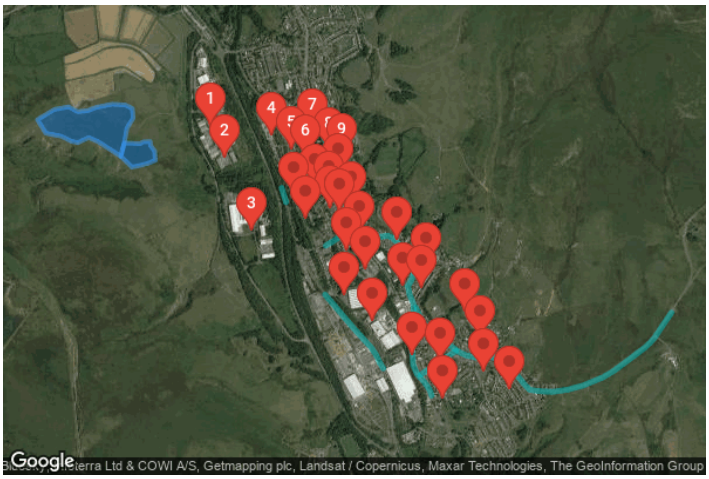
FORGESOLAR GLARE ANALYSIS

Project: **BR10167 - PEP**
Site configuration: **BR10167 - PEP Glint Assessment**

Created 24 Jan, 2024
Updated 02 Feb, 2024
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 10 MW to 100 MW
Site ID 110367.19076

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 V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy	Peak Luminance
	°	°	min	hr	min	hr	kWh	cd/m^2
PV array 1	15.0	180.0	51,980	866.3	642	10.7	-	346,896
PV array 2	15.0	180.0	31,130	518.8	0	0.0	-	182,634

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

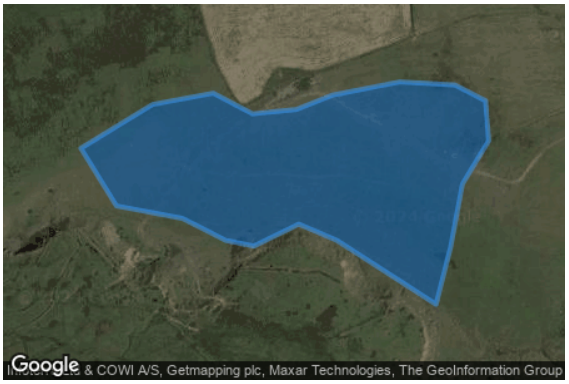
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
13 - Tre-York Street	4,375	72.9	178	3.0
14 - B4256 Hill Street	5,303	88.4	0	0.0
15 - Moriah Street	0	0.0	0	0.0
7 - Tan-Y-Llan Terrace	1,978	33.0	99	1.6
Railway north	1,280	21.3	108	1.8
Railway south	162	2.7	0	0.0
Route 6 - B4257	6,465	107.8	86	1.4
OP 1	0	0.0	0	0.0
OP 2	386	6.4	0	0.0
OP 3	2,001	33.4	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	77	1.3	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	362	6.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	2,226	37.1	78	1.3
OP 12	1,874	31.2	0	0.0
OP 13	2,154	35.9	0	0.0
OP 14	3,594	59.9	0	0.0
OP 15	3,976	66.3	0	0.0
OP 16	1,062	17.7	0	0.0
OP 17	3,852	64.2	0	0.0
OP 18	4,006	66.8	93	1.6
OP 19	5,261	87.7	0	0.0
OP 20	4,995	83.2	0	0.0
OP 21	3,710	61.8	0	0.0
OP 22	571	9.5	0	0.0
OP 23	161	2.7	0	0.0
OP 24	4,102	68.4	0	0.0
OP 25	5,817	97.0	0	0.0
OP 26	4,552	75.9	0	0.0
OP 27	4,650	77.5	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	583	9.7	0	0.0
OP 31	3,161	52.7	0	0.0
OP 32	0	0.0	0	0.0
OP 33	414	6.9	0	0.0

Component Data

PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 15.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass with 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	51.763203	-3.302845	339.09	2.50	341.59
2	51.763880	-3.304548	351.22	2.50	353.72
3	51.764053	-3.305203	355.21	2.50	357.71
4	51.763821	-3.305975	366.73	2.50	369.23
5	51.763880	-3.306458	362.89	2.50	365.39
6	51.764113	-3.307198	365.58	2.50	368.08
7	51.764246	-3.308336	369.82	2.50	372.32
8	51.764857	-3.308947	385.71	2.50	388.21
9	51.765321	-3.307713	379.07	2.50	381.57
10	51.765441	-3.306673	377.59	0.00	377.59
11	51.765222	-3.305997	374.58	2.50	377.08
12	51.765268	-3.305246	373.88	2.50	376.38
13	51.765421	-3.304623	371.96	2.50	374.46
14	51.765560	-3.303465	364.00	2.50	366.50
15	51.765527	-3.302521	356.63	2.50	359.13
16	51.765361	-3.301995	352.77	2.50	355.27
17	51.764936	-3.301941	351.63	2.50	354.13
18	51.764478	-3.302392	355.33	2.50	357.83
19	51.763807	-3.302596	347.33	2.50	349.83

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 15.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass with 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	51.763203	-3.302844	339.05	2.50	341.55
2	51.762745	-3.302070	335.12	2.50	337.62
3	51.762715	-3.302054	335.11	2.50	337.61
4	51.762800	-3.301367	333.78	2.50	336.28
5	51.762883	-3.300879	333.09	2.50	335.59
6	51.763024	-3.300316	334.19	2.50	336.69
7	51.763446	-3.300372	337.86	2.50	340.36
8	51.763691	-3.300667	342.51	2.50	345.01
9	51.763871	-3.300689	343.79	2.50	346.29
10	51.763859	-3.301201	347.23	2.50	349.73
11	51.763776	-3.301418	346.52	2.50	349.02
12	51.763802	-3.302588	347.13	2.50	349.63

Route Receptors

Name: 13 - Tre-York Street
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	51.760201	-3.285759	286.05	1.00	287.05
2	51.760131	-3.286049	283.17	1.00	284.17
3	51.760061	-3.286210	281.49	1.00	282.49
4	51.759968	-3.286419	277.88	1.00	278.88
5	51.759899	-3.286473	277.89	1.00	278.89
6	51.759733	-3.286629	277.30	1.00	278.30
7	51.759580	-3.286806	274.95	1.00	275.95
8	51.759480	-3.287015	274.01	1.00	275.01
9	51.759361	-3.287294	272.04	1.00	273.04
10	51.759245	-3.287626	269.26	1.00	270.26
11	51.759162	-3.287825	268.64	1.00	269.64

Name: 14 - B4256 Hill Street
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	51.756362	-3.281227	282.95	1.00	283.95
2	51.755964	-3.280948	285.16	1.00	286.16
3	51.755745	-3.280712	287.02	1.00	288.02
4	51.755479	-3.280400	287.22	1.00	288.22
5	51.755047	-3.279617	290.41	1.00	291.41
6	51.754343	-3.278040	295.20	1.00	296.20
7	51.754204	-3.277557	296.42	1.00	297.42
8	51.754104	-3.276849	297.97	1.00	298.97
9	51.754124	-3.275701	300.20	1.00	301.20
10	51.754071	-3.275175	301.94	1.00	302.94
11	51.753971	-3.274693	303.37	1.00	304.37
12	51.753453	-3.273995	305.71	1.00	306.71
13	51.752909	-3.273309	305.89	1.00	306.89
14	51.752650	-3.272901	308.00	1.00	309.00
15	51.752590	-3.272343	310.23	1.00	311.23
16	51.752557	-3.271195	314.37	1.00	315.37
17	51.752650	-3.270122	319.41	1.00	320.41
18	51.752829	-3.269028	326.78	1.00	327.78
19	51.753208	-3.267526	335.00	1.00	336.00
20	51.753513	-3.266700	338.97	1.00	339.97
21	51.754051	-3.265530	345.52	1.00	346.52
22	51.754563	-3.264436	349.46	1.00	350.46
23	51.754802	-3.264028	351.38	1.00	352.38
24	51.755034	-3.263706	353.61	1.00	354.61
25	51.755546	-3.263159	356.76	1.00	357.76
26	51.756137	-3.262505	357.72	1.00	358.72

Name: 15 - Moriah Street
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	51.754410	-3.278287	294.45	1.00	295.45
2	51.753314	-3.280905	272.70	1.00	273.70

Name: 7 - Tan-Y-Llan Terrace
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	51.762037	-3.287240	286.31	1.00	287.31
2	51.762170	-3.287471	286.45	1.00	287.45
3	51.762150	-3.287664	285.87	1.00	286.87
4	51.761941	-3.289139	284.64	1.00	285.64
5	51.761961	-3.289209	284.72	1.00	285.72
6	51.762010	-3.289241	284.97	1.00	285.97
7	51.762339	-3.289305	286.15	1.00	287.15
8	51.762718	-3.289354	286.98	1.00	287.98
9	51.762953	-3.289305	288.45	1.00	289.45
10	51.763046	-3.289273	288.76	1.00	289.76
11	51.763232	-3.289305	288.88	1.00	289.88
12	51.763906	-3.289563	290.22	1.00	291.22
13	51.764185	-3.289643	288.89	1.00	289.89
14	51.764248	-3.289643	288.50	1.00	289.50

Name: Railway north
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	51.761776	-3.291060	274.38	2.75	277.13
2	51.761129	-3.290738	273.56	2.75	276.31

Name: Railway south
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	51.756947	-3.287878	267.15	2.75	269.90
2	51.755884	-3.286419	264.15	2.75	266.90
3	51.755426	-3.285786	263.84	2.75	266.59
4	51.754749	-3.284789	264.58	2.75	267.33
5	51.754573	-3.284520	264.09	2.75	266.84
6	51.754234	-3.284156	264.28	2.75	267.03
7	51.753892	-3.283893	264.25	2.75	267.00
8	51.753613	-3.283624	263.34	2.75	266.09

Name: Route 6 - B4257
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	51.764490	-3.289858	288.22	1.00	289.22
2	51.764317	-3.289606	288.61	1.00	289.61
3	51.764221	-3.289413	290.30	1.00	291.30
4	51.764168	-3.289043	291.73	1.00	292.73
5	51.764317	-3.288104	295.65	1.00	296.65
6	51.762923	-3.287267	292.48	1.00	293.48
7	51.761392	-3.286328	287.79	1.00	288.79
8	51.760831	-3.285974	287.83	1.00	288.83
9	51.760155	-3.285642	286.92	1.00	287.92
10	51.759478	-3.285352	286.72	1.00	287.72
11	51.759577	-3.283678	290.21	1.00	291.21
12	51.759617	-3.283271	292.58	1.00	293.58
13	51.759511	-3.282949	293.03	1.00	294.03
14	51.758694	-3.281522	292.49	1.00	293.49
15	51.758335	-3.281404	292.70	1.00	293.70
16	51.757944	-3.281372	291.19	1.00	292.19
17	51.757585	-3.281565	287.18	1.00	288.18
18	51.757326	-3.281822	284.91	1.00	285.91
19	51.756947	-3.281683	282.39	1.00	283.39
20	51.756522	-3.281404	281.32	1.00	282.32
21	51.755852	-3.281361	280.23	1.00	281.23
22	51.754669	-3.281522	276.69	1.00	277.69
23	51.753760	-3.281425	272.86	1.00	273.86
24	51.753361	-3.281146	271.97	1.00	272.97
25	51.753002	-3.280621	272.48	1.00	273.48
26	51.752637	-3.280213	271.61	1.00	272.61
27	51.752385	-3.280073	270.80	1.00	271.80

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	51.764543	-3.296250	302.09	1.80
OP 2	2	51.763102	-3.295199	301.30	1.80
OP 3	3	51.759842	-3.293267	294.78	1.80
OP 4	4	51.764098	-3.291776	274.69	1.80
OP 5	5	51.763500	-3.290306	280.95	1.80
OP 6	6	51.763102	-3.289330	288.86	1.80
OP 7	7	51.764257	-3.288794	293.73	1.80
OP 8	8	51.763447	-3.287560	294.47	1.80
OP 9	9	51.763142	-3.286637	295.76	1.80
OP 10	10	51.761415	-3.290145	270.62	1.80
OP 11	11	51.760340	-3.289276	269.28	1.80
OP 12	12	51.761787	-3.288590	285.48	1.80
OP 13	13	51.761449	-3.287570	281.43	1.80
OP 14	14	51.760851	-3.287528	279.92	1.80
OP 15	15	51.760678	-3.286830	282.86	1.80
OP 16	16	51.762265	-3.286862	290.69	1.80
OP 17	17	51.761010	-3.285983	288.92	1.80
OP 18	18	51.758918	-3.286283	276.25	1.80
OP 19	19	51.759675	-3.285371	288.10	1.80
OP 20	20	51.759416	-3.282582	293.09	1.80
OP 21	21	51.758042	-3.284899	276.98	1.80
OP 22	22	51.756880	-3.286498	266.41	1.80
OP 23	23	51.755704	-3.284363	267.25	1.80
OP 24	24	51.757311	-3.282185	285.12	1.80
OP 25	25	51.758208	-3.280414	298.97	1.80
OP 26	26	51.757192	-3.280822	288.04	1.80
OP 27	27	51.756136	-3.277636	308.80	1.80
OP 28	28	51.754170	-3.281487	274.28	1.80
OP 29	29	51.753898	-3.279427	286.50	1.80
OP 30	30	51.753459	-3.276262	293.27	1.80
OP 31	31	51.754934	-3.276520	303.95	1.80
OP 32	32	51.752244	-3.279234	274.93	1.80
OP 33	33	51.752669	-3.274363	294.55	1.80

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy	Peak Luminance
	°	°	min	hr	min	hr	kWh	cd/m^2
PV array 1	15.0	180.0	51,980	866.3	642	10.7	-	346,896
PV array 2	15.0	180.0	31,130	518.8	0	0.0	-	182,634

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
13 - Tre-York Street	4,375	72.9	178	3.0
14 - B4256 Hill Street	5,303	88.4	0	0.0
15 - Moriah Street	0	0.0	0	0.0
7 - Tan-Y-Llan Terrace	1,978	33.0	99	1.6
Railway north	1,280	21.3	108	1.8
Railway south	162	2.7	0	0.0
Route 6 - B4257	6,465	107.8	86	1.4
OP 1	0	0.0	0	0.0
OP 2	386	6.4	0	0.0
OP 3	2,001	33.4	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	77	1.3	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	362	6.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	2,226	37.1	78	1.3
OP 12	1,874	31.2	0	0.0
OP 13	2,154	35.9	0	0.0
OP 14	3,594	59.9	0	0.0
OP 15	3,976	66.3	0	0.0
OP 16	1,062	17.7	0	0.0
OP 17	3,852	64.2	0	0.0
OP 18	4,006	66.8	93	1.6
OP 19	5,261	87.7	0	0.0
OP 20	4,995	83.2	0	0.0
OP 21	3,710	61.8	0	0.0
OP 22	571	9.5	0	0.0

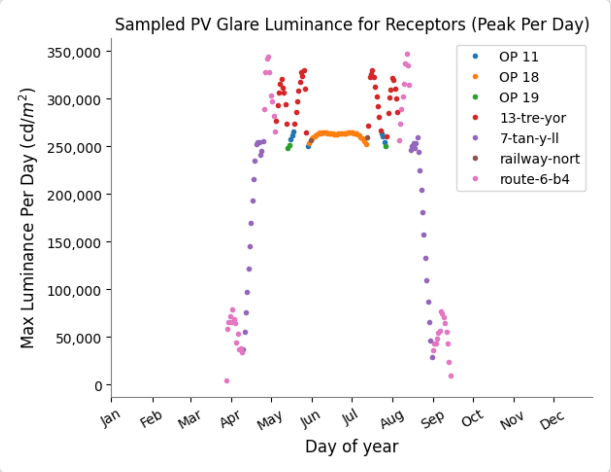
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 23	161	2.7	0	0.0
OP 24	4,102	68.4	0	0.0
OP 25	5,817	97.0	0	0.0
OP 26	4,552	75.9	0	0.0
OP 27	4,650	77.5	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	583	9.7	0	0.0
OP 31	3,161	52.7	0	0.0
OP 32	0	0.0	0	0.0
OP 33	414	6.9	0	0.0

PV: PV array 1 potential temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare		Peak Luminance
	min	hr	min	hr	cd/m^2
13 - Tre-York Street	2,575	42.9	178	3.0	332,040
7 - Tan-Y-Llan Terrace	1,978	33.0	99	1.6	288,696
Railway north	1,022	17.0	108	1.8	385,238
Route 6 - B4257	3,279	54.6	86	1.4	346,896
14 - B4256 Hill Street	2,748	45.8	0	0.0	187,458
Railway south	162	2.7	0	0.0	3,274
15 - Moriah Street	0	0.0	0	0.0	0
OP 11	1,775	29.6	78	1.3	268,457
OP 18	2,025	33.8	93	1.6	264,724
OP 2	386	6.4	0	0.0	115,713
OP 3	1,291	21.5	0	0.0	183,005
OP 6	77	1.3	0	0.0	5,081
OP 9	362	6.0	0	0.0	32,801
OP 12	1,874	31.2	0	0.0	207,224
OP 13	2,154	35.9	0	0.0	213,325
OP 14	2,514	41.9	0	0.0	242,811
OP 15	2,672	44.5	0	0.0	243,800
OP 16	1,062	17.7	0	0.0	152,739
OP 17	2,748	45.8	0	0.0	231,956
OP 19	2,756	45.9	0	0.0	254,599
OP 20	3,109	51.8	0	0.0	230,716
OP 21	1,946	32.4	0	0.0	240,153
OP 22	571	9.5	0	0.0	37,621
OP 23	161	2.7	0	0.0	2,065
OP 24	2,135	35.6	0	0.0	218,859
OP 25	3,033	50.5	0	0.0	221,282
OP 26	2,353	39.2	0	0.0	220,049
OP 27	2,435	40.6	0	0.0	189,441
OP 30	583	9.7	0	0.0	19,692
OP 31	1,780	29.7	0	0.0	133,903
OP 33	414	6.9	0	0.0	10,073
OP 1	0	0.0	0	0.0	0
OP 4	0	0.0	0	0.0	0
OP 5	0	0.0	0	0.0	0
OP 7	0	0.0	0	0.0	0
OP 8	0	0.0	0	0.0	0

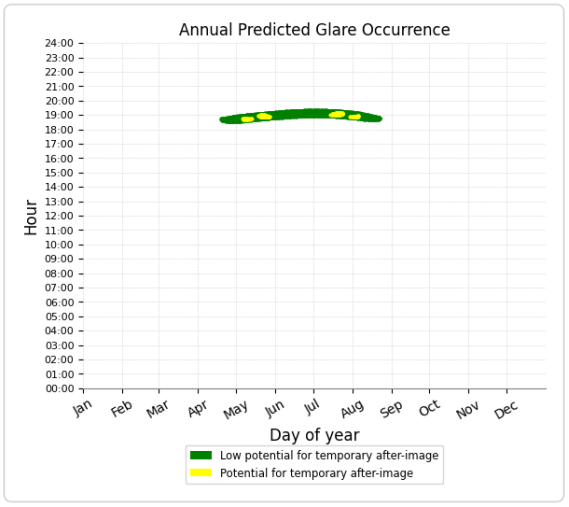
Receptor	Annual Green Glare		Annual Yellow Glare		Peak Luminance
	min	hr	min	hr	cd/m^2
OP 10	0	0.0	0	0.0	0
OP 28	0	0.0	0	0.0	0
OP 29	0	0.0	0	0.0	0
OP 32	0	0.0	0	0.0	0

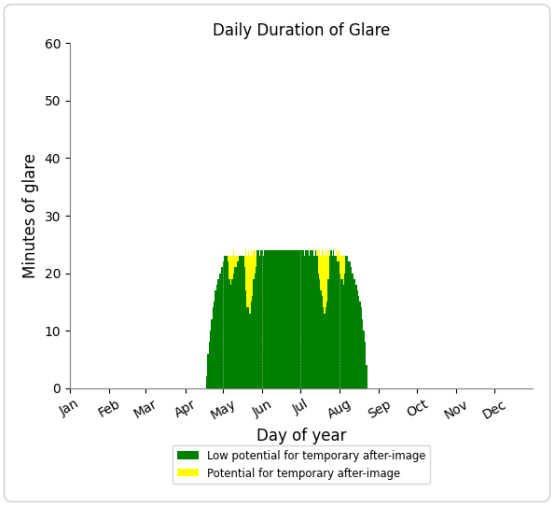


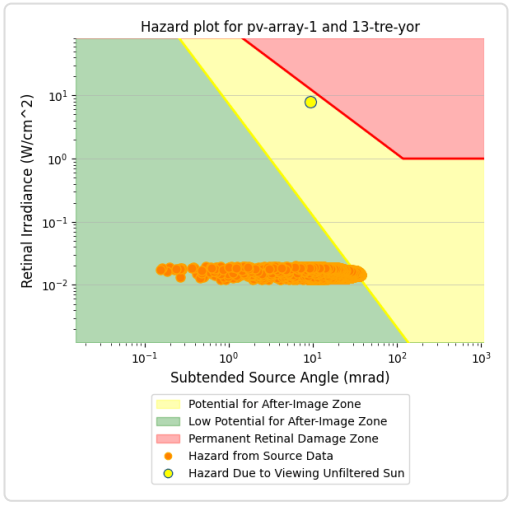
PV array 1 and Route: 13 - Tre-York Street

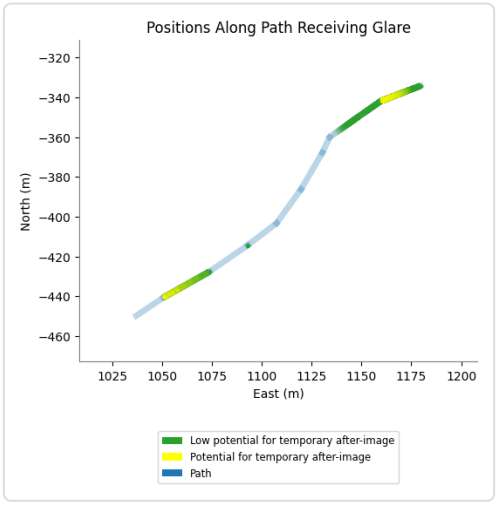
Yellow glare: 178 min.

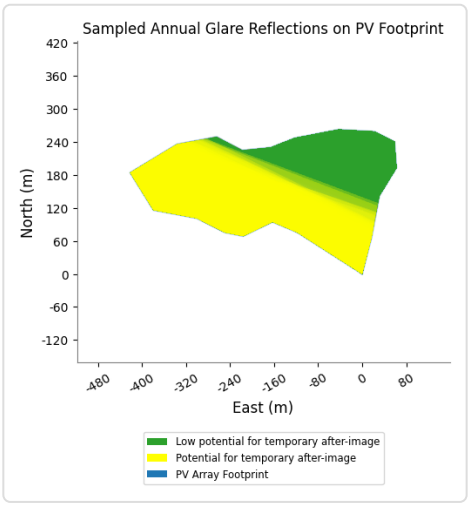
Green glare: 2,575 min.

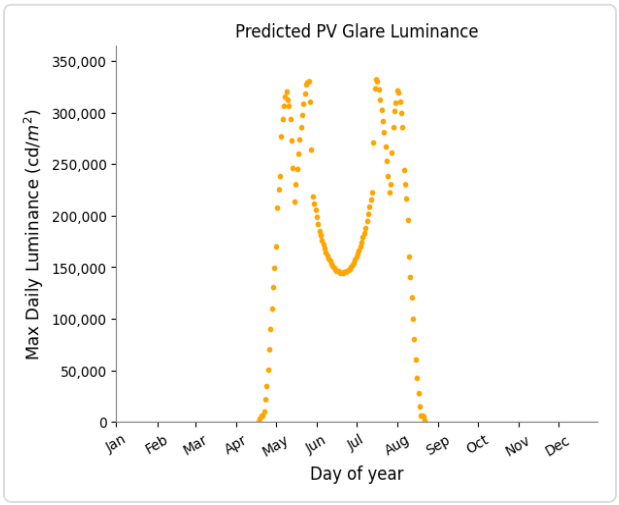








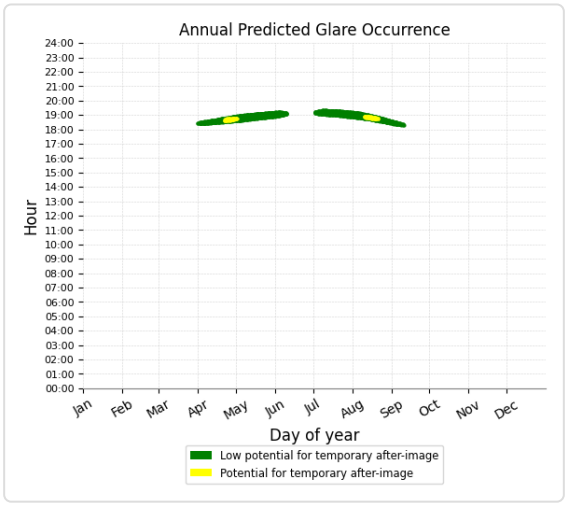


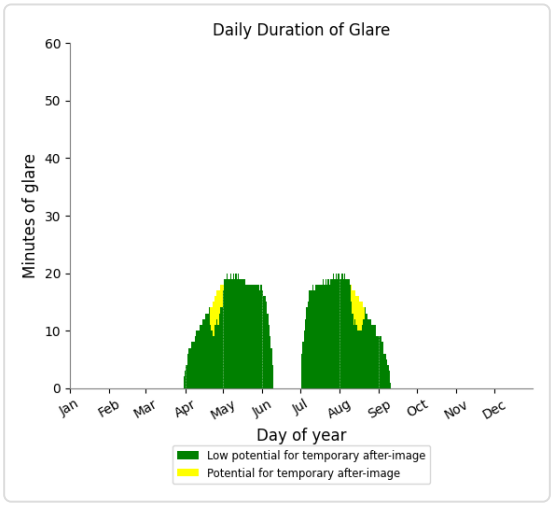


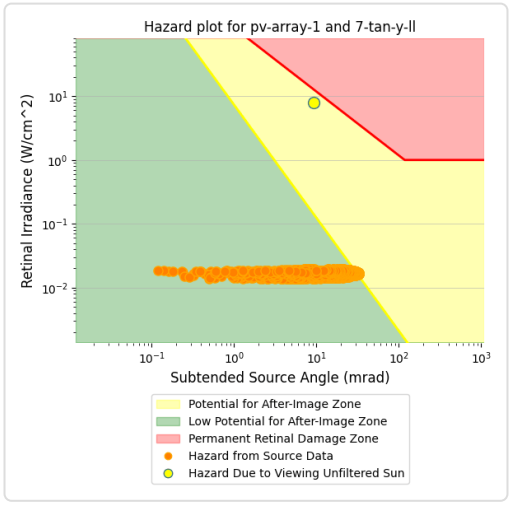
PV array 1 and Route: 7 - Tan-Y-Llan Terrace

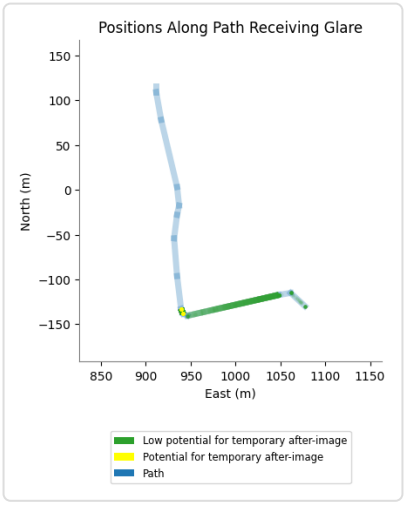
Yellow glare: 99 min.

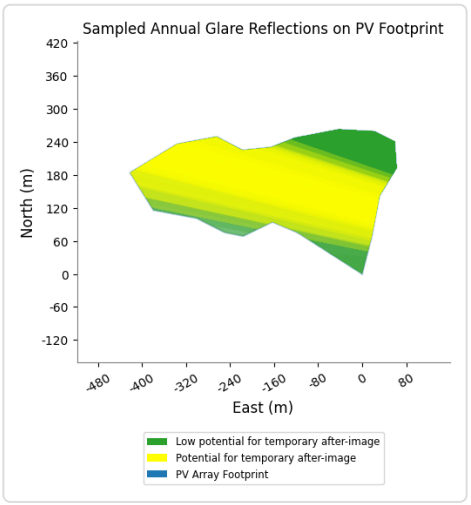
Green glare: 1,978 min.

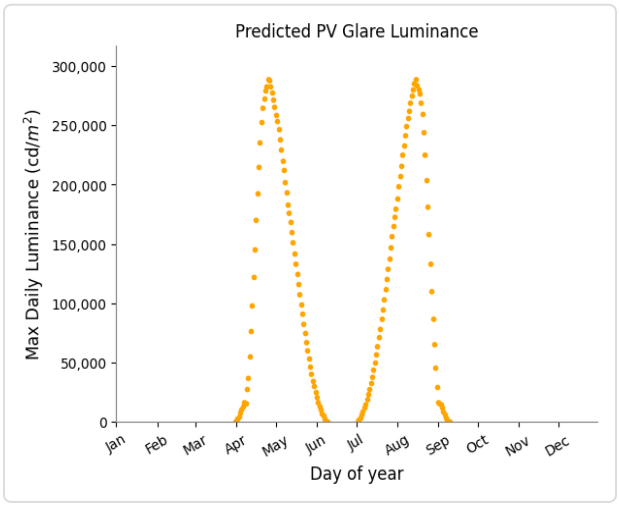








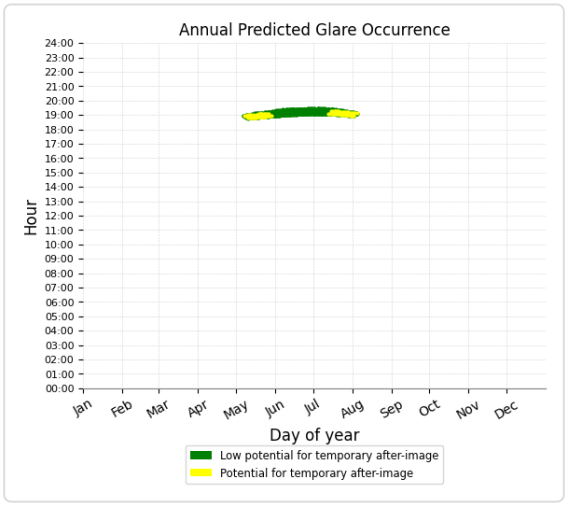


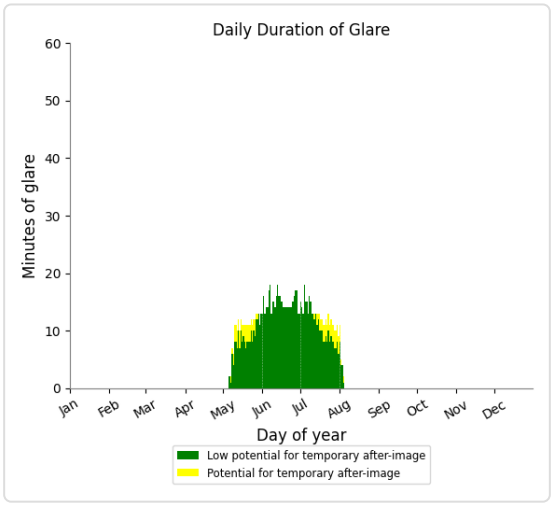


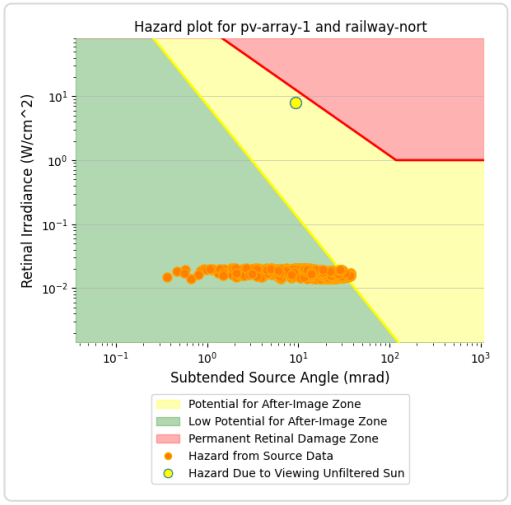
PV array 1 and Route: Railway north

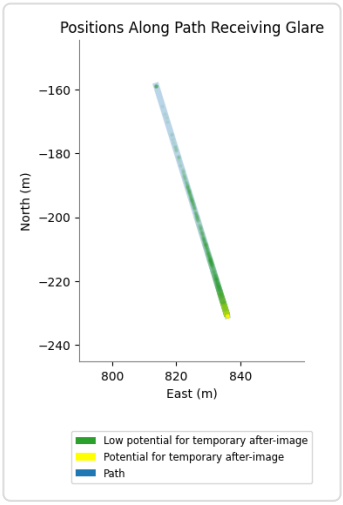
Yellow glare: 108 min.

