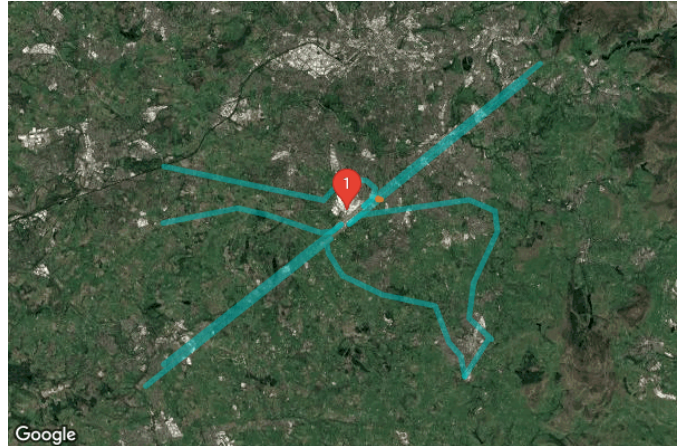


Manchester Green Rooftop Solar Array

Manchester Airport

Created Feb 26, 2025
Updated Mar 28, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
Site ID 142359.23987

Project type Advanced
Project status: active
Category 10 MW to 100 MW



Misc. Analysis Settings

DNI: varies (1,000.0 W/m² peak)
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad

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

Summary of Results

Glare with low potential for temporary after-image predicted

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	25.0	275.0	0	0	-
PV array 10	25.0	138.0	20,997	0	-
PV array 11	25.0	138.0	20,810	0	-
PV array 12	25.0	93.0	24,215	0	-
PV array 2	25.0	93.0	10,158	0	-
PV array 3	25.0	233.0	0	0	-
PV array 4	25.0	180.0	8,678	0	-
PV array 5	25.0	226.0	807	0	-
PV array 6	25.0	180.0	10,939	0	-
PV array 7	25.0	3.0	11,297	0	-
PV array 8	25.0	183.0	15,607	0	-
PV array 9	25.0	321.0	13,979	0	-

Component Data

PV Array(s)

Total PV footprint area: 1,142 m^2

Name: PV array 1
Footprint area: 105 m^2
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 275.0 deg

Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366722	-2.241087	74.10	13.50	87.60
2	53.366650	-2.240984	74.24	13.50	87.74
3	53.366580	-2.240990	74.38	13.50	87.88
4	53.366554	-2.241118	74.37	13.50	87.87



Name: PV array 10
Footprint area: 101 m^2
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 138.0 deg

Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366320	-2.238729	73.10	13.50	86.60
2	53.366272	-2.238664	73.04	13.50	86.54
3	53.366182	-2.238837	73.83	13.50	87.33
4	53.366261	-2.238866	73.68	13.50	87.18
5	53.366324	-2.238733	73.10	13.50	86.60



Name: PV array 11
Footprint area: 55 m^2
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 138.0 deg

Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366395	-2.238601	72.52	13.50	86.02
2	53.366424	-2.238535	72.23	13.50	85.73
3	53.366389	-2.238428	72.12	13.50	85.62
4	53.366338	-2.238535	72.49	13.50	85.99



Name: PV array 12
Footprint area: 52 m^2
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 93.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366451	-2.238533	72.14	13.50	85.64
2	53.366434	-2.238535	72.20	13.50	85.70
3	53.366398	-2.238425	72.09	13.50	85.59
4	53.366502	-2.238407	71.80	13.50	85.30



Name: PV array 2
Footprint area: 60 m^2
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 93.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366645	-2.240961	74.27	13.50	87.77
2	53.366586	-2.240972	74.36	13.50	87.86
3	53.366604	-2.240856	74.39	13.50	87.89
4	53.366689	-2.240838	74.19	13.50	87.69



Name: PV array 3
Footprint area: 87 m^2
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 233.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366564	-2.240986	74.41	13.50	87.91
2	53.366540	-2.241091	74.40	13.50	87.90
3	53.366451	-2.240966	74.64	13.50	88.14
4	53.366491	-2.240875	74.62	13.50	88.12



Name: PV array 4
Footprint area: 112 m^2
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 180.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366571	-2.240955	74.41	13.50	87.91
2	53.366381	-2.240694	75.01	13.50	88.51
3	53.366416	-2.240662	74.93	13.50	88.43
4	53.366468	-2.240725	74.76	13.50	88.26
5	53.366466	-2.240773	74.73	13.50	88.23
6	53.366512	-2.240772	74.63	13.50	88.13
7	53.366583	-2.240887	74.42	13.50	87.92

Name: PV array 5
Footprint area: 53 m^2
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 226.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366401	-2.240764	74.91	13.50	88.41
2	53.366378	-2.240713	75.00	13.50	88.50
3	53.366301	-2.240761	75.15	13.50	88.65
4	53.366366	-2.240856	74.89	13.50	88.39

Name: PV array 6
Footprint area: 71 m^2
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 180.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366335	-2.240717	75.11	13.50	88.61
2	53.366331	-2.240528	75.29	13.50	88.79
3	53.366287	-2.240474	75.41	13.50	88.91
4	53.366295	-2.240748	75.16	13.50	88.66

Name: PV array 7
Footprint area: 88 m²
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 3.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366304	-2.239235	74.50	13.50	88.00
2	53.366350	-2.239233	74.35	13.50	87.85
3	53.366337	-2.238984	73.77	13.50	87.27
4	53.366287	-2.238991	73.95	13.50	87.45

Name: PV array 8
Footprint area: 227 m²
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 183.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366263	-2.239028	74.15	13.50	87.65
2	53.366260	-2.238877	73.71	13.50	87.21
3	53.366175	-2.238844	73.86	13.50	87.36
4	53.366206	-2.239411	75.02	13.50	88.52
5	53.366250	-2.239316	74.78	13.50	88.28
6	53.366238	-2.239024	74.18	13.50	87.68

Name: PV array 9
Footprint area: 131 m²
Axis tracking: Fixed (no rotation)
Tilt: 25.0 deg
Orientation: 321.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.366270	-2.238881	73.68	13.50	87.18
2	53.366428	-2.238546	72.26	13.50	85.76
3	53.366449	-2.238625	72.43	13.50	85.93
4	53.366427	-2.238702	72.69	13.50	86.19
5	53.366379	-2.238706	72.87	13.50	86.37
6	53.366384	-2.238782	73.07	13.50	86.57
7	53.366339	-2.238876	73.48	13.50	86.98
8	53.366276	-2.238884	73.65	13.50	87.15

Route Receptor(s)

Name: Macclesfield Entry

Route type One-way

View angle: 25.0 deg



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.236040	-2.135252	158.52	618.73	777.25
2	53.263422	-2.106050	224.90	552.31	777.21
3	53.263422	-2.102533	188.32	548.10	736.42
4	53.278862	-2.129901	142.36	526.34	668.70
5	53.304867	-2.124398	121.14	468.74	589.88
6	53.342574	-2.094886	139.44	382.56	522.00
7	53.357602	-2.098102	129.94	289.05	418.99
8	53.365656	-2.129970	83.13	273.48	356.61
9	53.354628	-2.263127	79.40	35.30	114.70
10	53.348037	-2.277466	66.91	15.24	82.15

Name: Macclesfield Exit

Route type One-way

View angle: 25.0 deg



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.337168	-2.300038	57.00	15.24	72.24
2	53.334432	-2.305615	56.00	36.93	92.93
3	53.326271	-2.302856	59.23	72.58	131.81
4	53.309982	-2.285484	68.04	154.43	222.47
5	53.296055	-2.236406	102.96	272.37	375.33
6	53.287853	-2.171501	154.65	407.05	561.70
7	53.260948	-2.154645	170.82	526.38	697.20
8	53.251023	-2.140109	166.76	592.30	759.06
9	53.236036	-2.135238	158.53	618.71	777.24

Name: Runway 05L 10NM Path

Route type One-way

View angle: 25.0 deg



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.244929	-2.506087	34.90	879.50	914.40
2	53.347687	-2.287502	66.67	15.24	81.91

Name: Runway 05R 10NM Path

Route type One-way

View angle: 25.0 deg



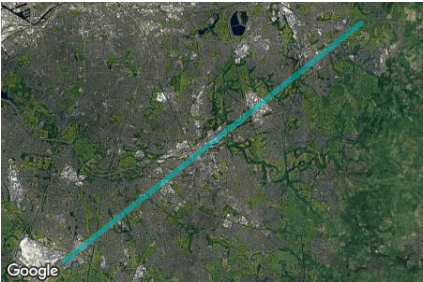
Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.228969	-2.528100	44.31	870.09	914.40
2	53.332103	-2.310399	56.50	15.24	71.74

Name: Runway 23L 10NM Path
Route type One-way
View angle: 25.0 deg



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.452352	-2.060420	121.36	793.04	914.40
2	53.348041	-2.277450	66.94	15.24	82.18

Name: Runway 23R 10NM Path
Route type One-way
View angle: 25.0 deg



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.465485	-2.042329	194.01	720.39	914.40
2	53.361210	-2.259518	77.00	15.24	92.24

Name: Stretton Entry
Route type One-way
View angle: 25.0 deg



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.348753	-2.506846	62.00	334.24	396.24
2	53.359659	-2.414944	42.76	263.67	306.43
3	53.354639	-2.377887	36.02	206.86	242.88
4	53.341727	-2.312974	54.98	74.51	129.49
5	53.342644	-2.298273	58.10	46.33	104.43
6	53.347689	-2.287535	66.62	15.24	81.86

Name: Thelwall Viaduct Exit
Route type One-way
View angle: 25.0 deg



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.361212	-2.259525	77.00	15.24	92.24
2	53.365491	-2.250772	76.86	30.30	107.16
3	53.374114	-2.245305	67.97	59.90	127.87
4	53.379746	-2.256119	63.18	83.87	147.05
5	53.381641	-2.279036	59.35	118.57	177.92
6	53.380669	-2.286227	59.33	128.45	187.78
7	53.365409	-2.309058	66.19	167.33	233.52
8	53.390259	-2.505775	12.17	384.07	396.24

Discrete Observation Receptors

Number	Latitude	Longitude	Ground elevation	Height above ground	Total Elevation
	deg	deg	m	m	m
1-ATCT	53.357825	-2.279589	70.00	60.00	130.00

1-ATCT map image



Obstruction Components

Name: Obstruction 1

Upper edge height: 15.0 m



Vertex	Latitude	Longitude	Ground elevation
	deg	deg	m
1	53.366667	-2.242085	74.43
2	53.366645	-2.241967	74.30
3	53.366123	-2.241903	74.96
4	53.366053	-2.241978	75.17
5	53.366296	-2.242493	75.56
6	53.366667	-2.242085	74.43

