PIKE COUNTY
SOLAR PROJECT

Exhibit G

Glare Analysis Study

8425 Woodfield Crossing Boulevard
Suite 560-W
Indianapolis, IN 46240

T +1 317 706 2000

www.erm.com

MEMO

TO	Christina Martens, Director of Permitting & Environmental Pike County Solar Project, LLC
FROM	Justin Ahn, Project Manager Duncan Quinn, Senior Consultant Joshua Adams, Partner-in-Charge Ben Sussman, Technical Consulting Director
DATE	26 April 2024
REFERENCE	0718089
SUBJECT	Pike County Solar Project - Glare Analysis Memorandum

1. INTRODUCTION

Pike County Solar Project, LLC (Pike) proposes to construct and operate the Pike County Solar Project (Project), a photovoltaic (PV) solar facility in Pike County, Kentucky. Pike has engaged Environmental Resources Management, Inc. (ERM) to conduct a glare analysis for the proposed Project.

The Kentucky Public Service Commission (PSC) recently started requiring glare analyses for solar projects subject to the PSC's electric generation and transmission siting board process. In support of this process, ERM has prepared this memorandum summarizing the methodologies utilized and results of the glare analysis. Glare analysis documentation from the industry-standard ForgeSolar online glare analysis tool is provided in Appendix A.

2. PROJECT AND SITE DESCRIPTION

The proposed Project footprint is approximately 1,543 acres containing 6 fenced areas of PV arrays and other Project infrastructure (Site). The Site is located on the north side of US Highway 119 and approximately 0.5 mile northeast of the unincorporated community of Meta (Figures 1, 2, and 3). The Project will have a generation capacity of up to 100 megawatts (MW).

Pike plans for the PV system to contain single-axis rotation modules oriented south at a bearing of 178 degrees with a tracking angle range of motion of +/-60 degrees. The average height of center of the PV panels above ground will be approximately 5 feet. The ground coverage ratio (GCR) of the PV panels will be 0.30 (30 percent). The PV panels will contain smooth glass with an anti-reflective coating. The PV panel tracking

modules will implement a shade- and slope-aware backtracking strategy with the shallowest possible angle of east/west rotation during backtracking of 0 degrees.

The Site is located at a former (inactive) surface coal mine that is partially reclaimed and includes some forested, undeveloped land adjacent to areas that were disturbed during mining activities. The majority of the PV panel arrays will be located on these previously cleared and disturbed areas, which occupy hilltops that were partially flattened during past mining operations. The elevation of the Site ranges from approximately 840 feet above mean sea level near Smith Fork to 1,600 feet at the highest hilltops.

The Project vicinity also features terrain with hilltops typically 400 to 600 feet higher in elevation than the surrounding valleys of nearby streams and creeks. Multiple residences are located within these valleys along Stanley Fork Road, Brushy Road, Bent Branch Road, Right Fork of Brushy Road, and Ford Mountain Road. At higher elevations, the Project vicinity similarly includes both undeveloped, forested areas and other former coal mine sites. An electric transmission line is located approximately 0.3 mile east of the Site.

3. VIEWPOINT SUMMARY AND DISCUSSION

A representative sample of potential viewpoints was identified within a one-mile radius of the proposed Project. Viewpoints are locations from which the Project may be visible to human receptors, such as residents, motorists, pilots, recreationists, and tourists. Such viewers may be sensitive to potential glare caused by the PV panels. These viewpoints, referred to as "receptors" in the glare analysis results (Appendix A), were identified through review of aerial imagery, topographic maps, and other publicly available online mapping resources.

Based on ERM's review of the Federal Aviation Administration (FAA) database,[1] aerial photos, and a Google search, the nearest aircraft facility is the Pike County Airport (KPBX), located 6.3 miles west-southwest of the Project. ERM evaluated 2-mile-long straight-approach flight paths (FP 1 and FP 2) to Runway 27/09, respectively, at this airport as part of the glare analysis (Figure 3). As reported by the FAA, the approach glide slopes of Runway 27/09 are both 3 degrees, and the threshold crossing heights are 47 feet and 35 feet, respectively. The Pike County Airport does not have an air traffic control tower (ATCT).

Pike and ERM identified four stationary locations to serve as representative viewpoints for the glare analysis. These viewpoints are identified using the abbreviation "OP" and are numbered sequentially—OP 1 through OP 4 (Figures 1 and 2). Viewpoints OP 1 and OP 2 represent fixed locations on Ford Mountain Road within the Project boundary.

[1] Federal Aviation Administration. Circle Search for Airports. Available online https://oeaaa.faa.gov/oeaaa/external/searchAction.jsp?action=showCircleSearchAirportsForm. Accessed 7 February 2024.

Viewpoint OP 3 is a residence on Stanley Fork Road adjacent to the northern Project boundary, and OP 4 is a residence on Brushy Road (Route 881) adjacent to the northeastern Project boundary. ERM also evaluated the segment of Ford Mountain Road within and near the Project boundary as a route receptor to determine whether glare could potentially be observed by motorists traveling this road.

Due to the proximity of proposed PV arrays to OP 1, OP 2, and Ford Mountain Road, the PV panels in this area would be highly visible to observers traveling this road. Although OP 3 and OP 4 are adjacent to the Project boundary, these two viewpoints are approximately 0.6 mile and 0.5 mile, respectively, from the nearest PV arrays. Viewpoints OP 3 and OP 4 are also located at the base of narrow valleys along creeks and are approximately 100 to 500 feet lower in elevation than the nearest PV arrays. Due to this topographic setting, existing forest vegetation, and distances between these viewpoints and the proposed PV arrays, the PV panels would not be visible at OP 3 and OP 4. Because other residences in the Project vicinity have similar topographic and vegetation settings, views of PV arrays from these residences are unlikely.

4. GLARE ANALYSIS

This glare analysis is based on design parameters provided by Pike for single-axis rotation PV modules as described above in Section 2. It is important to note that glare would not be experienced if the solar panels are screened by topography, structures, or vegetation. Therefore, locations where glare may occur would be limited to areas with direct views of the proposed solar panels. Potential visibility could change over time due to planting or removal of vegetation or construction or removal of structures. The ForgeSolar tool does not, by default, consider the screening effects of vegetation, artificial structures, or topographic features between a PV array and sensitive receptors. As noted in Section 3, solar panels would be highly visible at OP 1, OP 2, and Ford Mountain Road but not visible from OP 3 and OP 4.

4.1 BACKGROUND

PV panels are designed to absorb rather than reflect sunlight to maximize energy capture. Many PV panels utilize textured glass and/or have anti-reflective coatings to further minimize reflectivity. Based on information provided by Pike, the Project's PV panels will contain smooth glass with an anti-reflective coating. ERM included this parameter in the glare analysis.

PV solar projects do not typically cause harmful or nuisance levels of glare, defined as a continuous source of bright light that may be visible to nearby residents, motorists, or pilots. The absorbing, rather than reflecting, nature of PV technology, in conjunction

with proper site planning and design, has allowed PV panels to be commonly and safely installed on airport properties nationwide.[2]

The amount of light reflected from solar panels depends on several factors, including the amount of sunlight hitting the panel surface, the surface's reflectivity (based on variables such as the presence of textured glass and/or anti-reflective coatings), the geographic location, time of year, weather conditions, and solar panel orientation. These factors affect the angle of incidence of the sun relative to sensitive viewers, and the amount of glare experienced.[2] With respect to glare, angle of incidence is the angle at which light deviates from perpendicular to a surface. The angle of incidence changes as the sun moves across the sky and is generally lowest at solar noon (when the sun is at its highest point above the horizon and light is reflected toward the sky) and highest at dawn and dusk (when the sun is low in the sky and light is reflected from a high angle of incidence in the opposite direction).

4.2 METHODOLOGY

ERM used the industry standard ForgeSolar GlareGauge[3] tool to assess potential glare and ocular impact at the four viewpoints and one route receptor as shown on Figures 1 and 2. Glare was also assessed along flight approach paths FP 1 and FP 2 at the Pike County Airport located 6.3 miles west-southwest of the Site (Figure 3). The tool calculates ocular impact from anticipated levels of retinal irradiance (amount of light received by the retina) and the subtended angle (size and distance) of the glare source. The ForgeSolar tool uses three categories to report potential ocular hazards ranging from retinal burns to temporary after-image, defined as a visual phenomenon in which glare persists in the viewer's vision, even after looking away from the source. These categories include:

- "Green" ratings indicate a low potential to cause after-image (flash blindness);
- "Yellow" ratings indicate the potential to cause temporary after-image; and
- "Red" ratings indicate potential to cause retinal burn and permanent eye damage.[4]

When simulating glare, the ForgeSolar tool modifies the vertex elevations of a PV array footprint so that all points of the PV array reside on a single planar surface. The ForgeSolar tool also may convert PV array footprints with large concavities into a convex shape by filling in these concavities. Therefore, to enhance the accuracy of the glare analysis (by preventing the flattening of hills and reducing the presence of large

[2] Federal Aviation Administration. 2018. *Technical Guidance for Evaluating Selected Solar Technologies on Airports.* Version 1.1, April 2018. Available online https://www.faa.gov/sites/faa.gov/files/airports/environmental/FAA-Airport-Solar-Guide-2018.pdf.

[3] ForgeSolar Glare Analysis tool. Available online https://www.forgesolar.com/. Accessed 4 March 2024.

[4] ForgeSolar. Fundamentals: About Glint and Glare. Available online https://www.forgesolar.com/help/#glare. Accessed 4 March 2024.

concavities), ERM split the 6 fenced areas of PV arrays into a total of 17 PV arrays (labeled PV 1 through PV 17) as shown on Figures 1 and 2.

The ForgeSolar tool considers the direction the PV panels face throughout the day and the slope of the PV array, based on the underlying topography, elevation, and height above ground of the PV panels. Analysis of potential glare observed from stationary viewpoints (OP 1 through OP 4) is based on a 360-degree field of view. By comparison, the route-based analysis along Ford Mountain Road is calculated using a 100-degree field of view (50 degrees to the left and right) centered on the direction of travel (in both directions) along the route. Glare assessment along the flight paths also use a 100-degree field of view with a maximum downward viewing angle of 30 degrees. This default value is based on FAA research, which determined that the impact of glare beyond a 100-degree field of view is mitigated.[5]

4.3 RESULTS

As summarized in Table 1 and documented in Appendix A, the glare analysis results predict the Project will generate yellow glare along Ford Mountain Road and at OP 1. Green glare is predicted along Ford Mountain Road and at both stationary viewpoints, OP 1 and OP 2, on Ford Mountain Road.

Although green glare is also predicted at OP 3 (residence on Stanley Fork Road) and OP 4 (residence on Brushy Road), the PV arrays would not be visible at either location due to topography and existing vegetation as discussed in Section 3. This discrepancy is due to the fact that the ForgeSolar tool does not consider the screening effects of topography or vegetation.

The glare analysis predicts green glare along FP 2 (flight approach path to Runway 09 at the Pike County Airport). No yellow glare is predicted along FP 2, and no green or yellow glare is predicted along FP 1.

[5] Rogers, J. A., et al. 2015. "Evaluation of Glare as a Hazard for General Aviation Pilots on Final Approach." Federal Aviation Administration, Office of Aerospace Medicine. Report No. DOT/FAA/AM-15/12. Available online https://www.tc.faa.gov/its/worldpac/techrpt/am15-12.pdf.

Table 1: Pike County Solar Project - Summary of Predicted Glare

Viewpoint Location	Annual Green Glare (minutes/year)	Annual Yellow Glare (minutes/year)	Glare Source	Distance and Direction to Source	Approximate Time of Year and Day	Maximum Daily Duration (Green and Yellow combined) (minutes/day)	Comments
Ford Mountain Road	18,324	21,427	PV 4	~40 ft W	Year-round - mid morning to evening	300	
	2,924	4,099	PV 5	~20 ft W	Oct to Feb - mid day to evening	180	
	586	1,228	PV 7	300 ft E	Apr to Aug - morning	20	
	1,777	311	PV 8	0.8 mi ENE	Mar to Sep - morning	17	
	1,785		*PV 10*	*1.9 mi ENE*	*Apr to Aug - morning*	*17*	PV 10 not visible due to topography
FP 1							No glare predicted
FP 2	566		PV 8	8.4 mi E	Apr to May and Aug to Sep - morning	12	
	955		PV 10	9.5 mi E	Apr, May, Jul, Aug - morning	17	
	89		PV 14	10 mi E	Apr and Aug - morning	6	
OP 1	5,686	4,345	PV 4	144 ft SW	Nov to Feb - mid morning to afternoon	220	
	2,220	1,034	PV 5	850 ft SW	Nov to Jan - mid day to afternoon	120	
	802		*PV 10*	*1.9 mi ENE*	*May to Aug - morning*	*17*	PV 10 not visible due to topography
OP 2	540		PV 7	620 ft ENE	May to Jul - morning	11	
	573		PV 8	0.9 mi ENE	May to Jul - morning	17	
OP 3	*558*		*PV 4*	*1.5 mi SW*	*Nov to Jan - afternoon*	*23*	PV 4 not visible due to topography
	123		*PV 5*	*1.6 mi SW*	*Nov to Jan - afternoon*	*7*	PV 5 not visible due to topography
OP 4	*507*		*PV 1*	*1.9 mi SW*	*Nov to Jan - evening*	*20*	PV 1 not visible due to topography
	54		*PV 4*	*2.5 mi SW*	*Feb - afternoon*	*9*	PV 4 not visible due to topography
	266		*PV 5*	*2.6 mi SW*	*Nov to Jan - afternoon*	*10*	PV 5 not visible due to topography

It should be noted that glare observed at a viewpoint from multiple PV arrays may partially occur at the same time, particularly when glare is reflected from PV arrays that appear closely aligned relative to the observer. As a result, the total annual

duration of glare predicted for each viewpoint in Appendix A Summary of Results Table may include overlapping periods of glare for viewpoints that receive glare from more than one PV array.

In addition, the glare analysis does not consider potential cloud cover. The amounts of glare predicted in Table 1 and Appendix A represent total potential amounts of glare assuming clear, sunny skies every day throughout the year. NOAA's Comparative Climatic Data[6] database lists the closest weather stations with available data in Knoxville, Tennessee (approximately 151 miles southwest of the Site) and Columbus, Ohio (approximately 156 miles north of the Site). These stations recorded an average of 57 percent and 45 percent possible sunshine, respectively, on an annual basis over the period 1965-1983, which is the most recent data available for both stations. Interpolating between these two stations suggests that potential glare at the Site would typically occur about 51 percent of the time on average throughout the year, reducing the predicted amounts of glare presented in Table 1 and Appendix A by roughly half.

4.4 CONCLUSIONS

As currently designed, the Project would potentially reflect significant amounts of green and yellow glare onto a segment of Ford Mountain Road in proximity to arrays PV 4, PV 5, and PV 7. Programming the PV modules to backtrack to the shallowest possible angle of east/west rotation of 5 degrees or greater may reduce glare potentially observed along this road segment. These measures would also mitigate glare predicted at the stationary viewpoints OP 1 and OP 2 on Ford Mountain Road.

Although green glare is predicted along flight path FP 2, the PV arrays contributing to this glare are located at least 8 to 10 miles east of the threshold of Runway 09 (the end of FP 2). Furthermore, these PV arrays (PV 8, PV 10, and PV 14) would generate a maximum of only 6 to 17 minutes of green glare per day in the morning during spring and summer months (Table 1). In addition, pilots on final approach would likely experience only a few moments of glare before the aircraft moves into a position from which glare is no longer visible.