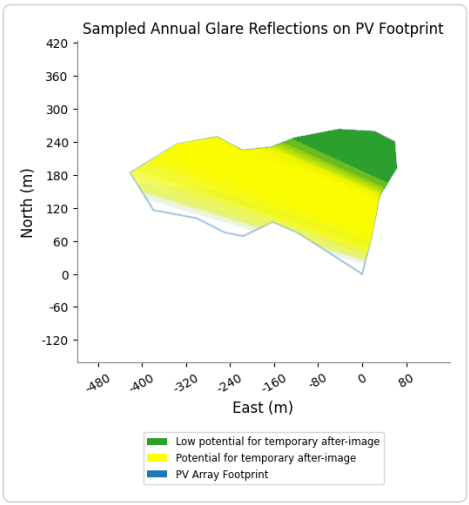
Green glare: 1,022 min.

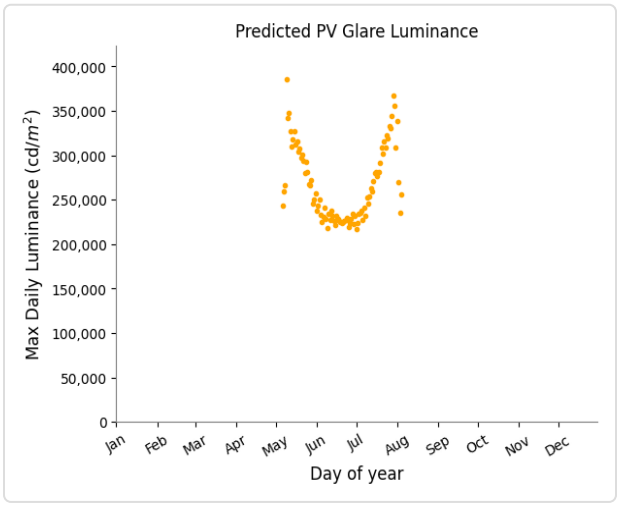








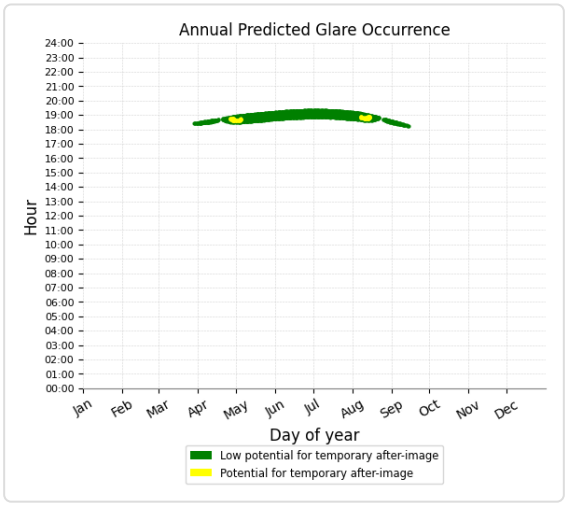


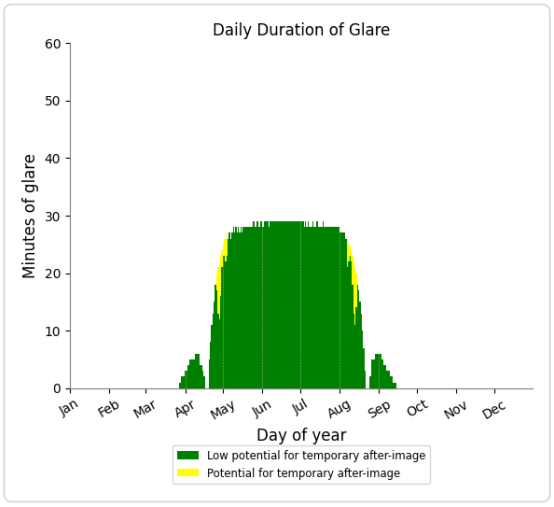


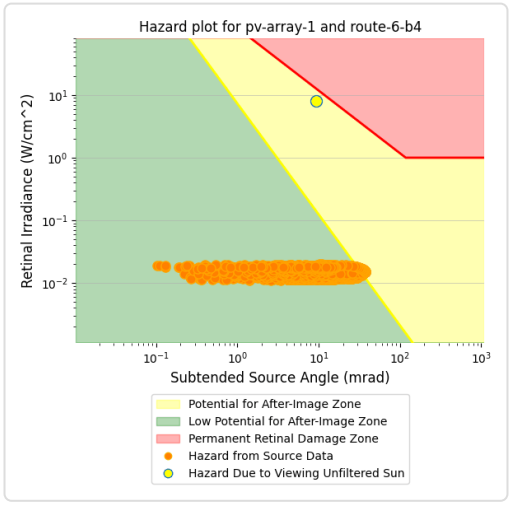
PV array 1 and Route: Route 6 - B4257

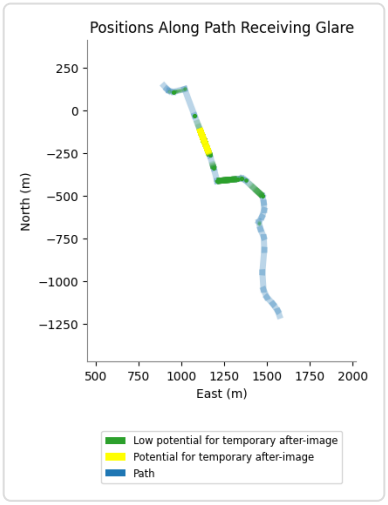
Yellow glare: 86 min.

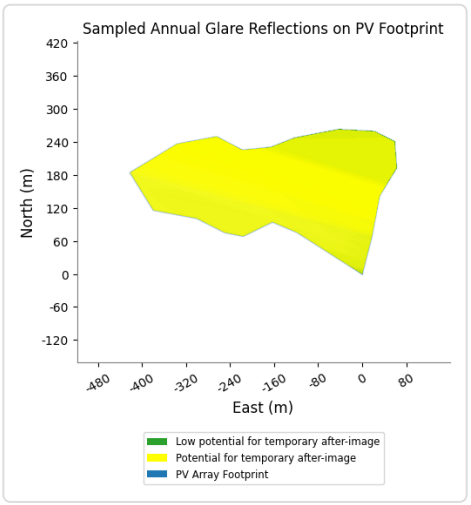
Green glare: 3,279 min.

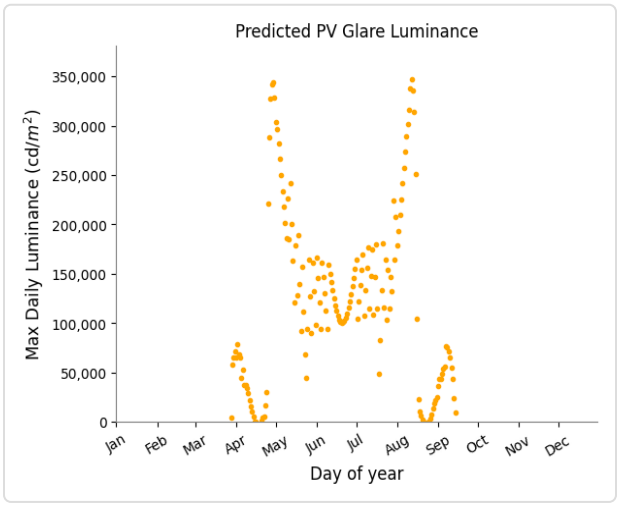








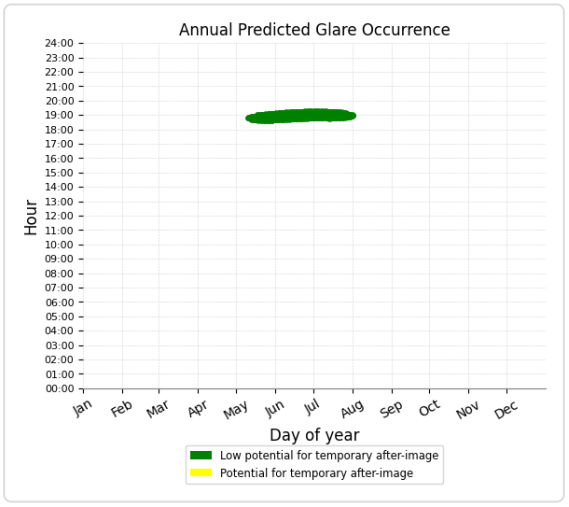


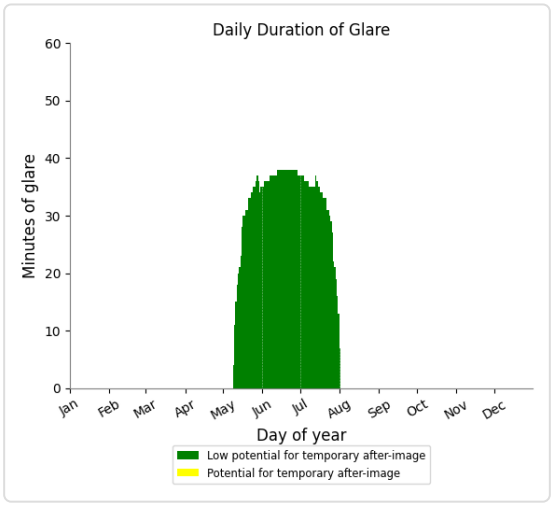


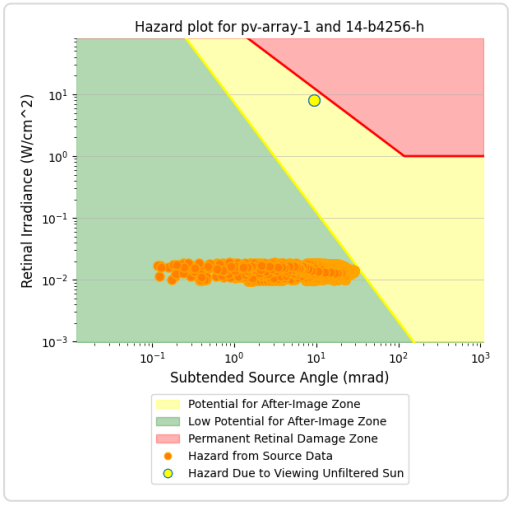
PV array 1 and Route: 14 - B4256 Hill Street

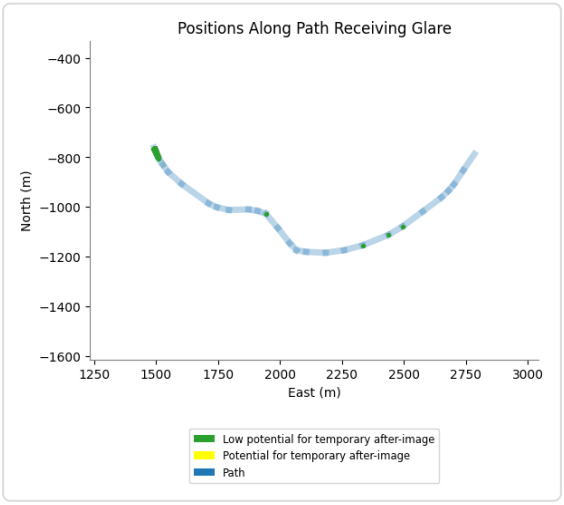
Yellow glare: none

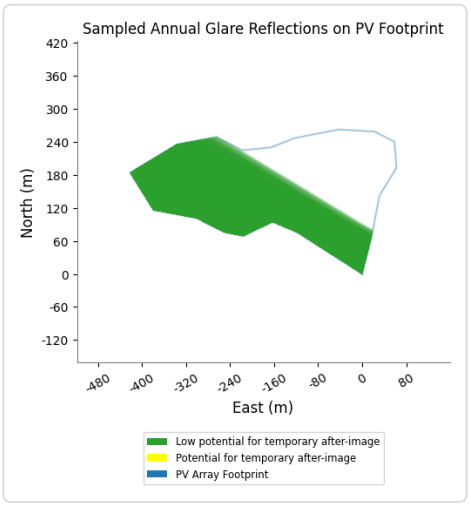
Green glare: 2,748 min.

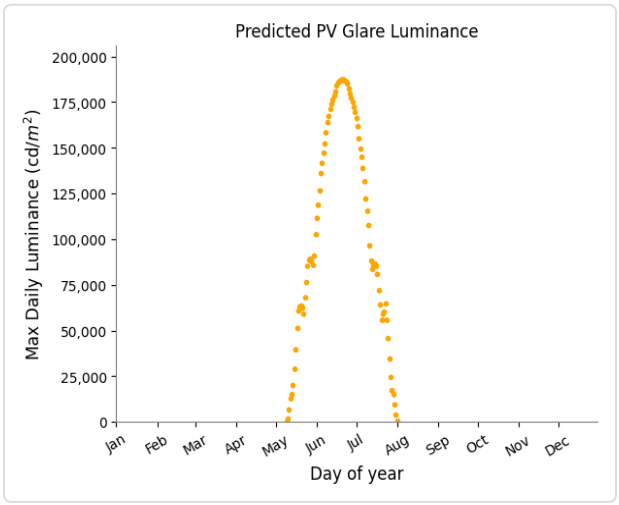








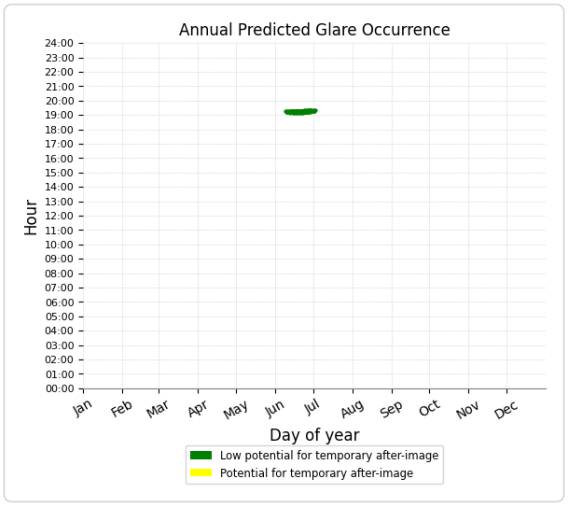


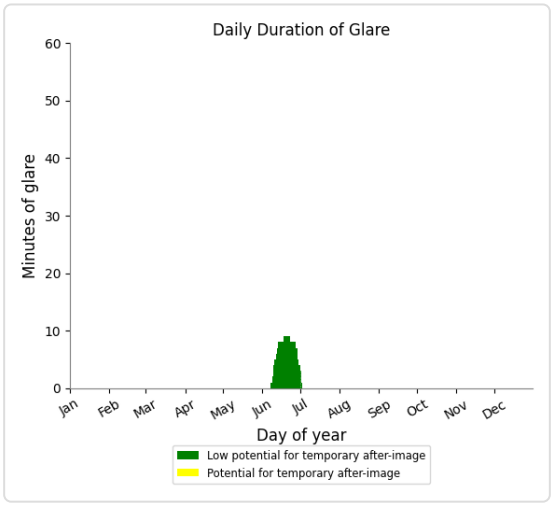


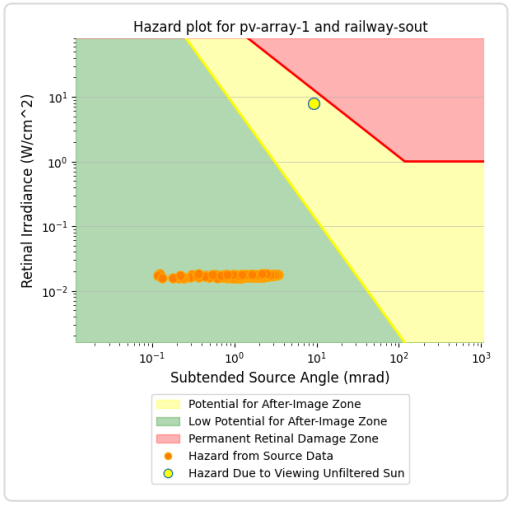
PV array 1 and Route: Railway south

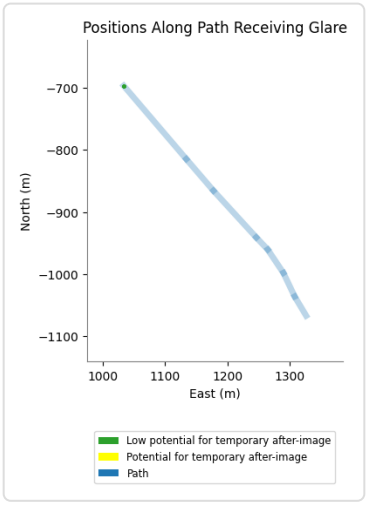
Yellow glare: none

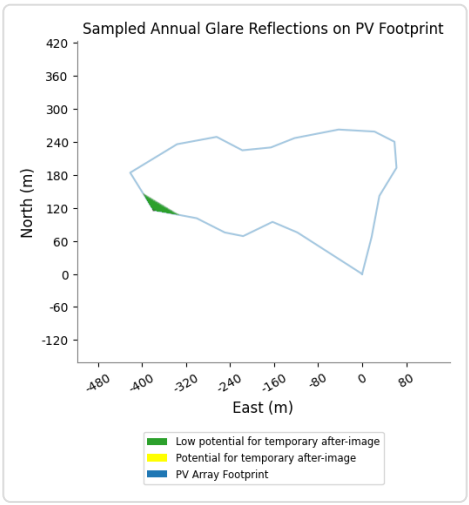
Green glare: 162 min.

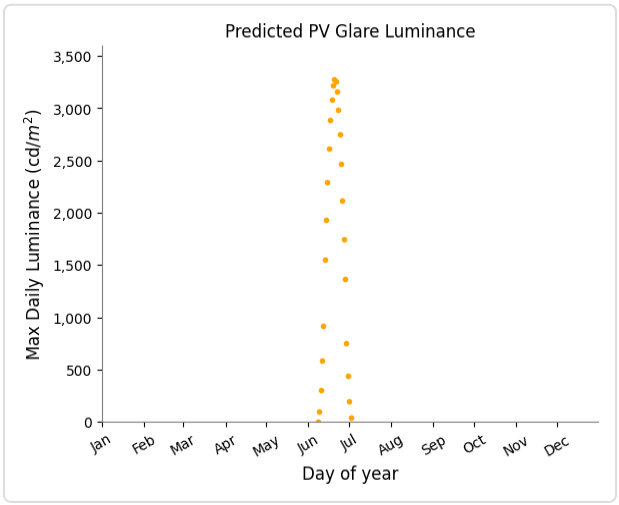












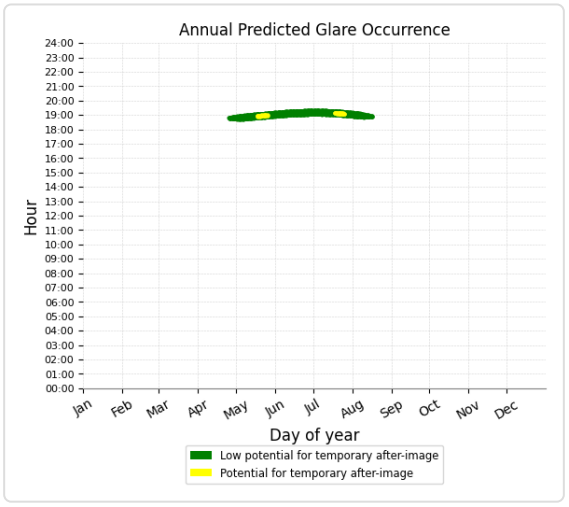
PV array 1 and Route: 15 - Moriah Street

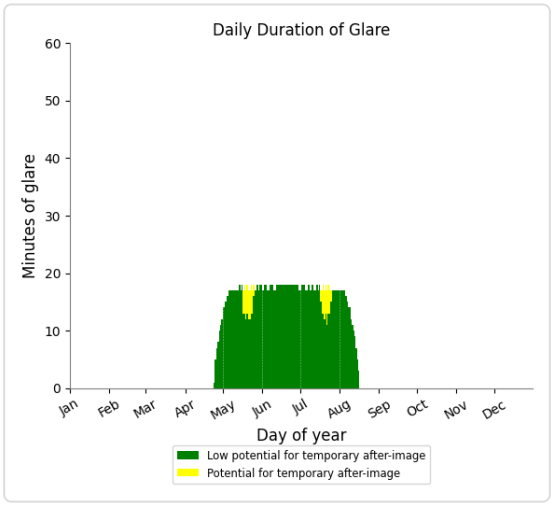
No glare found

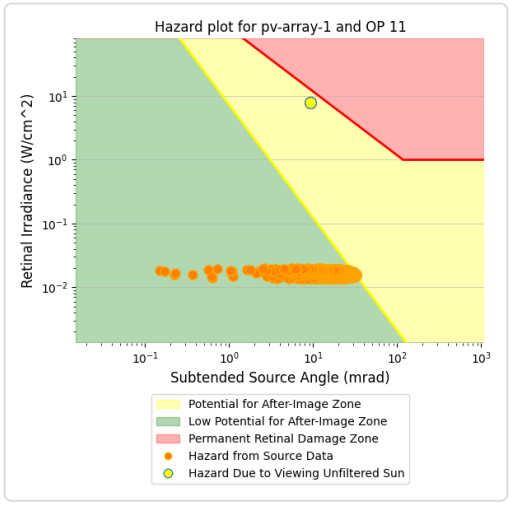
PV array 1 and OP 11

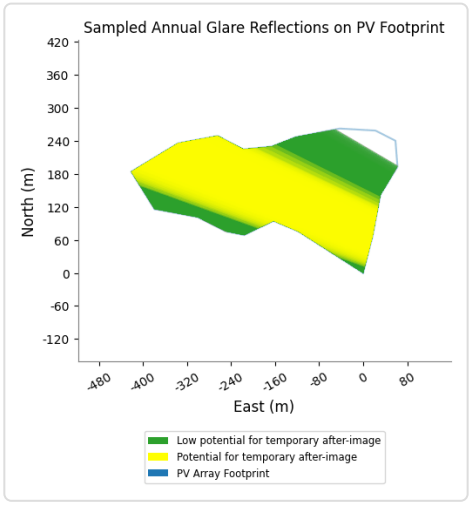
Yellow glare: 78 min.

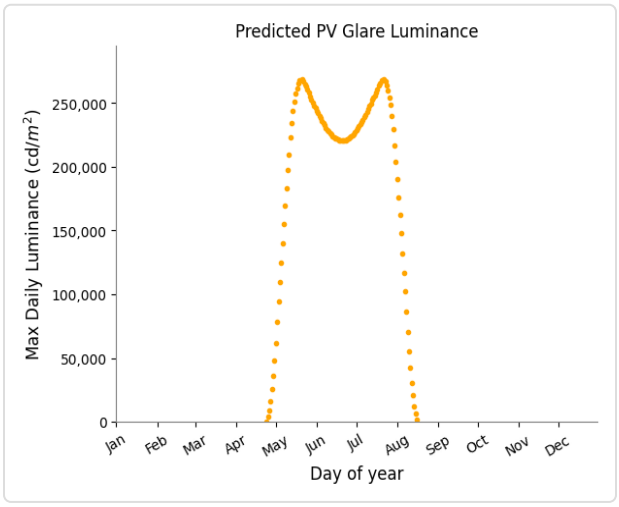
Green glare: 1,775 min.







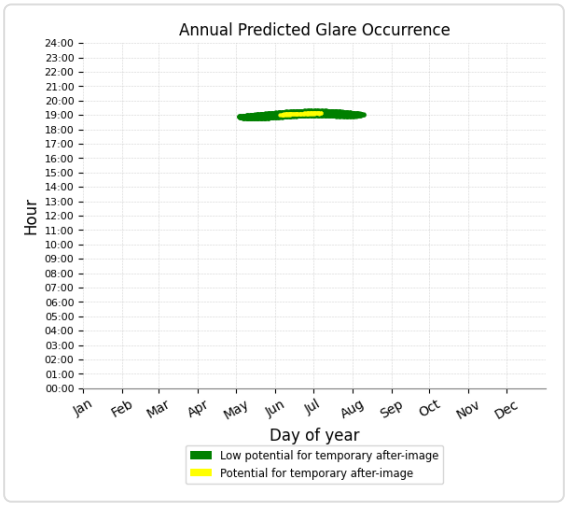


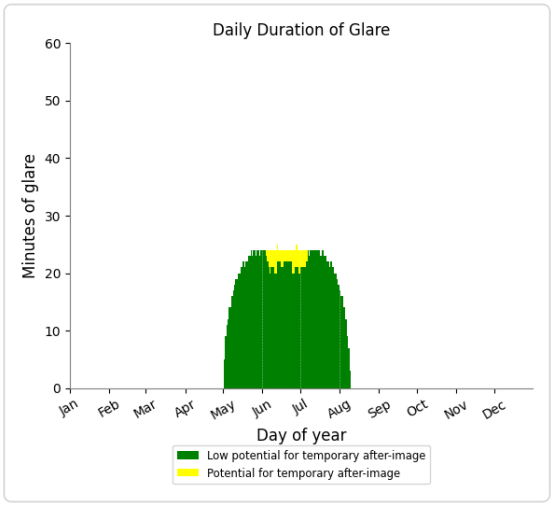


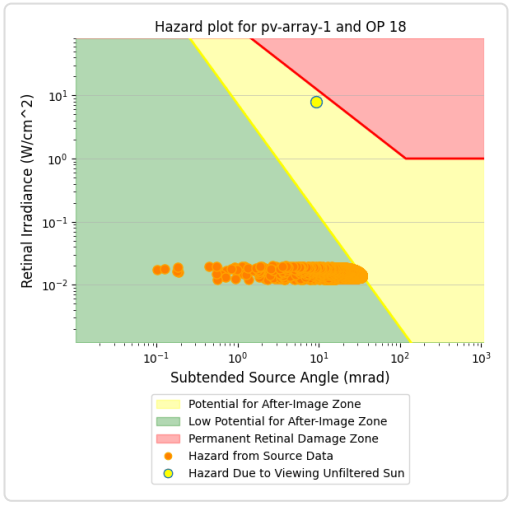
PV array 1 and OP 18

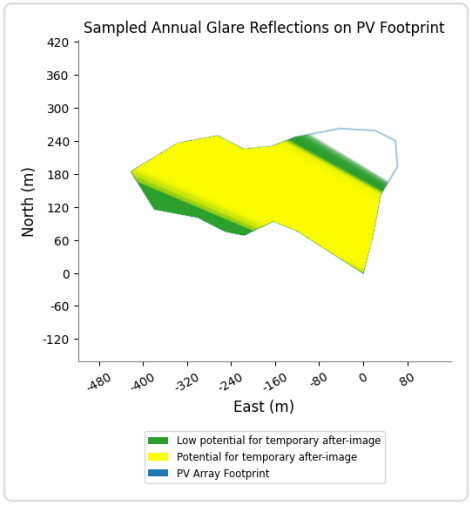
Yellow glare: 93 min.

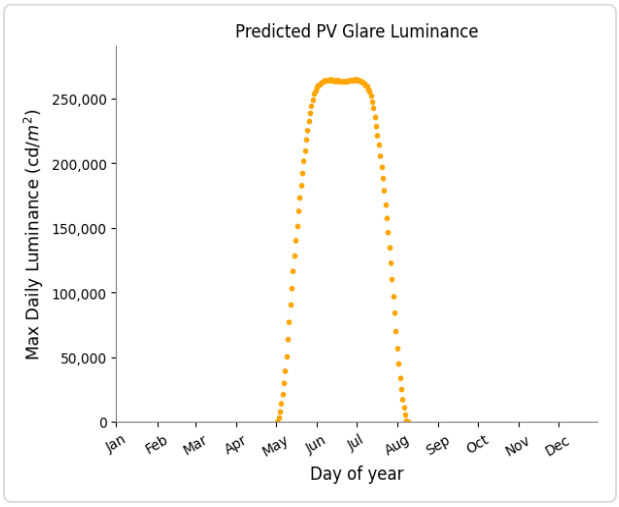
Green glare: 2,025 min.







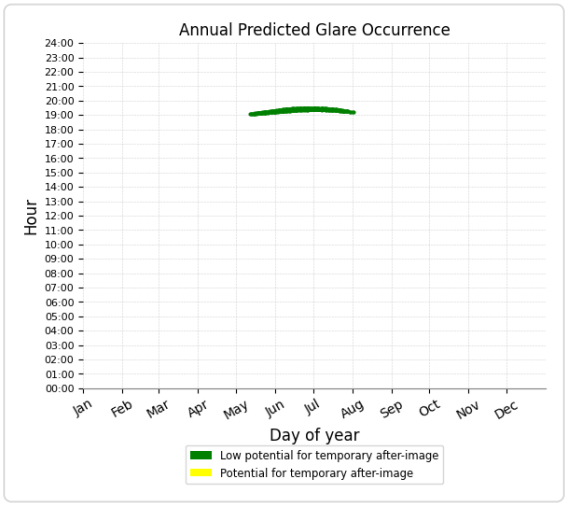


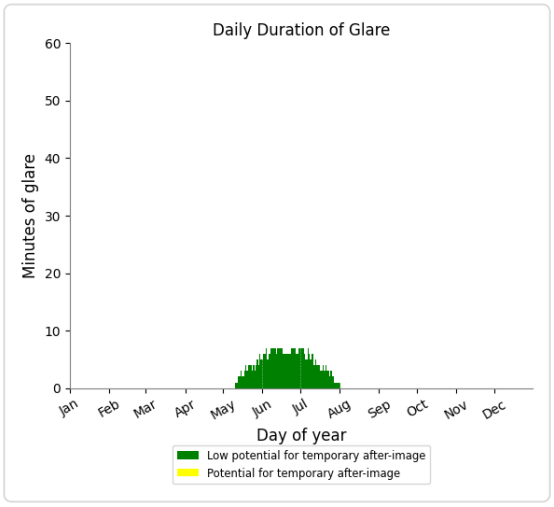


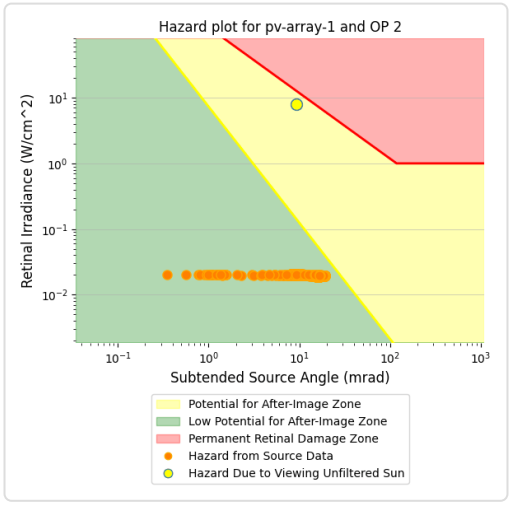
PV array 1 and OP 2

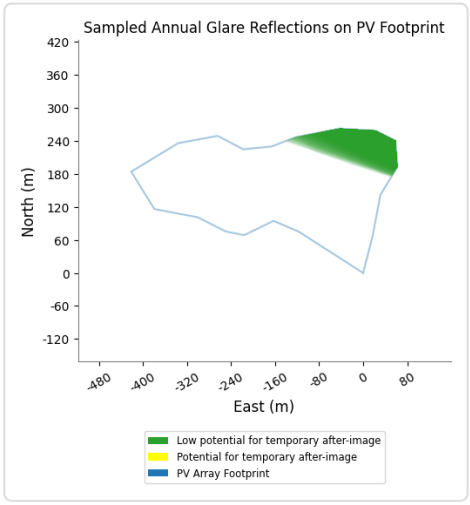
Yellow glare: none

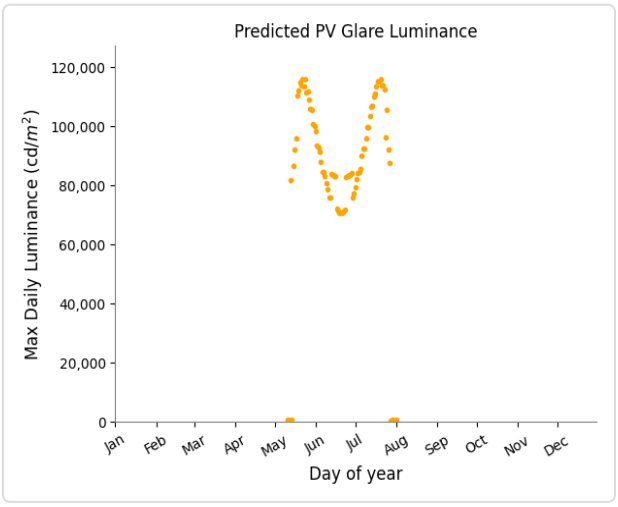
Green glare: 386 min.







