

Proximity

PV Glint & Glare Report

Proposed Industrial Development, Former
Electrium Site, Sharston Road, Wythenshawe

Kier Sharston Limited

Our Ref: 2290a/TWK Rev 01

12 March 2026



Introduction

As a condition of planning approval Manchester City Council have set a pre-commencement condition for the submission of an Aviation Perspective Glint and Glare Assessment of the proposed solar installation.

This Report has been prepared by Proximity and assesses the potential for Solar Glint & Glare on the flight operations for Manchester Airport from the roof top photovoltaic panels of the Proposed Development.



Block 1 SE

Block 3

Block 2

Block 1 NW

View of the **Proposed Development** - The area of the PV arrays to each of the Blocks has been assumed to be the full area of the roof slope where PV arrays are proposed - shaded blue

Planning Condition to Discharge

25) Prior to construction, the submission of an Aviation Perspective Glint and Glare Assessment of the proposed solar installation submitted to the City Council as Local Planning Authority in consultation with the aerodrome safeguarding authority for Manchester Airport (MAN); demonstrating no harmful impact to operations at MAN. The Glint and Glare Assessment is to assess at least the following aviation receptors:

- > Runway approach paths starting at 10NM from the runway threshold at 3000ft at a 3-degree glide slope down to 15m above the runway threshold in a straight line. With a receptor located at least at every 1NM interval.;*
- > 2 Mile Runway approach paths - expected luminance is not to exceed 20,000cd/m²;*
- > ATC Tower visual cab - predictions of no glint and glare towards ATC is required*

Reason - To ensure no detrimental impact to aviation operations at MAN caused by glint or glare to critical aviation receptors, pursuant to policies DM1 and SP1 of the Manchester Core Strategy.

Planning Context

The National Planning Policy Framework (NPPF)

The NPPF sets out the planning policies for England.

A key theme of the NPPF is the promotion of sustainable development, though no specific references are made to glint or glare from photovoltaic arrays or buildings.

National Policy Statement for Renewable Energy Infrastructure (EN-3)

The NPS is intended for large scale solar photovoltaic (PV), >50MW in England. Whilst the PV installation proposed on the roof of the Proposed Development is anticipated to be below this threshold, the NPS does provide useful guidance, although does not prescribe a specific method of assessment. In particular, Section 2.10.159 of the NPS states.

‘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.’

Assessment Approach

The following Guidance is relevant to this assessment:

- > Review of Solar Energy System Projects on Federally-Obligated Airports 2013 & 2021; and
- > CAST Aerodrome Safeguarding Advice Note 5 (February 2024) - Renewable Energy Developments.

The United States' Federal Aviation Administration (FAA) guidance in their Review of Solar Energy System Projects on Federally-Obligated Airports (2013) states that, for an on-airfield solar PV development, the ocular impact was to be assessed using the Solar Glare Hazard Analysis Tool (SGHAT).

The FAA withdrew this requirement in the 2021 edition of their guidance as the SGHAT software was no longer available free of charge. The 2021 edition was revised to only require the assessment of solar

Proximity uses the modelling software developed by Forge Solar. This software applies the same methodology as the SGHAT and enables analysis of the receptors identified in the 2013 FAA Guidance.

Assessment Approach

SGHAT bands glint and glare into 3 bands of severity (ocular hazards), shown as different colours in the analysis output. These bands are a function of the intensity of the reflection and the viewing angle and are not duration dependent.

Severity	Examples of Receptor
Red Glare	Glare predicted with potential for permanent eye damage (retinal burn)
Yellow Glare	Glare predicted with a potential for temporary after-image
Green Glare	Glare predicted with a low potential for temporary after image
No Glare	No glare predicted

Assessment Approach

The sensitivity of the receptors is set out below.

Sensitivity	Examples of Receptor
High	Airport Traffic Control Tower
Moderate	2-mile Approach
Low	Other Routes

Standard to Achieve

The FAA guidance (2013) states that to obtain 'no objection', from the FEE for a proposed airport based solar energy system, the applicant is to meet the following standard:

- > No Potential for glint or glare in the existing, or planned, Airport Traffic Control Tower (ATCT) cab; and
- > No potential for glare or 'low potential for after-image' (Green Glare) along the final approach path for any existing landing threshold, or future landing thresholds.

The final approach path is defined as two miles from fifty feet above the landing threshold using a standard 3-degree glide path (2-mile approach).

Receptors Assessed

Manchester Airport have requested that the following receptors be assessed:

- > Runway approach paths starting at 10NM from the runway threshold at 3000ft at a 3-degree glide slope down to 15m above the runway threshold in a straight line. With a receptor located at least at every 1NM interval;
- > 2 Mile Runway approach paths - expected luminance is not to exceed 20,000cd/m²; and
- > ATC Tower visual cab - predictions of no glint and glare towards ATC is required.

In addition to the receptors suggested by Manchester Airport, Proximity have also assessed the potential for glare impact on the local flight manoeuvring routes, a low sensitivity receptor.

The Stretton 05L-05R route being the closest local flight manoeuvre route to the proposed PV arrays.

Summary Results

Receptor	Glare	FAA Standard Met
ATCT	No Glare	Yes
2-mile approach (R23L)	No Glare	Yes
2-mile approach (R23R)	No Glare	Yes
2-mile approach (R05L)	No Glare	Yes
2-mile approach (R05R)	No Glare	Yes
10 NM approach 23L	Green Glare	No FFA standard
10 NM approach 23R	Green Glare	No FFA standard
10 NM approach 05L	No Glare	No FFA standard
10 NM approach 05R	No Glare	No FFA standard

Summary Results

Receptor	Glare	FAA Standard Met
Stretton 05L-05R Outbound	Green Glare	No FFA standard
Thelwall 05L-05R Outbound	No Glare	No FFA standard
Macclesfield South 23L-23R Inbound	No Glare	No FFA standard
Macclesfield South 23L-23R Outbound	No Glare	No FFA standard

Results

ATCT

The roof top PV arrays for the Proposed Development does not predict any glare to the ATCT. The FAA Guidance (2013) standard for no potential for glare to the ATCT has been met.

2-Mile Approach Flight Paths

Our analysis does not predict any glare to the 2-mile approach flight paths for runway 23L & 23R or 05L & 05R. Therefore the expected luminance to these flight paths will not exceed 20,000cd/m².

These receptors meet with the FAA Guidance (2013) standard, and the luminance limit set.