Name: Obstruction 2

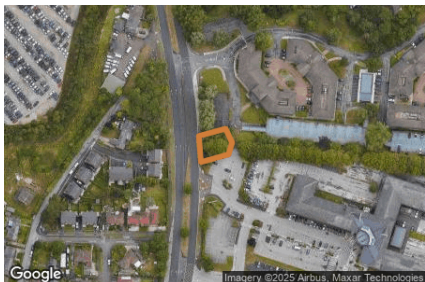
Upper edge height: 17.0 m



Vertex	Latitude	Longitude	Ground elevation
	deg	deg	m
1	53.366481	-2.241583	74.43
2	53.366484	-2.241369	74.43
3	53.366190	-2.241374	74.85
4	53.366164	-2.241578	74.90
5	53.366481	-2.241583	74.43

Name: Obstruction 3

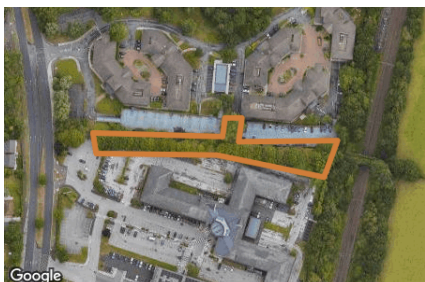
Upper edge height: 12.0 m



Vertex	Latitude	Longitude	Ground elevation
	deg	deg	m
1	53.366139	-2.241558	74.93
2	53.366189	-2.241252	74.85
3	53.366094	-2.241177	75.04
4	53.366013	-2.241217	75.11
5	53.365960	-2.241534	75.19
6	53.366139	-2.241558	74.93

Name: Obstruction 4

Upper edge height: 14.0 m



Vertex	Latitude	Longitude	Ground elevation
	deg	deg	m
1	53.366095	-2.241111	75.13
2	53.365954	-2.241073	75.37
3	53.365943	-2.239691	76.00
4	53.365791	-2.238468	73.45
5	53.366043	-2.238312	73.07
6	53.366035	-2.239444	75.51
7	53.366198	-2.239406	75.05
8	53.366198	-2.239600	75.33
9	53.366070	-2.239626	75.73
10	53.366095	-2.241111	75.13

Summary of PV Glare Analysis

PV configuration and total predicted glare

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced	Data File
	deg	deg	min	min	kWh	
PV array 1	25.0	275.0	0	0	-	-
PV array 10	25.0	138.0	20,997	0	-	-
PV array 11	25.0	138.0	20,810	0	-	-
PV array 12	25.0	93.0	24,215	0	-	-
PV array 2	25.0	93.0	10,158	0	-	-
PV array 3	25.0	233.0	0	0	-	-
PV array 4	25.0	180.0	8,678	0	-	-
PV array 5	25.0	226.0	807	0	-	-
PV array 6	25.0	180.0	10,939	0	-	-
PV array 7	25.0	3.0	11,297	0	-	-
PV array 8	25.0	183.0	15,607	0	-	-
PV array 9	25.0	321.0	13,979	0	-	-

Distinct glare per month

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

PV	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
pv-array-10 (green)	3903	4059	789	0	565	926	906	10	167	2978	5012	753
pv-array-10 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-11 (green)	3722	4049	864	0	570	946	918	10	205	3050	4839	672
pv-array-11 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-12 (green)	8	869	1096	3098	4694	2855	3915	4430	1326	1123	160	0
pv-array-12 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-2 (green)	0	815	1123	969	1106	1134	1139	1035	1030	1135	104	0
pv-array-2 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-4 (green)	805	1656	786	686	406	0	174	679	429	1834	1148	75
pv-array-4 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-5 (green)	0	378	26	0	0	0	0	0	0	393	10	0
pv-array-5 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-6 (green)	1386	1660	911	423	474	250	432	357	447	1820	1628	644
pv-array-6 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-7 (green)	0	0	35	973	3244	1381	2487	2151	246	0	0	0
pv-array-7 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-8 (green)	2865	1670	791	843	508	0	171	886	694	1443	2519	3217
pv-array-8 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-9 (green)	308	2114	1487	987	1103	1116	1132	1051	1021	2392	831	0
pv-array-9 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0

PV & Receptor Analysis Results

Results for each PV array and receptor

PV array 1 no glare found

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	0	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	0	0
Route: Runway 23R 10NM Path	0	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

No glare found



PV array 10 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	2407	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	17626	0
Route: Runway 23R 10NM Path	964	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

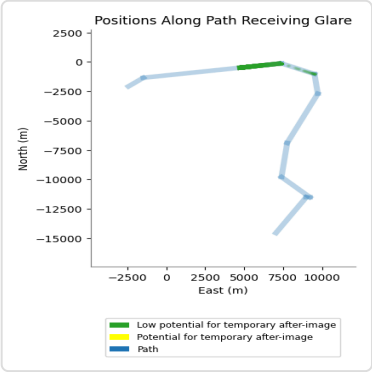
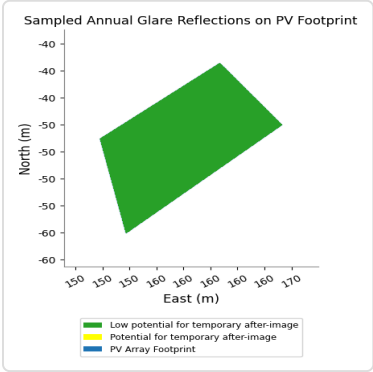
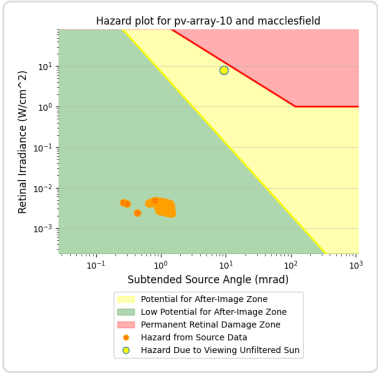
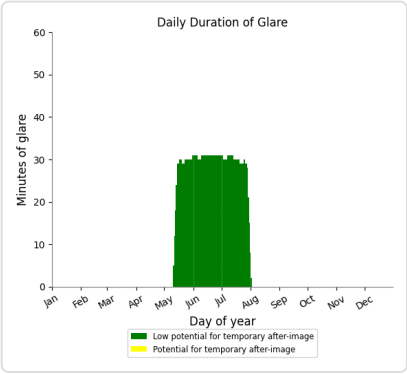
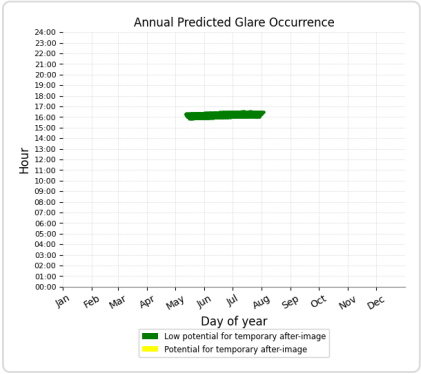
PV array 10: 1-ATCT

No glare found

PV array 10: Macclesfield Entry

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

- 2,407 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 10: Macclesfield Exit

No glare found

PV array 10: Runway 05L 10NM Path

No glare found

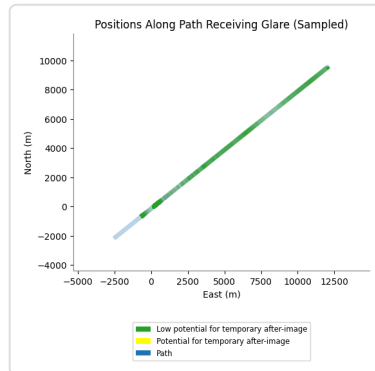
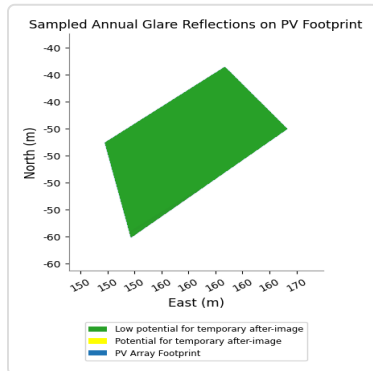
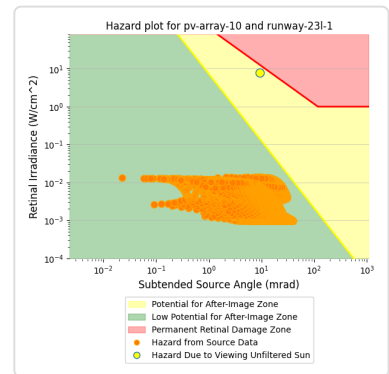
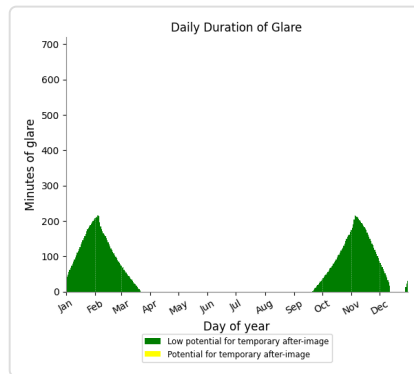
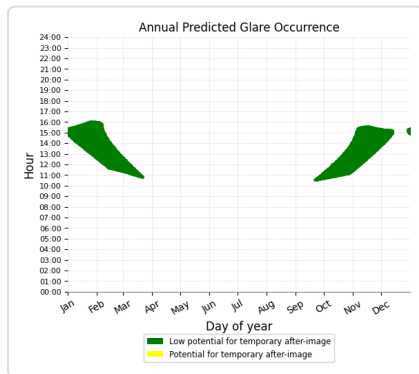
PV array 10: Runway 05R 10NM Path

No glare found

PV array 10: Runway 23L 10NM Path

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

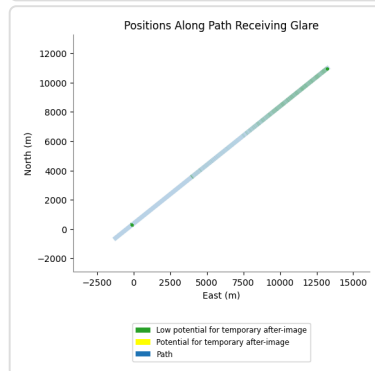
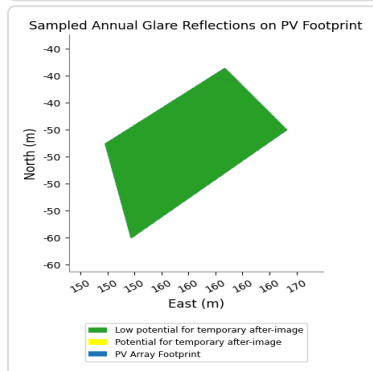
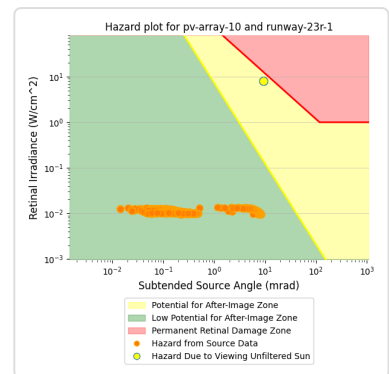
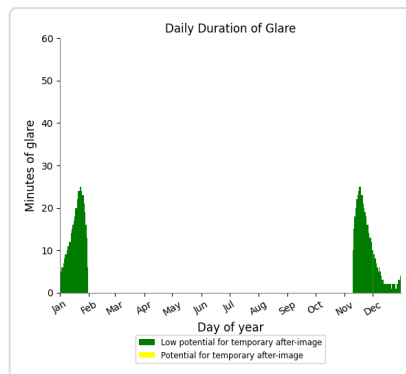
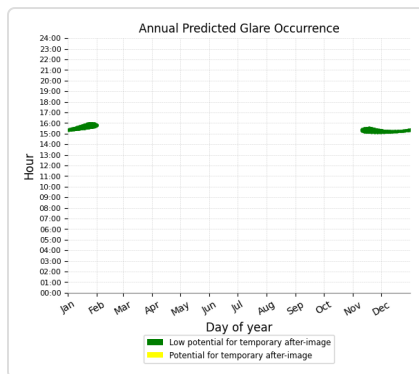
- 17,626 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 10: Runway 23R 10NM Path