In 2021, the FAA issued an updated policy regarding reviews of solar projects on federally obligated airport property in which the FAA concluded that in most cases "glare from solar energy systems to pilots on final approach is similar to glint and glare pilots routinely experience from water bodies, glass facade buildings, parking lots, and similar features."[7] FAA policy focuses on potential impacts on crews in ATCTs, which would not apply to airports without ATCTs such as the Pike County Airport. Based on

[6] NOAA's National Centers for Environmental Information. Comparative Climatic Data (CCD-2018) Dataset. Available online https://www.ncei.noaa.gov/products/land-based-station/comparative-climatic-data. Accessed 8 March 2024.
[7] FAA. 2021. Federal Aviation Administration Policy: Review of Solar Energy System Projects on Federally-Obligated Airports. 86 FR 25801.

these factors, glare impacts on pilots caused by the Project are expected to be minimal.

FIGURES

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Drawn By: Casey.Brotman

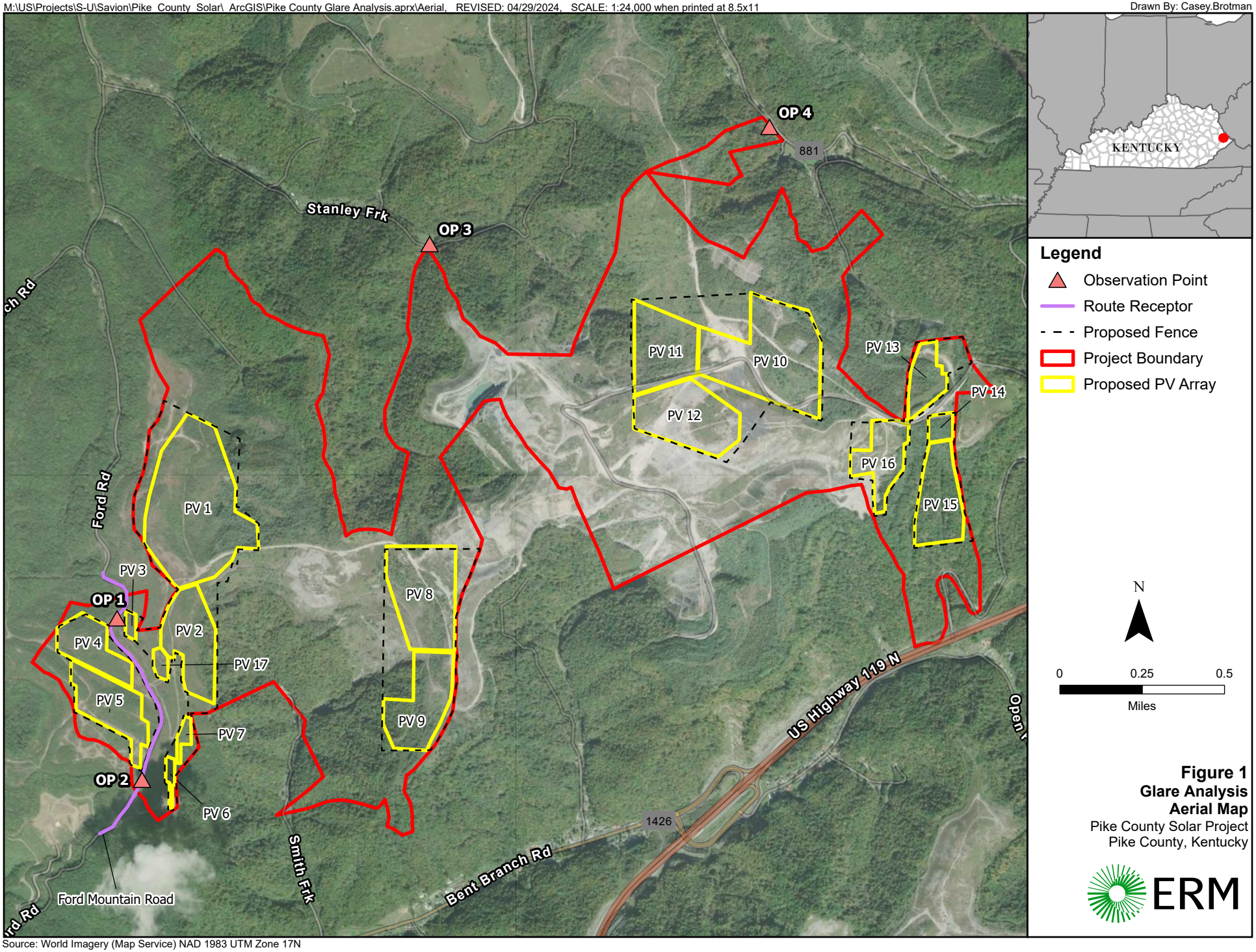

Figure 1
Glare Analysis
Aerial Map
Pike County Solar Project
Pike County, Kentucky

ERM

Source: World Imagery (Map Service) NAD 1983 UTM Zone 17N

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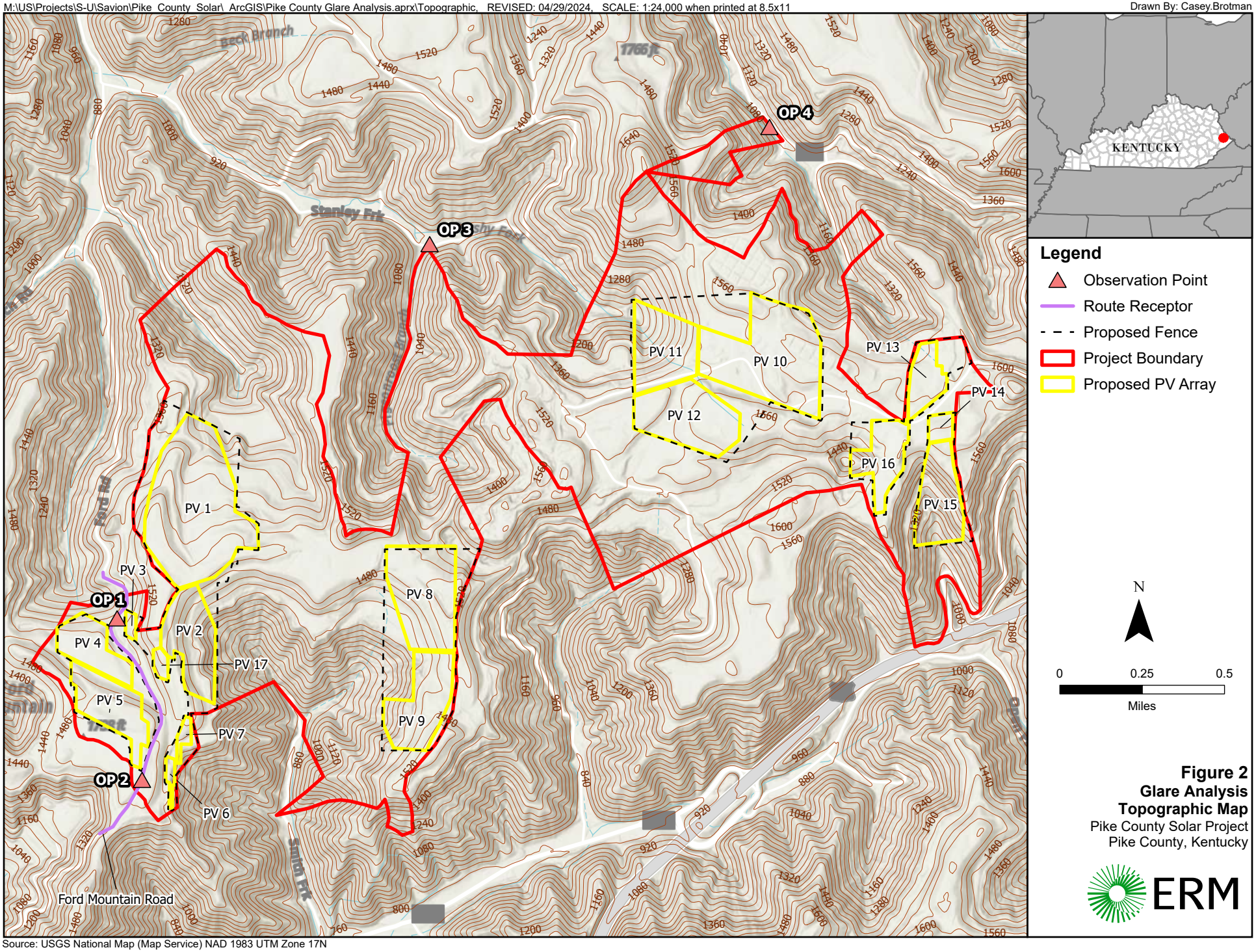
Drawn By: Casey.Brotman



Legend

- Observation Point
- Route Receptor
- Proposed Fence
- Project Boundary
- Proposed PV Array

N

0 0.25 0.5

Miles

Figure 2
Glare Analysis
Topographic Map
Pike County Solar Project
Pike County, Kentucky

ERM

Source: USGS National Map (Map Service) NAD 1983 UTM Zone 17N

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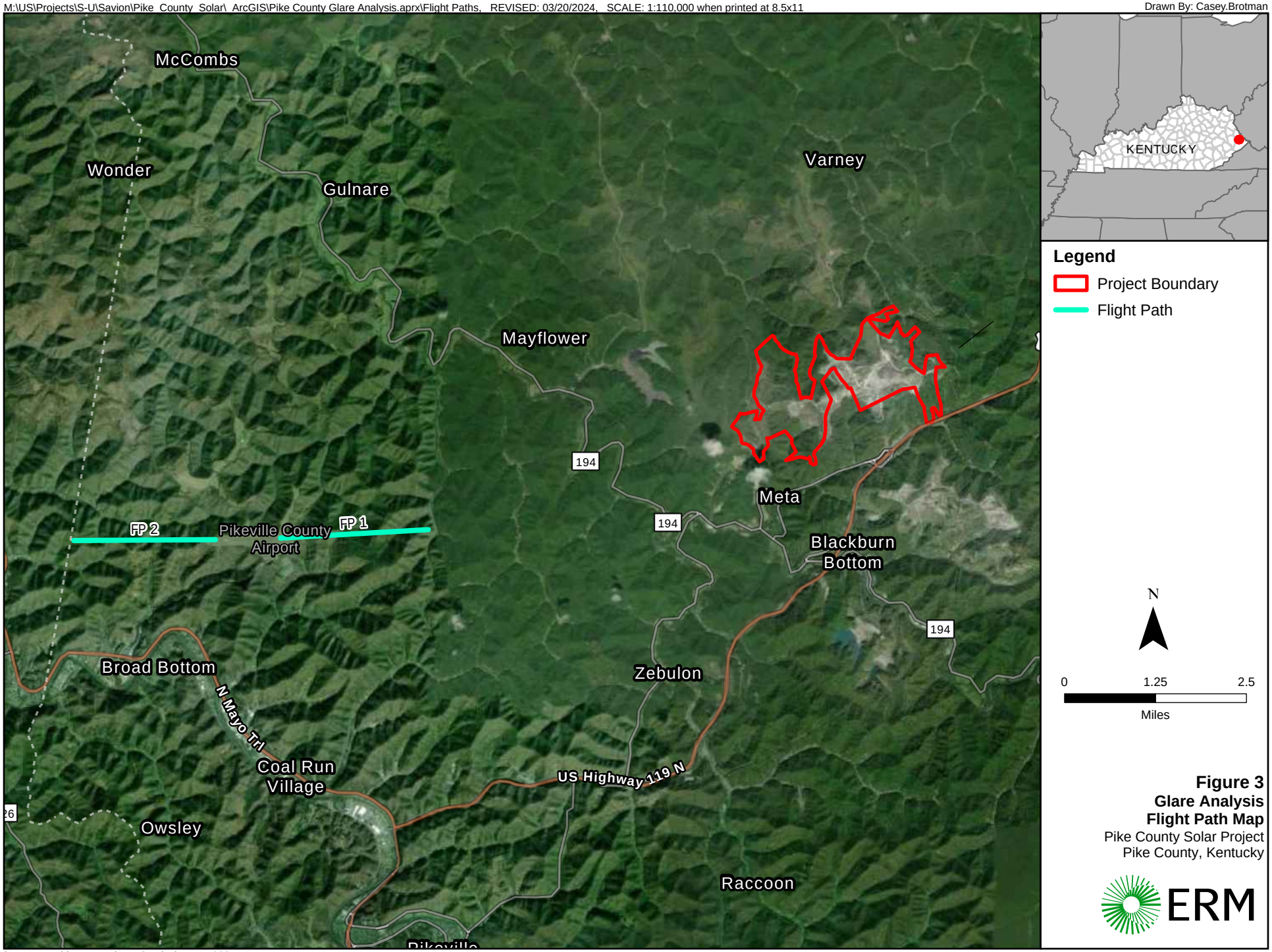


Figure 3
Glare Analysis
Flight Path Map
Pike County Solar Project
Pike County, Kentucky

ERM

Source: World Imagery (Map Service) NAD 1983 UTM Zone 17N

APPENDIX A - FORGESOLAR GLARE ANALYSIS RESULTS

FORGESOLAR GLARE ANALYSIS

Project: **Pike County Solar Project**
Proposed 100 MW solar facility in Pike County, Kentucky

Site configuration: **2024-04-12_v2_BT-0_178-deg**

Client: Pike County Solar Project, LLC

Created 24 Apr, 2024
Updated 24 Apr, 2024
Time-step 1 minute
Timezone offset UTC-5
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 10 MW to 100 MW
Site ID 117543.19416

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
	°	°	min	hr	min	hr	kWh
PV array 1	SA tracking	SA tracking	507	8.4	0	0.0	-
PV array 10	SA tracking	SA tracking	3,542	59.0	0	0.0	-
PV array 11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 12	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 13	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 14	SA tracking	SA tracking	89	1.5	0	0.0	-
PV array 15	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 16	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 17	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 2	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 3	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 4	SA tracking	SA tracking	24,622	410.4	25,772	429.5	-
PV array 5	SA tracking	SA tracking	5,533	92.2	5,133	85.5	-
PV array 6	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 7	SA tracking	SA tracking	1,126	18.8	1,228	20.5	-
PV array 8	SA tracking	SA tracking	2,916	48.6	311	5.2	-
PV array 9	SA tracking	SA tracking	0	0.0	0	0.0	-

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
Ford Mountain Road	25,396	423.3	27,065	451.1
FP 1	0	0.0	0	0.0
FP 2	1,610	26.8	0	0.0
OP 1	8,708	145.1	5,379	89.7
OP 2	1,113	18.6	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 3	681	11.3	0	0.0
OP 4	827	13.8	0	0.0

Component Data

PV Arrays

Name: PV array 1
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.595662	-82.441094	1336.84	5.00	1341.84
2	37.594004	-82.442510	1365.52	5.00	1370.52
3	37.591989	-82.443143	1468.21	5.00	1473.21
4	37.591012	-82.443363	1515.49	5.00	1520.49
5	37.589915	-82.443368	1526.12	5.00	1531.12
6	37.588181	-82.441740	1536.08	5.00	1541.08
7	37.587943	-82.441399	1523.72	5.00	1528.72
8	37.588421	-82.439468	1486.27	5.00	1491.27
9	37.589182	-82.438562	1521.42	5.00	1526.42
10	37.589791	-82.438229	1531.20	5.00	1536.20
11	37.589783	-82.437124	1529.88	5.00	1534.88
12	37.590825	-82.437135	1465.27	5.00	1470.27
13	37.591328	-82.438366	1457.76	5.00	1462.76
14	37.592410	-82.438369	1402.48	5.00	1407.48
15	37.595105	-82.439592	1245.77	5.00	1250.77

