



# Glint and Glare Analysis Report

**Cornerstone Solar Facility**

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## APPENDICES

Appendix A: Forge Solar Results

## 1.0 Introduction

Cornerstone Solar, LLC proposes to construct and operate the Cornerstone Solar Facility (Facility). The Facility includes development of a 200-megawatt (MW) alternating current (AC) ground-mounted photovoltaic solar generation facility within a fenced area of approximately 726 acres. The Project is located within Pennsylvania, along the West Virginia and Pennsylvania border, south of Eldersville Road, west of Cole School Road, and north of Meadowcroft Road.

### 1.1 Permitting and Regulatory Requirements

#### 1.1.1 Township of Jefferson Ordinance

Section 4.A.19 of the Jefferson Township, Washington County, Pennsylvania draft zoning ordinance governing solar energy facilities (Ordinance) requires that solar energy facilities (SEFs) do not have a significant adverse impact on neighboring or adjacent uses. It is required that the “Applicant provide a completed Glare Study ensuring that glare created by the SEF does not fall into the *red category*”. Additionally, the Ordinance specifies all adjacent roads and non-participating property owners’ residences within 1000 feet of the Facility must be included in the glare study.

This glare analysis was produced to determine the potential glare from the Project along the adjacent roadways and nearby properties within 1,000 to 2,000 feet of the Facility to meet this Ordinance requirement. In addition, because the Ordinance is based out of a Pennsylvania township, receptors based within West Virginia were not included in this analysis.

#### 1.1.2 Federal Aviation Administration Policy

In May 2021, the Federal Aviation Administration (FAA) issued a policy in 86 Federal Register 25801 for the development of solar projects on federally-obligated airports (FAA 2021a). The final policy is typically adopted by the industry for solar projects off airport property but within proximity of airports.

Within this policy, the FAA identified project criteria where the policy requirements do not apply. These include:

- 1 Solar energy systems on airports that do not have an air traffic control tower (ATCT);
- 2 Airports that are not federally obligated; or
- 3 Solar energy systems not located on airport property.

This Project is located over 6.5 nautical miles from the Trinity Medical Center West helipad, and over 8.5 nautical miles from the Geary A Bates/Jefferson County Airpark airport based on the FAA’s Circle Search for Airport Tool (FAA 2024). **Because the Facility is located off-site and a significant distance from the airport and helipad properties, evaluation is not necessary according to the FAA guidance.**



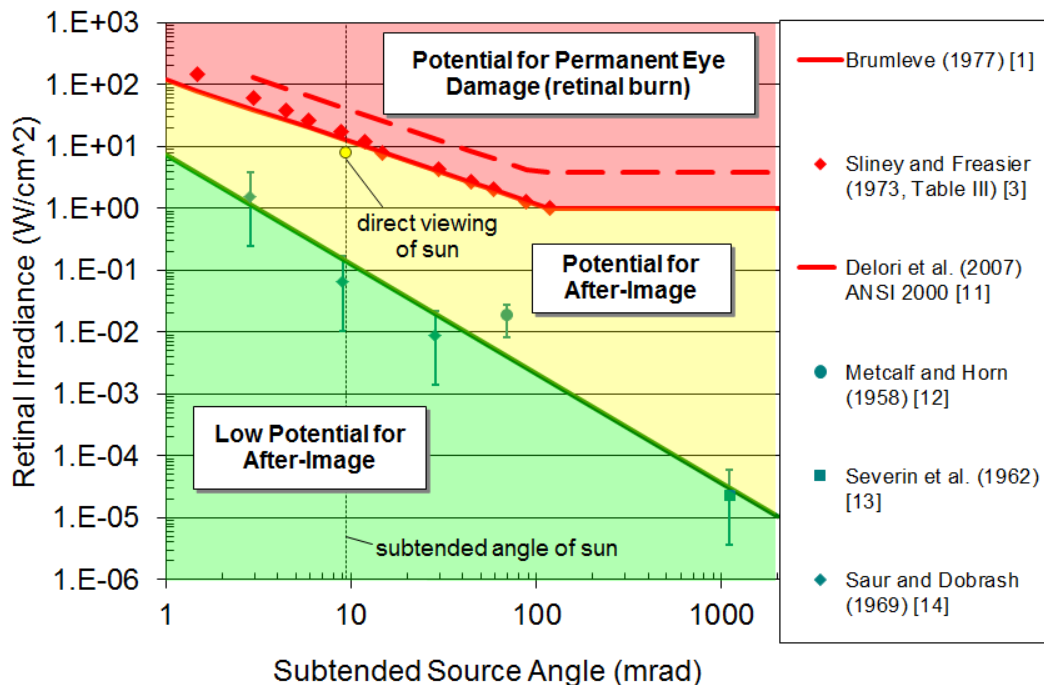
## 2.0 Approach/Methods

### 2.1 Glare Hazard Analysis Tool

To conduct the glint and glare analysis, TRC used methods developed by Sandia National Laboratories and described in the SGHAT User's Manual (Ho and Sims 2016). The SGHAT-compliant software used in this analysis is under license to TRC by ForgeSolar.

The SGHAT analyzes the potential for glare over the entire calendar year from when the sun rises above the horizon until the sun sets below the horizon. The magnitude of glint and glare depends on several factors such as the sun's position, the location of the observer, and characteristics of the solar PV array including location, orientation, tilt, and optical properties of the modules used. Glare visibility from an observer's location was analyzed once array characteristics were determined. Ocular hazard potential was estimated based on the retinal irradiance and subtended angle (size/distance) of the predicted glare (Ho et al, 2011). Potential ocular hazards range from temporary after-image to retinal burn depending on the retinal irradiance and subtended angle, as shown in **Figure 2-1**. The SGHAT classifies solar glare into three categories, denoted as "green," "yellow," or "red" glare.

- Green glare is the mildest of the classifications and has low potential to cause after-image and no potential to cause retinal burn.
- Yellow glare is a moderate level of glare and has some potential for temporary after-image and no potential to cause retinal burn.
- Red glare is a serious and significant form of glare with potential to cause retinal burn and/or permanent eye damage.



Source Ho et al, 2011

**Figure 2-1: Potential Glare Impacts**

In general, modern solar modules are designed to absorb the sun's energy to produce electricity. Solar modules are constructed from high transmission, low iron glass and are typically covered with anti-reflective coatings. Solar modules produce specular reflections, as the sun is reflecting off the generally smooth surface of the solar module. This reflection bounces off the solar module at specific angles, dependent on the sun's position and module angle, and can be observed as glint or glare by an observer that intersects the reflective angle.

Assumptions of the SGHAT are as follows. Additional assumptions noted by ForgeSolar are provided in **Appendix A**.

- The SGHAT does not rigorously represent the detailed geometry of a solar panel array; detailed features such as gaps between modules, variable heights of the PV array, and support structures may impact actual glare results. However, the accuracy of the current approach has been validated by a number of test cases.
- The glare spot is constrained by the PV array footprint size. Partitioning large arrays into smaller sections may reduce the maximum potential subtended angle (glare spot), potentially impacting results if actual glare spots are larger than the sub-array size.
- The variable direct normal irradiance (DNI) feature scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This DNI is indicative for the amount of solar radiation received on a surface normal to the sun within a 60-minute period. This variable profile provides a lower DNI in the mornings and evenings and a maximum (1,000 watts per square meter [W/m<sup>2</sup>] as recommended by ForgeSolar) at solar noon. The scaling uses a clear-day irradiance profile all year round. However, the actual DNI on any given day can be reduced by many factors, such as atmospheric conditions like overcast skies or atmospheric attenuation from humidity and particulates (Ho and Sims 2013). Therefore, modeling results are more conservative than what may be anticipated on a specific day.
- The modeling does not automatically consider obstacles (either natural or artificial, existing, or proposed) between the observation points and panel arrays. To view glare, there must be a clear line of site from the panels to the receptor location. Therefore, obstructions such as trees, hills, buildings, etc., may limit instances of glare.
- The ocular (visual) hazard, as shown in **Figure 2-1**, predicted by the tool is also dependent on several environmental, optical, and human factors, which can be uncertain. This may minimize the true ocular (visual) impact for an individual.

In general, default values given by the SGHAT in this analysis reflect the worst-case scenario. As such, the actual glare created by the Facility is likely to be less than that predicted by the model.

The following additional assumptions have been used for the analysis:

- Time zone for the Project was set at UTC-5 (Eastern Standard Time).
- Subtended angle of the sun of 9.3 milliradian, as recommended by the SGHAT. This is the average angle of the sun as viewed from earth as it moves throughout the course of the day.
- The time interval for the analysis was set to run at 1-minute increments.

Inputs, outputs, and other assumptions used in the analysis are documented in the solar glare hazard analysis reports (**Appendix A**).

## 2.2 Project Specifications

### 2.2.1 Array Area Specifications

The array areas are proposed to be mounted on a fixed tilt racking system. The modules are proposed to be installed with an orientation to the south (180°) with a module tilt angle of 25°. The approximate mid-point of the modules is proposed to be approximately 5 feet above ground surface. The modules are proposed to have a smooth-textured surface and have anti-reflective coating on the module surface.

The Facility was split into 75 separate array areas for modeling based on breaks in the array area or along general topography to provide manageable areas for modeling. Due to the size and extent of the Facility, the array areas were grouped into 9 different modeling areas based on their proximity to the selected receptors identified in **Section 2.3**. These groupings are identified by Group A through Group I.

**Figures 2-2** through **2-4** depict the general locations of each array area.

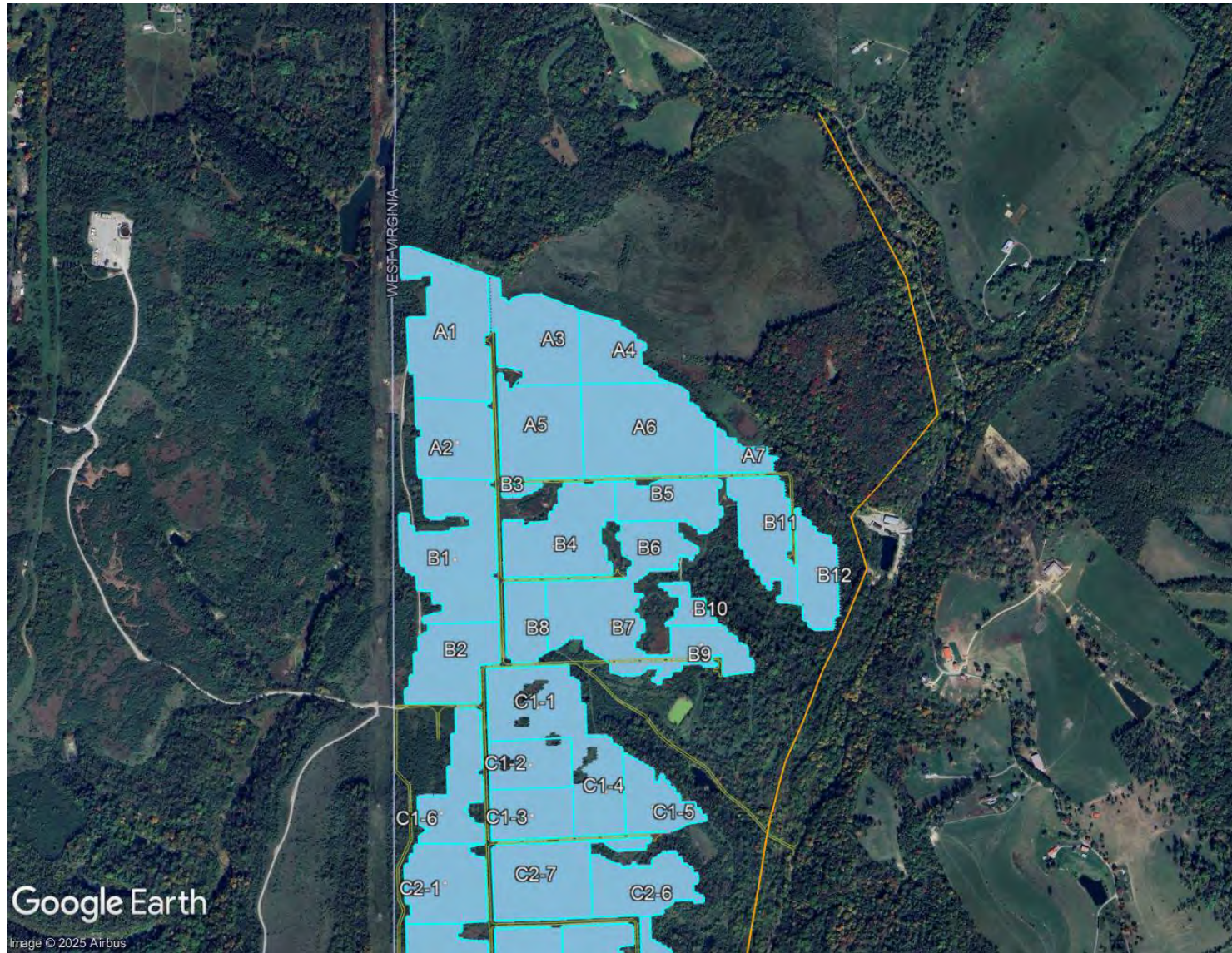
### 2.2.2 Visual Obstructions

As noted in **Section 2.1**, natural or man-made obstructions are not automatically included in the ForgeSolar model; however, simplistic obstruction modeling can be included into the analysis manually. In ForgeSolar, modeled obstructions are treated as an opaque parallelogram which block incoming sunlight or emanating glare reflections if they intersect the obstruction face. For the Facility, such obstructions include existing vegetation, surrounding topography, and other manmade infrastructure. However, only selected segments of existing vegetation were included as obstructions in the model.

Existing vegetation was modelled at a conservative height of 35 feet tall based on aerial imagery showing mature trees in the area and field photography that was completed for the Facility. On **Figures 2-2** through **2-4**, the orange polylines represent the existing treelines included in the model. Landscape screening is proposed to two locations within the Facility. The landscaping is modeled at 6 feet above ground surface, which represents the maximum height for vegetation initial installed for landscape screening. The locations of the proposed landscape screening are represented by yellow polylines on **Figures 2-2** through **2-4**.

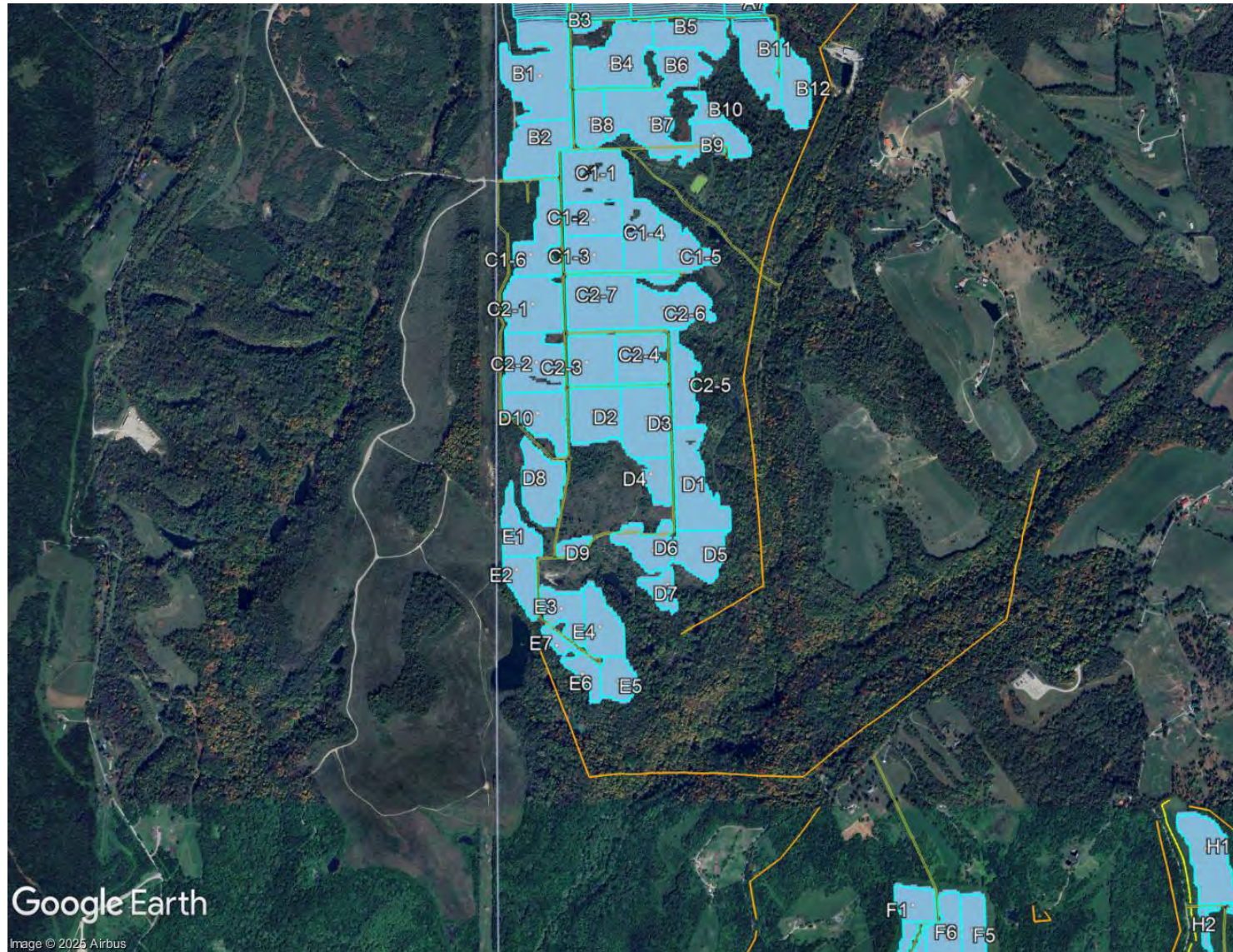
These modeled obstructions do not account for all obstructions around the vicinity of the Facility. A viewshed analysis is also being conducted for this Facility, which provides a more detailed review of the potential visibility of the Facility within the surrounding areas. This viewshed analysis accounts for the surrounding topography and existing vegetation but does not include proposed vegetative screening. The results of the viewshed analysis in relation to the glare results are detailed in **Section 3.0**.





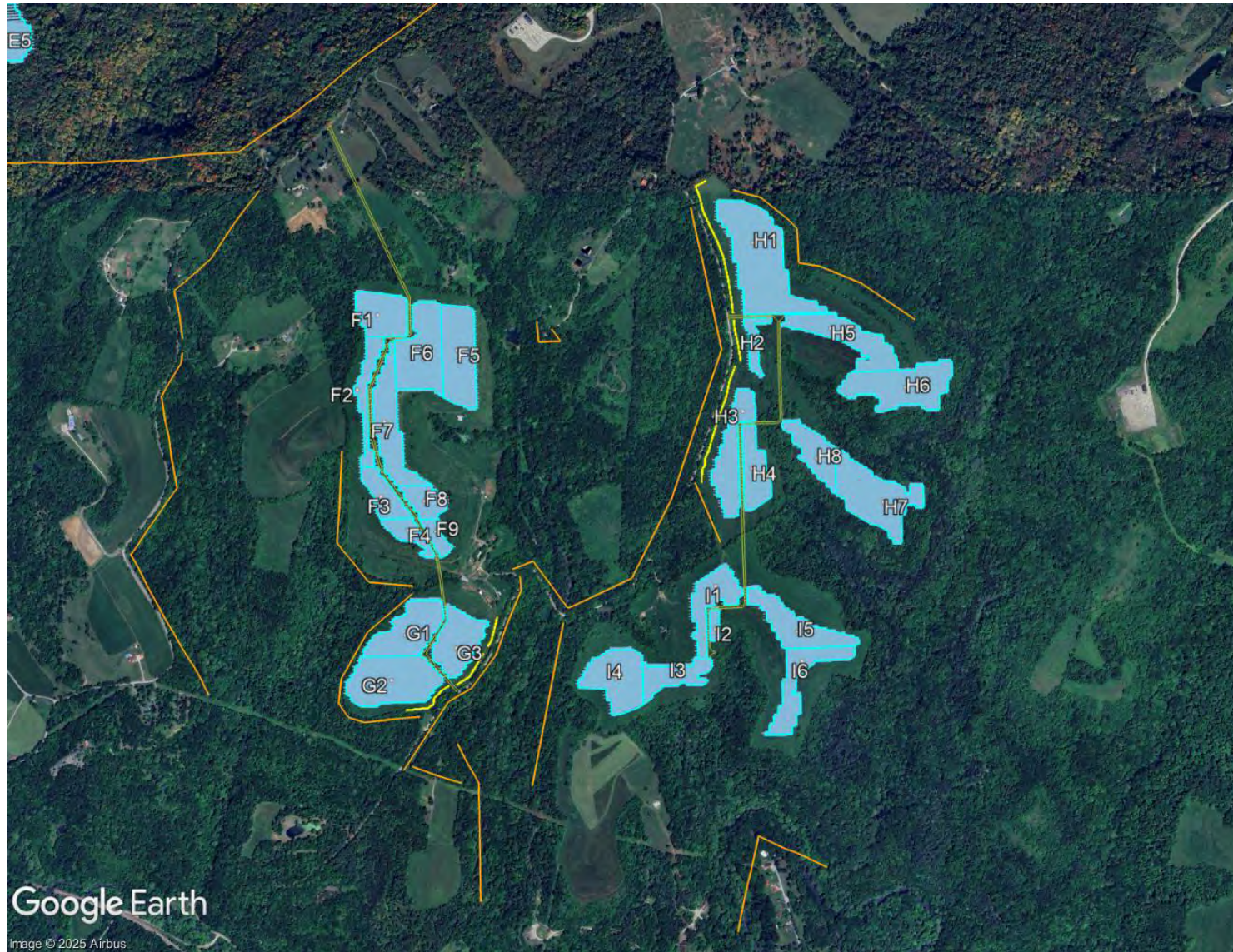
**Figure 2-2: Preliminary Array Locations (Array Groups A through C)**





**Figure 2-3: Preliminary Array Locations (Array Groups C through E)**





**Figure 2-4: Preliminary Array Locations (Array Groups F and I)**

## 2.3 Observer Parameters

### 2.3.1 Residential Locations

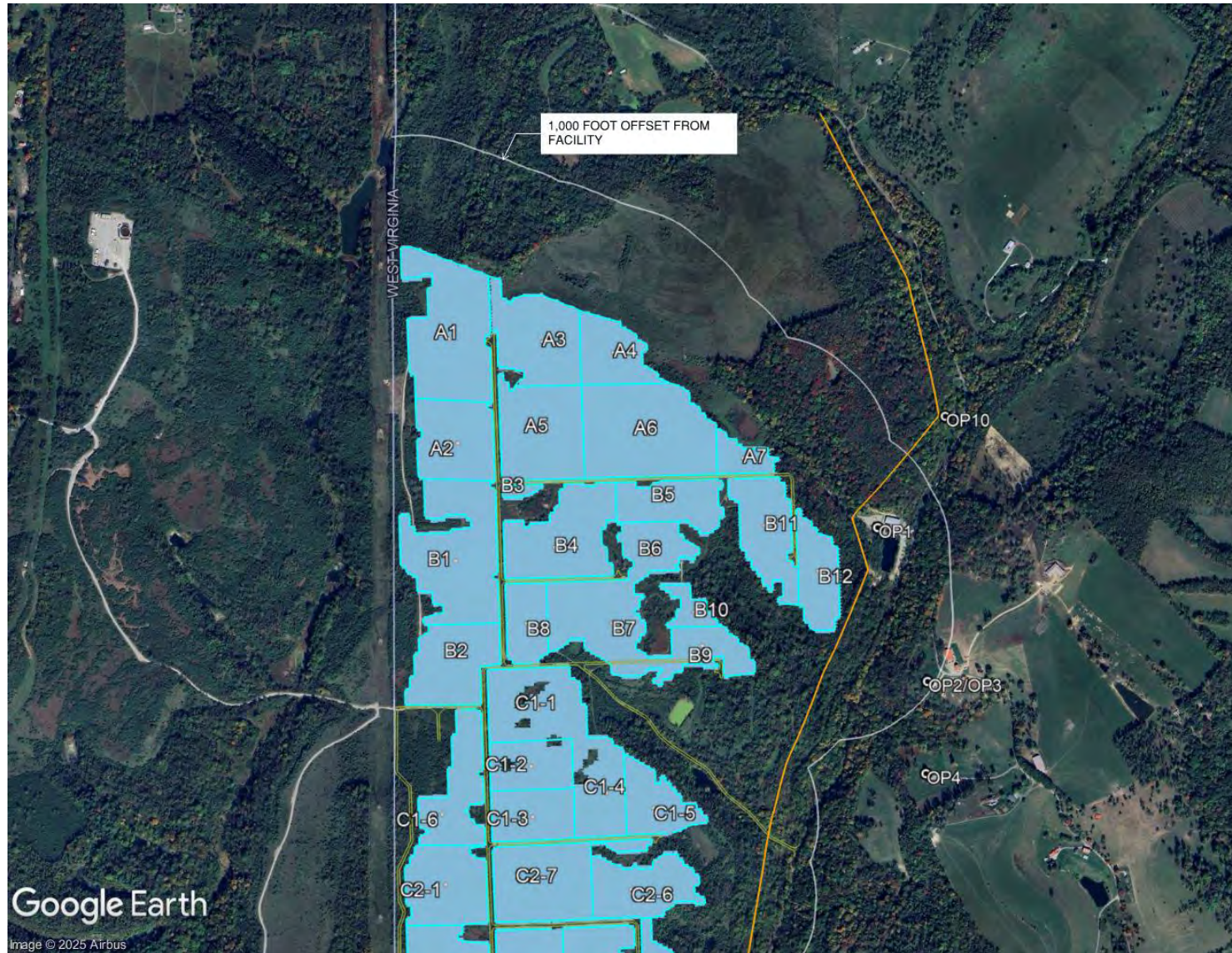
The local solar ordinance indicates that non-participating property owner residences, and roadways within 1,000 feet of the facility shall be included in the glare study. Therefore, presumed occupied properties located within 2,000 feet of an array area were evaluated for that array in the models. The analysis was conducted using ForgeSolar’s Observation Point (OP) tool to model glare visible from single locations. Available aerial imagery was used to estimate the type of building (commercial or 1 or 2 story residence). A height of six feet was used to represent an observer in the window of a single-story building, and 16 feet was used to represent an observer in the window on the second floor of a two-story building.

Twenty-four observation points (equating to 17 unique buildings) were identified within 2,000 feet proximity to the Facility. **Table 2-1** summarizes the modeled characteristics of the evaluated OPs and their corresponding labels. **Figure 2-5** through **2-7** shows the locations of the evaluated OPs in relation to the Project.

**Table 2-1: Observation Point**

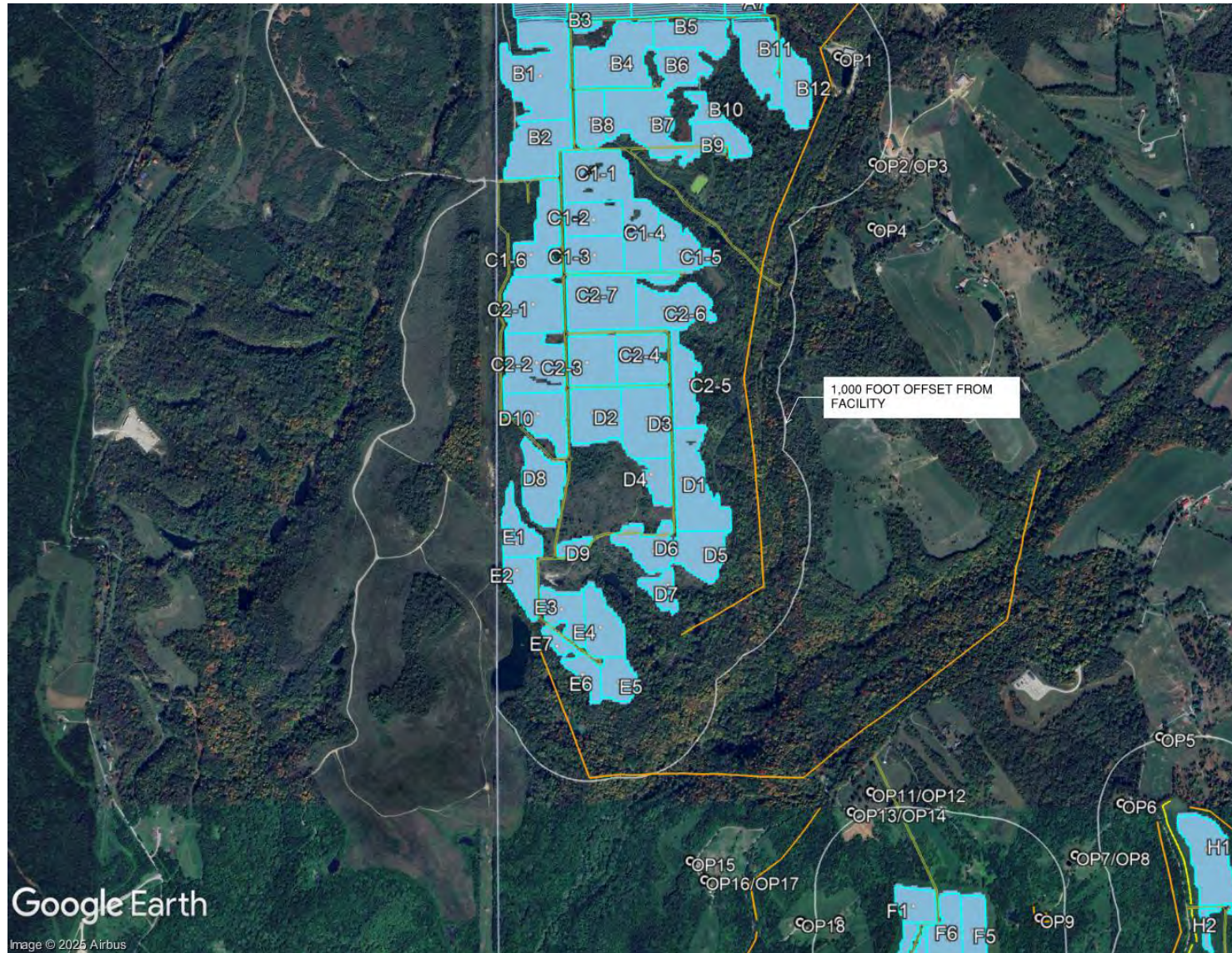
Observation Point Label	Type of Building	Height (ft)
OP1	Assumed one story commercial building	6
OP2/OP3	Assumed two story residence	6/16
OP4	Assumed one story residence	6
OP5	Assumed one story residence	6
OP6	Assumed one story residence	6
OP7/OP8	Assumed two story residence	6/16
OP9	Assumed one story residence	6
OP10	Assumed one story residence	6
OP11/OP12	Assumed two story residence	6/16
OP13/OP14	Assumed two story residence	6/16
OP15	Assumed one story residence	6
OP16/OP17	Assumed two story residence	6/16
OP18	Assumed one story residence	6
OP19/OP20	Assumed two story residence	6/16
OP21/OP22	Assumed two story residence	6/16
OP23	Assumed one story residence	6
OP24	Assumed one story residence	6





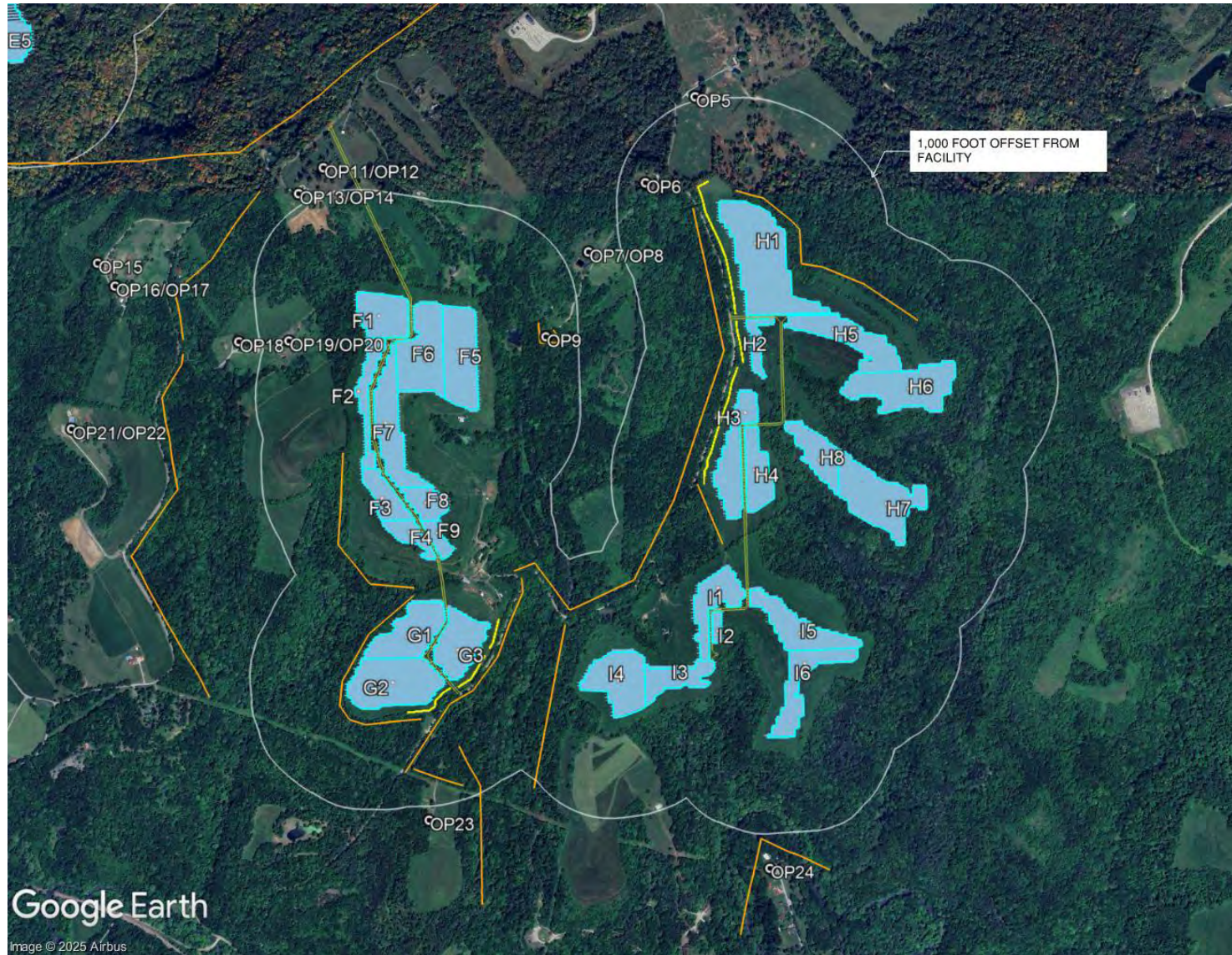
**Figure 2-5: Preliminary Array Locations With Observation Point Locations (OP-1 to OP-4 and OP-10)**





**Figure 2-6: Preliminary Array Locations With Observation Point Locations (OP2 to OP9 and OP11 to OP20)**





**Figure 2-7: Preliminary Array Locations With Observation Point Locations (OP5 to OP9 and OP11 to OP24)**

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### **2.3.2 Route Parameters**

The solar ordinance requires no solar energy facility shall produce glare that would constitute “Red Category Glare” to roadways and non participating property owner residences within 1,000 feet of the Facility. Therefore, public roadways and nearby properties that border the Facility were included in the model for glare evaluation.