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

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



PV array 10: Stretton Entry

No glare found

PV array 10: Thelwall Viaduct Exit

No glare found

PV array 11 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	2444	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	17358	0
Route: Runway 23R 10NM Path	1008	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

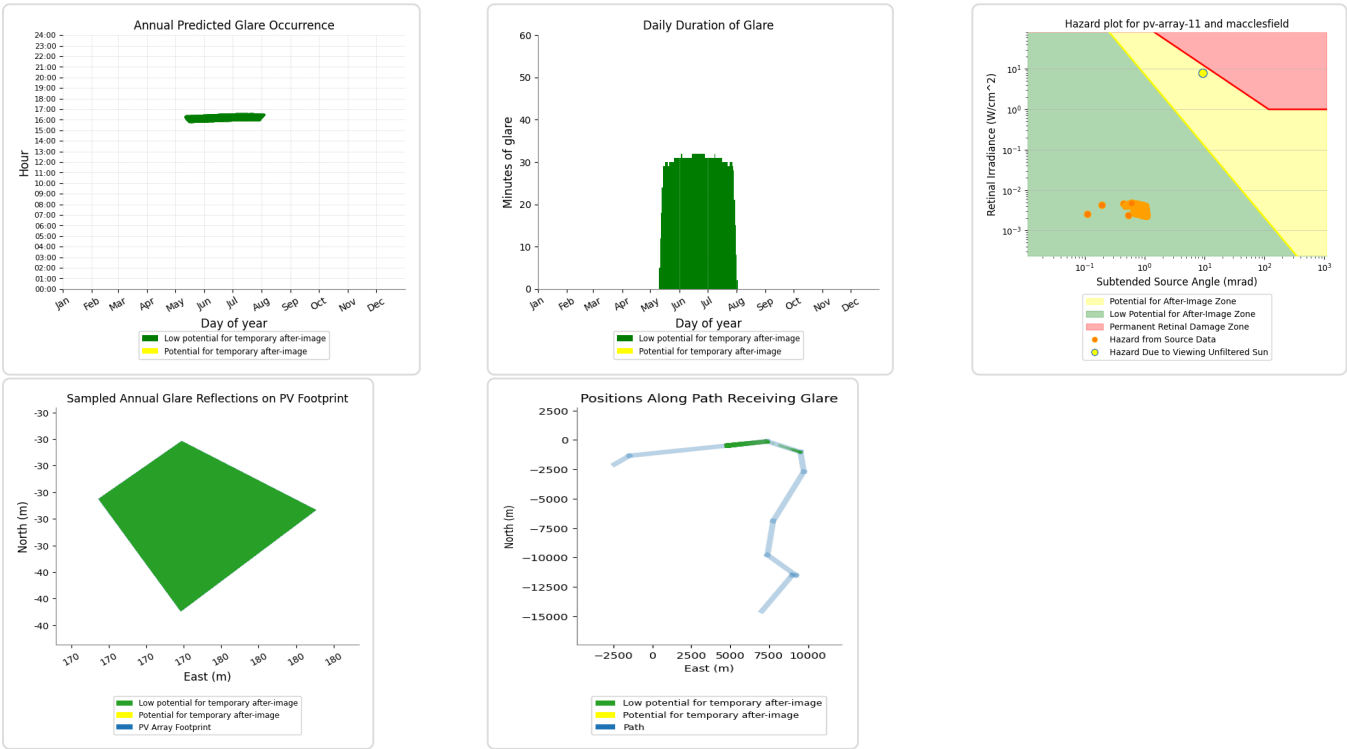
PV array 11: 1-ATCT

No glare found

PV array 11: Macclesfield Entry

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

- 2,444 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 11: Macclesfield Exit

No glare found

PV array 11: Runway 05L 10NM Path

No glare found

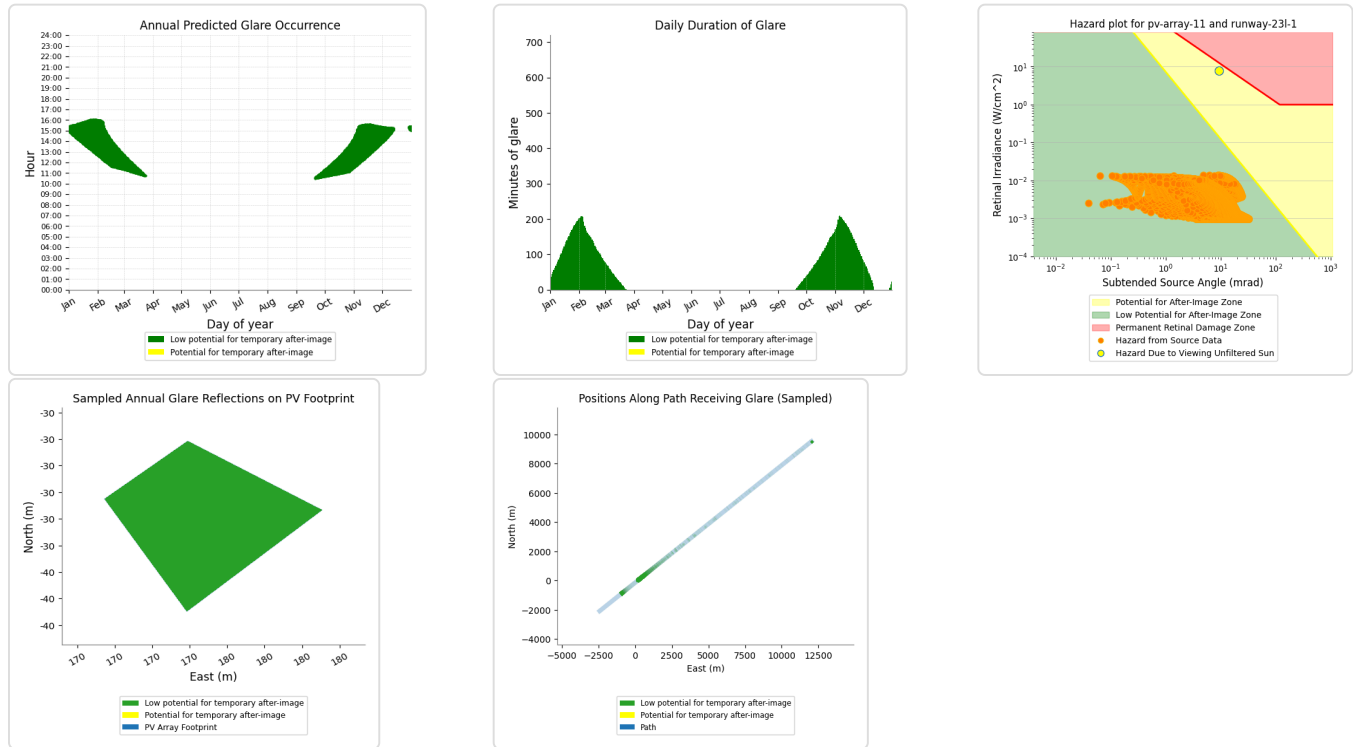
PV array 11: Runway 05R 10NM Path

No glare found

PV array 11: Runway 23L 10NM Path

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

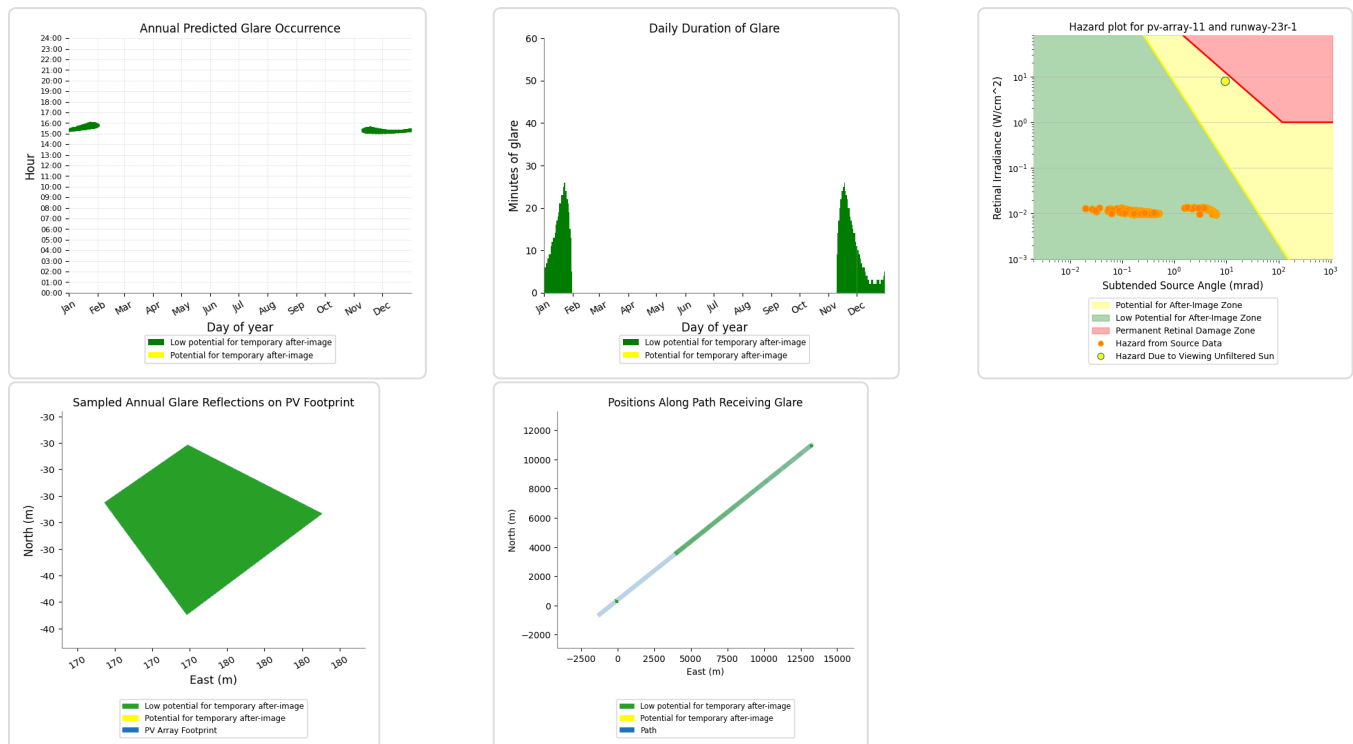
- 17,358 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 11: Runway 23R 10NM Path