Name: PV array 10
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.601289	-82.410048	1584.95	5.00	1589.95
2	37.599117	-82.410035	1522.45	5.00	1527.45
3	37.599904	-82.412856	1478.05	5.00	1483.05
4	37.597731	-82.412867	1470.90	5.00	1475.90
5	37.595879	-82.406097	1555.08	5.00	1560.08
6	37.599096	-82.406084	1580.07	5.00	1585.07
7	37.600435	-82.406899	1486.20	5.00	1491.20
8	37.600834	-82.408321	1553.68	5.00	1558.68
9	37.601051	-82.409147	1568.04	5.00	1573.04

Name: PV array 11
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.600930	-82.416515	1124.69	5.00	1129.69
2	37.599923	-82.412923	1472.58	5.00	1477.58
3	37.597730	-82.412913	1469.23	5.00	1474.23
4	37.596762	-82.416373	1484.13	5.00	1489.13
5	37.598768	-82.416573	1301.81	5.00	1306.81

Name: PV array 12
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.596725	-82.416373	1488.46	5.00	1493.46
2	37.596431	-82.416367	1497.75	5.00	1502.75
3	37.595346	-82.416310	1494.16	5.00	1499.16
4	37.594088	-82.411743	1475.65	5.00	1480.65
5	37.594832	-82.410456	1559.28	5.00	1564.28
6	37.595926	-82.410442	1558.35	5.00	1563.35
7	37.597610	-82.413228	1461.38	5.00	1466.38

Name: PV array 13
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.599219	-82.400623	1505.84	5.00	1510.84
2	37.598080	-82.401128	1553.95	5.00	1558.95
3	37.596976	-82.401244	1563.03	5.00	1568.03
4	37.595893	-82.401236	1577.80	5.00	1582.80
5	37.595926	-82.401034	1578.51	5.00	1583.51
6	37.596372	-82.400275	1577.19	5.00	1582.19
7	37.597211	-82.399126	1574.47	5.00	1579.47
8	37.597904	-82.399130	1556.90	5.00	1561.90
9	37.597900	-82.399396	1554.29	5.00	1559.29
10	37.598257	-82.399405	1548.58	5.00	1553.58
11	37.598252	-82.399714	1544.91	5.00	1549.91
12	37.599323	-82.399722	1543.37	5.00	1548.37

Name: PV array 14
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.596001	-82.400075	1577.28	5.00	1582.28
2	37.594930	-82.400069	1601.60	5.00	1606.60
3	37.595055	-82.398836	1621.40	5.00	1626.40
4	37.596141	-82.398846	1576.41	5.00	1581.41

Name: PV array 15
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.594885	-82.400035	1599.33	5.00	1604.33
2	37.593701	-82.400348	1472.27	5.00	1477.27
3	37.591374	-82.400729	1360.42	5.00	1365.42
4	37.590318	-82.400727	1360.86	5.00	1365.86
5	37.590607	-82.398090	1377.61	5.00	1382.61
6	37.591667	-82.398093	1448.55	5.00	1453.55
7	37.592770	-82.398372	1541.26	5.00	1546.26
8	37.593883	-82.398693	1571.09	5.00	1576.09
9	37.595002	-82.398881	1621.16	5.00	1626.16

Name: PV array 16
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.595682	-82.403198	1580.59	5.00	1585.59
2	37.594534	-82.403198	1533.80	5.00	1538.80
3	37.594423	-82.404343	1385.97	5.00	1390.97
4	37.593325	-82.404339	1464.18	5.00	1469.18
5	37.593457	-82.403097	1522.69	5.00	1527.69
6	37.592379	-82.403102	1544.31	5.00	1549.31
7	37.591685	-82.402983	1557.05	5.00	1562.05
8	37.591745	-82.402457	1561.84	5.00	1566.84
9	37.592457	-82.402412	1548.47	5.00	1553.47
10	37.592854	-82.402201	1544.87	5.00	1549.87
11	37.593653	-82.401476	1558.70	5.00	1563.70
12	37.594018	-82.401422	1558.37	5.00	1563.37
13	37.594727	-82.401433	1602.24	5.00	1607.24
14	37.594831	-82.401195	1601.66	5.00	1606.66
15	37.595318	-82.401202	1581.18	5.00	1586.18
16	37.595885	-82.401200	1578.06	5.00	1583.06
17	37.595868	-82.401347	1579.76	5.00	1584.76
18	37.595684	-82.401350	1579.58	5.00	1584.58
19	37.595822	-82.401761	1579.84	5.00	1584.84

Name: PV array 17
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.585346	-82.442376	1528.14	5.00	1533.14
2	37.585241	-82.442778	1502.51	5.00	1507.51
3	37.584555	-82.442775	1459.96	5.00	1464.96
4	37.584066	-82.442561	1459.57	5.00	1464.57
5	37.583890	-82.441938	1503.85	5.00	1508.85
6	37.584961	-82.441976	1521.90	5.00	1526.90

Name: PV array 2
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.587156	-82.442000	1539.32	5.00	1544.32
2	37.586846	-82.442134	1543.00	5.00	1548.00
3	37.586193	-82.442384	1555.33	5.00	1560.33
4	37.585362	-82.442376	1528.12	5.00	1533.12
5	37.584967	-82.441973	1521.24	5.00	1526.24
6	37.584844	-82.441619	1507.88	5.00	1512.88
7	37.585203	-82.441638	1498.49	5.00	1503.49
8	37.585025	-82.441138	1462.64	5.00	1467.64
9	37.583931	-82.441121	1503.61	5.00	1508.61
10	37.583420	-82.440946	1505.80	5.00	1510.80
11	37.582884	-82.439356	1377.52	5.00	1382.52
12	37.586145	-82.439388	1290.24	5.00	1295.24
13	37.588170	-82.440439	1514.13	5.00	1519.13
14	37.587924	-82.441399	1523.29	5.00	1528.29

Name: PV array 3
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.586973	-82.444350	1373.81	5.00	1378.81
2	37.585875	-82.444336	1391.98	5.00	1396.98
3	37.585618	-82.443762	1432.99	5.00	1437.99
4	37.586763	-82.443792	1416.63	5.00	1421.63

Name: PV array 4
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.585114	-82.448032	1415.56	5.00	1420.56
2	37.583541	-82.443942	1415.05	5.00	1420.05
3	37.584644	-82.443942	1397.36	5.00	1402.36
4	37.584924	-82.444672	1400.56	5.00	1405.56
5	37.585194	-82.445374	1416.87	5.00	1421.87
6	37.586247	-82.445364	1371.75	5.00	1376.75
7	37.586723	-82.446514	1332.75	5.00	1337.75
8	37.586183	-82.447959	1395.92	5.00	1400.92
9	37.586007	-82.448024	1409.70	5.00	1414.70

Name: PV array 5
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.582497	-82.447034	1479.41	5.00	1484.41
2	37.581273	-82.443920	1494.17	5.00	1499.17
3	37.580207	-82.443920	1492.96	5.00	1497.96
4	37.579992	-82.443361	1494.54	5.00	1499.54
5	37.581052	-82.443351	1495.42	5.00	1500.42
6	37.580941	-82.442978	1489.43	5.00	1494.43
7	37.582003	-82.442968	1500.76	5.00	1505.76
8	37.582177	-82.443375	1508.17	5.00	1513.17
9	37.583224	-82.443385	1415.37	5.00	1420.37
10	37.584761	-82.447252	1414.25	5.00	1419.25
11	37.583678	-82.447252	1490.48	5.00	1495.48
12	37.583560	-82.447023	1487.87	5.00	1492.87

Name: PV array 6
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.580544	-82.441994	1436.12	5.00	1441.12
2	37.579467	-82.442007	1434.70	5.00	1439.70
3	37.579388	-82.441790	1416.19	5.00	1421.19
4	37.578295	-82.441774	1403.53	5.00	1408.53
5	37.578249	-82.441591	1385.62	5.00	1390.62
6	37.579290	-82.441602	1400.64	5.00	1405.64
7	37.579290	-82.441484	1390.61	5.00	1395.61
8	37.580421	-82.441487	1413.74	5.00	1418.74

Name: PV array 7
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.582334	-82.440985	1488.37	5.00	1493.37
2	37.581975	-82.441125	1472.53	5.00	1477.53
3	37.581401	-82.441401	1448.56	5.00	1453.56
4	37.580251	-82.441380	1405.09	5.00	1410.09
5	37.580247	-82.441164	1395.06	5.00	1400.06
6	37.581093	-82.441179	1428.84	5.00	1433.84
7	37.581084	-82.440621	1422.94	5.00	1427.94
8	37.582232	-82.440650	1485.44	5.00	1490.44

Name: PV array 8
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.589796	-82.429939	1494.05	5.00	1499.05
2	37.588670	-82.429912	1461.58	5.00	1466.58
3	37.585455	-82.428728	1321.36	5.00	1326.36
4	37.585426	-82.426216	1482.52	5.00	1487.52
5	37.589826	-82.426351	1387.64	5.00	1392.64

Name: PV array 9
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 178.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.3
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.585394	-82.428368	1344.39	5.00	1349.39
2	37.583203	-82.428378	1424.47	5.00	1429.47
3	37.583199	-82.430014	1276.83	5.00	1281.83
4	37.582076	-82.429993	1310.92	5.00	1315.92
5	37.581047	-82.429395	1403.51	5.00	1408.51
6	37.581064	-82.427587	1530.62	5.00	1535.62
7	37.581460	-82.427316	1529.48	5.00	1534.48
8	37.582125	-82.426868	1527.98	5.00	1532.98
9	37.583235	-82.426318	1452.13	5.00	1457.13
10	37.583650	-82.426241	1447.76	5.00	1452.76
11	37.585375	-82.426222	1482.15	5.00	1487.15

Route Receptors

Name: Ford Mountain Road
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.588605	-82.445636	1318.60	8.00	1326.60
2	37.588401	-82.445593	1320.20	8.00	1328.20
3	37.588002	-82.444488	1360.00	8.00	1368.00
4	37.587747	-82.444306	1363.50	8.00	1371.50
5	37.587262	-82.444295	1368.90	8.00	1376.90
6	37.587071	-82.444402	1372.00	8.00	1380.00
7	37.586778	-82.444730	1368.70	8.00	1376.70
8	37.586327	-82.445116	1370.50	8.00	1378.50
9	37.586076	-82.445164	1373.30	8.00	1381.30
10	37.585791	-82.445030	1377.90	8.00	1385.90
11	37.585511	-82.444789	1382.90	8.00	1390.90
12	37.584945	-82.444043	1395.10	8.00	1403.10
13	37.584371	-82.443512	1400.80	8.00	1408.80
14	37.583602	-82.443045	1410.60	8.00	1418.60
15	37.582760	-82.442434	1429.50	8.00	1437.50
16	37.582505	-82.442316	1438.00	8.00	1446.00
17	37.582216	-82.442257	1452.30	8.00	1460.30
18	37.581965	-82.442300	1464.00	8.00	1472.00
19	37.580894	-82.442847	1488.60	8.00	1496.60
20	37.580282	-82.443110	1495.70	8.00	1503.70
21	37.579308	-82.443378	1492.20	8.00	1500.20
22	37.578947	-82.443549	1489.40	8.00	1497.40
23	37.578305	-82.444102	1472.30	8.00	1480.30
24	37.577901	-82.444478	1460.60	8.00	1468.60
25	37.577429	-82.444858	1400.70	8.00	1408.70
26	37.577112	-82.445591	1322.30	8.00	1330.30

Flight Path Receptors

Name: FP 1
Description: None
Threshold height: 47 ft
Direction: 267.0°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	37.561061	-82.562062	1463.10	47.00	1510.10
Two-mile	37.562574	-82.525596	1109.00	954.60	2063.60

Name: FP 2
Description: None
Threshold height: 35 ft
Direction: 87.0°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	37.560381	-82.578068	1447.00	35.00	1482.00
Two-mile	37.558868	-82.614534	1035.00	1000.40	2035.40

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	37.586661	-82.444832	1369.50	10.00
OP 2	2	37.579574	-82.443313	1493.40	10.00
OP 3	3	37.603336	-82.427861	972.30	16.00
OP 4	4	37.608716	-82.409161	1071.90	16.00

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
	°	°	min	hr	min	hr	kWh
PV array 1	SA tracking	SA tracking	507	8.4	0	0.0	-
PV array 10	SA tracking	SA tracking	3,542	59.0	0	0.0	-
PV array 11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 12	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 13	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 14	SA tracking	SA tracking	89	1.5	0	0.0	-
PV array 15	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 16	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 17	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 2	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 3	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 4	SA tracking	SA tracking	24,622	410.4	25,772	429.5	-
PV array 5	SA tracking	SA tracking	5,533	92.2	5,133	85.5	-
PV array 6	SA tracking	SA tracking	0	0.0	0	0.0	-
PV array 7	SA tracking	SA tracking	1,126	18.8	1,228	20.5	-
PV array 8	SA tracking	SA tracking	2,916	48.6	311	5.2	-
PV array 9	SA tracking	SA tracking	0	0.0	0	0.0	-

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
Ford Mountain Road	25,396	423.3	27,065	451.1
FP 1	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 2	1,610	26.8	0	0.0
OP 1	8,708	145.1	5,379	89.7
OP 2	1,113	18.6	0	0.0
OP 3	681	11.3	0	0.0
OP 4	827	13.8	0	0.0

PV: PV array 1 low potential for temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 4	507	8.4	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

PV array 1 and Route: Ford Mountain Road

No glare found

PV array 1 and FP: FP 1

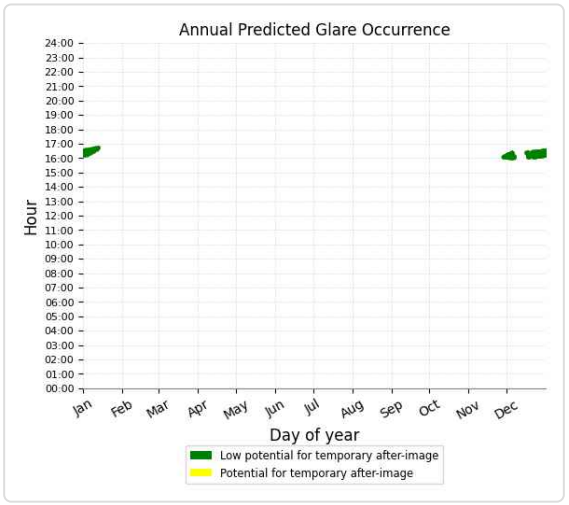
No glare found

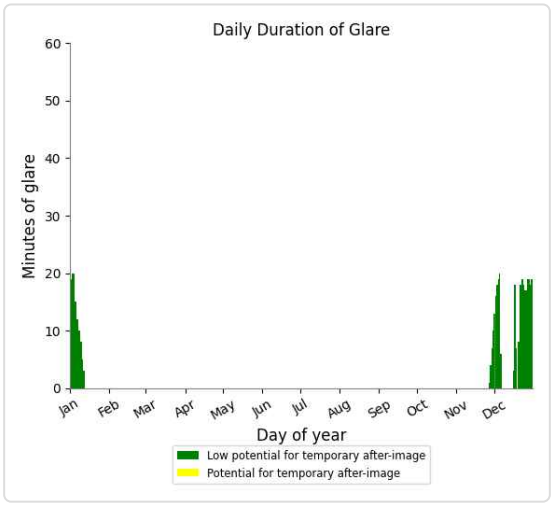
PV array 1 and FP: FP 2

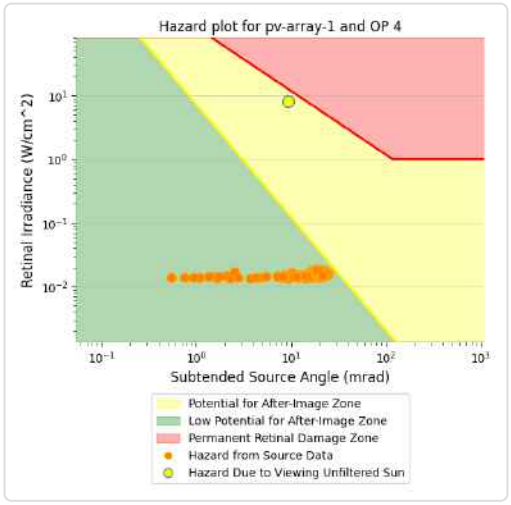
No glare found

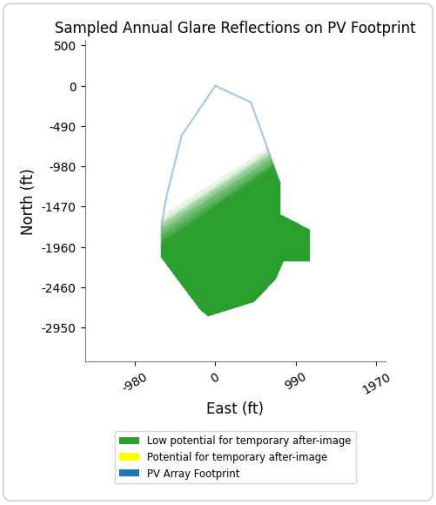
PV array 1 and OP 4

Yellow glare: none
Green glare: 507 min.