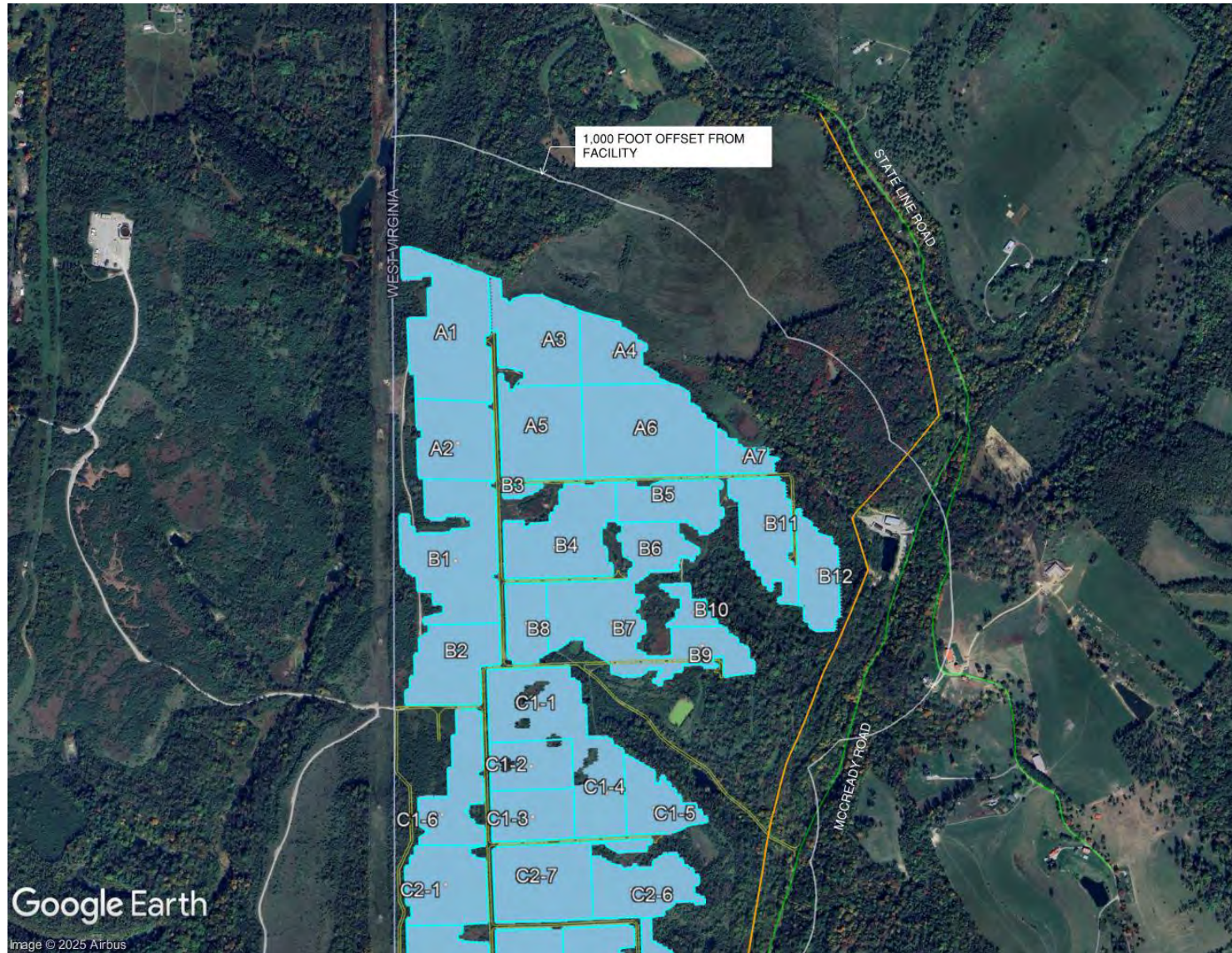
The roadways were identified via aerial imagery and Google Maps. Analysis for the roadways was conducted utilizing the Route Receptor in ForgeSolar. The Route Receptor provides a multi-line representation that simulates observers traveling along continuous paths such as roads, railways, helicopter paths, and multi-segment flight tracks. The following roadways were identified near the Project area:

- Bethel Ridge Road
- Locust Road
- McCready Road
- Miller Road
- Shades of Death Road
- State Line Road
- Village Road

**Figures 2-8 to 2-10** illustrates the locations of the evaluated routes in relation to the Project.

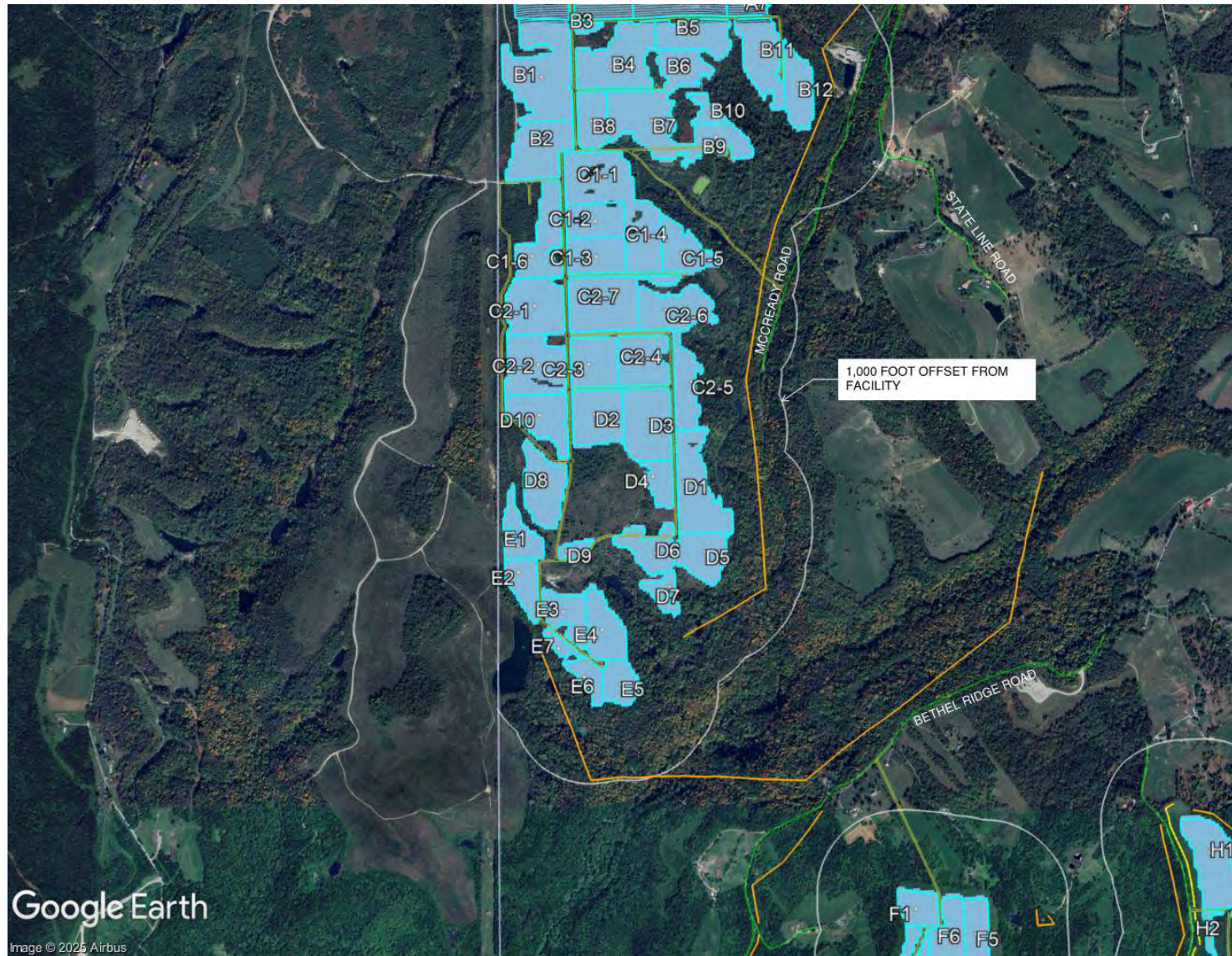
The viewing angle for observers traveling along the roadways was presumed to be -50 to 50° field of view (total viewing angle of 100°), based on standard assumptions provided by ForgeSolar. The height for observers traveling along the roadway was assumed to be 4.5 feet for passenger cars or 9 feet for commercial vehicles (as necessary).





**Figure 2-8: Route Receptor Locations Part 1**





**Figure 2-9: Route Receptor Locations Part 2**





**Figure 2-10: Route Receptor Locations Part 3**

### 3.0 Results

TRC conducted the solar glare hazard analysis using the SGHAT tool, licensed by ForgeSolar, to evaluate potential glare impacts of the proposed Facility on the selected receptors detailed in **Section 2.3**. TRC evaluated the potential solar glare impact of the proposed PV panels using the project specifications detailed in **Section 2.2.1**.

It should be noted that limitations of the modeling software may impact the results of this analysis. As noted in **Section 2.1**, the model assumes a clear day with limited radiative scattering. However, atmospheric conditions such as humidity, overcast skies, and atmospheric particulates would reduce the solar irradiance with increasing distance. (Ho 2013).

In addition, the model does not innately account for natural screening (e.g., existing vegetation, topography) that may limit view of the array area. While ForgeSolar can model obstructions, every potential visual obstruction cannot be included in the model. The viewshed analysis provides a detailed review on how the surrounding topography and vegetation may impact view of the Facility that ForgeSolar does not account for. The results detailed below were compared to the viewshed analysis conducted for the project to evaluate the likely potential of glare being seen from the Facility. If the potential impacted receptor was identified to not be visible in the viewshed analysis, no further discussion on the results is provided. The viewshed analysis for the Facility is provided under a separate cover.

The following subsection summarize the results of the modelling groups that specify glare and detail the applicability of the results based on the viewshed analysis. Detailed glare results are included in **Appendix A**. These results are subject to the limitations/assumptions of the model as detailed in **Section 2.1** of this report.

#### 3.1 Group A Results

Estimated results for Arrays A1 through A7 are summarized in **Table 3-1**, the remaining nearby residential properties or roadways did not observe glare. Red glare was not estimated to be observed at the evaluated receptors. No glare was estimated to be observed from Array A3 and A7. Residential properties evaluated are noted in **Table 2-1**. Refer to **Figures 2-5** through **2-8** for residential and roadway receptor locations.

**Table 3-1: Group A Glare Study Results**

Receptor	Green Glare (min/yr)					Yellow Glare (min/yr)				
	Arrays					Arrays				
	A1	A2	A4	A5	A6	A1	A2	A3	A5	A6
OP2	--	226 <sup>(1)</sup>	--	--	--	--	--	--	--	--
OP3	--	226 <sup>(1)</sup>	--	102 <sup>(1)</sup>	--	--	--	--	--	--
State Line Road	633 <sup>(1)</sup>	491	106 <sup>(1)</sup>	245	250 <sup>(1)</sup>	--	--	--	--	512 <sup>(1)</sup>

Footnotes:

<sup>(1)</sup> Based on viewshed analysis, the Facility is unlikely to be visible from the impacted receptor.



Glare is estimated to be observed as summarized below:

- Array A1: The Facility is unlikely to be visible along a segment of State Line Road, south of OP1, based on the conducted viewshed analysis; therefore, glare would also not be visible at the receptor.
- Array A2: The Facility is unlikely to be visible from residential property OP2/OP3 based on the conducted viewshed analysis; therefore, glare would also not be visible at the receptor.

As modeled, minor green glare is estimated to be observed along two segments of State Line Road, which may be able to view the Facility based on the viewshed analysis. The glare is estimated to occur at fixed positions along the roadway estimated to receive glare from late April through mid-August for less than 10 minutes per day during the evening hours (17:30 to 18:30).

- Array A4: The Facility is unlikely to be visible along a portion of State Line Road, south of OP1, based on the conducted viewshed analysis; therefore, glare would also not be visible at the receptor.
- Array A5: The Facility is unlikely to be visible from the second-floor receptor (OP3) of residential property OP2/OP3 based on the conducted viewshed analysis; therefore, glare would also not be visible at the receptor.

As modeled, minor green glare is estimated to be observed along a segment of State Line Road near residence OP2/OP3, which may have view of Facility based on the viewshed analysis. The glare is estimated to occur from late May through mid-July for less than 5 minutes per day during the evening hours (17:30 to 18:30) at fixed positions along the roadway estimated to receive glare.

- Array A6: The Facility is unlikely to be visible along a portion of State Line Road, south of OP1 based on the conducted viewshed analysis; therefore, glare would also not be visible at the receptor.

### 3.2 Group B Results

Estimated results for Arrays B1 through B12 are summarized in **Table 3-2**, the remaining nearby residential properties or roadways did not observe glare. Red glare was not estimated to be observed at the evaluated receptors. Residential properties evaluated are noted in **Table 2-1**. Refer to **Figures 2-5** and **2-8** for residential and roadway receptor locations.



**Table 3-2: Group B Glare Study Results**

Receptor	Green Glare (min/yr)												Yellow Glare (min/yr)								
	Arrays												Arrays								
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B1 – B3	B4	B5	B6	B7	B8	B9	B10 – B11	B12
OP 2	355 <sup>(1)</sup>	301 <sup>(1)</sup>	--	--	--	477 <sup>(1)</sup>	521 <sup>(1)</sup>	516 <sup>(1)</sup>	693 <sup>(1)</sup>	1,089 <sup>(1)</sup>	--	1,365 <sup>(1)</sup>	--	--	--	--	--	--	--	--	--
OP 3	331 <sup>(1)</sup>	352 <sup>(1)</sup>	--	489 <sup>(1)</sup>	--	578 <sup>(1)</sup>	642 <sup>(1)</sup>	593 <sup>(1)</sup>	692 <sup>(1)</sup>	1,106 <sup>(1)</sup>	--	1,473 <sup>(1)</sup>	--	--	--	--	--	--	--	--	--
OP 4	178 <sup>(1)</sup>	705 <sup>(1)</sup>	--	137 <sup>(1)</sup>	--	--	729 <sup>(1)</sup>	--	1,292 <sup>(1)</sup>	--	--	--	--	--	--	--	--	--	--	--	--
State Line Road	410	593	15	1,185	805	1,052	1,716	1,515	2,159	1,633	1,930	3,069	--	21	1	--	179	--	492	--	905

Footnotes:

<sup>(1)</sup> Based on viewshed analysis, the Facility is unlikely to be visible from the impacted receptor.

Glare is estimated to be observed as summarized below:

- Array B1: The Facility is unlikely to be visible from residential properties OP2/OP3 and OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, minor green glare is estimated to be observed along portions of State Line Road, east of OP2/OP3 and may be visible from the roadway based on the viewshed analysis. The glare is estimated to occur in the evening (17:30 to 18:30) for less than 5 minutes per day from late March through mid-September at fixed positions along the roadway estimated to receive glare.

- Array B2: The Facility is unlikely to be visible from residential properties OP2/OP3 and OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, minor green glare is estimated to be observed along portions of State Line Road and may be visible from the roadway based on the viewshed analysis. The glare is estimated to be visible in the evening (18:00 to 18:30) for less than 10 minutes per day intermittently from late March into mid-May and from August to October at fixed positions along the roadway estimated to receive glare.

- Array B3: As modeled, minor green glare is estimated to be observed along portions of State Line Road and may be visible from the roadway based on the viewshed analysis. The glare is estimated to be visible in the evening (around 18:00) for approximately 1 minute a day in June at fixed positions along the roadway estimated to receive glare.

- Array B4: The Facility is unlikely to be visible from residential properties OP2/OP3 and OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, minor green and minor yellow glare is estimated to be observed along portions of State Line Road east of OP2/OP3 and may be visible from the roadway based on the viewshed analysis. A combination of green and yellow glare is estimated to occur in the evening (17:30 to 18:30) for less than 15 minutes per day from mid-April through late August at fixed positions along the roadway estimated to receive glare, with yellow glare being estimated to be observed in the months of May and August for less than 11 minutes over the course of the month.

- Array B5: As modeled, minor green and minor yellow glare is estimated to be observed along portions of State Line Road east of OP2/OP3 and may be visible from the roadway based on the viewshed analysis. A combination of green and yellow glare is estimated to occur in the evenings (17:30 to 18:30) for less than approximately 10 minutes per day from late April through mid-August at fixed positions along the roadway estimated to receive glare, with yellow glare (1 minute) being estimated to be observed in April.

- Array B6: The Facility is unlikely to be visible from residential property OP2/OP3 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, minor green glare is estimated to be observed along portions of State Line Road east/northeast of OP2/OP3 and may be visible from the roadway based on the viewshed analysis. The glare is estimated to be visible in the evening (17:30 to 18:30) for less than 15 minutes per day from late April into mid-August at fixed positions along the roadway estimated to receive glare.

- **Array B7:** The Facility is unlikely to be visible from residential properties OP2/OP3 and OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, minor green and minor yellow glare is estimated to be observed along portions of State Line Road east of OP2/OP3 and may be visible from the roadway based on the viewshed analysis. A combination of green and yellow glare is estimated to be visible in the evening (17:30 to 18:30) for less than approximately 15 minutes per day from mid-March to late-September at fixed positions along the roadway estimated to receive glare, with yellow glare being estimated to be observed from April/May (40-49 minutes over the course of each month) and July through September (20-38 minutes over the course of each month).

- **Array B8:** The Facility is unlikely to be visible from residential property OP2/OP3 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, minor green glare is estimated to be observed along portions of State Line Road east of OP2/OP3 and may be visible from the roadway based on the viewshed analysis. The glare is estimated to be observed in the evening (17:30 to 18:30) for less than approximately 15 minutes per day from mid-March to late September at fixed positions along the roadway estimated to receive glare.

- **Array B9:** The Facility is unlikely to be visible from residential properties OP2/OP3 and OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, minor green and yellow glare is estimated to be observed along portions of State Line Road east of OP2/3 and may be visible from the roadway based on the viewshed analysis. A combination of green and yellow glare is estimated to be visible in the evening (17:30 to 19:00), ranging from approximately 10 to 20 minutes per day from late March into mid-September at fixed positions along the roadway estimated to receive glare, with yellow glare estimated to be observed during May (247 minutes during the month) and in July (171 minutes during the month) and August (74 minutes during the month).

- **Array B10:** The Facility is unlikely to be visible from residential property OP2/OP3 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, minor green glare is estimated to be observed along several portions of State Line Road east and southeast of OP2/OP3 and may be visible from the roadway based on the viewshed analysis. The glare is estimated to occur in the evening (17:30 to 18:30 pm) for around 10 minutes per day from April through early September at fixed positions along the roadway estimated to receive glare.

- **Array B11:** As modeled, green glare is estimated to be observed along several portions of State Line Road east and southeast of OP2/OP3 and may be visible from the roadway based on the viewshed analysis. The glare is estimated to occur in the evening (18:00 to 18:30 pm) for up to approximately 20 minutes per day from late April through mid-August at fixed positions along the roadway estimated to receive glare.

- **Array B12:** The Facility is unlikely to be visible from residential property OP2/OP3 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, green and yellow glare is estimated to be observed along several portions of State Line Road east and southeast of OP2/OP3 and may be visible from the roadway

based on the viewshed analysis. A combination of green and yellow glare is estimated to be visible in evenings (17:30 to 18:30) for up to approximately 40 minutes per day from late April through mid-August at fixed positions along the roadway estimated to receive glare, with yellow glare estimated to be observed from May through July (ranging from 162-427 minutes over the course of each month).

### 3.3 Group C Results

The estimated results for Group C are summarized in **Table 3-3**. No glare was estimated to be observed from Arrays C2-1 through C2-7. Red glare was not estimated to be observed at the evaluated receptors. The remaining nearby residential properties or roadways did not observe glare. Residential properties evaluated are noted in **Table 2-1**. Refer to **Figures 2-5, 2-6, 2-8, and 2-9** for residential and roadway receptor locations.

**Table 3-3: Group C1 Glare Study Results**

Receptor	Green Glare (min/yr)						Yellow Glare (min/yr)	
	Arrays						Arrays	
	C1-1	C1-2	C1-3	C1-4	C1-5	C1-6	C1-1	C1-2-C1-6
OP 2	102 <sup>(1)</sup>	--	--	--	--	--	--	--
OP 3	161 <sup>(1)</sup>	--	--	--	--	--	--	--
OP 4	708 <sup>(1)</sup>	279 <sup>(1)</sup>	--	456 <sup>(1)</sup>	319 <sup>(1)</sup>	365 <sup>(1)</sup>	--	--
State Line Road	1,192	715	356	929	778	768	57	--

Footnotes:

<sup>(1)</sup> Based on viewshed analysis, the Facility is unlikely to be visible from the impacted receptor.

Glare is estimated to be observed as summarized below:

- **Array C1-1:** The Facility is unlikely to be visible from residential properties OP2/OP3 and OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors.

As modeled, minor green and yellow glare is estimated to be observed along portions of State Line Road east OP2/OP3 and OP4. In these areas the Facility may be visible from the roadway based on the viewshed analysis. A combination of green and yellow glare is estimated to be visible in the evening (17:30 to 18:30) for up to approximately 15 minutes per day from March to early May and again from August to late September at fixed positions along the roadway estimated to receive glare, with yellow glare estimated to be observed during April (30 minutes during the month), August (9 minutes during the month), and September (18 minutes during the month).

- **Array C1-2:** The Facility is unlikely to be visible from residential property OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at this receptor.

As modeled, minor green glare is estimated to be observed along portions of State Line Road east of OP4. In this area the Facility may be visible from the roadway based on the viewshed analysis. The glare is estimated to be visible in the evening (18:00 to 18:30) for up to approximately 15 minutes per day from March to April and again from late August through September at fixed positions along the roadway estimated to receive glare.

- Array C1-3: As modeled, minor green glare is estimated to be observed along portions of State Line Road east and southeast of OP4. In this area the Facility may be visible from the roadway based on the viewshed analysis. The glare is estimated to be visible in the evening (18:00 to 19:00) for up to approximately 15 minutes per day in March and again in September at fixed positions along the roadway estimated to receive glare.
- Array C1-4: The Facility is unlikely to be visible from residential property OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at this receptor.  
As modeled, green glare is estimated to be observed along portions of State Line Road east and southeast of OP4. In a portion of this area, the Facility may be visible from the roadway based on the viewshed analysis. The glare is estimated to be visible in the evening (18:00 to 19:00) for up to approximately 20 minutes per day from March to mid-April and from late August through September at fixed positions along the roadway estimated to receive glare.
- Array C1-5: The Facility is unlikely to be visible from residential property OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at this receptor.  
As modeled, green glare is estimated to be observed along a portion of State Line Road east and southeast of OP4. In a portion of this area, the Facility may be visible from the roadway based on the viewshed analysis. The glare is estimated to be visible in the evening (18:00 to 18:30) for less than 20 minutes per day from March to early-April and in September to early October at fixed positions along the roadway estimated to receive glare.
- Array C1-6: The Facility is unlikely to be visible from residential property OP4 based on the conducted viewshed analysis; therefore, glare would also not be visible at this receptor.  
As modeled, minor green glare is estimated to be observed along portions of State Line Road east and southeast of OP2/OP3 and OP4. In these areas, the Facility may be visible from the roadway based on the viewshed analysis. The glare is estimated to be observed in the evening (18:00 to 18:45) for less than 15 minutes per day from March to April and late August through September at fixed positions along the roadway estimated to receive glare.

### 3.4 Group D Results

Estimated results for Arrays D1 through D10 are summarized in **Table 3-4**, the remaining nearby residential properties or roadways did not observe glare. Yellow and red glare was not estimated to be observed at the evaluated receptors. No glare was estimated to be observed from Arrays D8 or D10. Residential properties evaluated are noted in **Table 2-1**. Refer to **Figures 2-6** and **2-9** for residential and roadway receptor locations.

**Table 3-4: Group D Glare Study Results**

Receptor	Green Glare (min/yr)								Yellow Glare (min/yr)
	Arrays								Arrays
	D1	D2	D3	D4	D5	D6	D7	D9	D1 – D9
Bethel Ridge Road <sup>(2)</sup>	589 <sup>(1)</sup> 608 <sup>(1)</sup>	80 <sup>(1)</sup> 118 <sup>(1)</sup>	68 <sup>(1)</sup> 75 <sup>(1)</sup>	237 <sup>(1)</sup> 235 <sup>(1)</sup>	721 <sup>(1)</sup> 807 <sup>(1)</sup>	484 <sup>(1)</sup> 516 <sup>(1)</sup>	557 <sup>(1)</sup> 619 <sup>(1)</sup>	272 <sup>(1)</sup> 294 <sup>(1)</sup>	--

Footnotes:

<sup>(1)</sup> Based on viewshed analysis, the Facility is unlikely to be visible from the impacted receptor.

<sup>(2)</sup> The top number indicates glare observed by passenger car and the bottom number indicates glare observed by a larger commercial vehicle (e.g. semi-truck).

The Facility is unlikely to be visible from along the segments of Bethel Ridge Road (segment through a wooded area) based on the conducted viewshed analysis; therefore, glare would also not be visible from the array areas.

### 3.5 Group E Results

Estimated results for Arrays E1 through E7 are summarized in **Table 3-5**, the remaining nearby residential properties or roadways did not observe glare. Yellow and red glare was not estimated to be observed at the evaluated receptors. Residential properties evaluated are noted in **Table 2-1**. Refer to **Figures 2-10** and **2-15** for residential and roadway receptor locations.

**Table 3-5: Group E Glare Study Results**

Receptor	Green Glare (min/yr)							Yellow Glare (min/yr)
	Arrays							Arrays
	E1	E2	E3	E4	E5	E6	E7	E1-E7
OP 11	--	--	223	81	1,420	86	266	--
OP 12	--	--	229	88	1,504	192	313	--
OP 14	--	--	--	--	52	143	--	--
Bethel Ridge Road <sup>(2)</sup>	488 <sup>(1)</sup> 529 <sup>(1)</sup>	334 <sup>(1)</sup> 293 <sup>(1)</sup>	707 <sup>(1)</sup> 780 <sup>(1)</sup>	--	2,068 <sup>(1)</sup> 2,076 <sup>(1)</sup>	215 <sup>(1)</sup> 230 <sup>(1)</sup>	269 <sup>(1)</sup> 384 <sup>(1)</sup>	--

Footnotes:

<sup>(1)</sup> Based on viewshed analysis, the Facility is unlikely to be visible from the impacted receptor.

<sup>(2)</sup> The top number indicates glare observed by passenger car and the bottom number indicates glare observed by a larger commercial vehicle (e.g. semi-truck).

The Facility is unlikely to be visible from along the impacted segments of Bethel Ridge Road identified in Arrays E1 through E7 based on the conducted viewshed analysis; therefore, glare would also not be visible from the array areas.

The remaining estimated glare is summarized below:

- **Array E3:** As modeled, minor green glare is estimated to be observed at residential property OP11/ OP12, which may be able to view the Facility based on the viewshed analysis. The glare is estimated to occur in the evening (17:30 to 18:00) from June to early July for less than 10 minutes per day. As noted above, based on the viewshed analysis, the Facility is not likely to be visible from the impacted roadway receptors.
- **Array E4:** As modeled, minor green glare is estimated to be observed at residential property OP11/ OP12, which may be able to view the Facility based on the viewshed analysis. The glare is estimated to be visible in the evening (17:30 to 18:00) from June into early July for less than around 2 minutes per day. As noted above, based on the viewshed analysis, the Facility is not likely to be visible from the impacted roadway receptors.



- **Array E5:** As modeled, green glare is estimated to be observed at residential properties OP11/OP12 and OP13/14, which may be able to view the Facility based on the viewshed analysis. At OP11/OP12, the glare is estimated to be visible in the evening (17:00 to 18:00) from May into mid-August for less than 20 minutes per day. At OP14, the second story receptor from residential receptor OP13/OP14, the glare is estimated to be observed in the evening (17:30 to 18:00) from June and early July for less than 2 minutes per day. Glare is not estimated to be observed from OP13 representing a first-floor receptor. As noted above, based on the viewshed analysis, the Facility is not likely to be visible from the impacted roadway receptors.
- **Array E6:** As modeled, minor green glare is estimated to be observed at residential properties OP11/OP12 and OP13/14, which may be able to view the Facility based on the viewshed analysis. At OP11/OP12, the glare is estimated to be observed in evening (17:30 to 18:00) from May to early August for less than 5 minutes per day. At OP14, the second story receptor from residential receptor OP13/OP14, glare is estimated to be observed in the evening (17:30 to 18:00) from late May through July for less than 2 minutes per day. Glare is not estimated to be observed from OP13 representing a first-floor receptor. As noted above, based on the viewshed analysis, the Facility is not likely to be visible from the impacted roadway receptors.
- **Array E7:** As modeled, green glare is estimated to be observed at residential property OP11/OP12, which may be able to view the Facility based on the viewshed analysis. Glare is estimated to be visible in evening (17:30 to 18:15) from late May through July for less than 5 minutes per day. As noted above, based on the viewshed analysis, the Facility is not likely to be visible from the impacted roadway receptors.

### 3.6 Group F Results

Estimated results for Arrays F1 through F9 are summarized in **Table 3-6**, the remaining nearby residential properties or roadways did not observe glare. Yellow and red glare was not estimated to be observed at the evaluated receptors. Residential properties evaluated are noted in **Table 2-1**. Refer to **Figures 2-7** and **2-10** for residential and roadway receptor locations.

**Table 3-6: Group F Glare Study Results**

Receptor	Green Glare (min/yr)									Yellow Glare (min/yr)
	Arrays									Arrays
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F1 – F9
OP 21	133 <sup>(1)</sup>	163 <sup>(1)</sup>	--	--	61 <sup>(1)</sup>	474 <sup>(1)</sup>	193 <sup>(1)</sup>	---	--	--
OP 22	229 <sup>(1)</sup>	209 <sup>(1)</sup>	--	--	90 <sup>(1)</sup>	540 <sup>(1)</sup>	246 <sup>(1)</sup>	--	--	--
Bethel Ridge Road <sup>(2)</sup>	--	-- 108 <sup>(1)</sup>	--	456 <sup>(1)</sup> 479 <sup>(1)</sup>	--	49 <sup>(1)</sup> 568 <sup>(1)</sup>	-- 277 <sup>(1)</sup>	--	288 <sup>(1)</sup> 330 <sup>(1)</sup>	--
Miller Road	--	--	65 <sup>(1)</sup>	2,404 <sup>(1)</sup>	--	--	--	101 <sup>(1)</sup>	524 <sup>(1)</sup>	--

Footnotes:

<sup>(1)</sup> Based on viewshed analysis, the Facility is unlikely to be visible from the impacted receptor.

<sup>(2)</sup> The top number indicates glare observed by passenger car and the bottom number indicates glare observed by a larger commercial vehicle (e.g. semi-truck).

Based on the conducted viewshed analysis, the Facility is unlikely to be visible from the following locations:

- Residential property OP21/OP22;
- Along the fixed positions on Bethel Ridge Road that are estimated to receive glare as noted in **Appendix A**; and
- Along the fixed positions near the U-turn within Miller Road that are estimated to receive glare as noted in **Appendix A**.

Because the array areas are not visible, glare would also not be visible at these receptors from the array areas.

### 3.7 Group G Results

Estimated results for Arrays G1 through G9 are summarized in **Table 3-7**, the remaining nearby residential properties or roadways did not observe glare. Red glare was not estimated to be observed at the evaluated receptors. Residential properties evaluated are noted in **Table 2-1**. Refer to **Figures 2-7** and **2-10** for residential and roadway receptor locations.

**Table 3-7: Group G Glare Study Results**

Receptor	Green Glare (min/yr)			Yellow Glare (min/yr)		
	Arrays			Arrays		
	G1	G2	G3	G1	G2	G3
Bethel Ridge Road	728 <sup>(1)</sup> 825 <sup>(1)</sup>	202 <sup>(1)</sup> 324 <sup>(1)</sup>	525 <sup>(1)</sup> 628 <sup>(1)</sup>	--	--	--
Miller Road	--	1,234	--	--	142	--

Footnotes:

- <sup>(1)</sup> Based on viewshed analysis, the Facility is unlikely to be visible from the impacted receptor.  
<sup>(2)</sup> The top number indicates glare observed by passenger car and the bottom number indicates glare observed by a larger commercial vehicle (e.g. semi-truck).

The Facility is unlikely to be visible from along the impacted segments of Bethel Ridge Road identified in Array Areas G1 through G3 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors from these array areas. The remaining estimated glare is summarized below:

- Array G2: As modeled, green and yellow glare is estimated to be observed along Miller Road east of the Group G arrays and may be visible from the roadway based on the viewshed analysis. A combination of green and yellow glare is estimated to occur in the evening (18:00 to 19:00) from mid-April to early June and from early July to late August, ranging from less than 10 minutes to approximately 30 minutes per day, at fixed positions along the roadway estimated to receive glare, with yellow glare estimated to be observed during May through July (a total of 66 minutes for May, 4 minutes for June, and 72 minutes for July).

### 3.8 Group H Results

Estimated results for Arrays H1 through H8 are summarized in **Table 3-8**, the remaining nearby residential properties or roadways did not observe glare. Red glare was not estimated to be observed at the evaluated receptors. No glare was estimated to be observed from Arrays H2,



H4 through H6, and H8. Residential properties evaluated are noted in **Table 2-1**. Refer to **Figures 2-7** and **2-10** for residential and roadway receptor locations.

**Table 3-8: Group H Glare Study Results**

Receptor	Green Glare (min/yr)			Yellow Glare (min/yr)		
	Arrays			Arrays		
	H1	H3	H7	H1	H3	H7
Miller Road	119	1,480	2,760 <sup>(1)</sup>	120	808	302 <sup>(1)</sup>

Footnotes:

<sup>(1)</sup> Based on viewshed analysis, the Facility is unlikely to be visible from the impacted receptor.

The Facility is unlikely to be visible along the impacted segment of Miller Road from Array H7 based on the conducted viewshed analysis; therefore, glare would also not be visible at the receptor from this array area. The remaining estimate glare is summarized below:

- **Array H1:** As modeled, minor green and yellow glare is estimated to be observed along a segment of Miller Road, which may be able to view the Facility based on the viewshed analysis. A combination of green and yellow glare is estimated to occur in the morning (06:30 to 07:30) from late February to late March and from mid-September to mid-October, ranging from less than 10 minutes per day at fixed positions along the roadway estimated to receive glare, with yellow glare estimated to be observed in March (total of 60 minutes for the month), September (total of 22 minutes for the month), and October (total of 38 minutes for the month). As the proposed landscaping matures, glare along the segments of Miller Road may be reduced.
- **Array H3:** As modeled, green and yellow glare is estimated to be observed along a segment of Miller Road, which may be able to view the Facility based on the viewshed analysis. A combination of green and yellow glare is estimated to occur in the morning (05:30 to 07:30) from late May to late July, for up to 30 minutes per day at fixed positions along the roadway estimated to receive glare, with yellow glare estimated to be observed from May to July (ranging for 193-311 total minutes for each month). As the proposed landscaping matures, glare along the segments of Miller Road may be reduced.

### 3.9 Group I Results

Estimated results for Arrays I1 through I6 are summarized in **Table 3-9**, the remaining nearby residential properties or roadways did not observe glare. Red glare was not estimated to be observed at the evaluated receptors. Glare was not estimated to be observed from Arrays I2, I3, and I6. Residential properties evaluated are noted in **Table 2-1**. Refer to **Figures 2-7** and **2-10** for residential and roadway receptor locations.

**Table 3-9: Group I Glare Study Results**

Receptor	Green Glare (min/yr)			Yellow Glare (min/yr)		
	Arrays			Arrays		
	I1	I4	I5	I1	I4	I5
OP23	--	--	611 <sup>(1)</sup>	--	--	--
Miller Road	1,010 <sup>(1)</sup>	212 <sup>(1)</sup>	124 <sup>(1)</sup>	--	--	--

Footnotes:

<sup>(1)</sup> Based on viewshed analysis, the Facility is unlikely to be visible from the impacted receptor.



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The Facility is unlikely to be visible from along the segments of Miller Road impacted by Array Group I or residential receptor OP23 based on the conducted viewshed analysis; therefore, glare would also not be visible at these receptors from any of the array areas in Group I.

## 4.0 Conclusions

The SGHAT tool utilized the design specifications identified above and receptors to quantify potential glint and glare at various receptors as described in **Section 2.3**. As modeled, glare is estimated to be observed from the Facility; however, based on the viewshed analysis a large portion of the glare would not be visible from the receptor locations due to the viewshed analysis providing a more detailed review of the surrounding visual obstruction than can be conducted in the glare model.

The results of this analysis are subject to the limitations of both the modeling and viewshed analysis. Due to the following limitations of this study, it is considered a conservative approach for glare.

- The model uses large, continuous array areas; however, the true array areas will be more segmented than the model. Array areas include spacing between rows of panels and for access into the area, this segmentation can impact the modeled glare spot, reducing it as noted in assumptions in **Section 2.1**.
- The analysis assumes clear, sunny days, all year round for the glare generation which does not entirely reflect real-world conditions.
- As noted in **Section 2.1**, the model does not innately account for visual obstructions. These can include buildings, topography between the receptor and array area, or vegetation (existing or proposed). As noted in **Section 2.2.2**, existing and proposed vegetation was included in the model to account some visual obstructions. SGHAT models obstruction as opaque parallelograms, which may not be consistent with real life instances. However, existing and proposed vegetation would limit visibility of solar arrays through either completely blocking the view or disrupting the view by breaking the view area into sections. These would assist in minimizing or mitigating glare.

Although, glare is estimated to be visible from outside the Facility, the Facility meets the requirements of the Jefferson Township zoning ordinance as none of the estimated glare from the Facility constitutes red glare. In addition, the estimated glare will not have a significant adverse impact on neighboring uses as the estimated impacts are either minor or will be generally short in duration (e.g. vehicles would be moving through the impacted segments of a roadway resulting in a shorter duration on the individual and not prolonged exposure).