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

- 1,008 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 11: Stretton Entry

No glare found

PV array 11: Thelwall Viaduct Exit

No glare found

PV array 12 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	0	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	19753	0
Route: Runway 23R 10NM Path	4462	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

PV array 12: 1-ATCT

No glare found

PV array 12: Macclesfield Entry

No glare found

PV array 12: Macclesfield Exit

No glare found

PV array 12: Runway 05L 10NM Path

No glare found

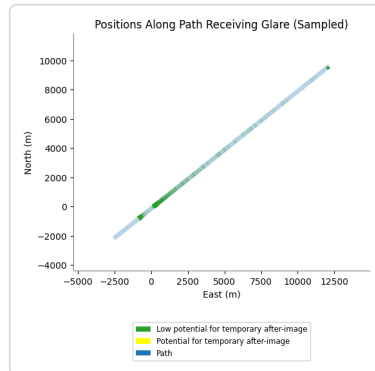
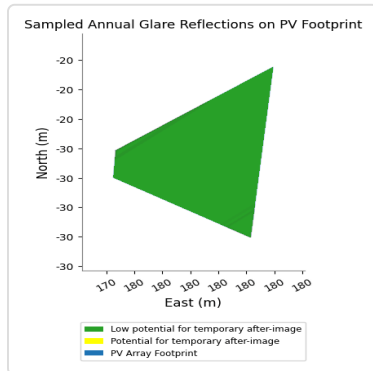
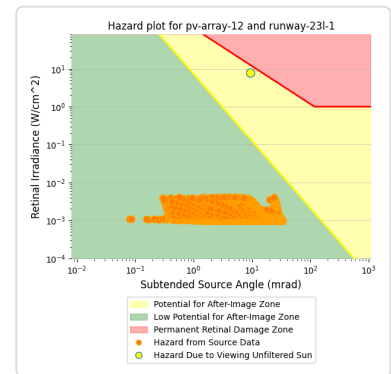
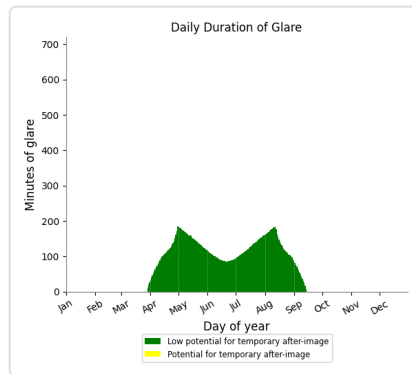
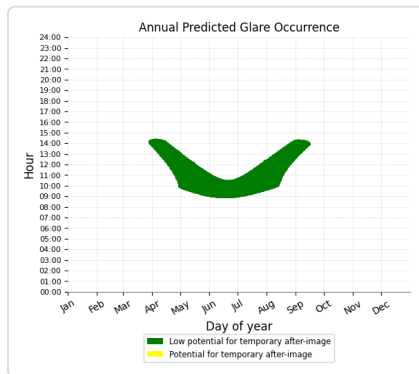
PV array 12: Runway 05R 10NM Path

No glare found

PV array 12: Runway 23L 10NM Path

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

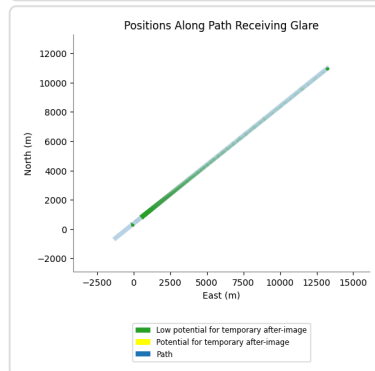
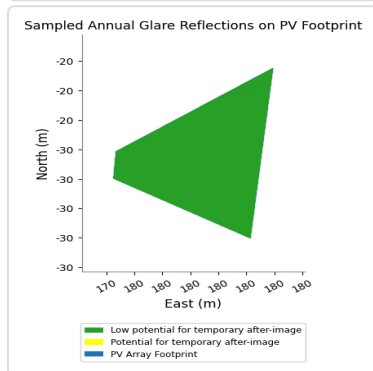
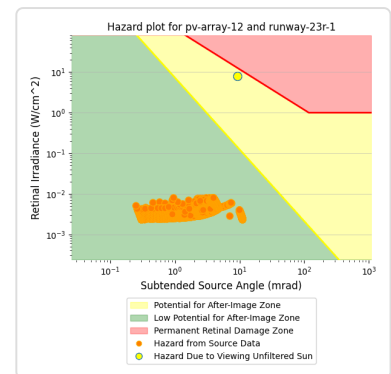
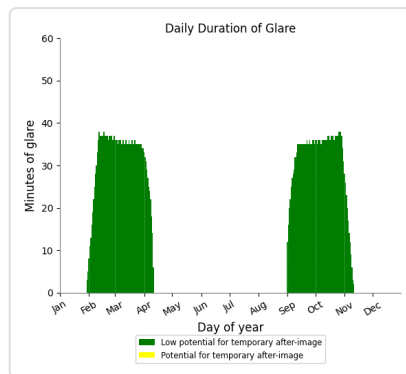
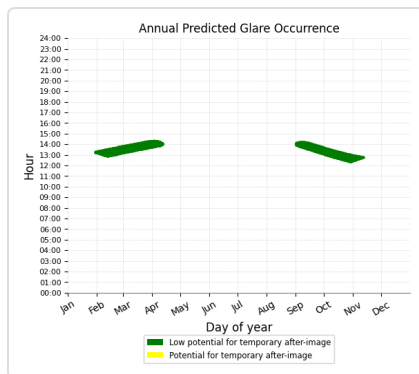
- 19,753 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 12: Runway 23R 10NM Path

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

- 4,462 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 12: Stretton Entry

No glare found

PV array 12: Thelwall Viaduct Exit

No glare found

PV array 2 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	0	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	5692	0
Route: Runway 23R 10NM Path	4466	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