10 NM Approach 05L & 05R

Our analysis does not predict any glare to the 10 NM approach for runway 05L & 05R.

Local Flight Maneuver Routes

Macclesfield South 23L-23R Inbound and Outbound routes do not predict any glare.

Thelwall 05L-05R Outbound route does not predict any glare.

10 NM Approach 23L

There is no FAA Guidance (2013) standard for this approach flight path.

Green Glare is predicted from all the PV arrays as shown in the table opposite.

Based on the low level of predicted Green Glare and the low sensitivity of the receptor, the potential for glare is not significant.

PV Array	Month	Time	Duration
Block 1 NW	End Feb - Early May Early August - Mid October	16:30-18:50 18:50 - 16:00	Peaks at 38 mins
Block 1 SE	Mid March - Late September	15:50 - 17:30	Peaks at 30 mins
Block 2	Early April - Early September	15:45 - 18:00	Peaks at 43 mins
Block 3	Mid Feb - Mid May Late July - Late October	16:30-18:20 18:30 - 16:00	Peaks at 29 mins

10 NM Approach 23R

There is no FAA Guidance (2013) standard for this approach flight path.

Green Glare is predicted from all the PV arrays as shown in the table opposite.

Based on the low level of predicted Green Glare and the low sensitivity of the receptor, the potential for glare is not significant.

PV Array	Month	Time	Duration
Block 1 NW	End Feb - Late April Early August - Mid October	16:30-18:50 18:50 - 16:00	Peaks at 45 mins
Block 1 SE	Early March - Early October	15:50 - 17:30	Peaks at 33 mins
Block 2	Late March - Early September	15:45 - 18:30	Peaks at 53 mins
Block 3	Early Feb - Early May Early August - Early November	16:30-18:20 18:30 - 16:00	Peaks at 34 mins

Stretton 05L-05R Outbound

There is no FAA Guidance (2013) standard for this approach flight path.

Green Glare is predicted from all the PV arrays as shown in the table opposite.

Based on the low level of predicted Green Glare and the low sensitivity of the receptor, the potential for glare is not significant.

PV Array	Month	Time	Duration
Block 1 NW	Mid May - Late July	05:10-06:00	Peaks at 30 mins
Block 1 SE	Mid April – Mid May Late May –Mid July Late July –Late August	04:30 – 05:30 04:00-04:45 04:45-05:30	Peaks at 28 mins
Block 2	Mid June - Early July	03:50 – 04:00	Peaks at 3 mins
Block 3	Mid May – Late July	05:30-06:10	Peaks at 27 mins

Conclusion

Through a technical assessment we have not identified any glint or glare that is considered detrimental to aviation operations at Manchester Airport.

ATC Tower visual cab - no Glint or Glare is predicted from the proposed arrays. This meets FAA guidance.

2 Mile Runway approach paths – there is no Glint or Glare predicted from the proposed arrays. Therefore, the expected luminance will not exceed 20,000cd/m². This meets FAA guidance.

The 10NM Runway approach paths to 05L & 05R – there is no Glint or Glare predicted from the proposed arrays.

The 10NM Runway approach paths to 23L & 23R will experience predicted Green Glare. The FAA do not set a standard for this length of approach. As this route meets the FAA standard for the, more sensitive, 2 Mile Runway Approach we do not consider that the Glint or Glare identified is detrimental.

The Stretton 05L-05R Outbound route will experience predicted Green Glare. The FAA does not set a standard to achieve for local routes. As this route meets the FAA standard for the, more sensitive, 2 Mile Runway Approach we do not consider that the Glint or Glare identified is detrimental.

Appendix One

Forge Solar Analysis Results

FORGESOLAR GLARE ANALYSIS

Project: **Sharston Industrial Estate**

Site configuration: **Sharston Industrial Estate Inbound-temp-0**

Analysis conducted by Tom Kibblewhite (tom@weareproximity.co.uk) at 14:32 on 05 Dec, 2025.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	PASS	Receptor(s) marked as ATCT do not receive glare

Default glare analysis parameters and observer eye characteristics (for reference only):

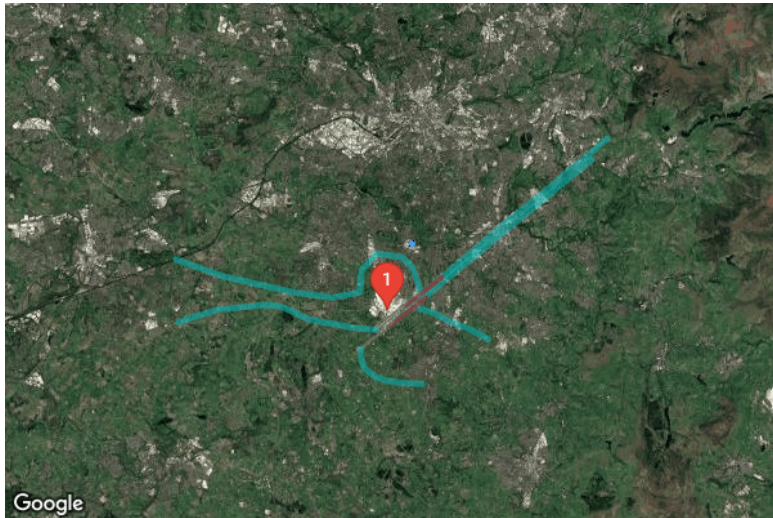
- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at <https://www.federalregister.gov/d/2013-24729>

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m²
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 166479.27792
Methodology: V2



PV Array(s)

Name: Block 1 PV Array NEW
Axis tracking: Fixed (no rotation)
Tilt: 6.0°
Orientation: 306.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.400046	-2.254171	39.39	11.54	50.93
2	53.400174	-2.254004	39.50	11.54	51.04
3	53.400065	-2.253747	39.11	13.89	53.00
4	53.399922	-2.253908	38.90	13.89	52.79

Name: Block 1 PV Array SE

Axis tracking: Fixed (no rotation)

Tilt: 6.0°

Orientation: 126.0°

Rated power: -

Panel material: Smooth glass without AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.399822	-2.253629	38.32	11.54	49.86
2	53.399950	-2.253468	38.58	11.54	50.12
3	53.400059	-2.253747	39.09	13.89	52.98
4	53.399922	-2.253903	38.89	13.89	52.78

Name: Block 2 PV Array

Axis tracking: Fixed (no rotation)