## 5.0 References

- Diver, Jr, R.B., Ghanbari, C.M., and Ho, C.K. 2010. *Methodology to assess potential glint and glare hazards from concentrating solar power plants : analytical models and experimental validation*. Retrieved March 2024 from: [https://www.sandia.gov/app/uploads/sites/167/2022/03/2011\\_Glare\\_J.SolarEnergyEngr\\_Vol133.pdf](https://www.sandia.gov/app/uploads/sites/167/2022/03/2011_Glare_J.SolarEnergyEngr_Vol133.pdf).
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- Google Earth Pro. 2025. Accessed July 2025.
- Ho, C.K. 2011. *Summary of Impact Analyses of Renewable Energy Technologies on Aviation and Airports, Presentation to Federal Aviation Administration, Feb. 16*. Retrieved March 2024 from: <https://www.osti.gov/servlets/purl/1671603>.
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- Ho, C.K., Sims, C.A. and Yellowhair J.E. 2016. *Solar Glare Hazard Analysis Tool (SGHAT) User's Manual c 3.0*. Retrieved February 2021 from: [https://www.forgesolar.com/static/docs/SGHAT3-GlareGauge\\_user\\_manual\\_v1.pdf](https://www.forgesolar.com/static/docs/SGHAT3-GlareGauge_user_manual_v1.pdf).

## Appendix A: Forge Solar Results

## Group A

# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar North**

300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section A\_revised**

Client: REV Renewables

Created 20 Sep, 2025

Updated 22 Oct, 2025

Time-step 1 minute

Timezone offset UTC-5

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m<sup>2</sup>

Category 100 MW to 1 GW

Site ID 159914.26057

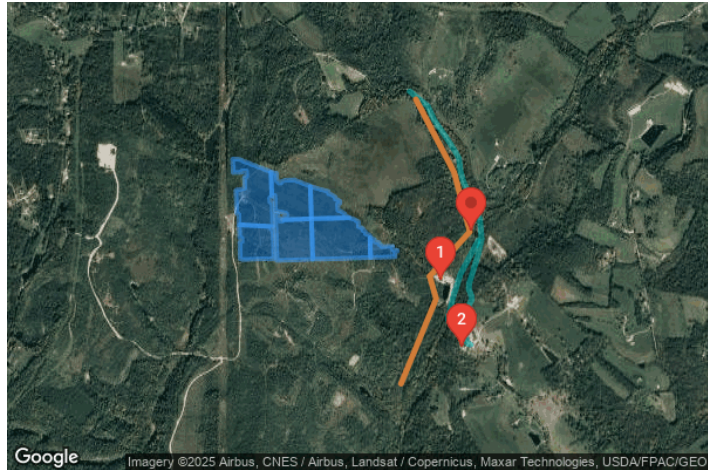
Ocular transmission coefficient 0.5

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 kWh
	°	°	min	hr	min	hr	
A1	25.0	180.0	633	10.6	0	0.0	-
A2	25.0	180.0	943	15.7	0	0.0	-
A3	25.0	180.0	0	0.0	0	0.0	-
A4	25.0	180.0	106	1.8	0	0.0	-
A5	25.0	180.0	347	5.8	0	0.0	-
A6	25.0	180.0	250	4.2	512	8.5	-
A7	25.0	180.0	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
McCready Rd	0	0.0	0	0.0
State Line Rd	1,725	28.8	512	8.5
OP 1	0	0.0	0	0.0
OP 2	226	3.8	0	0.0
OP 3	328	5.5	0	0.0
OP 10	0	0.0	0	0.0

# Component Data

## PV Arrays

**Name:** A1

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.340162	-80.515974	1221.34	5.00	1226.34
2	40.340237	-80.516140	1226.54	5.00	1231.54
3	40.340308	-80.516470	1225.71	5.00	1230.71
4	40.340383	-80.516637	1227.28	5.00	1232.28
5	40.340455	-80.516967	1223.61	5.00	1228.61
6	40.340530	-80.517134	1214.05	5.00	1219.05
7	40.340601	-80.517464	1185.56	5.00	1190.56
8	40.340676	-80.517630	1175.32	5.00	1180.32
9	40.340748	-80.517961	1165.76	5.00	1170.76
10	40.340823	-80.518127	1161.36	5.00	1166.36
11	40.340894	-80.518457	1155.01	5.00	1160.01
12	40.340886	-80.518782	1151.56	5.00	1156.56
13	40.340137	-80.518752	1166.70	5.00	1171.70
14	40.340153	-80.518100	1173.76	5.00	1178.76
15	40.340232	-80.518101	1172.94	5.00	1177.94
16	40.340240	-80.517774	1178.67	5.00	1183.67
17	40.339923	-80.517761	1192.14	5.00	1197.14
18	40.339878	-80.517923	1190.85	5.00	1195.85
19	40.339561	-80.517910	1198.02	5.00	1203.02
20	40.339245	-80.517899	1198.14	5.00	1203.14
21	40.339150	-80.518548	1186.05	5.00	1191.05
22	40.338517	-80.518522	1189.82	5.00	1194.82
23	40.337847	-80.518494	1167.05	5.00	1172.05
24	40.337809	-80.518329	1169.05	5.00	1174.05
25	40.337218	-80.518305	1165.53	5.00	1170.53
26	40.337119	-80.515849	1214.76	5.00	1219.76
27	40.338422	-80.515902	1225.25	5.00	1230.25
28	40.338497	-80.516069	1224.43	5.00	1229.43
29	40.338618	-80.516074	1223.34	5.00	1228.34
30	40.338734	-80.516079	1220.27	5.00	1225.27
31	40.338780	-80.515917	1222.45	5.00	1227.45
32	40.338859	-80.515920	1219.79	5.00	1224.79



**Name:** A2

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.337218	-80.518305	1165.53	5.00	1170.53
2	40.336506	-80.518276	1154.11	5.00	1159.11
3	40.336469	-80.518111	1155.80	5.00	1160.80
4	40.336273	-80.518103	1162.18	5.00	1167.18
5	40.336227	-80.518264	1155.41	5.00	1160.41
6	40.335320	-80.518227	1129.00	5.00	1134.00
7	40.335282	-80.518062	1138.20	5.00	1143.20
8	40.335337	-80.515776	1179.47	5.00	1184.47
9	40.336170	-80.515810	1192.16	5.00	1197.16
10	40.336919	-80.515841	1208.57	5.00	1213.57
11	40.336994	-80.516007	1209.48	5.00	1214.48
12	40.337073	-80.516011	1211.90	5.00	1216.90
13	40.337119	-80.515849	1214.76	5.00	1219.76

**Name:** A3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

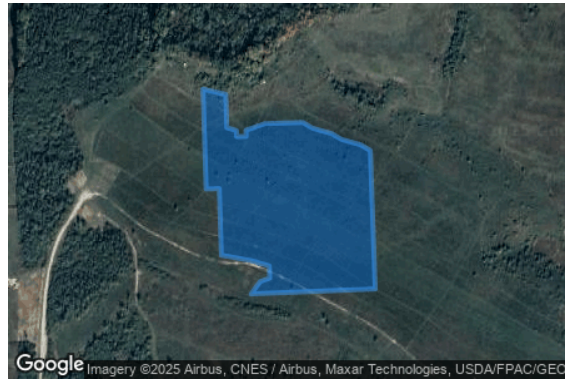
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.339360	-80.513099	1173.94	5.00	1178.94
2	40.339435	-80.513266	1172.10	5.00	1177.10
3	40.339506	-80.513596	1174.21	5.00	1179.21
4	40.339581	-80.513762	1172.45	5.00	1177.45
5	40.339653	-80.514093	1174.65	5.00	1179.65
6	40.339728	-80.514259	1174.05	5.00	1179.05
7	40.339712	-80.514911	1186.64	5.00	1191.64
8	40.339625	-80.515235	1192.92	5.00	1197.92
9	40.339546	-80.515233	1196.41	5.00	1201.41
10	40.339542	-80.515397	1196.07	5.00	1201.07
11	40.339621	-80.515400	1193.11	5.00	1198.11
12	40.339659	-80.515565	1191.91	5.00	1196.91
13	40.340092	-80.515583	1212.83	5.00	1217.83
14	40.340162	-80.515974	1221.34	5.00	1226.34
15	40.338859	-80.515920	1219.79	5.00	1224.79
16	40.338864	-80.515694	1223.17	5.00	1228.17
17	40.337994	-80.515659	1226.88	5.00	1231.88
18	40.337927	-80.515165	1227.02	5.00	1232.02
19	40.337856	-80.514835	1226.98	5.00	1231.98
20	40.337698	-80.514829	1226.14	5.00	1231.14
21	40.337652	-80.514990	1225.34	5.00	1230.34
22	40.337490	-80.515147	1224.61	5.00	1229.61
23	40.337554	-80.513015	1211.26	5.00	1216.26

**Name:** A4

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.337607	-80.510247	1136.08	5.00	1141.08
2	40.337682	-80.510413	1137.30	5.00	1142.30
3	40.337720	-80.510578	1141.18	5.00	1146.18
4	40.337837	-80.510583	1129.59	5.00	1134.59
5	40.337912	-80.510750	1131.55	5.00	1136.55
6	40.337987	-80.510916	1137.93	5.00	1142.93
7	40.338025	-80.511082	1148.55	5.00	1153.55
8	40.338378	-80.511096	1145.37	5.00	1150.37
9	40.338424	-80.510934	1138.95	5.00	1143.95
10	40.338541	-80.510939	1140.10	5.00	1145.10
11	40.338616	-80.511106	1145.84	5.00	1150.84
12	40.338654	-80.511271	1149.82	5.00	1154.82
13	40.338770	-80.511276	1147.85	5.00	1152.85
14	40.338845	-80.511442	1150.06	5.00	1155.06
15	40.338920	-80.511609	1150.80	5.00	1155.80
16	40.338958	-80.511774	1155.01	5.00	1160.01
17	40.339075	-80.511779	1151.78	5.00	1156.78
18	40.339146	-80.512109	1159.62	5.00	1164.62
19	40.339217	-80.512439	1165.45	5.00	1170.45
20	40.339289	-80.512769	1170.25	5.00	1175.25
21	40.339360	-80.513099	1173.94	5.00	1178.94
22	40.337554	-80.513015	1211.26	5.00	1216.26

**Name:** A5

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.337490	-80.515147	1224.61	5.00	1229.61
2	40.337411	-80.515146	1223.50	5.00	1228.50
3	40.337407	-80.515307	1222.47	5.00	1227.47
4	40.337565	-80.515316	1225.14	5.00	1230.14
5	40.337640	-80.515482	1225.92	5.00	1230.92
6	40.337798	-80.515489	1227.28	5.00	1232.28
7	40.337794	-80.515650	1227.17	5.00	1232.17
8	40.336333	-80.515591	1191.58	5.00	1196.58
9	40.335226	-80.515545	1175.35	5.00	1180.35
10	40.335257	-80.514238	1169.07	5.00	1174.07
11	40.335300	-80.512917	1167.35	5.00	1172.35
12	40.337554	-80.513015	1211.26	5.00	1216.26

**Name:** A6

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

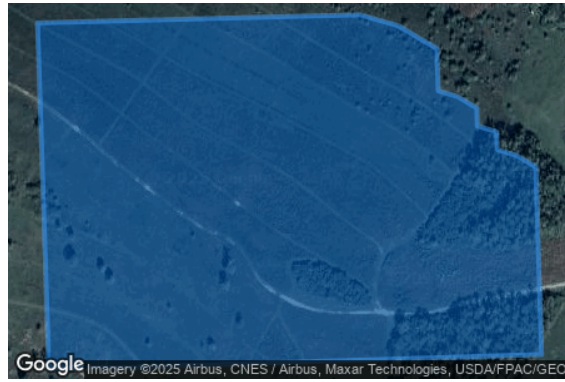
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.336498	-80.508729	1134.05	5.00	1139.05
2	40.336614	-80.508734	1126.43	5.00	1131.43
3	40.336689	-80.508901	1128.61	5.00	1133.61
4	40.336727	-80.509066	1132.70	5.00	1137.70
5	40.336843	-80.509070	1128.36	5.00	1133.36
6	40.336881	-80.509236	1138.17	5.00	1143.17
7	40.336998	-80.509240	1131.82	5.00	1136.82
8	40.337073	-80.509407	1138.27	5.00	1143.27
9	40.337111	-80.509572	1145.29	5.00	1150.29
10	40.337385	-80.509583	1122.93	5.00	1127.93
11	40.337461	-80.509750	1126.09	5.00	1131.09
12	40.337536	-80.509917	1128.06	5.00	1133.06
13	40.337607	-80.510247	1136.08	5.00	1141.08
14	40.337554	-80.513015	1211.26	5.00	1216.26
15	40.335300	-80.512917	1167.35	5.00	1172.35
16	40.335304	-80.512279	1168.67	5.00	1173.67
17	40.335328	-80.511297	1194.12	5.00	1199.12
18	40.335390	-80.508684	1130.66	5.00	1135.66

**Name:** A7

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

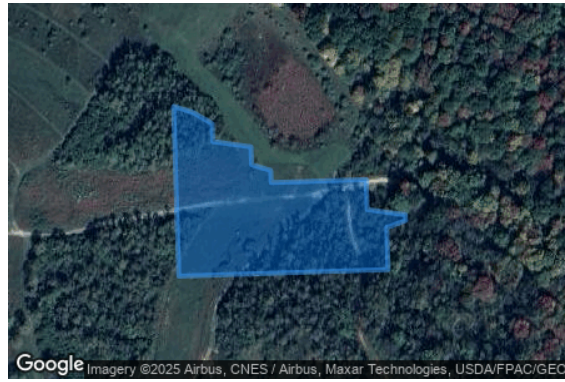
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.335433	-80.506886	1128.81	5.00	1133.81
2	40.335487	-80.506889	1124.97	5.00	1129.97
3	40.335708	-80.506898	1111.70	5.00	1116.70
4	40.335753	-80.506736	1108.62	5.00	1113.62
5	40.335791	-80.506737	1107.12	5.00	1112.12
6	40.335825	-80.507066	1115.01	5.00	1120.01
7	40.336020	-80.507074	1113.26	5.00	1118.26
8	40.336001	-80.507889	1109.41	5.00	1114.41
9	40.336080	-80.507894	1109.21	5.00	1114.21
10	40.336118	-80.508059	1111.97	5.00	1116.97
11	40.336234	-80.508064	1110.62	5.00	1115.62
12	40.336268	-80.508393	1120.53	5.00	1125.53
13	40.336384	-80.508397	1118.85	5.00	1123.85
14	40.336460	-80.508564	1125.69	5.00	1130.69
15	40.336498	-80.508729	1134.05	5.00	1139.05
16	40.335390	-80.508684	1130.66	5.00	1135.66
17	40.335429	-80.507048	1131.08	5.00	1136.08

## Route Receptors

**Name:** McCready Rd

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

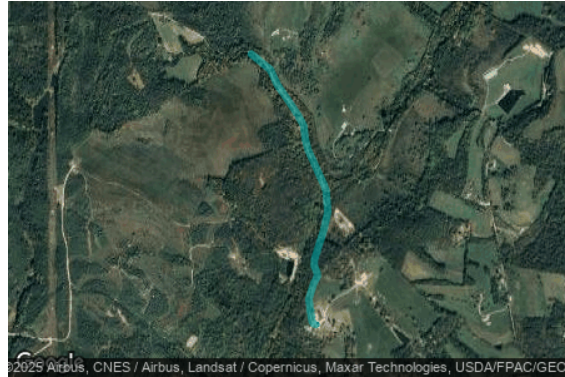
**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.336326	-80.500811	1010.54	4.50	1015.04
2	40.334489	-80.502090	1003.08	4.50	1007.58
3	40.333213	-80.502626	997.25	4.50	1001.75
4	40.331953	-80.503023	992.48	4.50	996.98



**Name:** State Line Rd  
**Path type:** Two-way  
**Azimuthal view angle:** 50.0°  
**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.344659	-80.505812	1064.65	4.50	1069.15
2	40.343841	-80.504503	1058.81	4.50	1063.31
3	40.343040	-80.504009	1051.06	4.50	1055.56
4	40.341999	-80.503063	1043.25	4.50	1047.75
5	40.341474	-80.502615	1042.89	4.50	1047.39
6	40.340932	-80.502216	1037.26	4.50	1041.76
7	40.340241	-80.502105	1032.42	4.50	1036.92
8	40.339659	-80.501909	1028.75	4.50	1033.25
9	40.338116	-80.500994	1016.56	4.50	1021.06
10	40.337799	-80.500792	1015.39	4.50	1019.89
11	40.337471	-80.500662	1014.82	4.50	1019.32
12	40.336597	-80.500576	1015.52	4.50	1020.02
13	40.336441	-80.500552	1018.51	4.50	1023.01
14	40.336299	-80.500585	1021.37	4.50	1025.87
15	40.335468	-80.500836	1043.53	4.50	1048.03
16	40.333929	-80.501467	1070.57	4.50	1075.07
17	40.333609	-80.501485	1079.77	4.50	1084.27
18	40.333263	-80.501293	1076.86	4.50	1081.36
19	40.333054	-80.501268	1072.18	4.50	1076.68
20	40.332669	-80.501535	1084.00	4.50	1088.50
21	40.331864	-80.501859	1102.79	4.50	1107.29
22	40.330703	-80.501643	1131.47	4.50	1135.97
23	40.330583	-80.501526	1134.98	4.50	1139.48
24	40.330539	-80.501355	1138.74	4.50	1143.24

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	40.334100	-80.503481	1014.69	6.00
OP 2	2	40.330369	-80.501957	1122.80	6.00
OP 3	3	40.330369	-80.501957	1122.80	16.00
OP 10	10	40.336839	-80.501315	1021.33	6.00



## Obstruction Components

**Name:** Treeline A1  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.328355	-80.506452	1058.82
2	40.333085	-80.503883	1077.14
3	40.334344	-80.504355	1045.72

**Name:** Treeline A2  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.334344	-80.504355	1045.72
2	40.336839	-80.501415	1030.04
3	40.340159	-80.502574	1043.70
4	40.344221	-80.505369	1062.03

# 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 kWh
			min	hr	min	hr	
A1	25.0	180.0	633	10.6	0	0.0	-
A2	25.0	180.0	943	15.7	0	0.0	-
A3	25.0	180.0	0	0.0	0	0.0	-
A4	25.0	180.0	106	1.8	0	0.0	-
A5	25.0	180.0	347	5.8	0	0.0	-
A6	25.0	180.0	250	4.2	512	8.5	-
A7	25.0	180.0	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
McCready Rd	0	0.0	0	0.0
State Line Rd	1,725	28.8	512	8.5
OP 1	0	0.0	0	0.0
OP 2	226	3.8	0	0.0
OP 3	328	5.5	0	0.0
OP 10	0	0.0	0	0.0

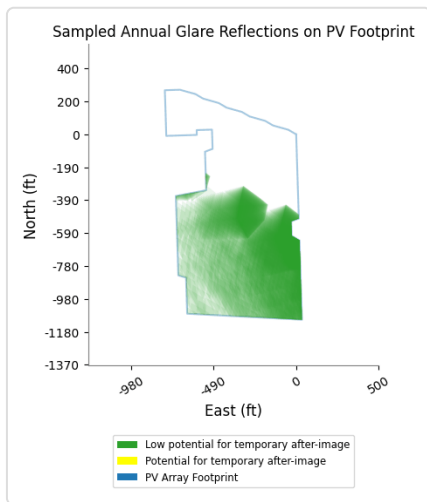
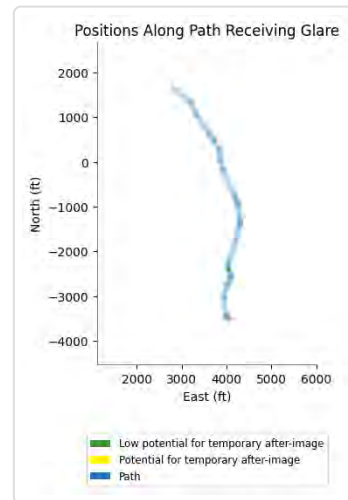
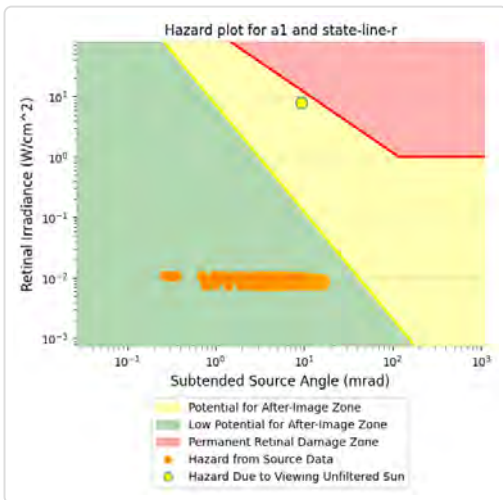
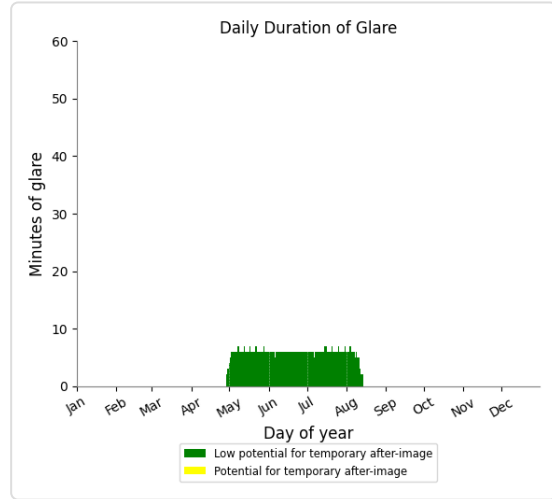
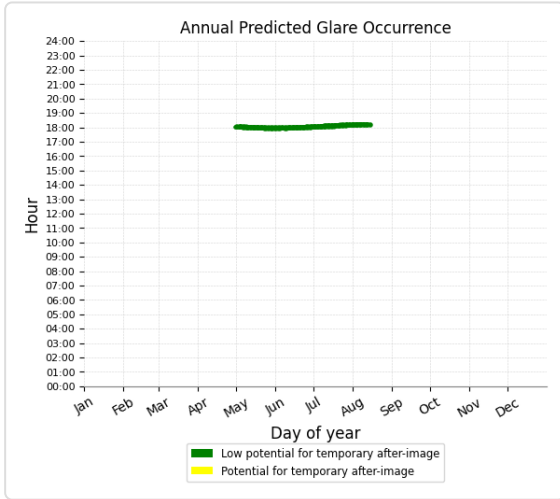
## PV: A1 low potential for temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	633	10.6	0	0.0
McCready Rd	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 10	0	0.0	0	0.0

## A1 and Route: State Line Rd

Yellow glare: none  
Green glare: 633 min.



## A1 and Route: McCreedy Rd

No glare found

## A1 and OP 1

No glare found

## A1 and OP 2

No glare found

## A1 and OP 3

No glare found

## A1 and OP 10

No glare found

## PV: A2 low potential for temporary after-image

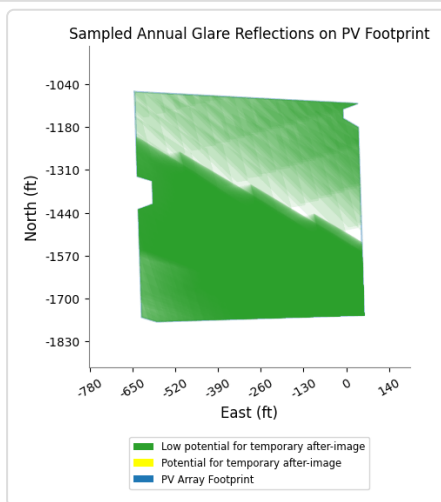
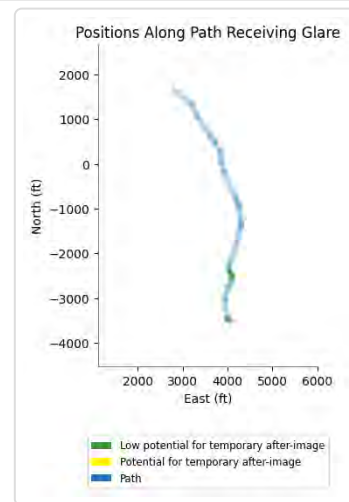
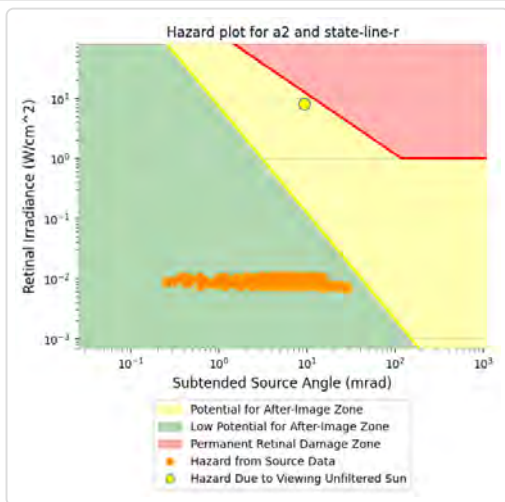
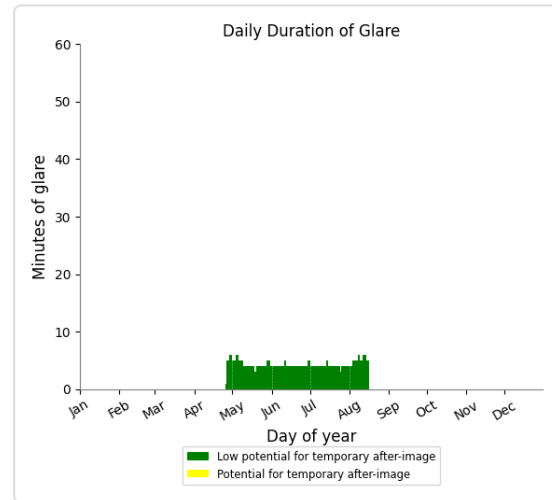
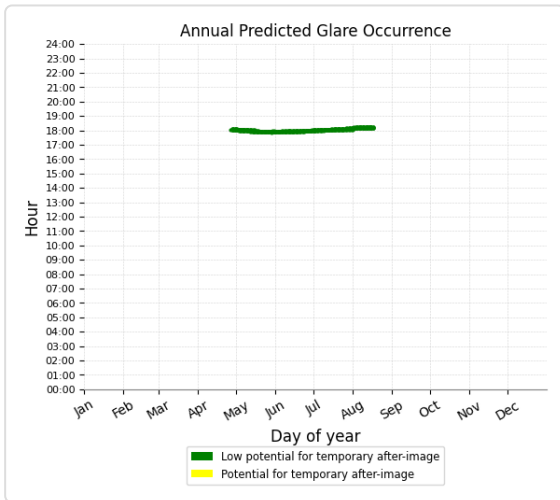
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	491	8.2	0	0.0
McCready Rd	0	0.0	0	0.0
OP 2	226	3.8	0	0.0
OP 3	226	3.8	0	0.0
OP 1	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## A2 and Route: State Line Rd

Yellow glare: none

Green glare: 491 min.



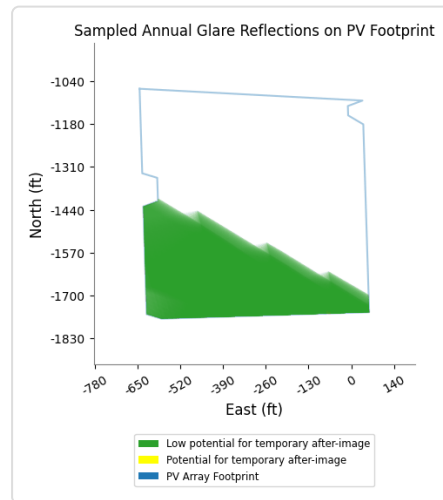
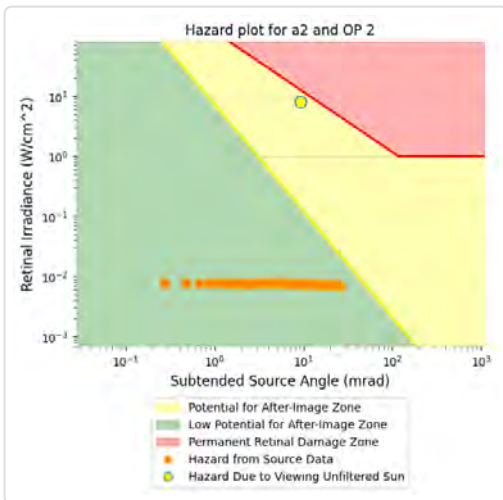
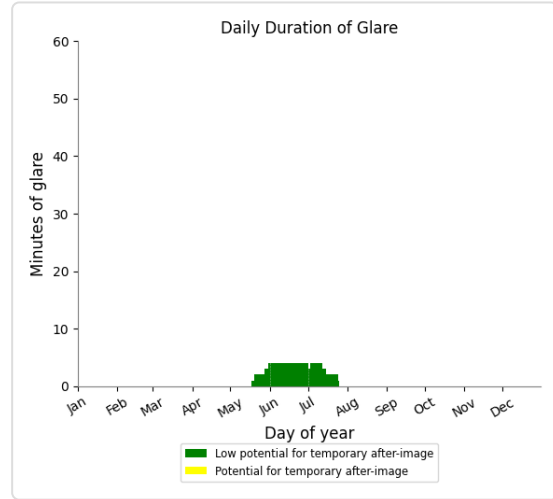
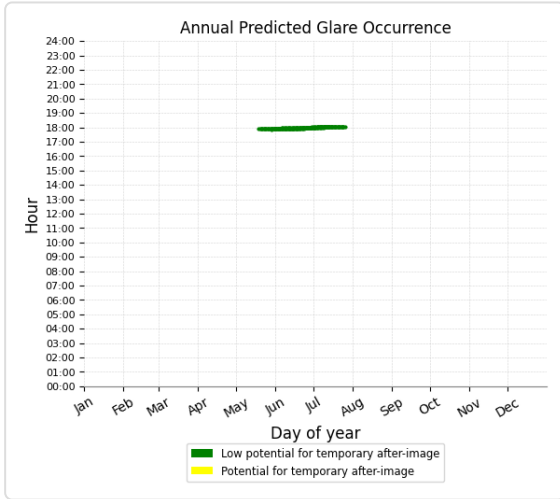
## A2 and Route: McCready Rd

No glare found

## A2 and OP 2

Yellow glare: none

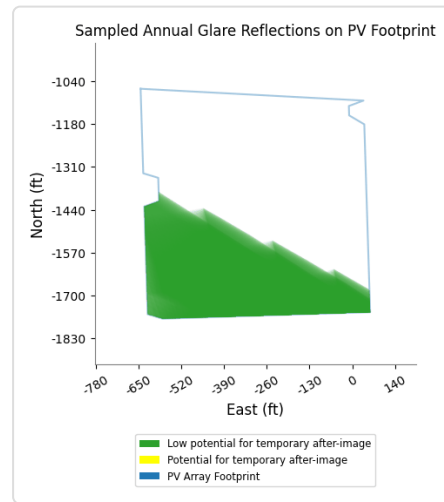
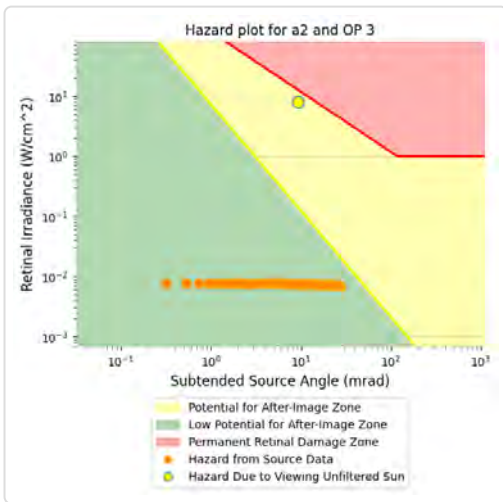
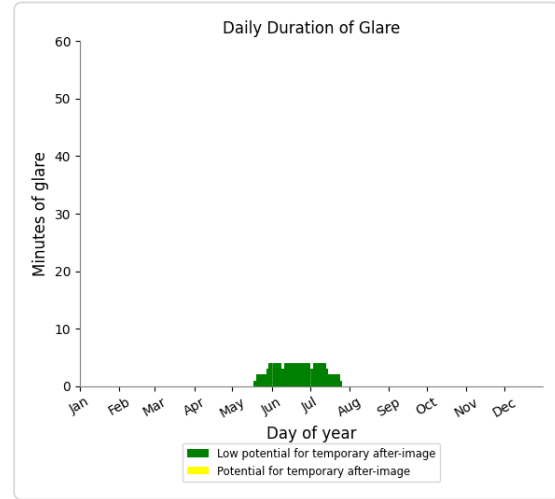
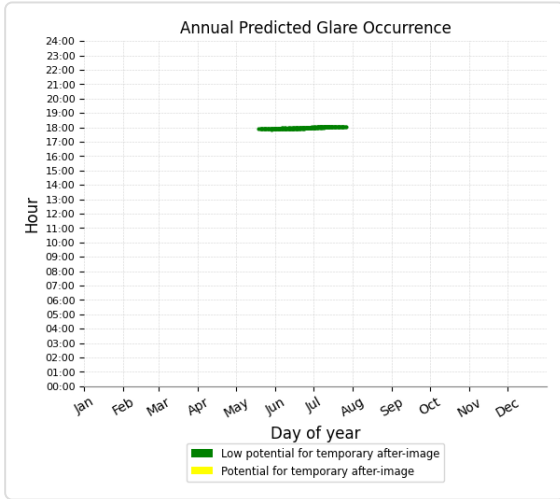
Green glare: 226 min.



## A2 and OP 3

Yellow glare: none

Green glare: 226 min.



## A2 and OP 1

No glare found

## A2 and OP 10

No glare found

**PV: A3** no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
McCready Rd	0	0.0	0	0.0
State Line Rd	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 10	0	0.0	0	0.0

**A3 and Route: McCready Rd**

No glare found

**A3 and Route: State Line Rd**

No glare found

**A3 and OP 1**

No glare found

**A3 and OP 2**

No glare found

**A3 and OP 3**

No glare found

**A3 and OP 10**

No glare found



**PV: A4** low potential for temporary after-image

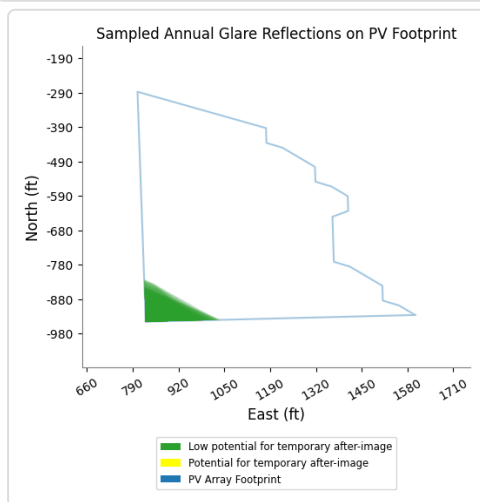
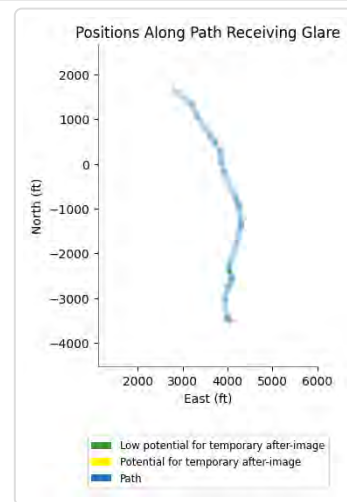
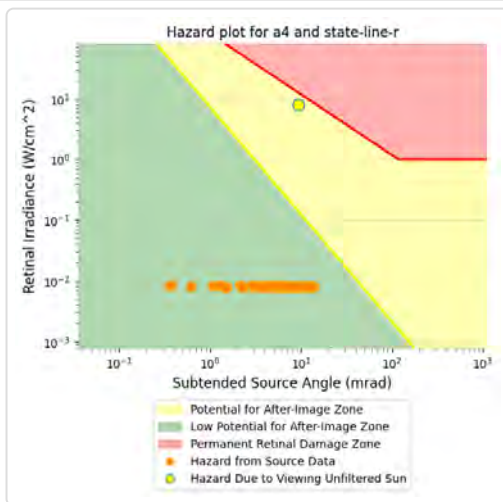
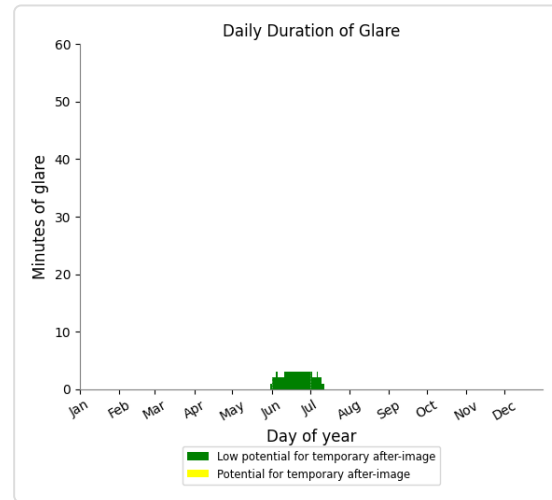
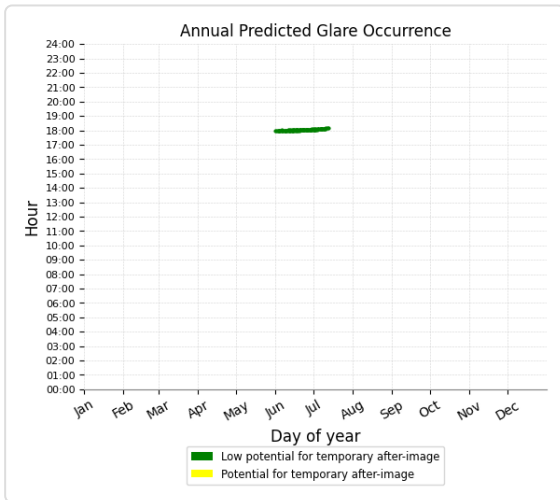
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	106	1.8	0	0.0
McCready Rd	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 10	0	0.0	0	0.0

## A4 and Route: State Line Rd

Yellow glare: none

Green glare: 106 min.