PV array 2: 1-ATCT

No glare found

PV array 2: Macclesfield Entry

No glare found

PV array 2: Macclesfield Exit

No glare found

PV array 2: Runway 05L 10NM Path

No glare found

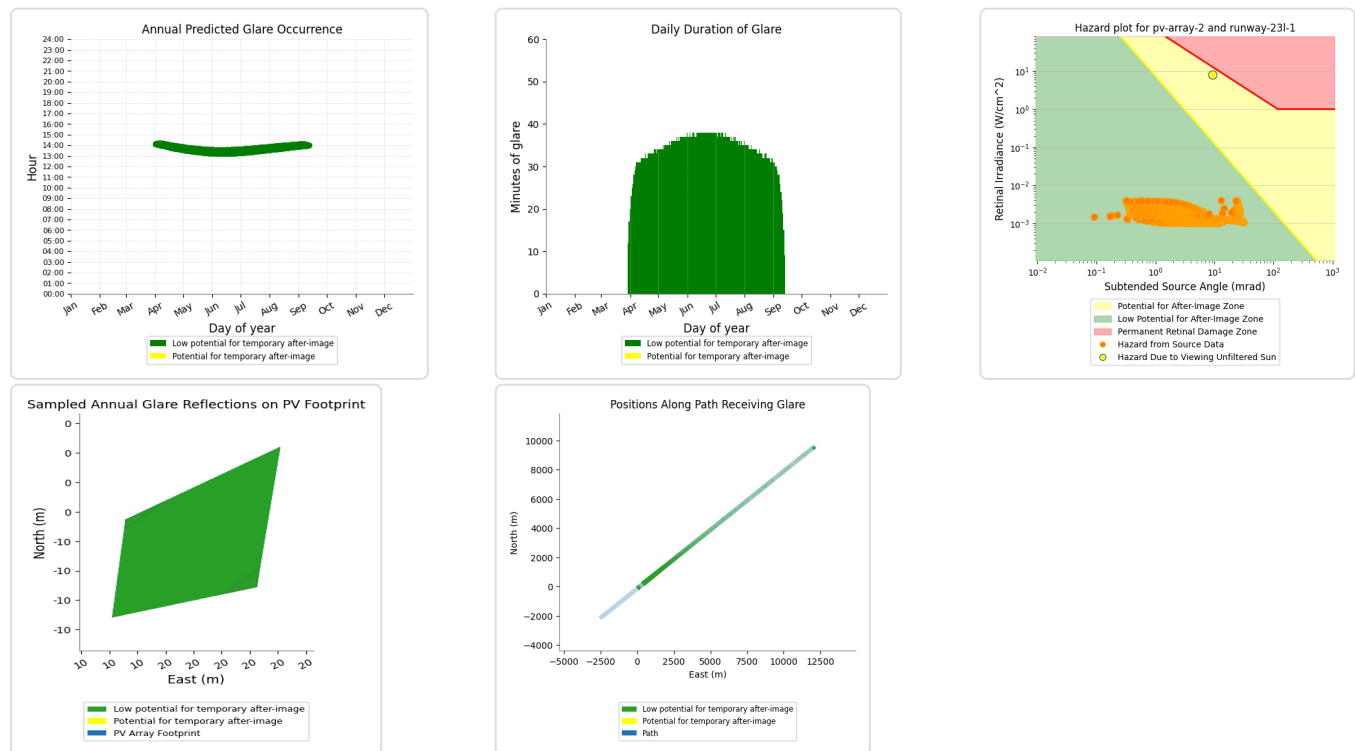
PV array 2: Runway 05R 10NM Path

No glare found

PV array 2: Runway 23L 10NM Path

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

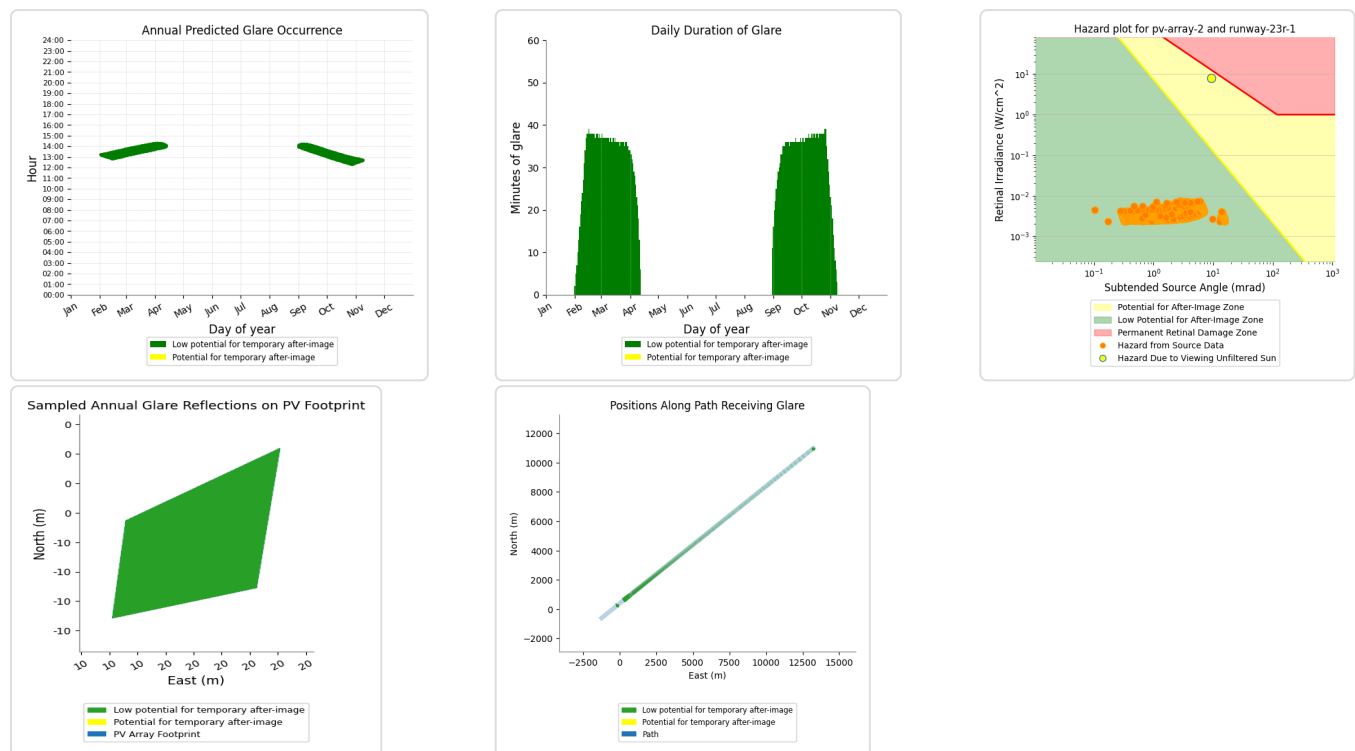
- 5,692 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 2: Runway 23R 10NM Path

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

- 4,466 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 2: Stretton Entry

No glare found

PV array 2: Thelwall Viaduct Exit

No glare found

PV array 3 no glare found

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	0	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	0	0
Route: Runway 23R 10NM Path	0	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

No glare found

PV array 4 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	2548	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	6130	0
Route: Runway 23R 10NM Path	0	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

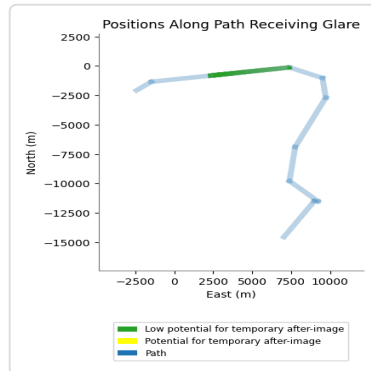
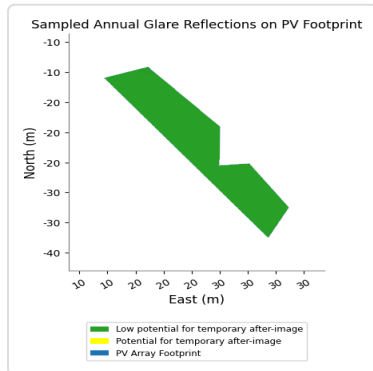
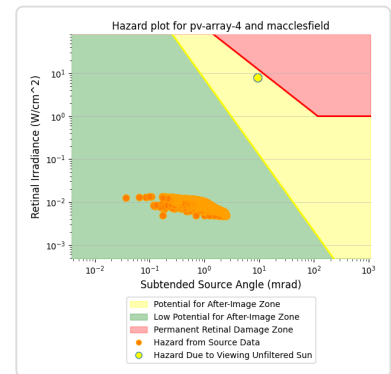
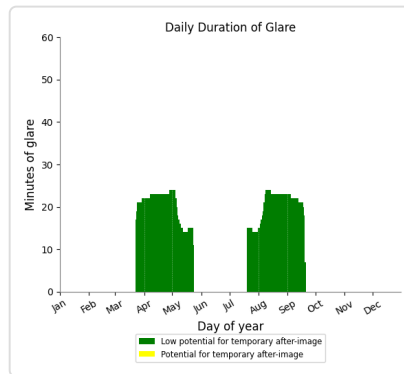
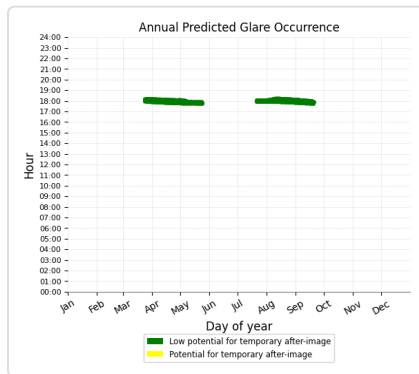
PV array 4: 1-ATCT

No glare found

PV array 4: Macclesfield Entry

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

- 2,548 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 4: Macclesfield Exit

No glare found

PV array 4: Runway 05L 10NM Path

No glare found

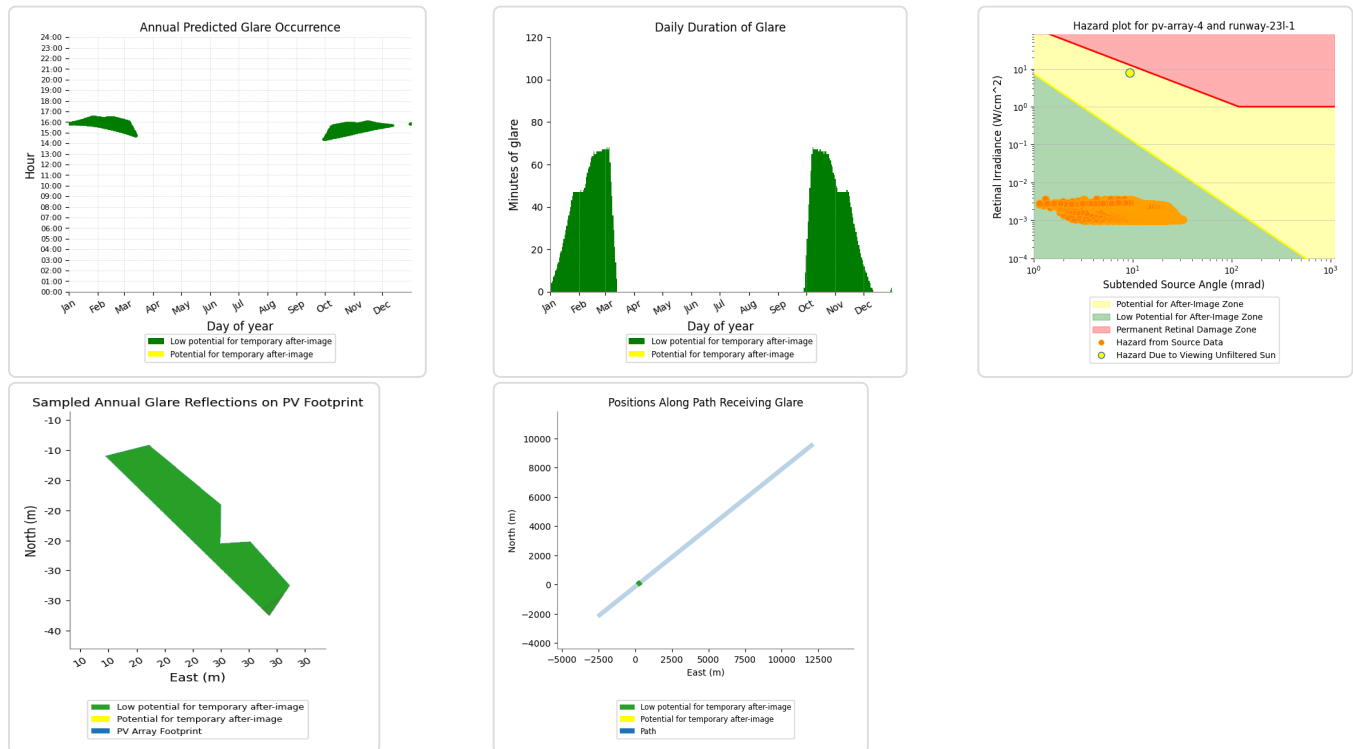
PV array 4: Runway 05R 10NM Path

No glare found

PV array 4: Runway 23L 10NM Path

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

- 6,130 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 4: Runway 23R 10NM Path

No glare found

PV array 4: Stretton Entry

No glare found

PV array 4: Thelwall Viaduct Exit

No glare found

PV array 5 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	0	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	807	0
Route: Runway 23R 10NM Path	0	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

PV array 5: 1-ATCT

No glare found

PV array 5: Macclesfield Entry

No glare found

PV array 5: Macclesfield Exit

No glare found

PV array 5: Runway 05L 10NM Path

No glare found

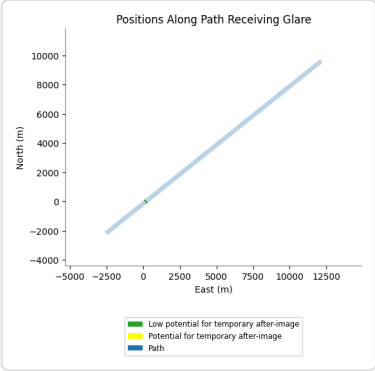
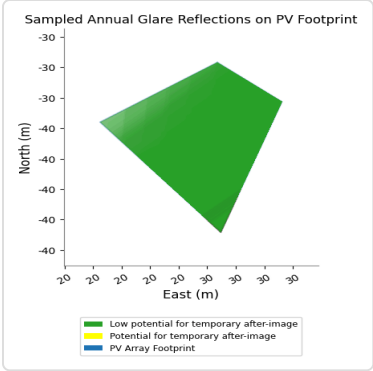
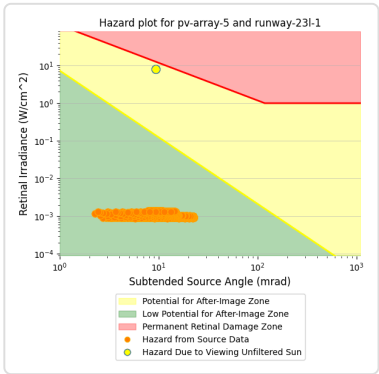
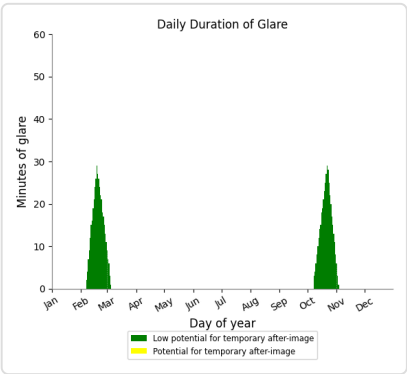
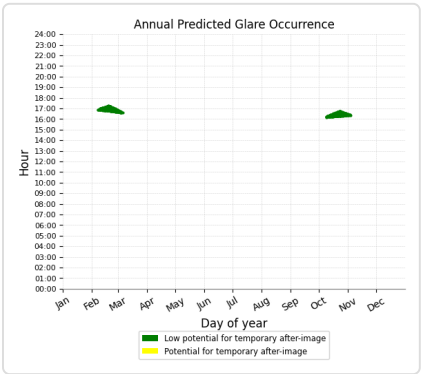
PV array 5: Runway 05R 10NM Path

