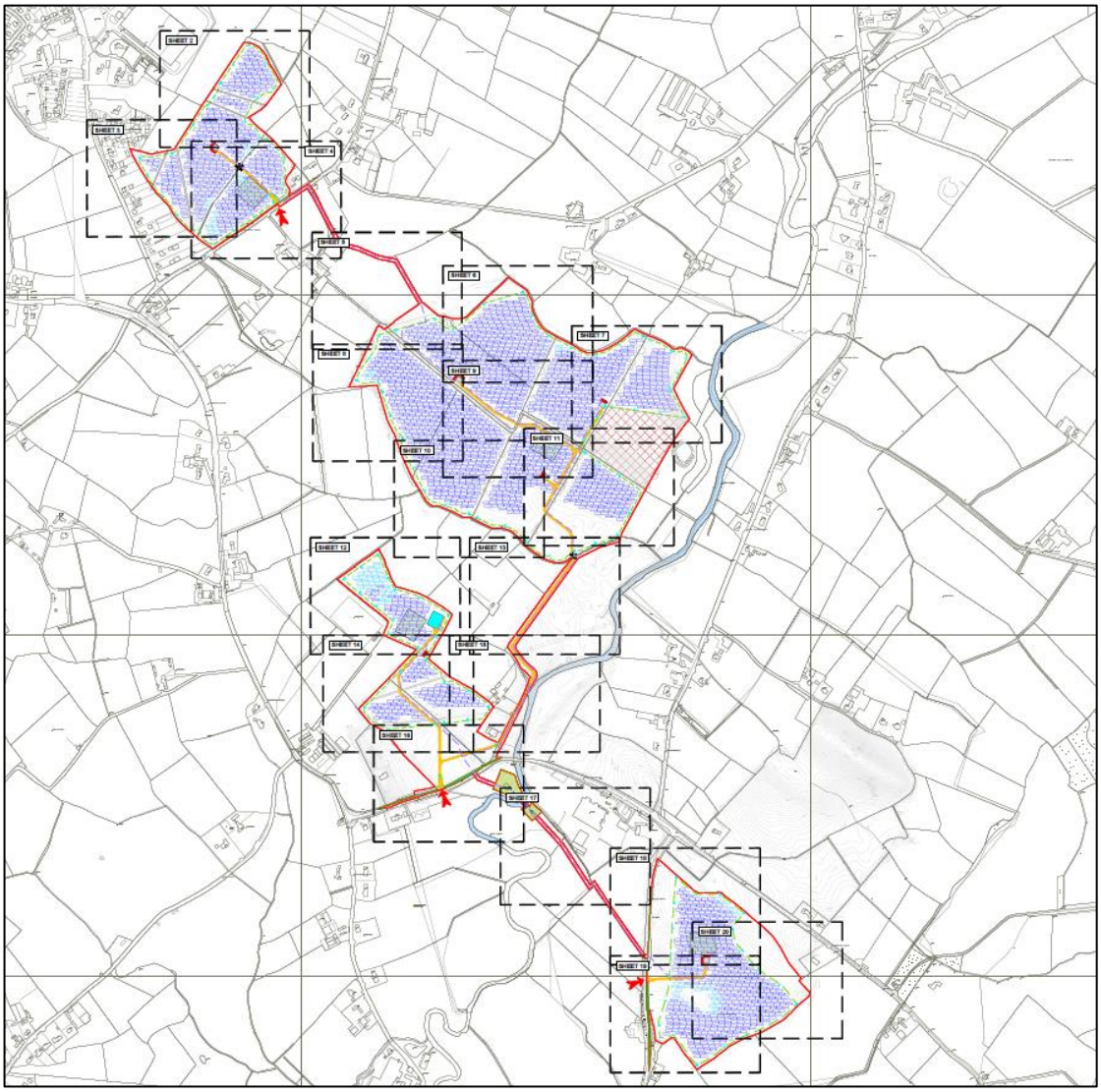


Figure 1 *Proposed development layout*

[6] Source: Figure 4 - 05215-RES-LAY-DR-PT-005 1 Rev 12.pdf

2.2 Reflector Areas

A resolution of 10m has been chosen for this assessment. This means that a geometric calculation is undertaken for each identified receptor from a point every 10m 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. The number of modelled reflector points are determined by the size of the reflector areas and the assessment resolution. The bounding coordinates for the proposed solar development have been extrapolated from the site plans.

Figure 2 below shows the assessed reflector areas that have been used for modelling purposes. Parcels 1-3 remain the same as those assessed within the previously submitted glint and glare assessment. This Addendum relates solely to the updated solar panel layout within Parcel 4.

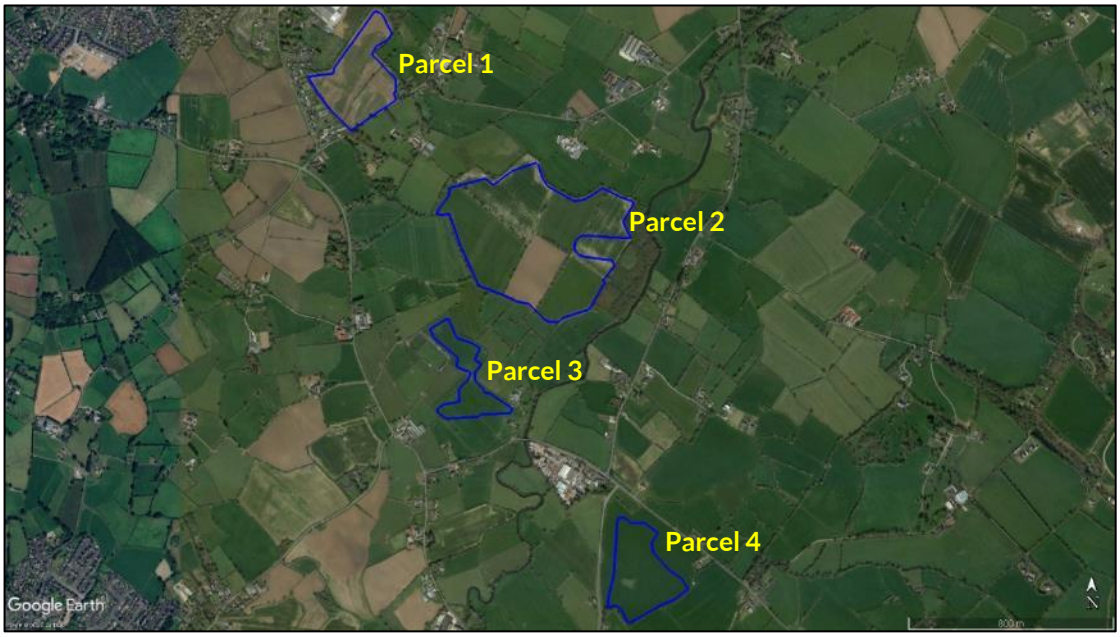


Figure 2 *Assessed reflector areas – aerial image*

2.3 Solar Panel Information

The technical information used for the modelling is presented in Table 1 below. The centre of the solar panel has been used as the assessed height in metres above ground level (agl). As well as the panel reductions at Land Parcel 4, the revised proposals also involve a reduction in overall proposed panel height at this land parcel to a maximum of 3m at their top edge. This is a reduction from the maximum height of 3.5m that was previously assessed.

Solar Panel Technical Information (Parcel 4)	
Azimuth angle[7]	180°
Elevation (tilt) angle[8]	18°
Centre height above ground level (agl)	2.025m agl[10]

Table 1 *Solar panel information*

2.4 Landscape Plan

Figure 3 below shows a excerpt of the latest landscape planting plan[11], relevant to parcel 4.

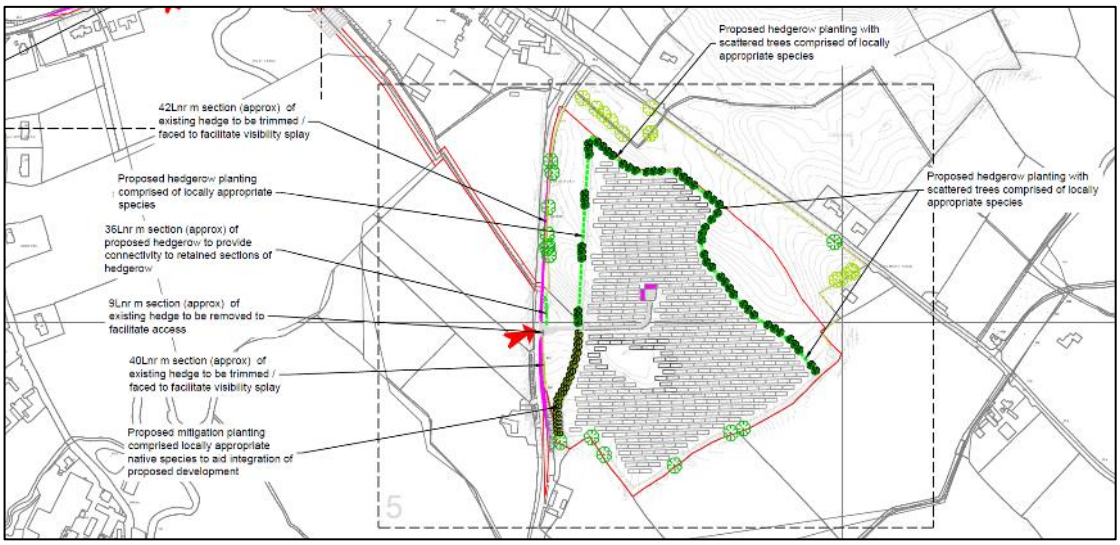


Figure 3 *Snapshot of Landscape Plan*

[7] Clockwise orientation the panels are facing relative to True North (0°)
[8] Relative to the horizontal.
[10] Minimum height = 1.05m agl, maximum height = 3m agl.
[11] 2702.5.01 to 2502.5.06_Mitigation Plans_Rev G.pdf

3 IDENTIFICATION OF RECEPTORS

3.1 Ground-Based Receptors Overview

The panels are fixed south facing and solar reflections at ground level towards the north at this latitude are highly unlikely. Therefore, re-modelling has only been undertaken for selected receptors which have the potential to experience glint and glare effects from the infrastructure proposed on Parcel 4:

- Road receptors 35 to 49, and 73 to 88;
- Dwelling receptors 130 to 162, and 218 to 245.

An additional dwelling receptor 246 has been added to represent a consented development.

All remaining receptors are to the north of parcel 4 and have been excluded from the remodelling as they will not be significantly affected by the change in the panel layout.

The re-modelled receptors are shown in Figure 4 on the following page and Figure 5 on page 15.

Figure 4 *Overview of re-modelled road receptors*

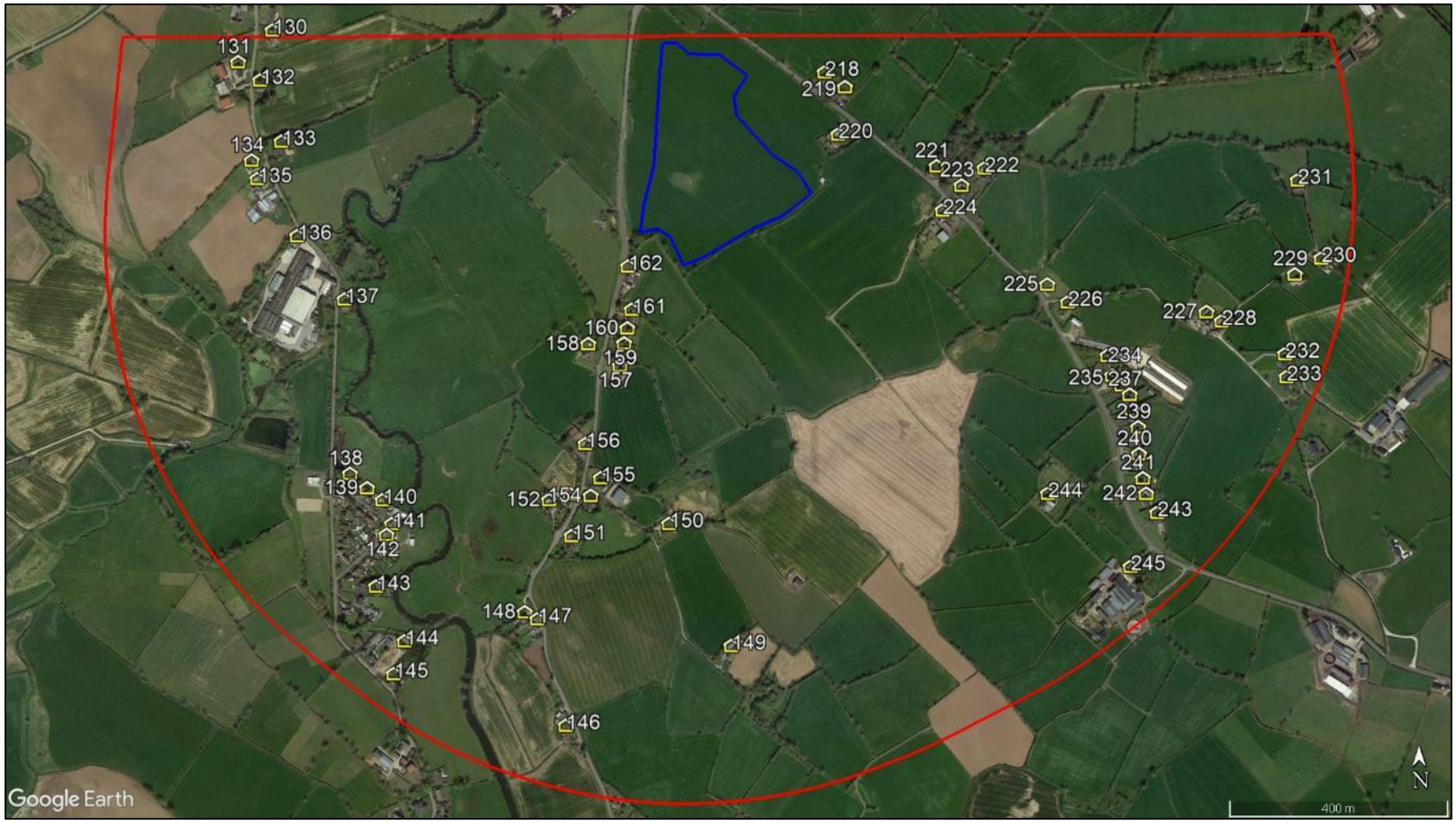


Figure 5 *Overview of re-modelled dwelling receptors 130 to 162 and 218 to 245*

Figure 6 *Additional dwelling receptor 246*

4 GEOMETRIC ASSESSMENT RESULTS AND DISCUSSION

4.1 Overview

The following sub-sections present the modelling results as well as the significance of any predicted impact in the context of existing screening, as well as the relevant criteria set out in the next subsection. The criteria are determined by the assessment process for each receptor, which are set out in Appendix D of the full glint and glare assessment report.