PV array 1 and OP 1

No glare found

PV array 1 and OP 2

No glare found

PV array 1 and OP 3

No glare found

PV: PV array 10 low potential for temporary after-image

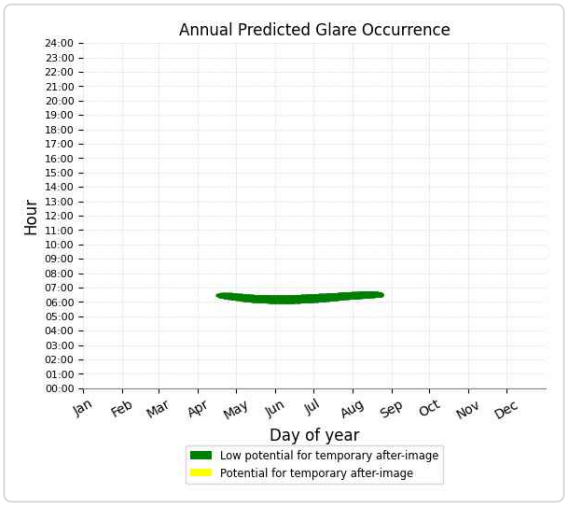
Receptor results ordered by category of glare

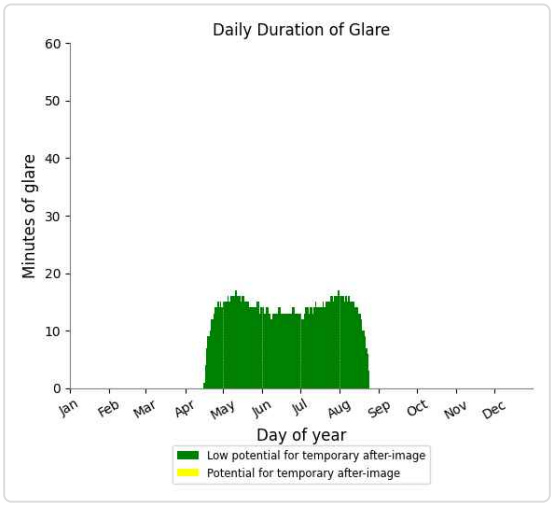
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	1,785	29.8	0	0.0
FP 2	955	15.9	0	0.0
FP 1	0	0.0	0	0.0
OP 1	802	13.4	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

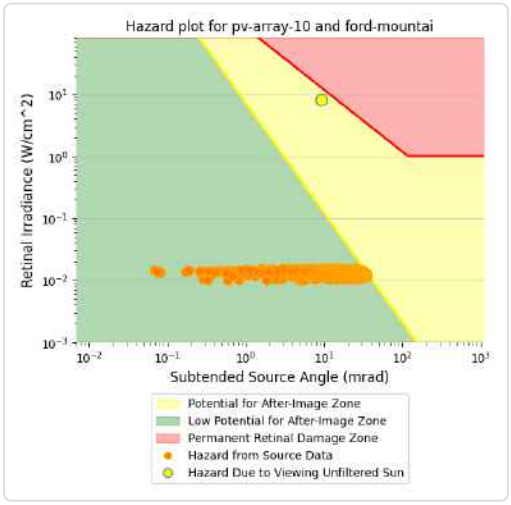
PV array 10 and Route: Ford Mountain Road

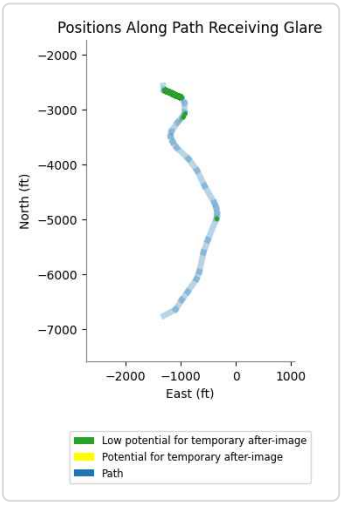
Yellow glare: none

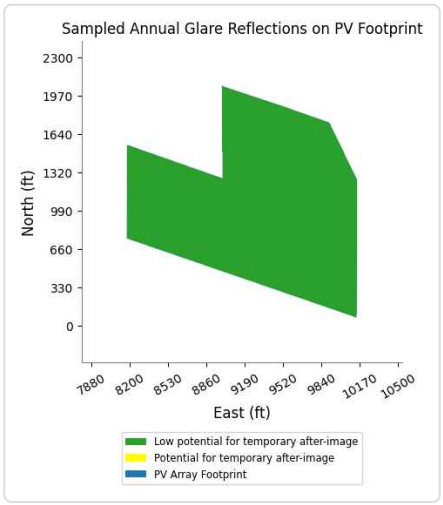
Green glare: 1,785 min.







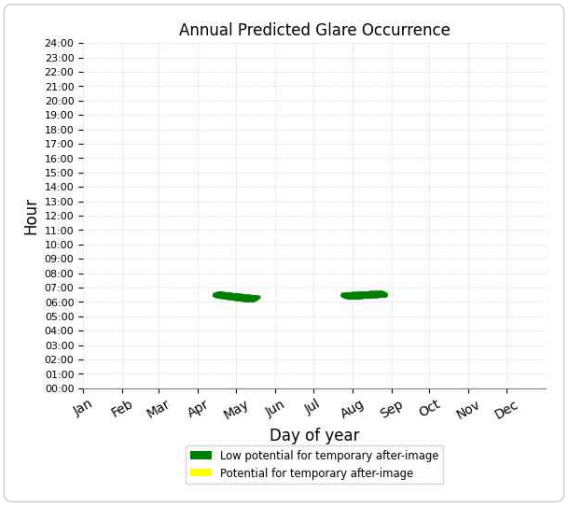


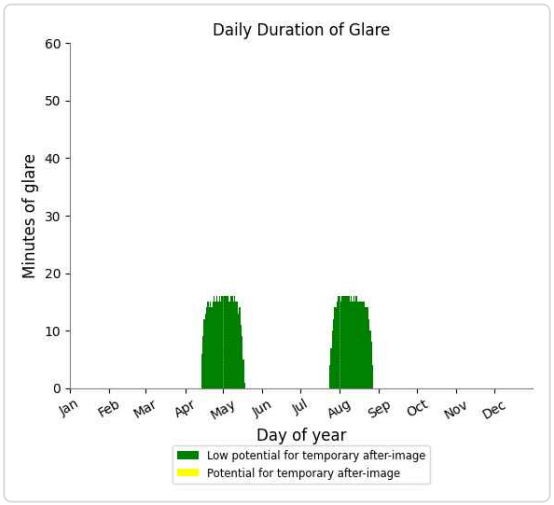


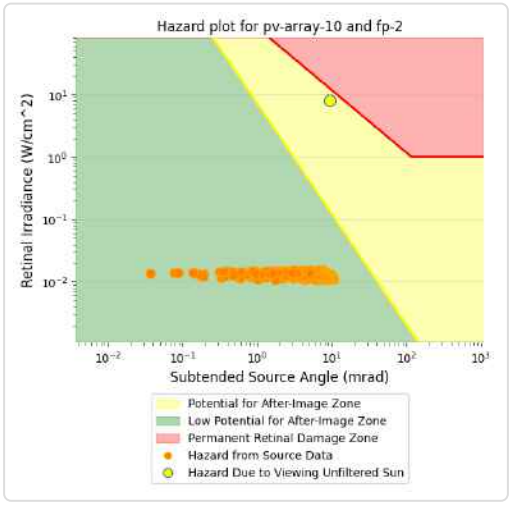
PV array 10 and FP: FP 2

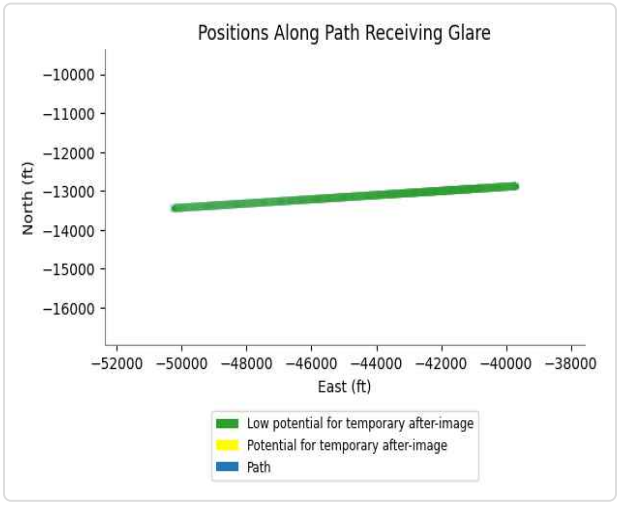
Yellow glare: none

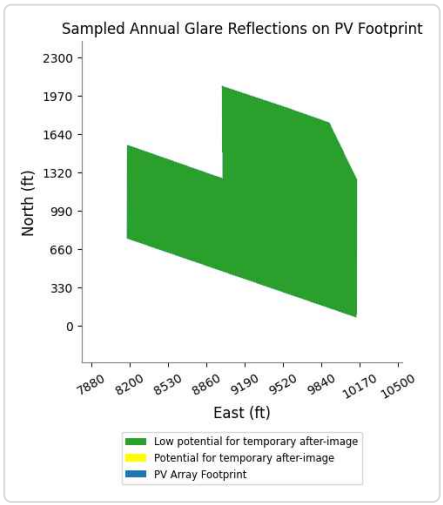
Green glare: 955 min.

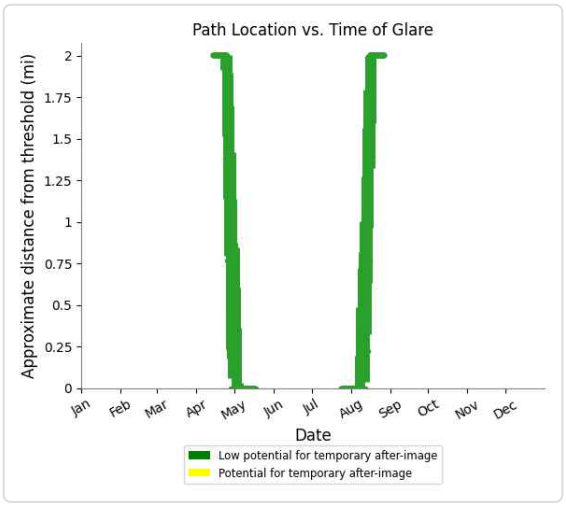












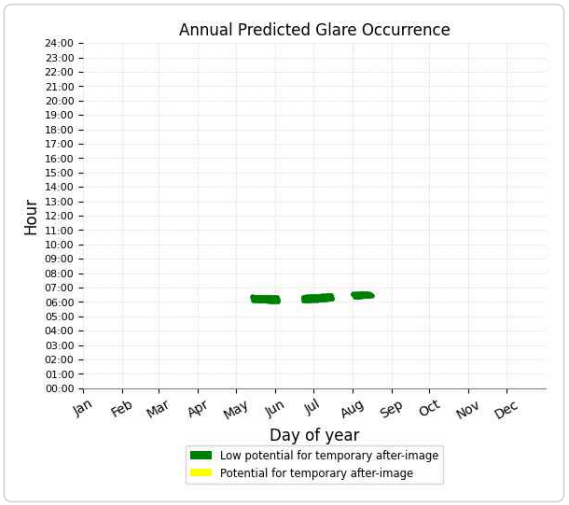
PV array 10 and FP: FP 1

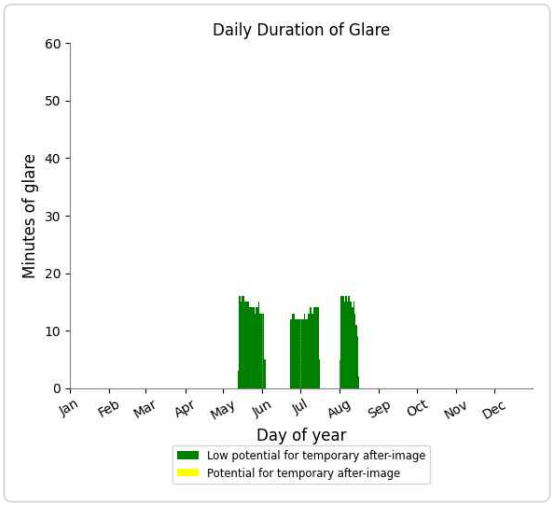
No glare found

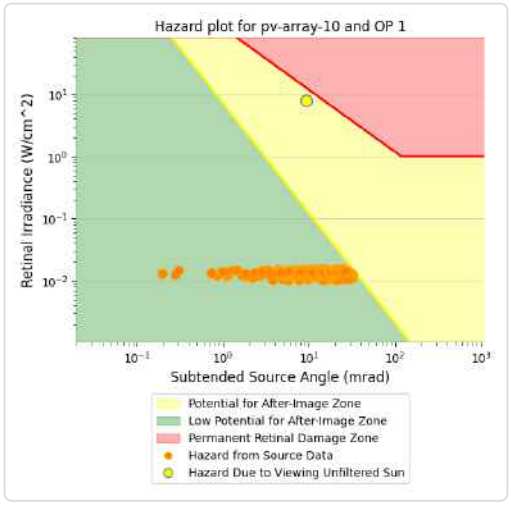
PV array 10 and OP 1

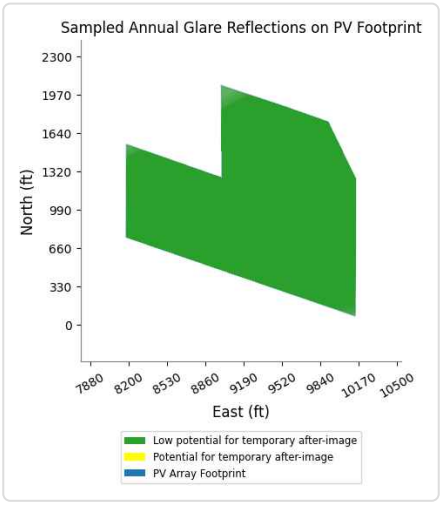
Yellow glare: none

Green glare: 802 min.