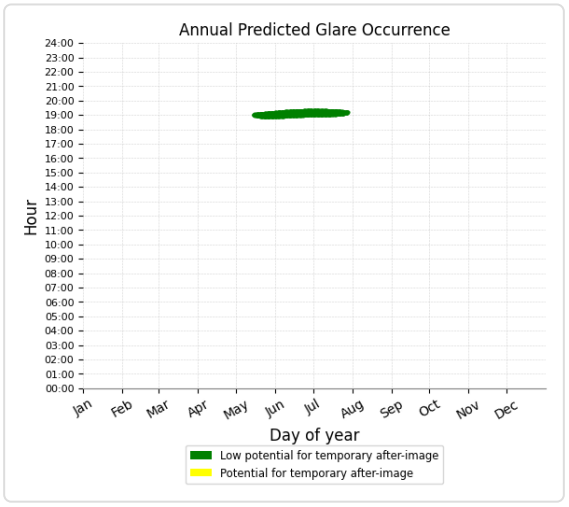


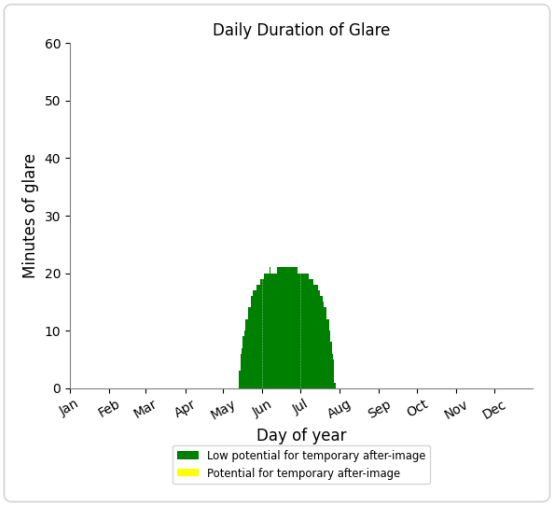


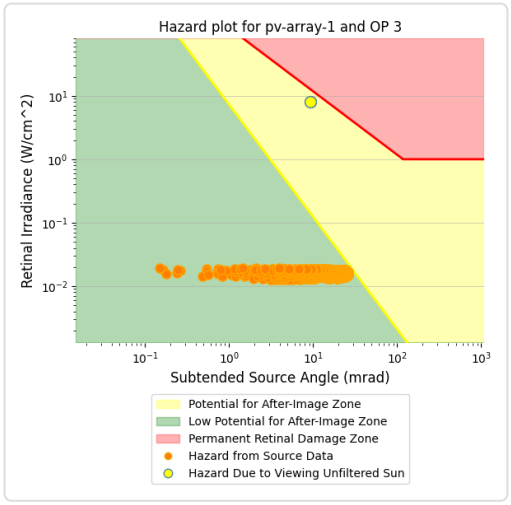
PV array 1 and OP 3

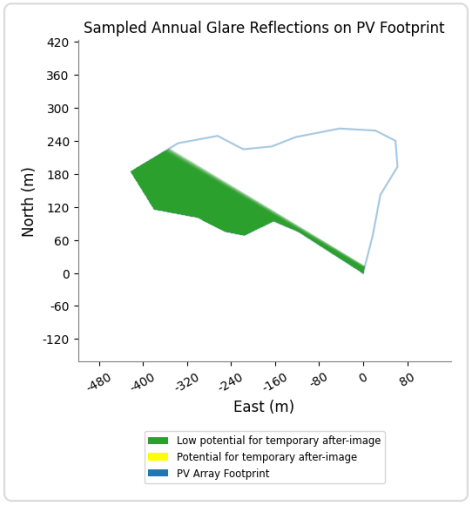
Yellow glare: none

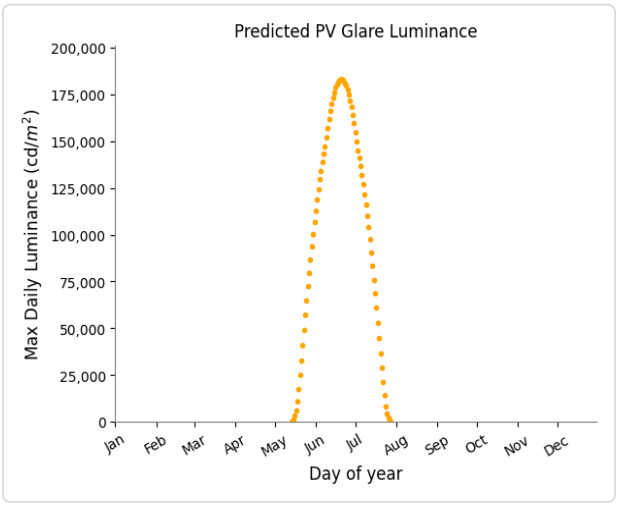
Green glare: 1,291 min.







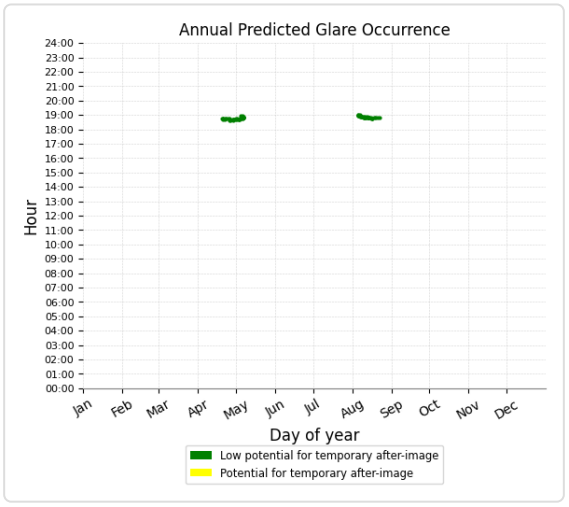


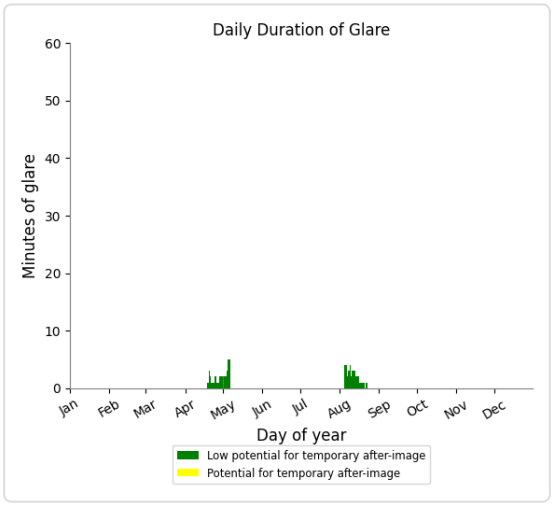


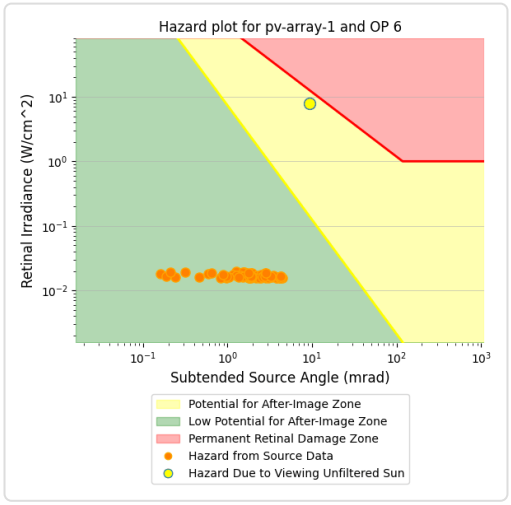
PV array 1 and OP 6

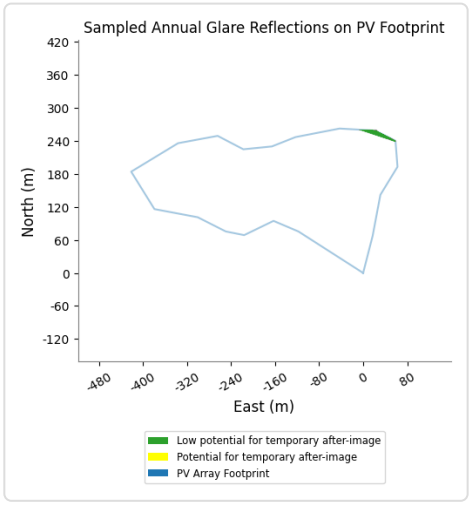
Yellow glare: none

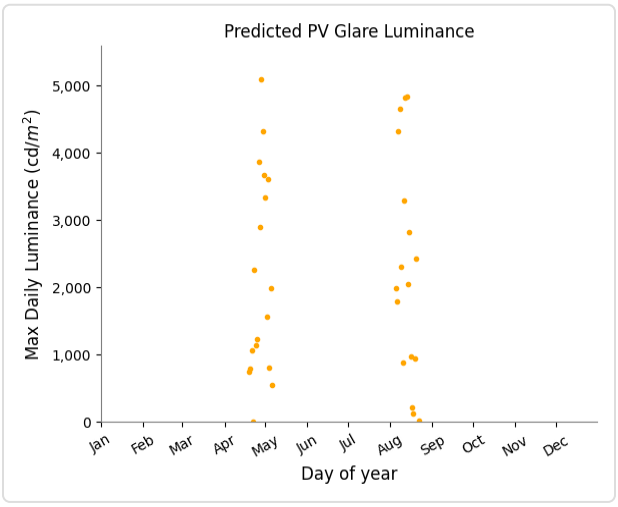
Green glare: 77 min.







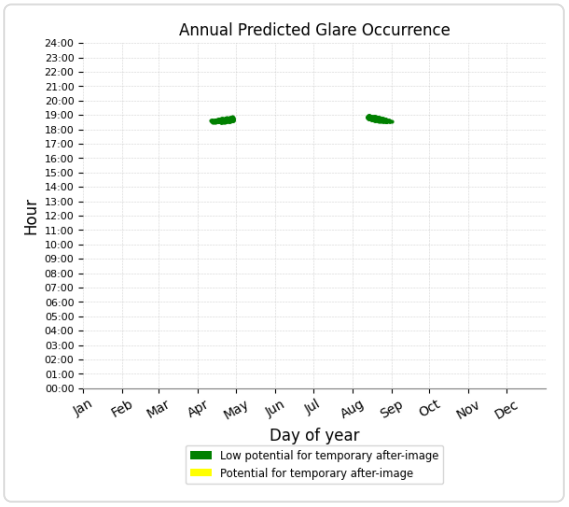


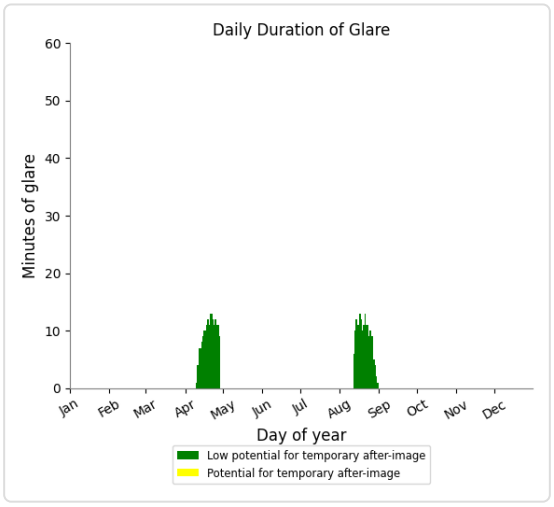


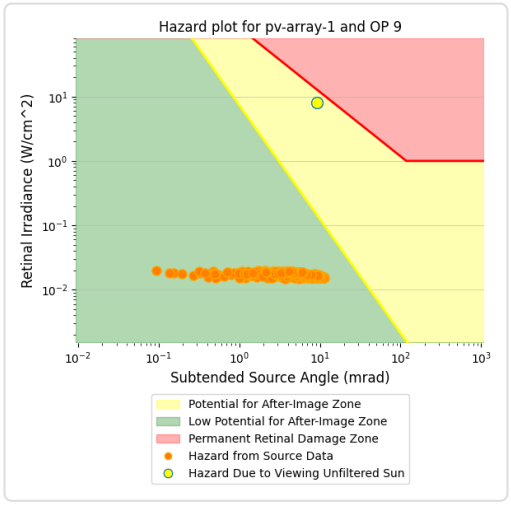
PV array 1 and OP 9

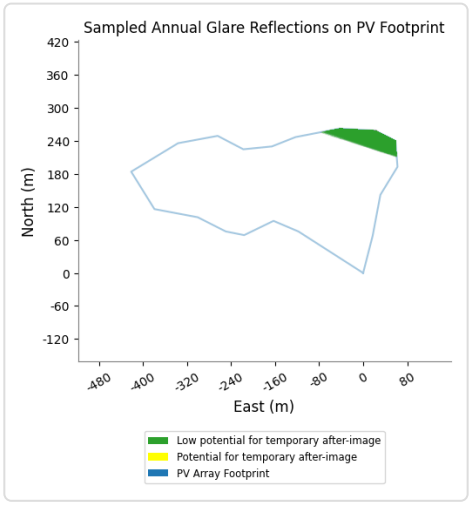
Yellow glare: none

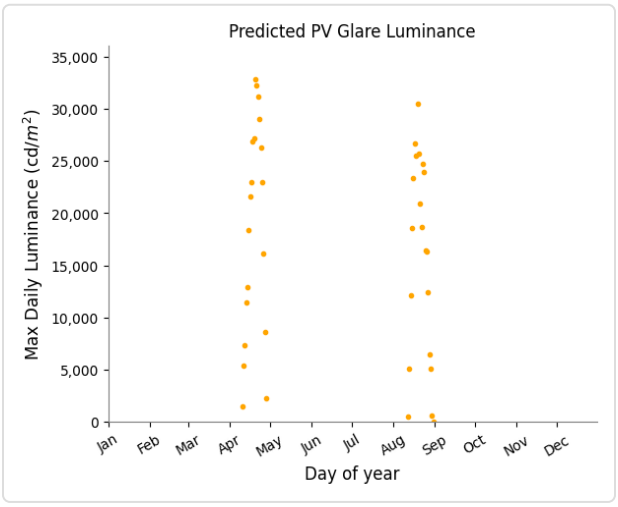
Green glare: 362 min.







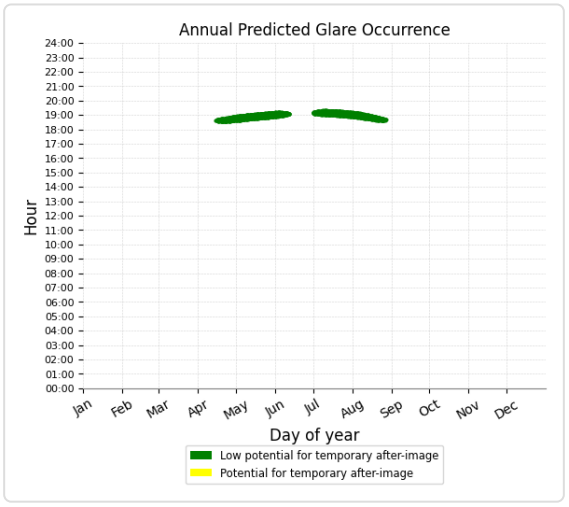


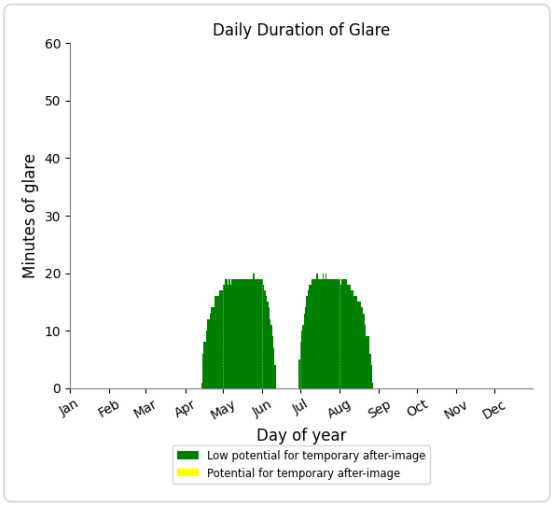


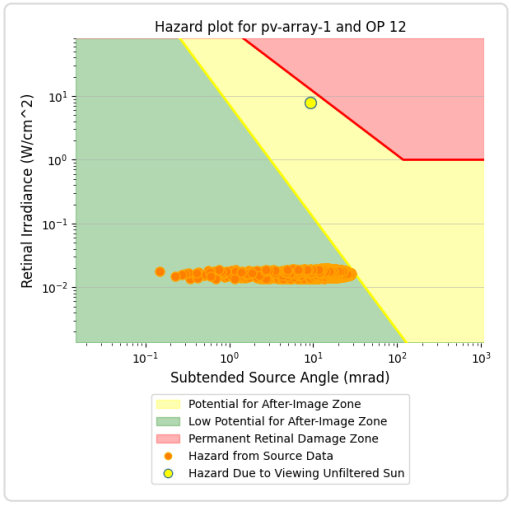
PV array 1 and OP 12

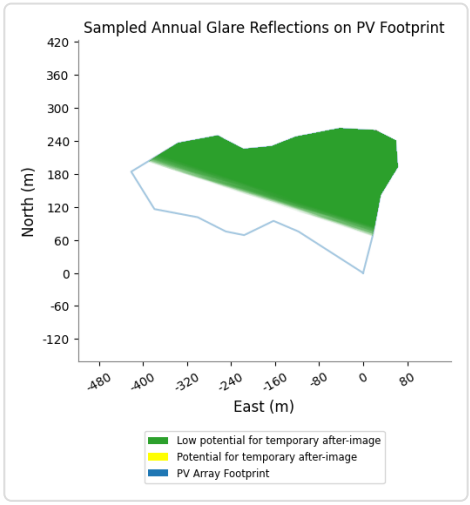
Yellow glare: none

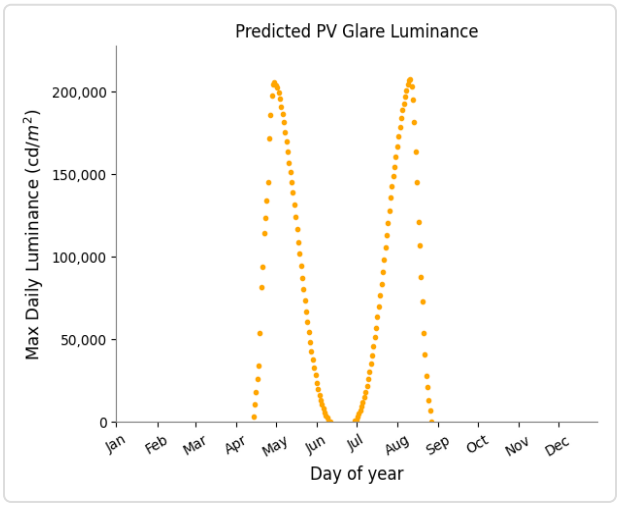
Green glare: 1,874 min.







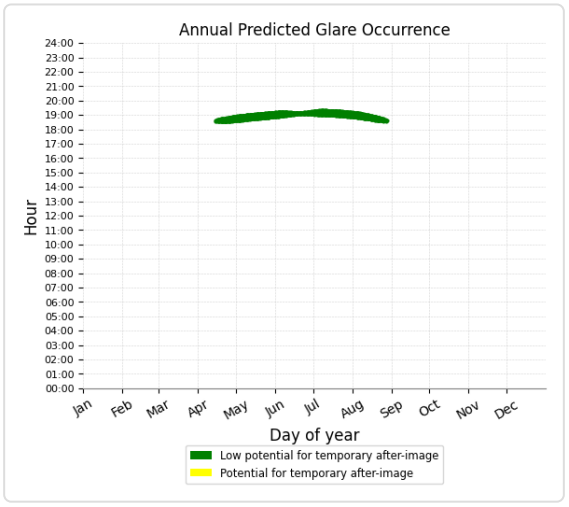


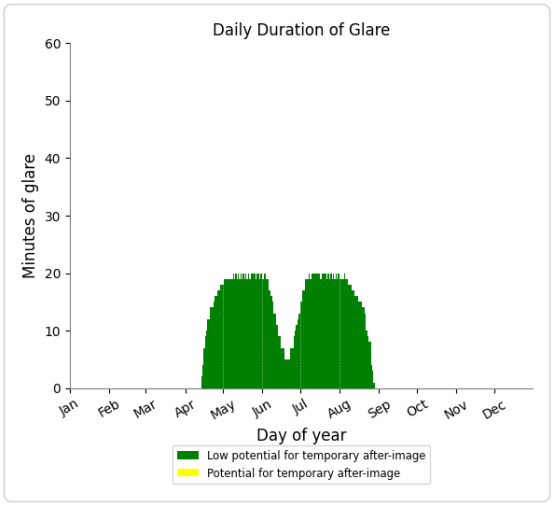


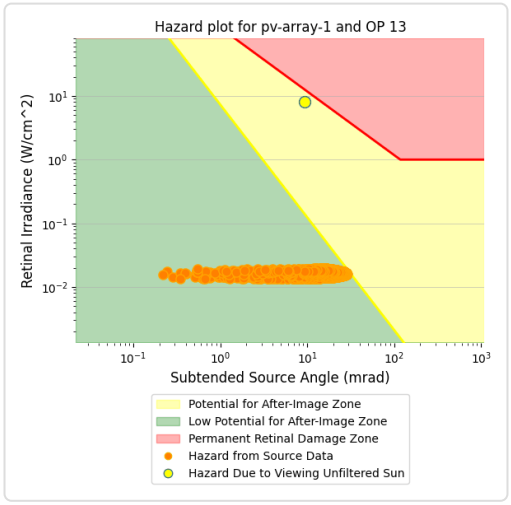
PV array 1 and OP 13

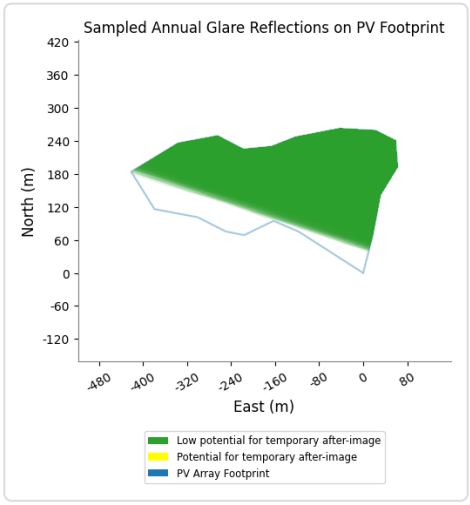
Yellow glare: none

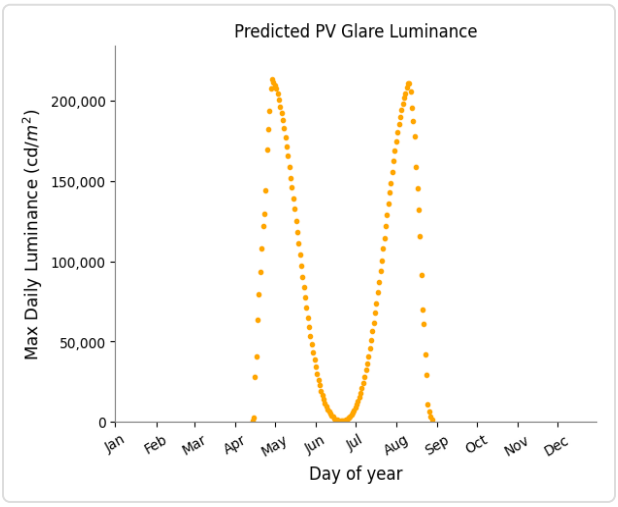
Green glare: 2,154 min.







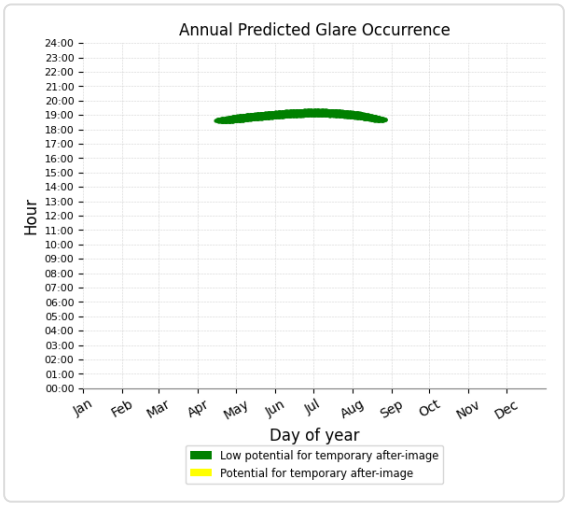


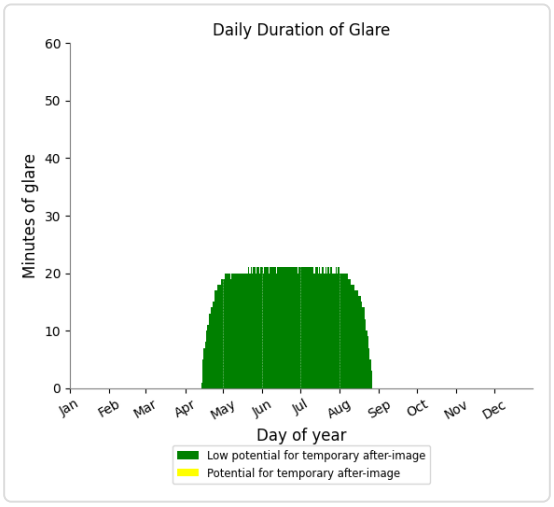


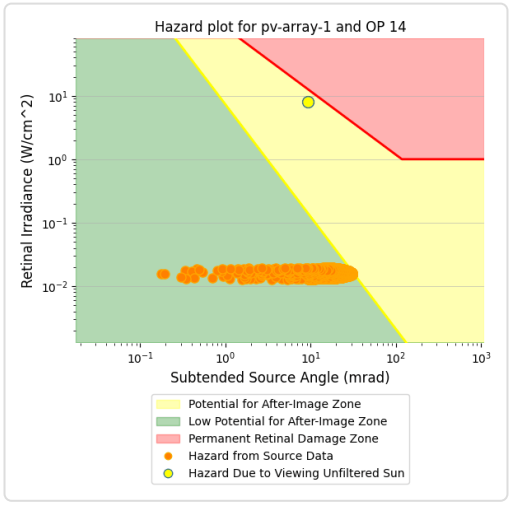
PV array 1 and OP 14

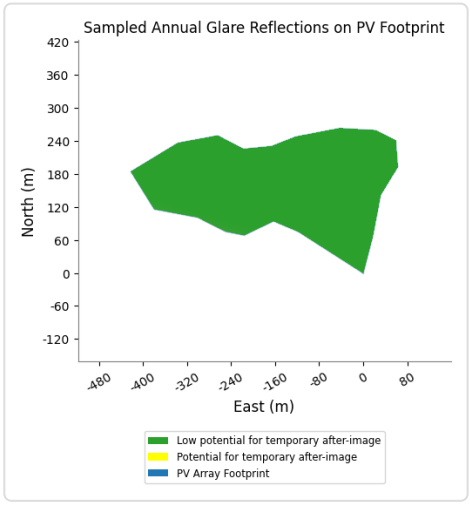
Yellow glare: none

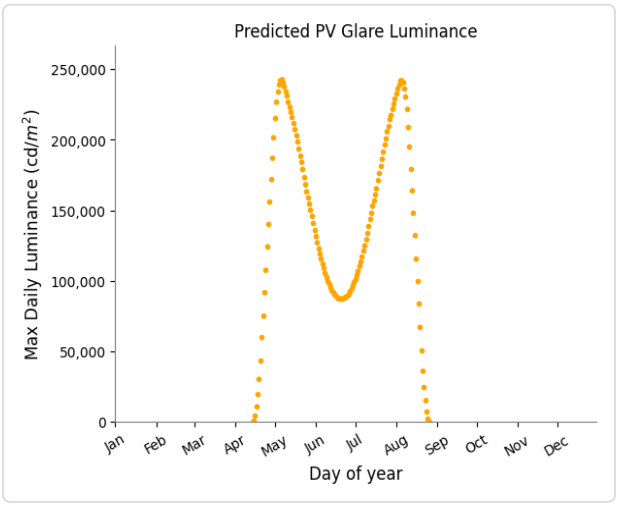
Green glare: 2,514 min.







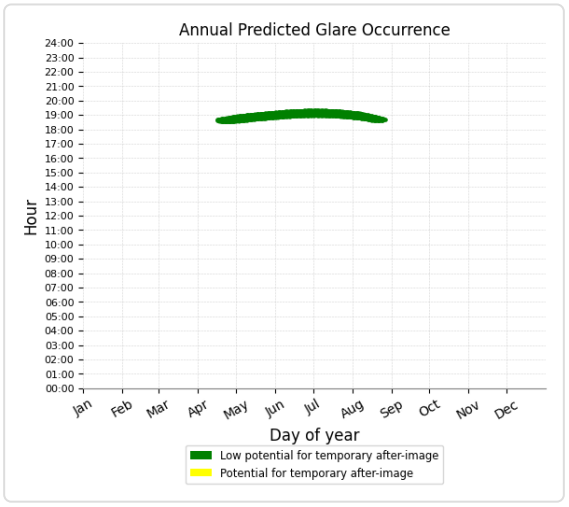


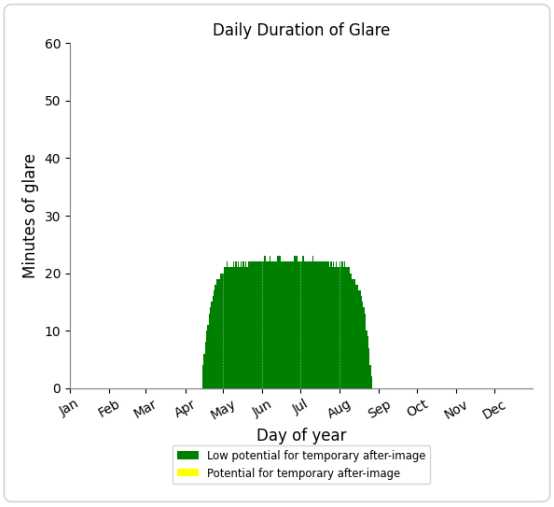


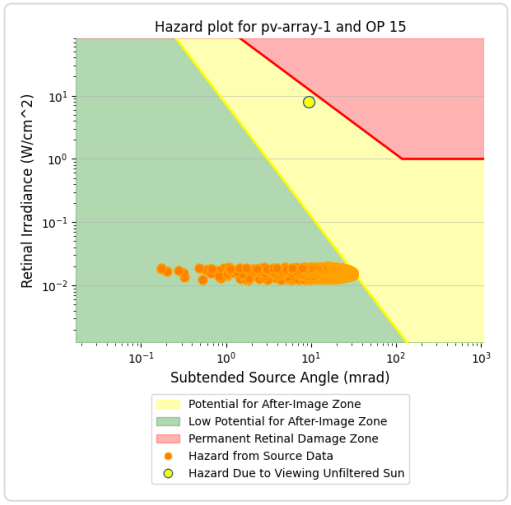
PV array 1 and OP 15

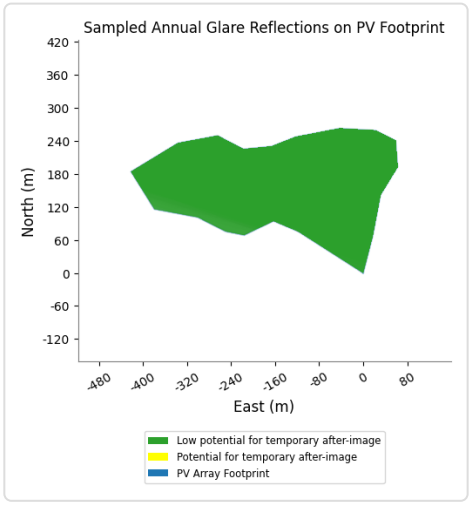
Yellow glare: none

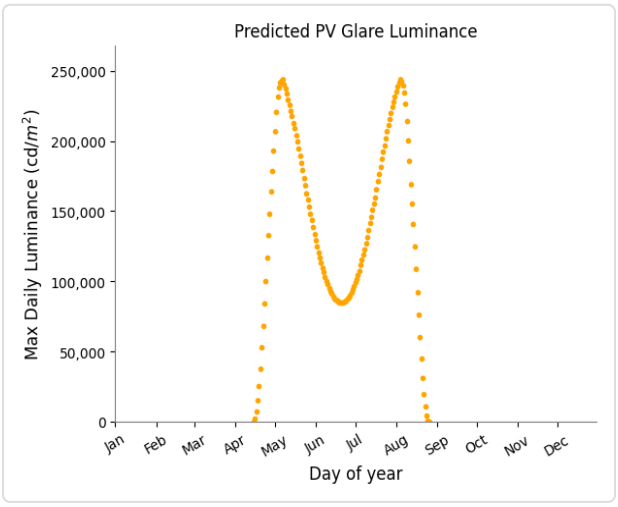
Green glare: 2,672 min.