## A4 and Route: McCready Rd

No glare found

## A4 and OP 1

No glare found

## A4 and OP 2

No glare found

## A4 and OP 3

No glare found

## A4 and OP 10

No glare found

## PV: A5 low potential for temporary after-image

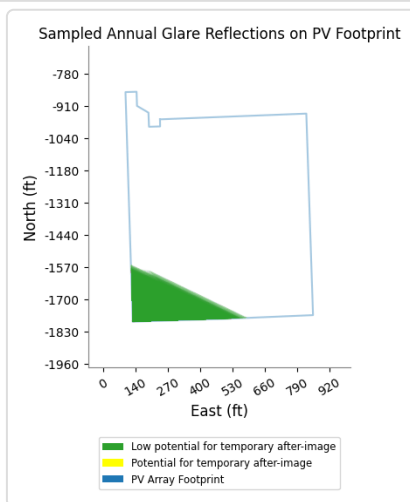
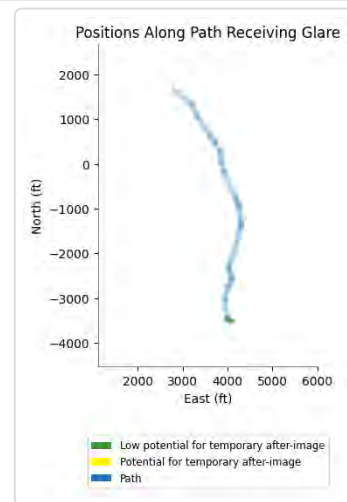
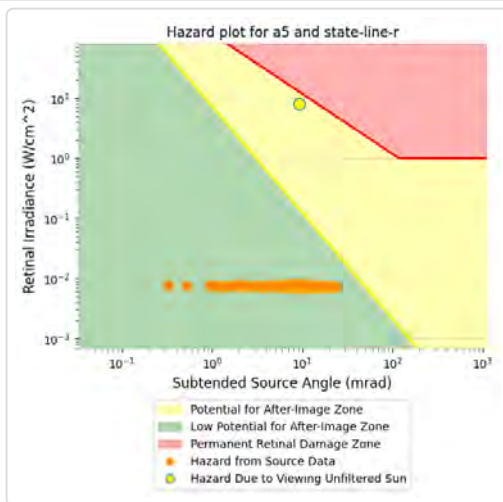
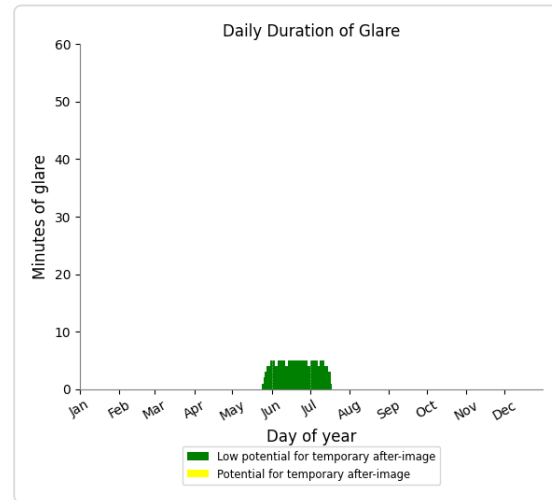
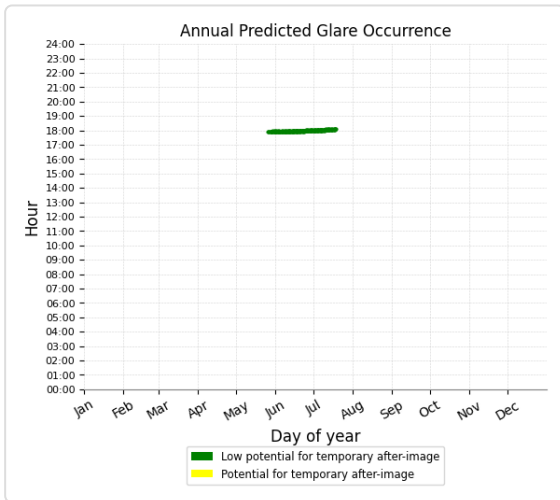
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	245	4.1	0	0.0
McCready Rd	0	0.0	0	0.0
OP 3	102	1.7	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## A5 and Route: State Line Rd

Yellow glare: none

Green glare: 245 min.



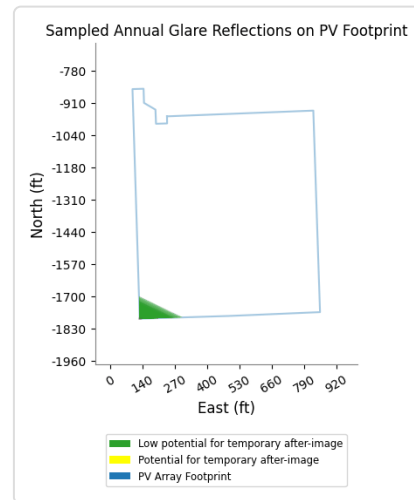
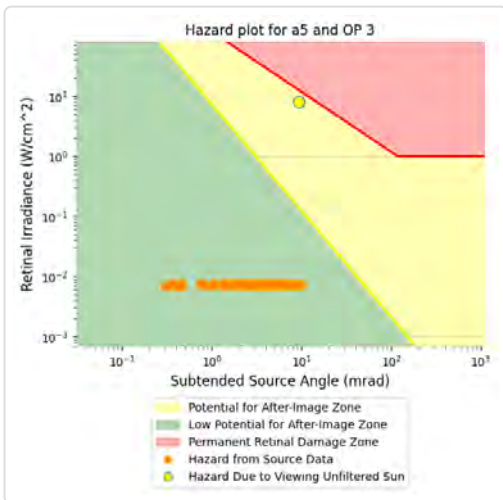
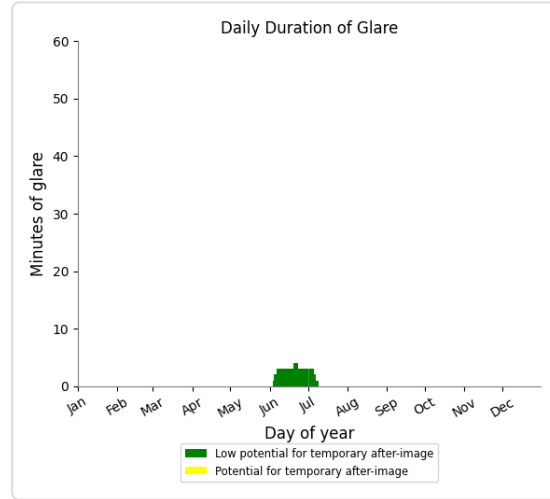
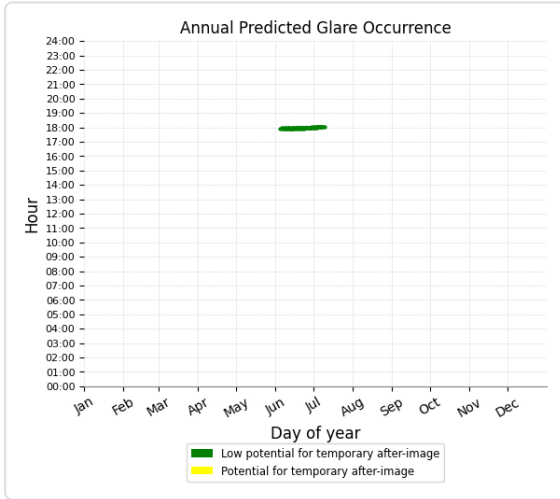
## A5 and Route: McCready Rd

No glare found



### A5 and OP 3

Yellow glare: none  
 Green glare: 102 min.



### A5 and OP 1

No glare found

### A5 and OP 2

No glare found

### A5 and OP 10

No glare found

**PV: A6** potential temporary after-image

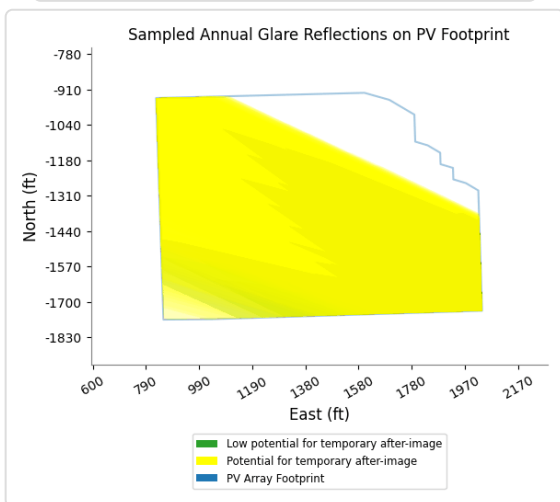
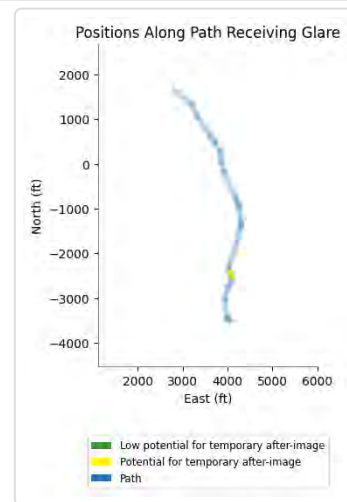
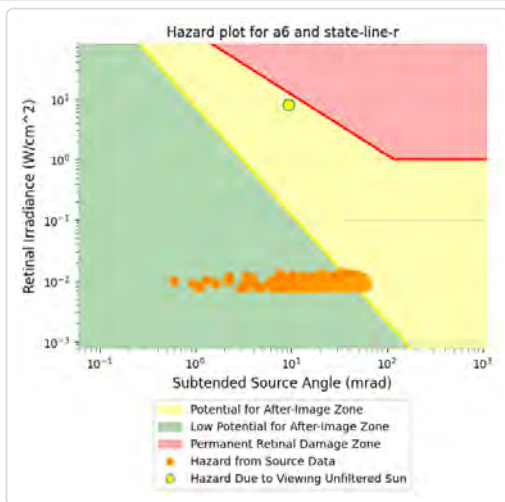
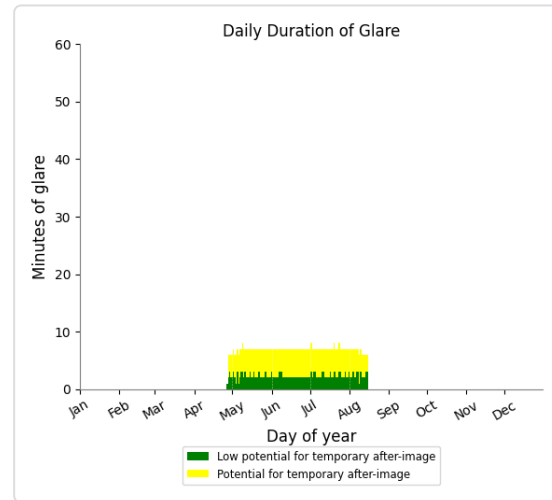
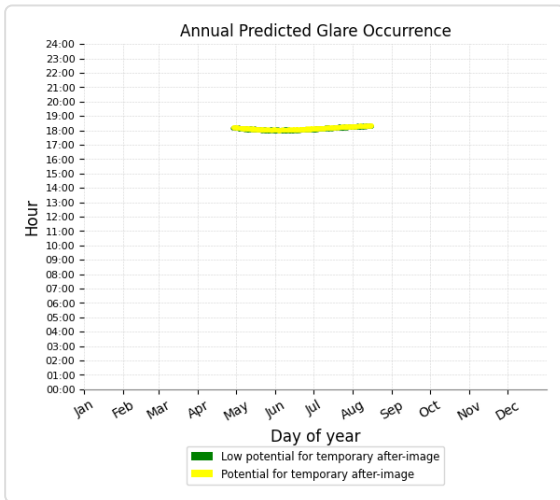
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	250	4.2	512	8.5
McCready Rd	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 10	0	0.0	0	0.0

## A6 and Route: State Line Rd

Yellow glare: 512 min.

Green glare: 250 min.



## A6 and Route: McCready Rd

No glare found



## A6 and OP 1

No glare found

## A6 and OP 2

No glare found

## A6 and OP 3

No glare found

## A6 and OP 10

No glare found

## PV: A7 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
McCready Rd	0	0.0	0	0.0
State Line Rd	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 10	0	0.0	0	0.0

## A7 and Route: McCready Rd

No glare found

## A7 and Route: State Line Rd

No glare found

## A7 and OP 1

No glare found

## A7 and OP 2

No glare found

## A7 and OP 3

No glare found

## A7 and OP 10

No glare found

# Assumptions

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"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/](http://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

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## Group B

# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar North**

300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section B\_revised**

Client: REV Renewables

Created 20 Sep, 2025

Updated 22 Oct, 2025

Time-step 1 minute

Timezone offset UTC-5

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m<sup>2</sup>

Category 100 MW to 1 GW

Site ID 159915.26057

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 kWh
			min	hr	min	hr	
B1	25.0	180.0	1,274	21.2	0	0.0	-
B10	25.0	180.0	3,828	63.8	0	0.0	-
B11	25.0	180.0	1,930	32.2	0	0.0	-
B12	25.0	180.0	5,907	98.5	905	15.1	-
B2	25.0	180.0	1,951	32.5	0	0.0	-
B3	25.0	180.0	15	0.2	0	0.0	-
B4	25.0	180.0	1,811	30.2	21	0.3	-
B5	25.0	180.0	805	13.4	1	0.0	-
B6	25.0	180.0	2,107	35.1	0	0.0	-
B7	25.0	180.0	3,608	60.1	179	3.0	-
B8	25.0	180.0	2,624	43.7	0	0.0	-
B9	25.0	180.0	4,836	80.6	492	8.2	-

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
McCready Rd	0	0.0	0	0.0
State Line Rd	16,082	268.0	1,598	26.6
OP 1	0	0.0	0	0.0



Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 2	5,317	88.6	0	0.0
OP 3	6,256	104.3	0	0.0
OP 4	3,041	50.7	0	0.0
OP 10	0	0.0	0	0.0

# Component Data

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## PV Arrays

**Name:** B1

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.335282	-80.518062	1138.20	5.00	1143.20
2	40.334375	-80.518025	1132.67	5.00	1137.67
3	40.334300	-80.517858	1137.30	5.00	1142.30
4	40.334311	-80.517370	1146.93	5.00	1151.93
5	40.334390	-80.517371	1150.47	5.00	1155.47
6	40.334406	-80.516719	1156.74	5.00	1161.74
7	40.334327	-80.516714	1153.15	5.00	1158.15
8	40.334289	-80.516549	1154.23	5.00	1159.23
9	40.334094	-80.516541	1153.24	5.00	1158.24
10	40.334036	-80.517193	1142.96	5.00	1147.96
11	40.333957	-80.517192	1144.76	5.00	1149.76
12	40.333930	-80.518336	1130.91	5.00	1135.91
13	40.334088	-80.518342	1130.43	5.00	1135.43
14	40.334126	-80.518507	1130.78	5.00	1135.78
15	40.334400	-80.518518	1126.25	5.00	1131.25
16	40.334392	-80.518843	1116.39	5.00	1121.39
17	40.333169	-80.518793	1132.87	5.00	1137.87
18	40.333131	-80.518628	1129.75	5.00	1134.75
19	40.333014	-80.518623	1121.69	5.00	1126.69
20	40.332939	-80.518457	1122.52	5.00	1127.52
21	40.332901	-80.518292	1120.78	5.00	1125.78
22	40.332548	-80.518277	1116.00	5.00	1121.00
23	40.332518	-80.517785	1126.53	5.00	1131.53
24	40.332243	-80.517774	1127.41	5.00	1132.41
25	40.332209	-80.517445	1129.68	5.00	1134.68
26	40.332014	-80.517437	1132.18	5.00	1137.18
27	40.331964	-80.517762	1128.51	5.00	1133.51
28	40.331877	-80.518086	1113.55	5.00	1118.55
29	40.331761	-80.518081	1113.54	5.00	1118.54
30	40.331723	-80.517916	1116.14	5.00	1121.14
31	40.331819	-80.515632	1169.44	5.00	1174.44
32	40.332806	-80.515672	1182.89	5.00	1187.89
33	40.332881	-80.515839	1181.00	5.00	1186.00
34	40.332960	-80.515842	1179.80	5.00	1184.80
35	40.333006	-80.515681	1181.90	5.00	1186.90
36	40.333834	-80.515715	1170.61	5.00	1175.61
37	40.335021	-80.515763	1171.76	5.00	1176.76
38	40.335096	-80.515930	1176.17	5.00	1181.17
39	40.335175	-80.515933	1177.68	5.00	1182.68
40	40.335221	-80.515771	1176.12	5.00	1181.12
41	40.335337	-80.515776	1179.47	5.00	1184.47

**Name:** B10

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.331710	-80.508534	1168.19	5.00	1173.19
2	40.331748	-80.508699	1170.93	5.00	1175.93
3	40.331864	-80.508703	1166.13	5.00	1171.13
4	40.331902	-80.508869	1170.92	5.00	1175.92
5	40.332018	-80.508873	1168.22	5.00	1173.22
6	40.332056	-80.509038	1167.10	5.00	1172.10
7	40.332331	-80.509050	1162.78	5.00	1167.78
8	40.332361	-80.509542	1153.28	5.00	1158.28
9	40.332715	-80.509556	1147.45	5.00	1152.45
10	40.332691	-80.510535	1144.22	5.00	1149.22
11	40.332654	-80.510533	1144.49	5.00	1149.49
12	40.332579	-80.510366	1145.32	5.00	1150.32
13	40.332541	-80.510201	1145.54	5.00	1150.54
14	40.332425	-80.510197	1146.03	5.00	1151.03
15	40.332391	-80.509868	1147.07	5.00	1152.07
16	40.332116	-80.509857	1150.46	5.00	1155.46
17	40.332070	-80.510019	1148.32	5.00	1153.32
18	40.331875	-80.510011	1149.77	5.00	1154.77
19	40.331829	-80.510172	1147.38	5.00	1152.38
20	40.331746	-80.510332	1145.90	5.00	1150.90
21	40.331709	-80.510331	1145.88	5.00	1150.88
22	40.331671	-80.510166	1148.40	5.00	1153.40



Name: B11

Axis tracking: Fixed (no rotation)

Tilt: 25.0°

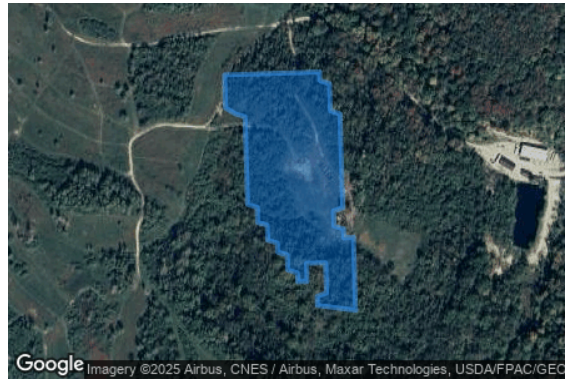
Orientation: 180.0°

Rated power: -

Panel material: Smooth glass with AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.335277	-80.508350	1121.62	5.00	1126.62
2	40.335265	-80.508350	1121.79	5.00	1126.79
3	40.334844	-80.508333	1124.41	5.00	1129.41
4	40.334769	-80.508166	1126.82	5.00	1131.82
5	40.334731	-80.508001	1131.19	5.00	1136.19
6	40.334061	-80.507974	1128.64	5.00	1133.64
7	40.333587	-80.507954	1122.54	5.00	1127.54
8	40.333549	-80.507789	1128.56	5.00	1133.56
9	40.333353	-80.507781	1124.86	5.00	1129.86
10	40.333315	-80.507616	1134.32	5.00	1139.32
11	40.333120	-80.507608	1142.32	5.00	1147.32
12	40.333082	-80.507443	1150.64	5.00	1155.64
13	40.332966	-80.507438	1149.84	5.00	1154.84
14	40.332928	-80.507273	1158.07	5.00	1163.07
15	40.332732	-80.507265	1156.01	5.00	1161.01
16	40.332694	-80.507100	1157.65	5.00	1162.65
17	40.332578	-80.507095	1151.33	5.00	1156.33
18	40.332582	-80.506934	1152.58	5.00	1157.58
19	40.332777	-80.506942	1158.10	5.00	1163.10
20	40.332819	-80.506943	1158.97	5.00	1163.97
21	40.332827	-80.506616	1145.61	5.00	1150.61
22	40.332511	-80.506602	1136.14	5.00	1141.14
23	40.332431	-80.506599	1134.40	5.00	1139.40
24	40.332386	-80.506760	1136.43	5.00	1141.43
25	40.332269	-80.506755	1130.28	5.00	1135.28
26	40.332206	-80.506099	1121.16	5.00	1126.16
27	40.333155	-80.506137	1156.12	5.00	1161.12
28	40.333151	-80.506303	1155.69	5.00	1160.69
29	40.333267	-80.506307	1156.14	5.00	1161.14
30	40.333305	-80.506472	1157.19	5.00	1162.19
31	40.333501	-80.506480	1157.76	5.00	1162.76
32	40.333547	-80.506319	1157.09	5.00	1162.09
33	40.334533	-80.506359	1150.59	5.00	1155.59
34	40.334770	-80.506369	1142.50	5.00	1147.50
35	40.334808	-80.506534	1146.55	5.00	1151.55
36	40.335162	-80.506548	1138.43	5.00	1143.43
37	40.335200	-80.506713	1138.50	5.00	1143.50
38	40.335316	-80.506718	1133.00	5.00	1138.00
39	40.335281	-80.508187	1124.92	5.00	1129.92

**Name:** B12

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.332206	-80.506099	1121.16	5.00	1126.16
2	40.332168	-80.505934	1120.94	5.00	1125.94
3	40.331814	-80.505919	1103.66	5.00	1108.66
4	40.331776	-80.505754	1104.73	5.00	1109.73
5	40.331660	-80.505749	1098.01	5.00	1103.01
6	40.331585	-80.505583	1098.64	5.00	1103.64
7	40.331600	-80.504931	1106.11	5.00	1111.11
8	40.331875	-80.504942	1116.75	5.00	1121.75
9	40.331921	-80.504780	1115.19	5.00	1120.19
10	40.332591	-80.504808	1129.47	5.00	1134.47
11	40.333619	-80.504850	1115.54	5.00	1120.54
12	40.333657	-80.505015	1119.55	5.00	1124.55
13	40.333852	-80.505023	1115.41	5.00	1120.41
14	40.333924	-80.505353	1129.64	5.00	1134.64
15	40.333962	-80.505518	1137.19	5.00	1142.19
16	40.334078	-80.505523	1135.68	5.00	1140.68
17	40.334116	-80.505688	1141.52	5.00	1146.52
18	40.334232	-80.505692	1139.82	5.00	1144.82
19	40.334307	-80.505859	1143.60	5.00	1148.60
20	40.334345	-80.506024	1146.85	5.00	1151.85
21	40.334541	-80.506032	1142.25	5.00	1147.25
22	40.334537	-80.506194	1146.70	5.00	1151.70
23	40.333155	-80.506137	1156.12	5.00	1161.12

**Name:** B2

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.331723	-80.517916	1116.14	5.00	1121.14
2	40.331527	-80.517908	1115.75	5.00	1120.75
3	40.331481	-80.518070	1113.67	5.00	1118.67
4	40.331398	-80.518230	1114.17	5.00	1119.17
5	40.331045	-80.518216	1115.30	5.00	1120.30
6	40.330999	-80.518377	1113.74	5.00	1118.74
7	40.330487	-80.518356	1112.74	5.00	1117.74
8	40.330441	-80.518518	1110.38	5.00	1115.38
9	40.330167	-80.518507	1112.47	5.00	1117.47
10	40.330121	-80.518668	1110.14	5.00	1115.14
11	40.329767	-80.518654	1117.22	5.00	1122.22
12	40.329807	-80.517020	1170.12	5.00	1175.12
13	40.329826	-80.516205	1188.51	5.00	1193.51
14	40.330338	-80.516226	1180.89	5.00	1185.89
15	40.330734	-80.516242	1170.74	5.00	1175.74
16	40.330791	-80.515590	1178.17	5.00	1183.17
17	40.331819	-80.515632	1169.44	5.00	1174.44

**Name:** B3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.335136	-80.514235	1167.68	5.00	1172.68
2	40.335105	-80.515540	1173.05	5.00	1178.05
3	40.334830	-80.515529	1169.79	5.00	1174.79
4	40.334846	-80.514877	1167.96	5.00	1172.96
5	40.334933	-80.514554	1167.35	5.00	1172.35
6	40.335016	-80.514394	1167.28	5.00	1172.28
7	40.335099	-80.514233	1167.53	5.00	1172.53

**Name:** B4

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

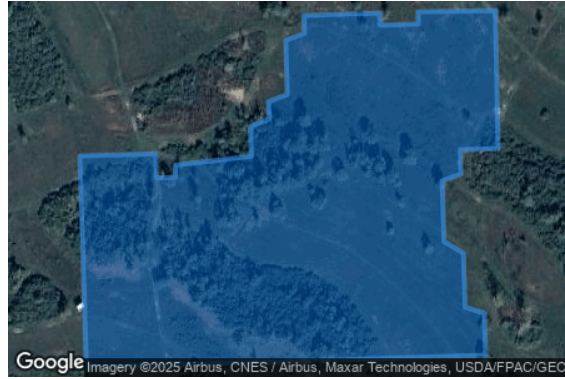
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.335175	-80.512599	1167.10	5.00	1172.10
2	40.335096	-80.512596	1166.28	5.00	1171.28
3	40.335089	-80.512923	1165.88	5.00	1170.88
4	40.335168	-80.512928	1166.30	5.00	1171.30
5	40.335152	-80.513579	1166.29	5.00	1171.29
6	40.335036	-80.513575	1165.36	5.00	1170.36
7	40.334990	-80.513736	1165.93	5.00	1170.93
8	40.334636	-80.513722	1167.29	5.00	1172.29
9	40.334591	-80.513884	1166.97	5.00	1171.97
10	40.334474	-80.513879	1168.38	5.00	1173.38
11	40.334428	-80.514041	1167.99	5.00	1172.99
12	40.334233	-80.514033	1171.65	5.00	1176.65
13	40.334175	-80.514684	1169.69	5.00	1174.69
14	40.334096	-80.514683	1172.26	5.00	1177.26
15	40.334092	-80.514846	1172.78	5.00	1177.78
16	40.334251	-80.514853	1168.79	5.00	1173.79
17	40.334235	-80.515505	1169.77	5.00	1174.77
18	40.332853	-80.515448	1183.95	5.00	1188.95
19	40.332920	-80.512672	1163.55	5.00	1168.55
20	40.332935	-80.512018	1148.12	5.00	1153.12
21	40.333210	-80.512030	1148.67	5.00	1153.67
22	40.333248	-80.512195	1149.61	5.00	1154.61
23	40.333601	-80.512209	1151.93	5.00	1156.93
24	40.333677	-80.512376	1154.71	5.00	1159.71
25	40.334072	-80.512392	1159.60	5.00	1164.60
26	40.334118	-80.512230	1158.43	5.00	1163.43
27	40.334276	-80.512237	1159.11	5.00	1164.11
28	40.334284	-80.511910	1158.44	5.00	1163.44
29	40.335185	-80.511936	1169.12	5.00	1174.12



**Name:** B5

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

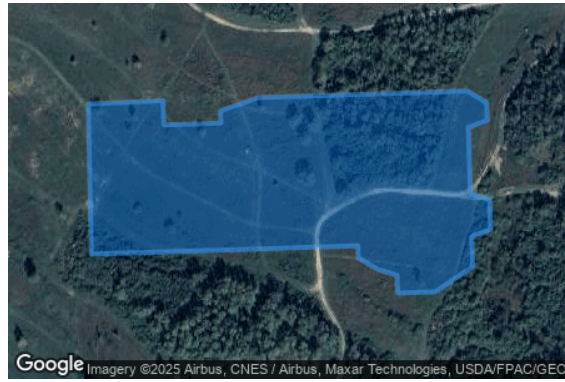
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.334252	-80.509946	1154.29	5.00	1159.29
2	40.334259	-80.509619	1154.48	5.00	1159.48
3	40.334180	-80.509614	1152.65	5.00	1157.65
4	40.334105	-80.509447	1149.12	5.00	1154.12
5	40.334067	-80.509282	1145.55	5.00	1150.55
6	40.333951	-80.509278	1143.54	5.00	1148.54
7	40.333959	-80.508953	1134.16	5.00	1139.16
8	40.334042	-80.508792	1132.34	5.00	1137.34
9	40.334125	-80.508632	1127.03	5.00	1132.03
10	40.334320	-80.508640	1129.80	5.00	1134.80
11	40.334366	-80.508478	1122.47	5.00	1127.47
12	40.334561	-80.508486	1123.21	5.00	1128.21
13	40.334599	-80.508652	1129.31	5.00	1134.31
14	40.335032	-80.508669	1129.07	5.00	1134.07
15	40.335078	-80.508508	1126.08	5.00	1131.08
16	40.335194	-80.508512	1125.62	5.00	1130.62
17	40.335269	-80.508679	1128.94	5.00	1133.94
18	40.335226	-80.510475	1197.53	5.00	1202.53
19	40.335139	-80.510798	1195.52	5.00	1200.52
20	40.335060	-80.510797	1191.41	5.00	1196.41
21	40.335049	-80.511285	1177.63	5.00	1182.63
22	40.335207	-80.511293	1185.41	5.00	1190.41
23	40.335185	-80.511936	1169.12	5.00	1174.12
24	40.334284	-80.511910	1158.44	5.00	1163.44
25	40.334205	-80.511905	1158.34	5.00	1163.34

**Name:** B6

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

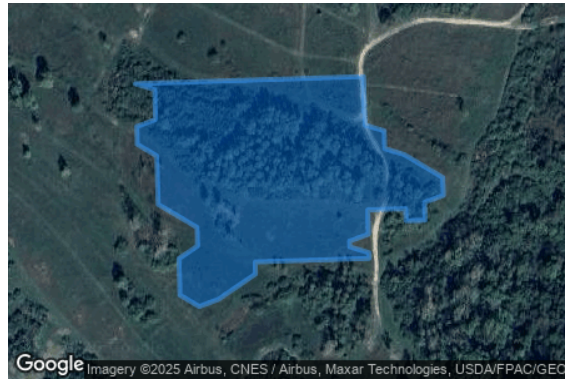
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.332751	-80.511357	1145.49	5.00	1150.49
2	40.332797	-80.511195	1145.14	5.00	1150.14
3	40.332880	-80.511035	1145.13	5.00	1150.13
4	40.332963	-80.510875	1145.09	5.00	1150.09
5	40.333042	-80.510876	1145.73	5.00	1150.73
6	40.333065	-80.509897	1143.40	5.00	1148.40
7	40.333102	-80.509899	1143.44	5.00	1148.44
8	40.333140	-80.510064	1143.56	5.00	1148.56
9	40.333178	-80.510066	1143.77	5.00	1148.77
10	40.333223	-80.509904	1143.39	5.00	1148.39
11	40.333382	-80.509909	1145.84	5.00	1150.84
12	40.333389	-80.509584	1141.73	5.00	1146.73
13	40.333310	-80.509579	1140.38	5.00	1145.38
14	40.333314	-80.509417	1138.28	5.00	1143.28
15	40.333431	-80.509422	1139.50	5.00	1144.50
16	40.333476	-80.509260	1137.37	5.00	1142.37
17	40.333593	-80.509265	1138.06	5.00	1143.06
18	40.333668	-80.509431	1143.49	5.00	1148.49
19	40.333743	-80.509598	1147.25	5.00	1152.25
20	40.333781	-80.509763	1150.22	5.00	1155.22
21	40.333897	-80.509768	1151.34	5.00	1156.34
22	40.333935	-80.509933	1153.04	5.00	1158.04
23	40.334252	-80.509946	1154.29	5.00	1159.29
24	40.334205	-80.511905	1158.34	5.00	1163.34
25	40.334167	-80.511740	1159.38	5.00	1164.38
26	40.333971	-80.511732	1157.38	5.00	1162.38
27	40.333926	-80.511894	1155.51	5.00	1160.51
28	40.333809	-80.511889	1153.69	5.00	1158.69
29	40.333734	-80.511722	1153.76	5.00	1158.76
30	40.333418	-80.511709	1149.76	5.00	1154.76
31	40.333342	-80.511543	1149.07	5.00	1154.07
32	40.333267	-80.511376	1148.90	5.00	1153.90
33	40.333146	-80.511371	1148.08	5.00	1153.08
34	40.333063	-80.511531	1147.60	5.00	1152.60
35	40.332826	-80.511523	1146.58	5.00	1151.58

**Name:** B7

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

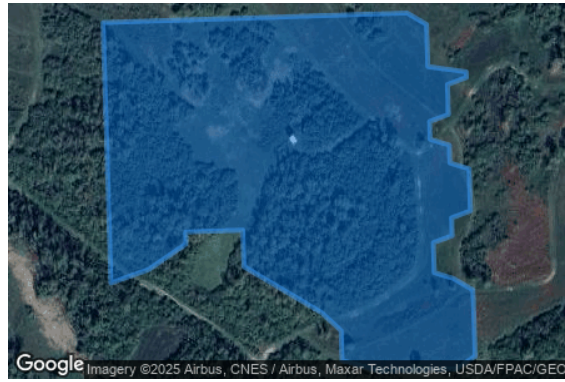
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.331065	-80.514068	1150.21	5.00	1155.21
2	40.331152	-80.513745	1147.59	5.00	1152.59
3	40.331235	-80.513585	1158.26	5.00	1163.26
4	40.331318	-80.513424	1164.91	5.00	1169.91
5	40.331397	-80.513426	1171.70	5.00	1176.70
6	40.331409	-80.512936	1178.24	5.00	1183.24
7	40.331172	-80.512926	1165.30	5.00	1170.30
8	40.331096	-80.512759	1164.74	5.00	1169.74
9	40.331021	-80.512593	1162.79	5.00	1167.79
10	40.330946	-80.512426	1159.80	5.00	1164.80
11	40.330871	-80.512259	1155.06	5.00	1160.06
12	40.330754	-80.512091	1149.94	5.00	1154.94
13	40.330558	-80.512083	1146.83	5.00	1151.83
14	40.330487	-80.511753	1147.15	5.00	1152.15
15	40.330503	-80.511101	1148.05	5.00	1153.05
16	40.330586	-80.510941	1150.17	5.00	1155.17
17	40.330665	-80.510943	1152.19	5.00	1157.19
18	40.330939	-80.510954	1150.28	5.00	1155.28
19	40.331018	-80.510959	1147.63	5.00	1152.63
20	40.331094	-80.511125	1147.83	5.00	1152.83
21	40.331132	-80.511291	1148.56	5.00	1153.56
22	40.331327	-80.511298	1147.97	5.00	1152.97
23	40.331373	-80.511137	1146.88	5.00	1151.88
24	40.331489	-80.511142	1147.12	5.00	1152.12
25	40.331535	-80.510980	1146.40	5.00	1151.40
26	40.331809	-80.510991	1146.21	5.00	1151.21
27	40.331847	-80.511156	1146.35	5.00	1151.35
28	40.331964	-80.511161	1146.37	5.00	1151.37
29	40.332002	-80.511326	1147.11	5.00	1152.11
30	40.332118	-80.511331	1145.88	5.00	1150.88
31	40.332164	-80.511169	1145.26	5.00	1150.26
32	40.332359	-80.511177	1143.98	5.00	1148.98
33	40.332405	-80.511015	1144.52	5.00	1149.52
34	40.332442	-80.511017	1144.31	5.00	1149.31
35	40.332476	-80.511345	1143.94	5.00	1148.94
36	40.332751	-80.511357	1145.49	5.00	1150.49
37	40.332826	-80.511523	1146.58	5.00	1151.58
38	40.332763	-80.514136	1199.36	5.00	1204.36