Tilt: 6.0°

Orientation: 36.0°

Rated power: -

Panel material: Smooth glass without AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.400916	-2.253750	40.00	9.95	49.95
2	53.400459	-2.252698	39.06	9.95	49.01
3	53.400347	-2.252848	38.89	11.22	50.11
4	53.400788	-2.253889	40.00	11.22	51.22

Name: Block 3 PV Array

Axis tracking: Fixed (no rotation)

Tilt: 6.0°

Orientation: 216.0°

Rated power: -

Panel material: Smooth glass without AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.401137	-2.253417	40.00	9.95	49.95
2	53.400724	-2.252371	39.44	9.95	49.39
3	53.400814	-2.252269	39.57	11.22	50.79
4	53.401210	-2.253321	40.00	11.22	51.22

Flight Path Receptor(s)

Name: FP 1 RW 23L

Description: None

Threshold height: 50 m

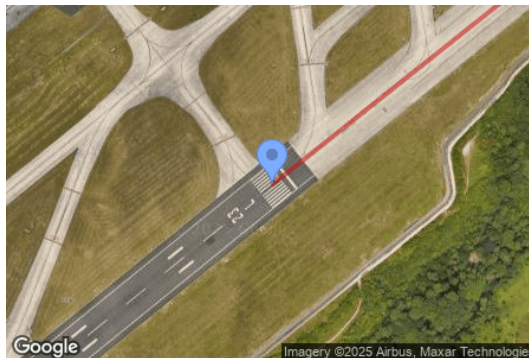
Direction: 231.5°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.348073	-2.277422	219.90	50.00	269.90
Two-mile	53.366060	-2.239457	247.70	575.60	823.30

Name: FP 2 RW 23R

Description: None

Threshold height: 50 m

Direction: 231.5°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.361211	-2.259512	252.60	50.00	302.60
Two-mile	53.379202	-2.221540	200.60	655.50	856.10

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
1-ATCT	1	53.357852	-2.279502	229.70	185.00

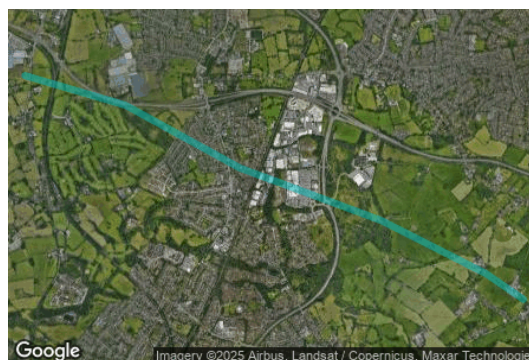
Map image of 1-ATCT



Route Receptor(s)

Name: Macclesfield South 23L-23R Inbound
Path type: One-way (toward increasing index)
Azimuthal view angle: 50.0°
Downward view angle: 90.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.339666	-2.172806	308.60	2500.00	2808.60
2	53.341880	-2.178235	307.70	2500.00	2807.70
3	53.346491	-2.193512	280.70	2500.00	2780.70
4	53.351000	-2.213940	264.80	2500.00	2764.80
5	53.356431	-2.230591	280.40	2500.00	2780.40
6	53.358992	-2.245183	261.70	2500.00	2761.70

Name: Macclesfield South 23L-23R Outbound

Path type: One-way (toward increasing index)

Azimuthal view angle: 50.0°

Downward view angle: 90.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.333400	-2.308071	187.00	2500.00	2687.00
2	53.326628	-2.308071	193.50	2500.00	2693.50
3	53.320886	-2.303951	206.10	2500.00	2706.10
4	53.315554	-2.292278	226.40	2500.00	2726.40
5	53.313298	-2.280262	230.90	2500.00	2730.90
6	53.311862	-2.263096	236.40	2500.00	2736.40
7	53.311247	-2.243183	232.50	2500.00	2732.50

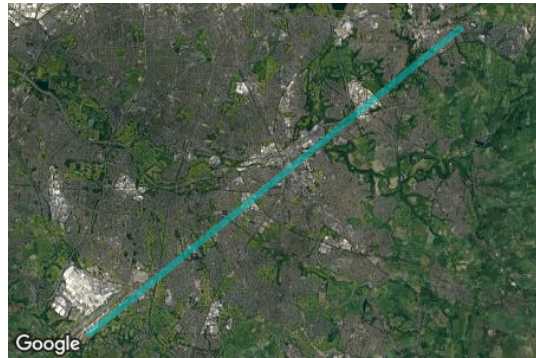
Name: Route 23L

Path type: One-way (toward increasing index)

Azimuthal view angle: 50.0°

Downward view angle: 90.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.453569	-2.062040	426.90	3250.00	3676.90
2	53.442976	-2.083931	355.00	2930.00	3285.00
3	53.432412	-2.105366	277.50	2610.00	2887.50
4	53.421940	-2.126919	261.90	2290.00	2551.90
5	53.411438	-2.148286	196.80	1970.00	2166.80
6	53.400902	-2.169885	244.90	1650.00	1894.90
7	53.390304	-2.191417	175.90	1330.00	1505.90
8	53.379812	-2.213092	209.70	1010.00	1219.70
9	53.369223	-2.234357	232.90	690.00	922.90
10	53.358604	-2.255715	261.20	370.00	631.20
11	53.348194	-2.277282	221.10	50.00	271.10

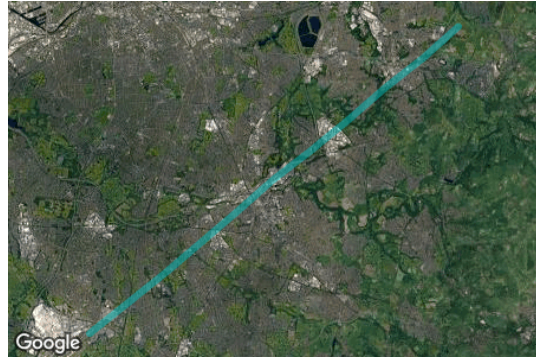
Name: Route 23R

Path type: One-way (toward increasing index)