When determining the visibility of the reflecting panels for an observer, a conservative review of the available imagery is undertaken, whereby it is assumed views of the panels are possible if it cannot be reliably determined that existing screening will remove effects.

The modelling output showing the precise predicted times and the reflecting panel areas are presented in Appendix A.

4.2 Roads

4.2.1 Impact Significance Methodology

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 the reflecting panels are predicted to be significantly obstructed from view, no impact is predicted, and mitigation is not required.

Where solar reflections are not experienced as a sustained source of glare, 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 recommended.

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

- Whether the solar reflection originates from directly in front of a road user – a solar reflection that is directly in front of a road user is more hazardous than a solar reflection to one side;
- Whether visibility is likely for elevated drivers (applicable to dual carriageways and motorways only) – there is typically a higher density of elevated drivers along dual carriageways and motorways compared to other types of road;
- The separation distance to the 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.

If following consideration of the relevant factors, the solar reflections do not remain significant, the impact significance is low, and mitigation is not recommended.

If following consideration of the relevant factors, the solar reflections remain significant, then the impact significance is moderate, and mitigation is recommended.

Where solar reflections originate from directly in front of a road user and there are no mitigating factors, the impact significance is high, and mitigation is required.

4.2.2 Geometric Modelling Results

The re-modelling results for road receptors 35 to 49, and 73 to 88 are analysed are presented in Table 2 on the following pages.

Road Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Whether reflections occur inside a road user's primary FOV (with consideration of screening)[12]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended or Required?
35 – 45	Solar reflections predicted to originate from **inside** of a road user's primary horizontal field of view (from parcel 4)	All reflecting panels are predicted to be screened by intervening terrain, buildings, and/or existing vegetation and proposed landscape planting as shown in Figure 3 on page 12	No	N/A	Baseline: No impact	No
46 – 49	Solar reflections are not geometrically possible	N/A	N/A	N/A	No impact	No

[12] Assessment scenario may include an initial conservative qualitative consideration of screening. The reflecting area of the solar development may be partially screened such that it does not meet the key criteria i.e. whether the solar reflection occurs within a road users' main field of view.

Road Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Whether reflections occur inside a road user's primary FOV (with consideration of screening)[12]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended or Required?
73 – 74	Solar reflections predicted to originate from **outside** of a road user's primary horizontal field of view (from parcel 4)	All reflecting panels are predicted to be screened by intervening terrain, buildings, and/or existing vegetation and proposed landscape planting as shown in Figure 3 on page 12	No	N/A	Baseline: No impact	No
75 – 76	Solar reflections predicted to originate from **outside** of a road user's primary horizontal field of view (from parcel 4)	Lack of existing screening All reflecting panels are predicted to be screened by proposed landscape planting as shown in Figure 3 on page 12	No	N/A	Baseline: Low impact With proposed mitigation planting: No impact	No

Road Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Whether reflections occur inside a road user's primary FOV (with consideration of screening)[12]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended or Required?
77	Solar reflections predicted to originate from **inside** of a road user's primary horizontal field of view (from parcel 4)	Reflecting panels are predicted to be screened by intervening terrain, buildings and existing vegetation	No	N/A	Baseline: No impact	No
78 – 88	Solar reflections are not geometrically possible	N/A	N/A	N/A	No impact	No

Table 2 *Geometric modelling results, assessment of impact significance, and mitigation recommendation/requirement – road receptors*

4.2.3 Conclusions

A low impact is predicted on the road section from receptor 75 to 76 along the B9 (Drumlin Road) under baseline conditions. With the consideration of proposed landscape planting[13], no impact is predicted on this road section.

No impacts are predicted on any of the remaining re-modelled road sections under baseline conditions

4.3 Dwellings

4.3.1 Impact Significance Methodology

The key considerations for residential dwellings are:

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

Where solar reflections are not geometrically possible or the reflecting panels are predicted to be significantly obstructed from view, no impact is predicted, and mitigation is not required.

Where solar reflections are experienced for less than three 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 recommended.

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

- Whether visibility is likely from all storeys – the ground floor is typically considered the main living space and has a greater significance with respect to residential amenity;
- The separation distance to the panel area – larger separation distances reduce the proportion of an observer's field of view that is affected by glare;
- Whether the dwelling appears to have windows facing the reflecting area – factors that restrict potential views of a reflecting area reduce the level of impact;
- The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not.

If following consideration of the relevant factors, the solar reflections do not remain significant, the impact significance is low, and mitigation is not recommended. If following consideration of

[13] Landscape proposals at Parcel 4 comprise planting of semi-mature trees with a minimum height of 6m, augmented with mitigation planting which will sit under the canopies of the semi-mature trees. Collectively this will form an immediately effective visual screen all year round, given the presence of evergreen species within the planting mix.

the relevant factors, the solar reflections remain significant, then the impact significance is moderate, and mitigation is recommended.

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

4.3.2 Geometric Modelling Results

The re-modelling results for dwelling receptors 130 to 162, and 218 to 246 are analysed in Table 3 on the following pages.

Dwelling Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Duration of effects[14] (with consideration of screening)[15]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended?
130	Solar reflections are not geometrically possible	N/A	N/A	N/A	Baseline: No impact	No
131 – 133	Solar reflections predicted for **less** than 60 minutes on any given day and for **less** than 3 months of the year (from parcel 4)	All reflecting panels are predicted to be screened by intervening terrain, buildings, and/or existing vegetation and proposed landscape planting as shown in Figure 3 on page 12	None	N/A	Baseline: No impact	No

[14] With respect to the ground floor only

[15] Assessment scenario may include an initial conservative qualitative consideration of screening in determining the duration of predicated effects in practice. The reflecting area of the solar development may be partially screened such that it does not meet the two key criteria i.e. 1) The solar reflection occurs for more than 3 months per year. 2) and/or for more than 60 minutes on any given day.

Dwelling Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Duration of effects[14] (with consideration of screening)[15]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended?
134 – 137	Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year (from parcel 4)	All reflecting panels are predicted to be screened by intervening terrain, buildings, and/or existing vegetation and proposed landscape planting as shown in Figure 3 on page 12	None	N/A	Baseline: No impact	No
138 – 161	Solar reflections are not geometrically possible	N/A	N/A	N/A	Baseline: No impact	No

Dwelling Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Duration of effects[14] (with consideration of screening)[15]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended?
162	Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year (from parcel 4)	All reflecting panels are predicted to be screened by intervening terrain, buildings, and/or existing vegetation and proposed landscape planting as shown in Figure 3 on page 12	None	N/A	Baseline: No impact	No

Dwelling Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Duration of effects[14] (with consideration of screening)[15]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended?
218 – 220	Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year (from parcel 4)	Intervening terrain and vegetation Visibility of reflecting panels cannot be ruled out under baseline conditions All reflecting panels are predicted to be screened by proposed landscape planting as shown in Figure 3 on page 12	Baseline: **less** than 60 minutes on any given day and for **more** than 3 months of the year (from parcel 4) With proposed mitigation planting: **none**	N/A	Baseline: Moderate impact With proposed mitigation planting: No impact	No

Dwelling Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Duration of effects[14] (with consideration of screening)[15]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended?
221 – 228	Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year (from parcel 4)	All reflecting panels are predicted to be screened by intervening terrain, and/or existing vegetation and proposed landscape planting as shown in Figure 3 on page 12	None	N/A	Baseline: No impact	No
229 – 233	Solar reflections predicted for **less** than 60 minutes on any given day and for **less** than 3 months of the year (from parcel 4)	All reflecting panels are predicted to be screened by intervening terrain, buildings, and/or existing vegetation	None	N/A	Baseline: No impact	No

Dwelling Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Duration of effects[14] (with consideration of screening)[15]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended?
234 – 237	Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year (from parcel 4)	All reflecting panels are predicted to be screened by intervening terrain, buildings, and/or existing vegetation	None	N/A	Baseline: No impact	No
238 – 240	Solar reflections predicted for **less** than 60 minutes on any given day and for **less** than 3 months of the year (from parcel 4)	All reflecting panels are predicted to be screened by intervening terrain, buildings, and/or existing vegetation	None	N/A	Baseline: No impact	No
241 – 245	Solar reflections are not geometrically possible	N/A	N/A	N/A	Baseline: No impact	No

Dwelling Receptor	Geometric modelling results from panel areas within 1km (without consideration of screening)	Identified screening and predicted visibility (desk-based review)	Duration of effects[14] (with consideration of screening)[15]	Relevant Factors	Predicted Impact Classification	Further Mitigation Recommended?
246	Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year (from parcel 4)	All reflecting panels are predicted to be screened by existing vegetation proposed landscape planting as shown in Figure 3 on page 12	None	N/A	Baseline: No impact	No

Table 3 *Geometric modelling results, assessment of impact significance, and mitigation recommendation/requirement – dwelling receptors*

4.3.3 Conclusions

A moderate impact is predicted on dwellings 218 to 220 under baseline conditions. With the consideration of proposed landscape planting[16], no impact is predicted on dwellings 218 to 220.

No impacts are predicted on the remaining re-modelled dwelling receptors under baseline conditions.

[16] Landscape proposals at Parcel 4 comprise planting of semi-mature trees with a minimum height of 6m, augmented with mitigation planting which will sit under the canopies of the semi-mature trees. Collectively this will form an immediately effective visual screen all year round, given the presence of evergreen species within the planting mix.

APPENDIX A – DETAILED MODELLING RESULTS

Overview

The results charts for the receptors are shown on the following pages.

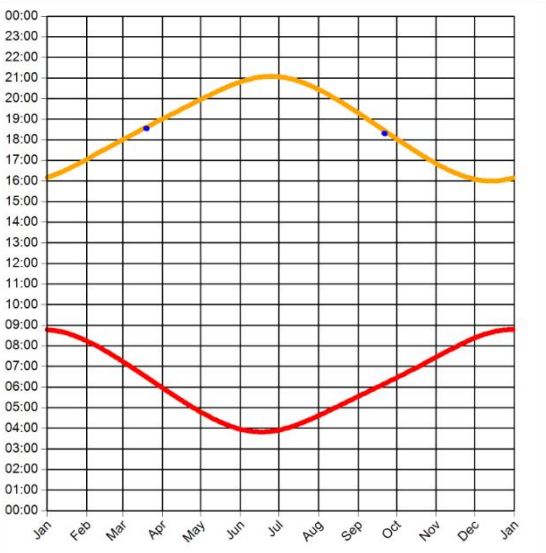
Each Pager Power chart shows:

- 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 reflecting panels – bottom right image. The reflecting area is shown in yellow. If the yellow panels are not visible from the observer location, no issues will occur in practice. Additional obstructions which may obscure the panels from view are considered separately within the analysis;
- The reflection date/time graph – left hand side of the page. 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).