No glare found

PV array 5: Runway 23L 10NM Path

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

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



PV array 5: Runway 23R 10NM Path

No glare found

PV array 5: Stretton Entry

No glare found

PV array 5: Thelwall Viaduct Exit

No glare found

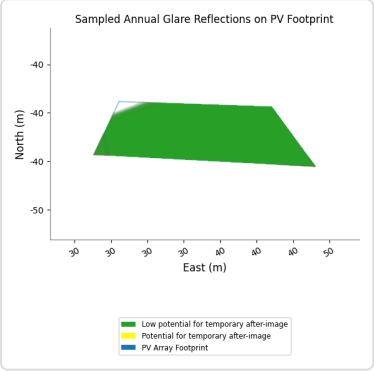
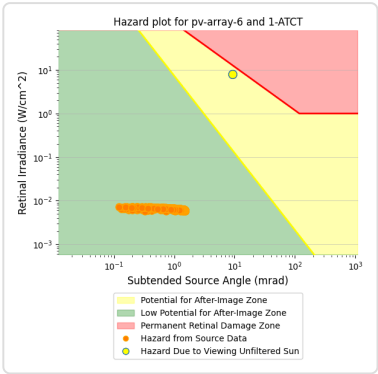
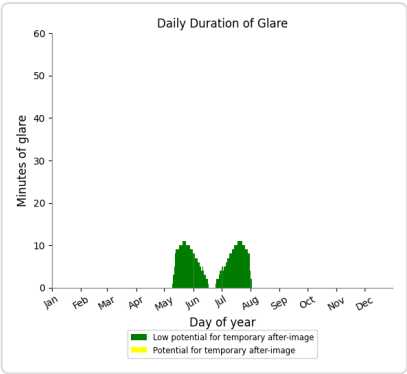
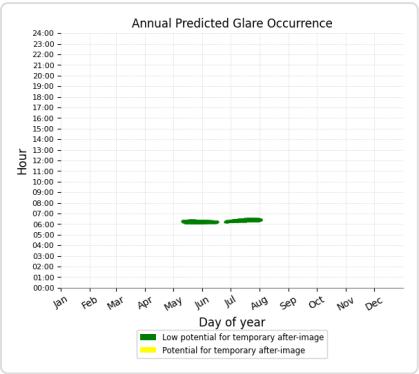
PV array 6 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	557	0
Route: Macclesfield Entry	1572	0

Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	8053	0
Route: Runway 23R 10NM Path	0	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	757	0

PV array 6: 1-ATCT

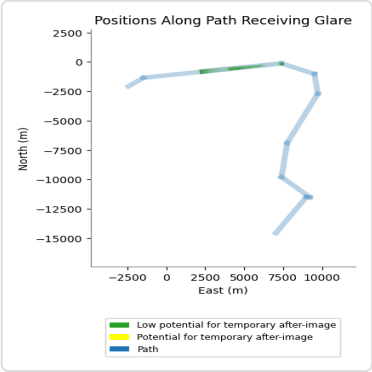
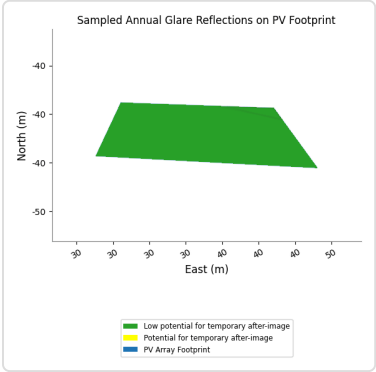
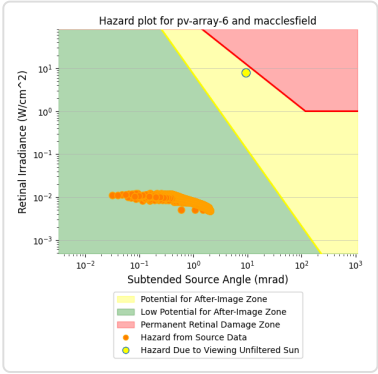
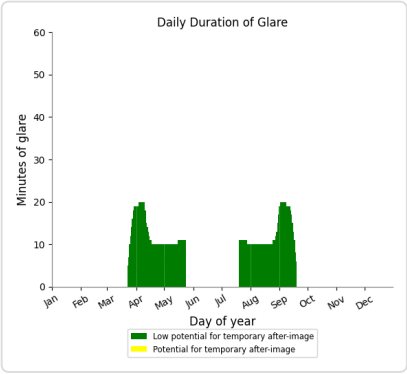
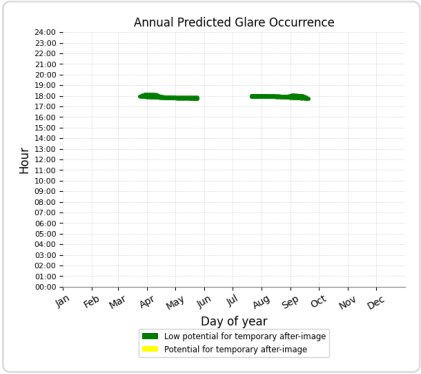
- PV array is expected to produce the following glare for this receptor:
- 557 minutes of "green" glare with low potential to cause temporary after-image.
 - 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 6: Macclesfield Entry

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

- 1,572 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 6: Macclesfield Exit

No glare found

PV array 6: Runway 05L 10NM Path

No glare found

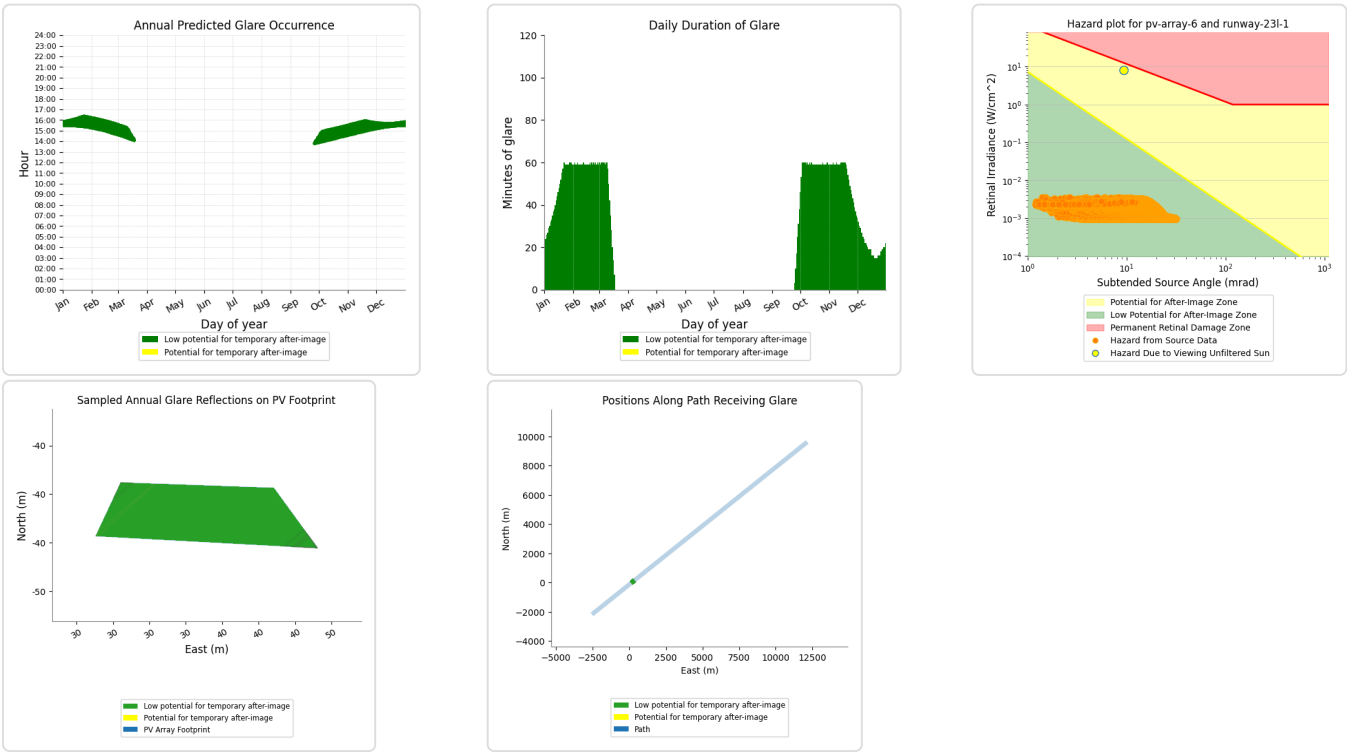
PV array 6: Runway 05R 10NM Path

No glare found

PV array 6: Runway 23L 10NM Path

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

- 8,053 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 6: Runway 23R 10NM Path