**Name:** B8

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.330820	-80.514385	1176.69	5.00	1181.69
2	40.330936	-80.514390	1175.30	5.00	1180.30
3	40.330982	-80.514228	1163.43	5.00	1168.43
4	40.331065	-80.514068	1150.21	5.00	1155.21
5	40.332763	-80.514136	1199.36	5.00	1204.36
6	40.332732	-80.515443	1183.43	5.00	1188.43
7	40.331941	-80.515411	1154.76	5.00	1159.76
8	40.330955	-80.515370	1182.05	5.00	1187.05
9	40.330880	-80.515204	1181.32	5.00	1186.32
10	40.330800	-80.515201	1180.33	5.00	1185.33
11	40.330816	-80.514547	1180.30	5.00	1185.30

**Name:** B9

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

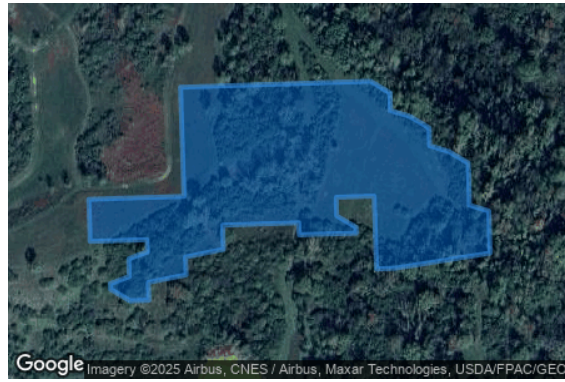
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.330665	-80.510943	1152.19	5.00	1157.19
2	40.330677	-80.510454	1140.34	5.00	1145.34
3	40.330598	-80.510449	1137.44	5.00	1142.44
4	40.330552	-80.510611	1137.04	5.00	1142.04
5	40.330435	-80.510606	1130.72	5.00	1135.72
6	40.330390	-80.510768	1130.03	5.00	1135.03
7	40.330352	-80.510766	1127.87	5.00	1132.87
8	40.330277	-80.510600	1126.85	5.00	1131.85
9	40.330281	-80.510438	1125.89	5.00	1130.89
10	40.330397	-80.510443	1131.16	5.00	1136.16
11	40.330447	-80.510118	1129.61	5.00	1134.61
12	40.330563	-80.510122	1135.88	5.00	1140.88
13	40.330613	-80.509797	1129.96	5.00	1134.96
14	40.330729	-80.509802	1136.20	5.00	1141.20
15	40.330771	-80.509802	1139.14	5.00	1144.14
16	40.330787	-80.509150	1134.14	5.00	1139.14
17	40.330708	-80.509145	1130.03	5.00	1135.03
18	40.330720	-80.508657	1141.19	5.00	1146.19
19	40.330757	-80.508658	1141.89	5.00	1146.89
20	40.330832	-80.508825	1140.62	5.00	1145.62
21	40.330953	-80.508828	1146.55	5.00	1151.55
22	40.330961	-80.508503	1149.61	5.00	1154.61
23	40.330486	-80.508482	1143.04	5.00	1148.04
24	40.330490	-80.508320	1147.39	5.00	1152.39
25	40.330589	-80.507507	1171.72	5.00	1176.72
26	40.330863	-80.507518	1167.61	5.00	1172.61
27	40.330901	-80.507683	1166.64	5.00	1171.64
28	40.331176	-80.507694	1161.48	5.00	1166.48
29	40.331251	-80.507861	1162.04	5.00	1167.04
30	40.331289	-80.508026	1161.33	5.00	1166.33
31	40.331405	-80.508031	1160.82	5.00	1165.82
32	40.331480	-80.508197	1162.90	5.00	1167.90
33	40.331518	-80.508362	1167.52	5.00	1172.52
34	40.331635	-80.508367	1165.04	5.00	1170.04
35	40.331710	-80.508534	1168.19	5.00	1173.19
36	40.331671	-80.510166	1148.40	5.00	1153.40
37	40.330959	-80.510137	1146.48	5.00	1151.48
38	40.330939	-80.510954	1150.28	5.00	1155.28



# Route Receptors

**Name:** McCreedy Rd

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



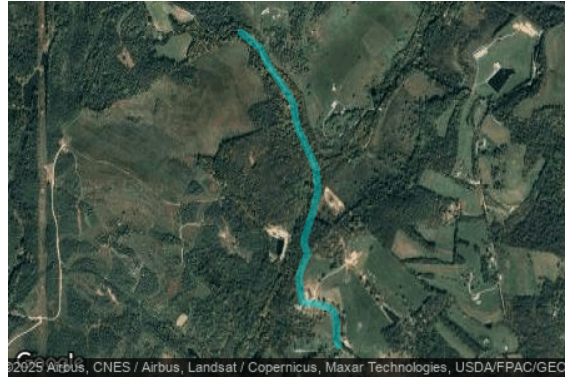
Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.336326	-80.500811	1010.54	4.50	1015.04
2	40.334489	-80.502090	1003.08	4.50	1007.58
3	40.333213	-80.502626	997.25	4.50	1001.75
4	40.331953	-80.503023	992.48	4.50	996.98
5	40.331135	-80.503377	989.19	4.50	993.69
6	40.330449	-80.503850	985.83	4.50	990.33
7	40.330056	-80.504021	986.50	4.50	991.00
8	40.328061	-80.504708	978.69	4.50	983.19
9	40.326833	-80.505673	969.60	4.50	974.10
10	40.326081	-80.506017	964.17	4.50	968.67
11	40.325843	-80.506156	962.07	4.50	966.57
12	40.325213	-80.506210	960.77	4.50	965.27

Name: State Line Rd

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.344659	-80.505812	1064.65	4.50	1069.15
2	40.343841	-80.504503	1058.81	4.50	1063.31
3	40.343040	-80.504009	1051.06	4.50	1055.56
4	40.341999	-80.503063	1043.25	4.50	1047.75
5	40.341474	-80.502615	1042.89	4.50	1047.39
6	40.340932	-80.502216	1037.26	4.50	1041.76
7	40.340241	-80.502105	1032.42	4.50	1036.92
8	40.339659	-80.501909	1028.75	4.50	1033.25
9	40.338116	-80.500994	1016.56	4.50	1021.06
10	40.337799	-80.500792	1015.39	4.50	1019.89
11	40.337471	-80.500662	1014.82	4.50	1019.32
12	40.336597	-80.500576	1015.52	4.50	1020.02
13	40.336441	-80.500552	1018.51	4.50	1023.01
14	40.336299	-80.500585	1021.37	4.50	1025.87
15	40.335468	-80.500836	1043.53	4.50	1048.03
16	40.333929	-80.501467	1070.57	4.50	1075.07
17	40.333609	-80.501485	1079.77	4.50	1084.27
18	40.333263	-80.501293	1076.86	4.50	1081.36
19	40.333054	-80.501268	1072.18	4.50	1076.68
20	40.332669	-80.501535	1084.00	4.50	1088.50
21	40.331864	-80.501859	1102.79	4.50	1107.29
22	40.330703	-80.501643	1131.47	4.50	1135.97
23	40.330583	-80.501526	1134.98	4.50	1139.48
24	40.330519	-80.500791	1152.27	4.50	1156.77
25	40.330384	-80.500040	1157.60	4.50	1162.10
26	40.330251	-80.499676	1159.53	4.50	1164.03
27	40.330024	-80.499420	1164.15	4.50	1168.65
28	40.329398	-80.499267	1173.28	4.50	1177.78
29	40.328581	-80.499259	1199.43	4.50	1203.93
30	40.328317	-80.499127	1209.20	4.50	1213.70

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	40.334100	-80.503481	1014.69	6.00
OP 2	2	40.330369	-80.501957	1122.80	6.00
OP 3	3	40.330369	-80.501957	1122.80	16.00
OP 4	4	40.328134	-80.502018	1133.01	6.00
OP 10	10	40.336839	-80.501315	1021.33	6.00

## Obstruction Components

Name: Treeline B1  
Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.327063	-80.506903	1044.81
2	40.328355	-80.506452	1058.82
3	40.333085	-80.503883	1077.14
4	40.334344	-80.504355	1045.25

**Name:** Treeline B2  
**Top height:** 35.0 ft



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.334344	-80.504355	1045.72
2	40.336839	-80.501415	1030.04
3	40.340159	-80.502574	1043.70
4	40.344221	-80.505369	1062.03

# 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 kWh
			min	hr	min	hr	
B1	25.0	180.0	1,274	21.2	0	0.0	-
B10	25.0	180.0	3,828	63.8	0	0.0	-
B11	25.0	180.0	1,930	32.2	0	0.0	-
B12	25.0	180.0	5,907	98.5	905	15.1	-
B2	25.0	180.0	1,951	32.5	0	0.0	-
B3	25.0	180.0	15	0.2	0	0.0	-
B4	25.0	180.0	1,811	30.2	21	0.3	-
B5	25.0	180.0	805	13.4	1	0.0	-
B6	25.0	180.0	2,107	35.1	0	0.0	-
B7	25.0	180.0	3,608	60.1	179	3.0	-
B8	25.0	180.0	2,624	43.7	0	0.0	-
B9	25.0	180.0	4,836	80.6	492	8.2	-

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
McCready Rd	0	0.0	0	0.0
State Line Rd	16,082	268.0	1,598	26.6
OP 1	0	0.0	0	0.0
OP 2	5,317	88.6	0	0.0
OP 3	6,256	104.3	0	0.0
OP 4	3,041	50.7	0	0.0
OP 10	0	0.0	0	0.0



**PV: B1** low potential for temporary after-image

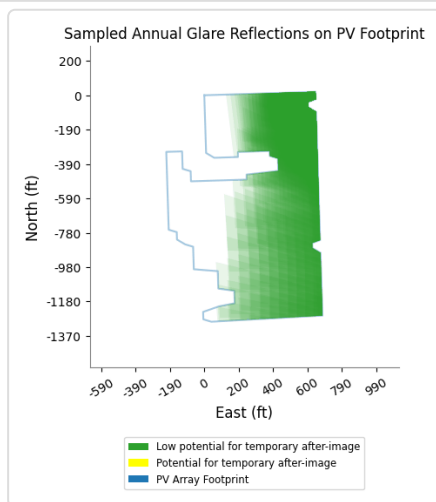
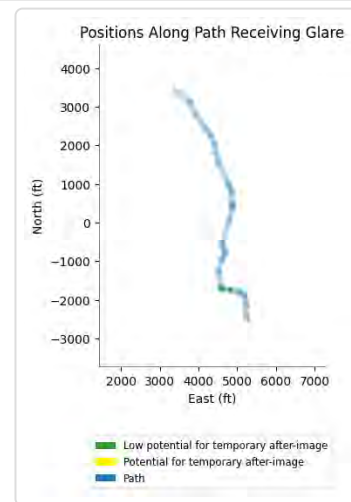
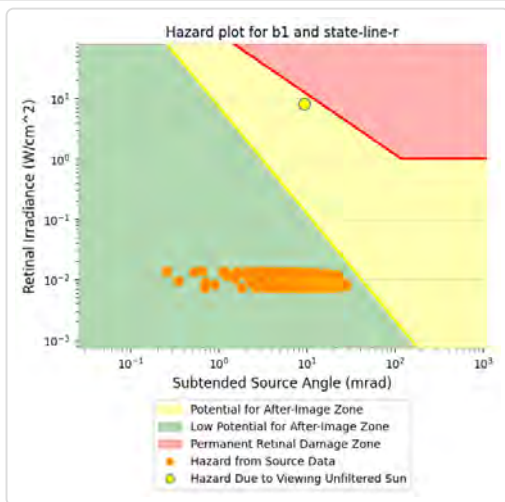
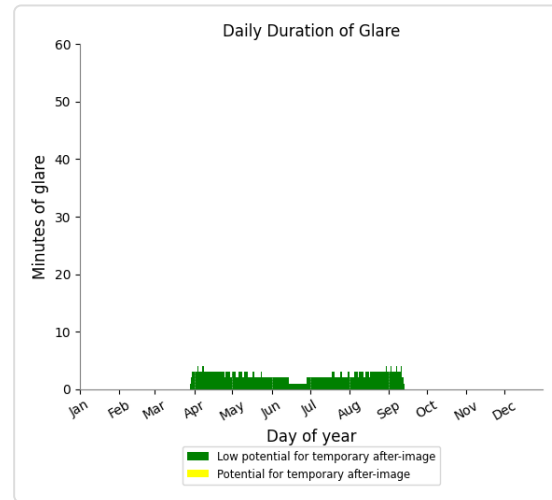
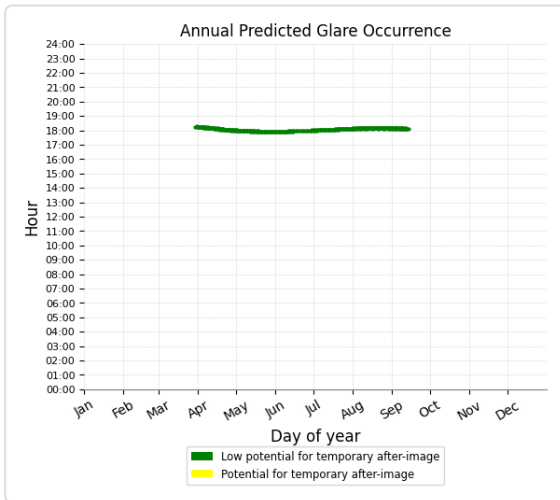
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	410	6.8	0	0.0
McCready Rd	0	0.0	0	0.0
OP 2	355	5.9	0	0.0
OP 3	331	5.5	0	0.0
OP 4	178	3.0	0	0.0
OP 1	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## B1 and Route: State Line Rd

Yellow glare: none

Green glare: 410 min.



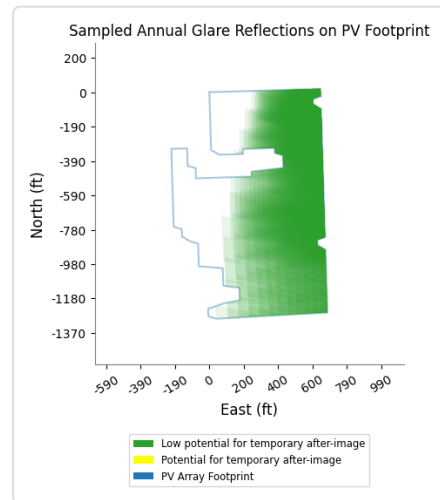
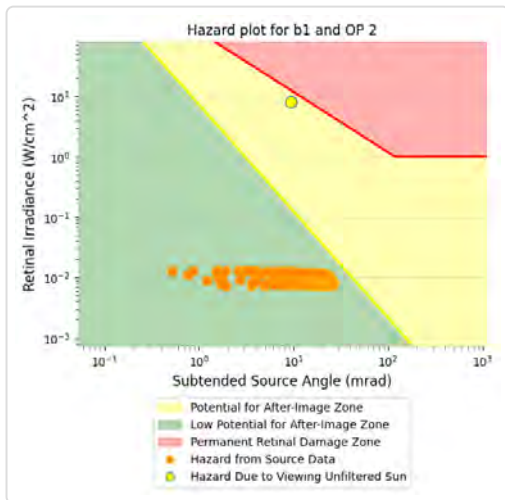
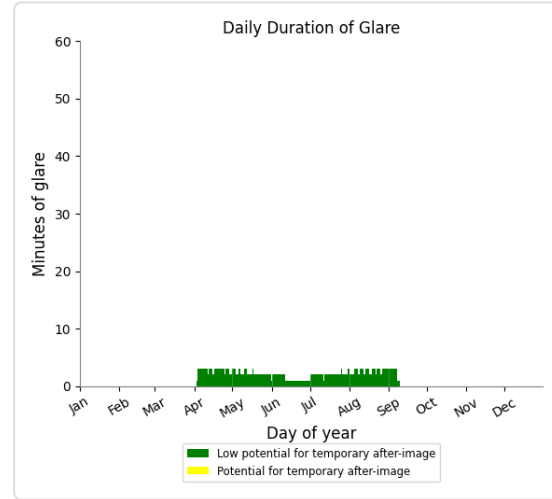
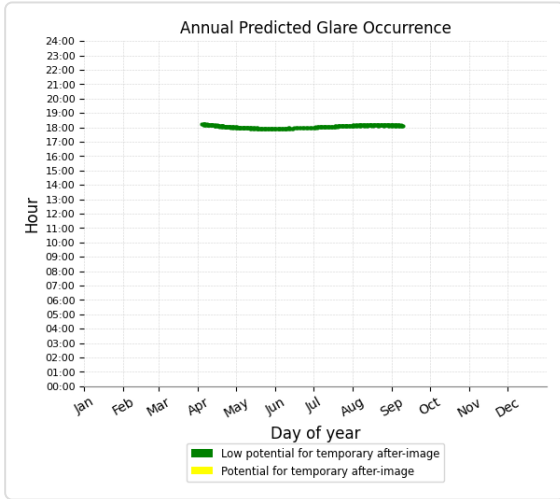
## B1 and Route: McCready Rd

No glare found

## B1 and OP 2

Yellow glare: none

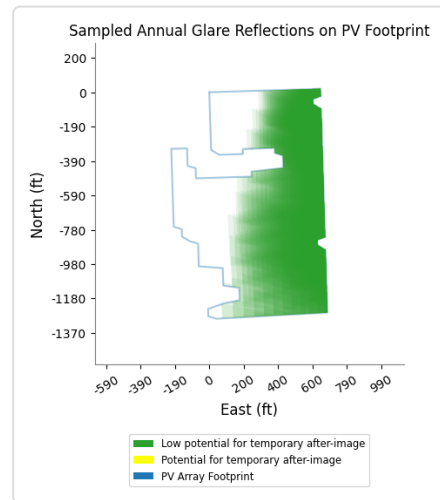
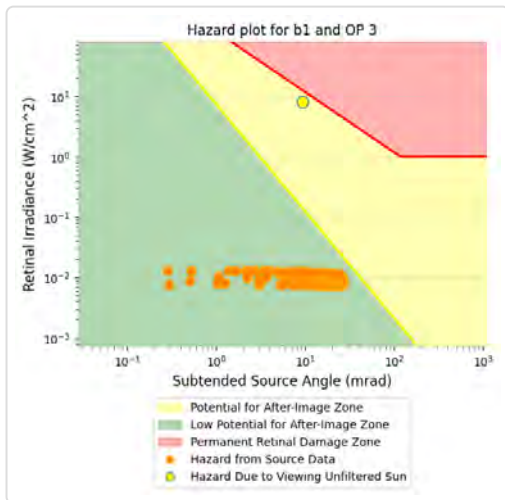
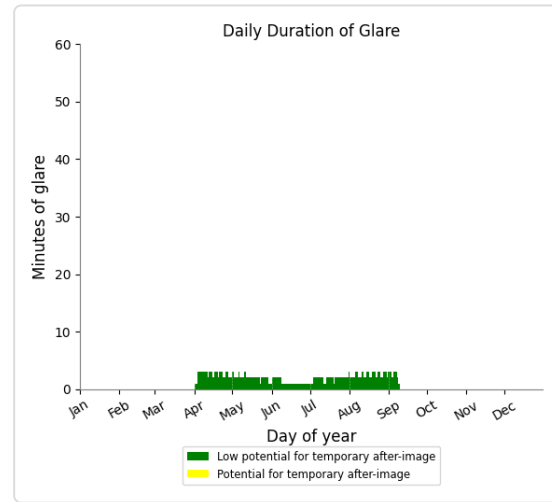
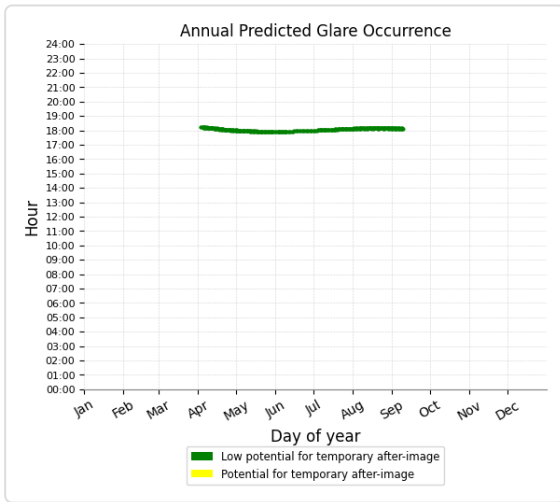
Green glare: 355 min.



## B1 and OP 3

Yellow glare: none

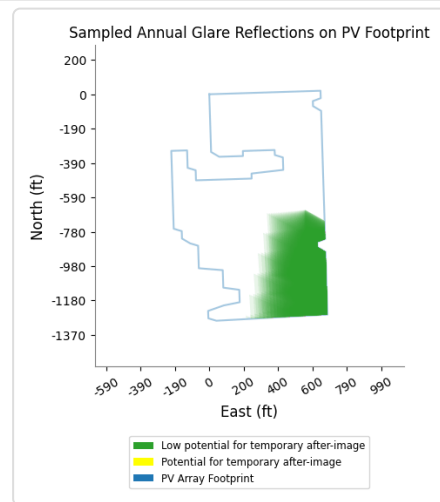
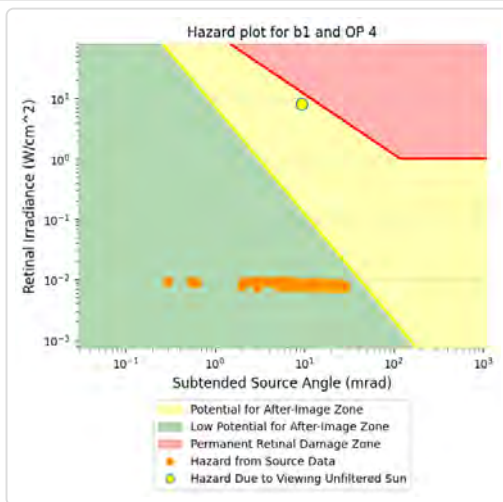
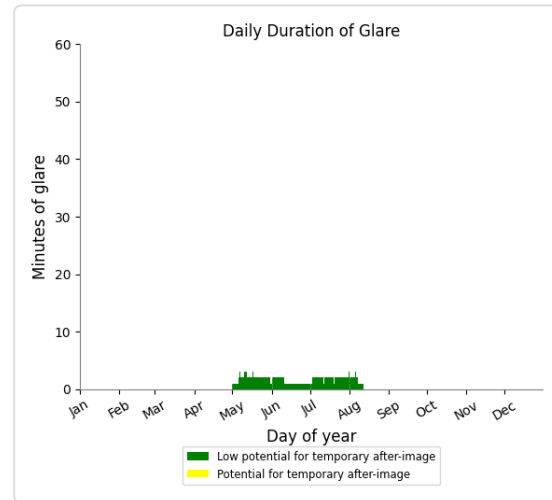
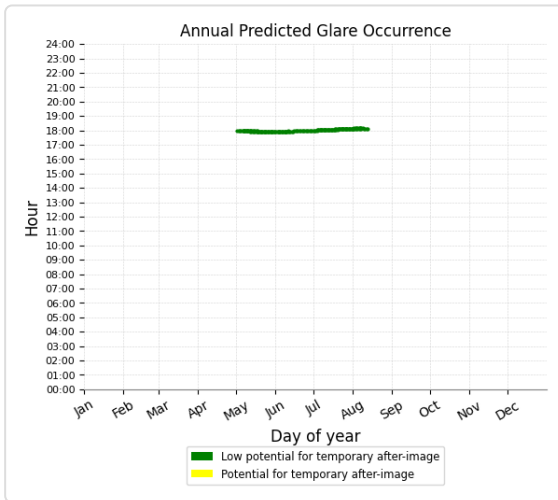
Green glare: 331 min.



## B1 and OP 4

Yellow glare: none

Green glare: 178 min.



## B1 and OP 1

No glare found

## B1 and OP 10

No glare found



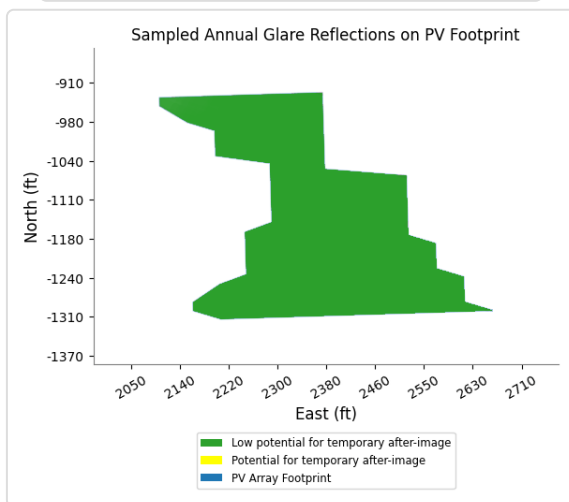
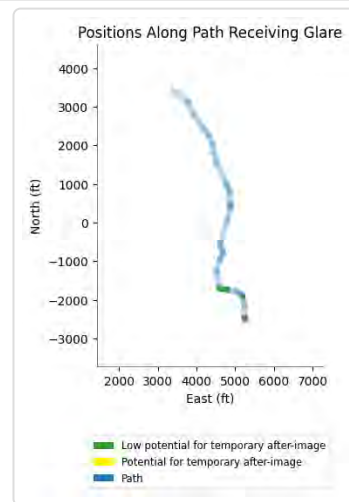
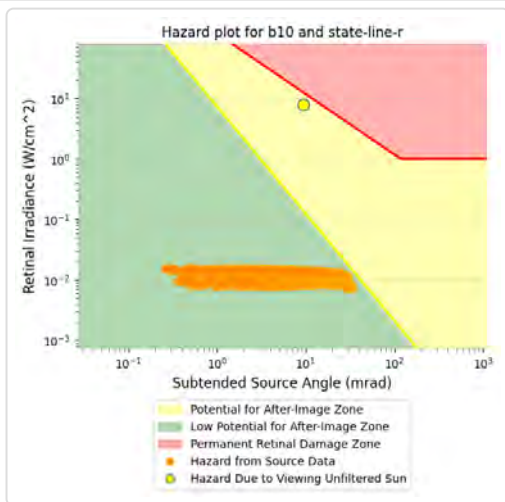
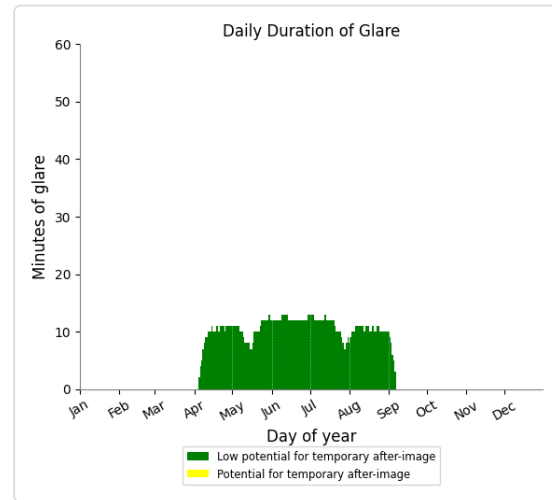
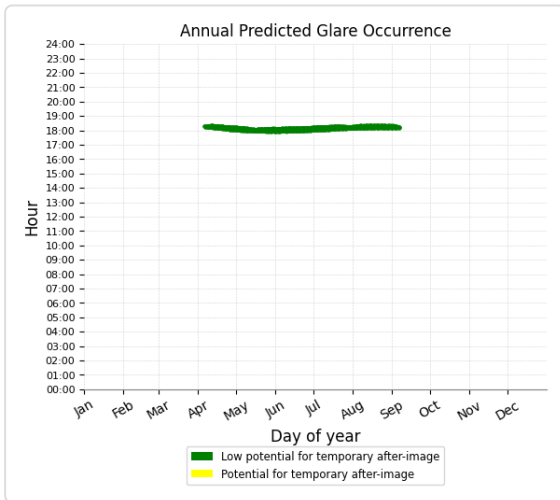
**PV: B10** low potential for temporary after-image

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	1,633	27.2	0	0.0
McCready Rd	0	0.0	0	0.0
OP 2	1,089	18.1	0	0.0
OP 3	1,106	18.4	0	0.0
OP 1	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## B10 and Route: State Line Rd

Yellow glare: none  
Green glare: 1,633 min.



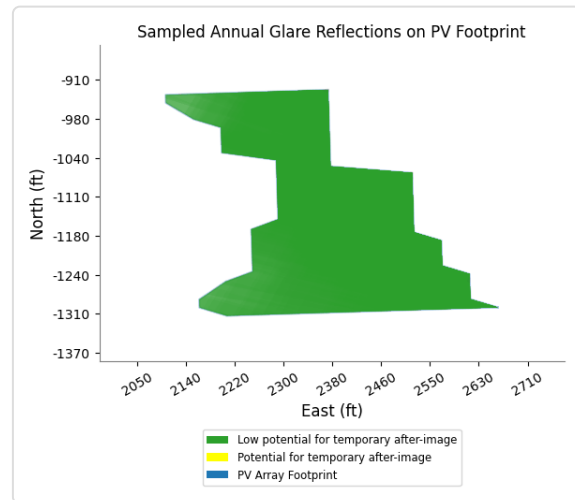
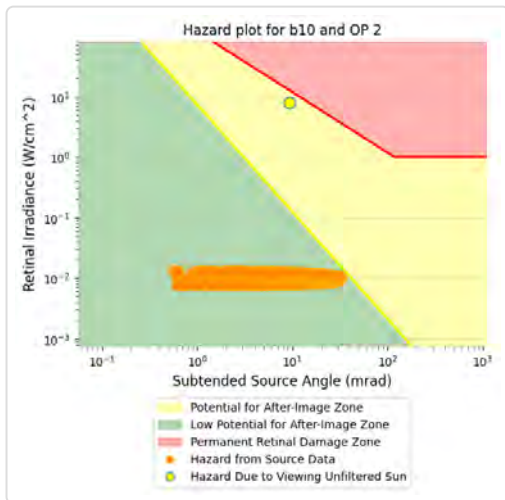
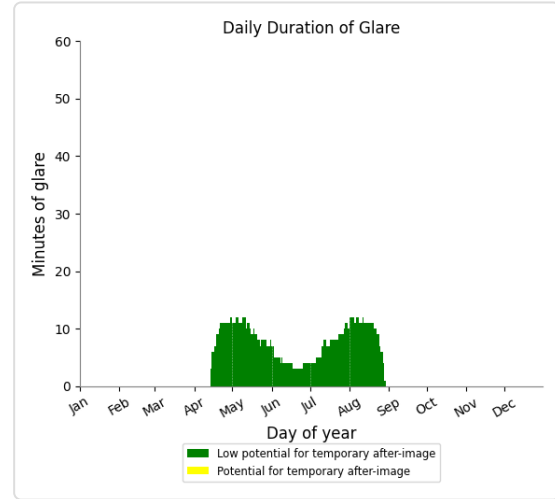
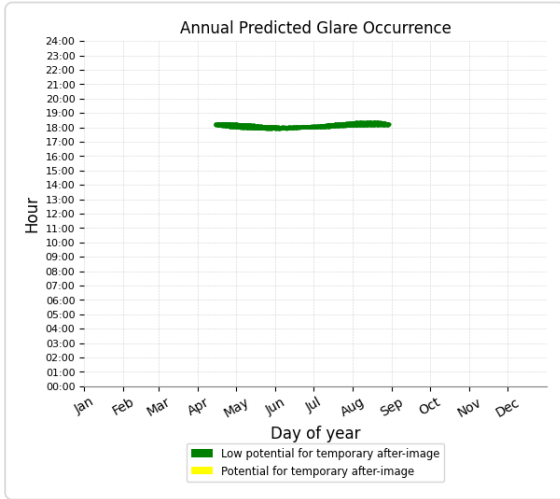
## B10 and Route: McCready Rd

No glare found

## B10 and OP 2

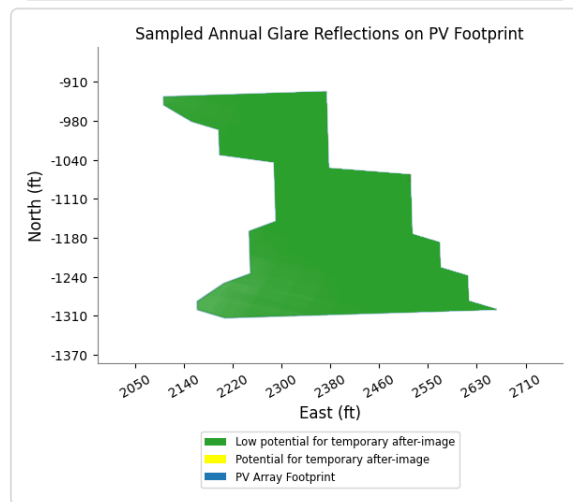
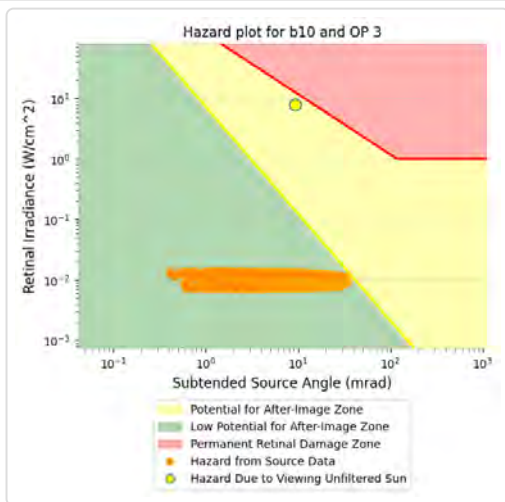
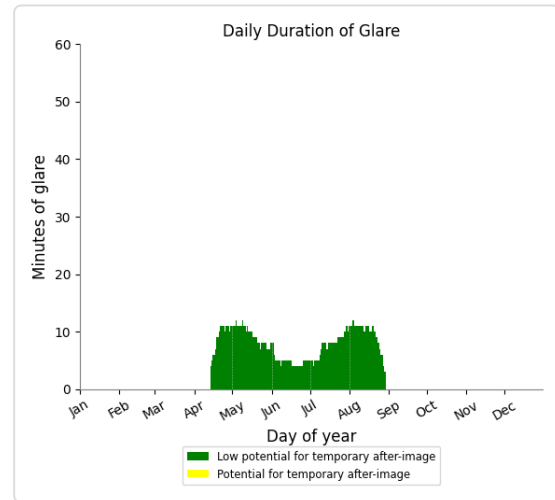
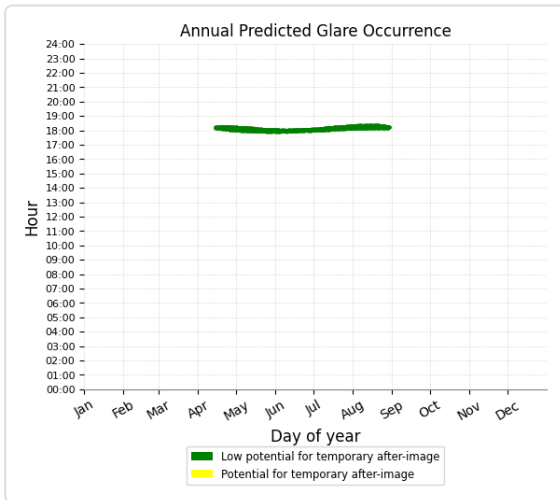
Yellow glare: none

Green glare: 1,089 min.



### B10 and OP 3

Yellow glare: none  
 Green glare: 1,106 min.