Road Receptors

Observer 35 Results

Reflection Date/Time (GMT) Graph



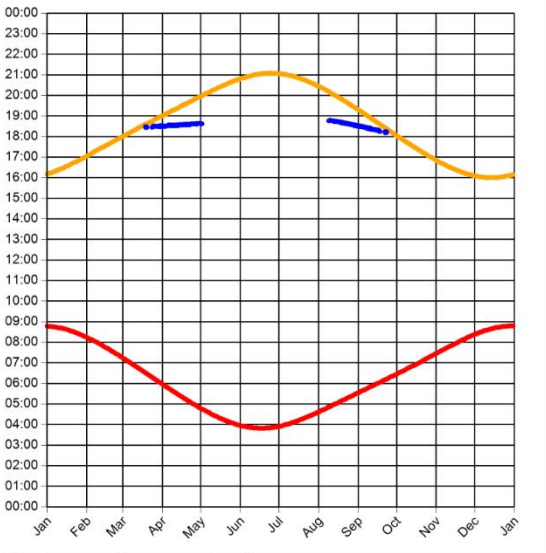
Min observer difference angle: 0.4°
Max observer difference angle: 0.7°

Observer Location — Sun azimuth range is 270° - 270.5° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

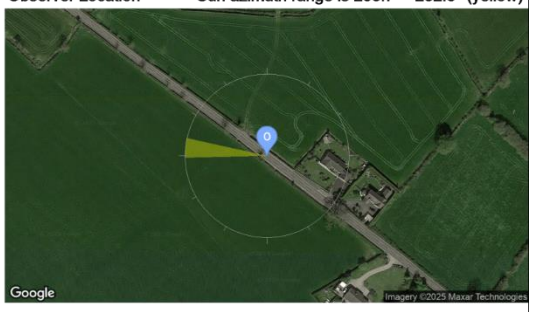
Observer 36 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.6°
Max observer difference angle: 12.2°

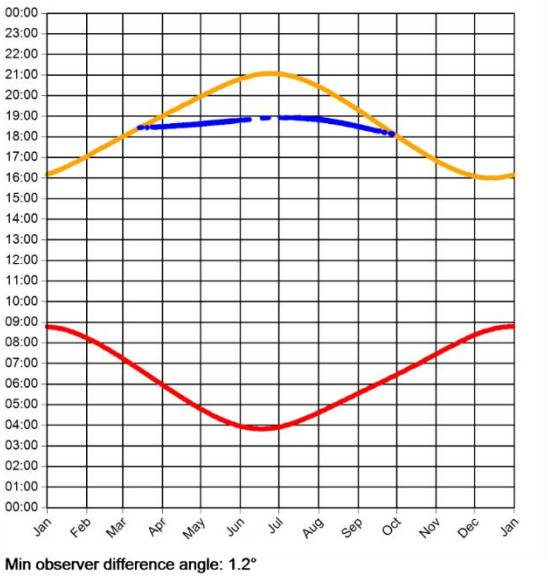
Observer Location — Sun azimuth range is 268.7° - 282.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

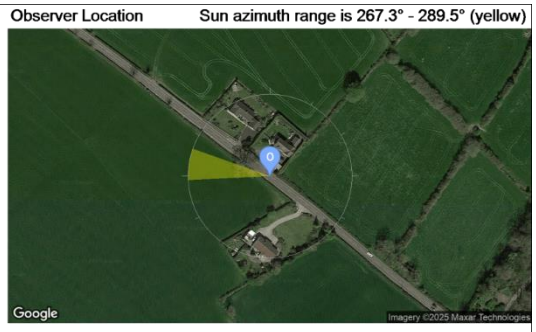
Observer 37 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.2°
Max observer difference angle: 17°

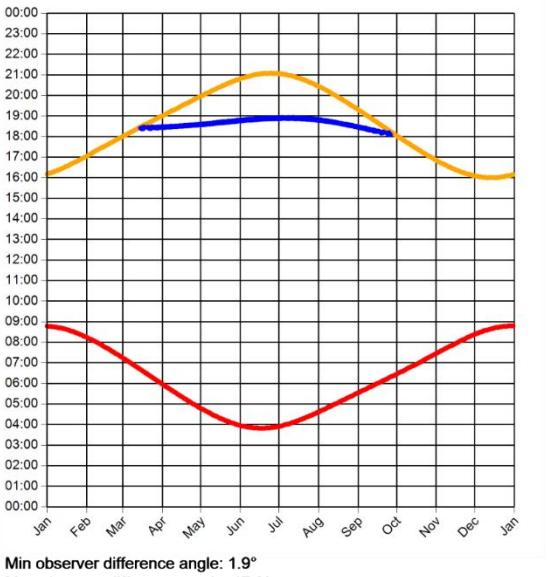
Observer Location — Sun azimuth range is 267.3° - 289.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

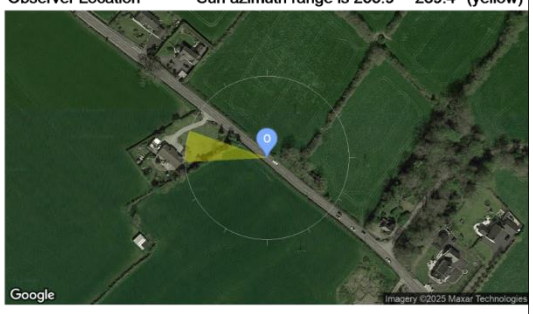
Observer 38 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.9°
Max observer difference angle: 17.9°

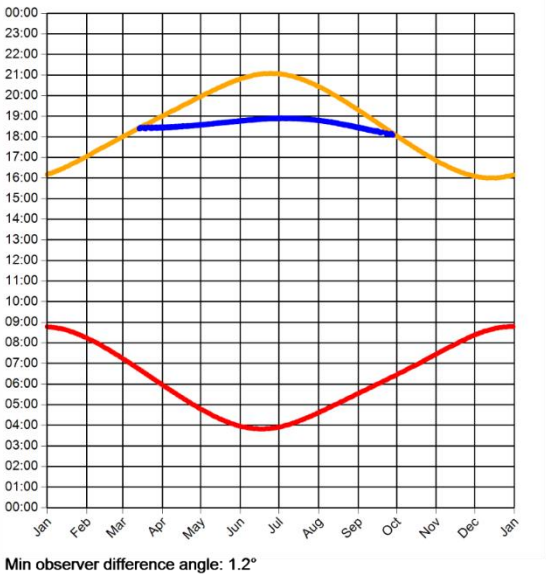
Observer Location — Sun azimuth range is 266.9° - 289.4° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

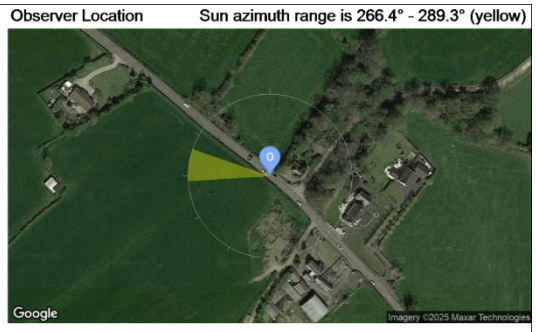
Observer 39 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.2°
Max observer difference angle: 17.9°

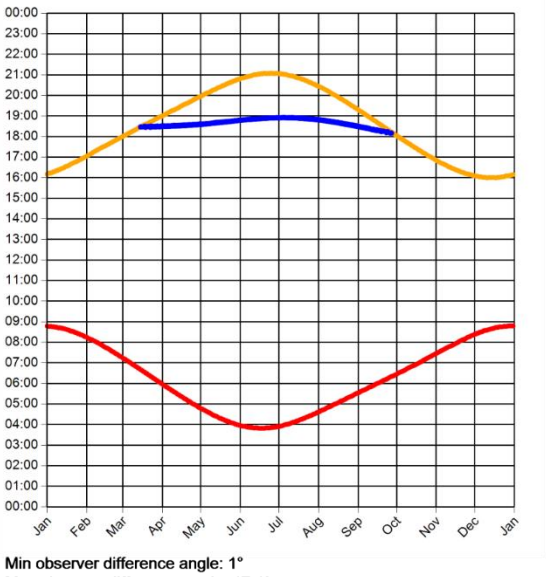
Observer Location Sun azimuth range is 266.4° - 289.3° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

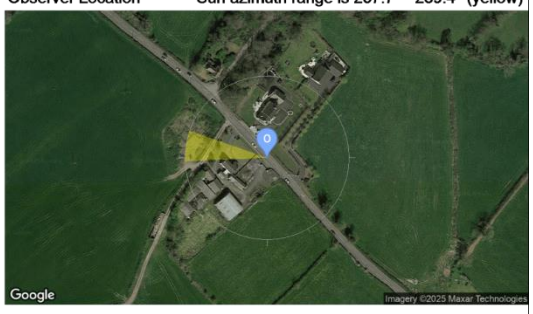
Observer 40 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1°
Max observer difference angle: 17.4°

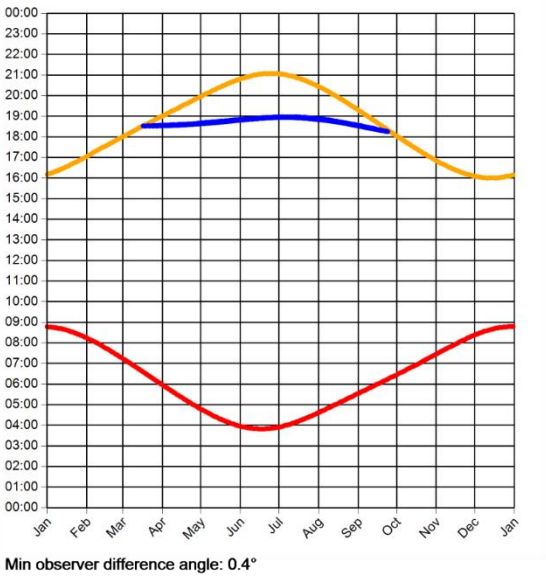
Observer Location Sun azimuth range is 267.7° - 289.4° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

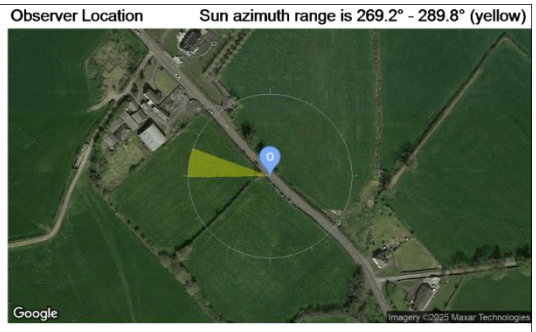
Observer 41 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.4°
Max observer difference angle: 16.7°

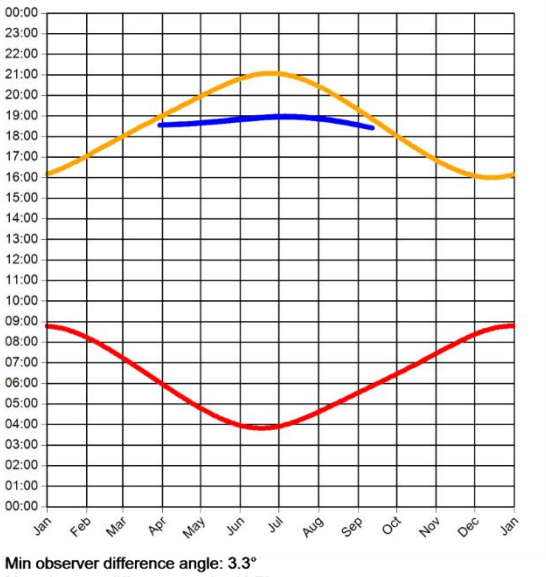
Observer Location — Sun azimuth range is 269.2° - 289.8° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 42 Results

Reflection Date/Time (GMT) Graph



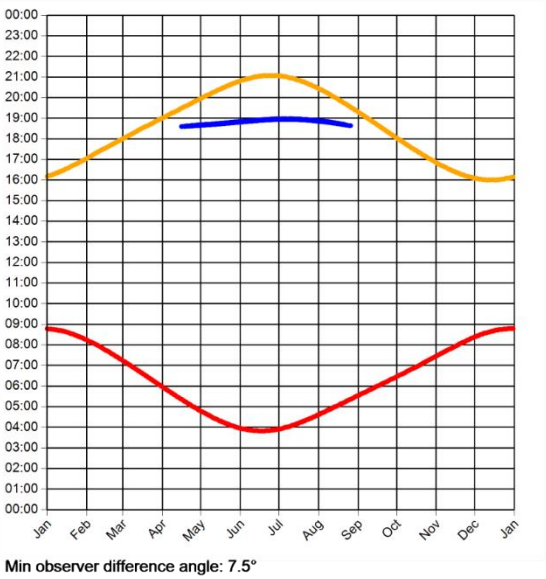
Min observer difference angle: 3.3°
Max observer difference angle: 16.7°

Observer Location — Sun azimuth range is 273.1° - 290° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

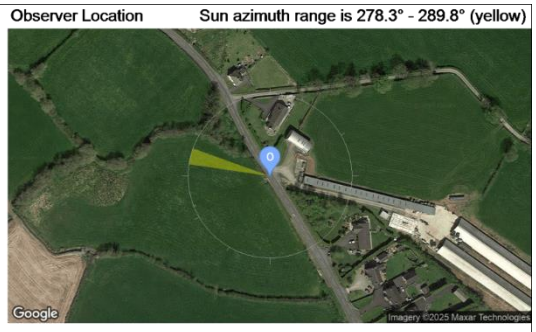
Observer 43 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 7.5°
Max observer difference angle: 16.7°