Azimuthal view angle: 50.0°

Downward view angle: 90.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.467160	-2.045179	603.90	3250.00	3853.90
2	53.456224	-2.065821	395.80	2930.00	3325.80
3	53.446148	-2.087516	326.70	2610.00	2936.70
4	53.435034	-2.109076	248.90	2290.00	2538.90
5	53.424693	-2.130265	282.20	1970.00	2252.20
6	53.414545	-2.152441	155.10	1650.00	1805.10
7	53.403615	-2.173240	244.90	1330.00	1574.90
8	53.392757	-2.194634	157.50	1010.00	1167.50
9	53.382119	-2.215604	206.50	690.00	896.50
10	53.371666	-2.237564	219.40	370.00	589.40
11	53.361334	-2.259356	252.40	50.00	302.40

Name: Stretton

Path type: One-way (toward increasing index)

Azimuthal view angle: 50.0°

Downward view angle: 90.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.350631	-2.503050	202.90	1300.00	1502.90
2	53.358418	-2.462195	218.70	1300.00	1518.70
3	53.361696	-2.409323	157.30	1300.00	1457.30
4	53.360467	-2.393530	122.30	1300.00	1422.30
5	53.352066	-2.362288	108.40	1300.00	1408.40
6	53.348992	-2.333792	142.00	1300.00	1442.00
7	53.346737	-2.313193	179.90	1300.00	1479.90
8	53.345713	-2.291907	210.10	1300.00	1510.10

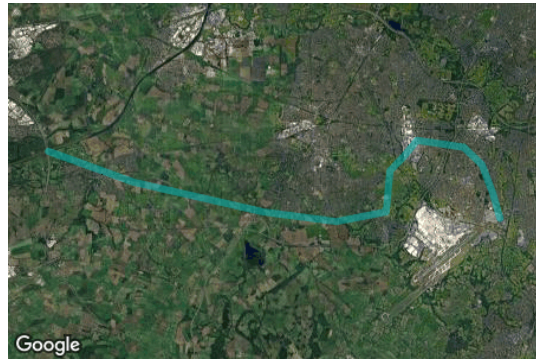
Name: Thelwall

Path type: One-way (toward increasing index)

Azimuthal view angle: 50.0°

Downward view angle: 90.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.367351	-2.243466	239.60	1300.00	1539.60
2	53.376159	-2.247757	216.50	1300.00	1516.50
3	53.385886	-2.253969	190.60	1300.00	1490.60
4	53.391926	-2.264612	167.30	1300.00	1467.30
5	53.394281	-2.291735	126.10	1300.00	1426.10
6	53.388855	-2.299116	150.60	1300.00	1450.60
7	53.383838	-2.307356	153.10	1300.00	1453.10
8	53.369604	-2.309588	222.60	1300.00	1522.60
9	53.366224	-2.338427	109.60	1300.00	1409.60
10	53.369604	-2.381170	81.80	1300.00	1381.80
11	53.374725	-2.418936	87.00	1300.00	1387.00
12	53.379845	-2.456358	141.90	1300.00	1441.90
13	53.390493	-2.505797	39.30	1300.00	1339.30

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
Block 1 PV Array NEW	6.0	306.0	10,393	0	-
Block 1 PV Array SE	6.0	126.0	12,678	0	-
Block 2 PV Array	6.0	36.0	12,644	0	-
Block 3 PV Array	6.0	216.0	10,604	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
FP 1 RW 23L	0	0
FP 2 RW 23R	0	0
1-ATCT	0	0
Macclesfield South 23L-23R Inbound	0	0
Macclesfield South 23L-23R Outbound	0	0
Route 23L	19271	0
Route 23R	21833	0
Stretton	5215	0
Thelwall	0	0

Results for: Block 1 PV Array NEW

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1 RW 23L	0	0
FP 2 RW 23R	0	0
1-ATCT	0	0
Macclesfield South 23L-23R Inbound	0	0
Macclesfield South 23L-23R Outbound	0	0
Route 23L	4205	0
Route 23R	4352	0
Stretton	1836	0
Thelwall	0	0

Flight Path: FP 1 RW 23L

0 minutes of yellow glare

0 minutes of green glare

Flight Path: FP 2 RW 23R

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare

0 minutes of green glare

Route: Macclesfield South 23L-23R Inbound

0 minutes of yellow glare

0 minutes of green glare

Route: Macclesfield South 23L-23R Outbound

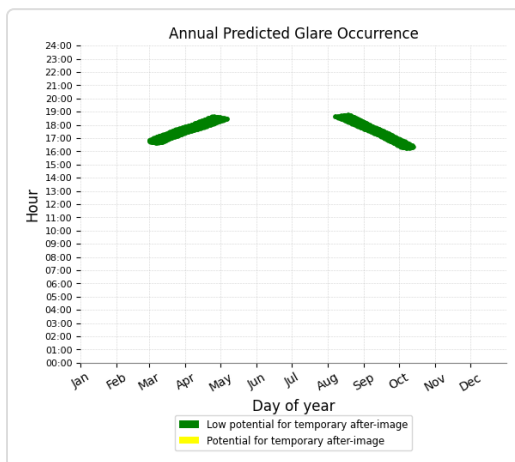
0 minutes of yellow glare

0 minutes of green glare

Route: Route 23L

0 minutes of yellow glare

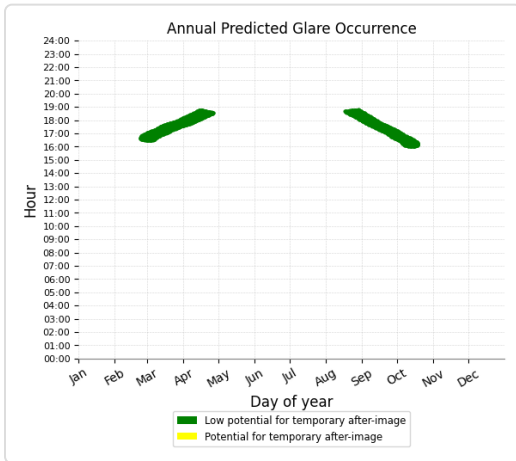
4205 minutes of green glare



Route: Route 23R

0 minutes of yellow glare

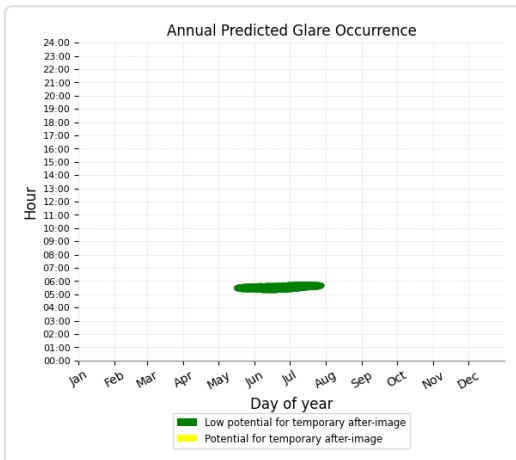
4352 minutes of green glare



Route: Stretton

0 minutes of yellow glare

1836 minutes of green glare



Route: Thelwall

0 minutes of yellow glare

0 minutes of green glare

Results for: Block 1 PV Array SE

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1 RW 23L	0	0
FP 2 RW 23R	0	0
1-ATCT	0	0
Macclesfield South 23L-23R Inbound	0	0
Macclesfield South 23L-23R Outbound	0	0
Route 23L	5004	0
Route 23R	5815	0
Stretton	1859	0
Thelwall	0	0