No glare found

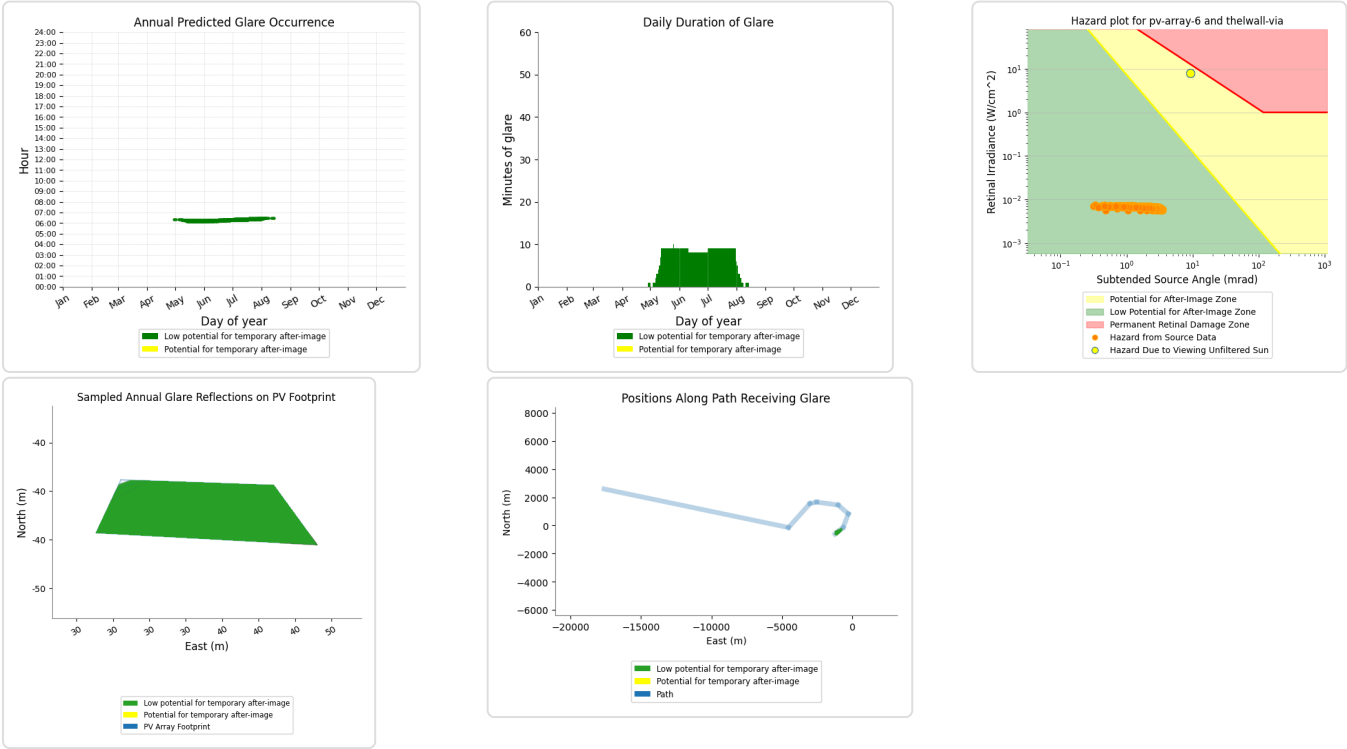
PV array 6: Stretton Entry

No glare found

PV array 6: Thelwall Viaduct Exit

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

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



PV array 7 low potential for temporary after-image

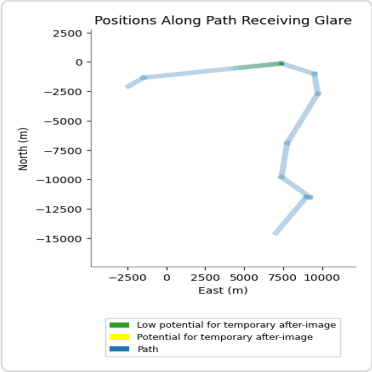
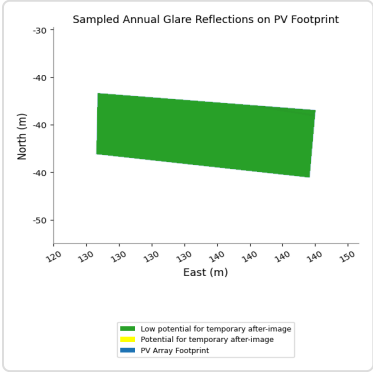
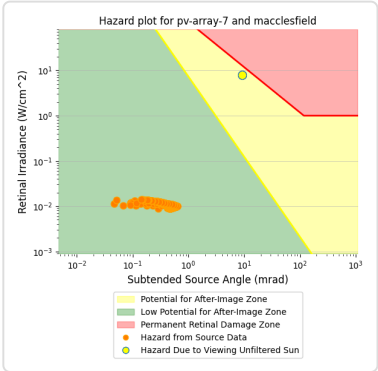
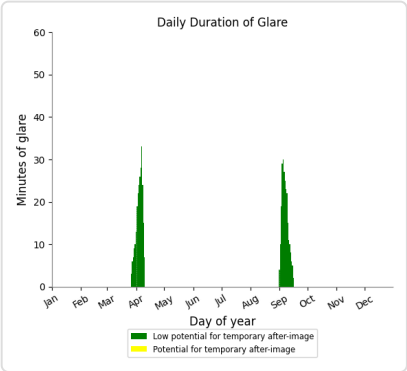
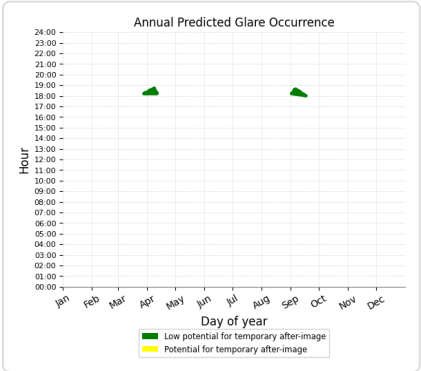
Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	492	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	3987	0
Route: Runway 23R 10NM Path	6818	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

PV array 7: 1-ATCT

No glare found

PV array 7: Macclesfield Entry

- PV array is expected to produce the following glare for this receptor:
- 492 minutes of "green" glare with low potential to cause temporary after-image.
 - 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 7: Macclesfield Exit

No glare found

PV array 7: Runway 05L 10NM Path

No glare found

PV array 7: Runway 05R 10NM Path

No glare found

PV array 7: Runway 23L 10NM Path

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

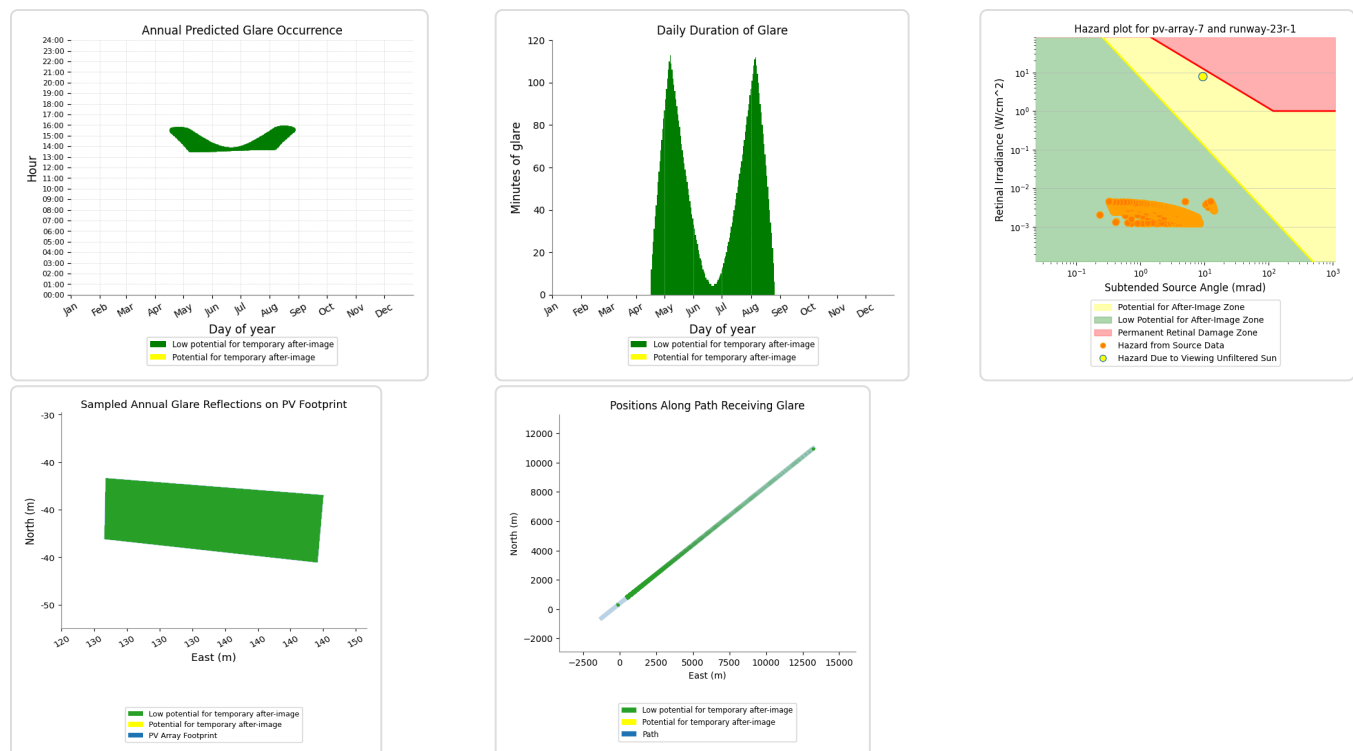
- 3,987 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 7: Runway 23R 10NM Path

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

- 6,818 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 7: Stretton Entry

No glare found

PV array 7: Thelwall Viaduct Exit

No glare found

PV array 8 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	3002	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	12605	0
Route: Runway 23R 10NM Path	0	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

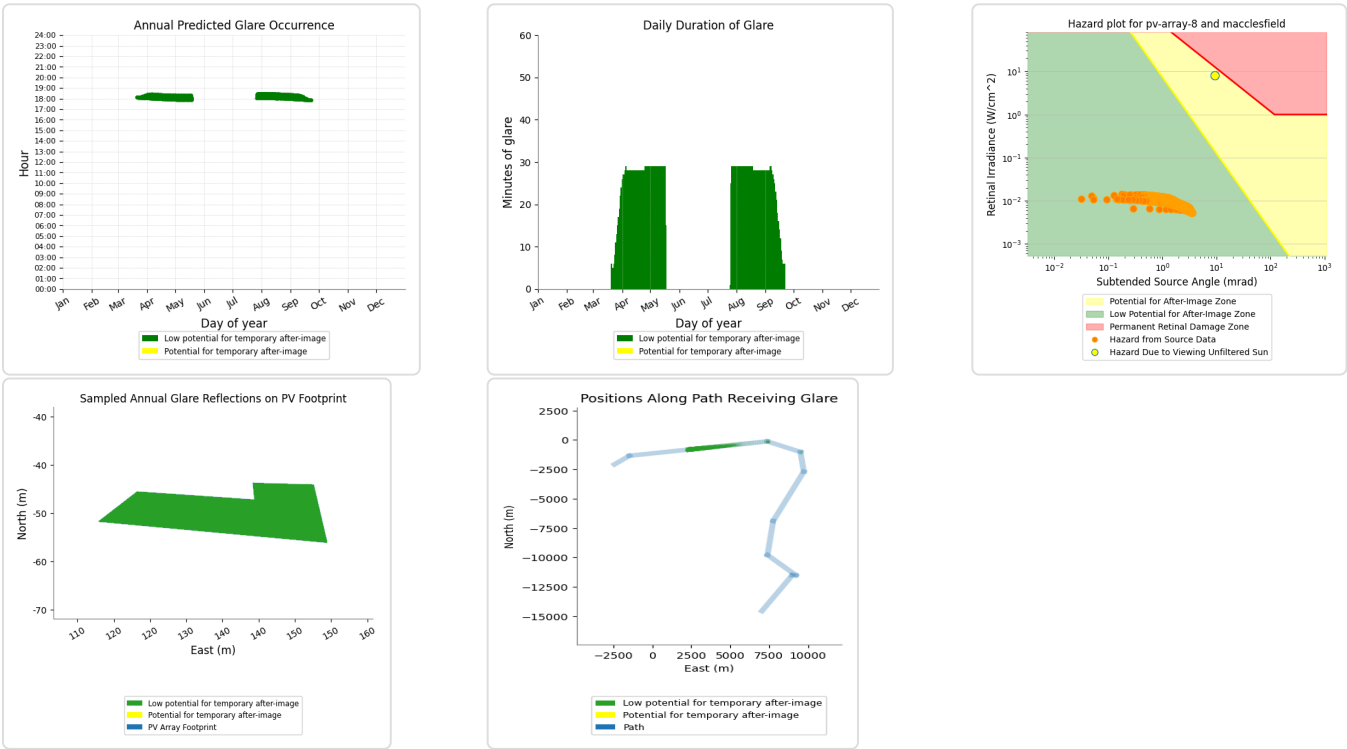
PV array 8: 1-ATCT

No glare found

PV array 8: Macclesfield Entry

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

- 3,002 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 8: Macclesfield Exit