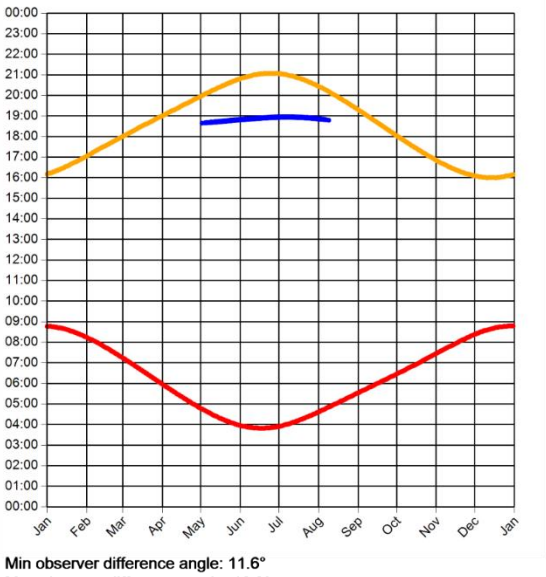
Observer Location Sun azimuth range is 278.3° - 289.8° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 44 Results

Reflection Date/Time (GMT) Graph



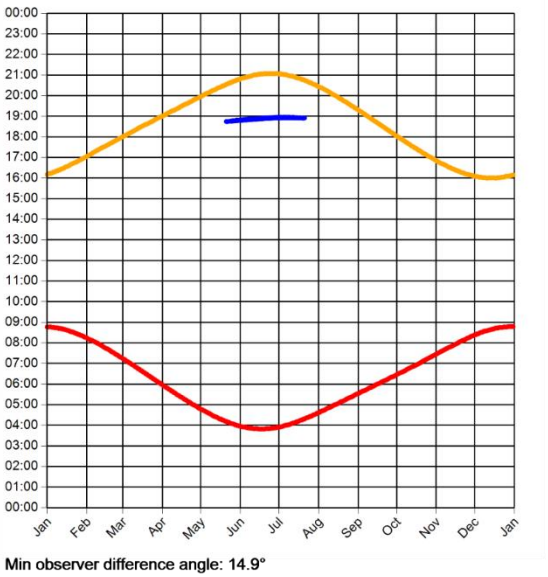
Min observer difference angle: 11.6°
Max observer difference angle: 16.9°

Observer Location Sun azimuth range is 282.7° - 289.7° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

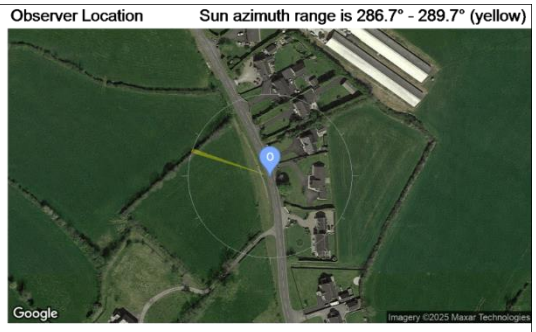
Observer 45 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 14.9°
Max observer difference angle: 17.1°

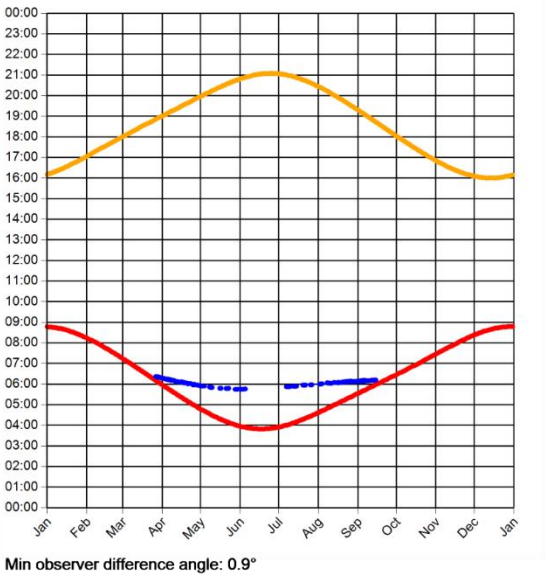
Observer Location — Sun azimuth range is 286.7° - 289.7° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

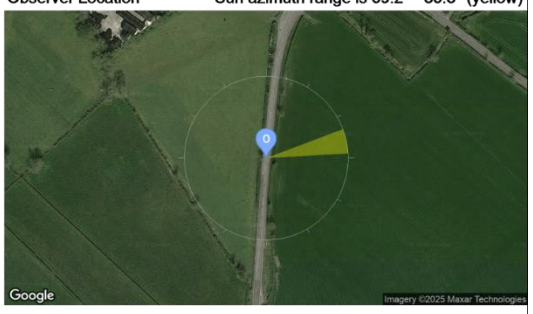
Observer 73 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.9°
Max observer difference angle: 12.4°

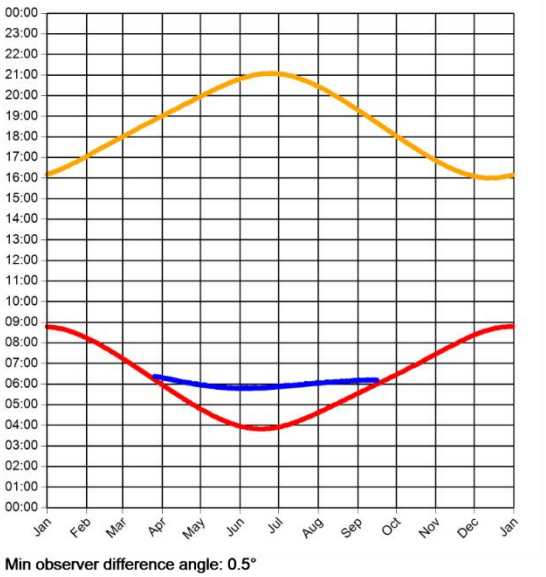
Observer Location — Sun azimuth range is 69.2° - 86.8° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 74 Results

Reflection Date/Time (GMT) Graph



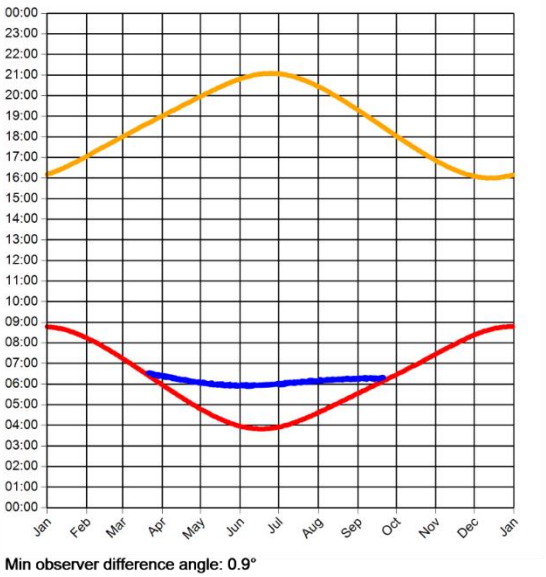
Min observer difference angle: 0.5°
Max observer difference angle: 14.3°

Observer Location — Sun azimuth range is 68.6° - 87° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

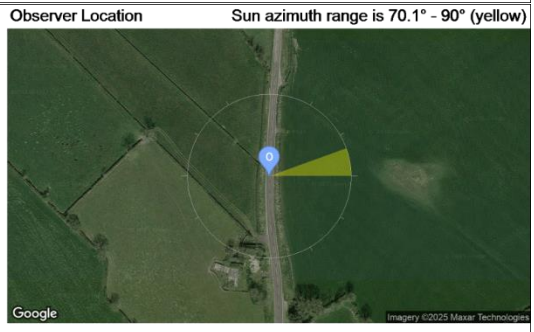
Observer 75 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.9°
Max observer difference angle: 17.3°

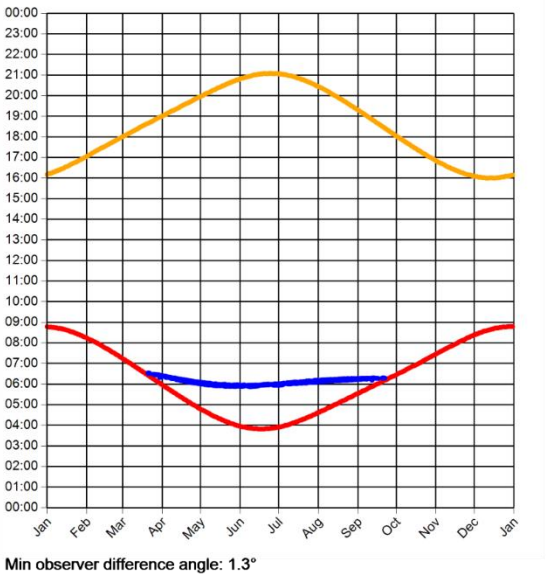
Observer Location — Sun azimuth range is 70.1° - 90° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 76 Results

Reflection Date/Time (GMT) Graph



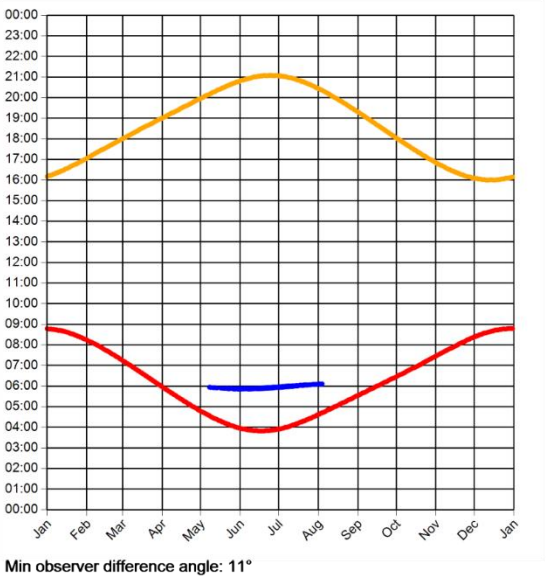
Min observer difference angle: 1.3°
Max observer difference angle: 17.5°

Observer Location — Sun azimuth range is 69.9° - 89.9° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

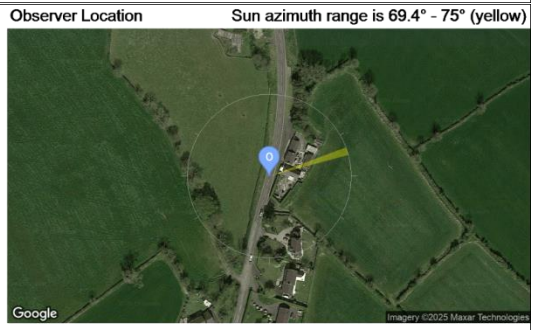
Observer 77 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 11°
Max observer difference angle: 15.8°

Observer Location — Sun azimuth range is 69.4° - 75° (yellow)

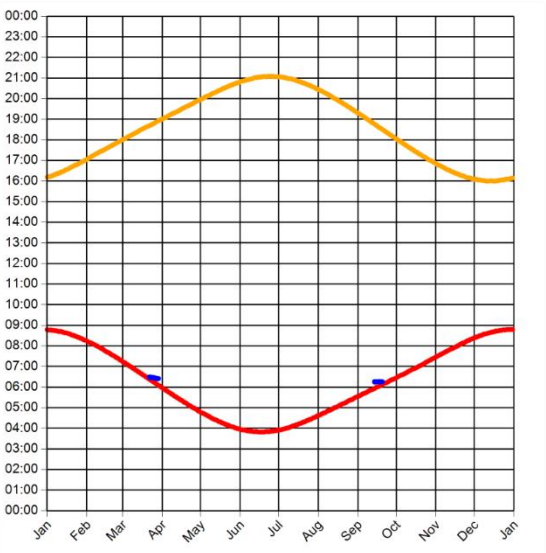


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Dwelling Receptors

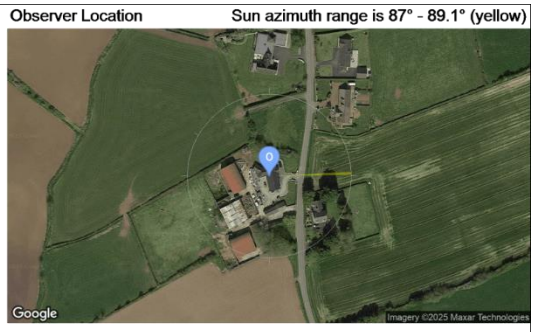
Observer 131 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.9°
Max observer difference angle: 2.7°

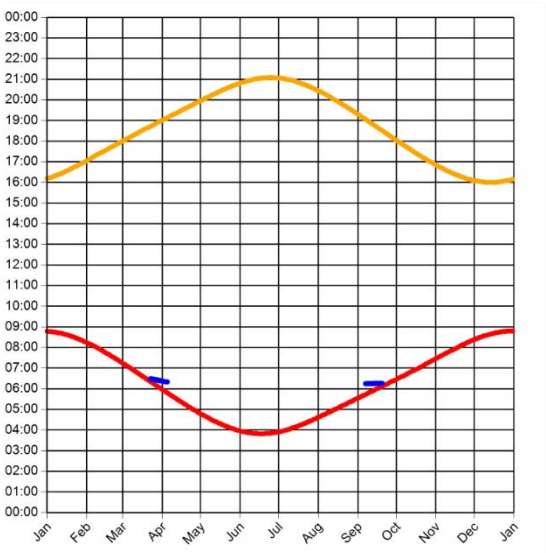
Observer Location — Sun azimuth range is 87° - 89.1° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