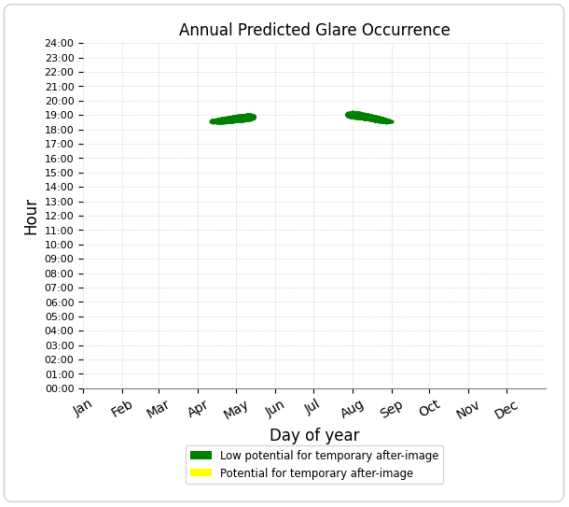


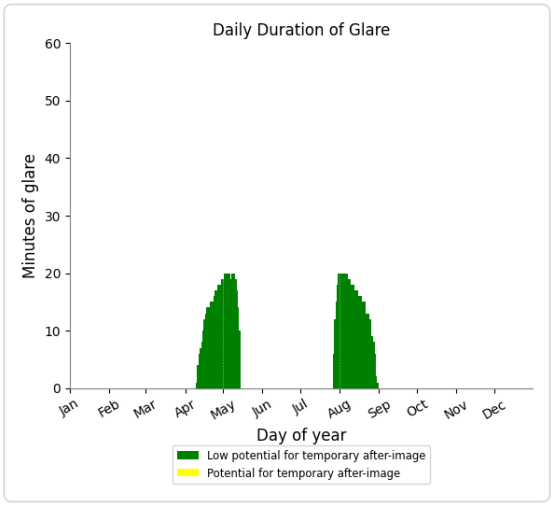


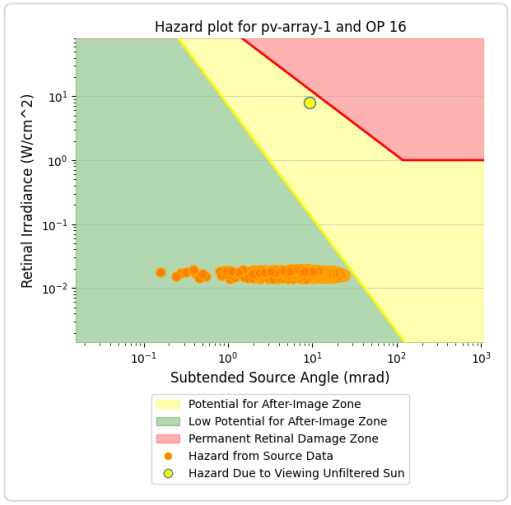
PV array 1 and OP 16

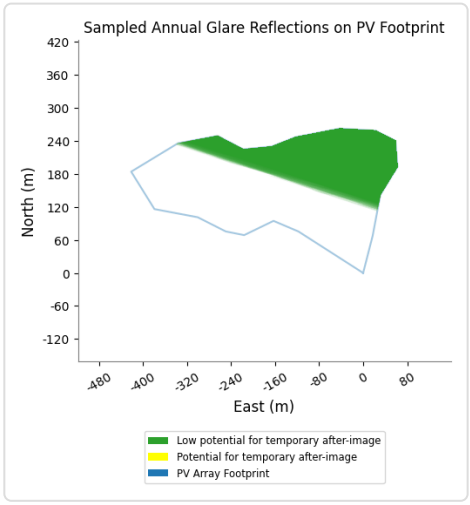
Yellow glare: none

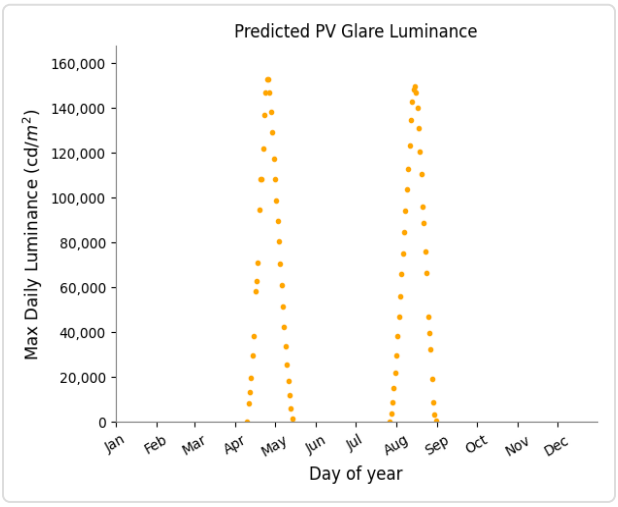
Green glare: 1,062 min.







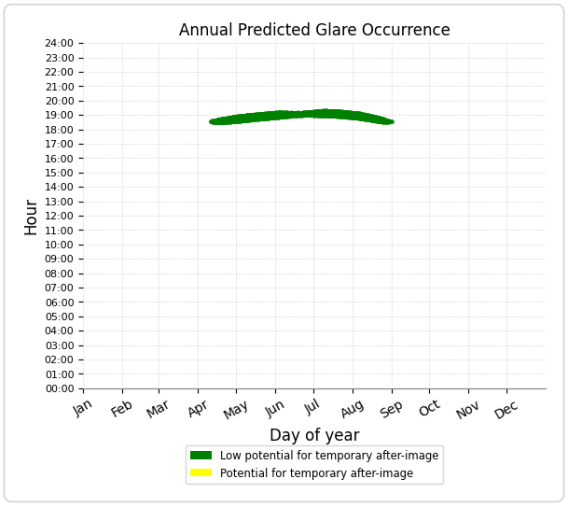


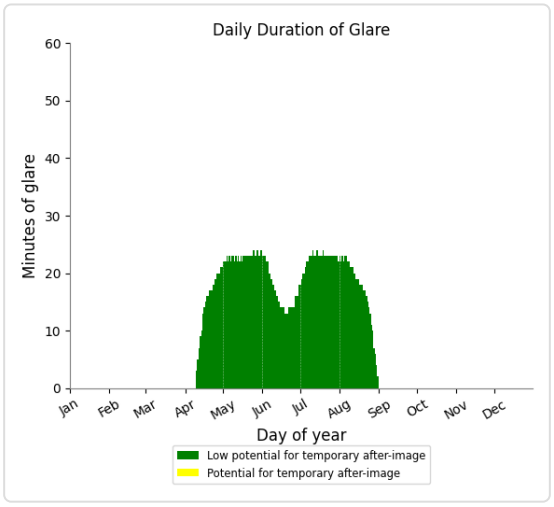


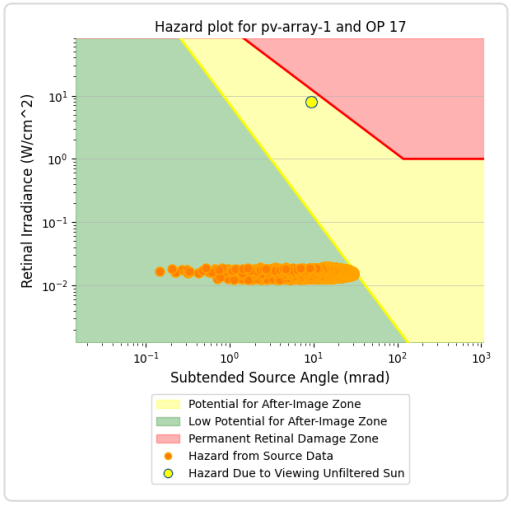
PV array 1 and OP 17

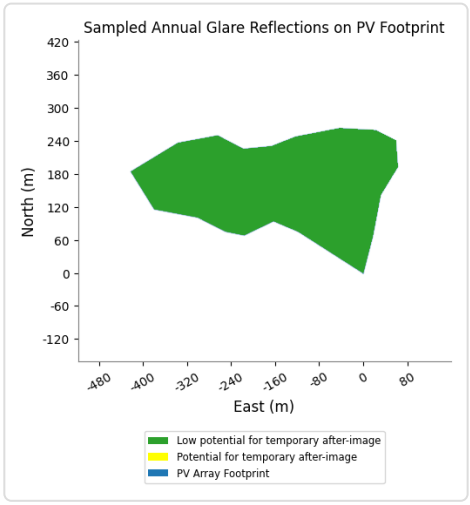
Yellow glare: none

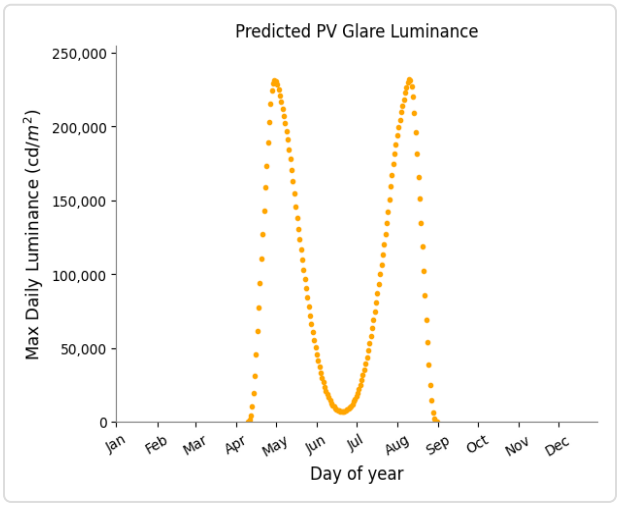
Green glare: 2,748 min.







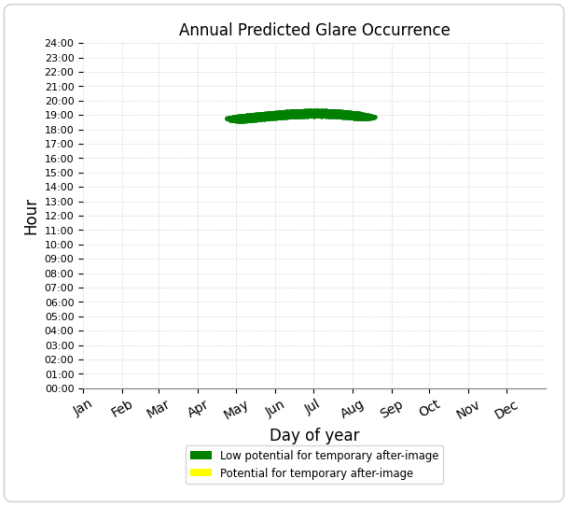


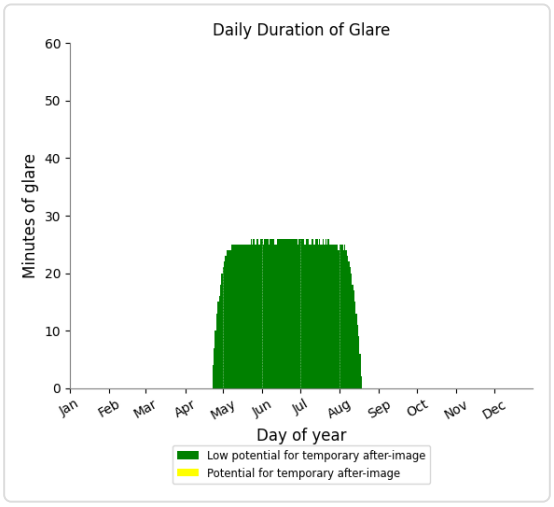


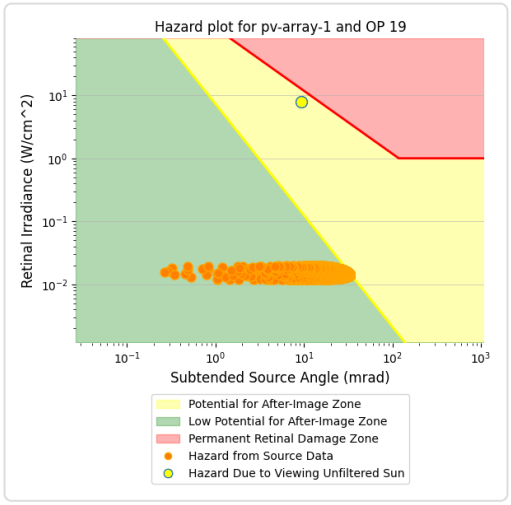
PV array 1 and OP 19

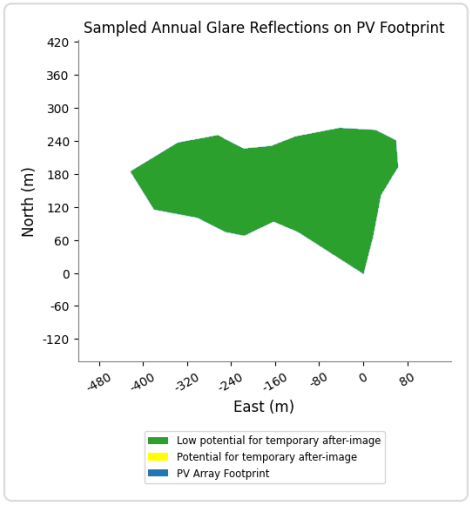
Yellow glare: none

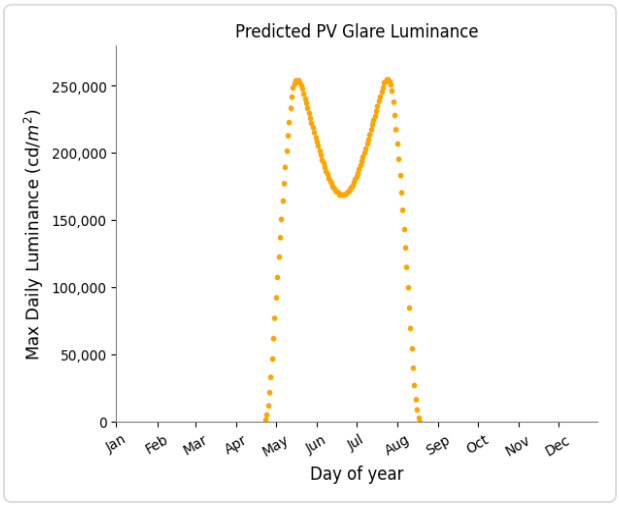
Green glare: 2,756 min.







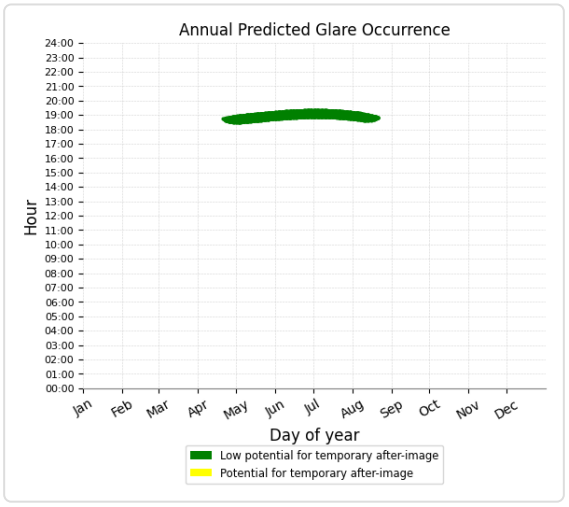


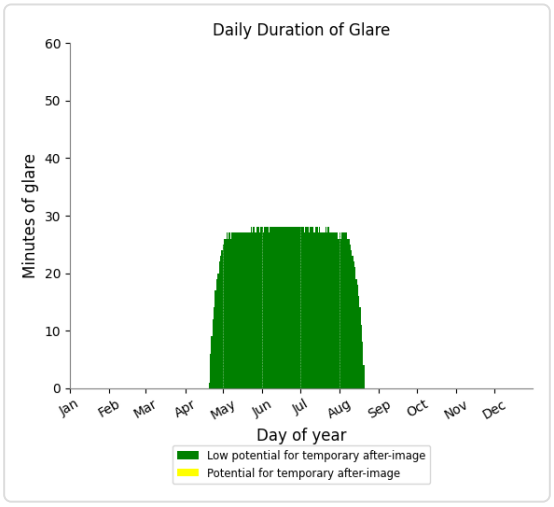


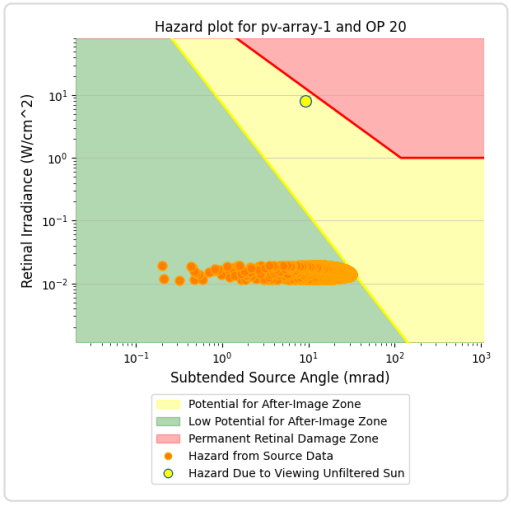
PV array 1 and OP 20

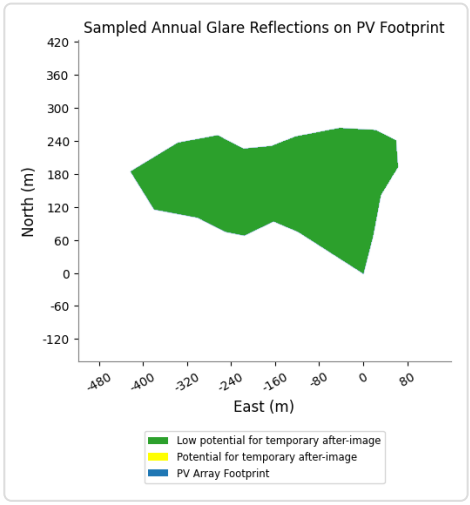
Yellow glare: none

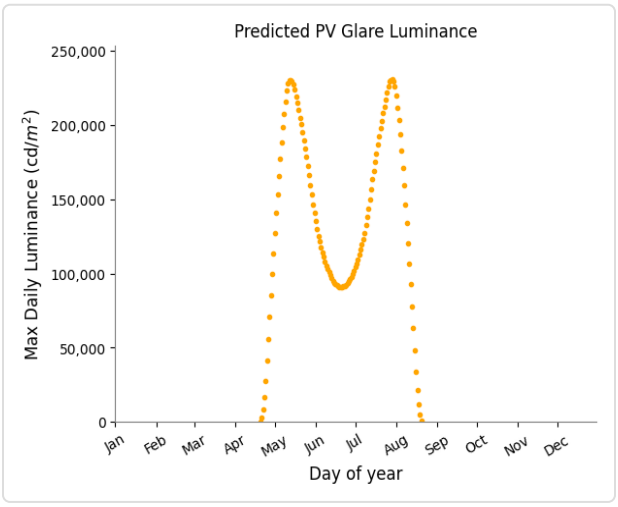
Green glare: 3,109 min.







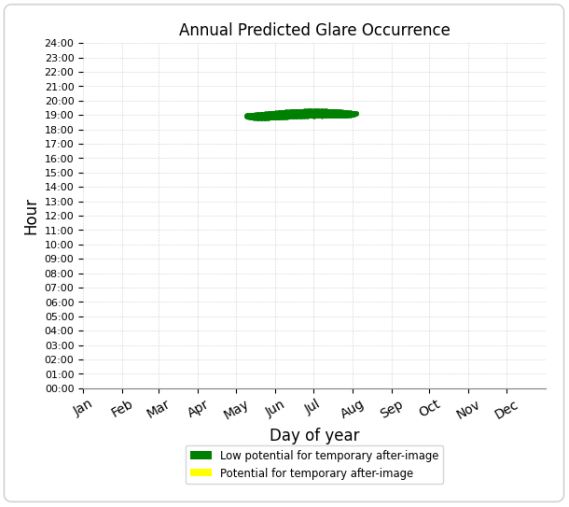


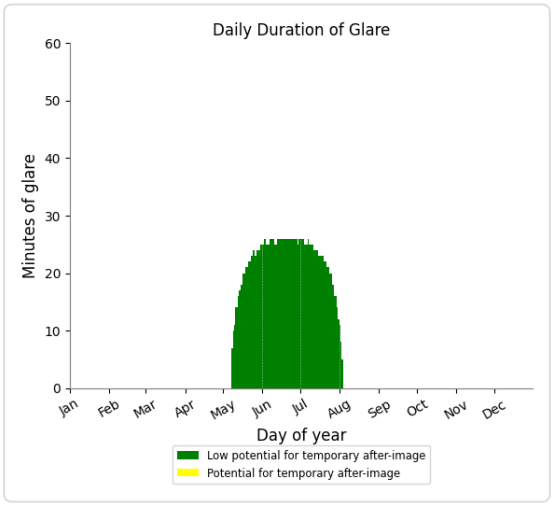


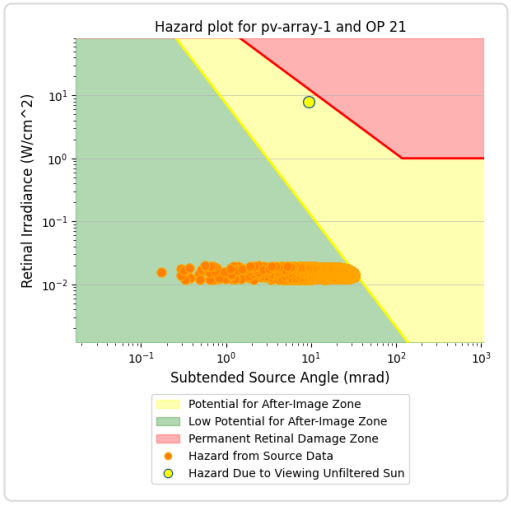
PV array 1 and OP 21

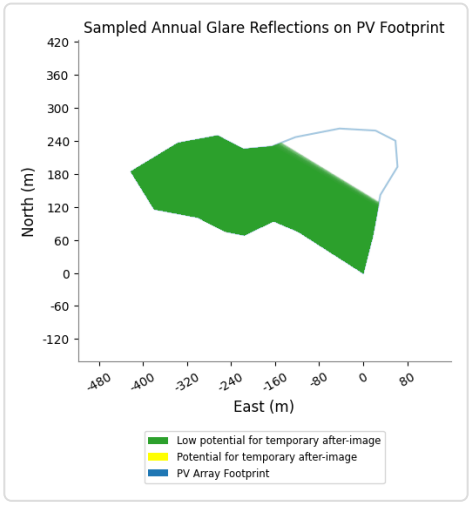
Yellow glare: none

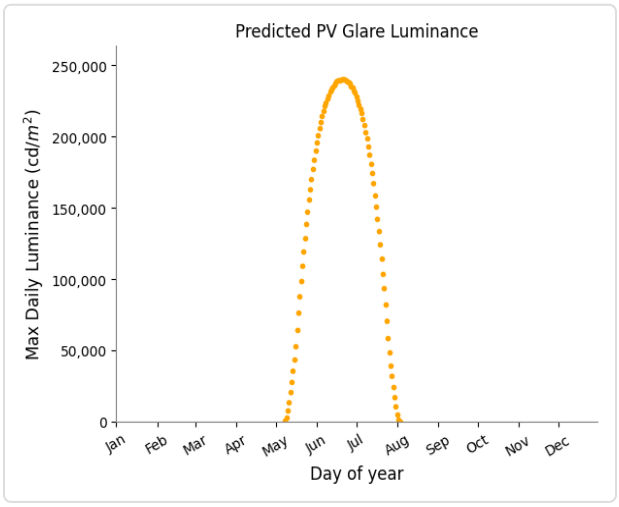
Green glare: 1,946 min.







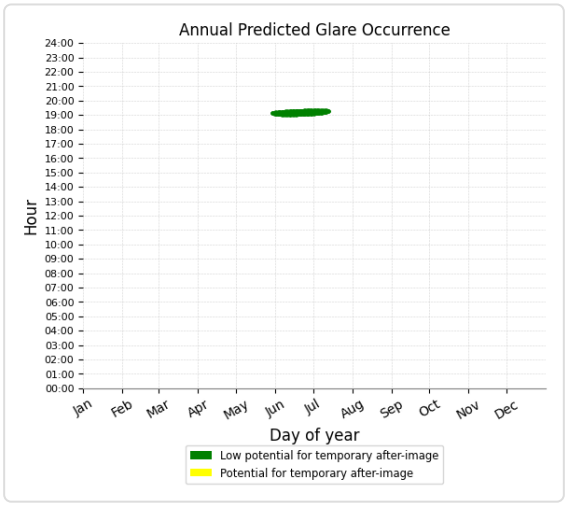


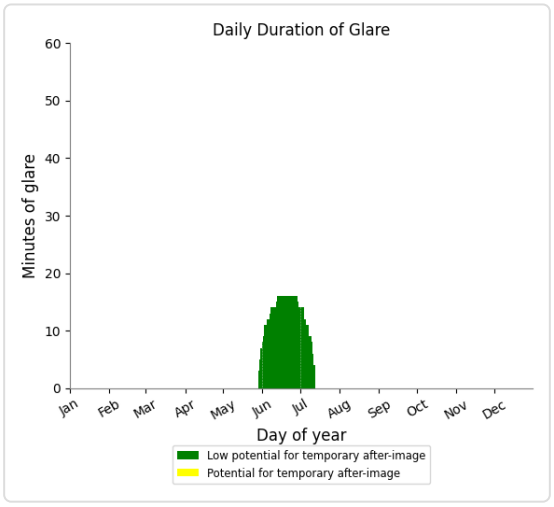


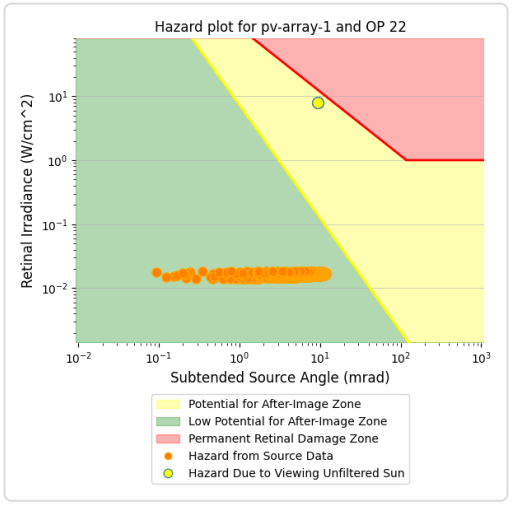
PV array 1 and OP 22

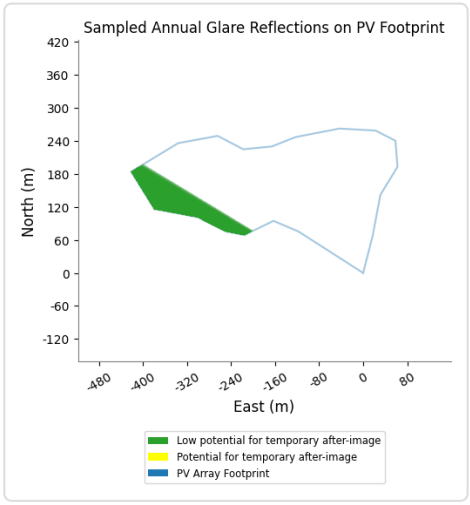
Yellow glare: none

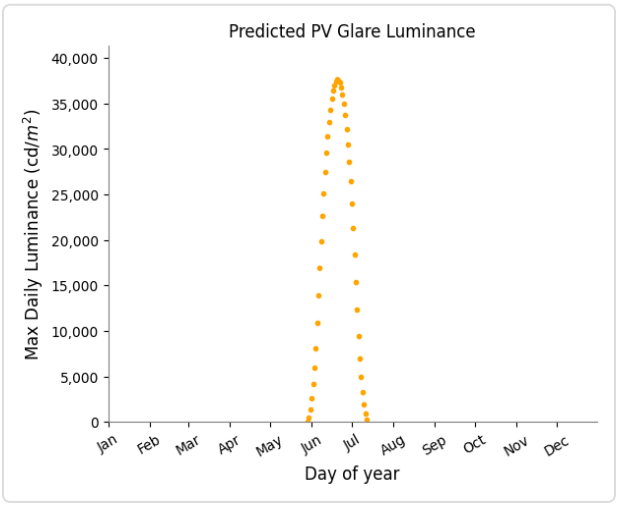
Green glare: 571 min.







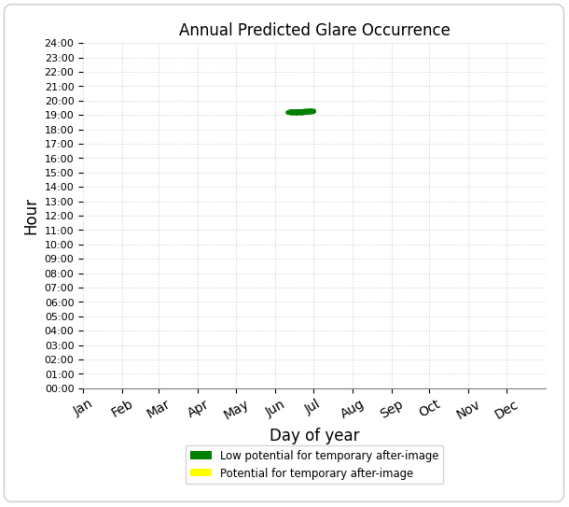


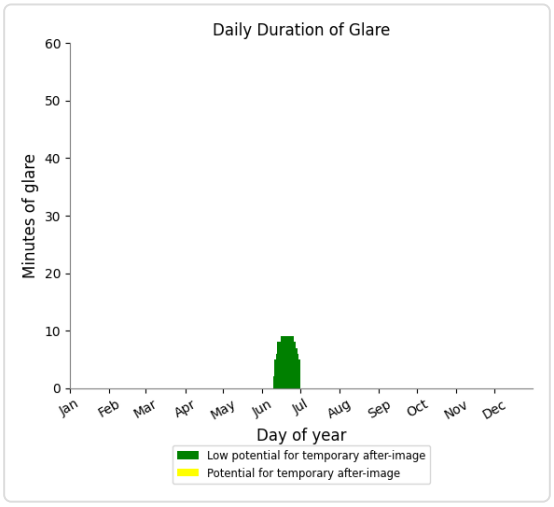


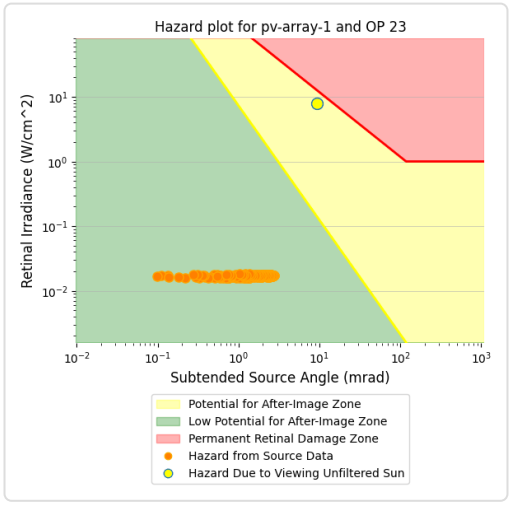
PV array 1 and OP 23

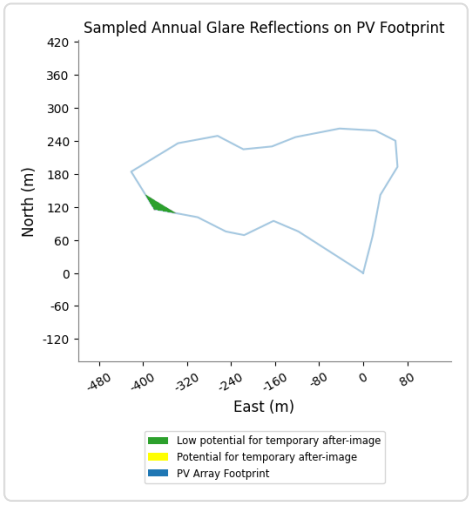
Yellow glare: none

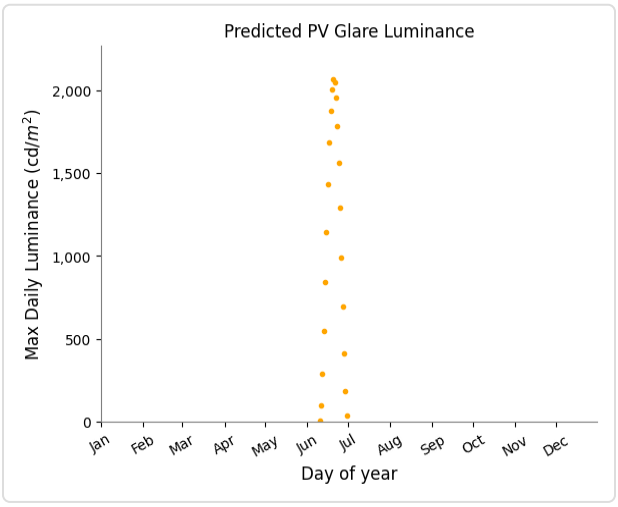
Green glare: 161 min.