Flight Path: FP 1 RW 23L

0 minutes of yellow glare

0 minutes of green glare

Flight Path: FP 2 RW 23R

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare

0 minutes of green glare

Route: Macclesfield South 23L-23R Inbound

0 minutes of yellow glare

0 minutes of green glare

Route: Macclesfield South 23L-23R Outbound

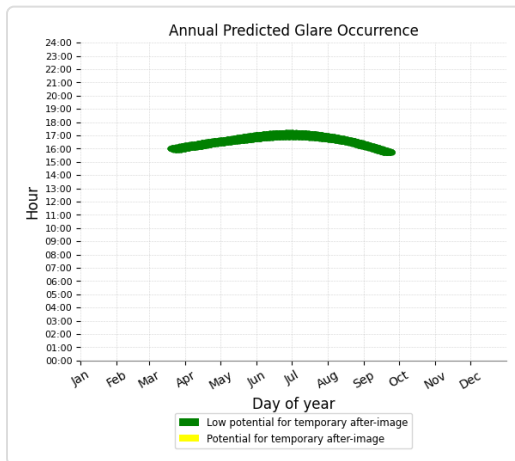
0 minutes of yellow glare

0 minutes of green glare

Route: Route 23L

0 minutes of yellow glare

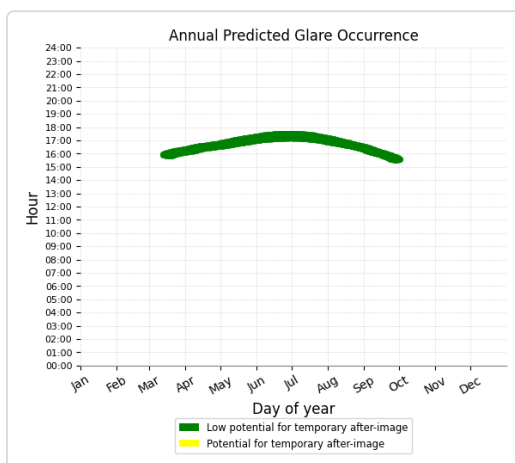
5004 minutes of green glare



Route: Route 23R

0 minutes of yellow glare

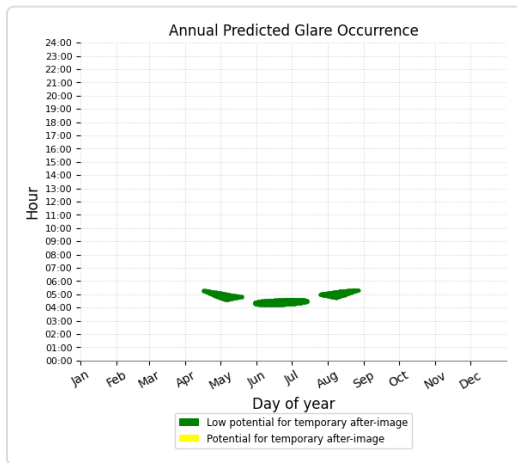
5815 minutes of green glare



Route: Stretton

0 minutes of yellow glare

1859 minutes of green glare



Route: Thelwall

0 minutes of yellow glare

0 minutes of green glare

Results for: Block 2 PV Array

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1 RW 23L	0	0
FP 2 RW 23R	0	0
1-ATCT	0	0
Macclesfield South 23L-23R Inbound	0	0
Macclesfield South 23L-23R Outbound	0	0
Route 23L	5612	0
Route 23R	7006	0
Stretton	26	0
Thelwall	0	0