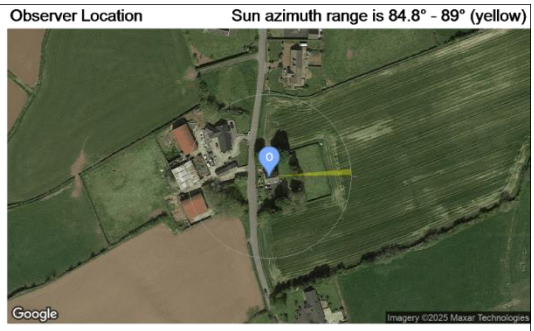
Observer 132 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.2°
Max observer difference angle: 4.6°

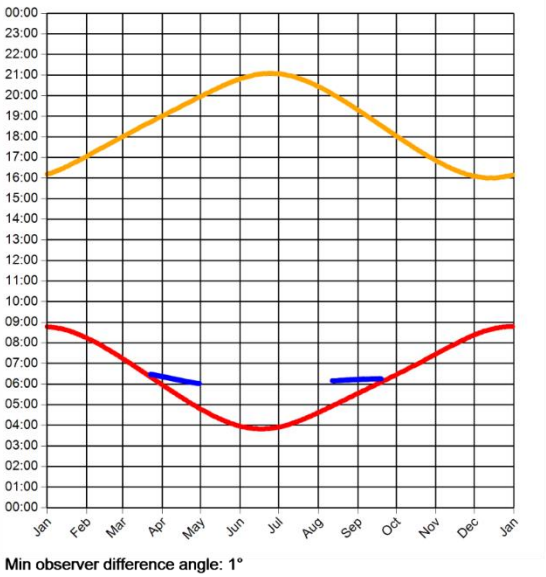
Observer Location — Sun azimuth range is 84.8° - 89° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

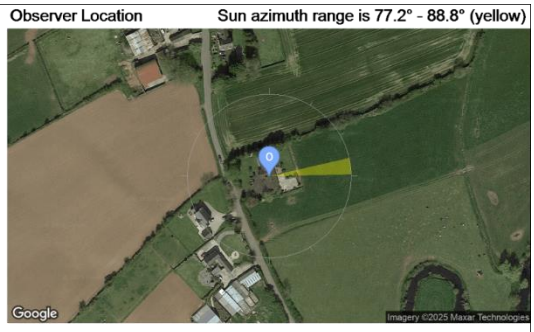
Observer 133 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1°
Max observer difference angle: 9.8°

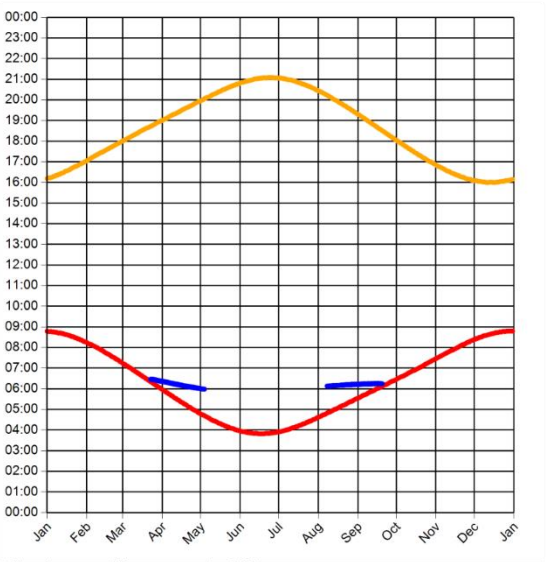
Observer Location — Sun azimuth range is 77.2° - 88.8° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 134 Results

Reflection Date/Time (GMT) Graph



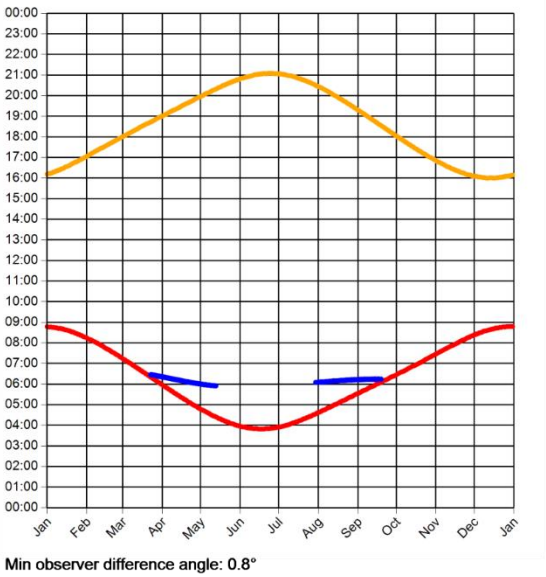
Min observer difference angle: 0.8°
Max observer difference angle: 10.3°

Observer Location — Sun azimuth range is 76° - 88.7° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

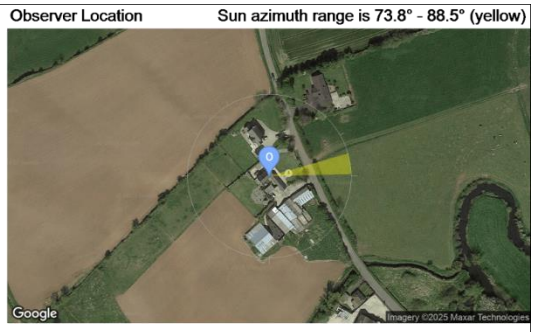
Observer 135 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.8°
Max observer difference angle: 11.7°

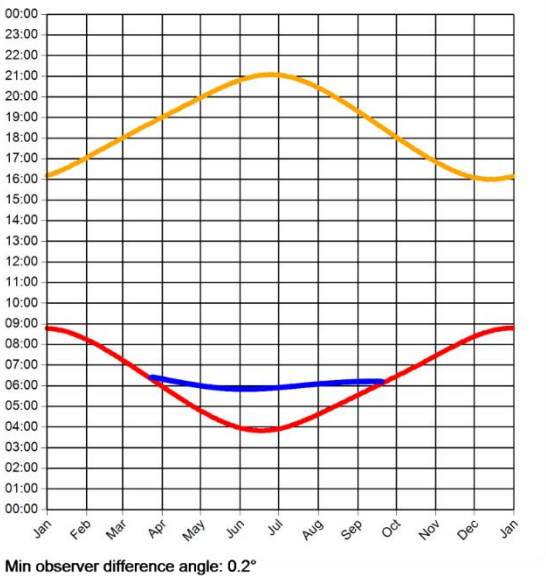
Observer Location — Sun azimuth range is 73.8° - 88.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

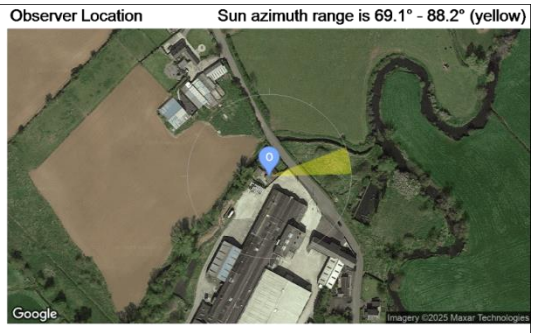
Observer 136 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.2°
Max observer difference angle: 14.7°

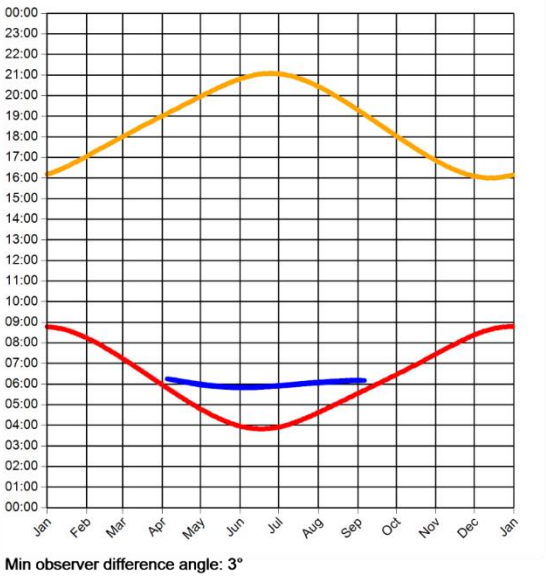
Observer Location — Sun azimuth range is 69.1° - 88.2° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

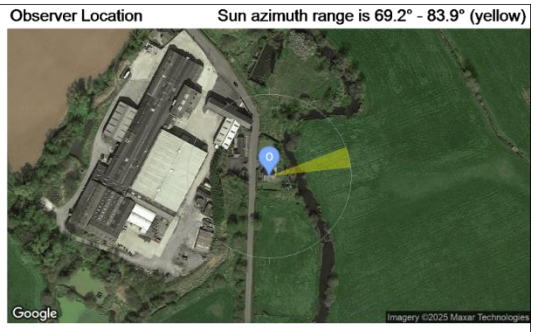
Observer 137 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 3°
Max observer difference angle: 14.9°

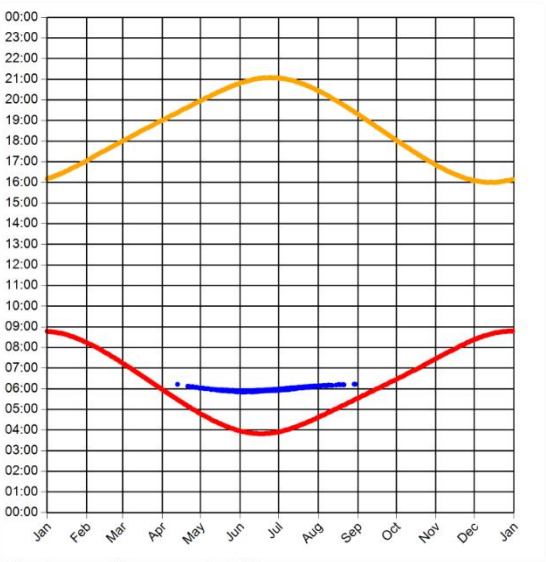
Observer Location — Sun azimuth range is 69.2° - 83.9° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

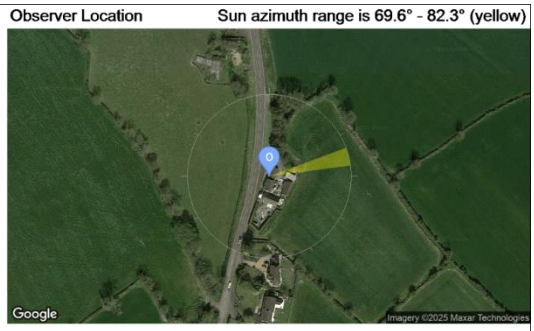
Observer 162 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 6.2°
Max observer difference angle: 16.3°

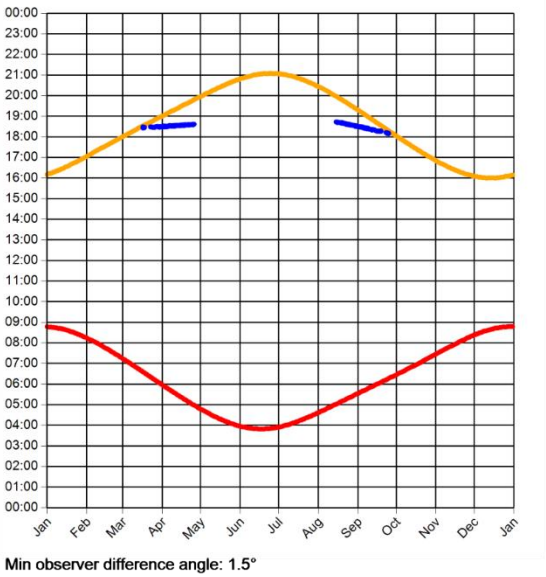
Observer Location — Sun azimuth range is 69.6° - 82.3° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

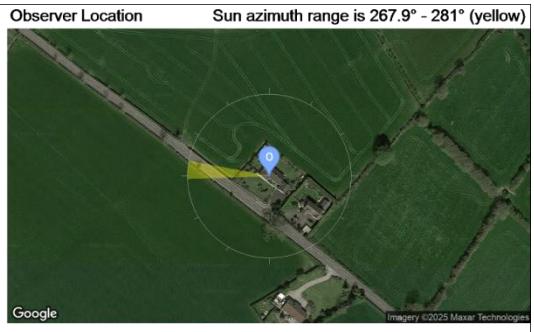
Observer 218 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.5°
Max observer difference angle: 11.1°

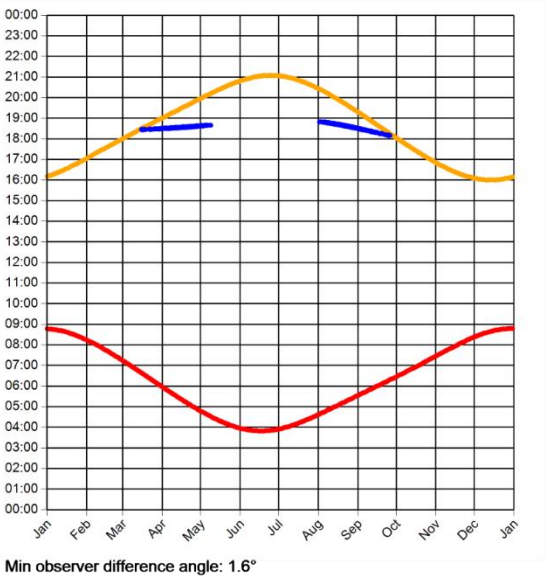
Observer Location — Sun azimuth range is 267.9° - 281° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