### B10 and OP 1

No glare found

### B10 and OP 4

No glare found

### B10 and OP 10

No glare found

**PV: B11** low potential for temporary after-image

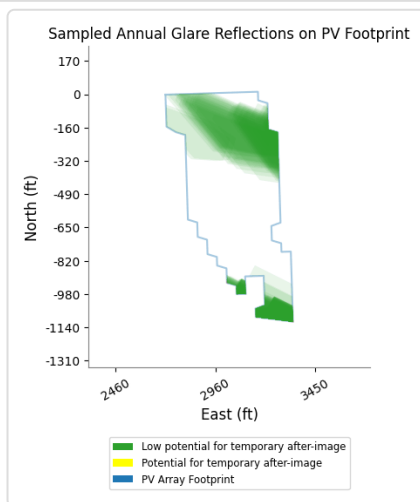
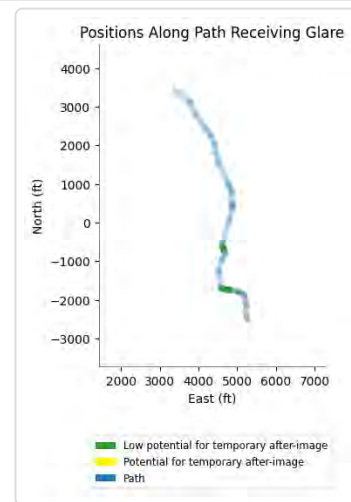
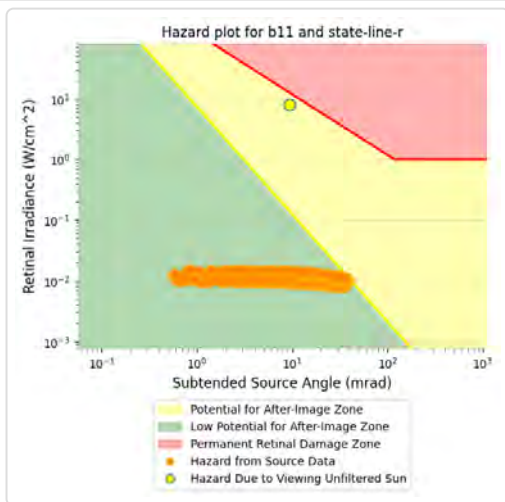
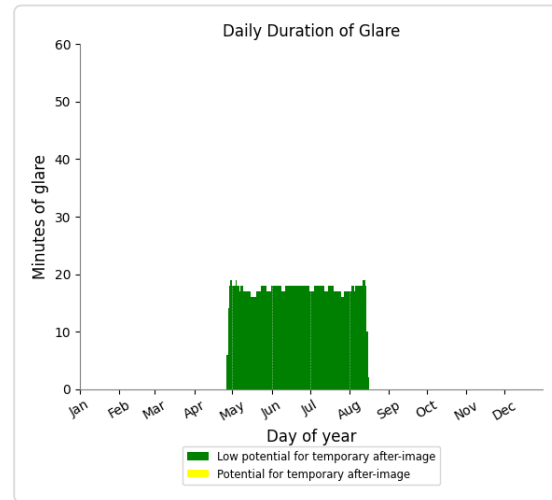
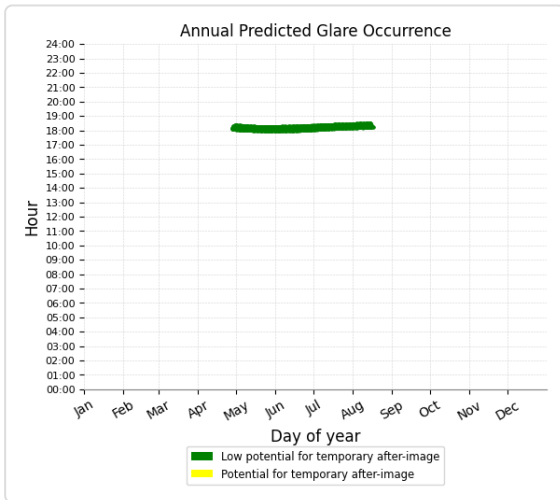
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	1,930	32.2	0	0.0
McCready Rd	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
OP 10	0	0.0	0	0.0



## B11 and Route: State Line Rd

Yellow glare: none  
 Green glare: 1,930 min.



## B11 and Route: McCready Rd

No glare found

### **B11 and OP 1**

No glare found

### **B11 and OP 2**

No glare found

### **B11 and OP 3**

No glare found

### **B11 and OP 4**

No glare found

### **B11 and OP 10**

No glare found

### **PV: B12** potential temporary after-image

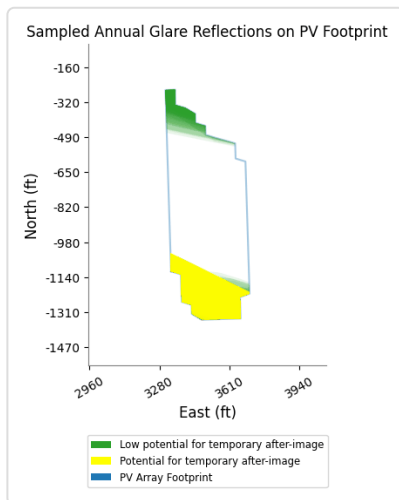
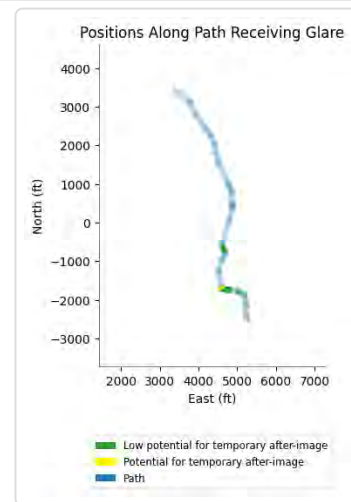
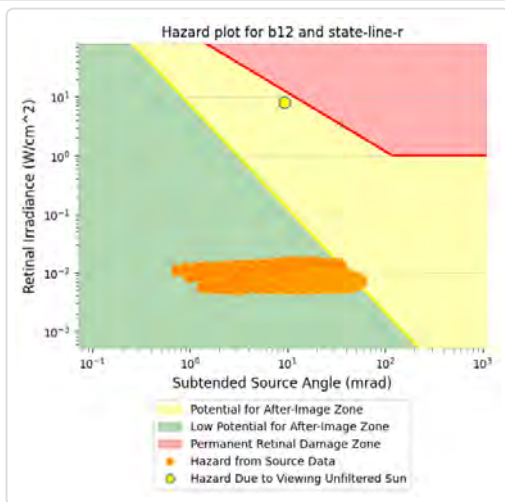
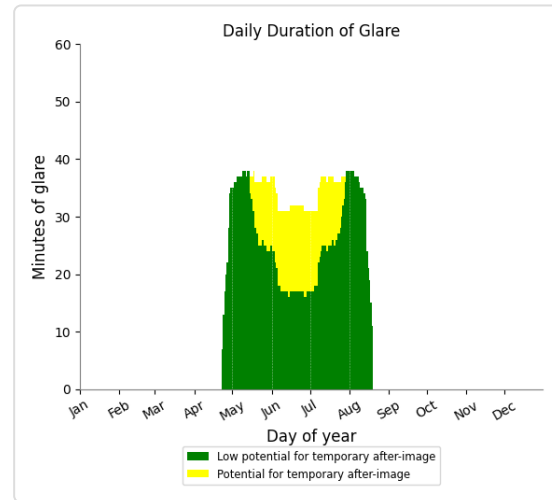
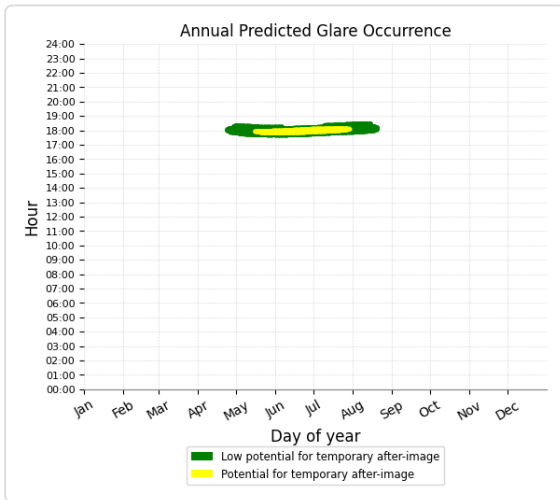
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	3,069	51.1	905	15.1
McCready Rd	0	0.0	0	0.0
OP 2	1,365	22.8	0	0.0
OP 3	1,473	24.6	0	0.0
OP 1	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## B12 and Route: State Line Rd

Yellow glare: 905 min.

Green glare: 3,069 min.



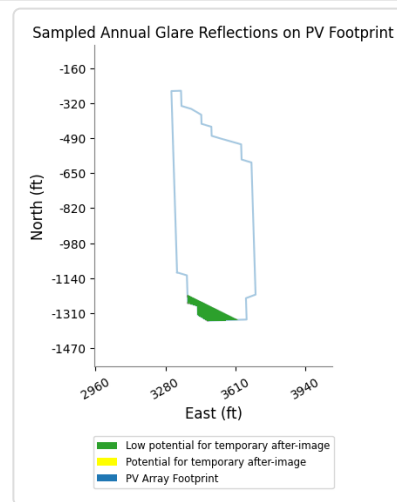
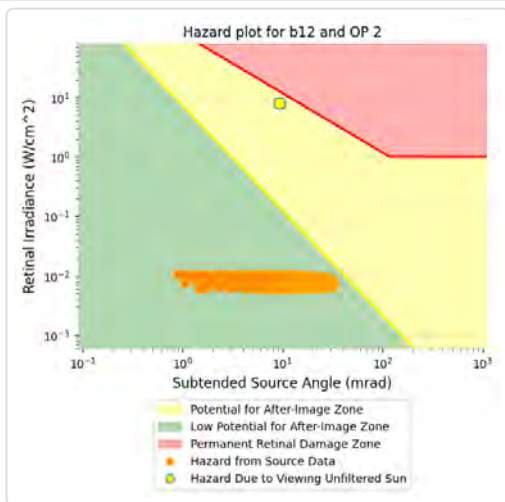
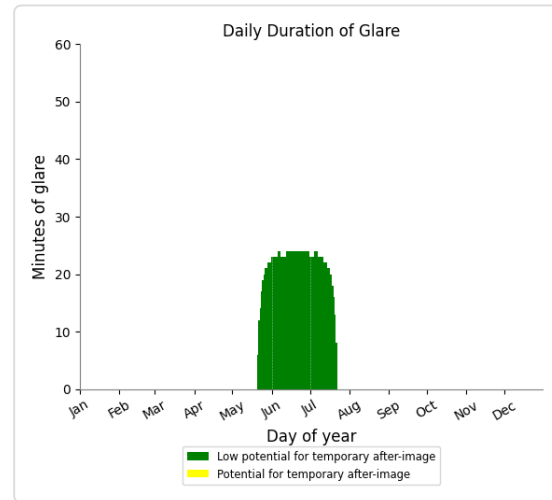
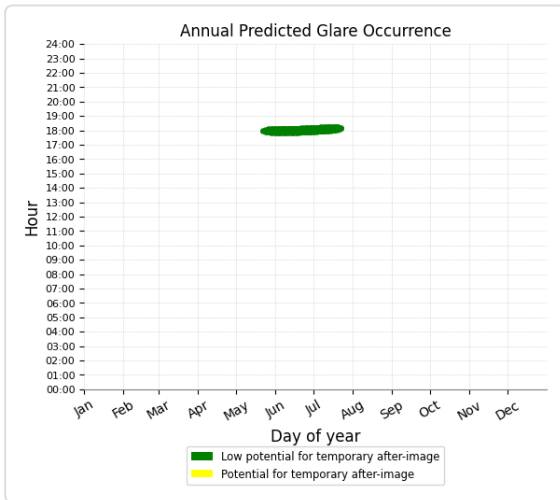
## B12 and Route: McCready Rd

No glare found

## B12 and OP 2

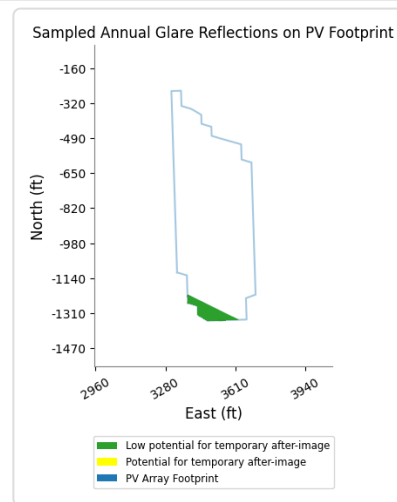
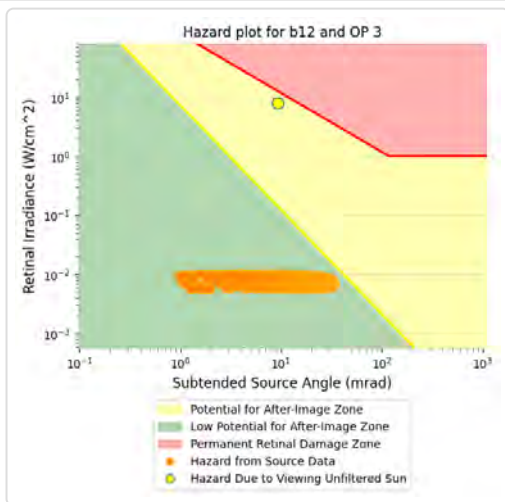
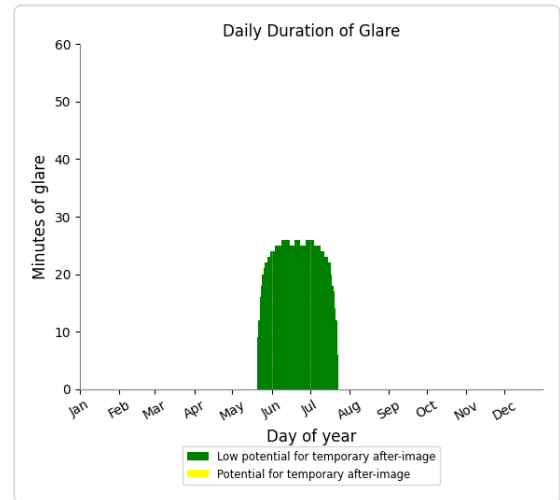
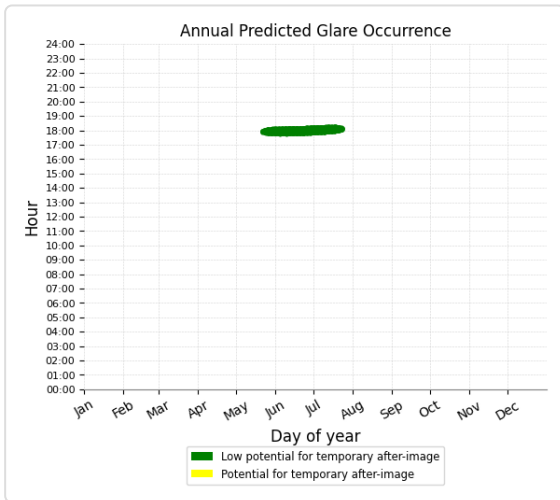
Yellow glare: none

Green glare: 1,365 min.



### B12 and OP 3

Yellow glare: none  
 Green glare: 1,473 min.



### B12 and OP 1

No glare found

### B12 and OP 4

No glare found

### B12 and OP 10

No glare found



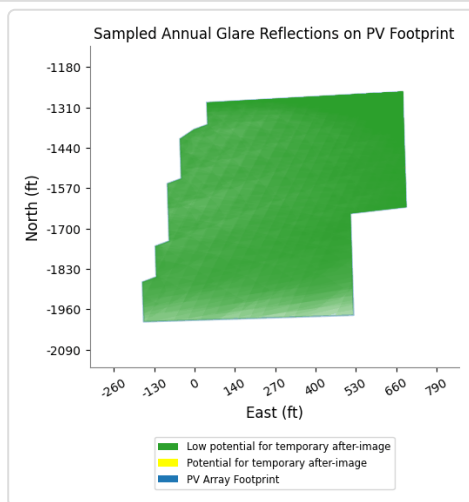
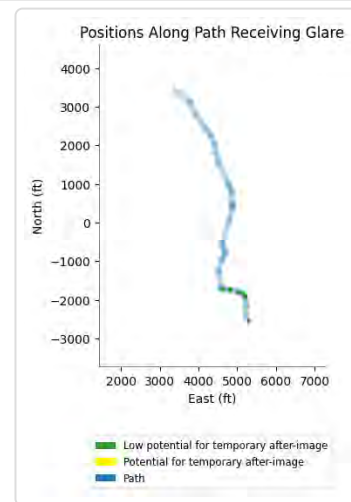
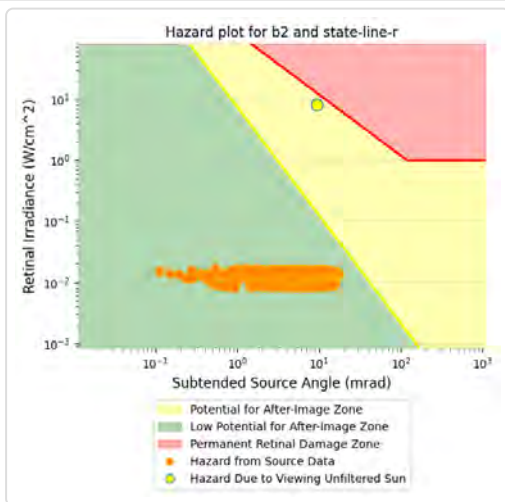
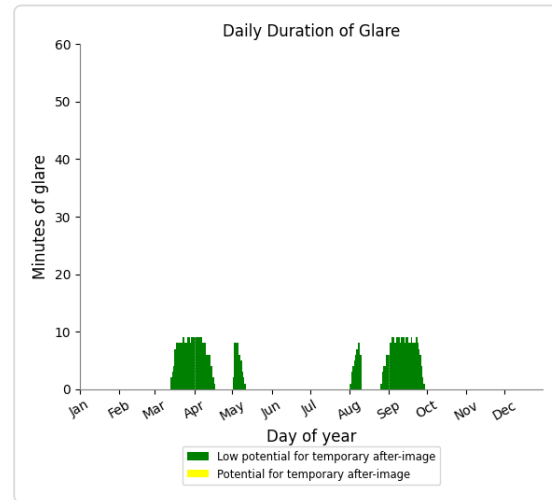
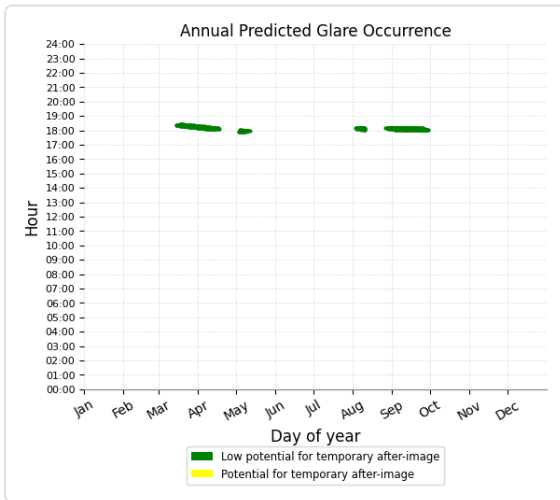
**PV: B2** low potential for temporary after-image

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	593	9.9	0	0.0
McCready Rd	0	0.0	0	0.0
OP 2	301	5.0	0	0.0
OP 3	352	5.9	0	0.0
OP 4	705	11.8	0	0.0
OP 1	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## B2 and Route: State Line Rd

Yellow glare: none  
Green glare: 593 min.



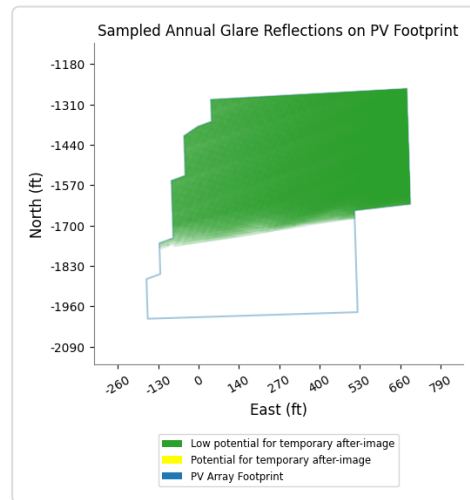
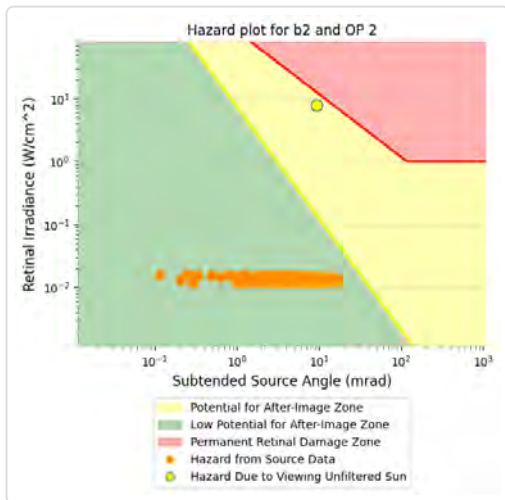
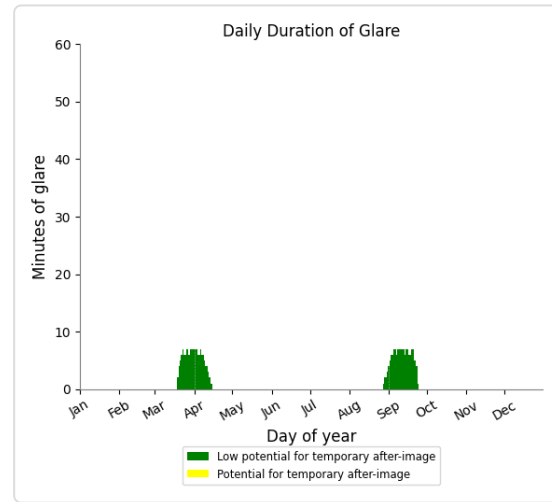
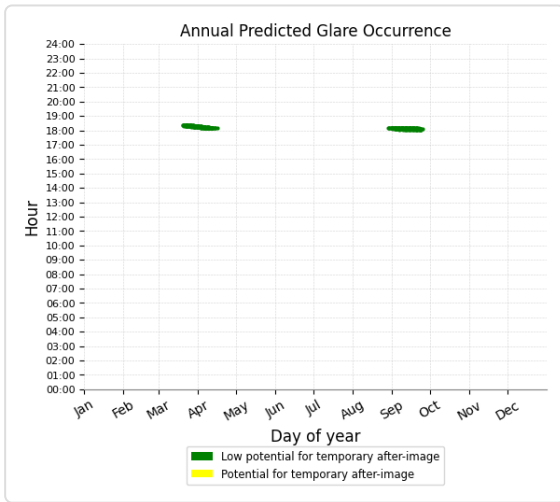
## B2 and Route: McCreedy Rd

No glare found

## B2 and OP 2

Yellow glare: none

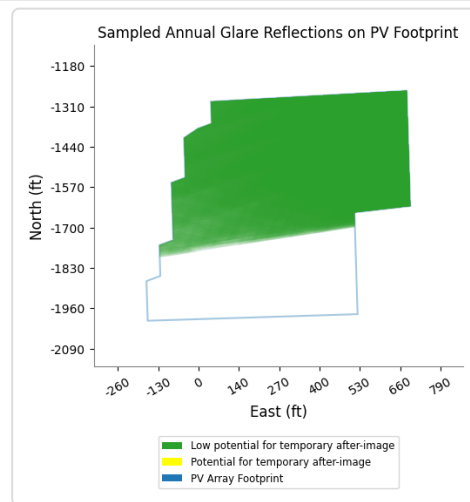
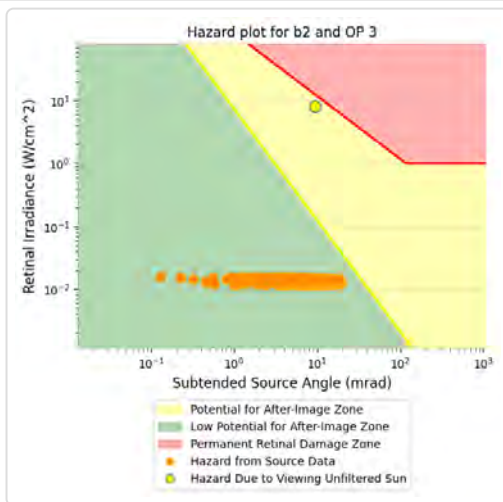
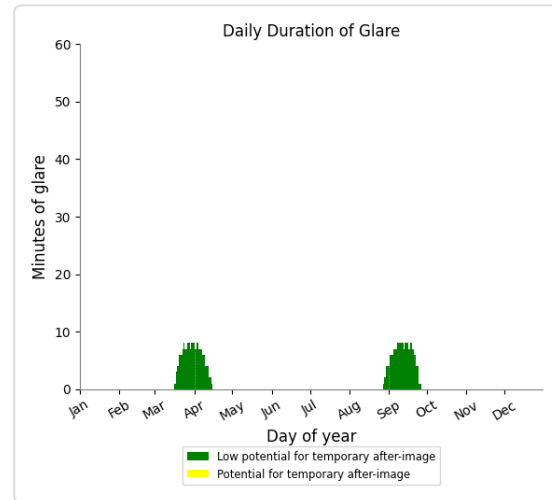
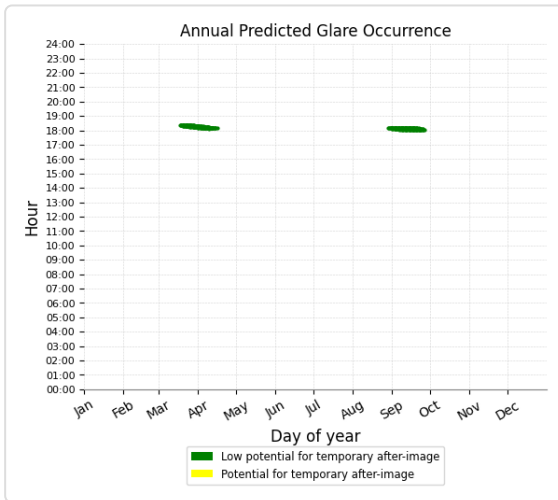
Green glare: 301 min.



## B2 and OP 3

Yellow glare: none

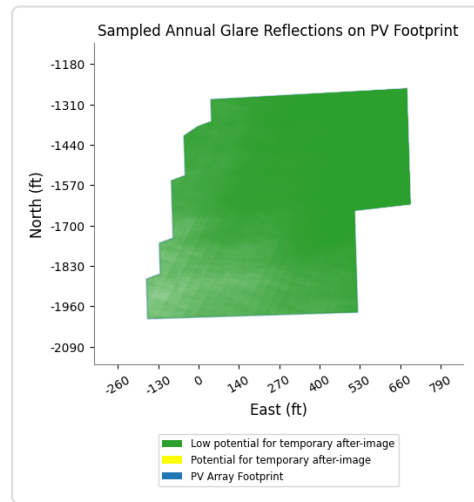
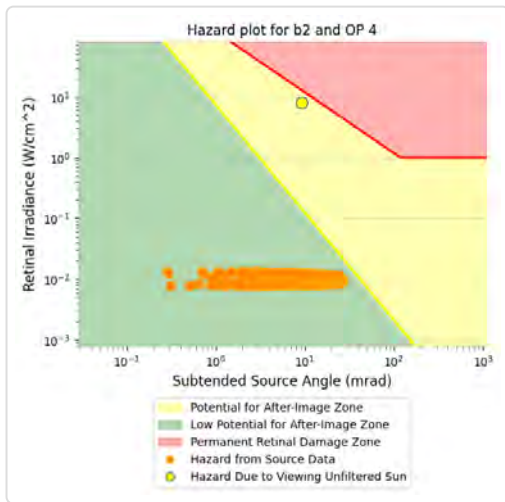
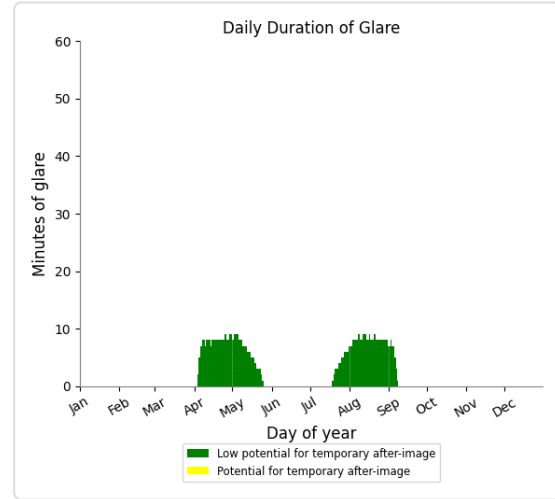
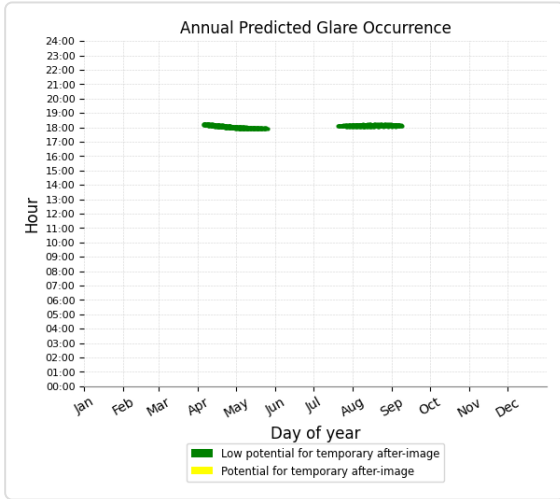
Green glare: 352 min.



## B2 and OP 4

Yellow glare: none

Green glare: 705 min.



## B2 and OP 1

No glare found

## B2 and OP 10

No glare found



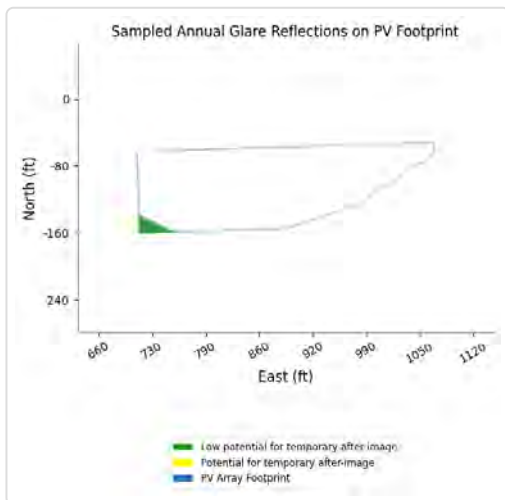
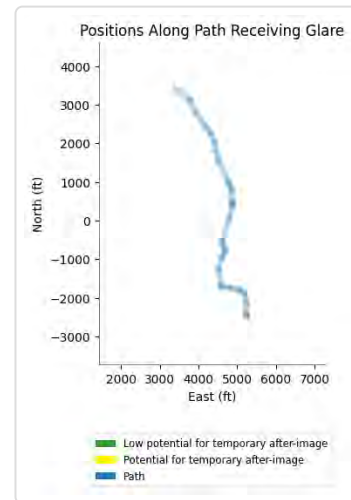
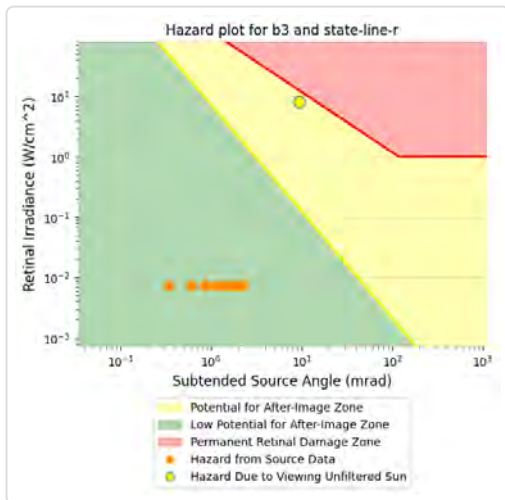
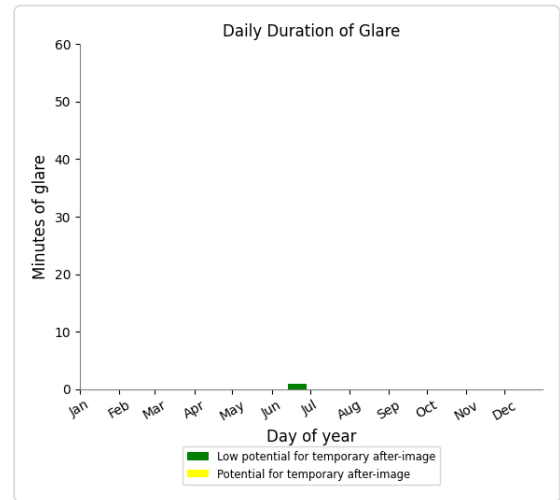
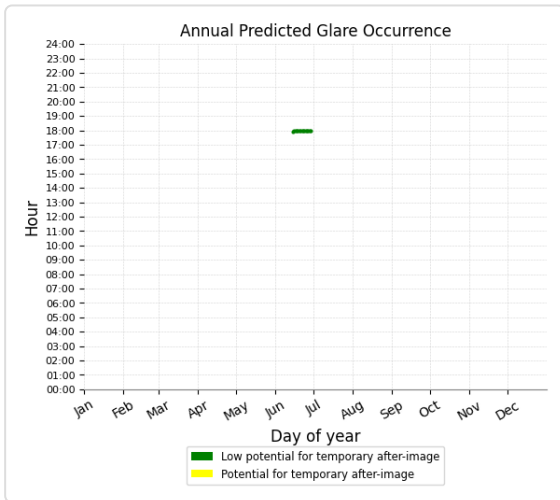
**PV: B3** low potential for temporary after-image

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	15	0.2	0	0.0
McCready Rd	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
OP 10	0	0.0	0	0.0

### B3 and Route: State Line Rd

Yellow glare: none  
 Green glare: 15 min.



### B3 and Route: McCreedy Rd

No glare found

### **B3 and OP 1**

No glare found

### **B3 and OP 2**

No glare found

### **B3 and OP 3**

No glare found

### **B3 and OP 4**

No glare found

### **B3 and OP 10**

No glare found

### **PV: B4** potential temporary after-image

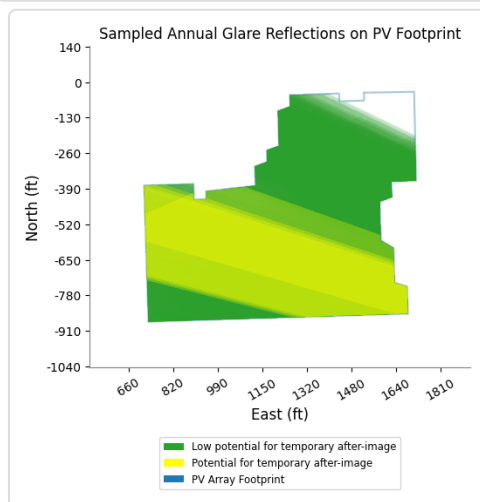
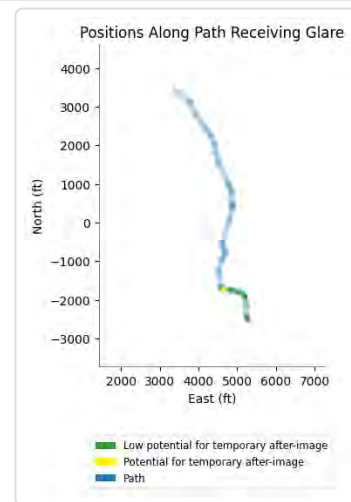
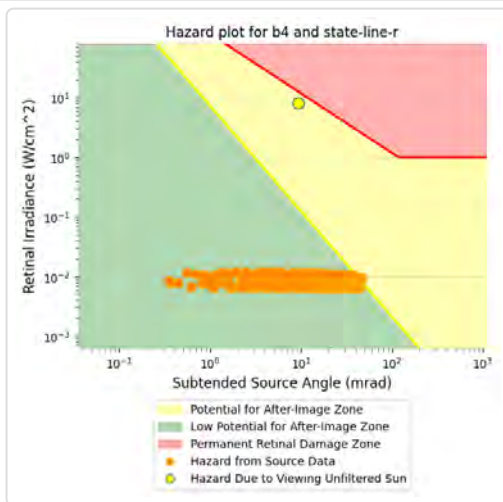
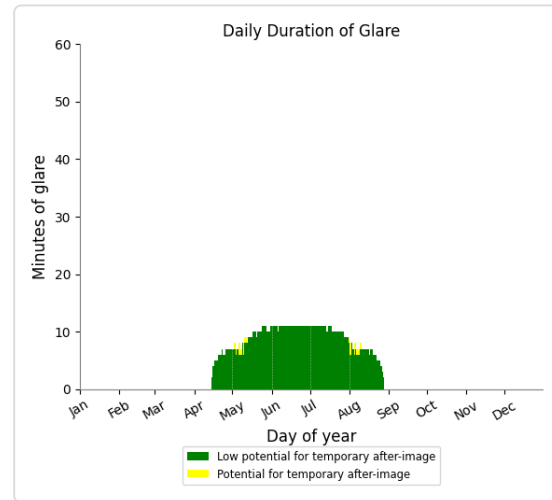
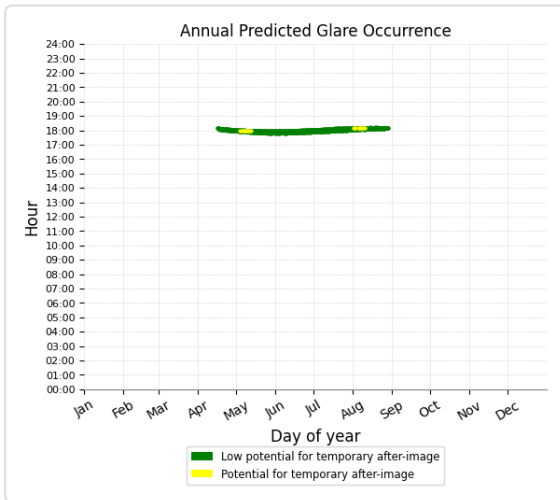
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	1,185	19.8	21	0.3
McCready Rd	0	0.0	0	0.0
OP 3	489	8.2	0	0.0
OP 4	137	2.3	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## B4 and Route: State Line Rd

Yellow glare: 21 min.