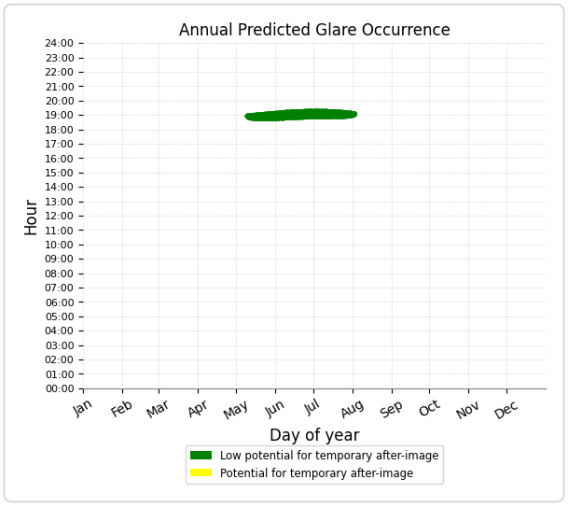


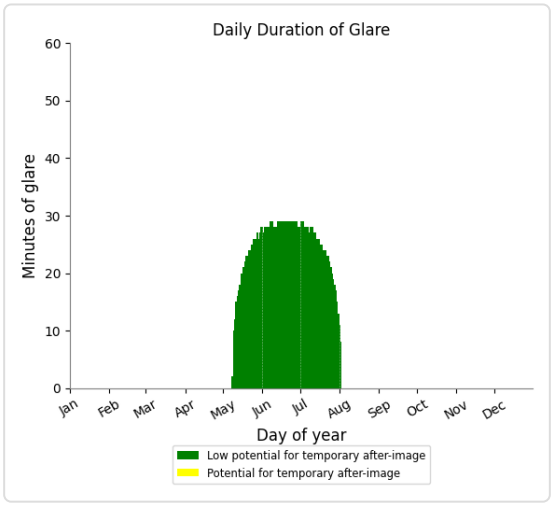


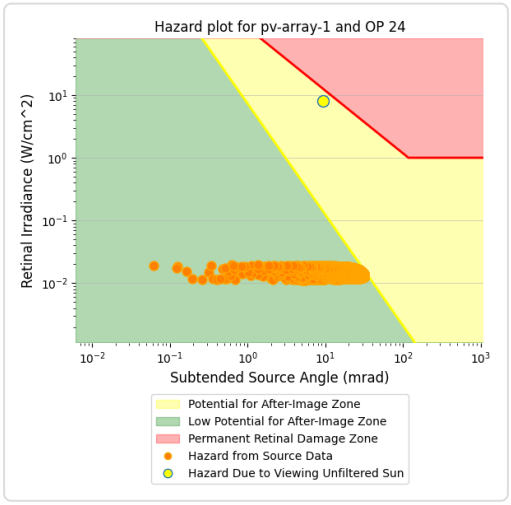
PV array 1 and OP 24

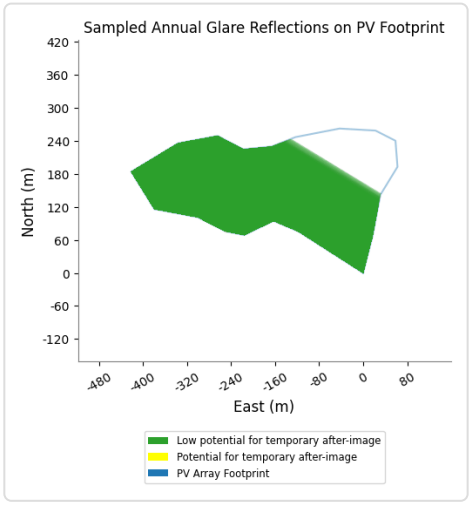
Yellow glare: none

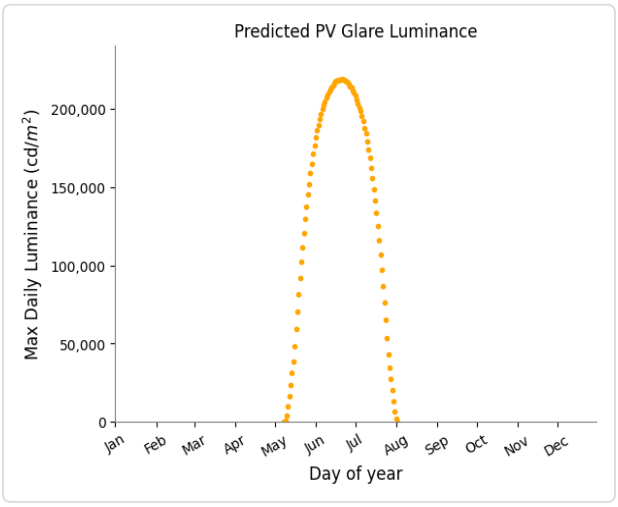
Green glare: 2,135 min.







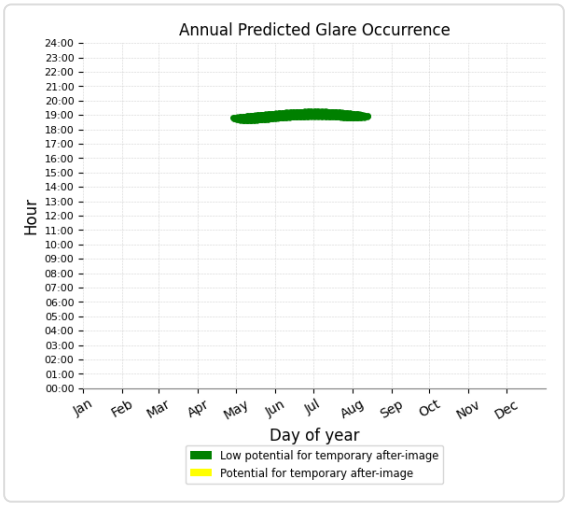


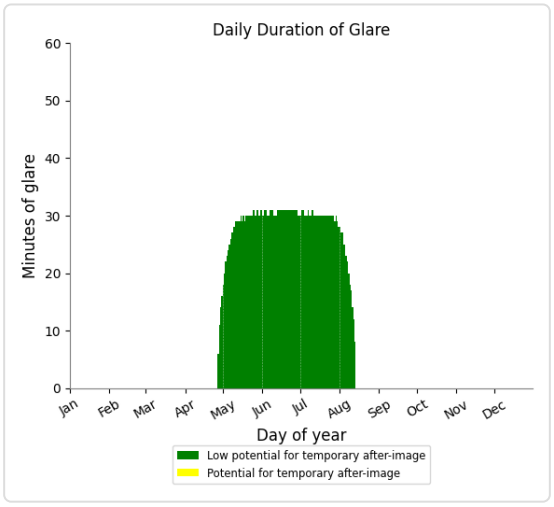


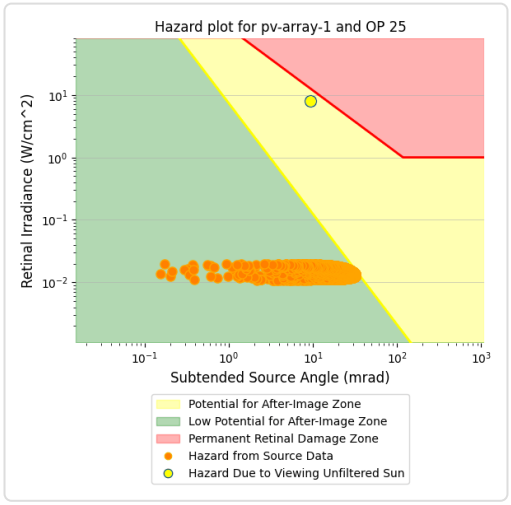
PV array 1 and OP 25

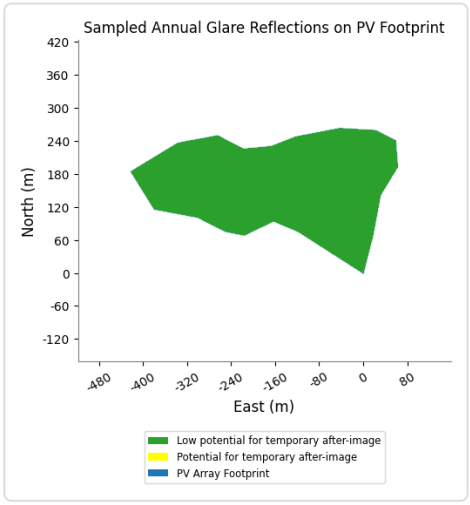
Yellow glare: none

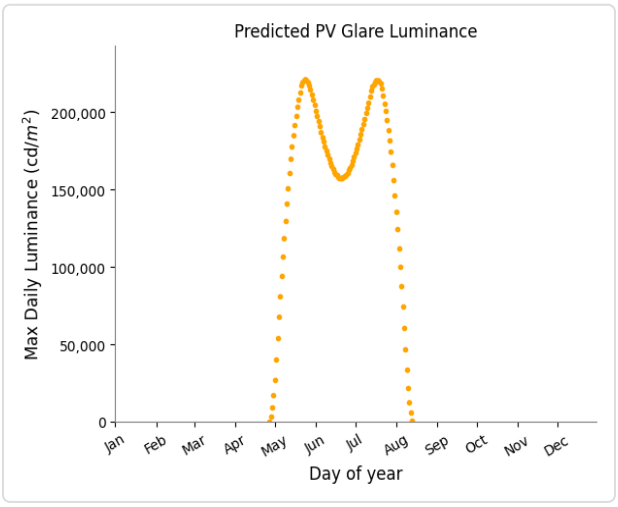
Green glare: 3,033 min.







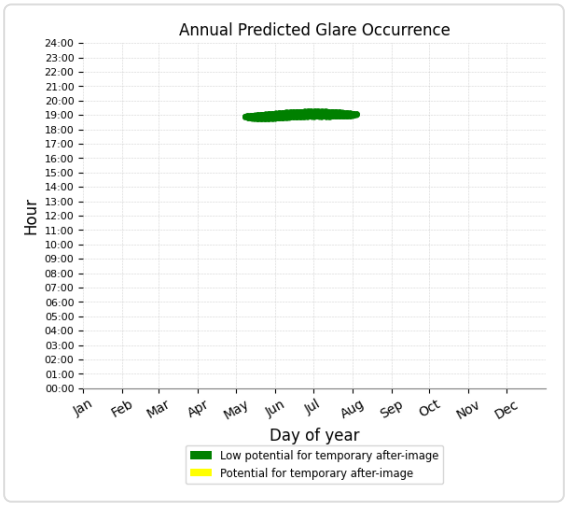


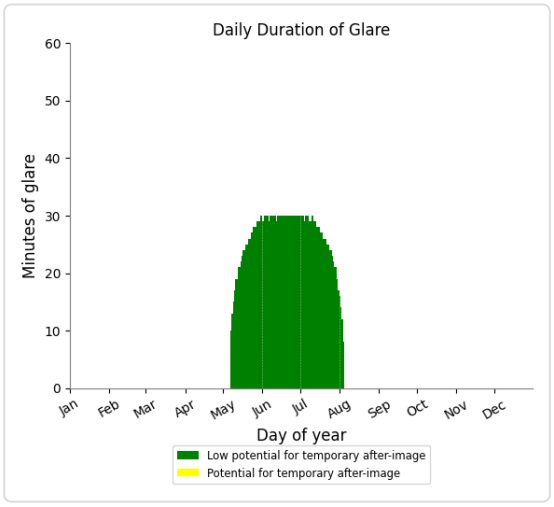


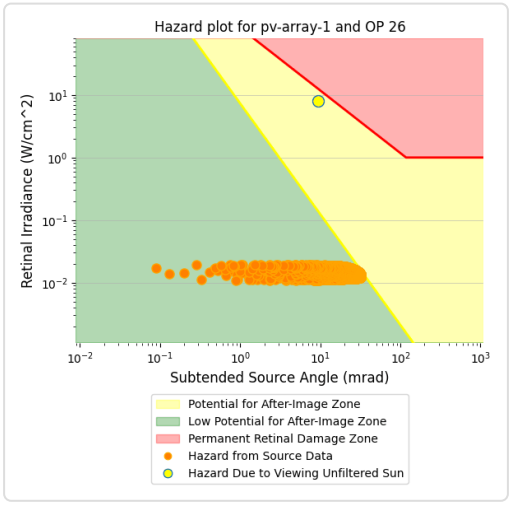
PV array 1 and OP 26

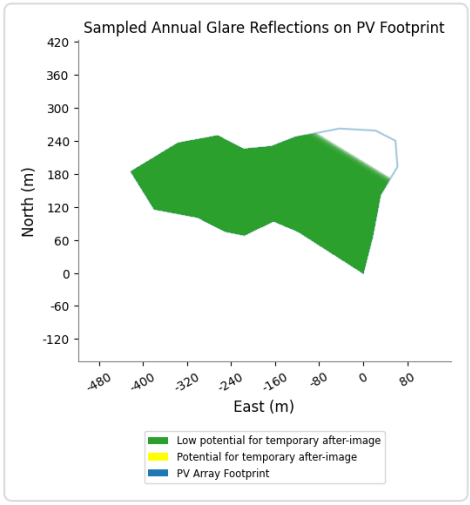
Yellow glare: none

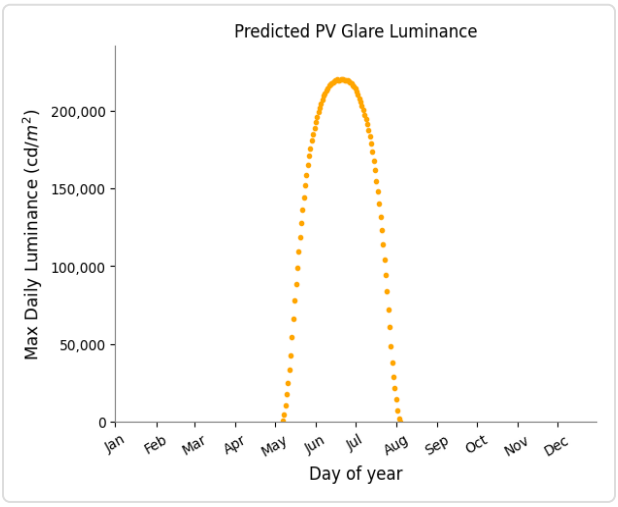
Green glare: 2,353 min.







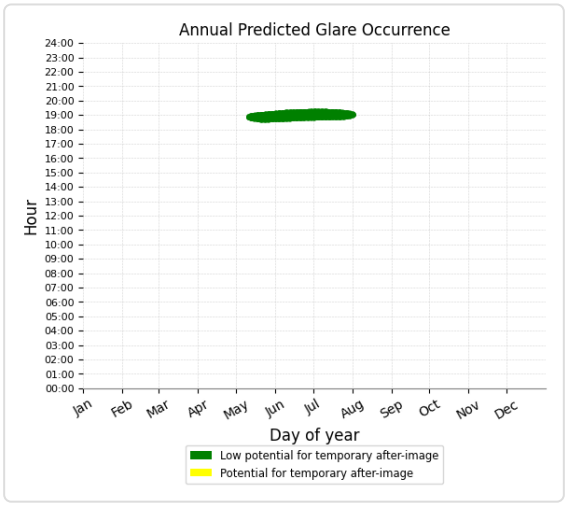


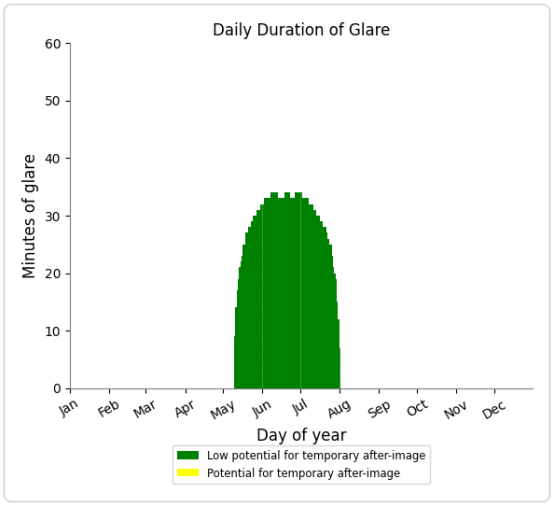


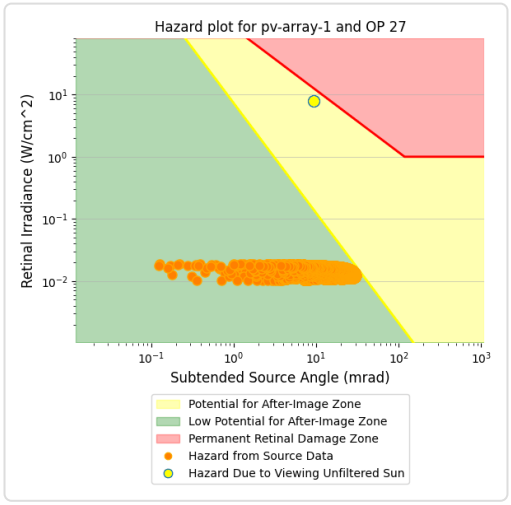
PV array 1 and OP 27

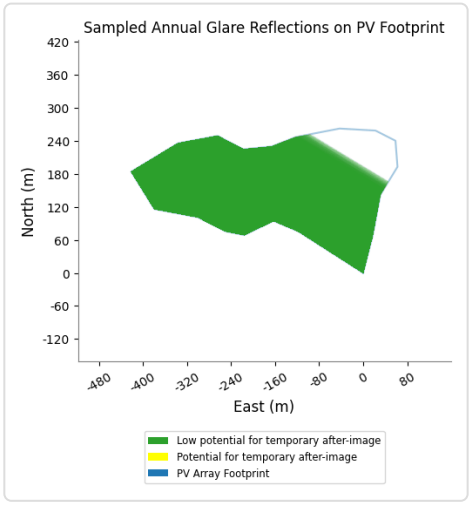
Yellow glare: none

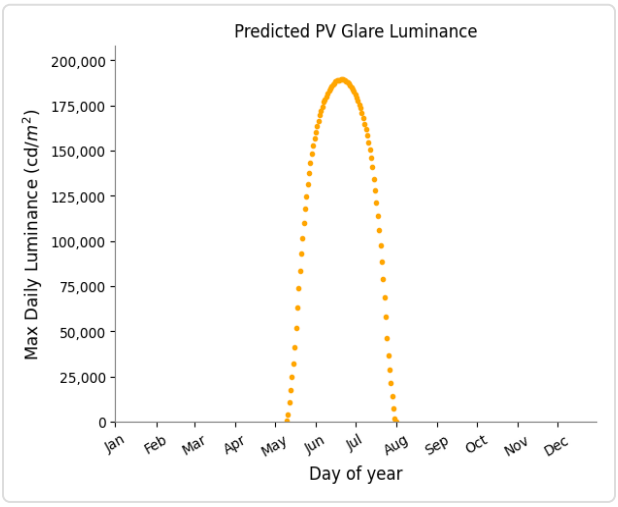
Green glare: 2,435 min.







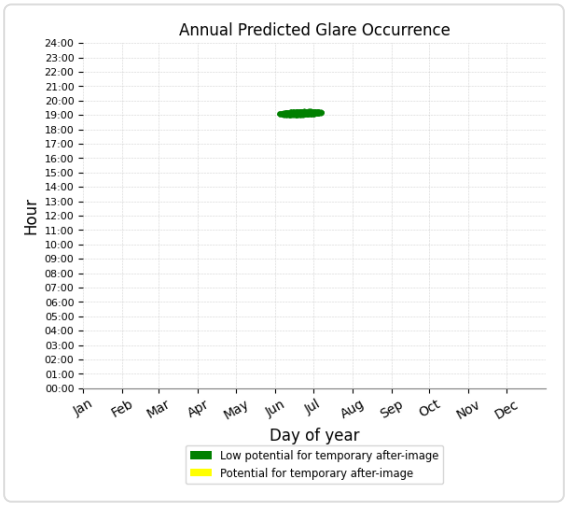


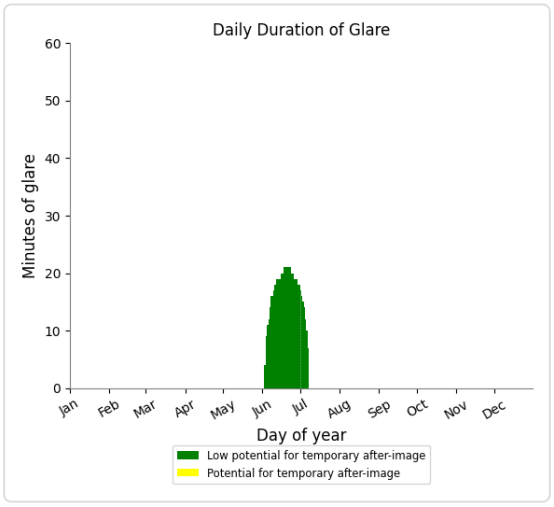


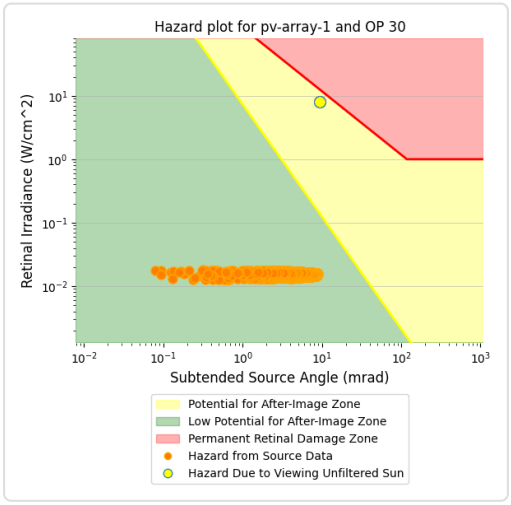
PV array 1 and OP 30

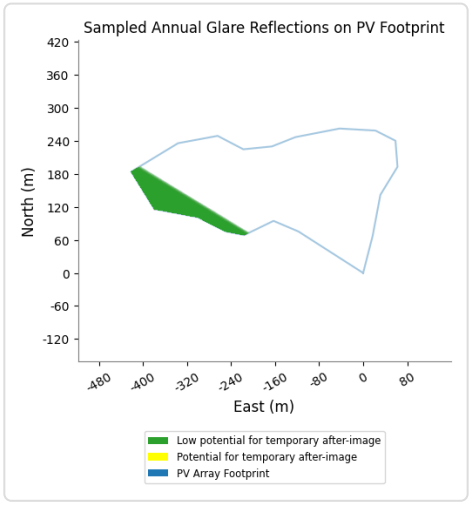
Yellow glare: none

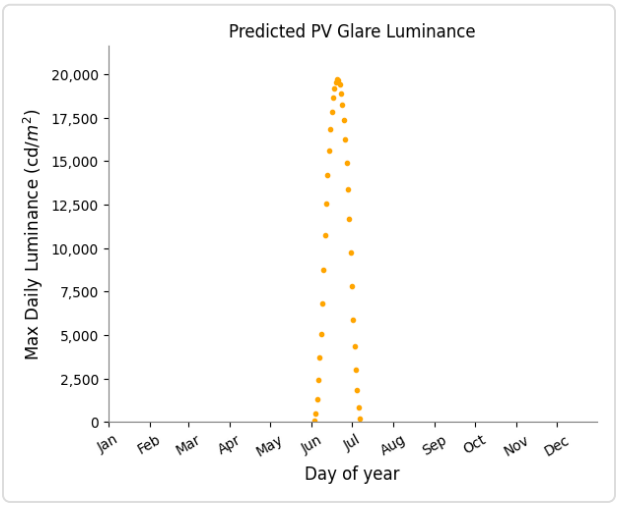
Green glare: 583 min.







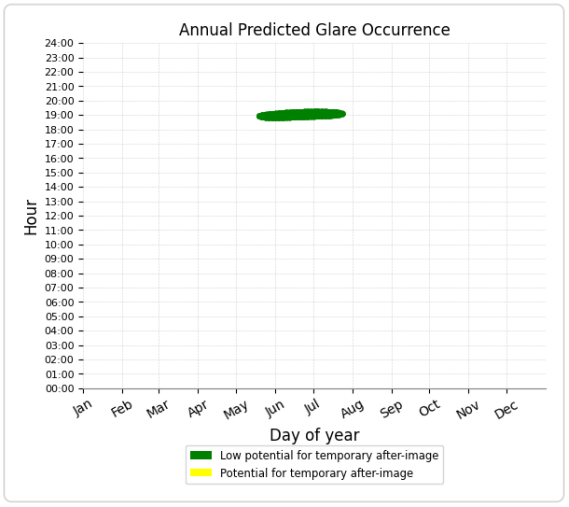


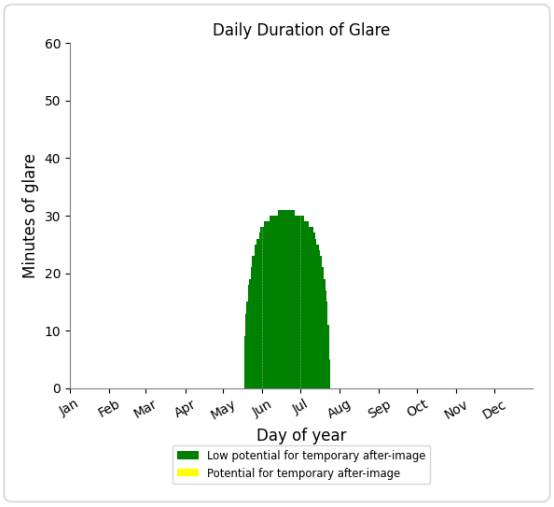


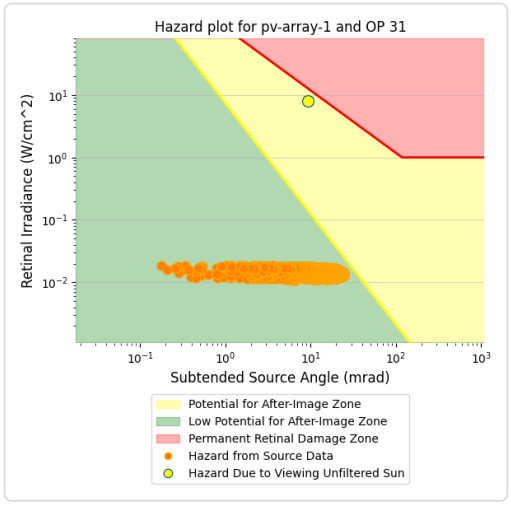
PV array 1 and OP 31

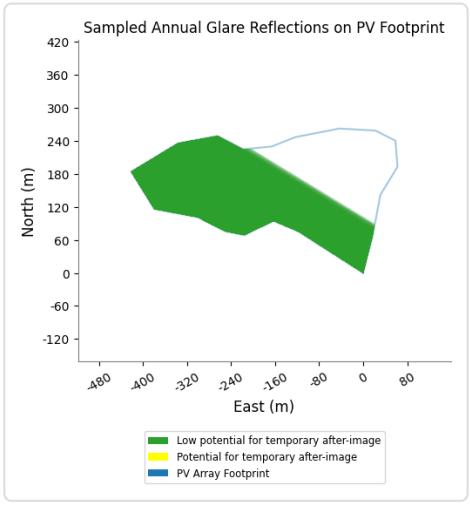
Yellow glare: none

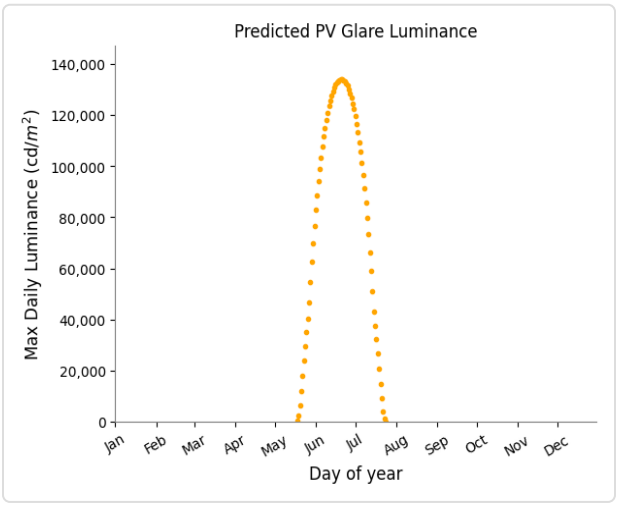
Green glare: 1,780 min.