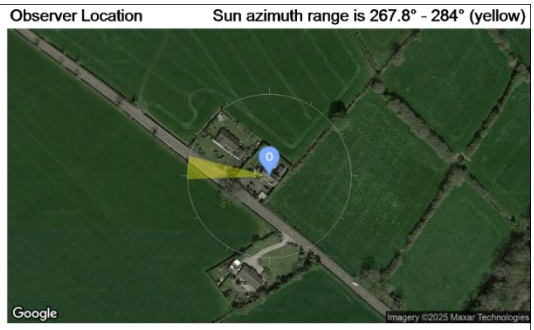
Observer 219 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.6°
Max observer difference angle: 13.5°

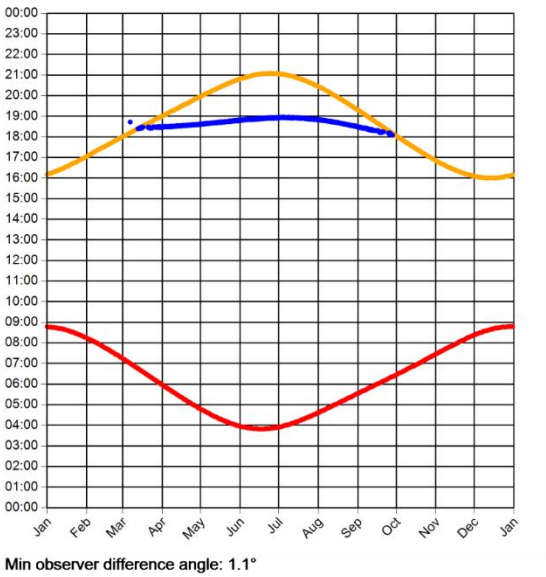
Observer Location — Sun azimuth range is 267.8° - 284° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

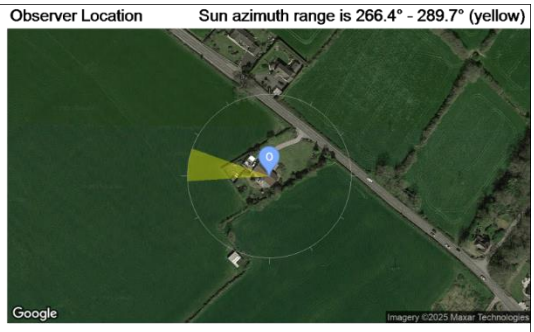
Observer 220 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.1°
Max observer difference angle: 17.2°

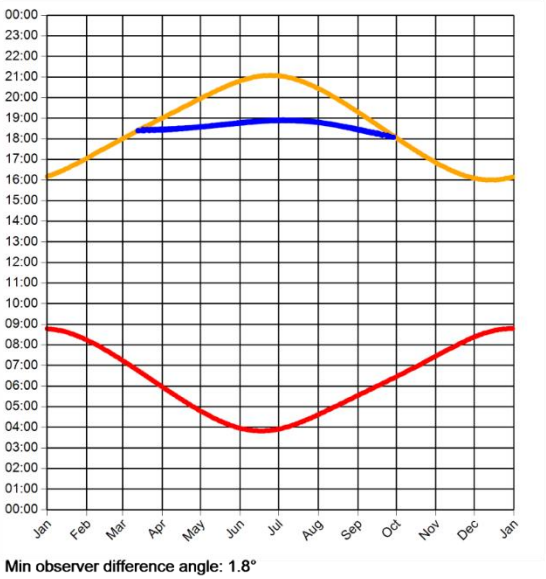
Observer Location Sun azimuth range is 266.4° - 289.7° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

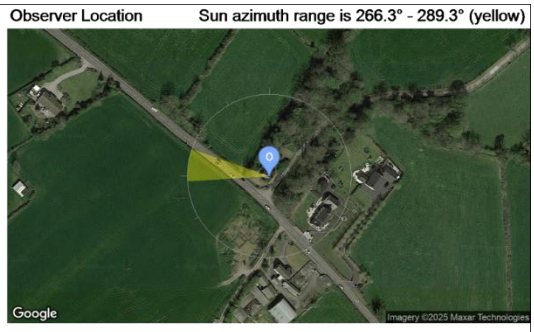
Observer 221 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.8°
Max observer difference angle: 18.1°

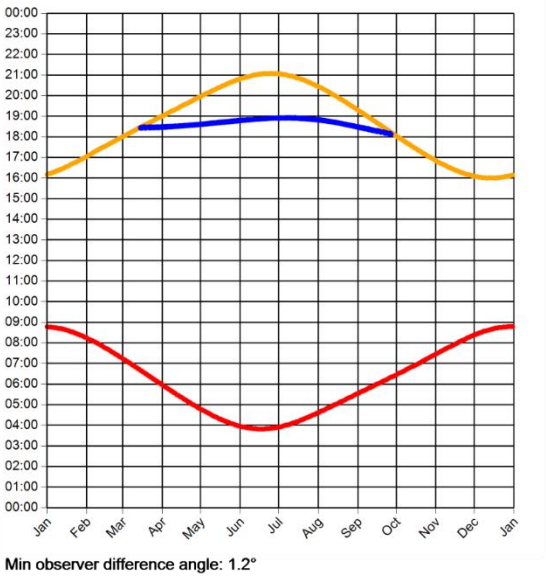
Observer Location Sun azimuth range is 266.3° - 289.3° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

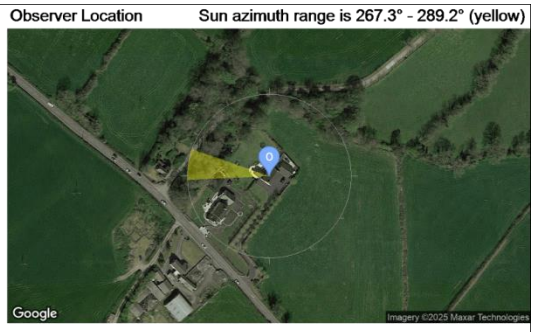
Observer 222 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.2°
Max observer difference angle: 17.4°

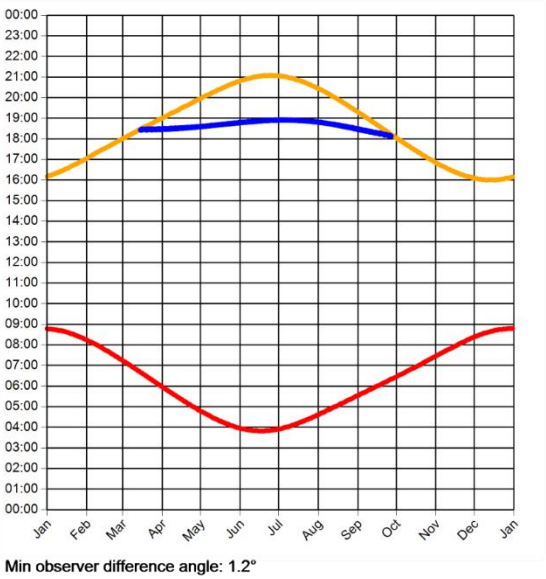
Observer Location — Sun azimuth range is 267.3° - 289.2° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

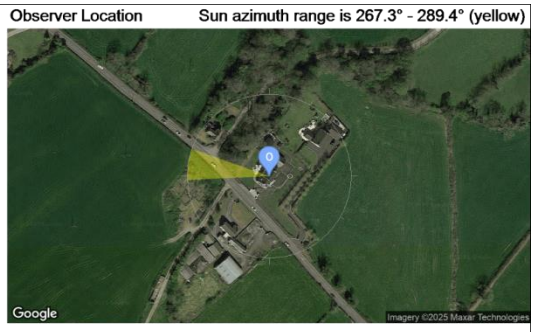
Observer 223 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.2°
Max observer difference angle: 17.6°

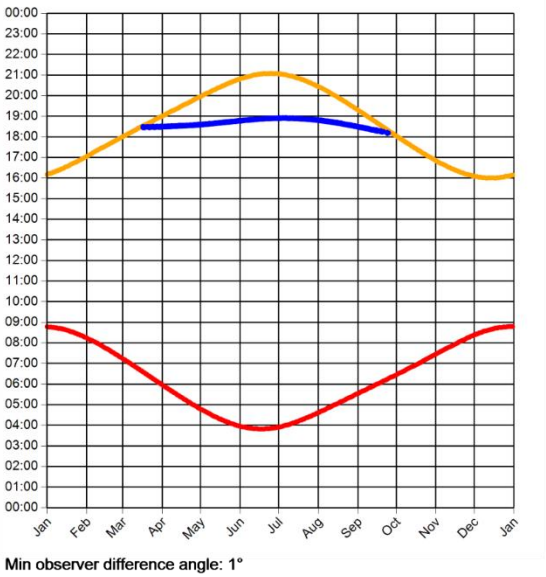
Observer Location — Sun azimuth range is 267.3° - 289.4° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

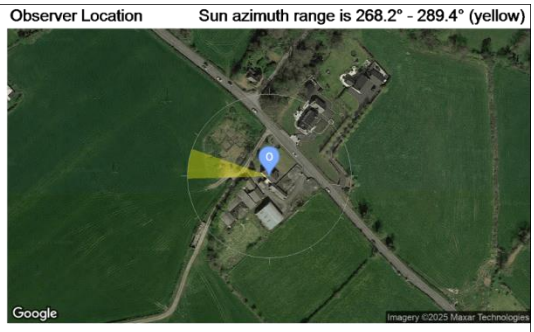
Observer 224 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1°
Max observer difference angle: 17.7°

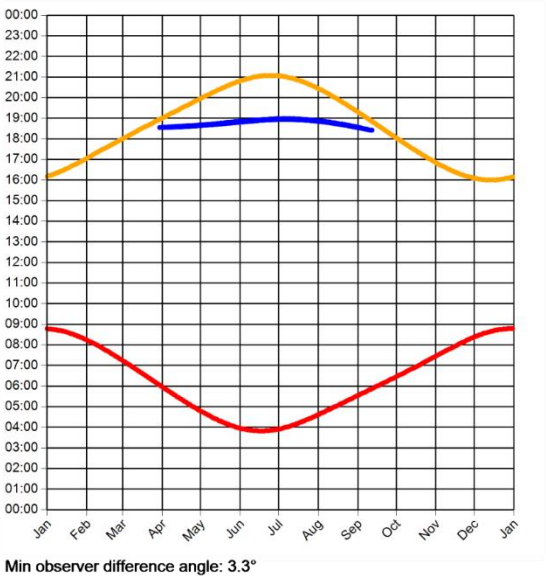
Observer Location — Sun azimuth range is 268.2° - 289.4° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

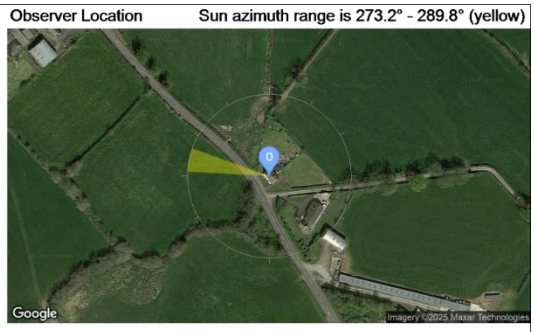
Observer 225 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 3.3°
Max observer difference angle: 16.7°

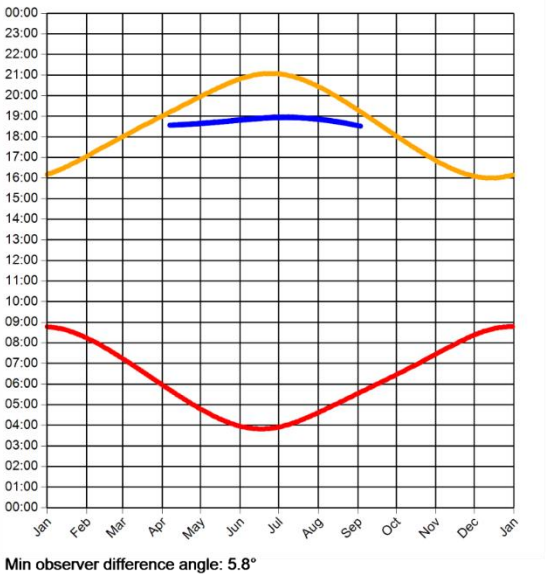
Observer Location — Sun azimuth range is 273.2° - 289.8° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

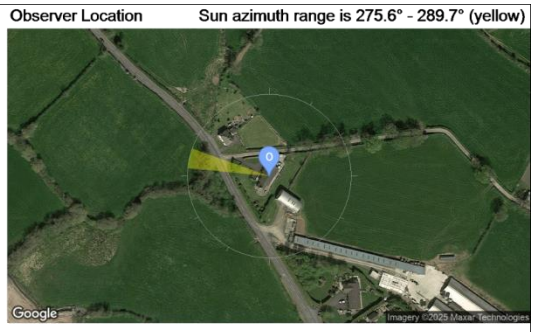
Observer 226 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 5.8°
Max observer difference angle: 17°