PV array 10 and OP 2

No glare found

PV array 10 and OP 3

No glare found

PV array 10 and OP 4

No glare found

PV: PV array 11 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 11 and Route: Ford Mountain Road

No glare found

PV array 11 and FP: FP 1

No glare found

PV array 11 and FP: FP 2

No glare found

PV array 11 and OP 1

No glare found

PV array 11 and OP 2

No glare found

PV array 11 and OP 3

No glare found

PV array 11 and OP 4

No glare found

PV: PV array 12 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 12 and Route: Ford Mountain Road

No glare found

PV array 12 and FP: FP 1

No glare found

PV array 12 and FP: FP 2

No glare found

PV array 12 and OP 1

No glare found

PV array 12 and OP 2

No glare found

PV array 12 and OP 3

No glare found

PV array 12 and OP 4

No glare found

PV: PV array 13 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 13 and Route: Ford Mountain Road

No glare found

PV array 13 and FP: FP 1

No glare found

PV array 13 and FP: FP 2

No glare found

PV array 13 and OP 1

No glare found

PV array 13 and OP 2

No glare found

PV array 13 and OP 3

No glare found

PV array 13 and OP 4

No glare found

PV: PV array 14 low potential for temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 2	89	1.5	0	0.0
FP 1	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

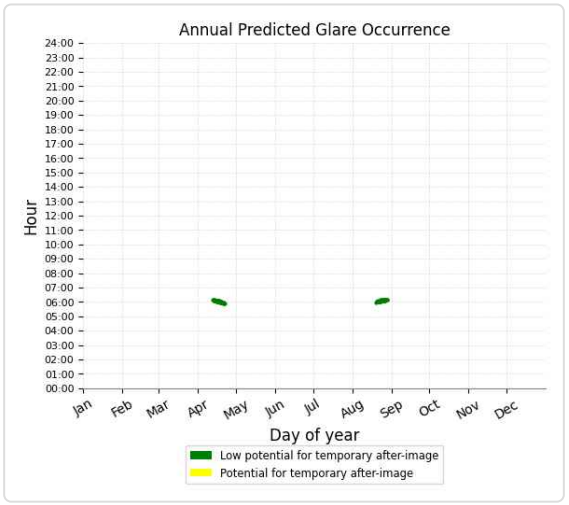
PV array 14 and Route: Ford Mountain Road

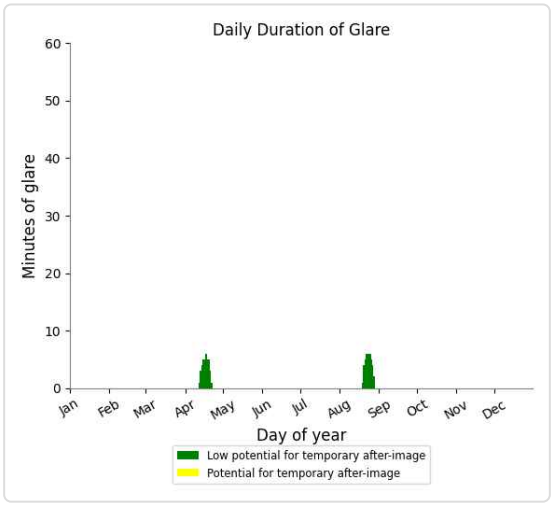
No glare found

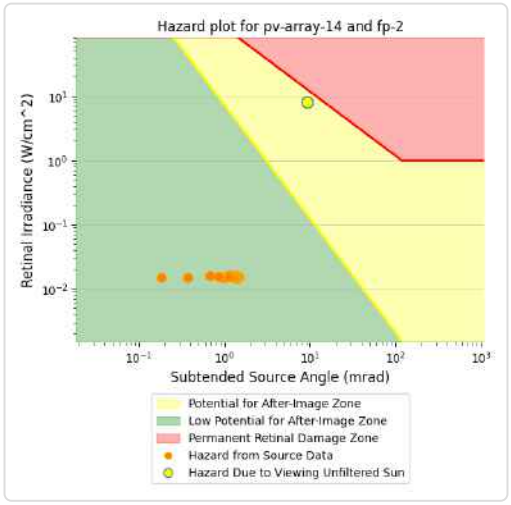
PV array 14 and FP: FP 2

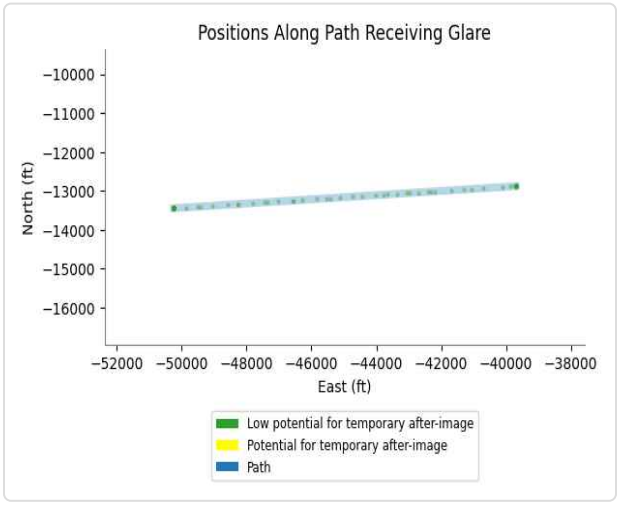
Yellow glare: none

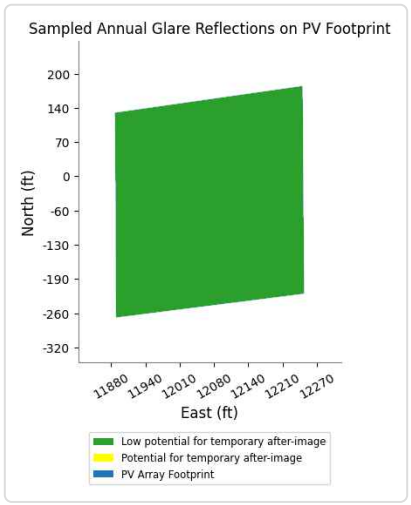
Green glare: 89 min.

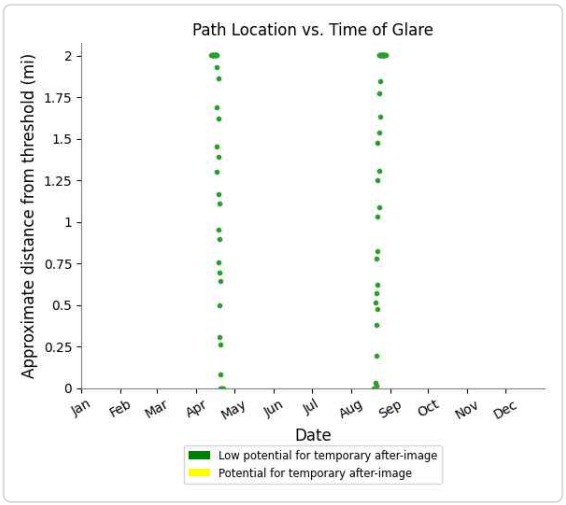












PV array 14 and FP: FP 1

No glare found

PV array 14 and OP 1

No glare found

PV array 14 and OP 2

No glare found

PV array 14 and OP 3

No glare found

PV array 14 and OP 4

No glare found

PV: PV array 15 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 15 and Route: Ford Mountain Road

No glare found

PV array 15 and FP: FP 1

No glare found

PV array 15 and FP: FP 2

No glare found

PV array 15 and OP 1

No glare found

PV array 15 and OP 2

No glare found

PV array 15 and OP 3

No glare found

PV array 15 and OP 4

No glare found

PV: PV array 16 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 16 and Route: Ford Mountain Road

No glare found

PV array 16 and FP: FP 1

No glare found

PV array 16 and FP: FP 2

No glare found

PV array 16 and OP 1

No glare found

PV array 16 and OP 2

No glare found

PV array 16 and OP 3

No glare found

PV array 16 and OP 4

No glare found

PV: PV array 17 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 17 and Route: Ford Mountain Road

No glare found

PV array 17 and FP: FP 1

No glare found

PV array 17 and FP: FP 2

No glare found

PV array 17 and OP 1

No glare found

PV array 17 and OP 2

No glare found

PV array 17 and OP 3

No glare found

PV array 17 and OP 4

No glare found

PV: PV array 2 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 2 and Route: Ford Mountain Road

No glare found

PV array 2 and FP: FP 1

No glare found

PV array 2 and FP: FP 2

No glare found

PV array 2 and OP 1

No glare found

PV array 2 and OP 2

No glare found

PV array 2 and OP 3

No glare found

PV array 2 and OP 4

No glare found

PV: PV array 3 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 3 and Route: Ford Mountain Road

No glare found

PV array 3 and FP: FP 1

No glare found

PV array 3 and FP: FP 2

No glare found

PV array 3 and OP 1

No glare found

PV array 3 and OP 2

No glare found

PV array 3 and OP 3

No glare found

PV array 3 and OP 4

No glare found

PV: PV array 4 potential temporary after-image

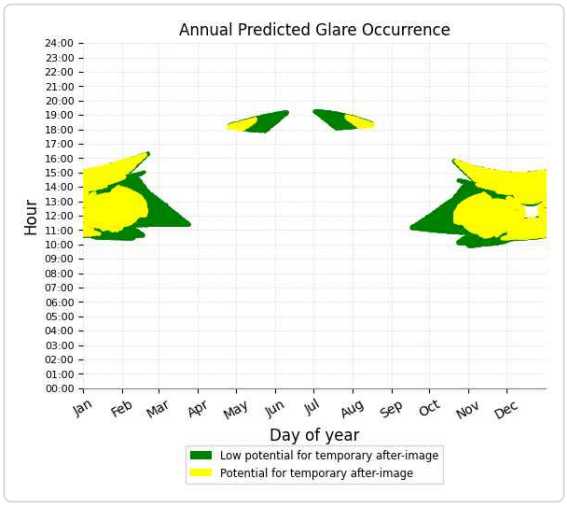
Receptor results ordered by category of glare

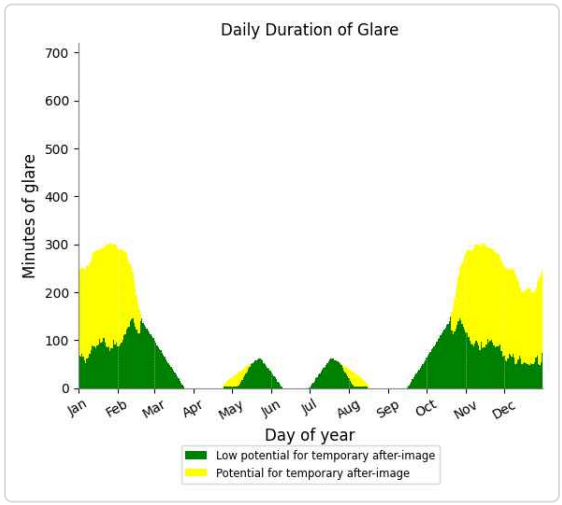
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	18,324	305.4	21,427	357.1
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	5,686	94.8	4,345	72.4
OP 3	558	9.3	0	0.0
OP 4	54	0.9	0	0.0
OP 2	0	0.0	0	0.0

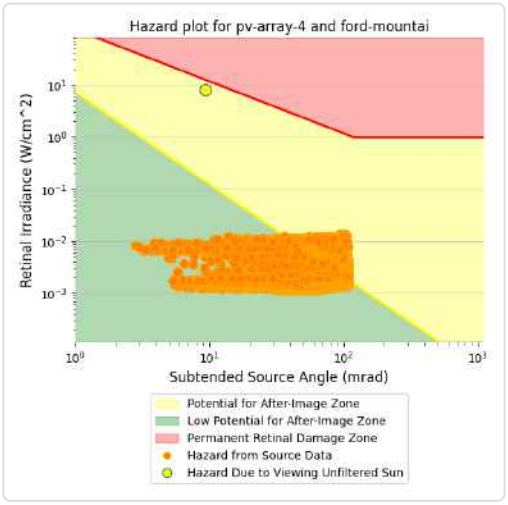
PV array 4 and Route: Ford Mountain Road

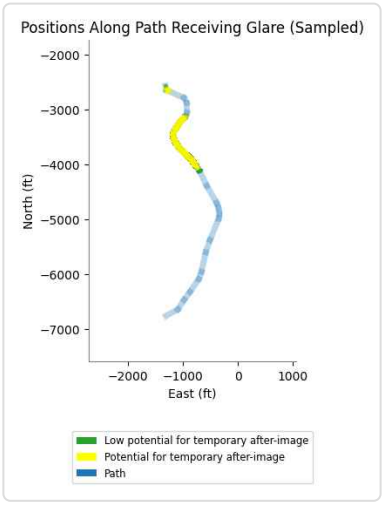
Yellow glare: 21,427 min.

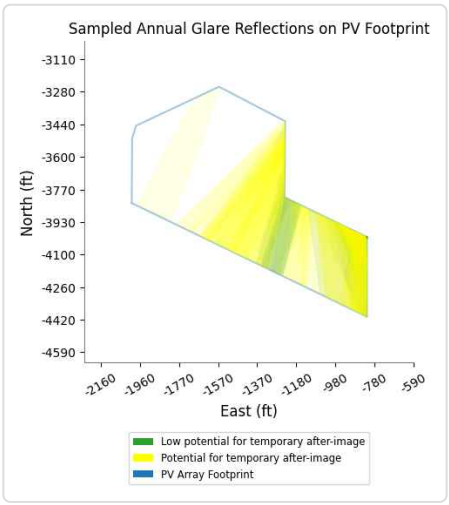
Green glare: 18,324 min.











PV array 4 and FP: FP 1

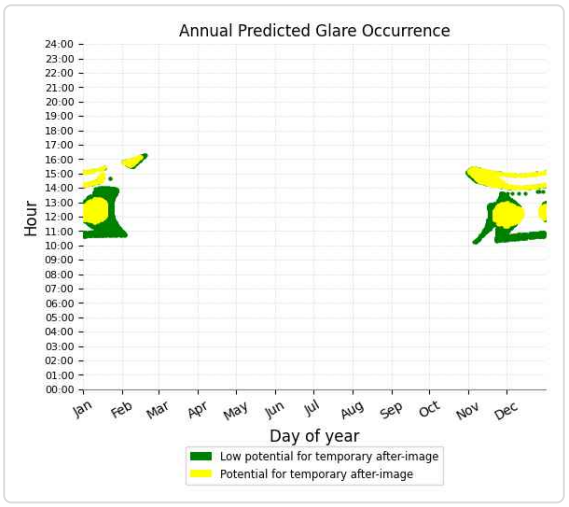
No glare found

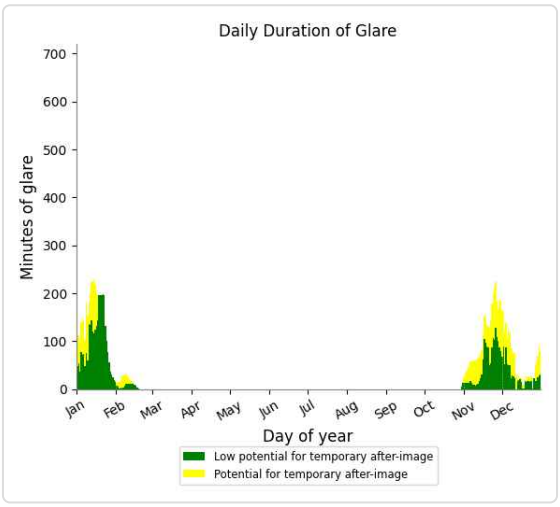
PV array 4 and FP: FP 2

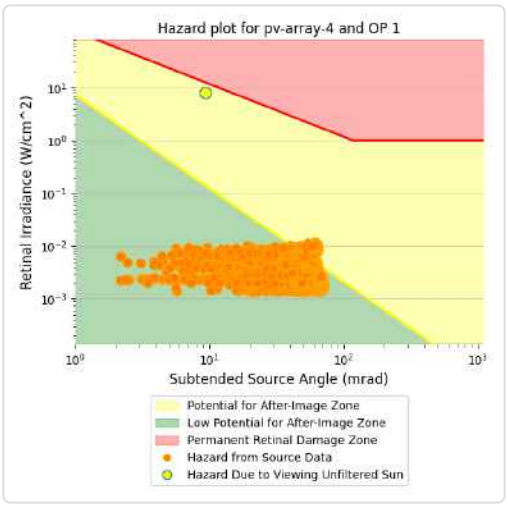
No glare found

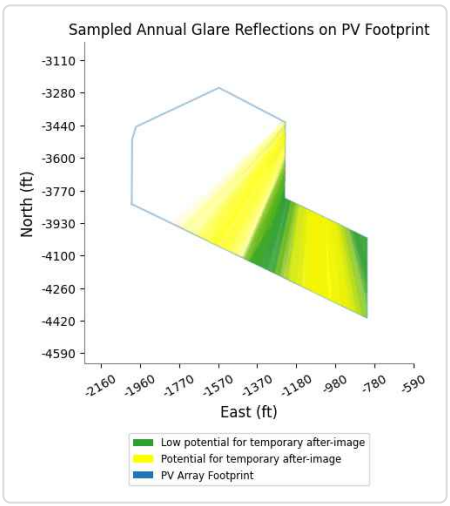
PV array 4 and OP 1

Yellow glare: 4,345 min.
Green glare: 5,686 min.