Flight Path: FP 1 RW 23L

0 minutes of yellow glare

0 minutes of green glare

Flight Path: FP 2 RW 23R

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare

0 minutes of green glare

Route: Macclesfield South 23L-23R Inbound

0 minutes of yellow glare

0 minutes of green glare

Route: Macclesfield South 23L-23R Outbound

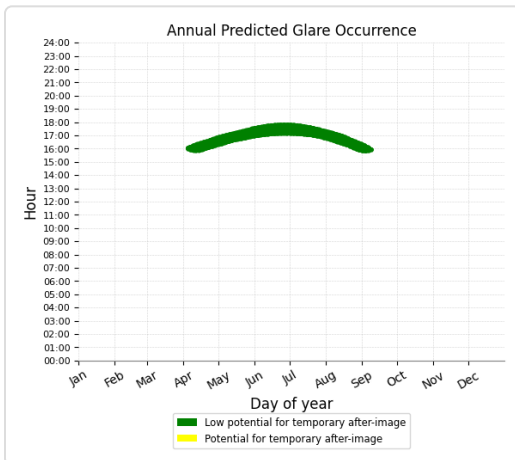
0 minutes of yellow glare

0 minutes of green glare

Route: Route 23L

0 minutes of yellow glare

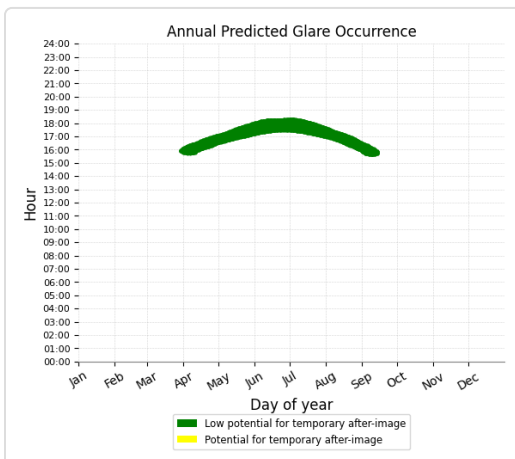
5612 minutes of green glare



Route: Route 23R

0 minutes of yellow glare

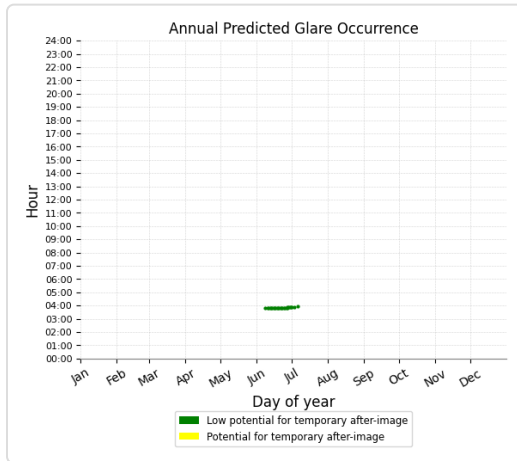
7006 minutes of green glare



Route: Stretton

0 minutes of yellow glare

26 minutes of green glare



Route: Thelwall

0 minutes of yellow glare

0 minutes of green glare

Results for: Block 3 PV Array

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1 RW 23L	0	0
FP 2 RW 23R	0	0
1-ATCT	0	0
Macclesfield South 23L-23R Inbound	0	0
Macclesfield South 23L-23R Outbound	0	0
Route 23L	4450	0
Route 23R	4660	0
Stretton	1494	0
Thelwall	0	0

Flight Path: FP 1 RW 23L

0 minutes of yellow glare

0 minutes of green glare

Flight Path: FP 2 RW 23R

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare

0 minutes of green glare

Route: Macclesfield South 23L-23R Inbound

0 minutes of yellow glare

0 minutes of green glare

Route: Macclesfield South 23L-23R Outbound

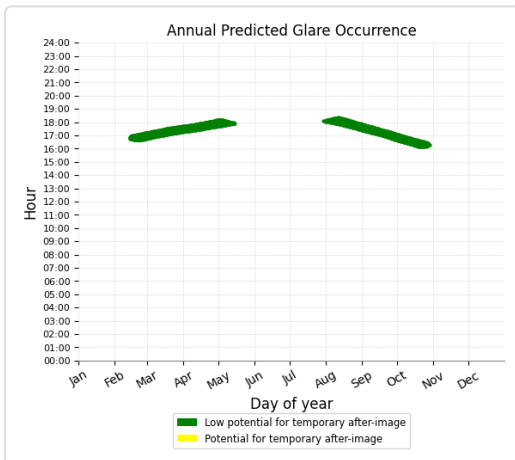
0 minutes of yellow glare

0 minutes of green glare

Route: Route 23L

0 minutes of yellow glare

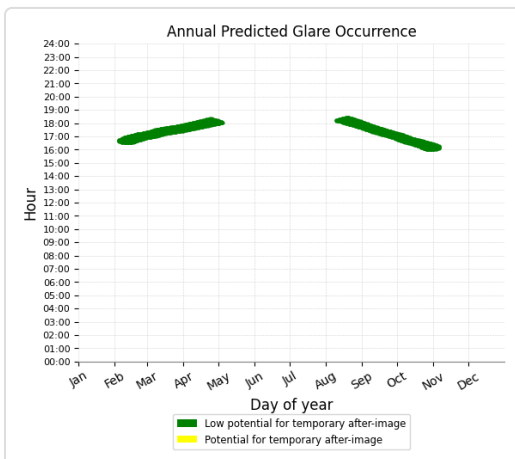
4450 minutes of green glare



Route: Route 23R

0 minutes of yellow glare

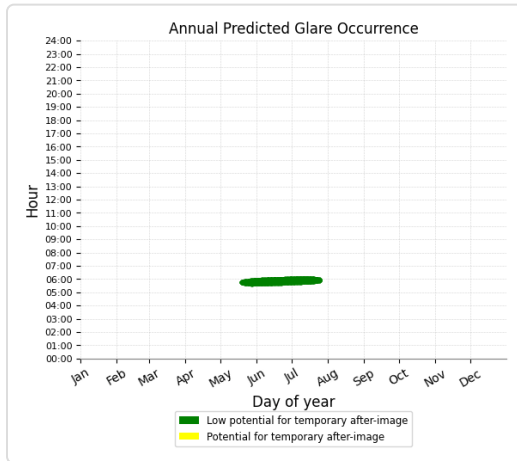
4660 minutes of green glare



Route: Stretton

0 minutes of yellow glare

1494 minutes of green glare



Route: Thelwall

0 minutes of yellow glare

0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.

Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.

Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to V1 algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.

The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size.

Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)

Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.

Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.

The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.

Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

Refer to the Help page at www.forgesolar.com/help/ for assumptions and limitations not listed here.

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FORGESOLAR GLARE ANALYSIS

Project: **Sharston Industrial Estate**

Site configuration: **Sharston Industrial Estate Departures**

Analysis conducted by Tom Kibblewhite (tom@weareproximity.co.uk) at 15:06 on 05 Dec, 2025.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	PASS	Receptor(s) marked as ATCT do not receive glare

Default glare analysis parameters and observer eye characteristics (for reference only):

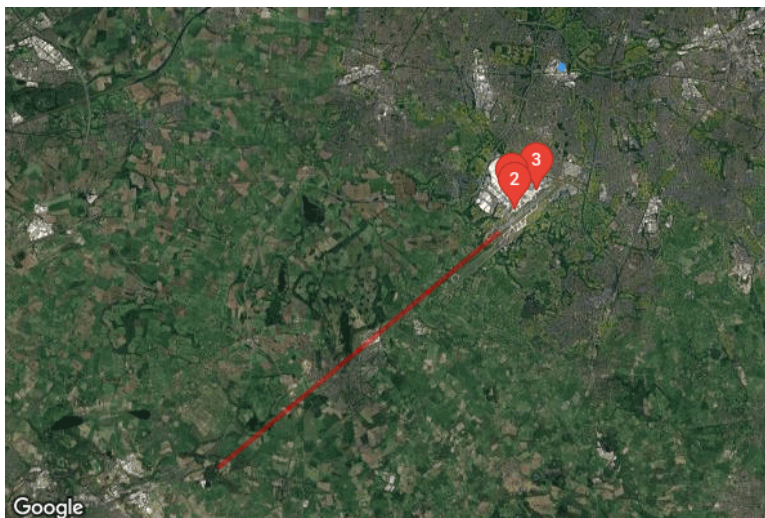
- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at <https://www.federalregister.gov/d/2013-24729>