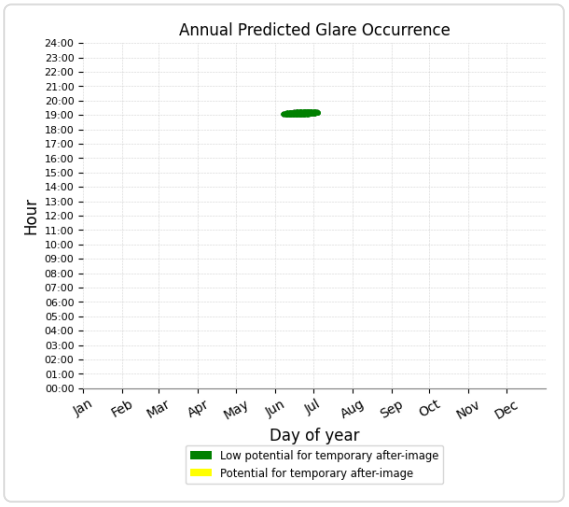


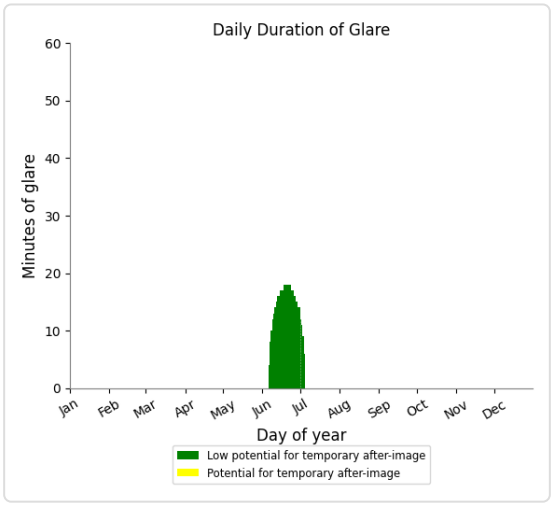


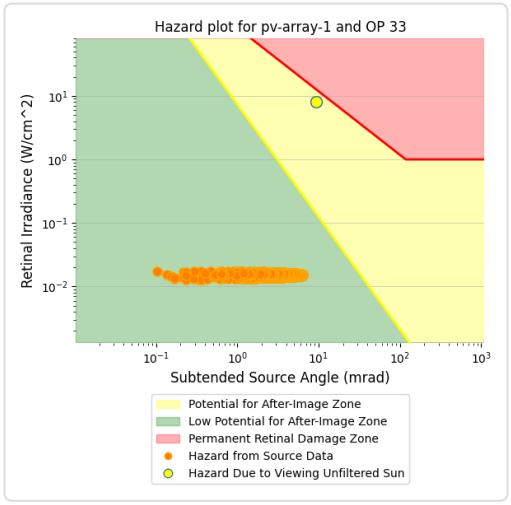
PV array 1 and OP 33

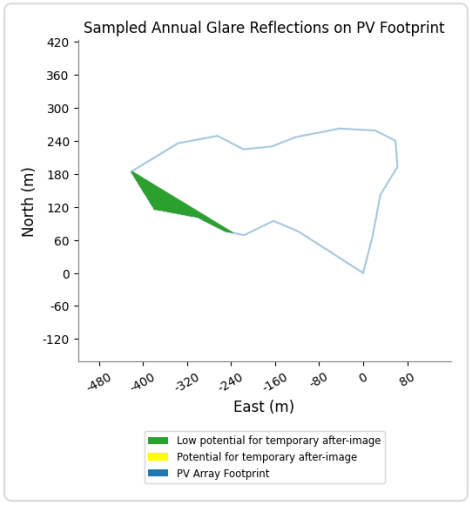
Yellow glare: none

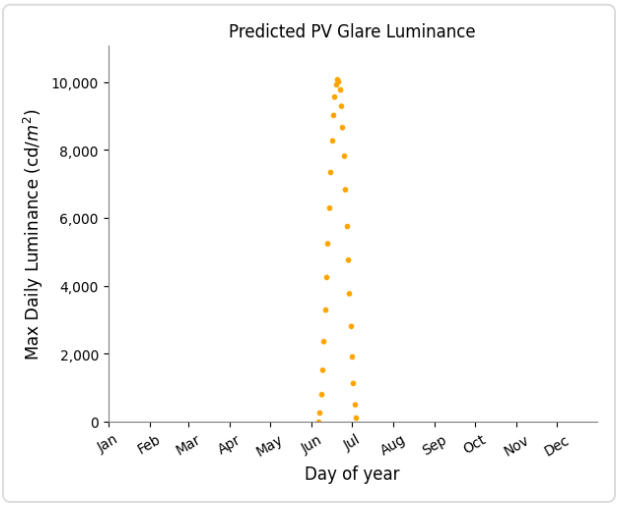
Green glare: 414 min.











PV array 1 and OP 1

No glare found

PV array 1 and OP 4

No glare found

PV array 1 and OP 5

No glare found

PV array 1 and OP 7

No glare found

PV array 1 and OP 8

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 28

No glare found

PV array 1 and OP 29

No glare found

PV array 1 and OP 32

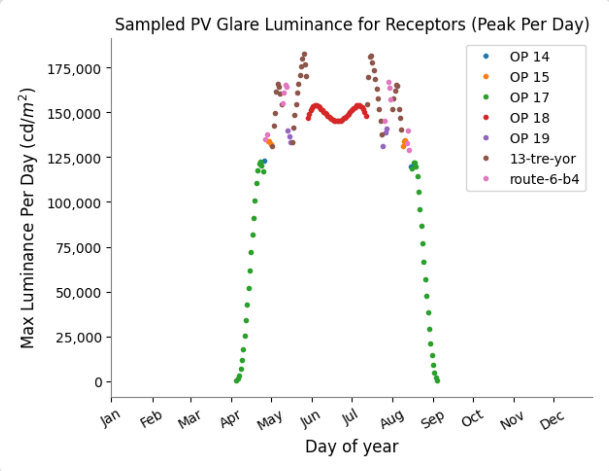
No glare found

PV: PV array 2 low potential for temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare		Peak Luminance
	min	hr	min	hr	cd/m²
13 - Tre-York Street	1,800	30.0	0	0.0	182,634
14 - B4256 Hill Street	2,555	42.6	0	0.0	69,725
Railway north	258	4.3	0	0.0	64,610
Route 6 - B4257	3,186	53.1	0	0.0	167,253
15 - Moriah Street	0	0.0	0	0.0	0
7 - Tan-Y-Llan Terrace	0	0.0	0	0.0	0
Railway south	0	0.0	0	0.0	0
OP 3	710	11.8	0	0.0	52,578
OP 11	451	7.5	0	0.0	103,193
OP 14	1,080	18.0	0	0.0	132,562
OP 15	1,304	21.7	0	0.0	134,614
OP 17	1,104	18.4	0	0.0	122,571
OP 18	1,981	33.0	0	0.0	154,234
OP 19	2,505	41.8	0	0.0	142,379
OP 20	1,886	31.4	0	0.0	118,859
OP 21	1,764	29.4	0	0.0	131,797
OP 24	1,967	32.8	0	0.0	113,656
OP 25	2,784	46.4	0	0.0	108,433
OP 26	2,199	36.6	0	0.0	109,853
OP 27	2,215	36.9	0	0.0	88,330
OP 31	1,381	23.0	0	0.0	59,300
OP 1	0	0.0	0	0.0	0
OP 2	0	0.0	0	0.0	0
OP 4	0	0.0	0	0.0	0
OP 5	0	0.0	0	0.0	0
OP 6	0	0.0	0	0.0	0
OP 7	0	0.0	0	0.0	0
OP 8	0	0.0	0	0.0	0
OP 9	0	0.0	0	0.0	0
OP 10	0	0.0	0	0.0	0
OP 12	0	0.0	0	0.0	0
OP 13	0	0.0	0	0.0	0
OP 16	0	0.0	0	0.0	0
OP 22	0	0.0	0	0.0	0
OP 23	0	0.0	0	0.0	0
OP 28	0	0.0	0	0.0	0
OP 29	0	0.0	0	0.0	0
OP 30	0	0.0	0	0.0	0

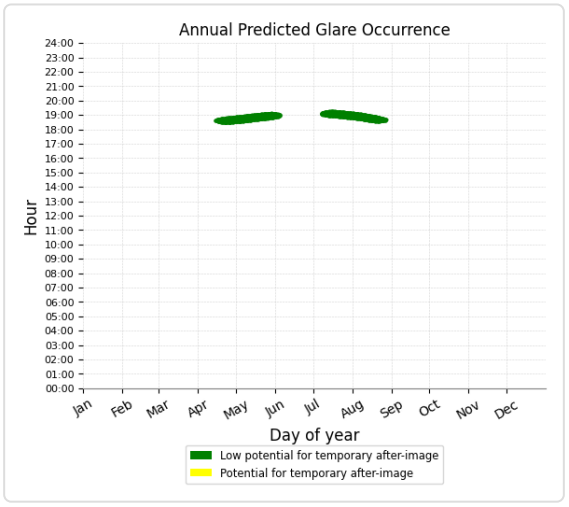
Receptor	Annual Green Glare		Annual Yellow Glare		Peak Luminance
	min	hr	min	hr	cd/m^2
OP 32	0	0.0	0	0.0	0
OP 33	0	0.0	0	0.0	0

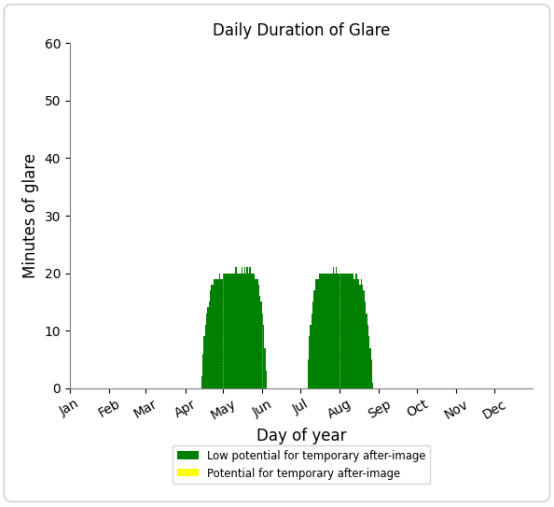


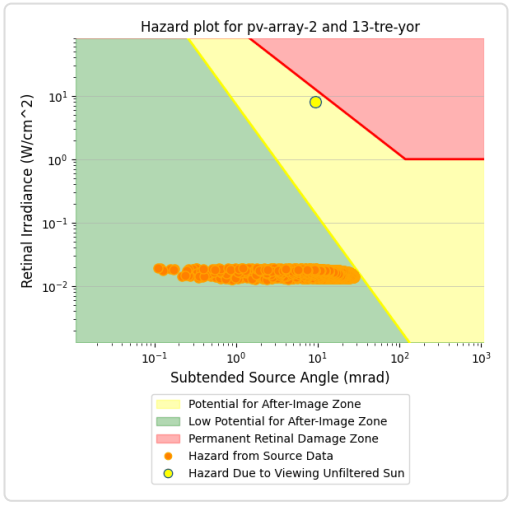
PV array 2 and Route: 13 - Tre-York Street

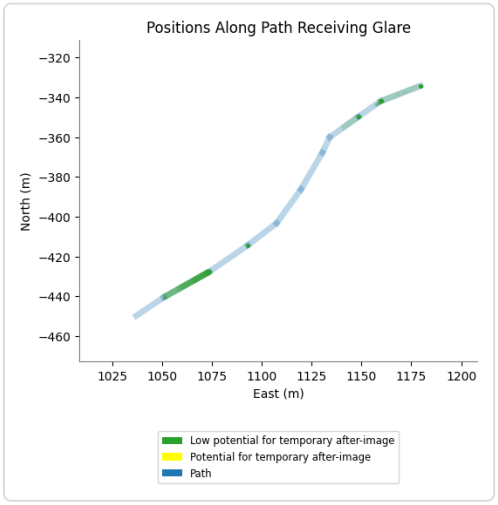
Yellow glare: none

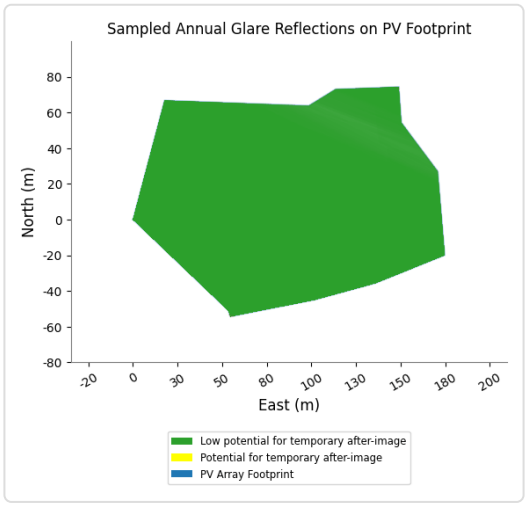
Green glare: 1,800 min.

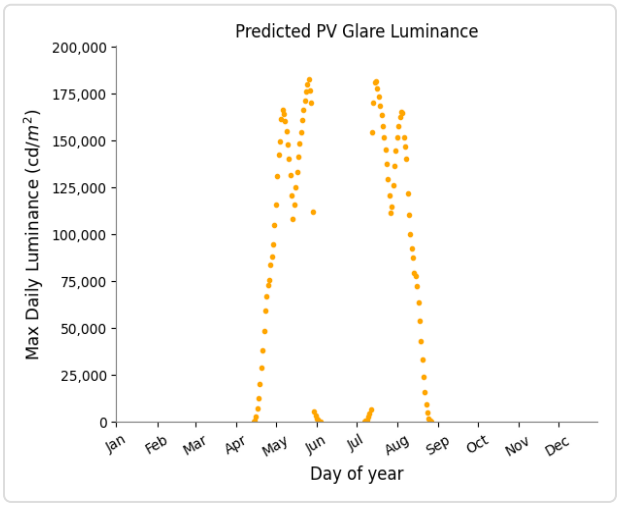








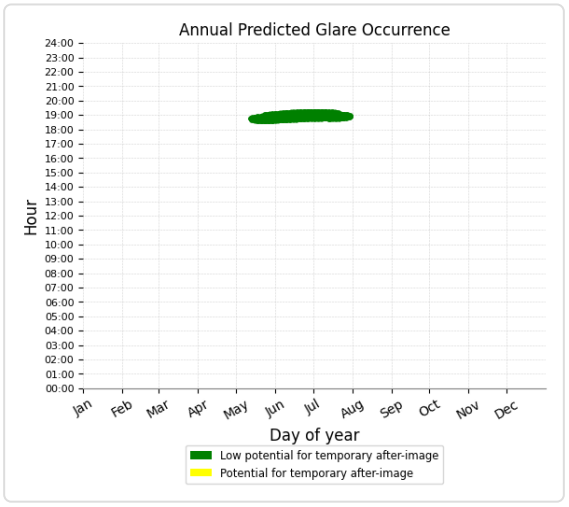


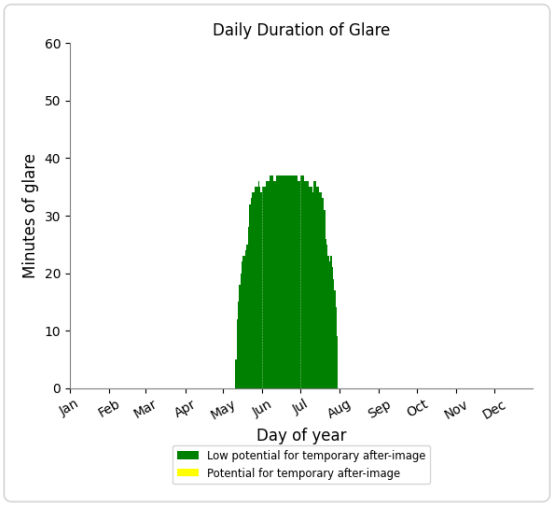


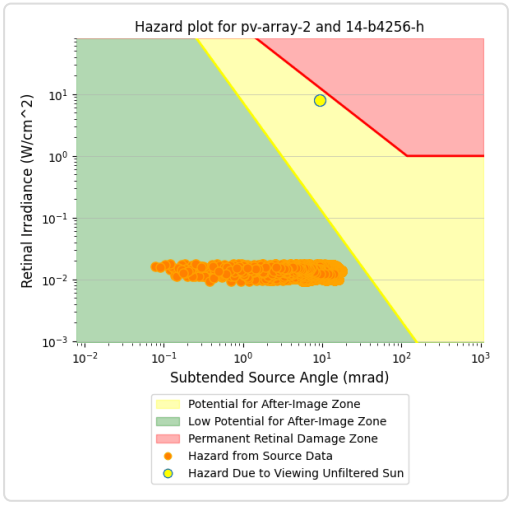
PV array 2 and Route: 14 - B4256 Hill Street

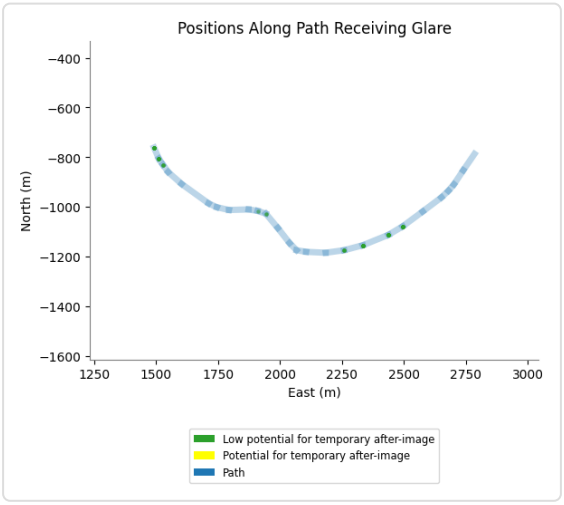
Yellow glare: none

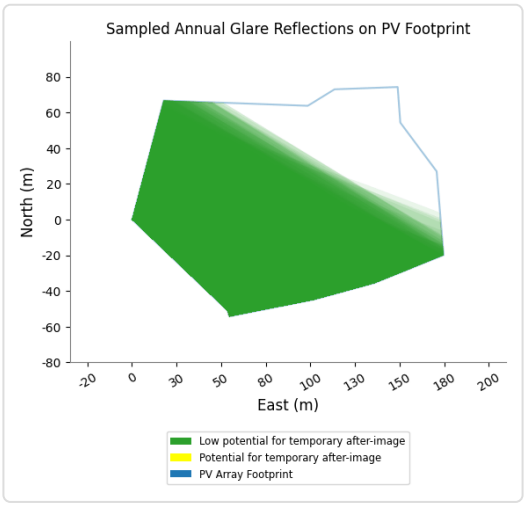
Green glare: 2,555 min.

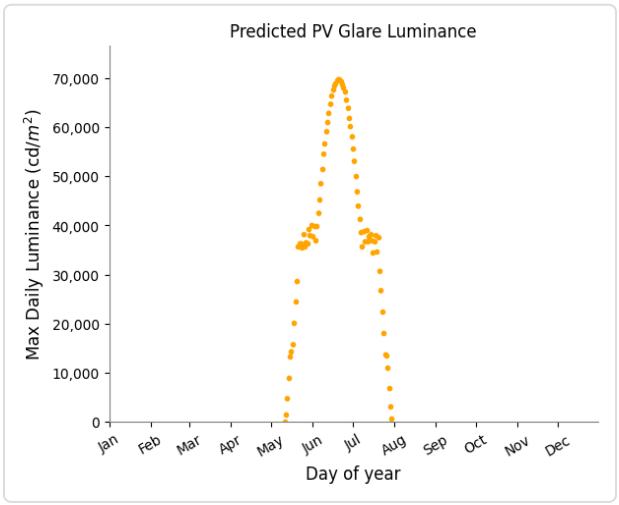








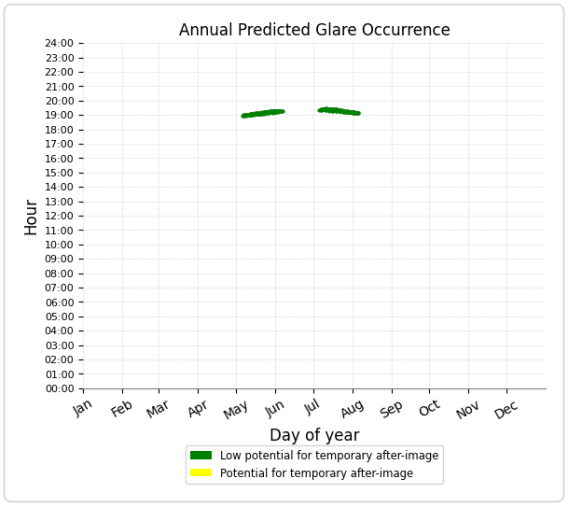


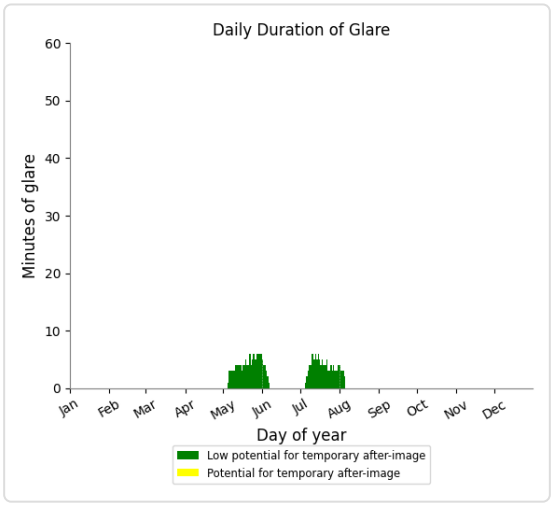


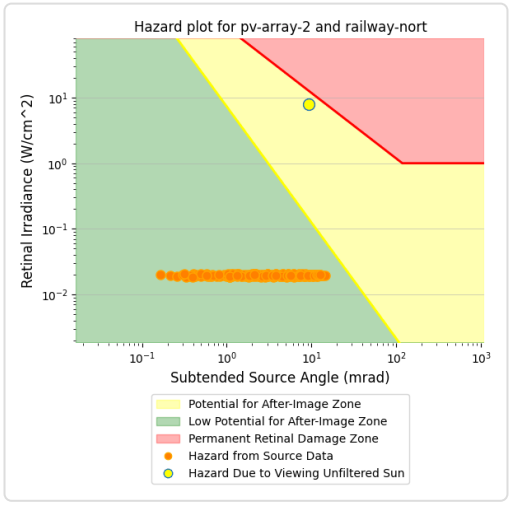
PV array 2 and Route: Railway north

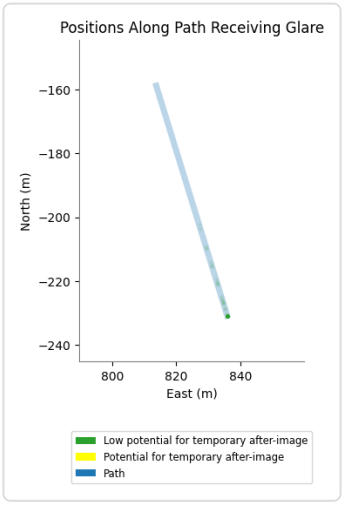
Yellow glare: none

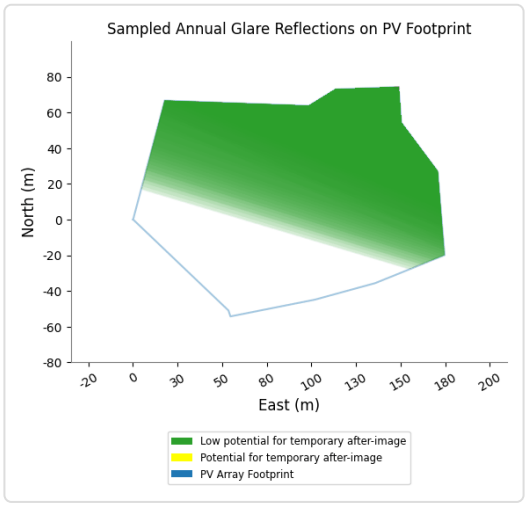
Green glare: 258 min.

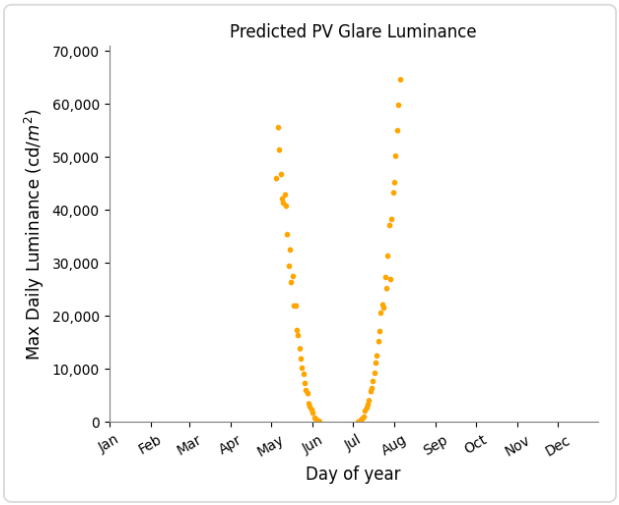








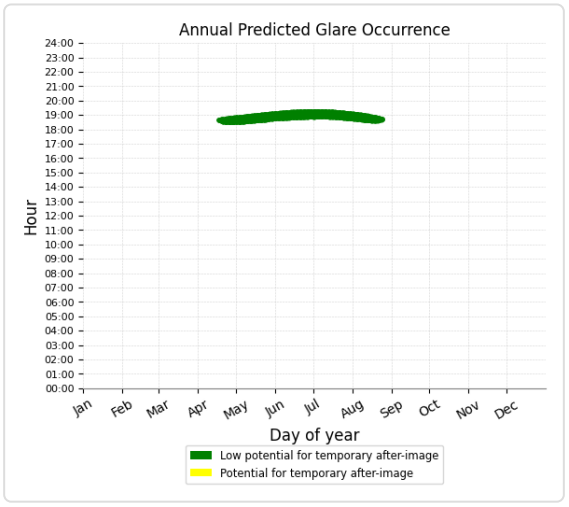


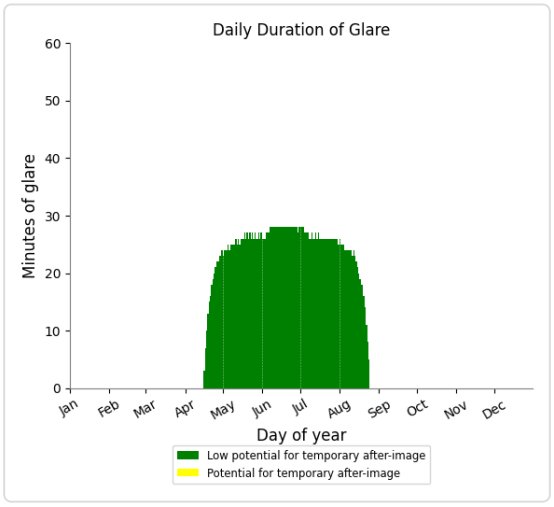


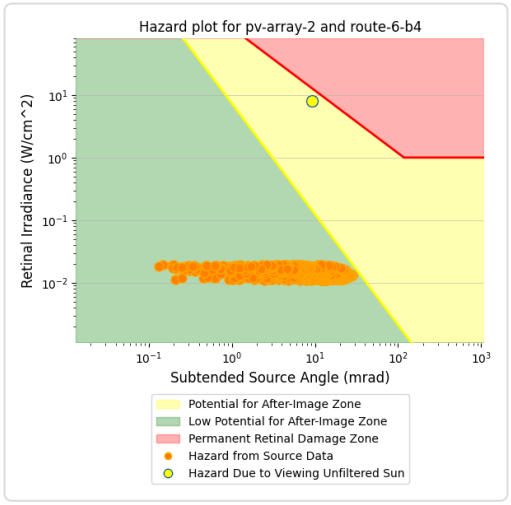
PV array 2 and Route: Route 6 - B4257

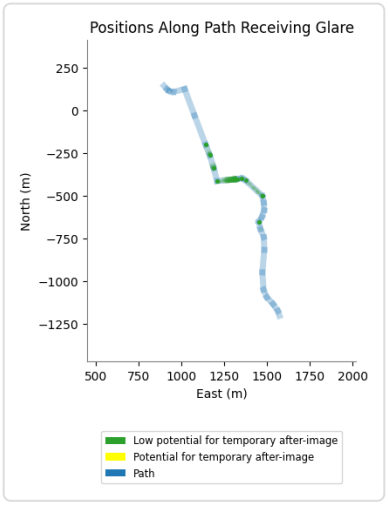
Yellow glare: none

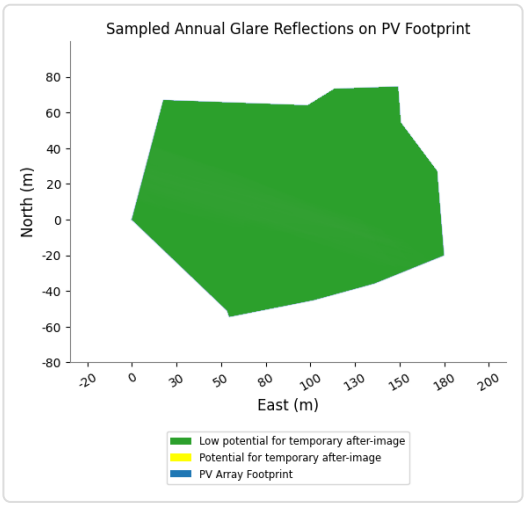
Green glare: 3,186 min.

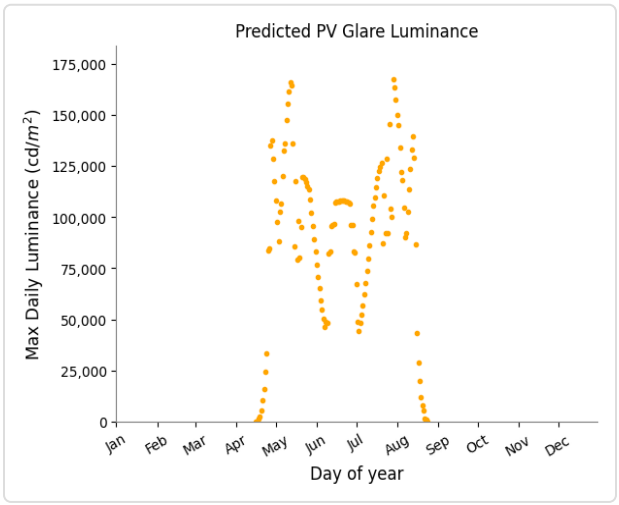












PV array 2 and Route: 15 - Moriah Street

No glare found

PV array 2 and Route: 7 - Tan-Y-Llan Terrace

No glare found

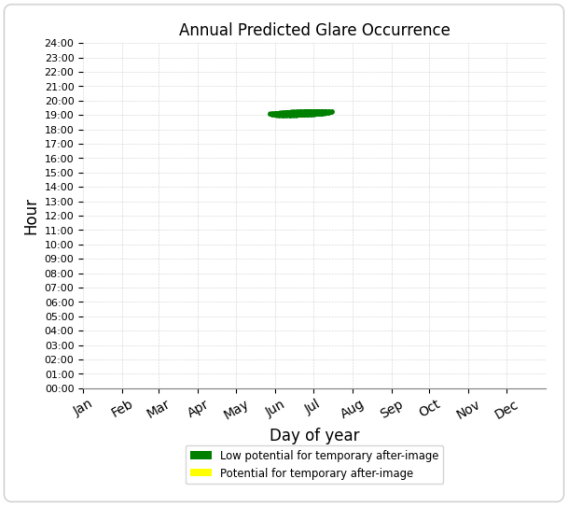
PV array 2 and Route: Railway south

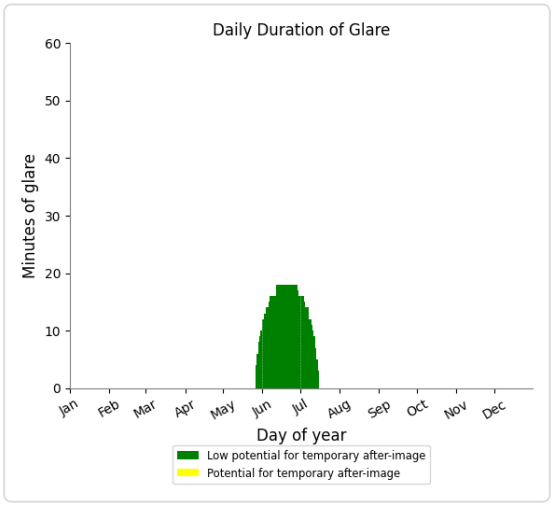
No glare found

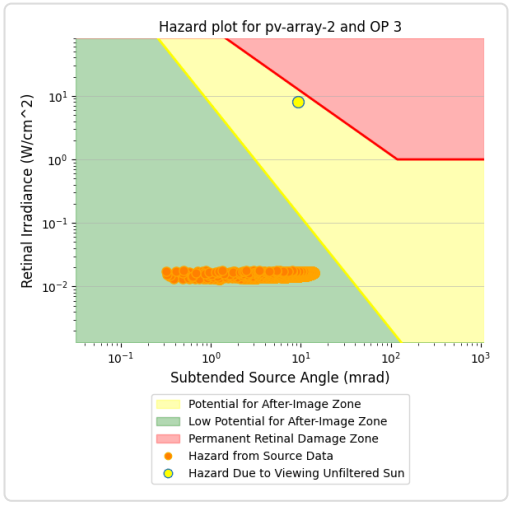
PV array 2 and OP 3

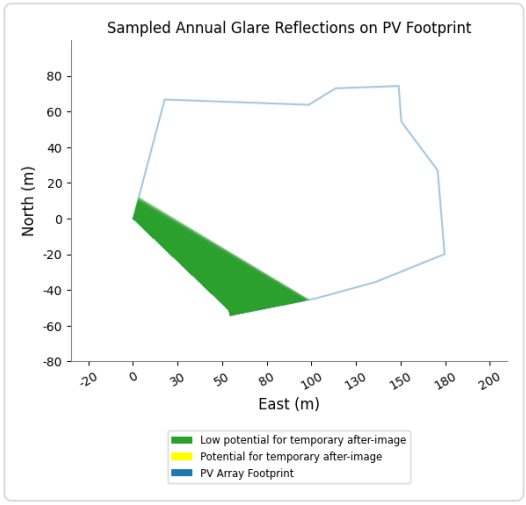
Yellow glare: none

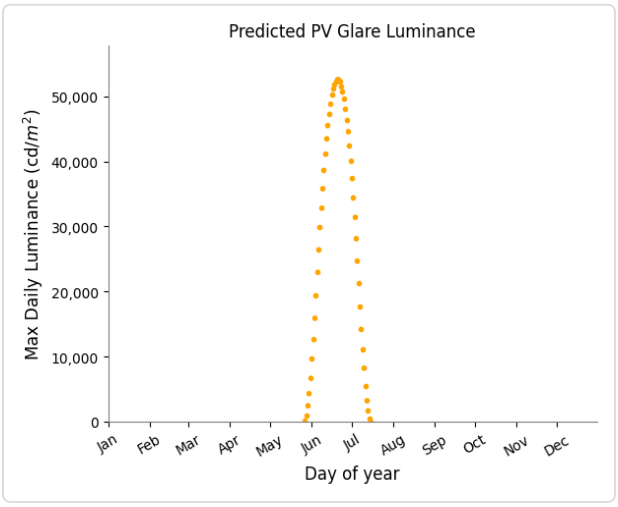
Green glare: 710 min.