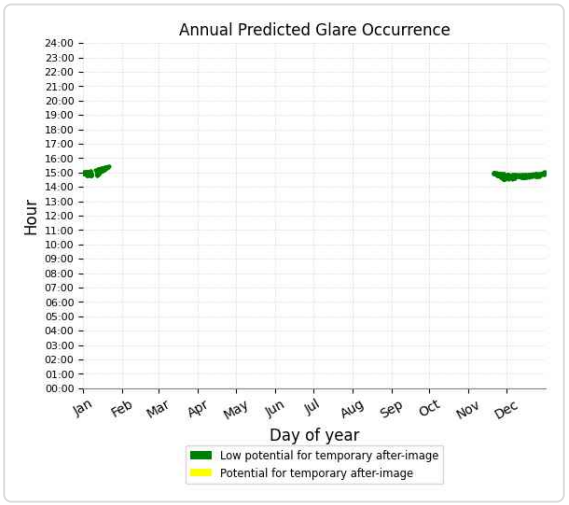


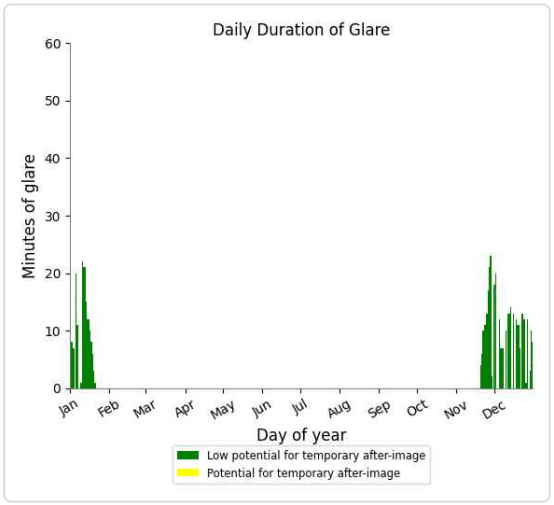


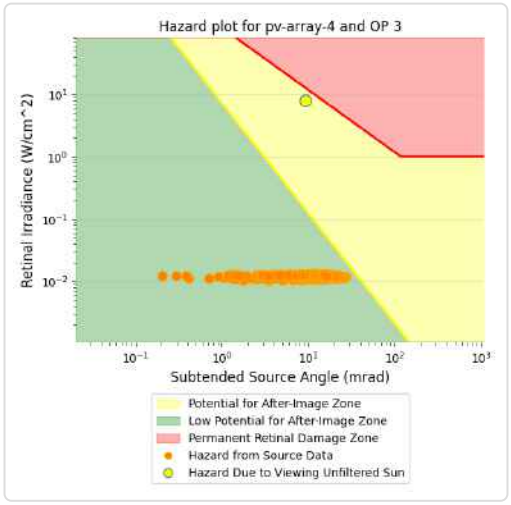
PV array 4 and OP 3

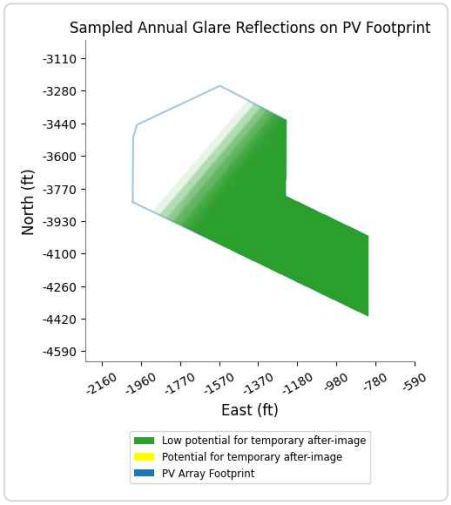
Yellow glare: none

Green glare: 558 min.





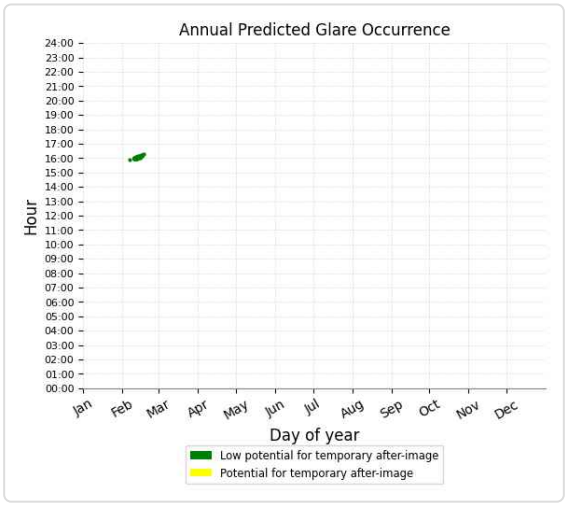


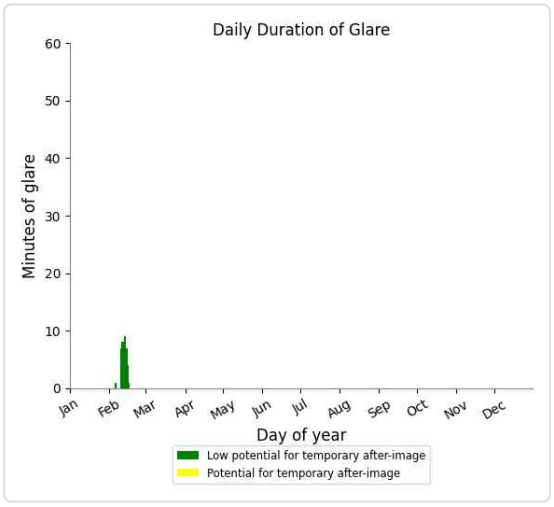


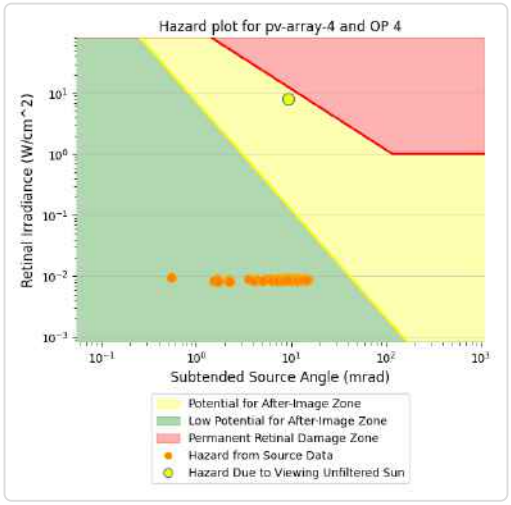
PV array 4 and OP 4

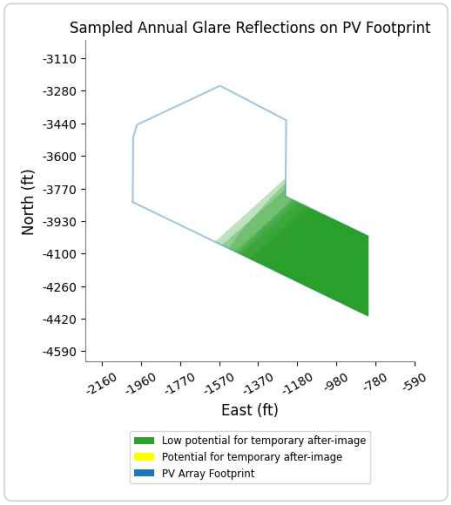
Yellow glare: none

Green glare: 54 min.









PV array 4 and OP 2

No glare found

PV: PV array 5 potential temporary after-image

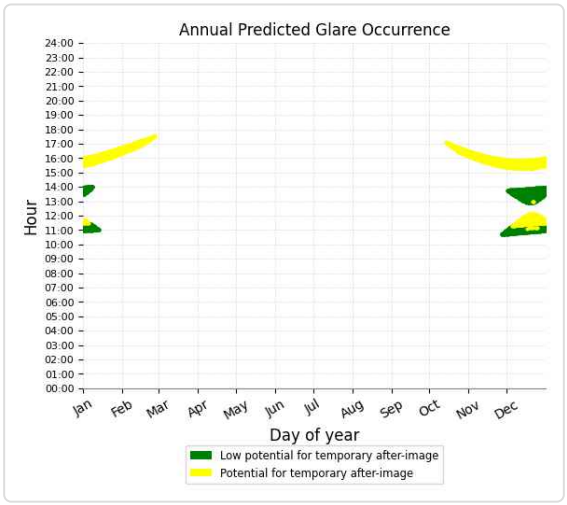
Receptor results ordered by category of glare

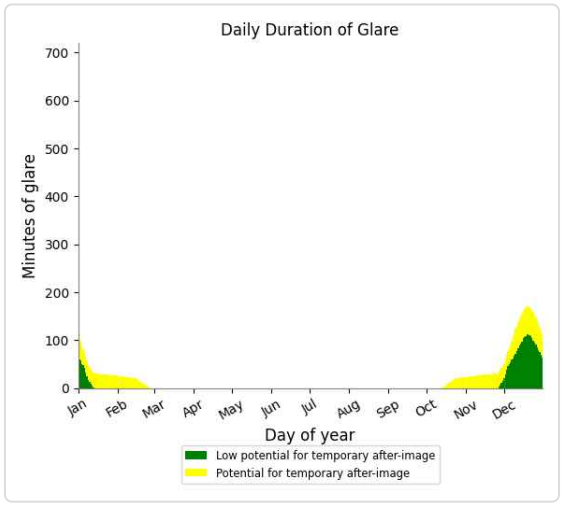
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	2,924	48.7	4,099	68.3
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	2,220	37.0	1,034	17.2
OP 3	123	2.0	0	0.0
OP 4	266	4.4	0	0.0
OP 2	0	0.0	0	0.0

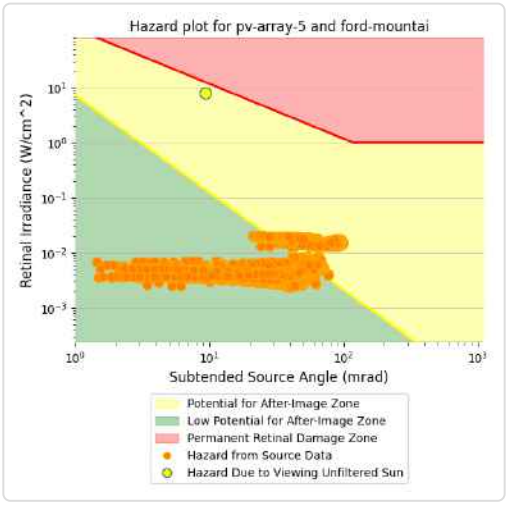
PV array 5 and Route: Ford Mountain Road

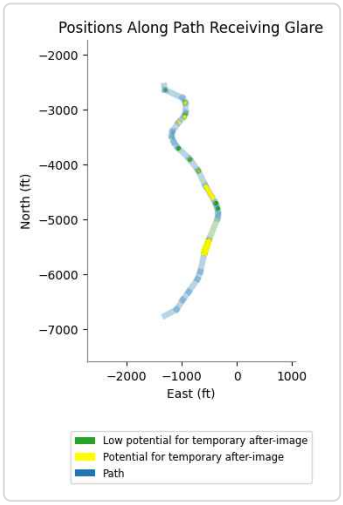
Yellow glare: 4,099 min.

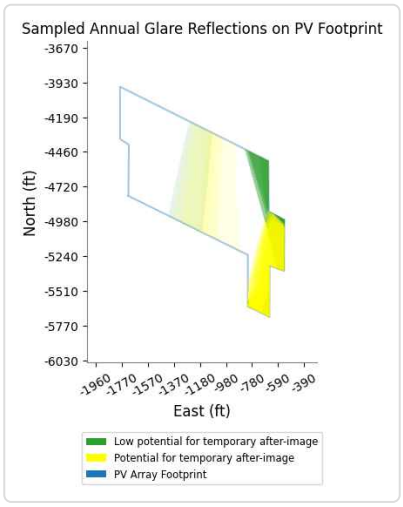
Green glare: 2,924 min.











PV array 5 and FP: FP 1

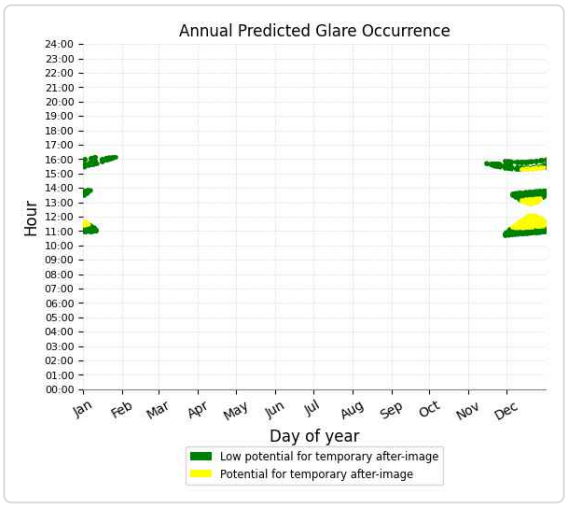
No glare found

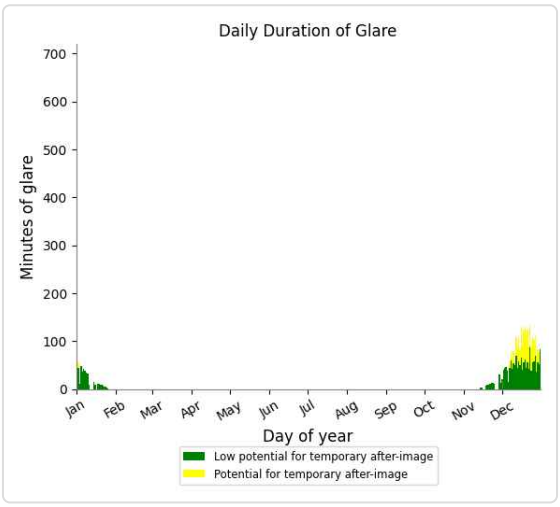
PV array 5 and FP: FP 2

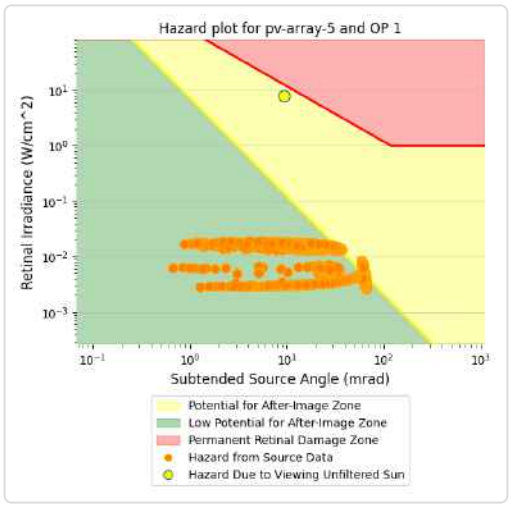
No glare found

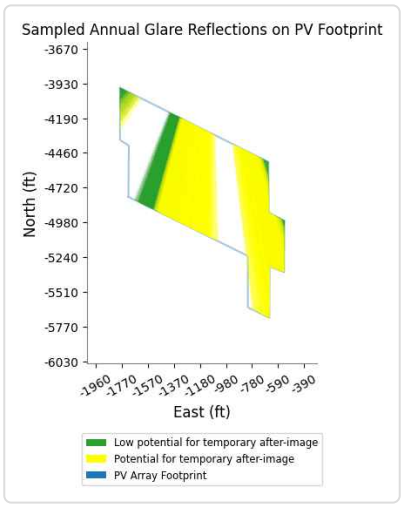
PV array 5 and OP 1

Yellow glare: 1,034 min.
Green glare: 2,220 min.