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m²
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 166482.27792
Methodology: V2



PV Array(s)

Name: Block 1 PV Array NW
Axis tracking: Fixed (no rotation)
Tilt: 6.0°
Orientation: 306.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.400036	-2.254165	39.37	11.54	50.91
2	53.400153	-2.254026	39.47	11.54	51.01
3	53.400057	-2.253755	39.09	13.89	52.98
4	53.399924	-2.253921	38.91	13.89	52.80

Name: Block 1 PV Array SE

Axis tracking: Fixed (no rotation)

Tilt: 8.0°

Orientation: 126.0°

Rated power: -

Panel material: Smooth glass without AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.399800	-2.253629	38.27	11.54	49.81
2	53.399937	-2.253473	38.55	11.54	50.09
3	53.400059	-2.253752	39.09	13.89	52.98
4	53.399921	-2.253924	38.91	13.89	52.80

Name: Block 2 PV Array

Axis tracking: Fixed (no rotation)

Tilt: 6.0°

Orientation: 36.0°

Rated power: -

Panel material: Smooth glass without AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.400455	-2.252701	39.06	9.95	49.01
2	53.400903	-2.253731	40.00	9.95	49.95
3	53.400794	-2.253886	40.00	11.22	51.22
4	53.400343	-2.252835	38.87	11.22	50.09

Name: Block 3 PV Array

Axis tracking: Fixed (no rotation)

Tilt: 6.0°

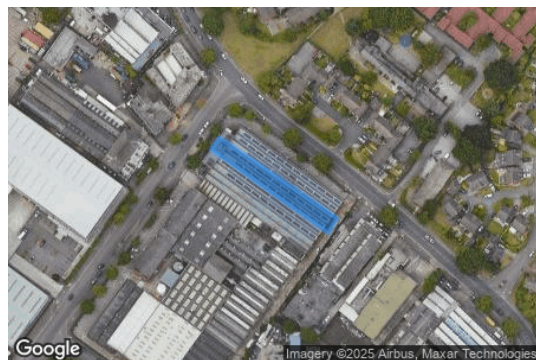
Orientation: 216.0°

Rated power: -

Panel material: Smooth glass without AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.401181	-2.253366	40.00	9.95	49.95
2	53.400730	-2.252298	39.45	9.95	49.40
3	53.400810	-2.252213	39.57	11.22	50.79
4	53.401245	-2.253285	40.00	11.22	51.22

Flight Path Receptor(s)

Name: FP 1

Description: None

Threshold height: 50 m

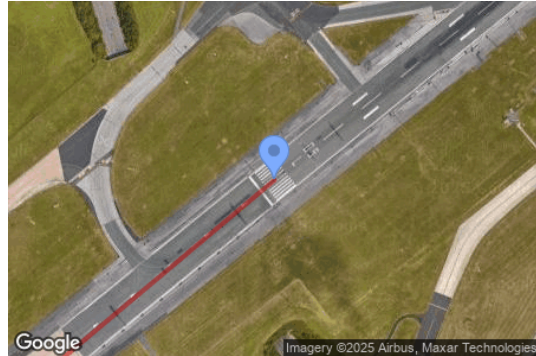
Direction: 50.0°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.347677	-2.287538	218.60	50.00	268.60
Two-mile	53.329092	-2.324683	164.00	658.00	822.00

Name: FP 2

Description: None

Threshold height: 657 m

Direction: 50.1°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.329090	-2.324686	164.00	658.00	822.00
Two-mile	53.310524	-2.361843	196.60	1178.80	1375.40

Name: FP 3

Description: None

Threshold height: 1178 m

Direction: 50.1°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.310527	-2.361849	196.60	1178.80	1375.40
Two-mile	53.291977	-2.399011	144.40	1784.40	1928.80

Name: FP 4
Description: None
Threshold height: 1784 m
Direction: 50.1°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.291991	-2.399044	144.40	1784.40	1928.80
Two-mile	53.273425	-2.436168	120.40	2361.80	2482.20

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
1-ATCT	1	53.357852	-2.279502	229.70	185.00
OP 2	2	53.355142	-2.278324	238.80	50.00
OP 3	3	53.361097	-2.266458	257.60	50.00

Map image of 1-ATCT



GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
Block 1 PV Array NW	6.0	306.0	0	0	-
Block 1 PV Array SE	8.0	126.0	0	0	-
Block 2 PV Array	6.0	36.0	0	0	-
Block 3 PV Array	6.0	216.0	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
FP 1	0	0
FP 2	0	0
FP 3	0	0
FP 4	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0

Results for: Block 1 PV Array NW

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	0	0
FP 2	0	0
FP 3	0	0
FP 4	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0

Flight Path: FP 1

0 minutes of yellow glare

0 minutes of green glare

Flight Path: FP 2

0 minutes of yellow glare

0 minutes of green glare

Flight Path: FP 3

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Results for: Block 1 PV Array SE

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	0	0
FP 2	0	0
FP 3	0	0
FP 4	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0

Flight Path: FP 1

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 2

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 3

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Results for: Block 2 PV Array

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	0	0
FP 2	0	0
FP 3	0	0
FP 4	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0

Flight Path: FP 1

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 2

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 3

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Results for: Block 3 PV Array

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	0	0
FP 2	0	0
FP 3	0	0
FP 4	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0

Flight Path: FP 1

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 2

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 3

0 minutes of yellow glare

0 minutes of green glare

Flight Path: FP 4

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.

Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.

Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to V1 algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.

The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size.

Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)

Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.

Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.

The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.

Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

Refer to the Help page at www.forgesolar.com/help/ for assumptions and limitations not listed here.

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FORGESOLAR GLARE ANALYSIS

Project: **Sharston Industrial Estate**

Sharston Solar Panels

Site configuration: **Sharston Inbound SOUTH-temp-1**

Analysis conducted by Tom Kibblewhite (tom@weareproximity.co.uk) at 09:10 on 11 Mar, 2026.