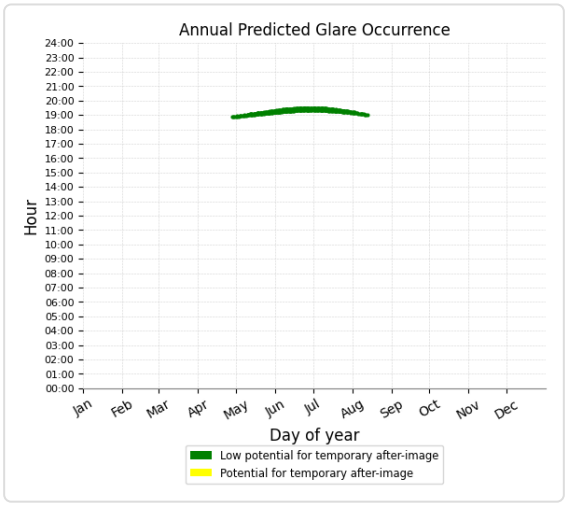


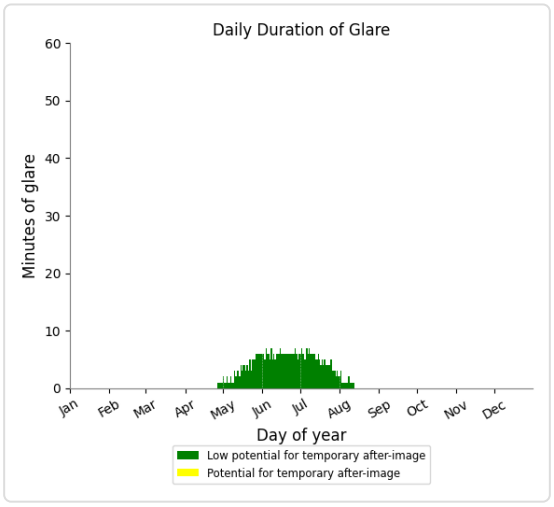


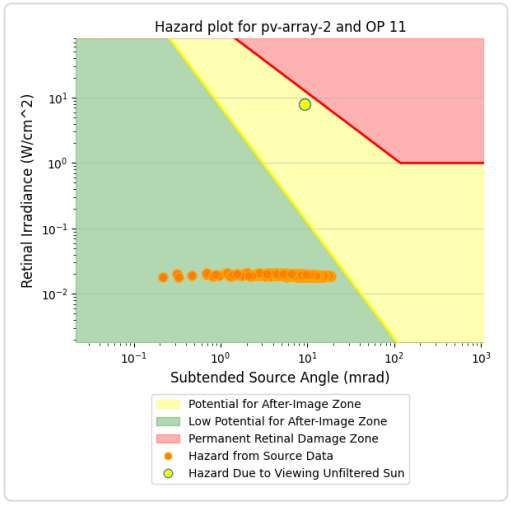
PV array 2 and OP 11

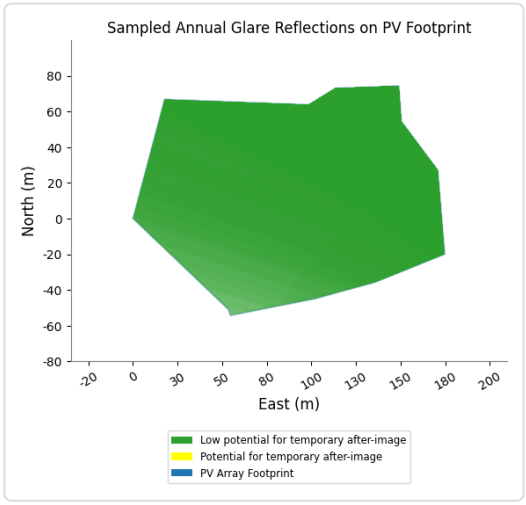
Yellow glare: none

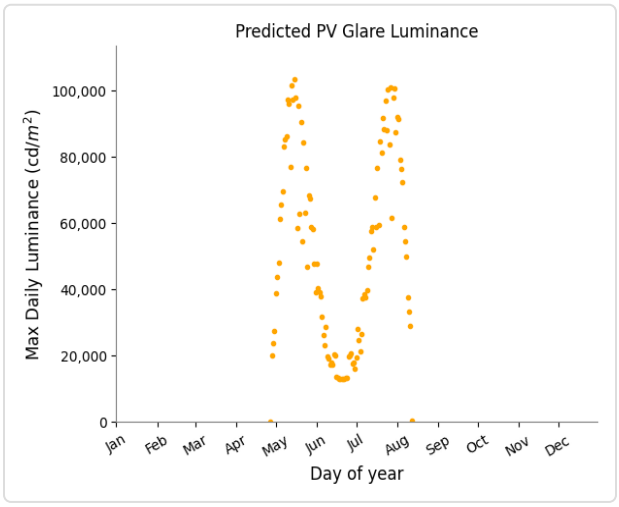
Green glare: 451 min.







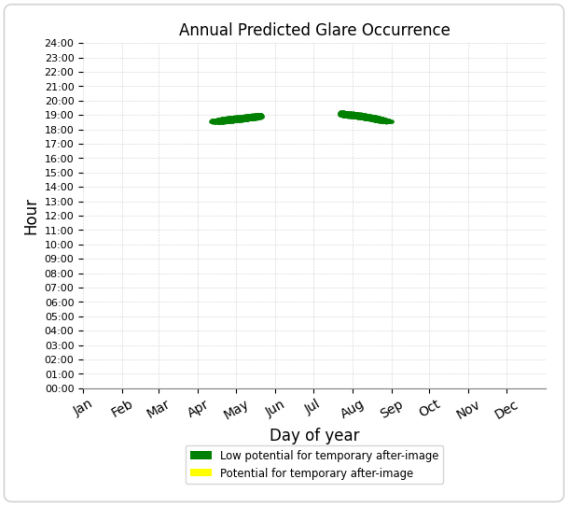


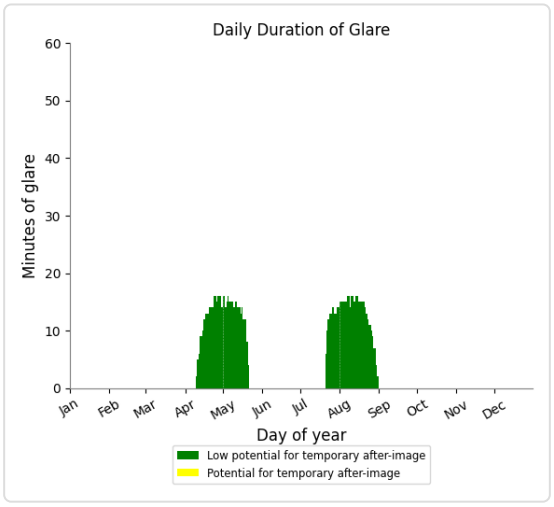


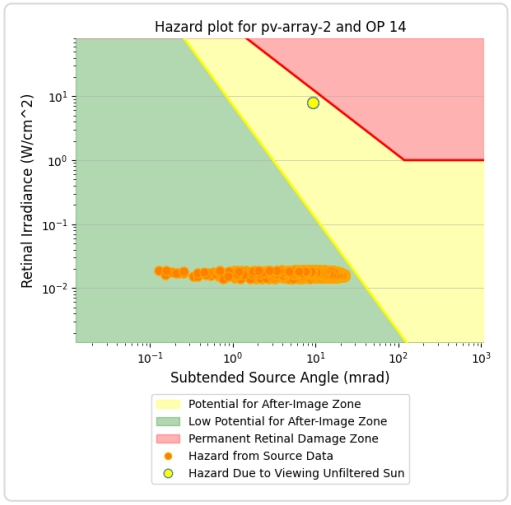
PV array 2 and OP 14

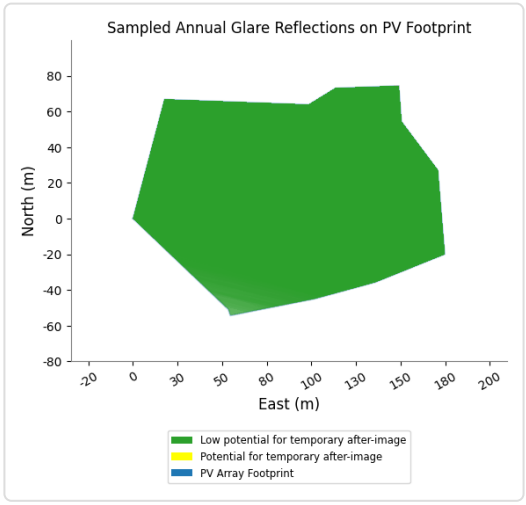
Yellow glare: none

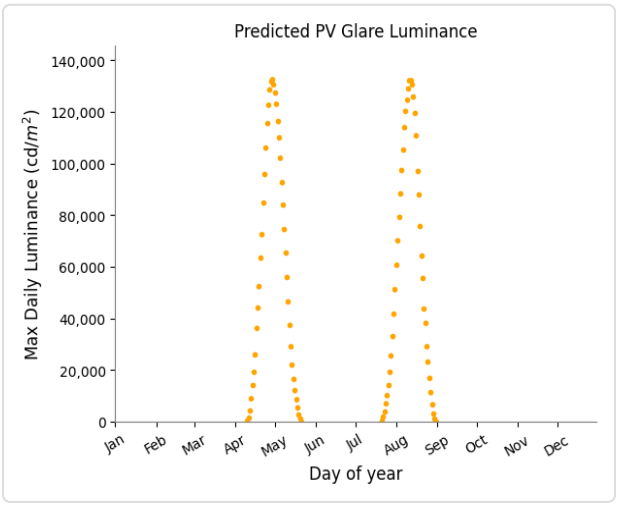
Green glare: 1,080 min.







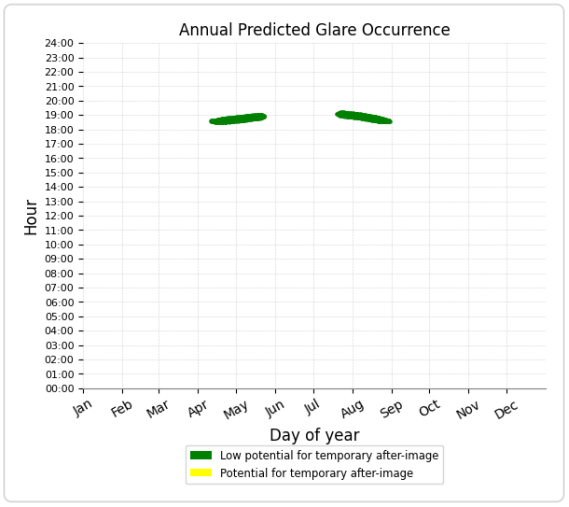


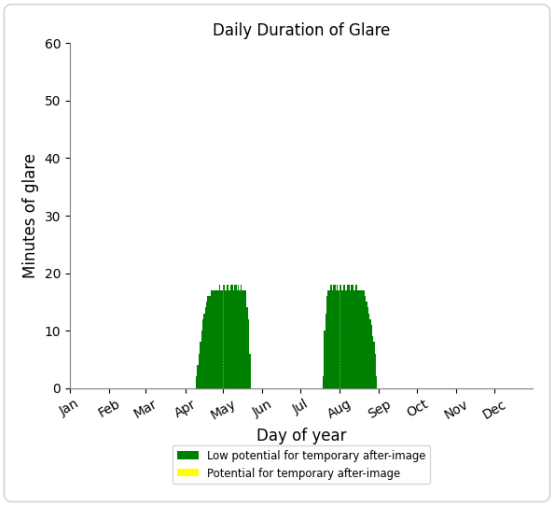


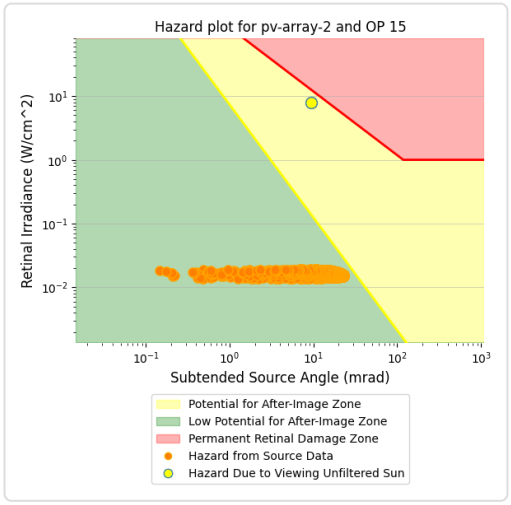
PV array 2 and OP 15

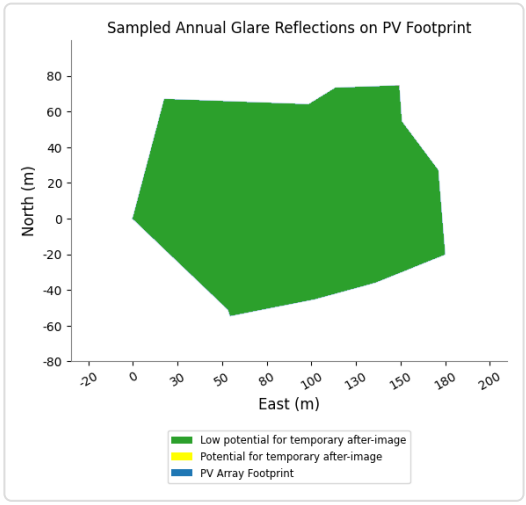
Yellow glare: none

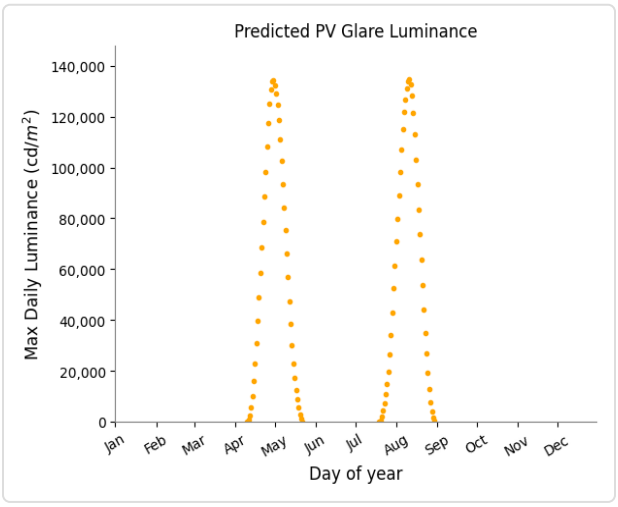
Green glare: 1,304 min.







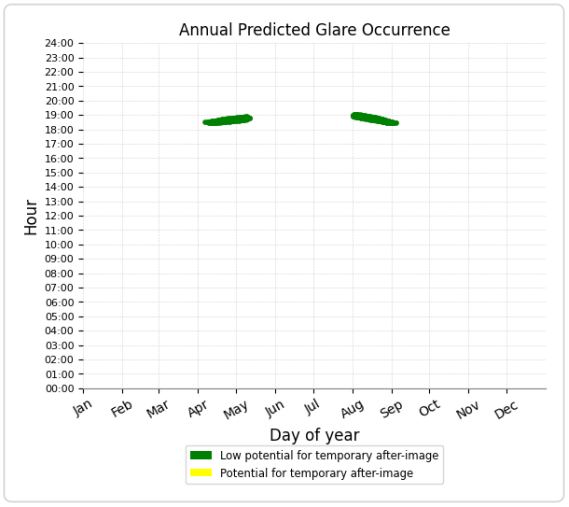


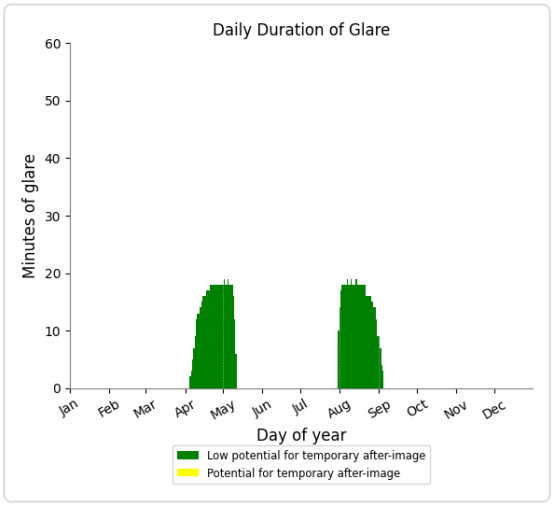


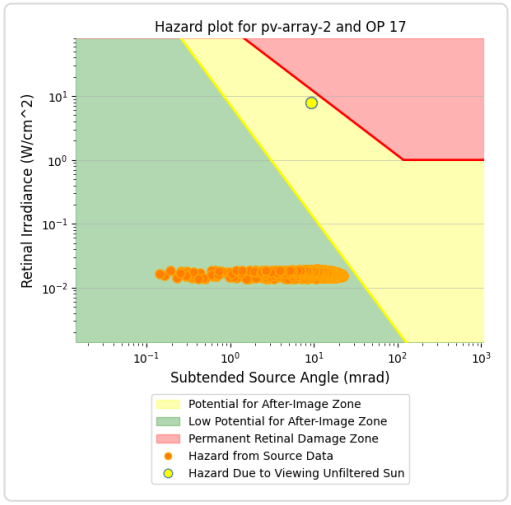
PV array 2 and OP 17

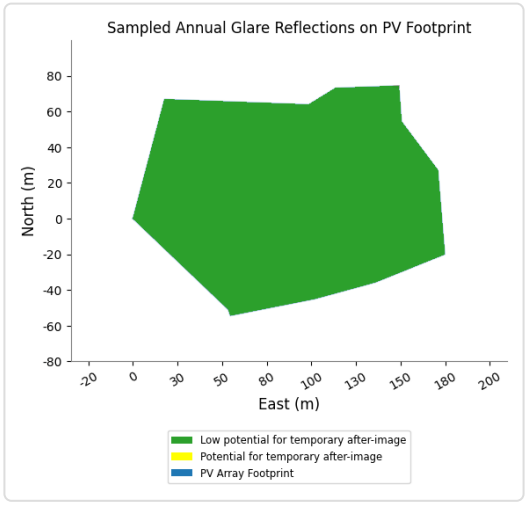
Yellow glare: none

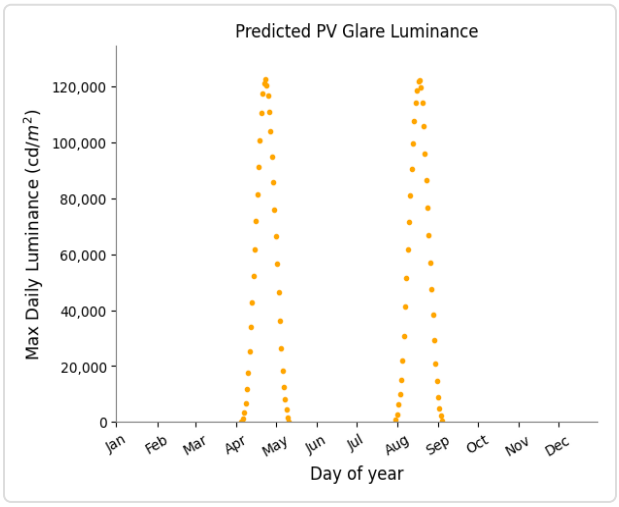
Green glare: 1,104 min.







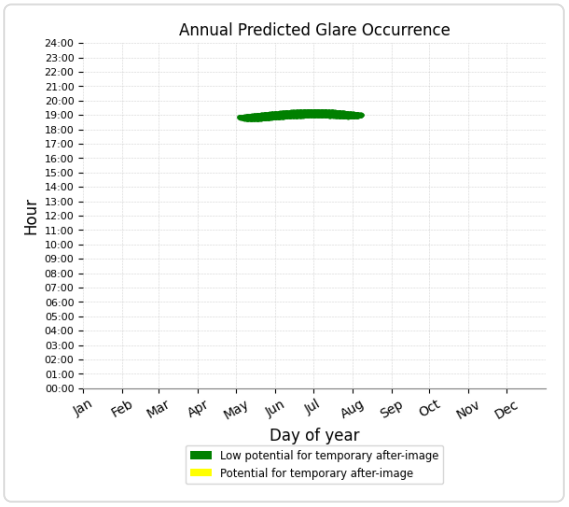


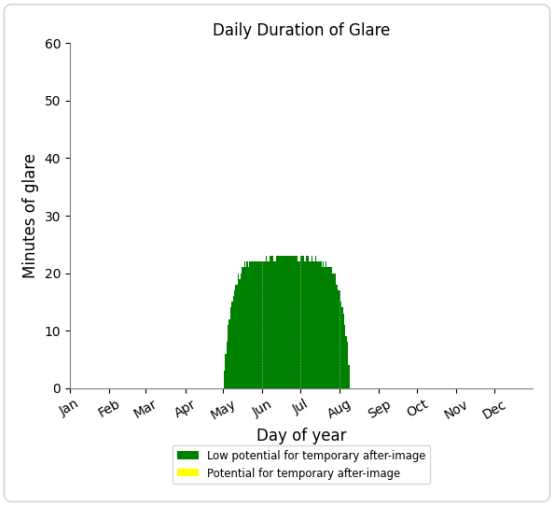


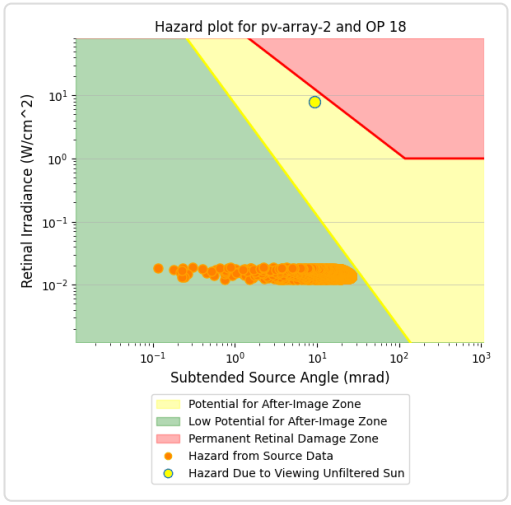
PV array 2 and OP 18

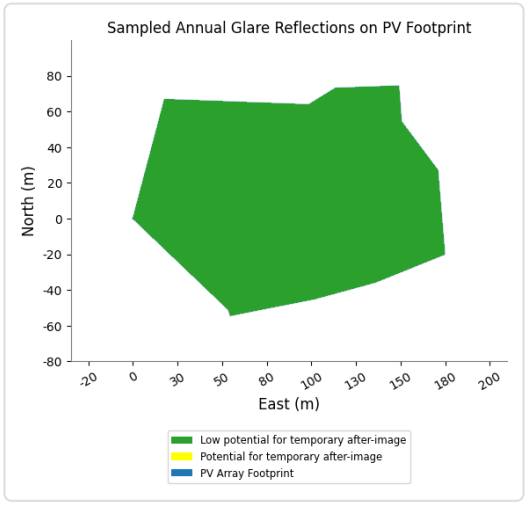
Yellow glare: none

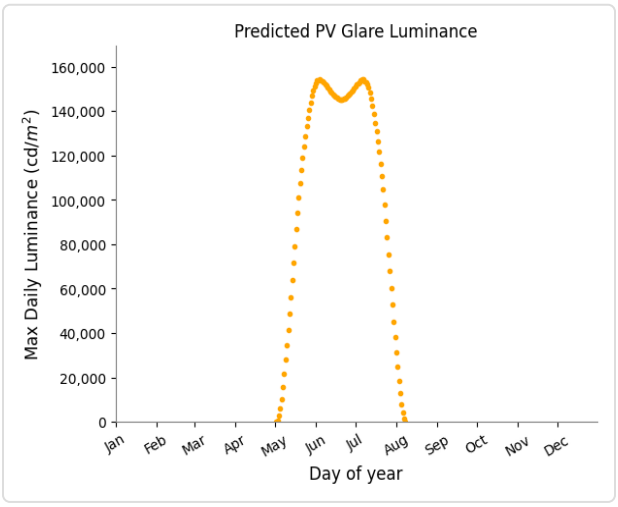
Green glare: 1,981 min.







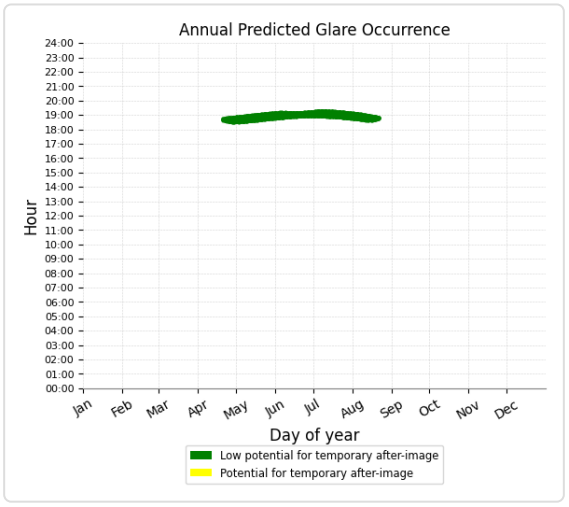


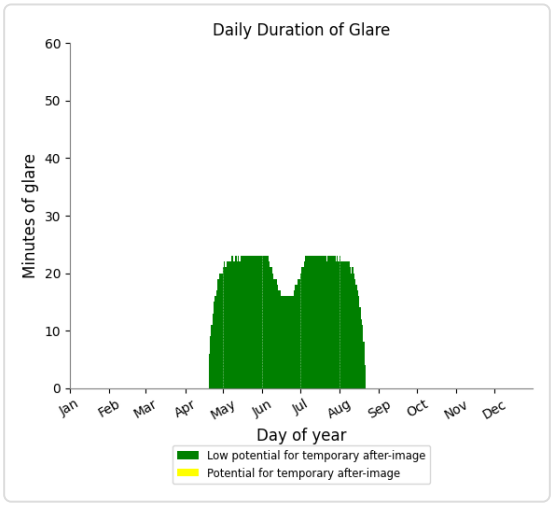


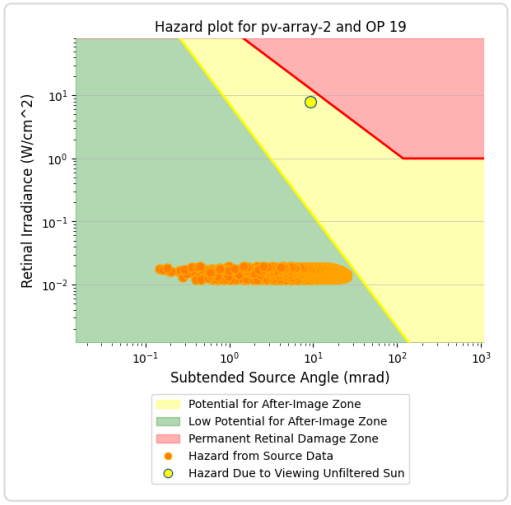
PV array 2 and OP 19

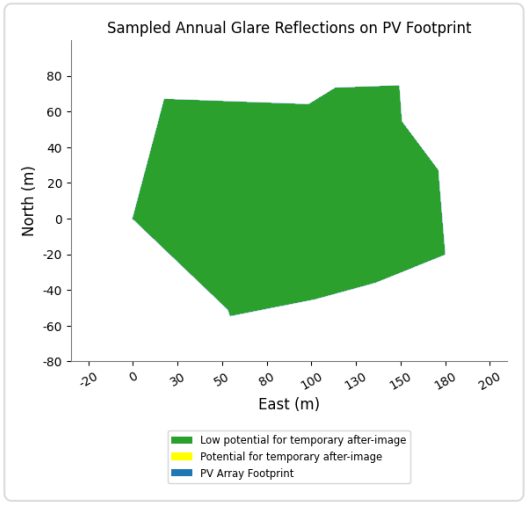
Yellow glare: none

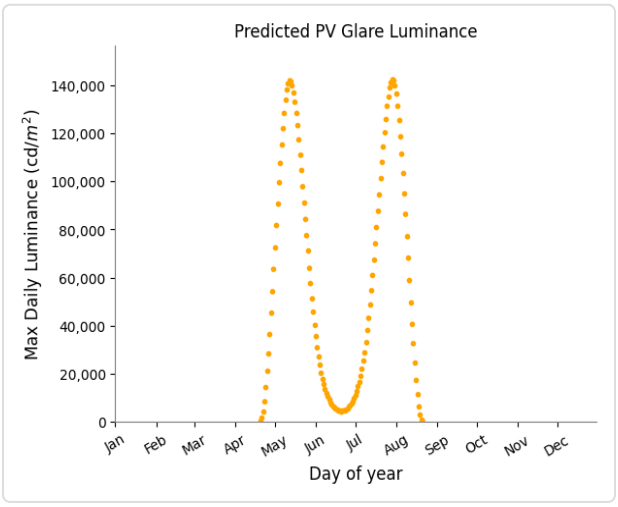
Green glare: 2,505 min.