Green glare: 1,185 min.



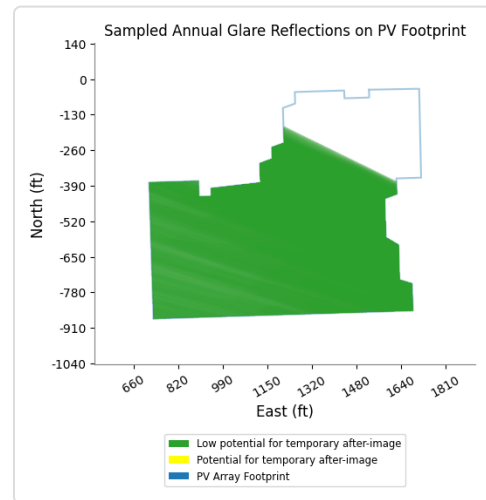
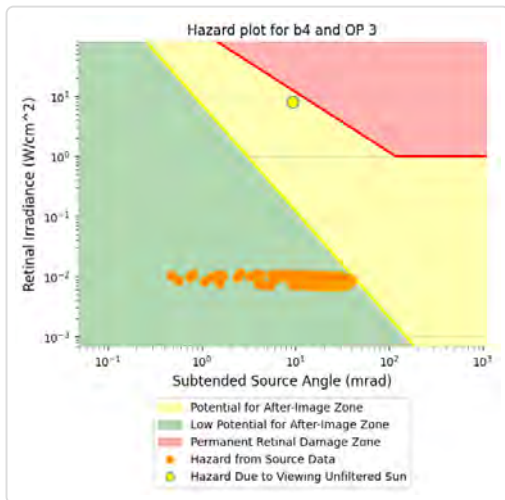
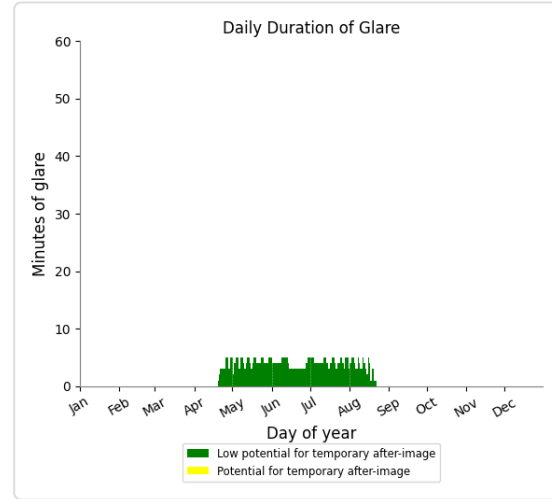
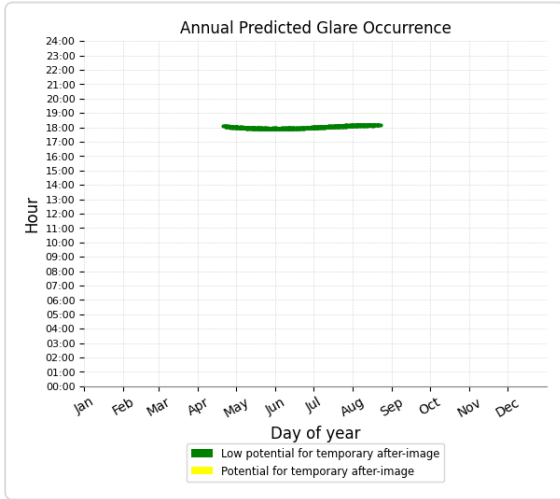
## B4 and Route: McCreedy Rd

No glare found

## B4 and OP 3

Yellow glare: none

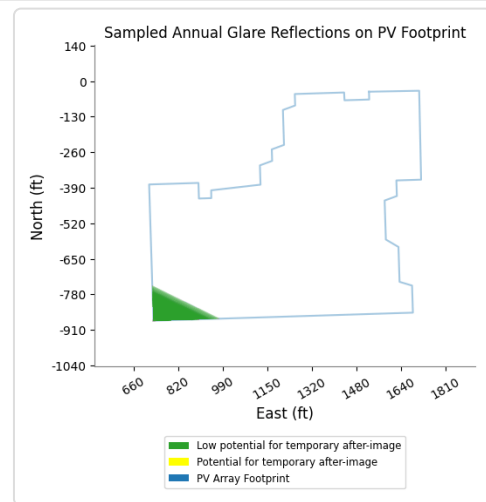
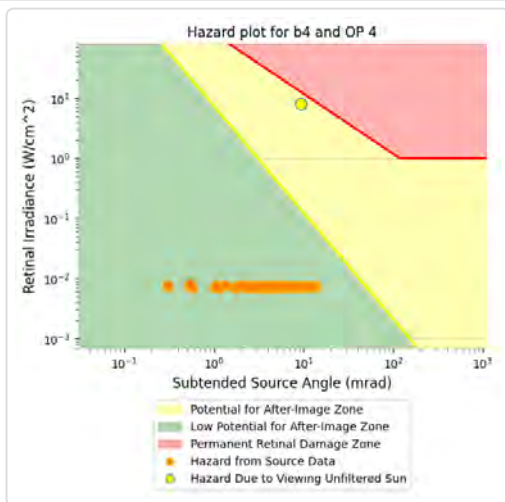
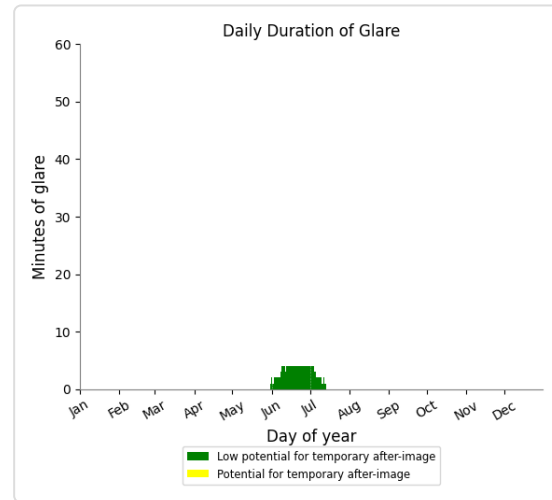
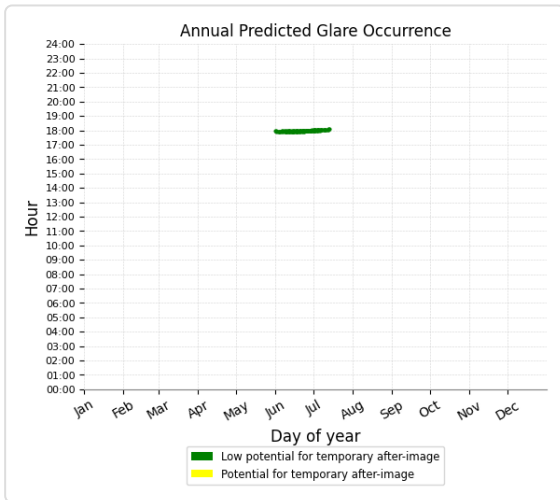
Green glare: 489 min.



## B4 and OP 4

Yellow glare: none

Green glare: 137 min.



## B4 and OP 1

No glare found

## B4 and OP 2

No glare found

## B4 and OP 10

No glare found



**PV: B5** potential temporary after-image

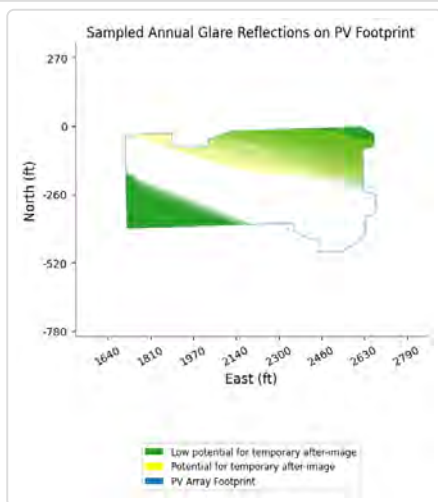
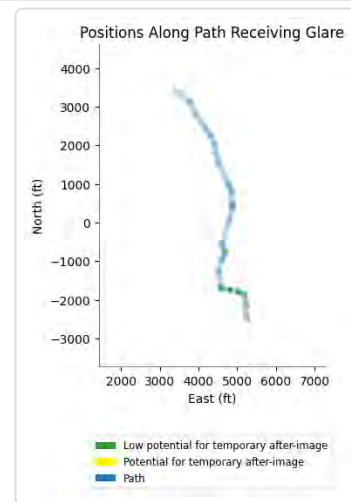
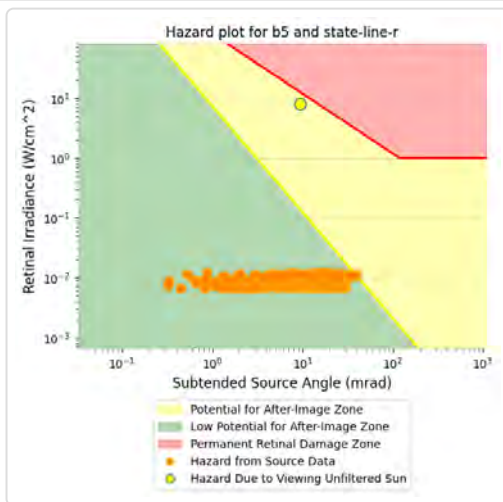
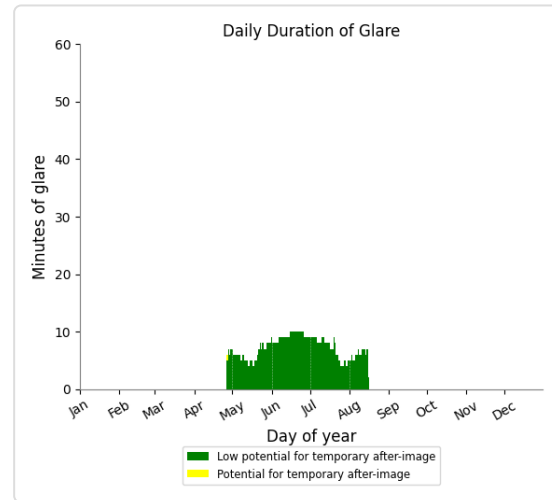
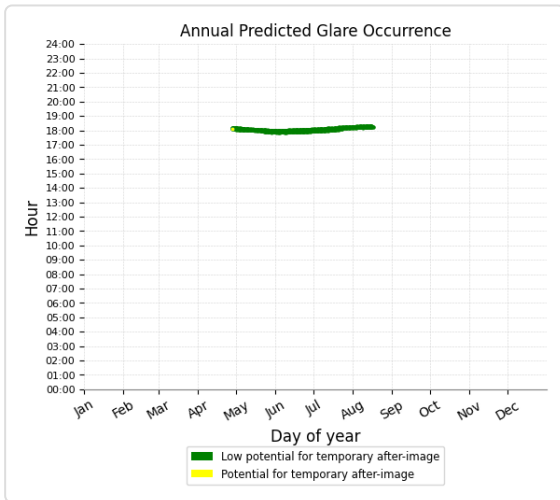
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	805	13.4	1	0.0
McCready Rd	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
OP 10	0	0.0	0	0.0

## B5 and Route: State Line Rd

Yellow glare: 1 min.

Green glare: 805 min.



## B5 and Route: McCready Rd

No glare found

## B5 and OP 1

No glare found

## B5 and OP 2

No glare found

## B5 and OP 3

No glare found

## B5 and OP 4

No glare found

## B5 and OP 10

No glare found

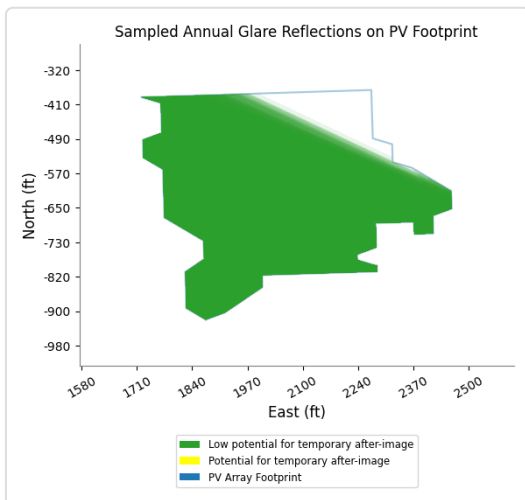
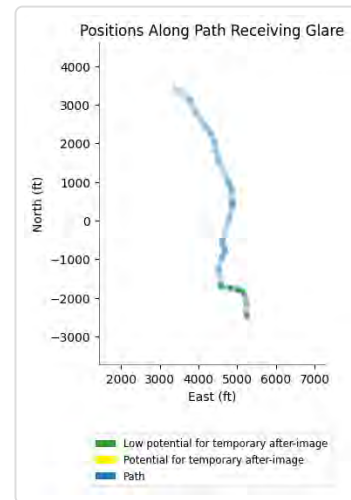
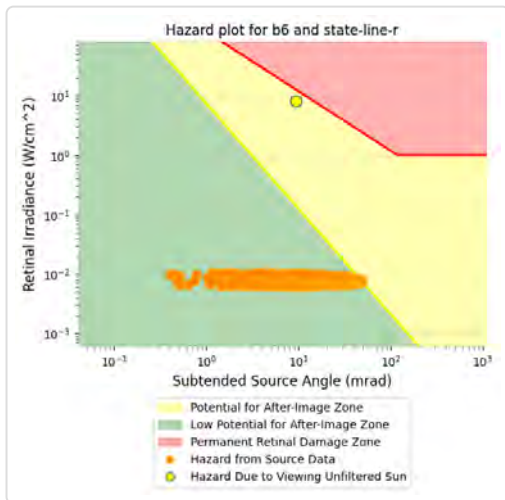
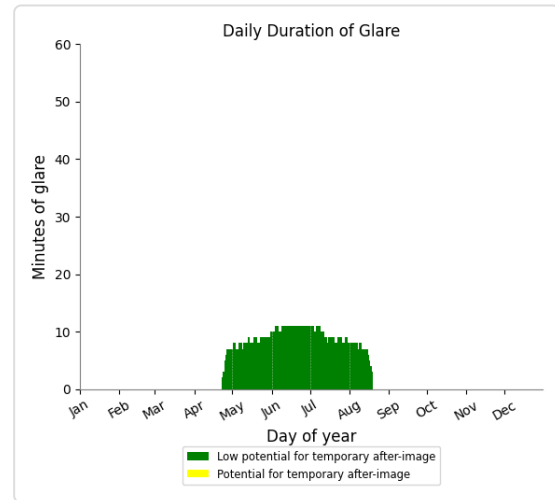
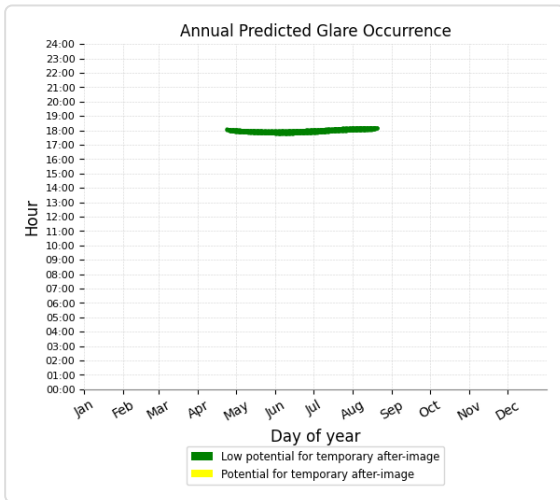
## PV: B6 low potential for temporary after-image

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	1,052	17.5	0	0.0
McCready Rd	0	0.0	0	0.0
OP 2	477	8.0	0	0.0
OP 3	578	9.6	0	0.0
OP 1	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## B6 and Route: State Line Rd

Yellow glare: none  
 Green glare: 1,052 min.



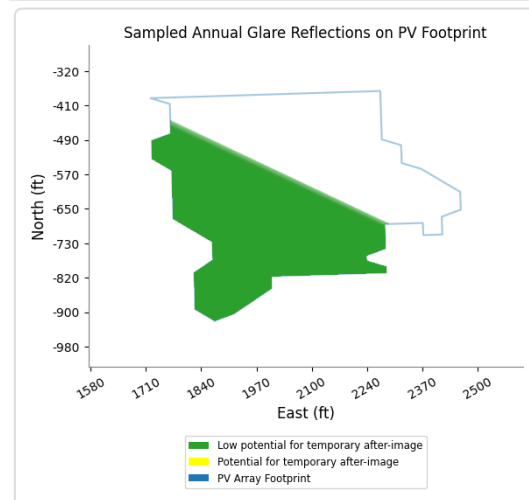
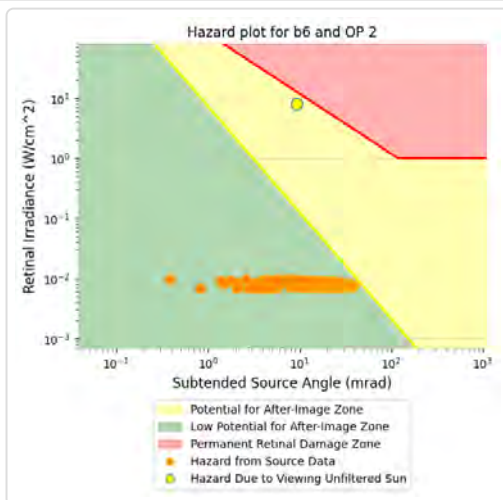
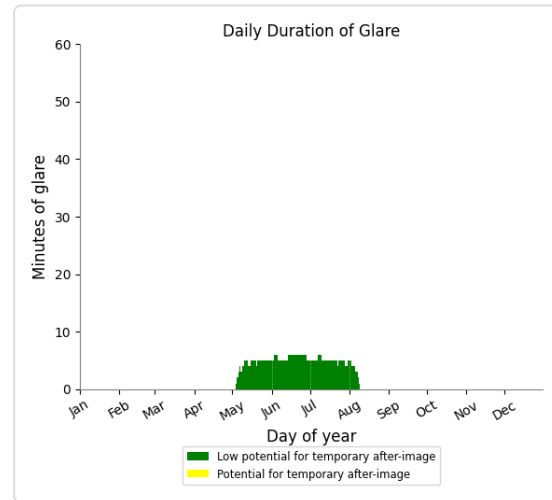
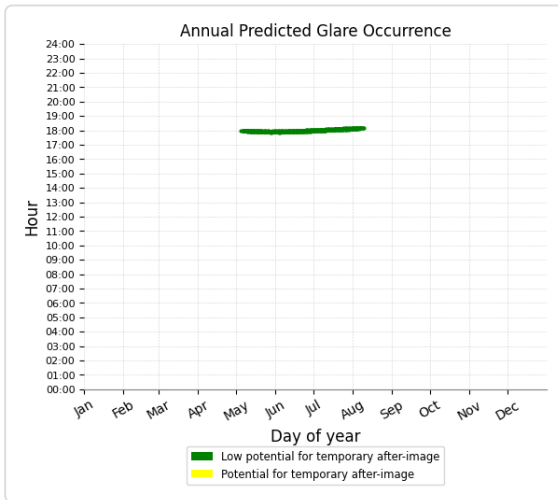
## B6 and Route: McCready Rd

No glare found

## B6 and OP 2

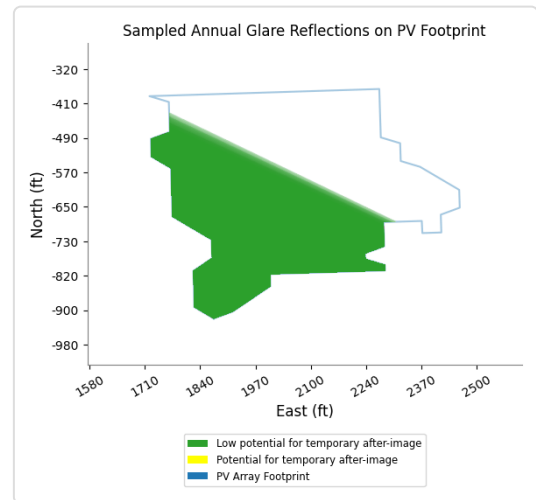
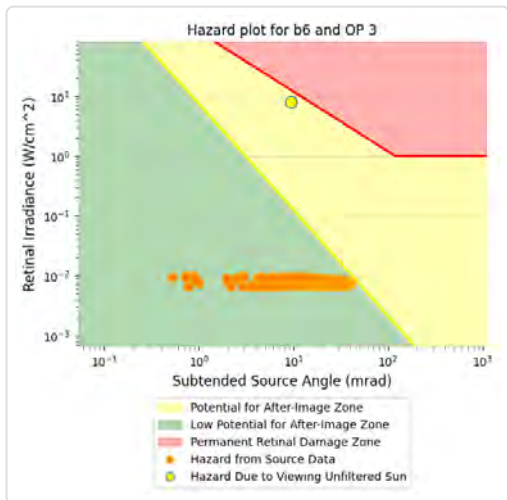
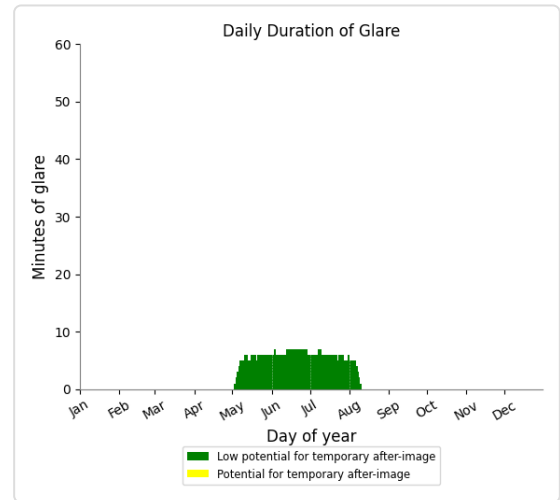
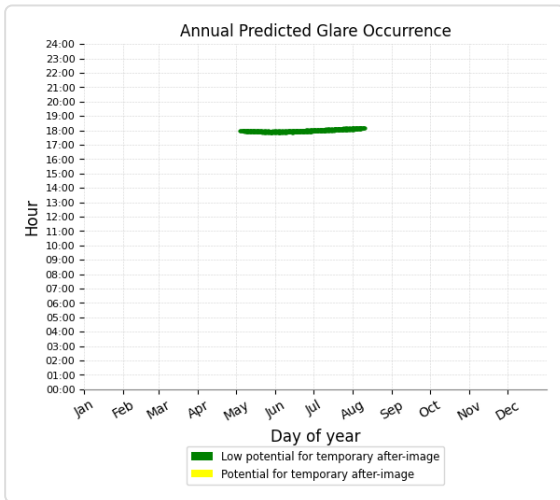
Yellow glare: none

Green glare: 477 min.



### B6 and OP 3

Yellow glare: none  
 Green glare: 578 min.



### B6 and OP 1

No glare found

### B6 and OP 4

No glare found

### B6 and OP 10

No glare found



**PV: B7** potential temporary after-image

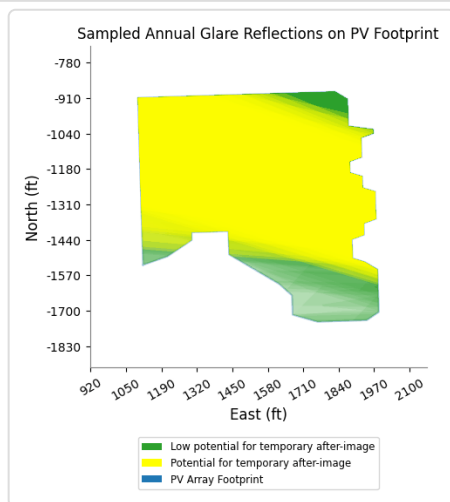
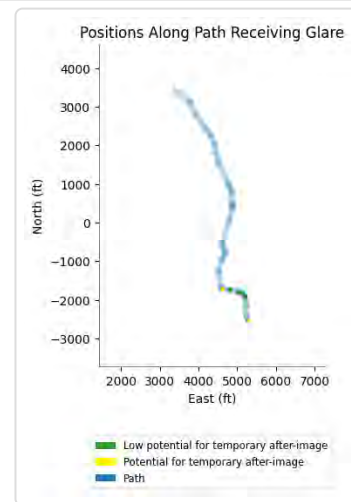
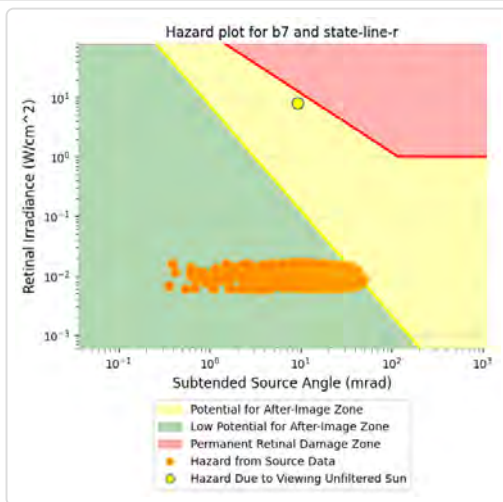
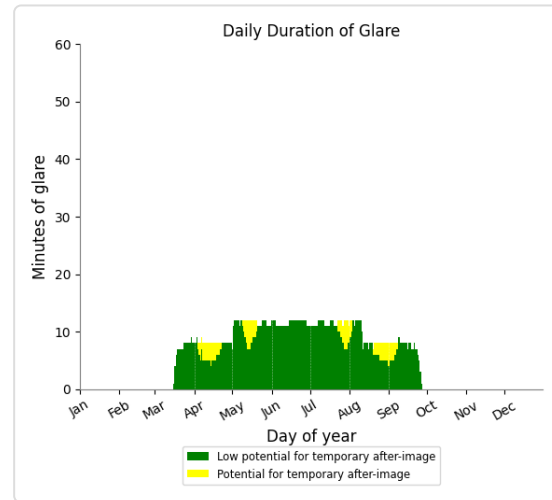
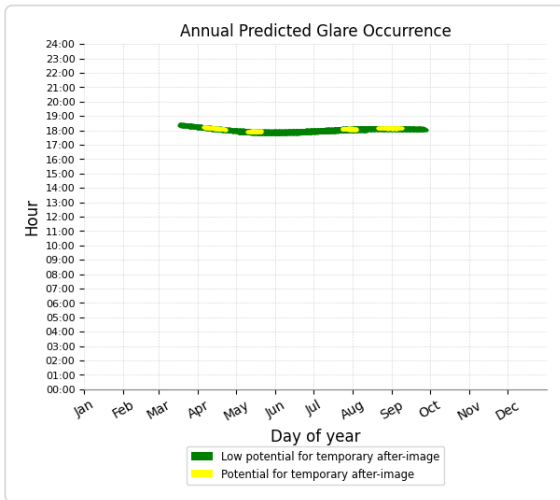
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	1,716	28.6	179	3.0
McCready Rd	0	0.0	0	0.0
OP 2	521	8.7	0	0.0
OP 3	642	10.7	0	0.0
OP 4	729	12.2	0	0.0
OP 1	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## B7 and Route: State Line Rd

Yellow glare: 179 min.

Green glare: 1,716 min.



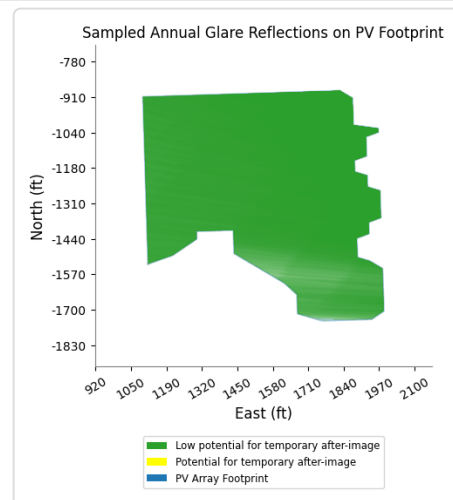
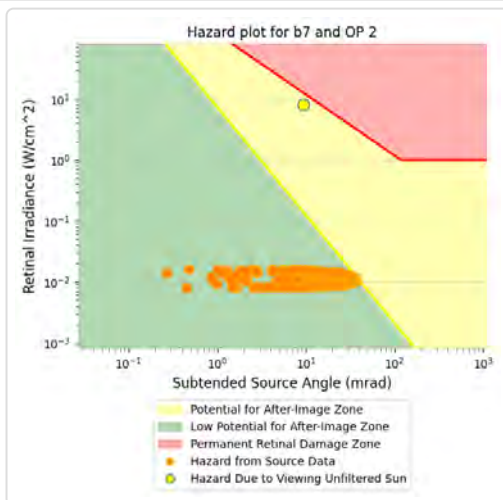
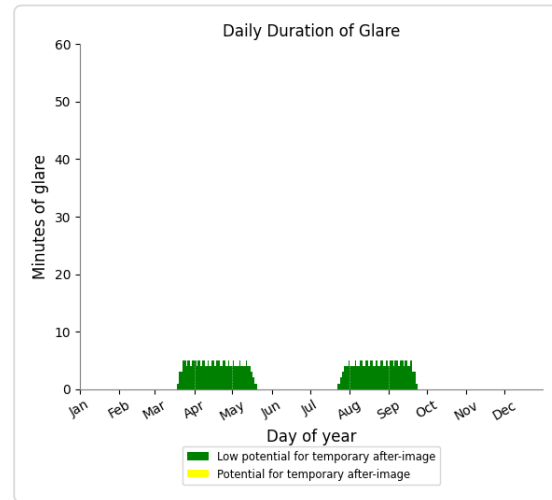
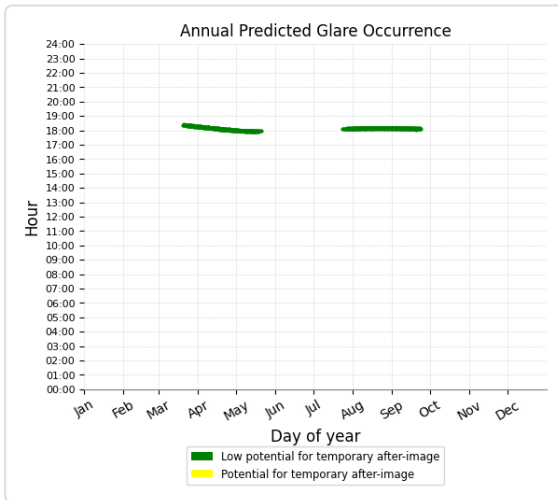
## B7 and Route: McCready Rd

No glare found

## B7 and OP 2

Yellow glare: none

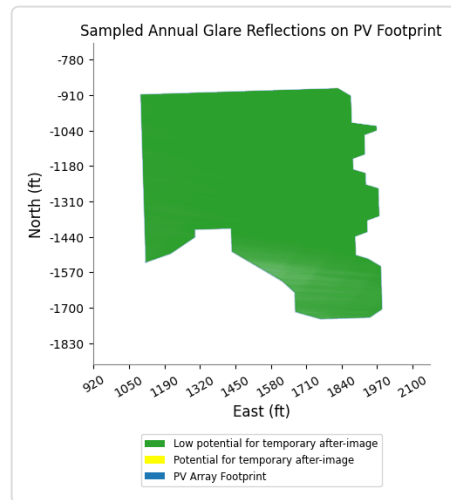
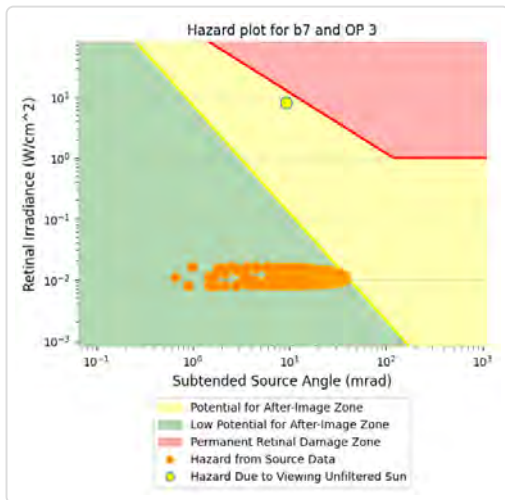
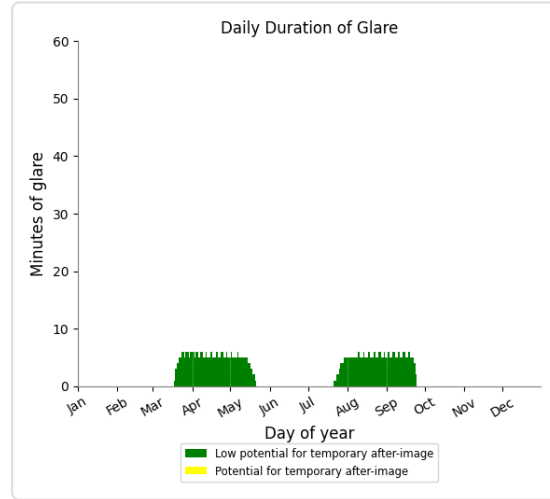
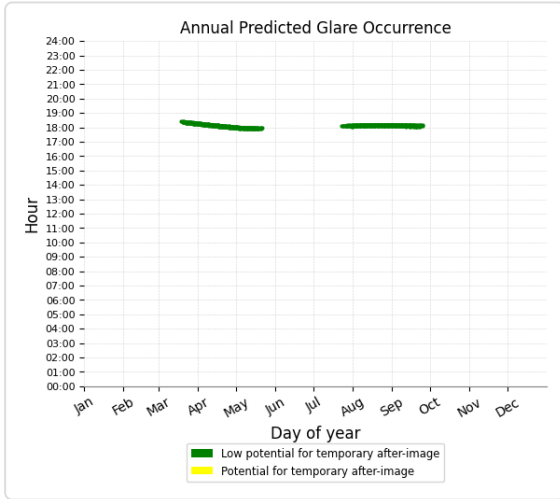
Green glare: 521 min.



## B7 and OP 3

Yellow glare: none

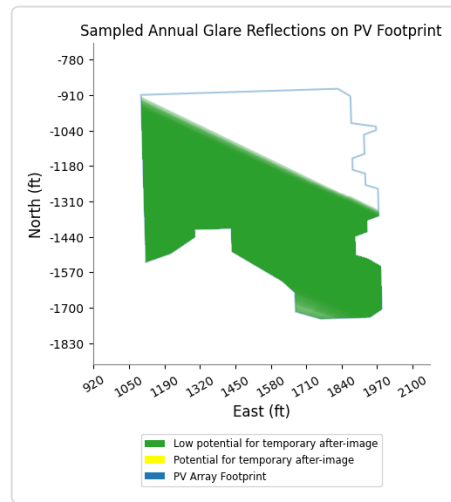
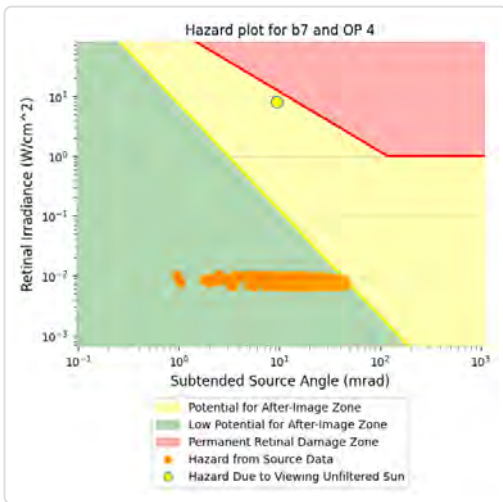
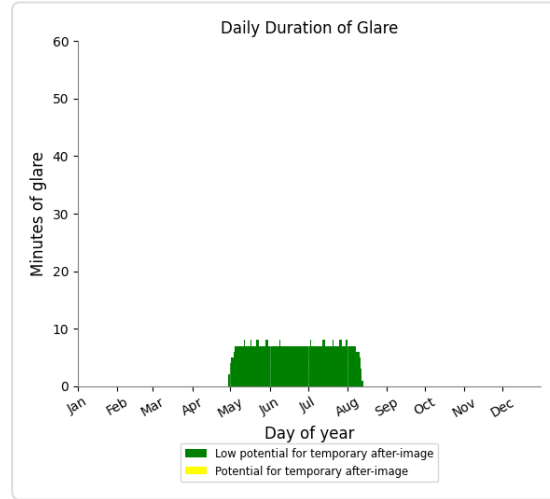
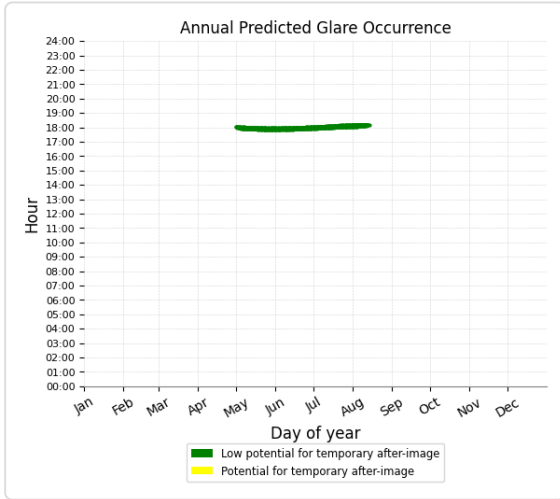
Green glare: 642 min.