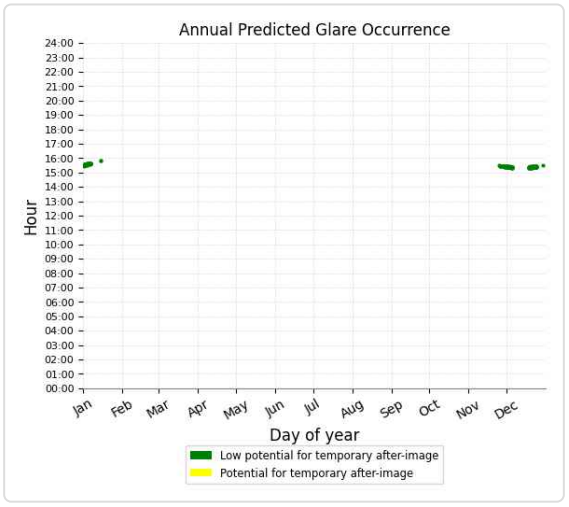


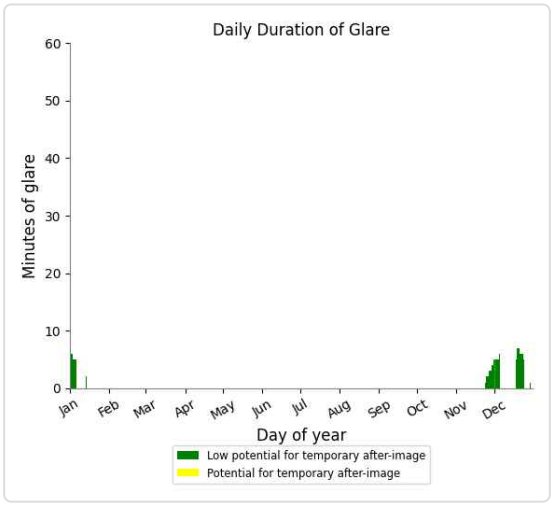


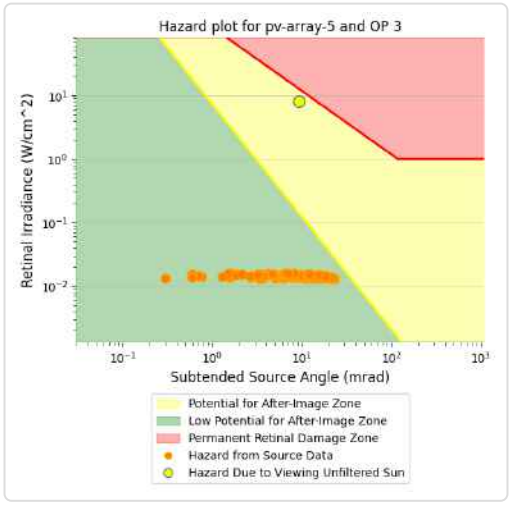
PV array 5 and OP 3

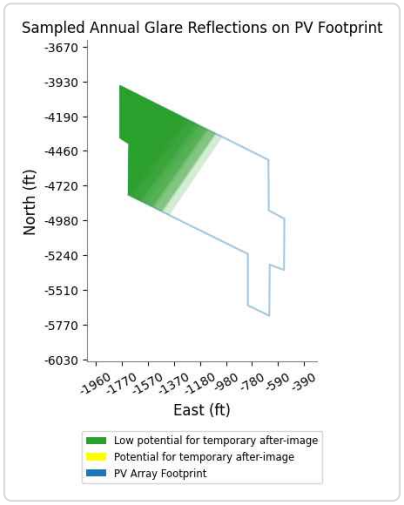
Yellow glare: none

Green glare: 123 min.





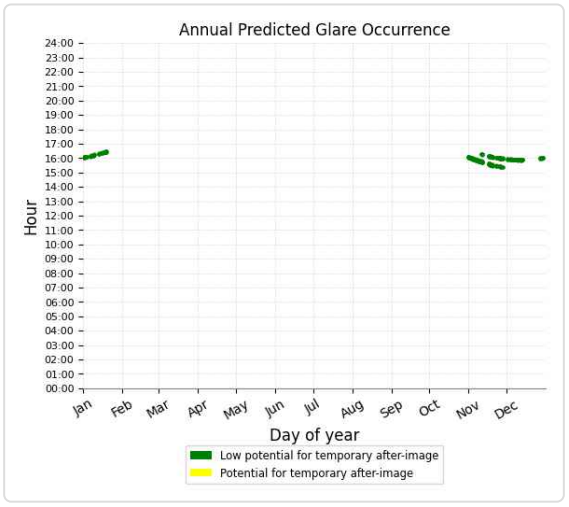


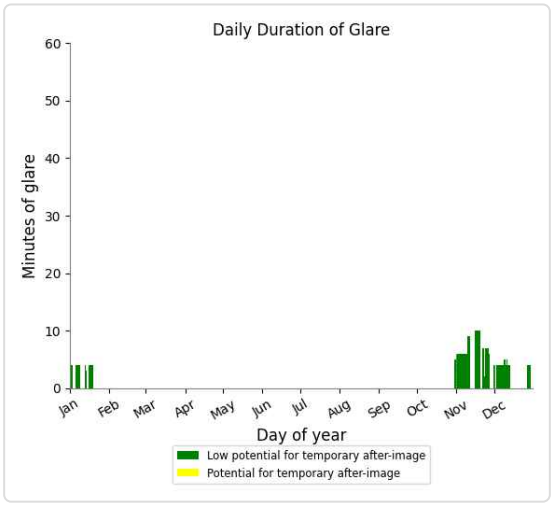


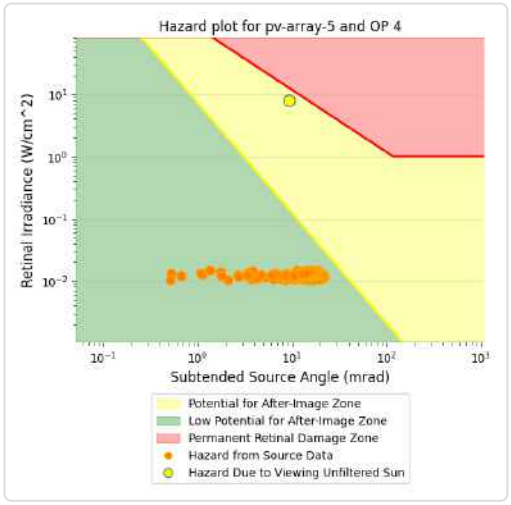
PV array 5 and OP 4

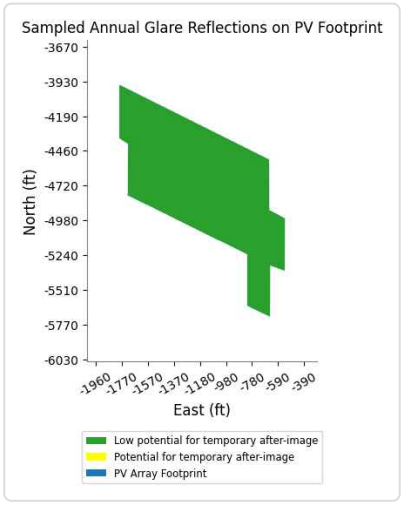
Yellow glare: none

Green glare: 266 min.









PV array 5 and OP 2

No glare found

PV: PV array 6 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 6 and Route: Ford Mountain Road

No glare found

PV array 6 and FP: FP 1

No glare found

PV array 6 and FP: FP 2

No glare found

PV array 6 and OP 1

No glare found

PV array 6 and OP 2

No glare found

PV array 6 and OP 3

No glare found

PV array 6 and OP 4

No glare found

PV: PV array 7 potential temporary after-image

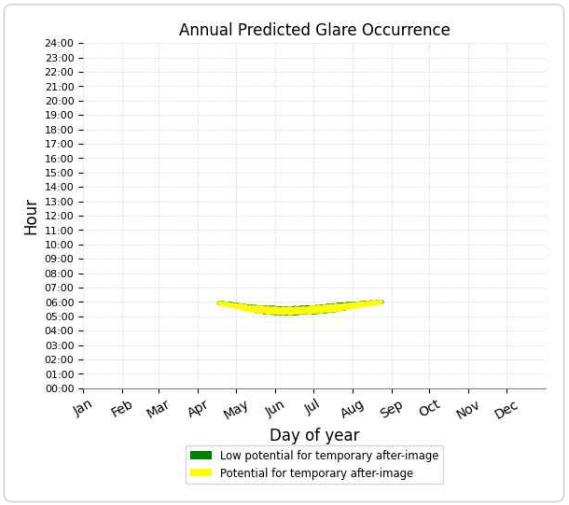
Receptor results ordered by category of glare

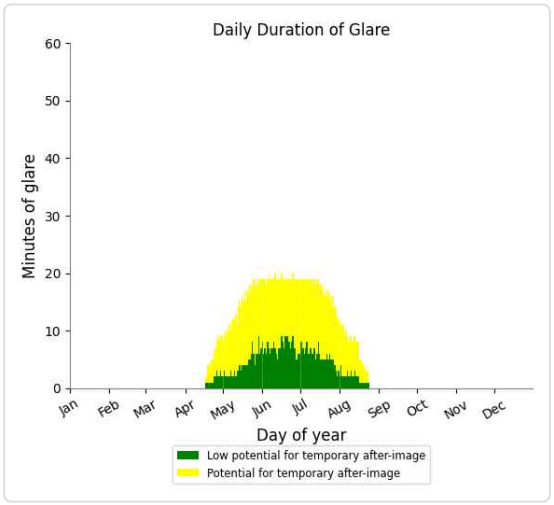
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	586	9.8	1,228	20.5
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 2	540	9.0	0	0.0
OP 1	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

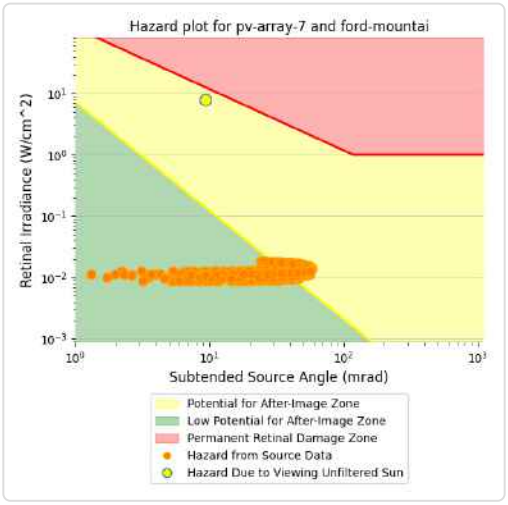
PV array 7 and Route: Ford Mountain Road

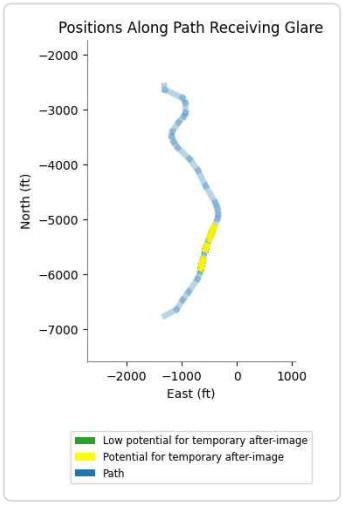
Yellow glare: 1,228 min.

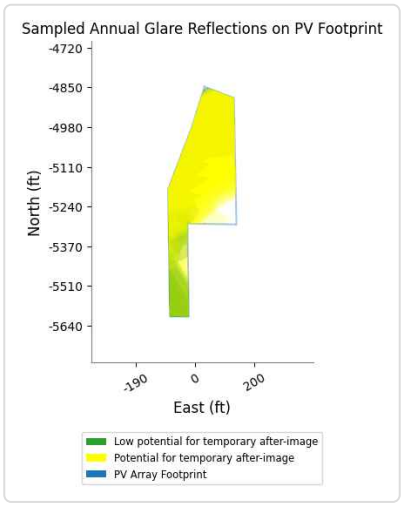
Green glare: 586 min.











PV array 7 and FP: FP 1

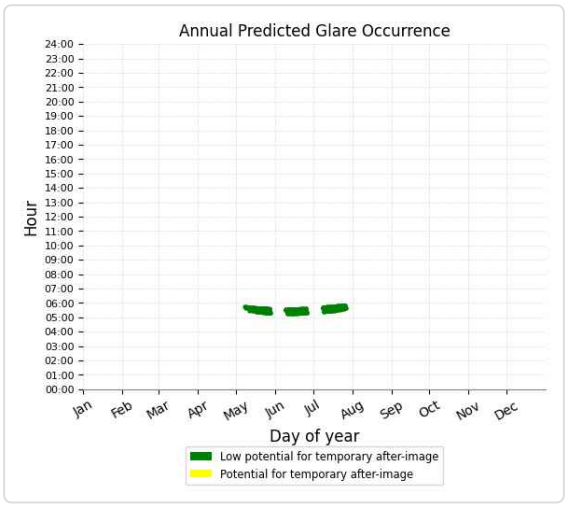
No glare found

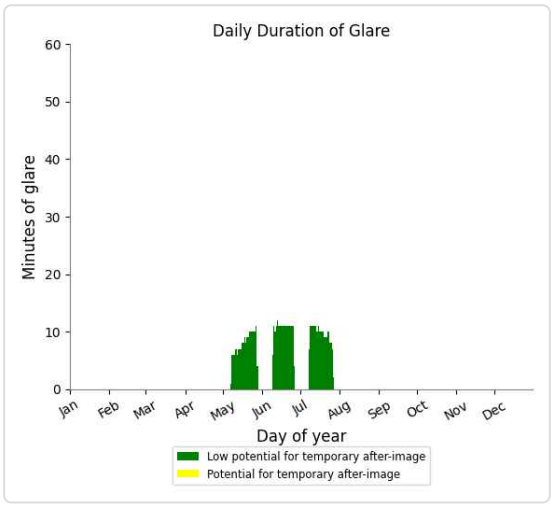
PV array 7 and FP: FP 2

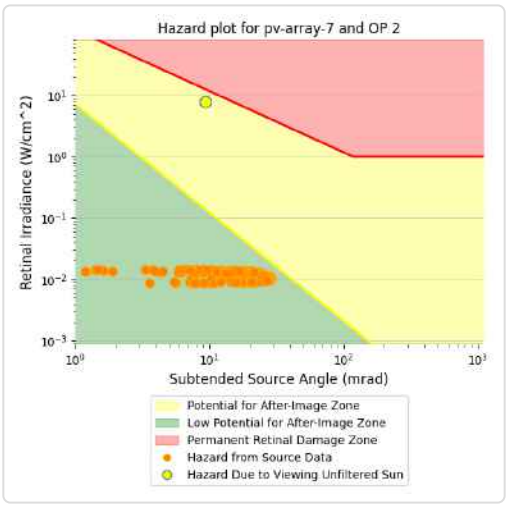
No glare found

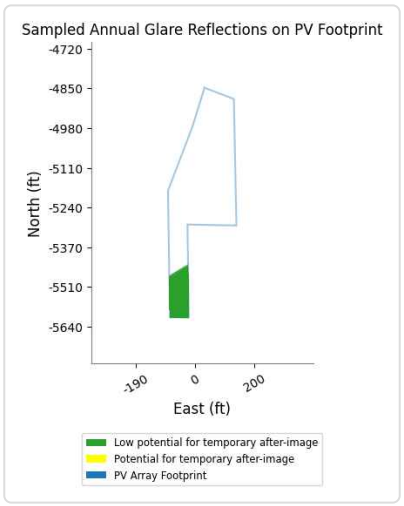
PV array 7 and OP 2

Yellow glare: none
Green glare: 540 min.