Calculated via ForgeSolar Radiometric Physics Engine v3.1.0

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	PASS	Receptor(s) marked as ATCT do not receive glare

Default glare analysis parameters and observer eye characteristics (for reference only):

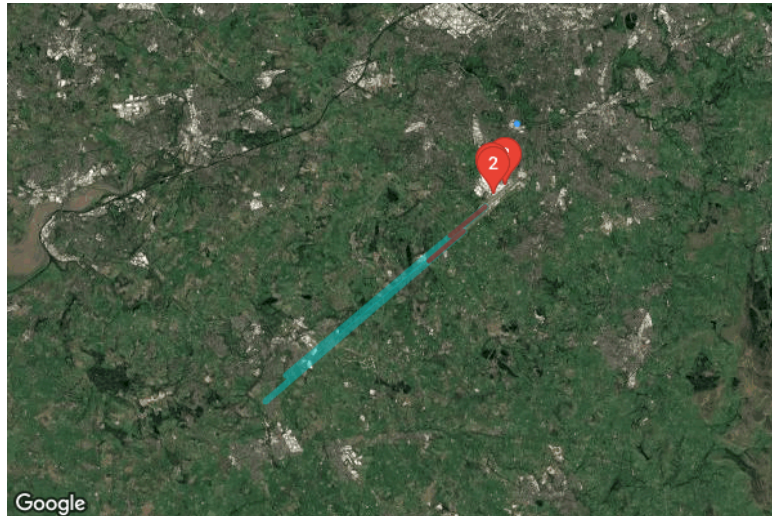
- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at <https://www.federalregister.gov/d/2013-24729>

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m²
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 172804.27792



PV Array(s)

Name: Block 1 PV Array NW
Axis tracking: Fixed (no rotation)
Tilt: 6.0°
Orientation: 306.0°
Rated power: -
Panel material: Smooth glass without AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.400036	-2.254165	39.40	11.50	50.90
2	53.400153	-2.254026	39.50	11.50	51.00
3	53.400057	-2.253755	39.10	13.90	53.00
4	53.399924	-2.253921	38.90	13.90	52.80

Name: Block 1 PV Array SE

Axis tracking: Fixed (no rotation)

Tilt: 8.0°

Orientation: 126.0°

Rated power: -

Panel material: Smooth glass without AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.399800	-2.253629	38.30	11.50	49.80
2	53.399937	-2.253473	38.60	11.50	50.10
3	53.400059	-2.253752	39.10	13.90	53.00
4	53.399921	-2.253924	38.90	13.90	52.80

Name: Block 2 PV Array

Axis tracking: Fixed (no rotation)

Tilt: 6.0°

Orientation: 36.0°

Rated power: -

Panel material: Smooth glass without AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.400455	-2.252701	39.10	9.90	49.00
2	53.400903	-2.253731	40.00	10.00	50.00
3	53.400794	-2.253886	40.00	11.20	51.20
4	53.400343	-2.252835	38.90	11.20	50.10

Name: Block 3 PV Array
Axis tracking: Fixed (no rotation)
Tilt: 6.0°
Orientation: 216.0°
Rated power: -
Panel material: Smooth glass without AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.401181	-2.253366	40.00	10.00	50.00
2	53.400730	-2.252298	39.40	10.00	49.40
3	53.400810	-2.252213	39.60	11.20	50.80
4	53.401245	-2.253285	40.00	11.20	51.20

Flight Path Receptor(s)

Name: 05L 0-2
Description:
Threshold height: 50 m
Direction: 50.6°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.347700	-2.287520	66.65	50.00	116.65
Two-mile	53.329359	-2.325006	50.02	235.32	285.34

Name: 05R 0-2

Description:

Threshold height: 50 m

Direction: 49.4°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.332228	-2.310791	56.69	50.00	106.69
Two-mile	53.313424	-2.347612	50.67	224.70	275.37

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
1-ATCT	1	53.357852	-2.279502	229.70	185.00
OP 2	2	53.355142	-2.278324	238.80	50.00
OP 3	3	53.361097	-2.266458	257.60	50.00

Map image of 1-ATCT



Route Receptor(s)

Name: 05L

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.347708	-2.287516	66.66	50.00	116.66
2	53.240440	-2.500028	20.02	1021.00	1041.02

Name: 05R

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 3.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.332110	-2.310548	56.51	50.00	106.51
2	53.223942	-2.521929	44.04	1021.00	1065.04

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
Block 1 PV Array NW	6.0	306.0	0	0	-
Block 1 PV Array SE	8.0	126.0	0	0	-
Block 2 PV Array	6.0	36.0	0	0	-
Block 3 PV Array	6.0	216.0	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
05L 0-2	0	0
05R 0-2	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0
05L	0	0
05R	0	0

Results for: Block 1 PV Array NW

Receptor	Green Glare (min)	Yellow Glare (min)
05L 0-2	0	0
05R 0-2	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0
05L	0	0
05R	0	0

Flight Path: 05L 0-2

0 minutes of yellow glare

0 minutes of green glare

Flight Path: 05R 0-2

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Route: 05L

0 minutes of yellow glare

0 minutes of green glare

Route: 05R

0 minutes of yellow glare

0 minutes of green glare

Results for: Block 1 PV Array SE

Receptor	Green Glare (min)	Yellow Glare (min)
05L 0-2	0	0
05R 0-2	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0
05L	0	0
05R	0	0

Flight Path: 05L 0-2

0 minutes of yellow glare

0 minutes of green glare

Flight Path: 05R 0-2

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Route: 05L

0 minutes of yellow glare

0 minutes of green glare

Route: 05R

0 minutes of yellow glare

0 minutes of green glare

Results for: Block 2 PV Array

Receptor	Green Glare (min)	Yellow Glare (min)
05L 0-2	0	0
05R 0-2	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0
05L	0	0
05R	0	0

Flight Path: 05L 0-2

0 minutes of yellow glare

0 minutes of green glare

Flight Path: 05R 0-2

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Route: 05L

0 minutes of yellow glare

0 minutes of green glare

Route: 05R

0 minutes of yellow glare

0 minutes of green glare

Results for: Block 3 PV Array

Receptor	Green Glare (min)	Yellow Glare (min)
05L 0-2	0	0
05R 0-2	0	0
1-ATCT	0	0
OP 2	0	0
OP 3	0	0
05L	0	0
05R	0	0

Flight Path: 05L 0-2

0 minutes of yellow glare

0 minutes of green glare

Flight Path: 05R 0-2

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Route: 05L

0 minutes of yellow glare

0 minutes of green glare

Route: 05R

0 minutes of yellow glare

0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.

Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.

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.)

Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.

Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.

The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.

Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

Refer to the Help page at www.forgesolar.com/help/ for assumptions and limitations not listed here.

This analysis was conducted using the best available radiometric modeling at the time of generation. Future updates to the modeling methodology may yield different results.

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