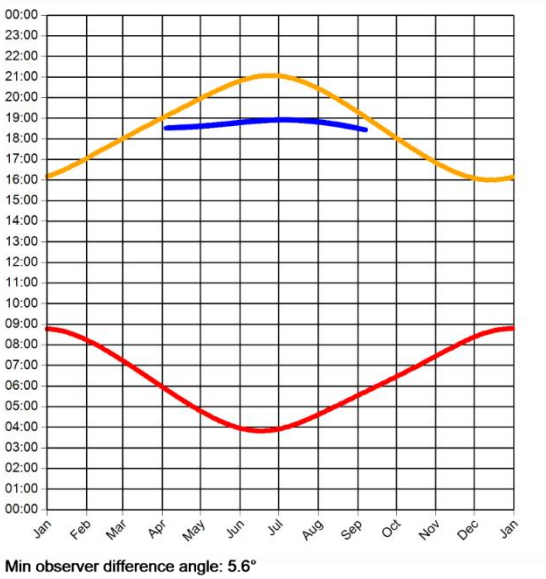
Observer Location — Sun azimuth range is 275.6° - 289.7° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

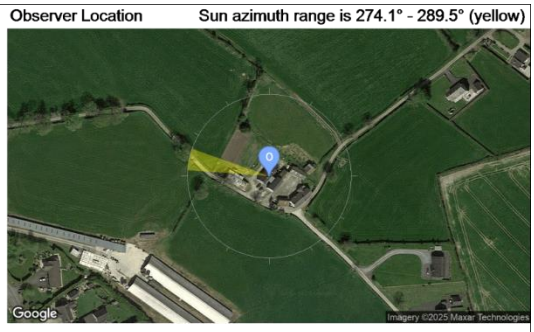
Observer 227 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 5.6°
Max observer difference angle: 17.3°

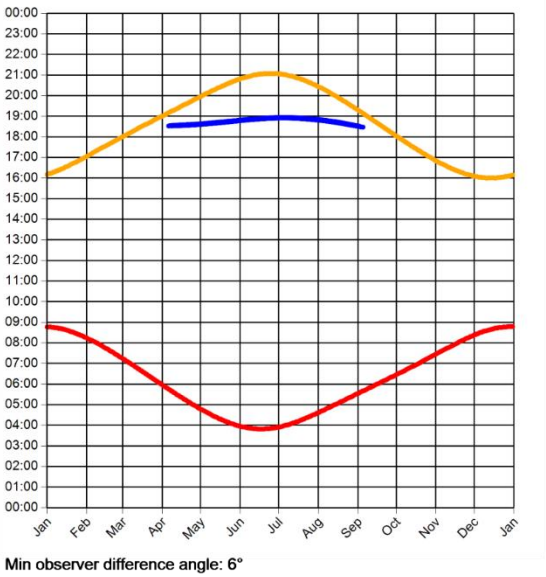
Observer Location — Sun azimuth range is 274.1° - 289.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

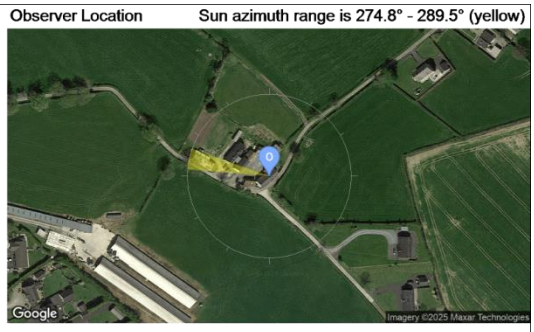
Observer 228 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 6°
Max observer difference angle: 17.2°

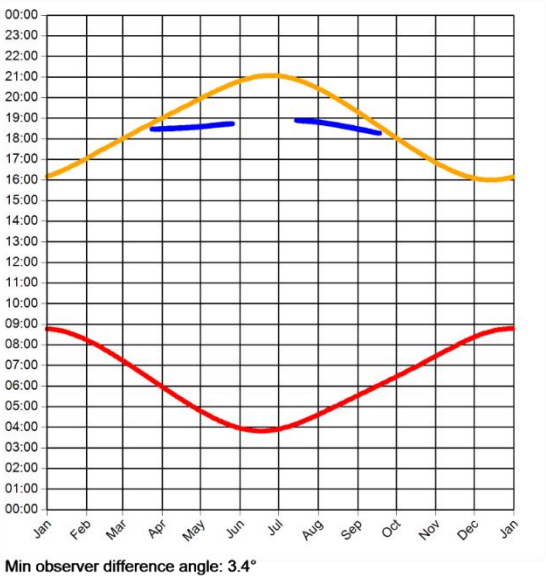
Observer Location — Sun azimuth range is 274.8° - 289.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

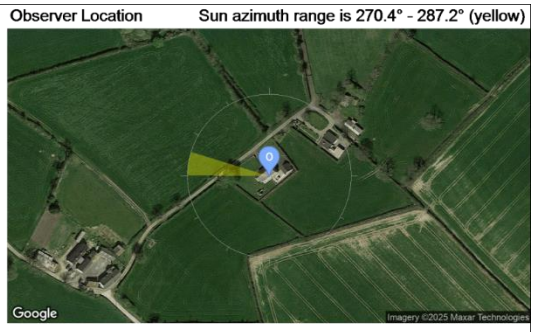
Observer 229 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 3.4°
Max observer difference angle: 16.3°

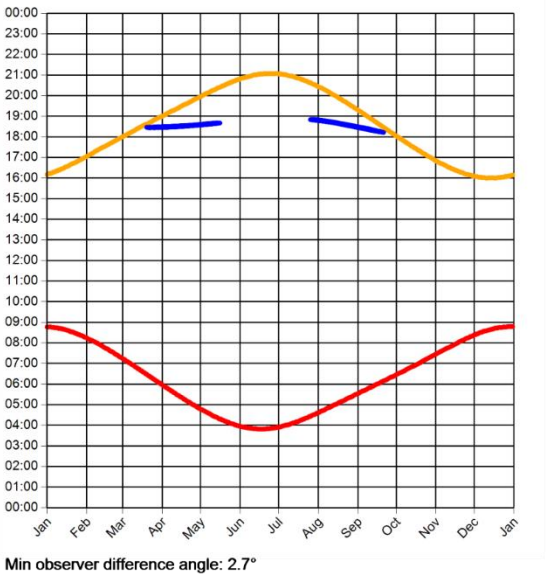
Observer Location — Sun azimuth range is 270.4° - 287.2° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

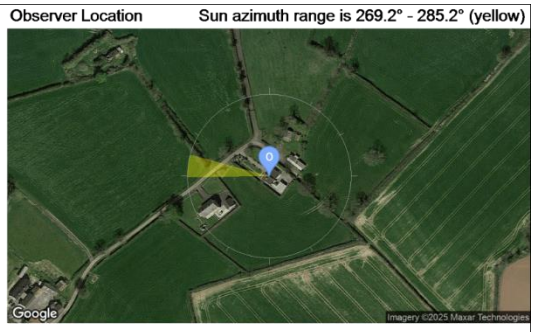
Observer 230 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 2.7°
Max observer difference angle: 15.2°

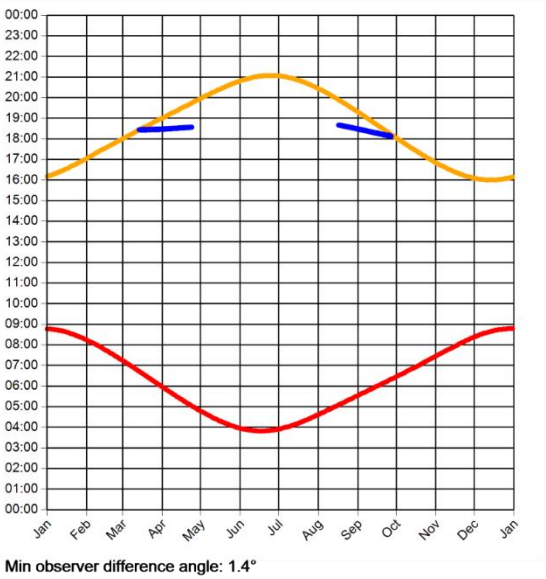
Observer Location — Sun azimuth range is 269.2° - 285.2° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

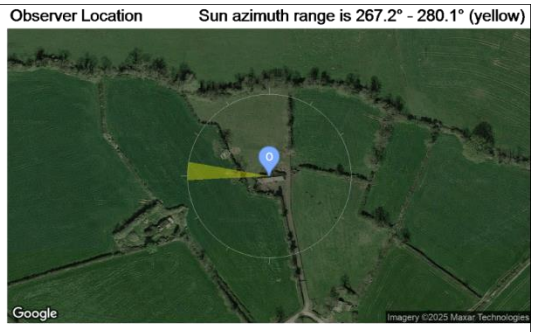
Observer 231 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.4°
Max observer difference angle: 11.2°

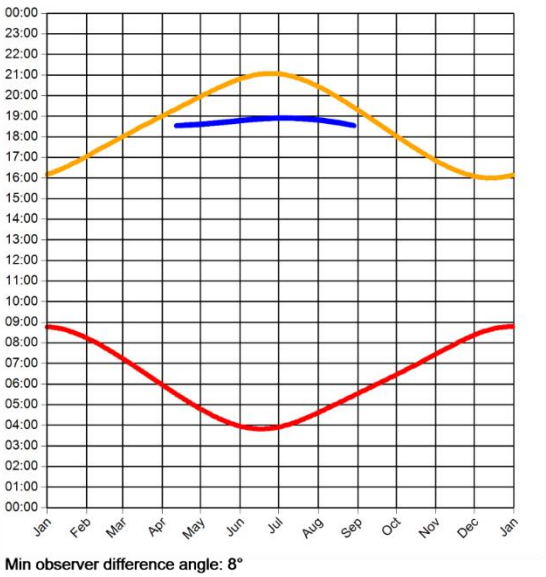
Observer Location — Sun azimuth range is 267.2° - 280.1° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

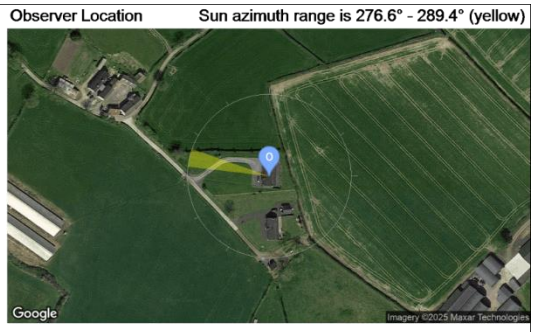
Observer 232 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 8°
Max observer difference angle: 17.5°

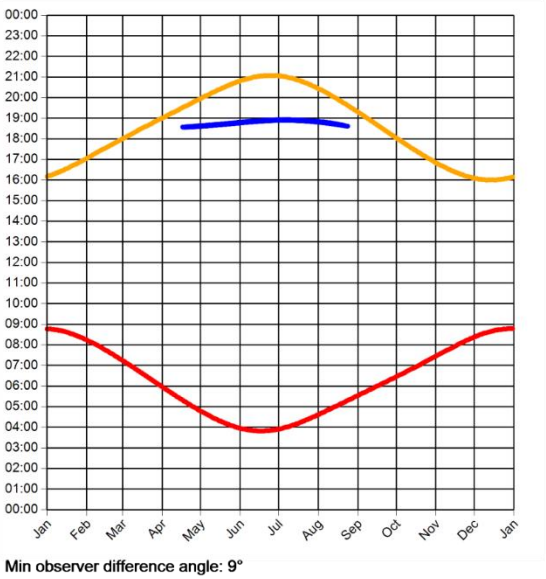
Observer Location — Sun azimuth range is 276.6° - 289.4° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

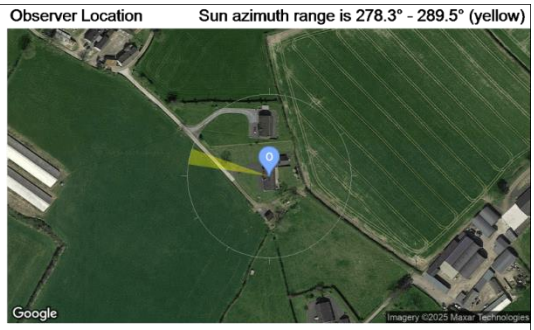
Observer 233 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 9°
Max observer difference angle: 17.5°