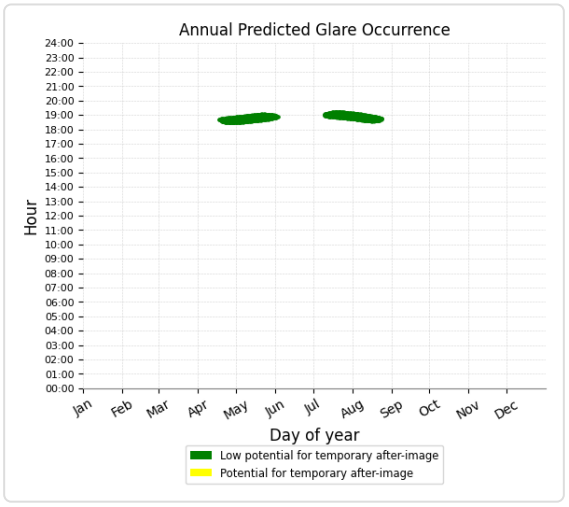


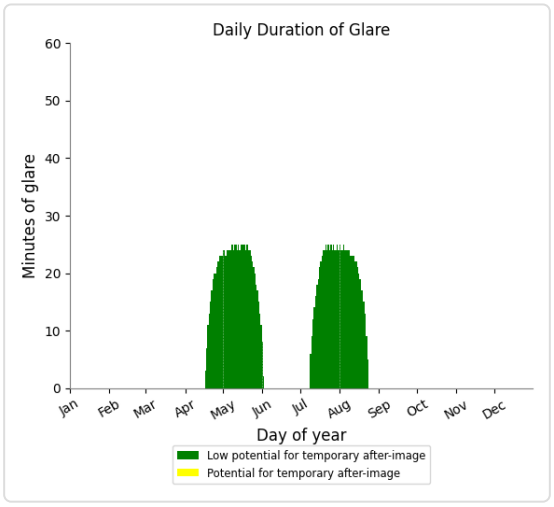


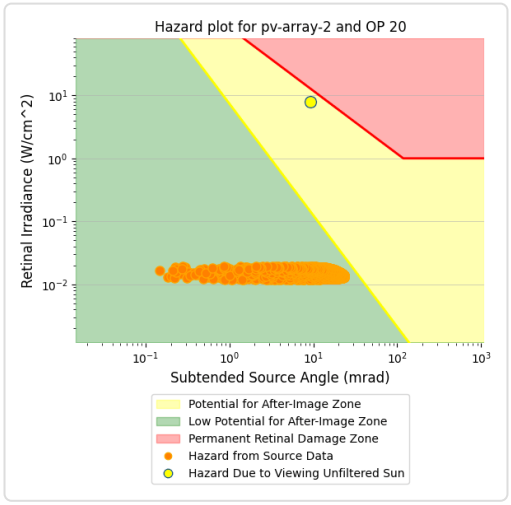
PV array 2 and OP 20

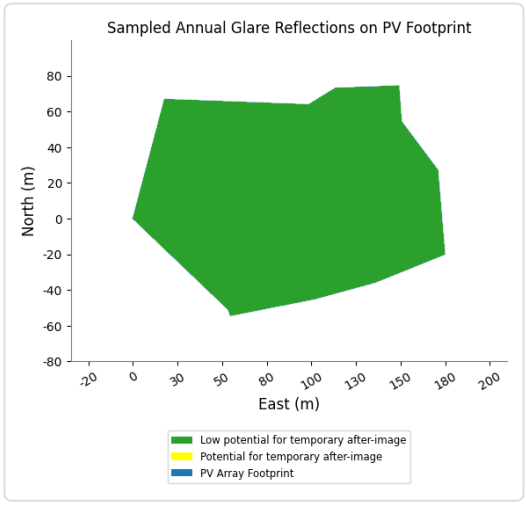
Yellow glare: none

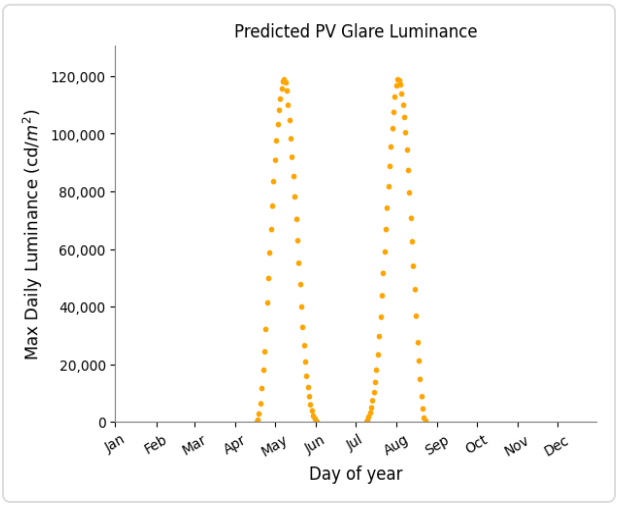
Green glare: 1,886 min.







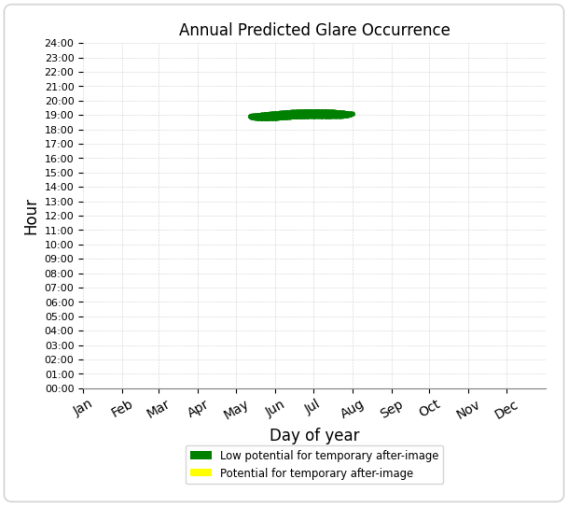


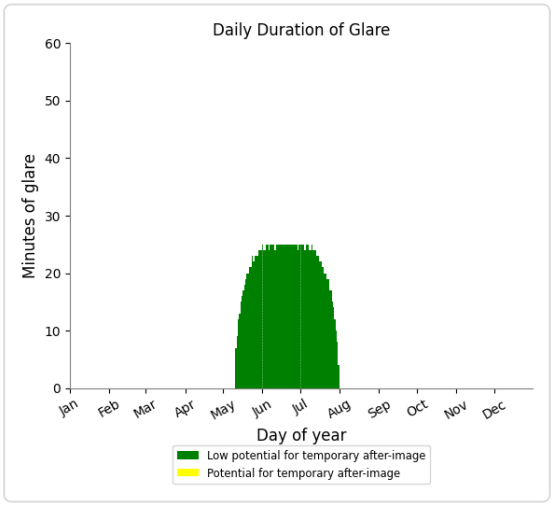


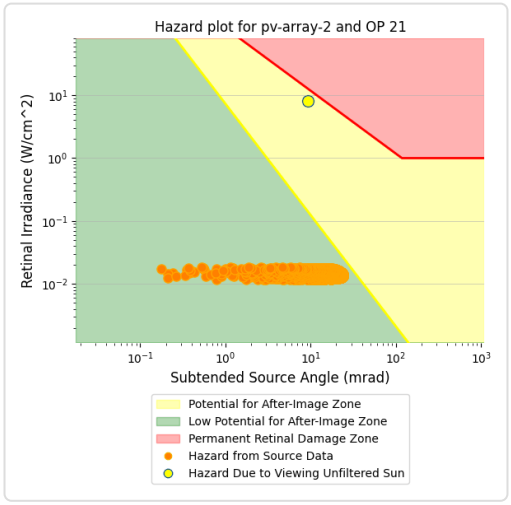
PV array 2 and OP 21

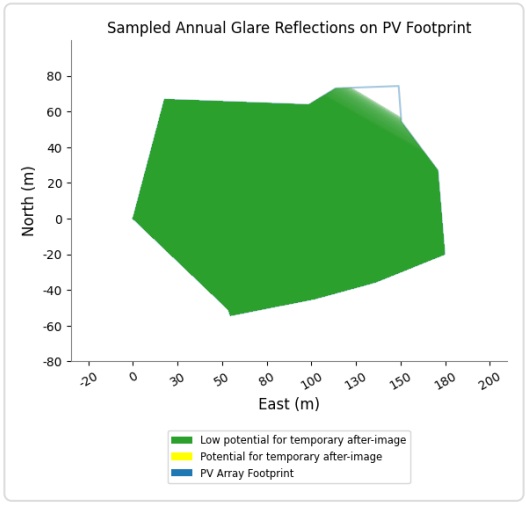
Yellow glare: none

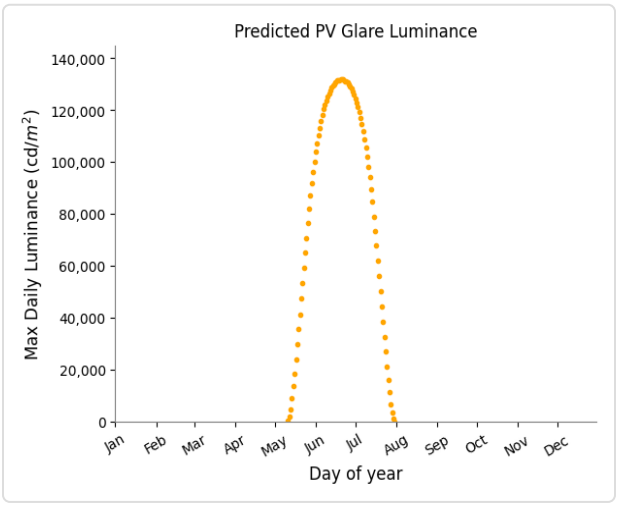
Green glare: 1,764 min.







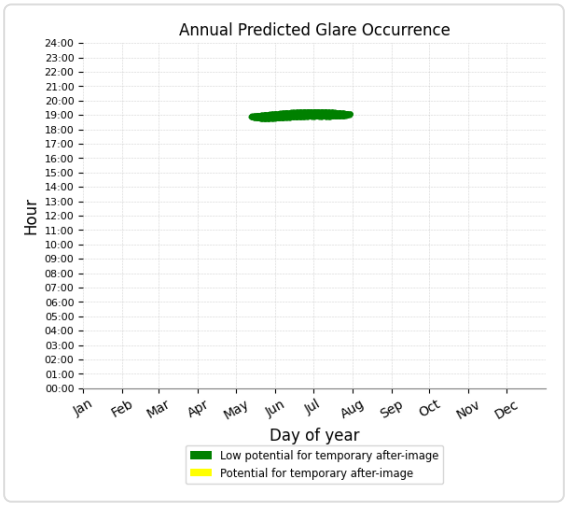


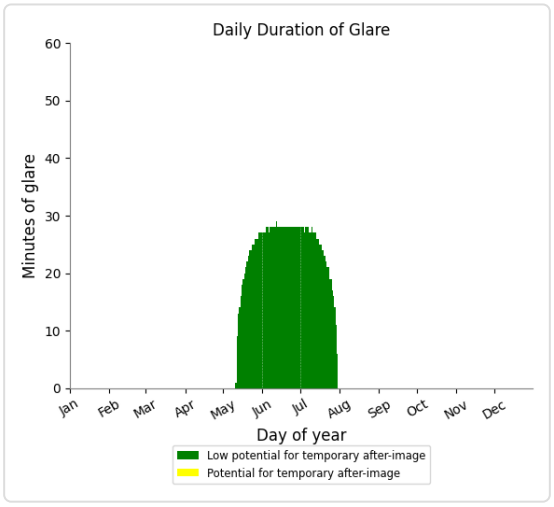


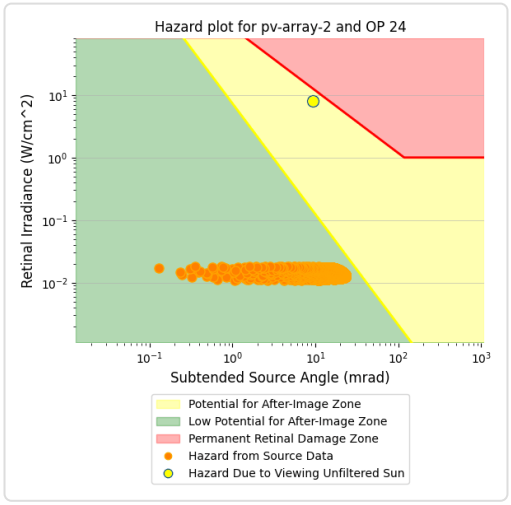
PV array 2 and OP 24

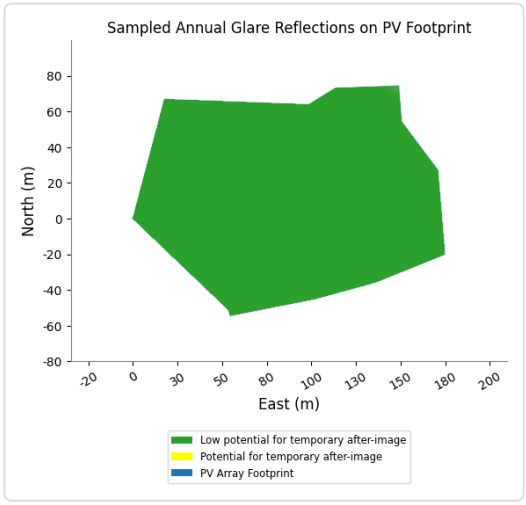
Yellow glare: none

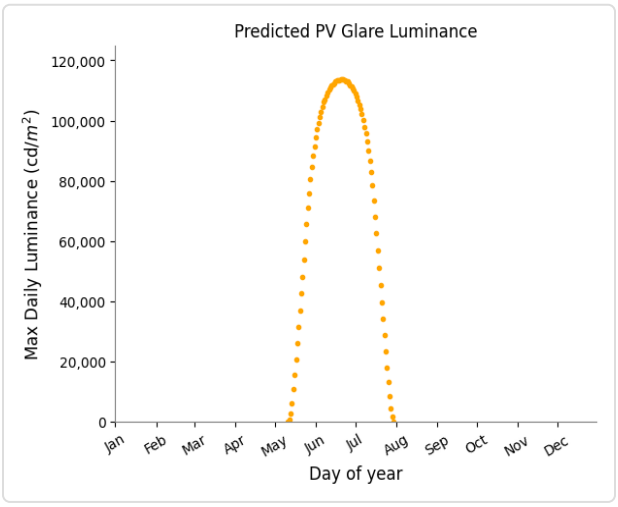
Green glare: 1,967 min.







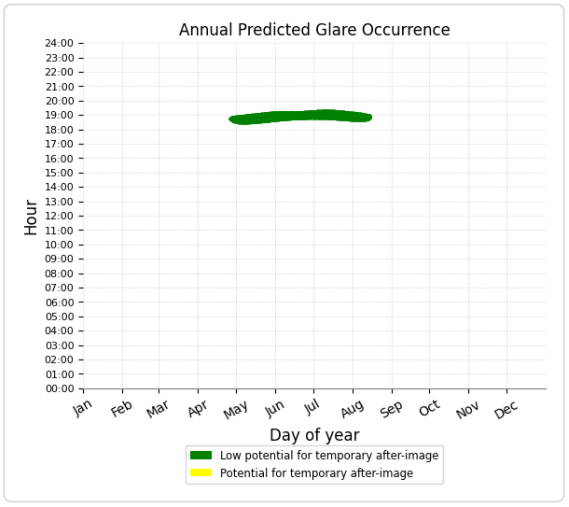


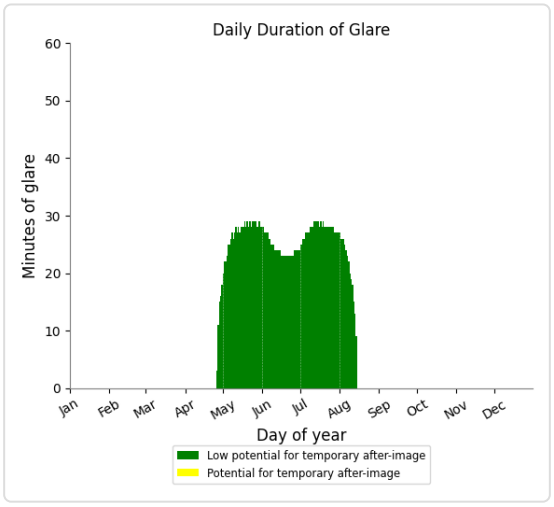


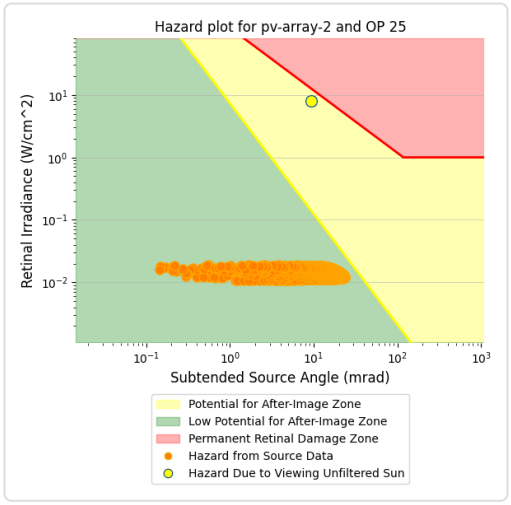
PV array 2 and OP 25

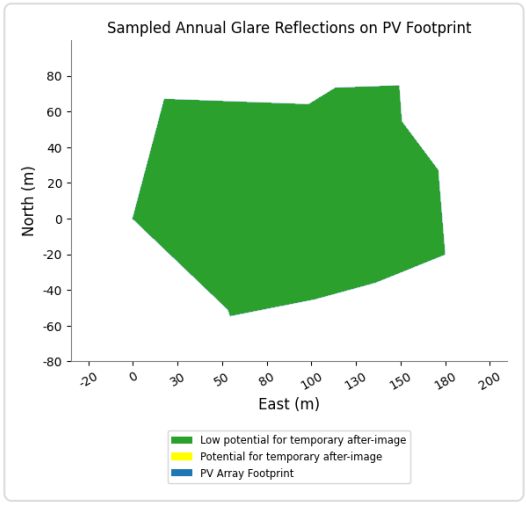
Yellow glare: none

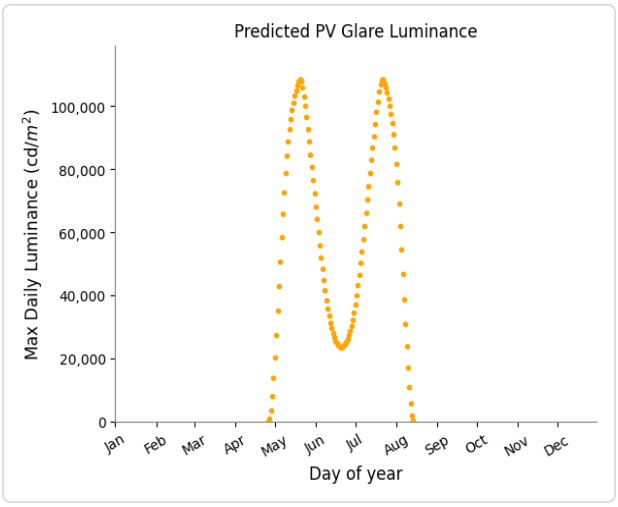
Green glare: 2,784 min.







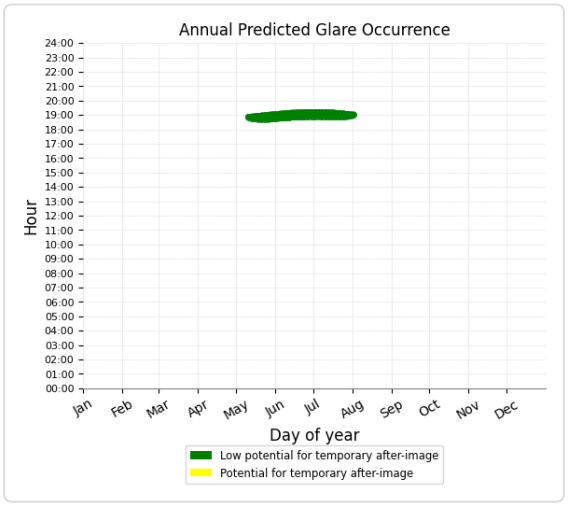


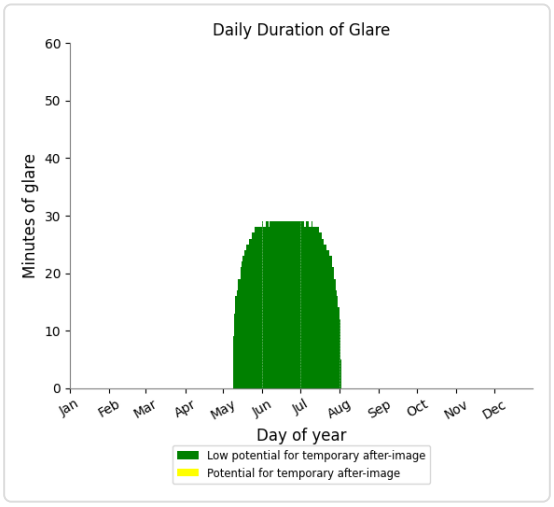


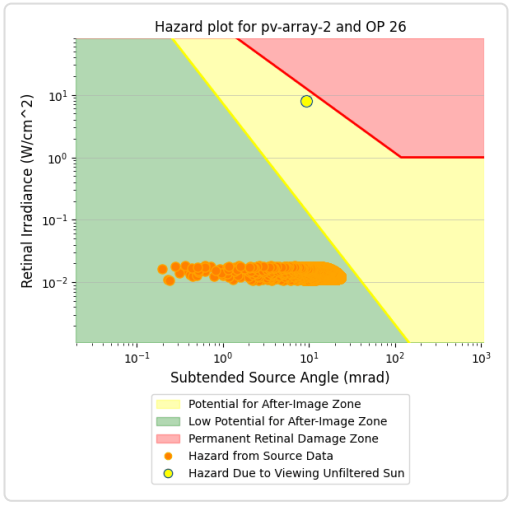
PV array 2 and OP 26

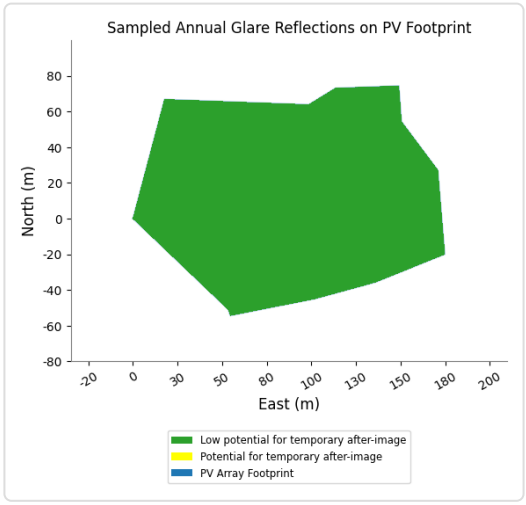
Yellow glare: none

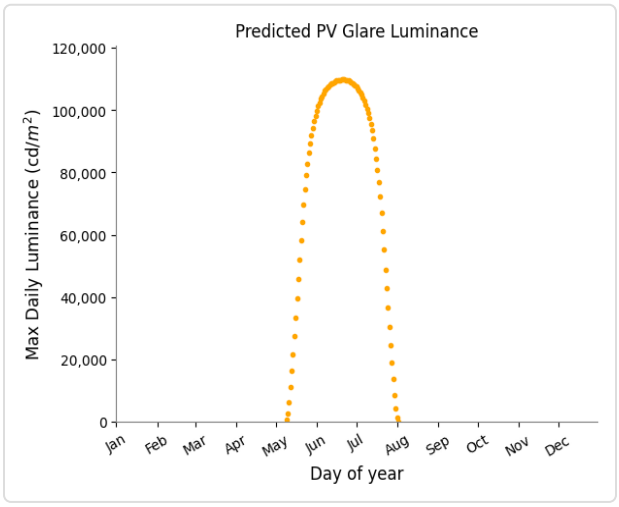
Green glare: 2,199 min.







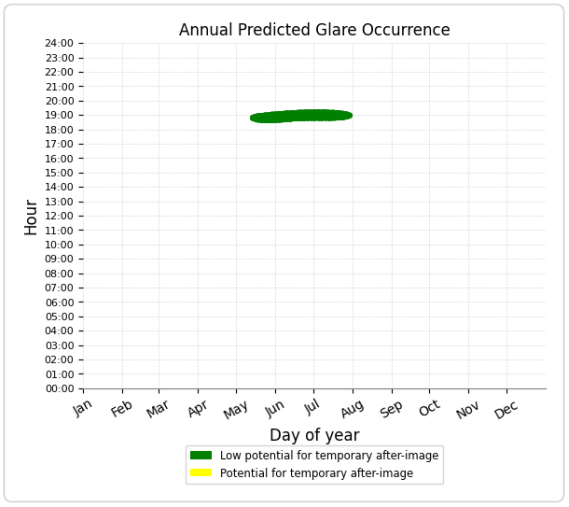


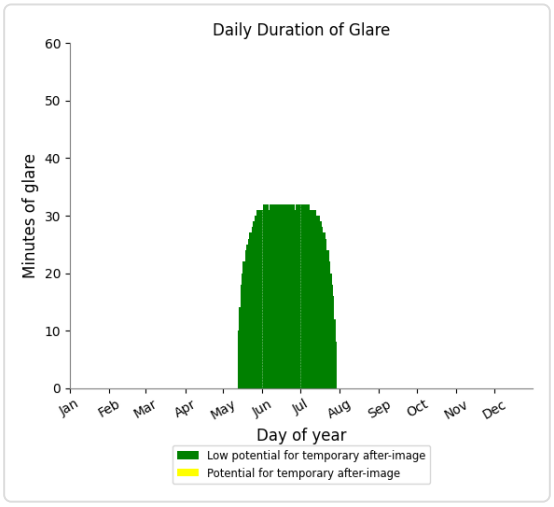


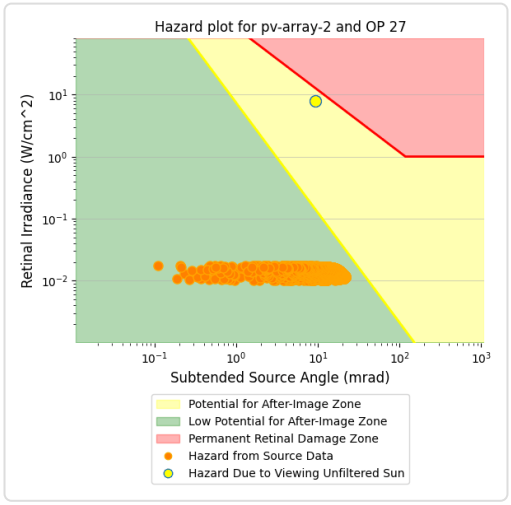
PV array 2 and OP 27

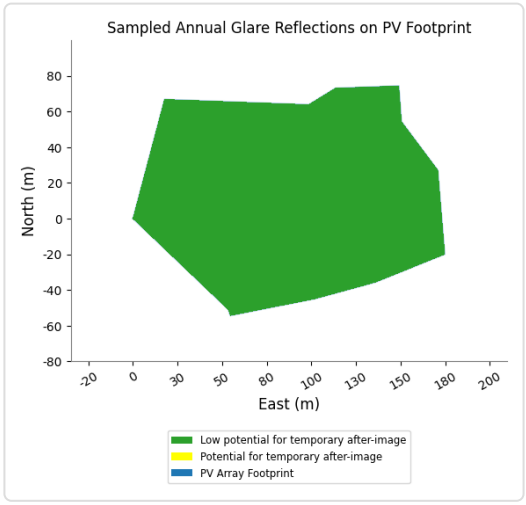
Yellow glare: none

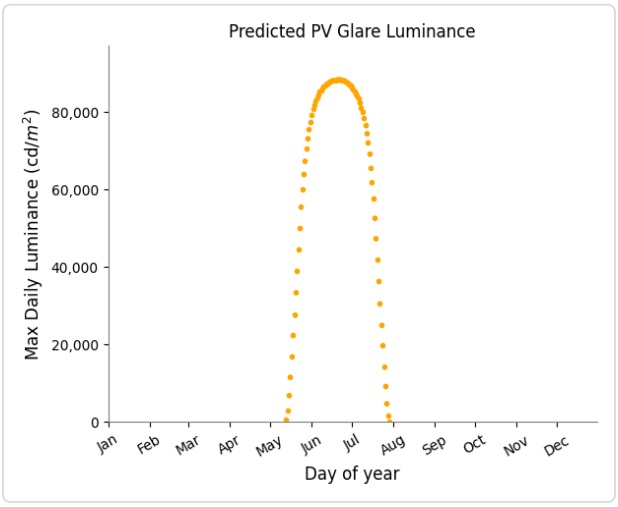
Green glare: 2,215 min.







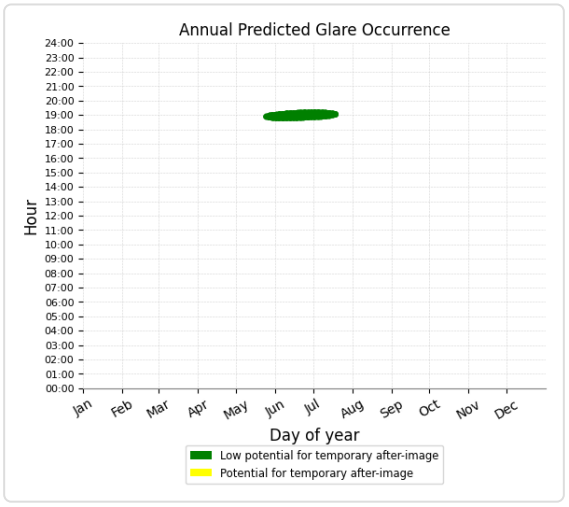


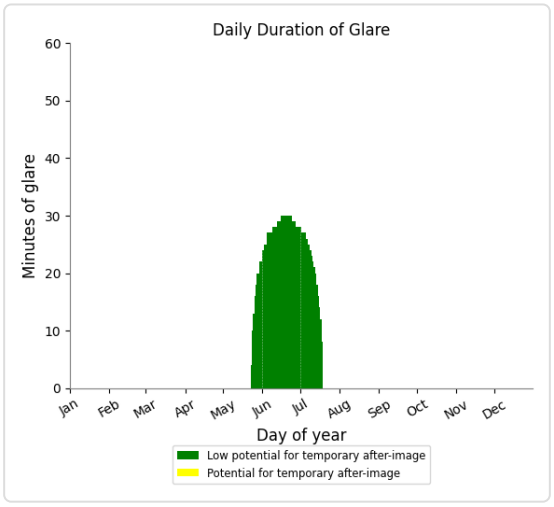


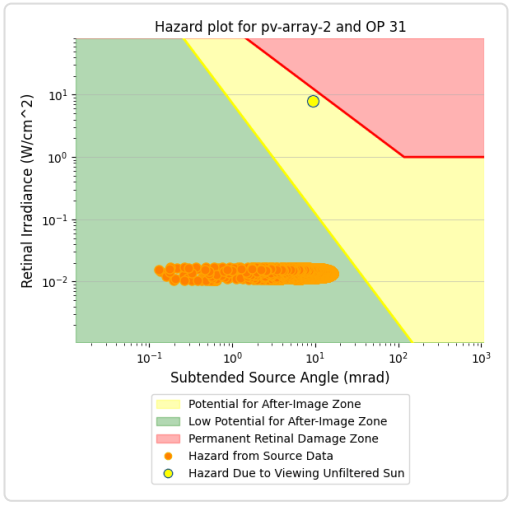
PV array 2 and OP 31

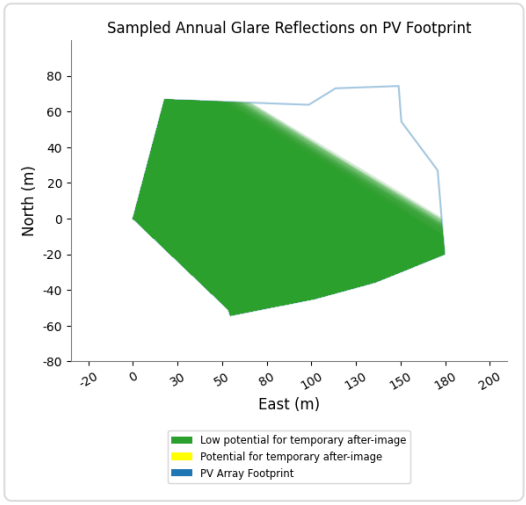
Yellow glare: none

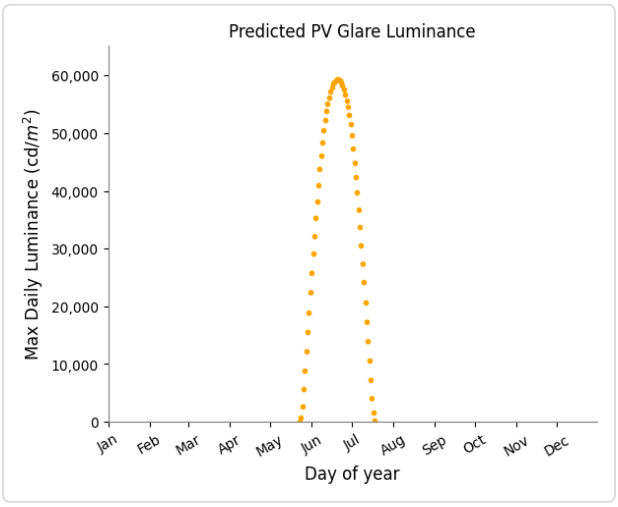
Green glare: 1,381 min.











PV array 2 and OP 1

No glare found

PV array 2 and OP 2

No glare found

PV array 2 and OP 4

No glare found

PV array 2 and OP 5

No glare found

PV array 2 and OP 6

No glare found

PV array 2 and OP 7

No glare found

PV array 2 and OP 8

No glare found

PV array 2 and OP 9

No glare found

PV array 2 and OP 10

No glare found

PV array 2 and OP 12

No glare found

PV array 2 and OP 13

No glare found

PV array 2 and OP 16

No glare found

PV array 2 and OP 22

No glare found

PV array 2 and OP 23

No glare found

PV array 2 and OP 28

No glare found

PV array 2 and OP 29

No glare found

PV array 2 and OP 30

No glare found

PV array 2 and OP 32

No glare found

PV array 2 and OP 33

No glare found

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.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
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. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
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.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
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.
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.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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