PV array 7 and OP 1

No glare found

PV array 7 and OP 3

No glare found

PV array 7 and OP 4

No glare found

PV: PV array 8 potential temporary after-image

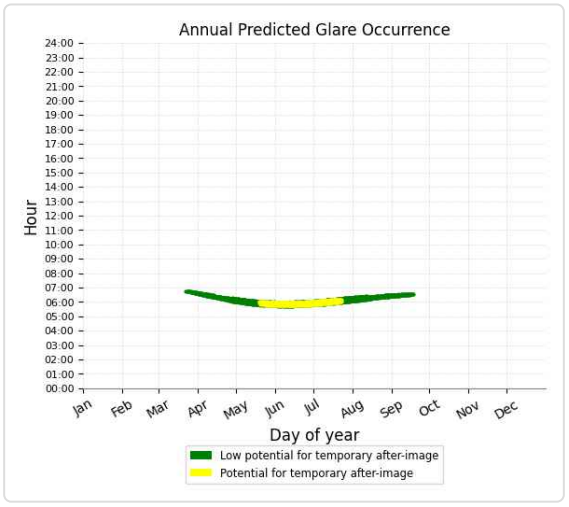
Receptor results ordered by category of glare

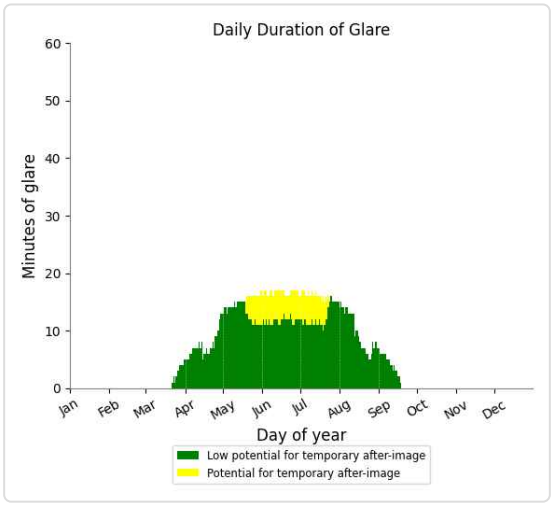
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	1,777	29.6	311	5.2
FP 2	566	9.4	0	0.0
FP 1	0	0.0	0	0.0
OP 2	573	9.6	0	0.0
OP 1	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

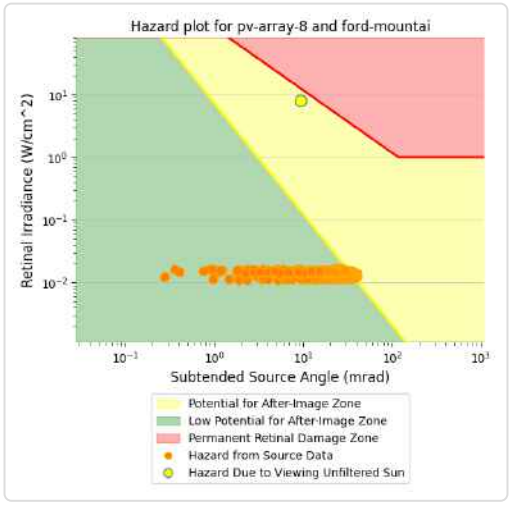
PV array 8 and Route: Ford Mountain Road

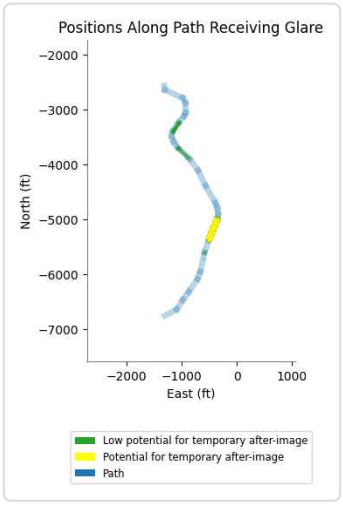
Yellow glare: 311 min.

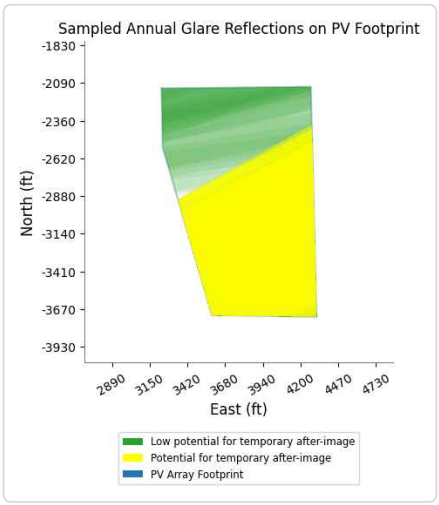
Green glare: 1,777 min.







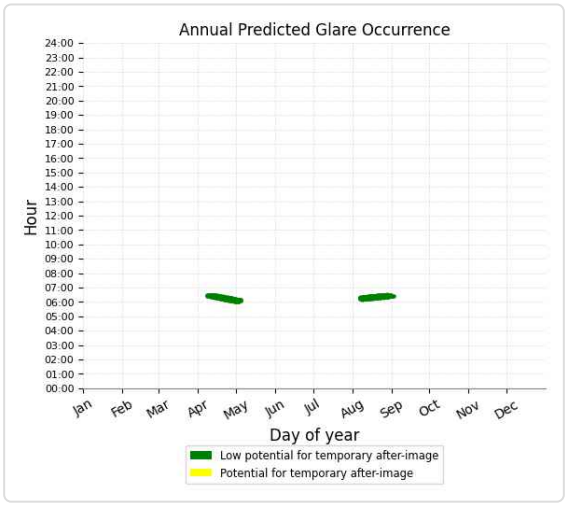


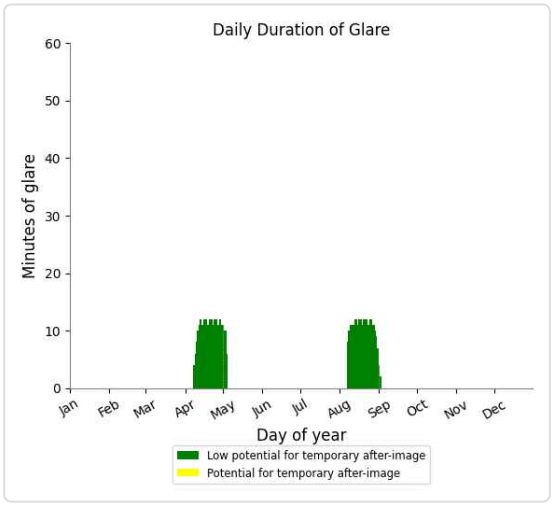


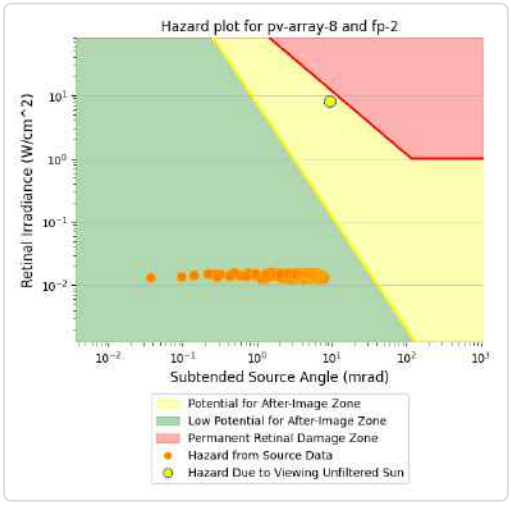
PV array 8 and FP: FP 2

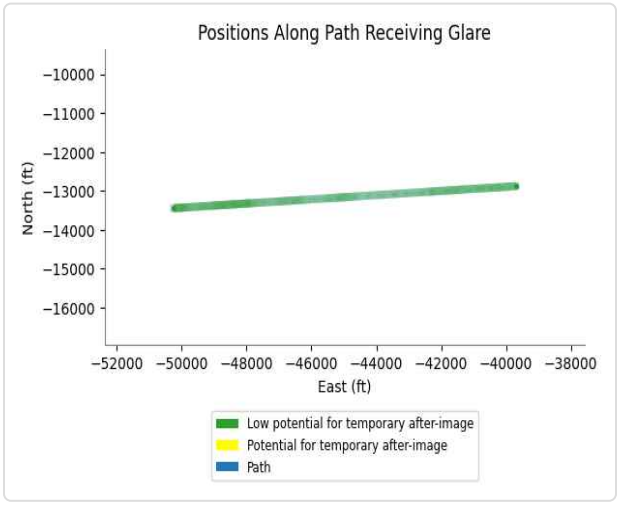
Yellow glare: none

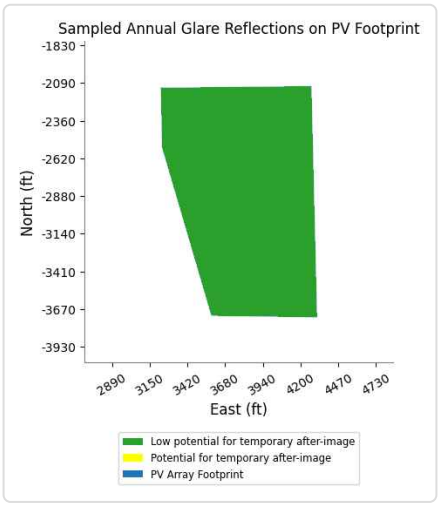
Green glare: 566 min.

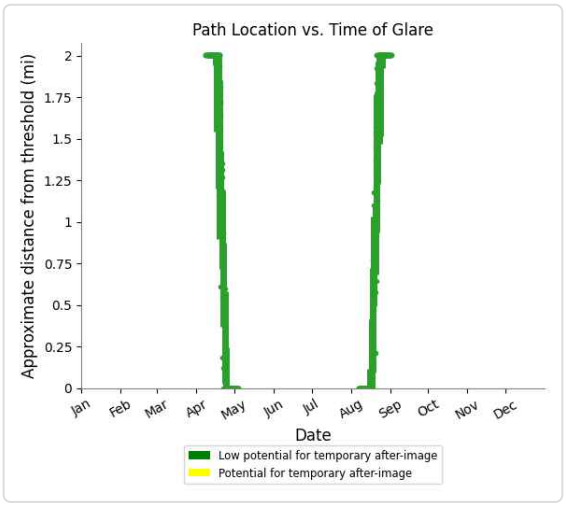












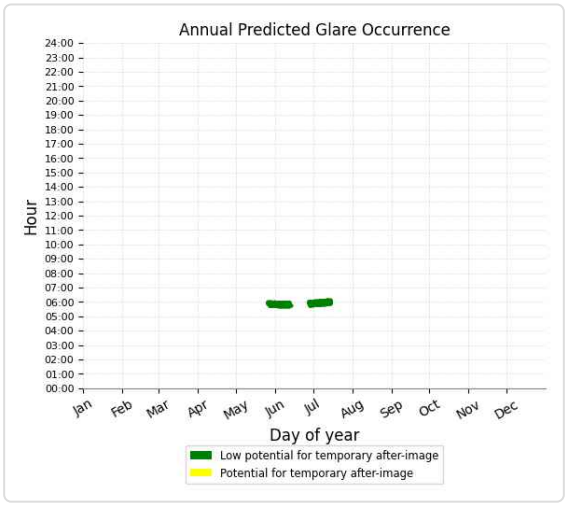
PV array 8 and FP: FP 1

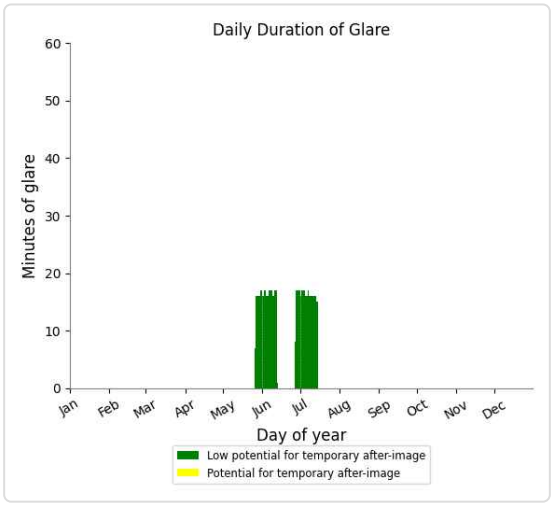
No glare found

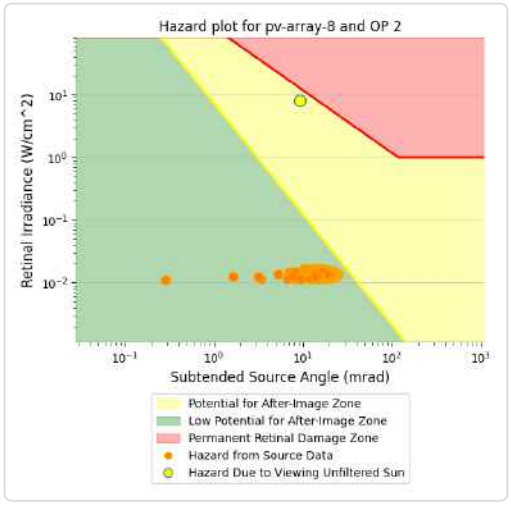
PV array 8 and OP 2

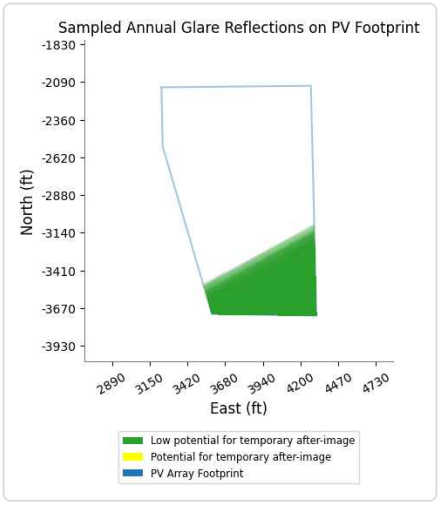
Yellow glare: none

Green glare: 573 min.









PV array 8 and OP 1

No glare found

PV array 8 and OP 3

No glare found

PV array 8 and OP 4

No glare found

PV: PV array 9 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Ford Mountain Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

PV array 9 and Route: Ford Mountain Road

No glare found

PV array 9 and FP: FP 1

No glare found

PV array 9 and FP: FP 2

No glare found

PV array 9 and OP 1

No glare found

PV array 9 and OP 2

No glare found

PV array 9 and OP 3

No glare found

PV array 9 and OP 4

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