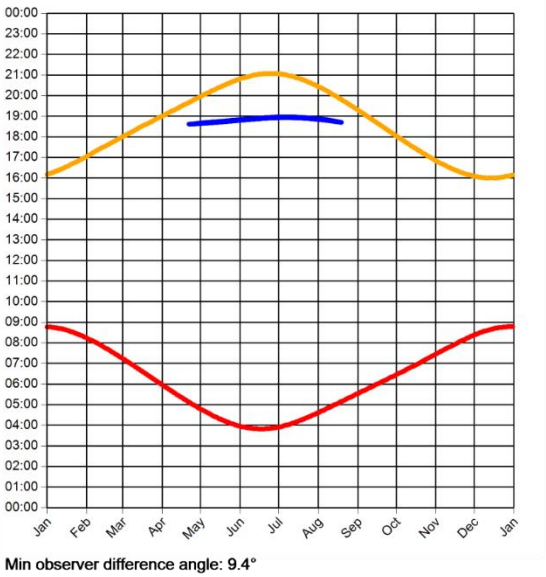
Observer Location — Sun azimuth range is 278.3° - 289.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

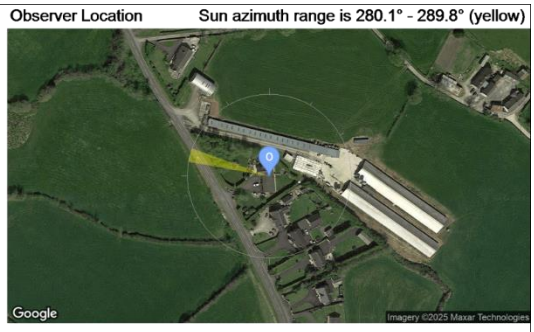
Observer 234 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 9.4°
Max observer difference angle: 16.8°

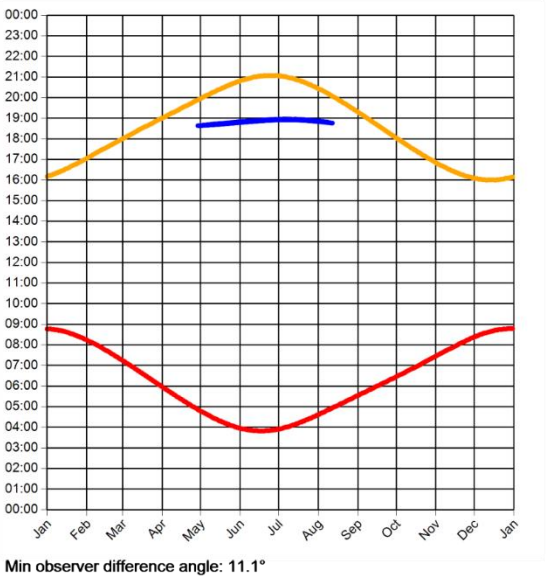
Observer Location — Sun azimuth range is 280.1° - 289.8° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

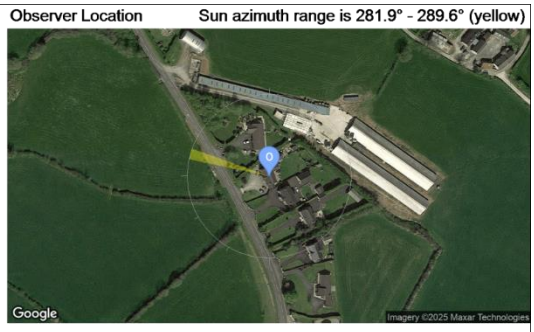
Observer 235 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 11.1°
Max observer difference angle: 17.1°

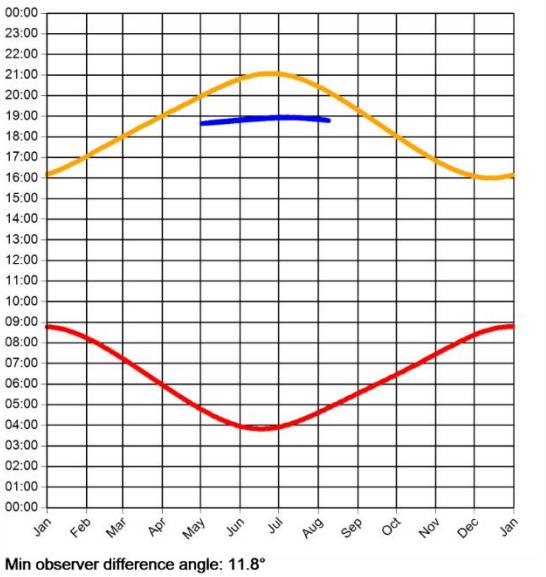
Observer Location — Sun azimuth range is 281.9° - 289.6° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

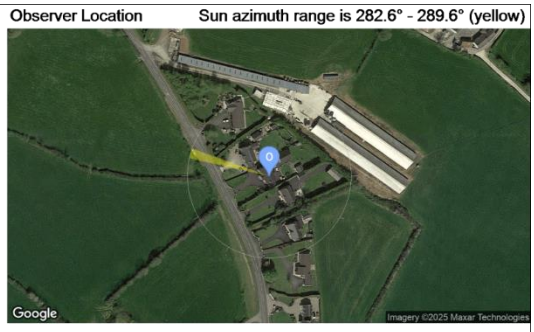
Observer 236 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 11.8°
Max observer difference angle: 17.2°

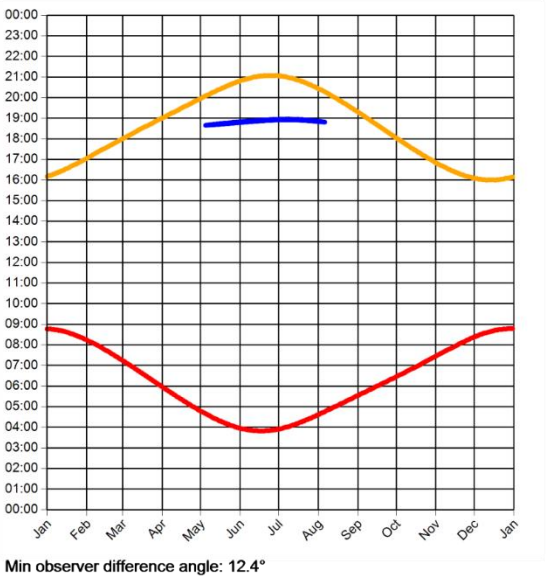
Observer Location Sun azimuth range is 282.6° - 289.6° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 237 Results

Reflection Date/Time (GMT) Graph



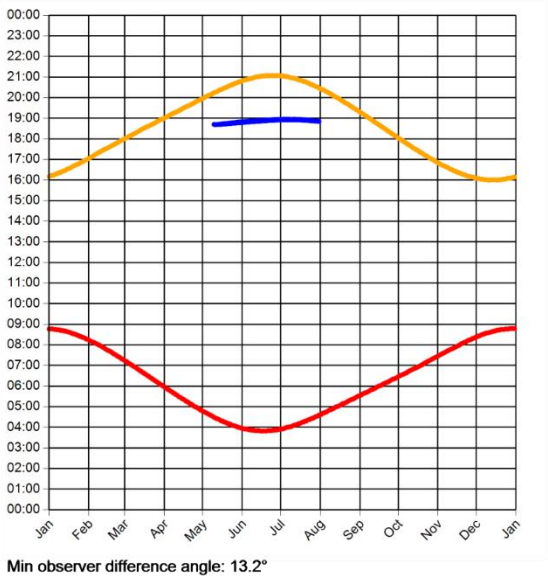
Min observer difference angle: 12.4°
Max observer difference angle: 17.2°

Observer Location Sun azimuth range is 283.3° - 289.6° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

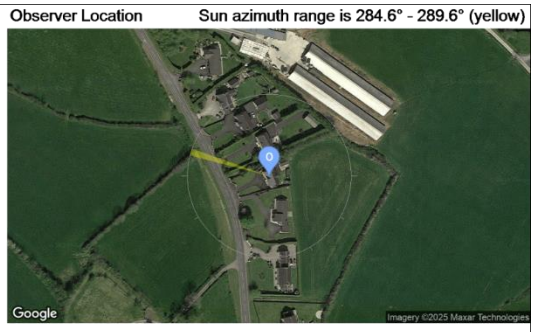
Observer 238 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 13.2°
Max observer difference angle: 17.1°

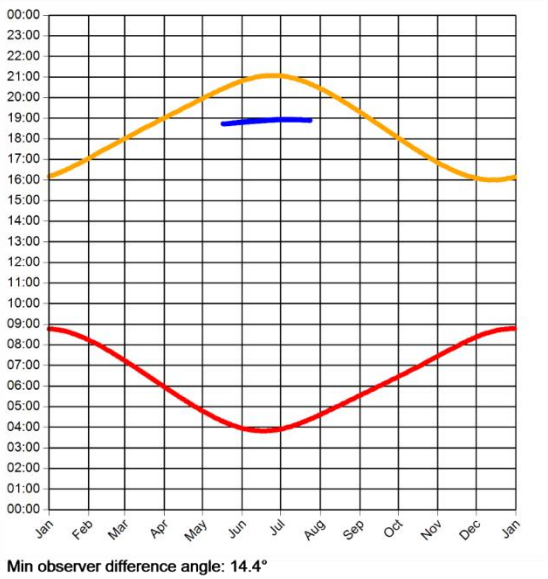
Observer Location — Sun azimuth range is 284.6° - 289.6° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

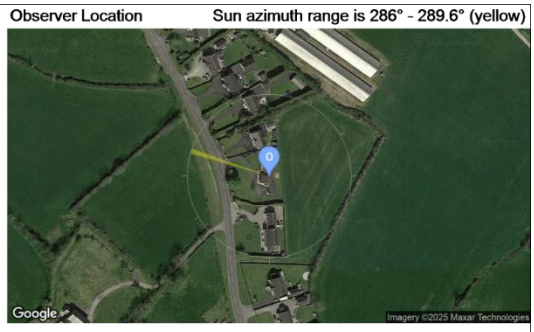
Observer 239 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 14.4°
Max observer difference angle: 17.1°

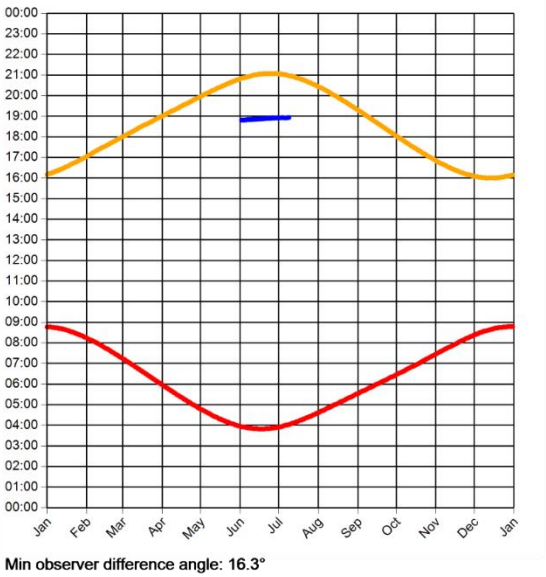
Observer Location — Sun azimuth range is 286° - 289.6° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

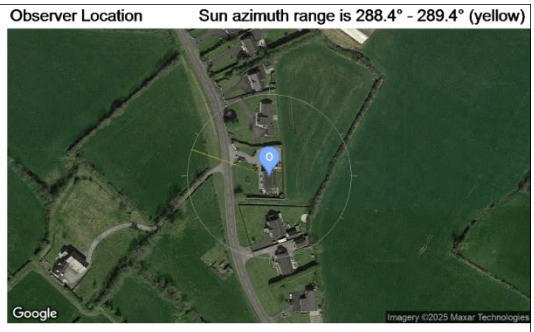
Observer 240 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 16.3°
Max observer difference angle: 17.2°

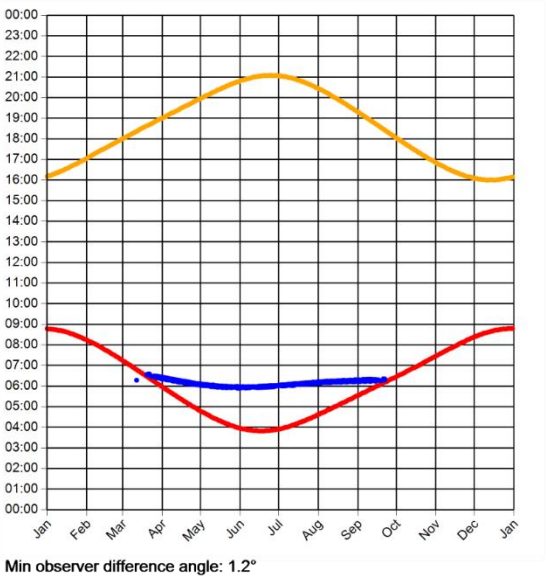
Observer Location — Sun azimuth range is 288.4° - 289.4° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

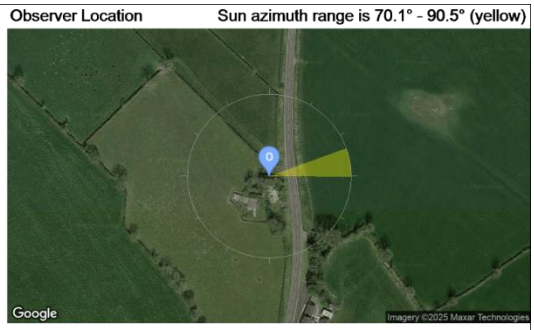
Observer Dwelling 246 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 1.2°
Max observer difference angle: 17.9°

Observer Location — Sun azimuth range is 70.1° - 90.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

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