No glare found

PV array 8: Runway 05L 10NM Path

No glare found

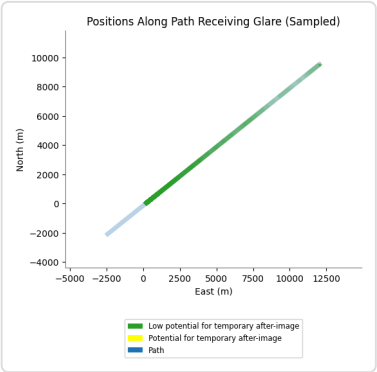
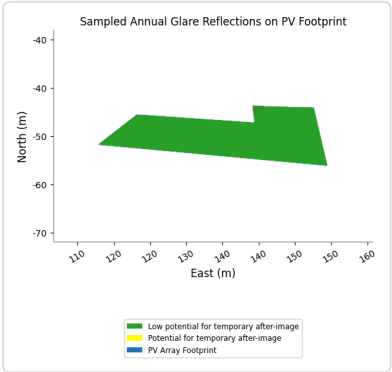
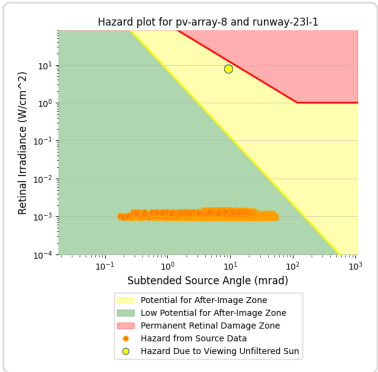
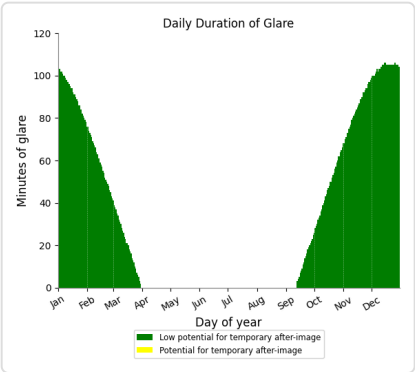
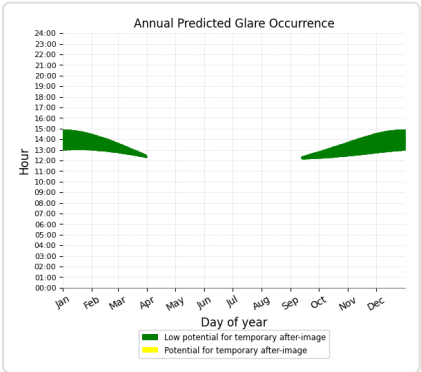
PV array 8: Runway 05R 10NM Path

No glare found

PV array 8: Runway 23L 10NM Path

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

- 12,605 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 8: Runway 23R 10NM Path

No glare found

PV array 8: Stretton Entry

No glare found

PV array 8: Thelwall Viaduct Exit

No glare found

PV array 9 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
OP: 1-ATCT	0	0
Route: Macclesfield Entry	0	0
Route: Macclesfield Exit	0	0
Route: Runway 05L 10NM Path	0	0
Route: Runway 05R 10NM Path	0	0
Route: Runway 23L 10NM Path	9346	0
Route: Runway 23R 10NM Path	4633	0
Route: Stretton Entry	0	0
Route: Thelwall Viaduct Exit	0	0

PV array 9: 1-ATCT

No glare found

PV array 9: Macclesfield Entry

No glare found

PV array 9: Macclesfield Exit

No glare found

PV array 9: Runway 05L 10NM Path

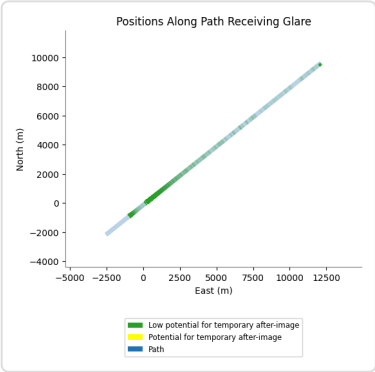
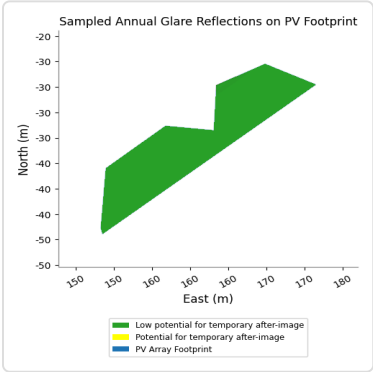
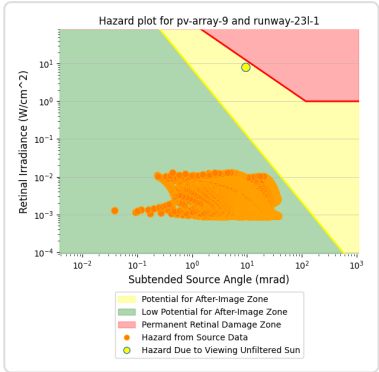
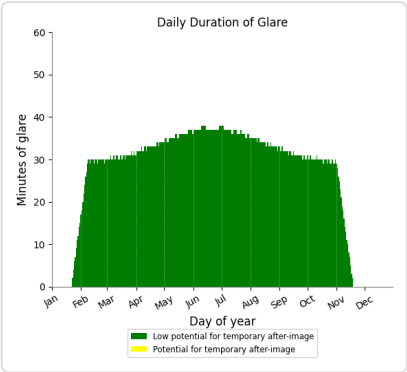
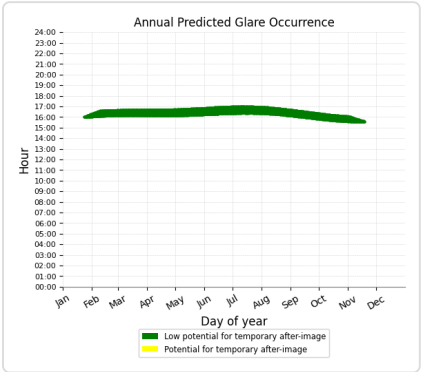
No glare found

PV array 9: Runway 05R 10NM Path

No glare found

PV array 9: Runway 23L 10NM Path

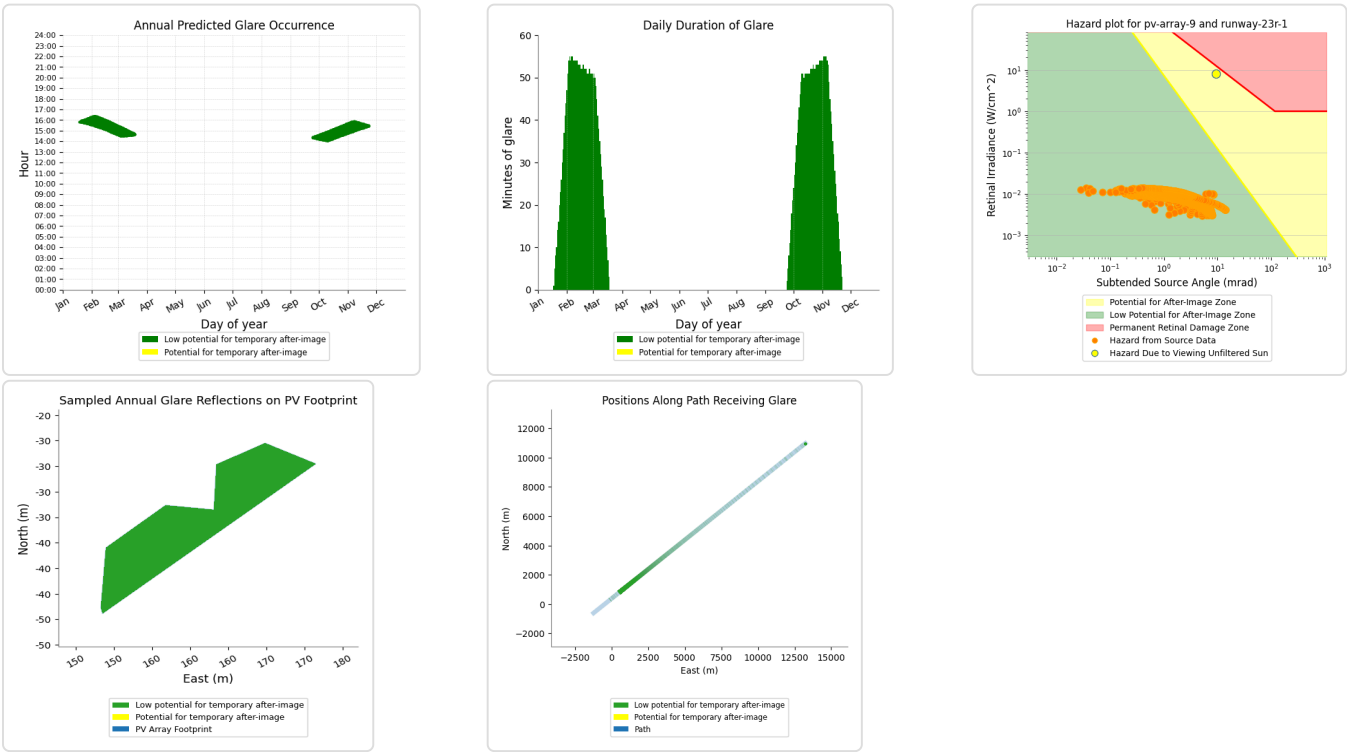
- PV array is expected to produce the following glare for this receptor:
- 9,346 minutes of "green" glare with low potential to cause temporary after-image.
 - 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 9: Runway 23R 10NM Path

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

- 4,633 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 9: Stretton Entry

No glare found

PV array 9: Thelwall Viaduct Exit

No glare found

Summary of Vertical Surface Glare Analysis

Assumptions

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