## B7 and OP 4

Yellow glare: none

Green glare: 729 min.



## B7 and OP 1

No glare found

## B7 and OP 10

No glare found

**PV: B8** low potential for temporary after-image

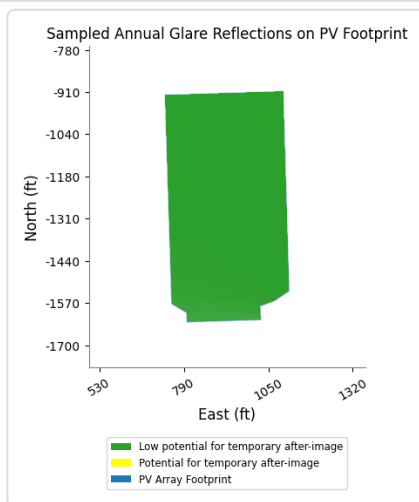
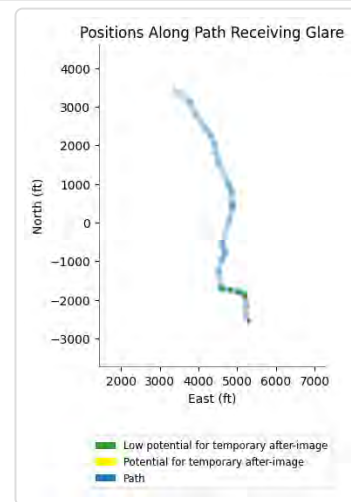
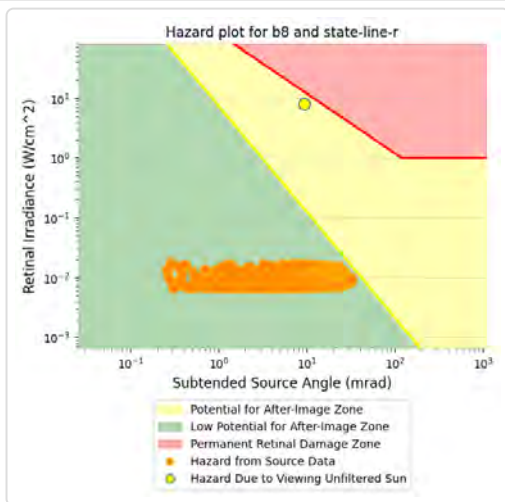
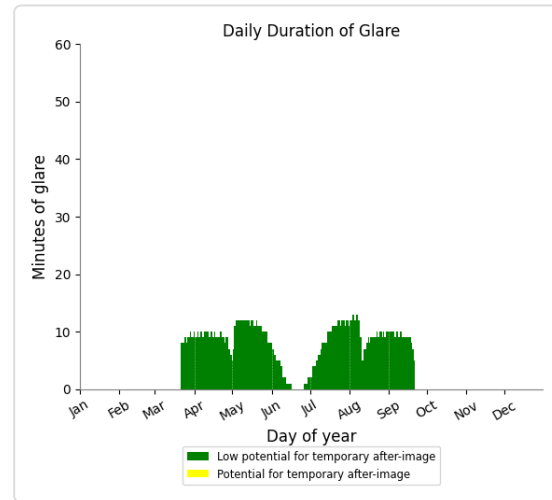
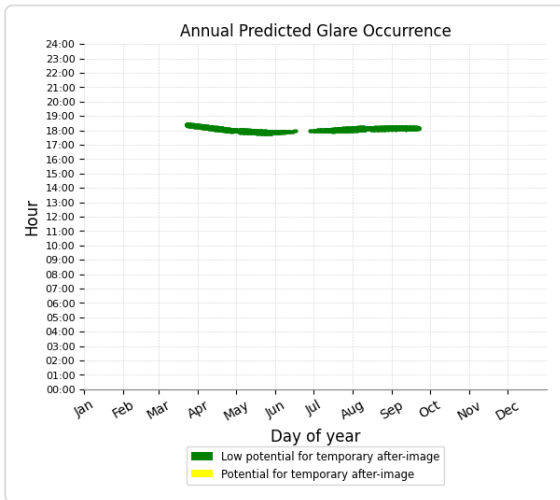
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	1,515	25.2	0	0.0
McCready Rd	0	0.0	0	0.0
OP 2	516	8.6	0	0.0
OP 3	593	9.9	0	0.0
OP 1	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 10	0	0.0	0	0.0



## B8 and Route: State Line Rd

Yellow glare: none  
 Green glare: 1,515 min.



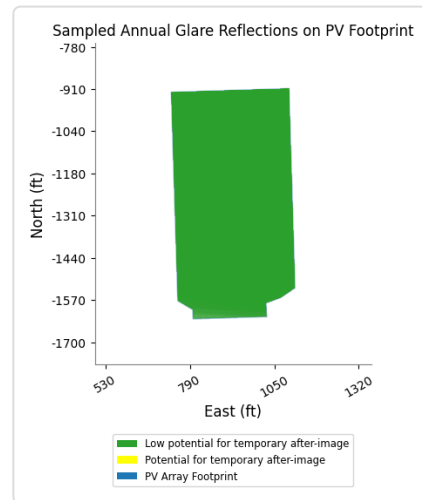
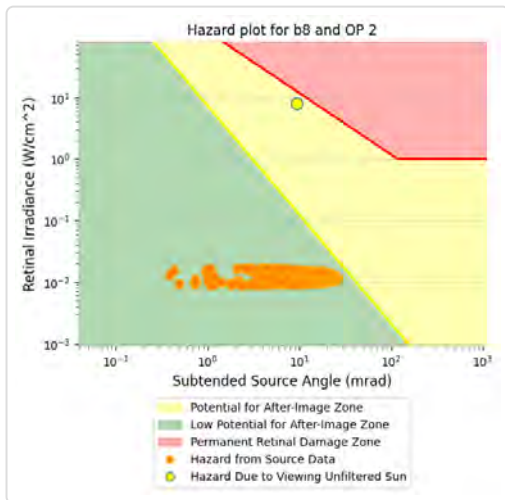
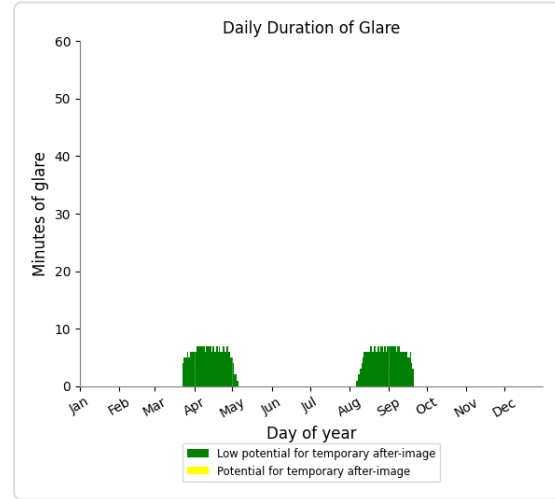
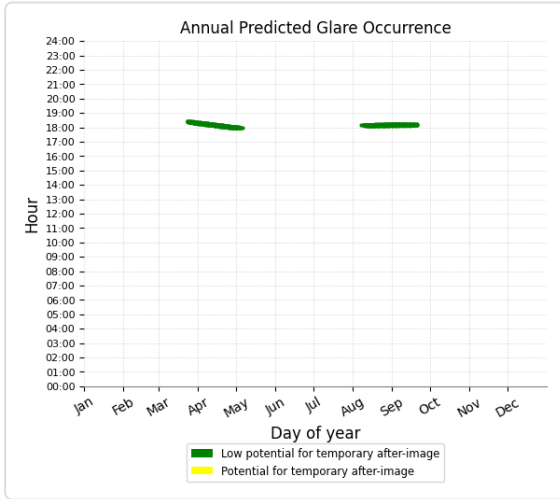
## B8 and Route: McCreedy Rd

No glare found

## B8 and OP 2

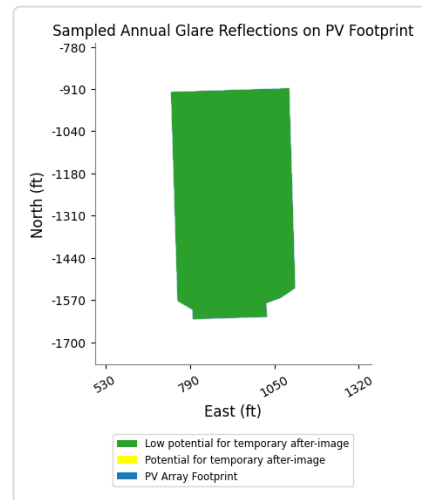
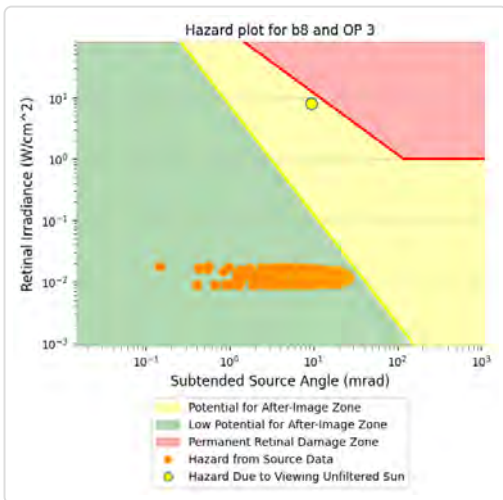
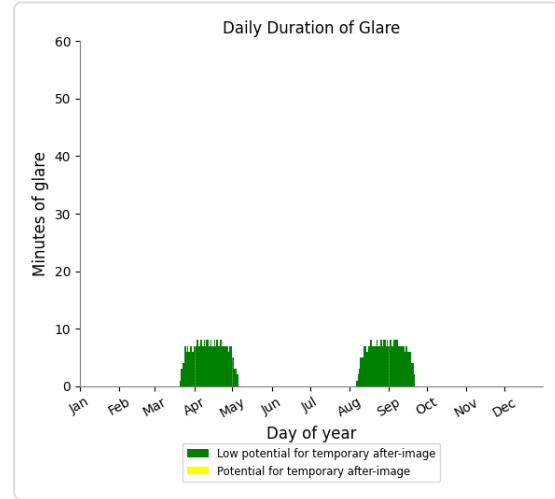
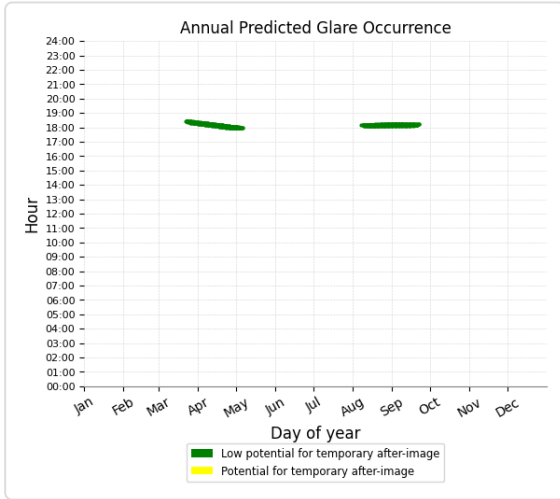
Yellow glare: none

Green glare: 516 min.



### B8 and OP 3

Yellow glare: none  
Green glare: 593 min.



### B8 and OP 1

No glare found

### B8 and OP 4

No glare found

### B8 and OP 10

No glare found

**PV: B9** potential temporary after-image

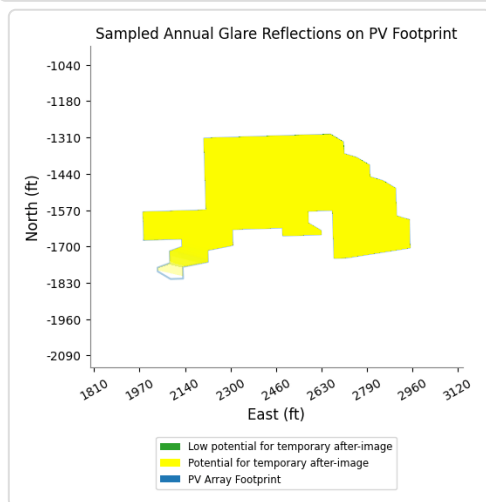
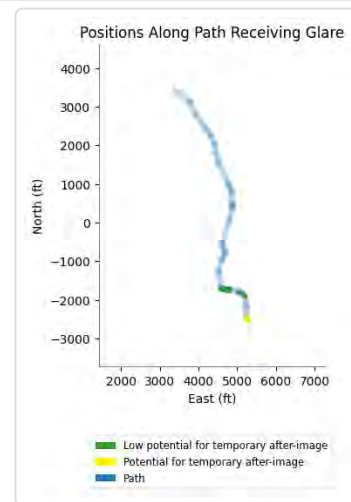
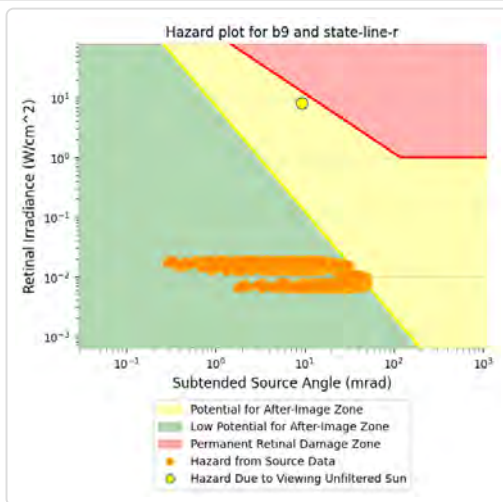
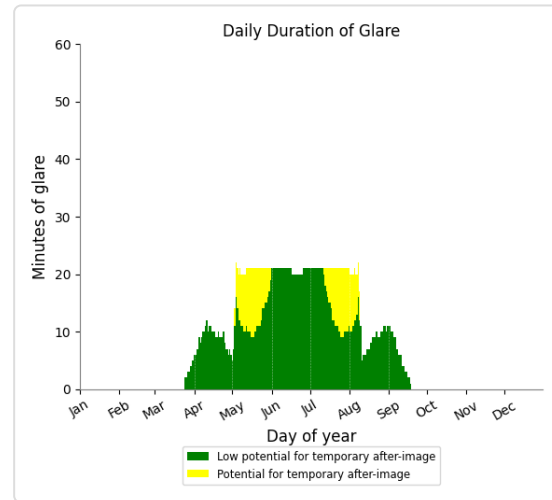
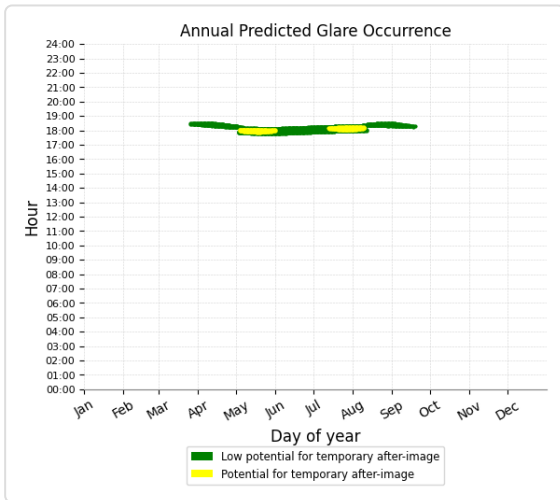
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	2,159	36.0	492	8.2
McCready Rd	0	0.0	0	0.0
OP 2	693	11.6	0	0.0
OP 3	692	11.5	0	0.0
OP 4	1,292	21.5	0	0.0
OP 1	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

## B9 and Route: State Line Rd

Yellow glare: 492 min.

Green glare: 2,159 min.



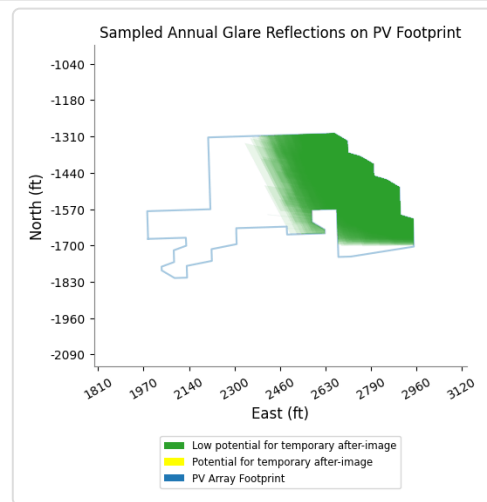
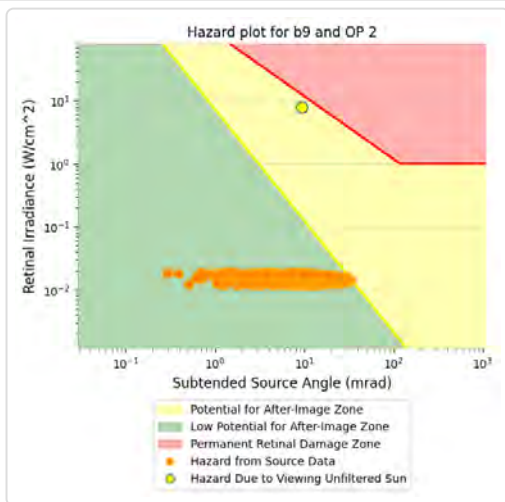
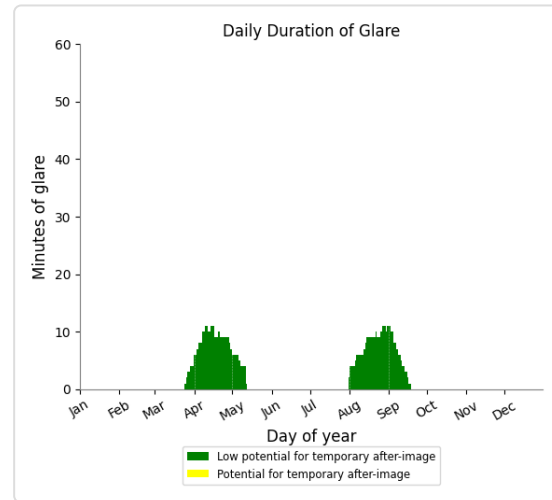
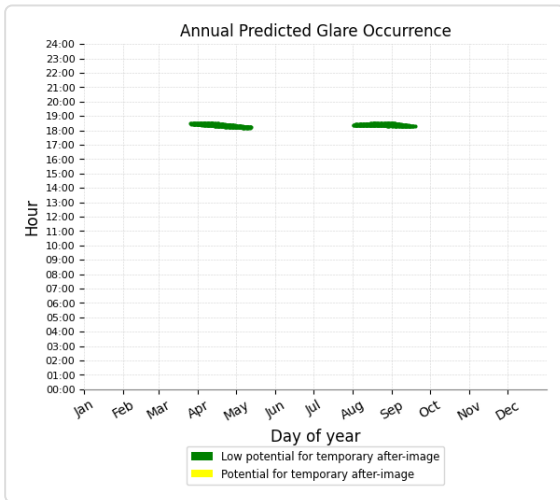
## B9 and Route: McCready Rd

No glare found

## B9 and OP 2

Yellow glare: none

Green glare: 693 min.

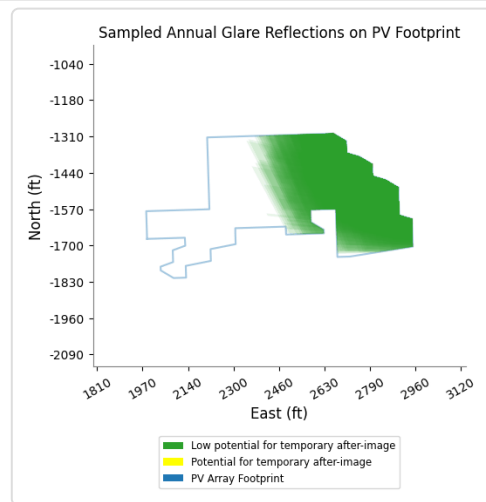
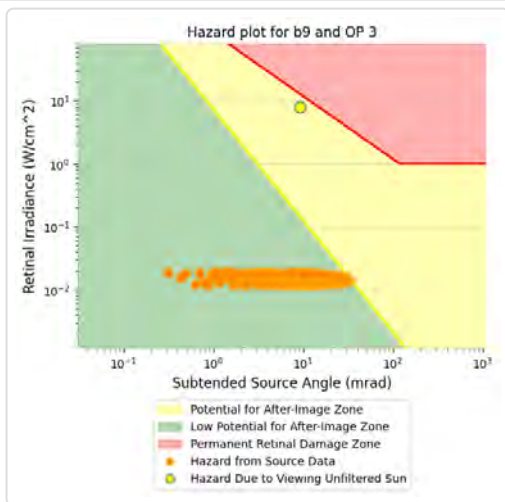
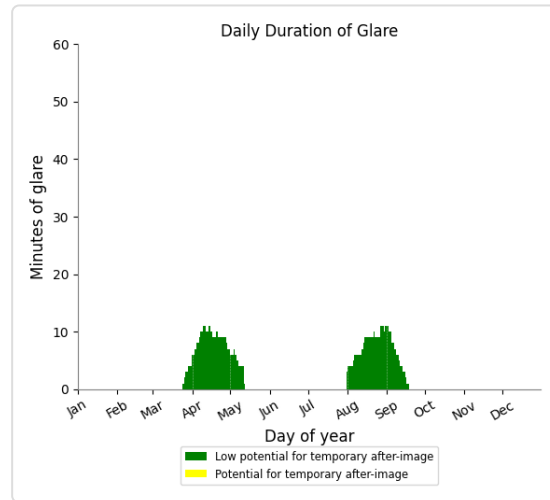
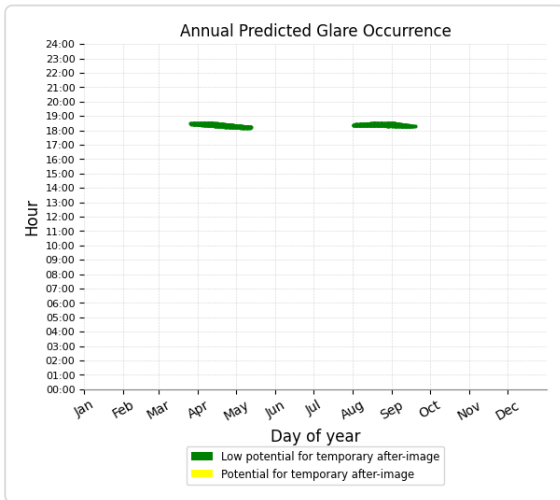




### B9 and OP 3

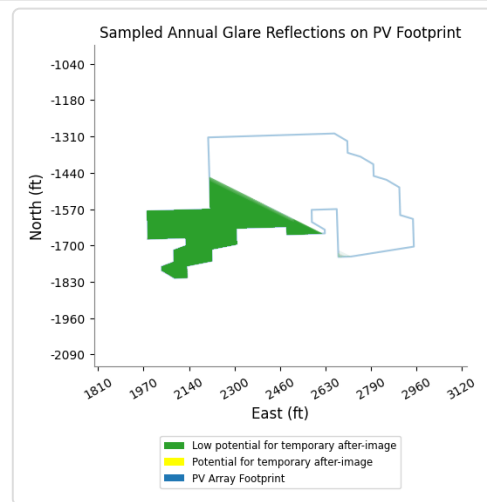
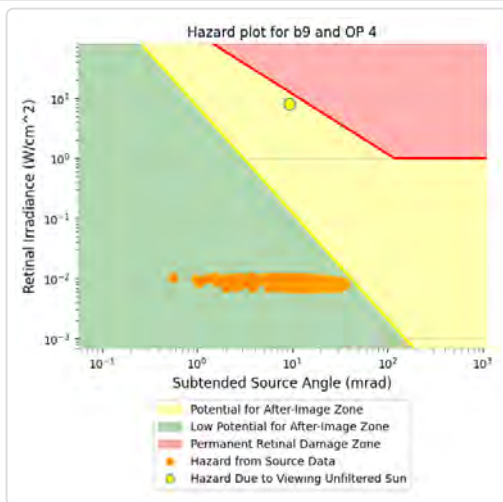
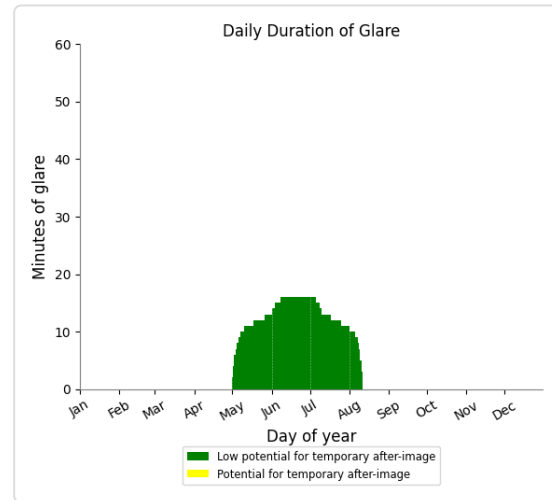
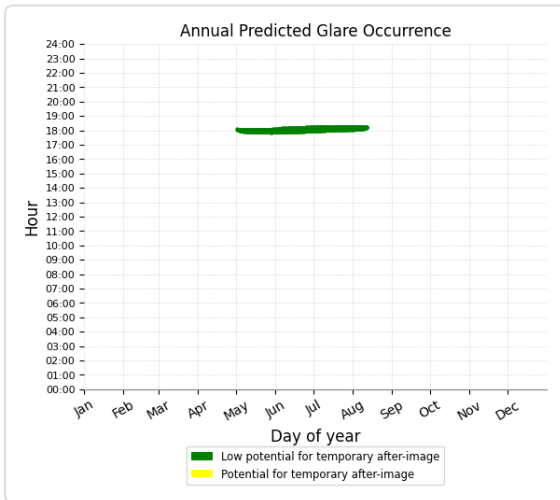
Yellow glare: none

Green glare: 692 min.



## B9 and OP 4

Yellow glare: none  
Green glare: 1,292 min.



## B9 and OP 1

No glare found

## B9 and OP 10

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/](http://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

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## Group C

# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar North**

300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section C1\_revised**

Client: REV Renewables

Created 20 Sep, 2025

Updated 22 Oct, 2025

Time-step 1 minute

Timezone offset UTC-5

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m<sup>2</sup>

Category 100 MW to 1 GW

Site ID 159916.26057

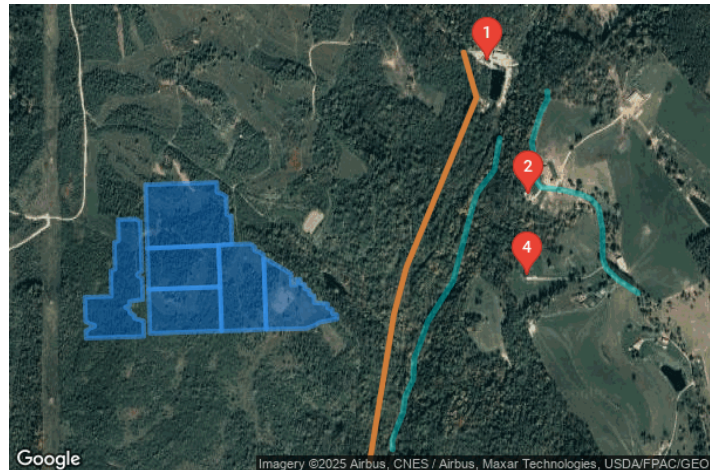
Ocular transmission coefficient 0.5

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 kWh
			min	hr	min	hr	
C1-1	25.0	180.0	2,163	36.0	57	0.9	-
C1-2	25.0	180.0	994	16.6	0	0.0	-
C1-3	25.0	180.0	356	5.9	0	0.0	-
C1-4	25.0	180.0	1,385	23.1	0	0.0	-
C1-5	25.0	180.0	1,097	18.3	0	0.0	-
C1-6	25.0	180.0	1,133	18.9	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
McCready Rd	0	0.0	0	0.0
State Line Rd	4,738	79.0	57	0.9
OP 1	0	0.0	0	0.0
OP 2	102	1.7	0	0.0
OP 3	161	2.7	0	0.0
OP 4	2,127	35.5	0	0.0

# Component Data

## PV Arrays

**Name:** C1-1  
**Axis tracking:** Fixed (no rotation)  
**Tilt:** 25.0°  
**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.328994	-80.512837	1173.24	5.00	1178.24
2	40.329785	-80.512871	1163.61	5.00	1168.61
3	40.329823	-80.513036	1170.37	5.00	1175.37
4	40.330335	-80.513057	1159.07	5.00	1164.07
5	40.330410	-80.513224	1161.16	5.00	1166.16
6	40.330448	-80.513389	1162.02	5.00	1167.02
7	40.330723	-80.513400	1145.00	5.00	1150.00
8	40.330699	-80.514380	1175.73	5.00	1180.73
9	40.330679	-80.515197	1179.14	5.00	1184.14
10	40.330660	-80.516013	1177.44	5.00	1182.44
11	40.328882	-80.515940	1190.21	5.00	1195.21
12	40.328966	-80.513331	1185.17	5.00	1190.17

**Name:** C1-2  
**Axis tracking:** Fixed (no rotation)  
**Tilt:** 25.0°  
**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.328882	-80.515940	1190.21	5.00	1195.21
2	40.328966	-80.513331	1185.17	5.00	1190.17
3	40.327806	-80.513270	1172.86	5.00	1177.86
4	40.327734	-80.515899	1199.57	5.00	1204.57



**Name:** C1-3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.327063	-80.515865	1202.38	5.00	1207.38
2	40.326510	-80.515843	1204.96	5.00	1209.96
3	40.326577	-80.513218	1163.91	5.00	1168.91
4	40.327806	-80.513270	1172.86	5.00	1177.86
5	40.327734	-80.515899	1199.57	5.00	1204.57

**Name:** C1-4

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.328589	-80.511677	1151.84	5.00	1156.84
2	40.328705	-80.511682	1148.34	5.00	1153.34
3	40.328780	-80.511849	1155.22	5.00	1160.22
4	40.328818	-80.512014	1158.30	5.00	1163.30
5	40.328935	-80.512018	1158.06	5.00	1163.06
6	40.329010	-80.512185	1160.18	5.00	1165.18
7	40.328994	-80.512837	1173.24	5.00	1178.24
8	40.328966	-80.513331	1185.17	5.00	1190.17
9	40.327806	-80.513270	1172.86	5.00	1177.86
10	40.326577	-80.513218	1163.91	5.00	1168.91
11	40.326596	-80.512250	1142.56	5.00	1147.56
12	40.326625	-80.511587	1125.14	5.00	1130.14

**Name:** C1-5

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.326646	-80.510126	1095.24	5.00	1100.24
2	40.326647	-80.510124	1095.25	5.00	1100.25
3	40.326733	-80.509802	1094.64	5.00	1099.64
4	40.326816	-80.509642	1093.24	5.00	1098.24
5	40.326911	-80.508992	1090.36	5.00	1095.36
6	40.327028	-80.508997	1088.26	5.00	1093.26
7	40.327065	-80.509162	1092.81	5.00	1097.81
8	40.327182	-80.509167	1087.12	5.00	1092.12
9	40.327220	-80.509332	1093.68	5.00	1098.68
10	40.327336	-80.509336	1084.82	5.00	1089.82
11	40.327366	-80.509828	1106.39	5.00	1111.39
12	40.327562	-80.509836	1110.86	5.00	1115.86
13	40.327600	-80.510001	1114.42	5.00	1119.42
14	40.327716	-80.510006	1115.02	5.00	1120.02
15	40.327754	-80.510171	1119.47	5.00	1124.47
16	40.327870	-80.510176	1116.61	5.00	1121.61
17	40.327908	-80.510341	1120.61	5.00	1125.61
18	40.328025	-80.510346	1118.37	5.00	1123.37
19	40.328021	-80.510507	1120.71	5.00	1125.71
20	40.327862	-80.510501	1122.27	5.00	1127.27
21	40.327859	-80.510664	1128.75	5.00	1133.75
22	40.328175	-80.510679	1130.15	5.00	1135.15
23	40.328250	-80.510846	1131.93	5.00	1136.93
24	40.328325	-80.511012	1133.70	5.00	1138.70
25	40.328400	-80.511179	1141.47	5.00	1146.47
26	40.328476	-80.511346	1143.85	5.00	1148.85
27	40.328551	-80.511512	1145.88	5.00	1150.88
28	40.328589	-80.511677	1151.84	5.00	1156.84
29	40.326625	-80.511587	1125.14	5.00	1130.14
30	40.326643	-80.510289	1094.84	5.00	1099.84

**Name:** C1-6

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.329686	-80.517015	1173.22	5.00	1178.22
2	40.329679	-80.517015	1173.37	5.00	1178.37
3	40.329095	-80.516991	1180.68	5.00	1185.68
4	40.329049	-80.517152	1173.23	5.00	1178.23
5	40.328300	-80.517122	1173.53	5.00	1178.53
6	40.328254	-80.517283	1165.16	5.00	1170.16
7	40.327542	-80.517256	1156.85	5.00	1161.85
8	40.327519	-80.518235	1139.35	5.00	1144.35
9	40.326849	-80.518207	1140.11	5.00	1145.11
10	40.326774	-80.518041	1142.22	5.00	1147.22
11	40.326736	-80.517875	1143.56	5.00	1148.56
12	40.326698	-80.517874	1143.64	5.00	1148.64
13	40.326653	-80.518036	1142.25	5.00	1147.25
14	40.326570	-80.518196	1138.84	5.00	1143.84
15	40.326374	-80.518188	1138.39	5.00	1143.39
16	40.326425	-80.516065	1203.44	5.00	1208.44
17	40.326858	-80.516083	1201.32	5.00	1206.32
18	40.326929	-80.516413	1196.06	5.00	1201.06
19	40.327008	-80.516416	1195.49	5.00	1200.49
20	40.327083	-80.516583	1192.00	5.00	1197.00
21	40.327162	-80.516586	1191.60	5.00	1196.60
22	40.327238	-80.516753	1183.63	5.00	1188.63
23	40.327283	-80.516591	1190.80	5.00	1195.80
24	40.327400	-80.516596	1190.43	5.00	1195.43
25	40.327453	-80.516108	1198.47	5.00	1203.47
26	40.328044	-80.516132	1198.97	5.00	1203.97
27	40.328119	-80.516298	1197.42	5.00	1202.42
28	40.328161	-80.516300	1196.95	5.00	1201.95
29	40.328244	-80.516140	1196.86	5.00	1201.86
30	40.329626	-80.516197	1191.01	5.00	1196.01
31	40.329701	-80.516363	1191.81	5.00	1196.81
32	40.329690	-80.516852	1179.46	5.00	1184.46

# Route Receptors

**Name:** McCreedy Rd

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.331953	-80.503034	992.48	4.50	996.98
2	40.331070	-80.503227	989.19	4.50	993.69
3	40.330449	-80.503850	985.83	4.50	990.33
4	40.330056	-80.504021	986.50	4.50	991.00
5	40.327946	-80.504751	977.65	4.50	982.15
6	40.326833	-80.505673	969.60	4.50	974.10
7	40.326081	-80.506017	964.17	4.50	968.67
8	40.325843	-80.506156	962.07	4.50	966.57
9	40.325213	-80.506210	960.77	4.50	965.27
10	40.324747	-80.506499	960.01	4.50	964.51
11	40.324313	-80.506574	956.49	4.50	960.99
12	40.323536	-80.506971	955.33	4.50	959.83
13	40.323275	-80.506961	958.24	4.50	962.74

**Name:** State Line Rd  
**Path type:** Two-way  
**Azimuthal view angle:** 50.0°  
**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.333263	-80.501293	1076.86	4.50	1081.36
2	40.333054	-80.501268	1072.18	4.50	1076.68
3	40.332669	-80.501535	1084.00	4.50	1088.50
4	40.331864	-80.501859	1102.79	4.50	1107.29
5	40.330703	-80.501643	1131.47	4.50	1135.97
6	40.330583	-80.501526	1134.98	4.50	1139.48
7	40.330519	-80.500791	1152.27	4.50	1156.77
8	40.330384	-80.500040	1157.60	4.50	1162.10
9	40.330251	-80.499676	1159.53	4.50	1164.03
10	40.330024	-80.499420	1164.15	4.50	1168.65
11	40.329398	-80.499267	1173.28	4.50	1177.78
12	40.328581	-80.499259	1199.43	4.50	1203.93
13	40.328317	-80.499127	1209.20	4.50	1213.70
14	40.328001	-80.498697	1215.76	4.50	1220.26
15	40.327638	-80.497968	1200.15	4.50	1204.65

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	40.334100	-80.503481	1014.69	6.00
OP 2	2	40.330369	-80.501957	1122.80	6.00
OP 3	3	40.330369	-80.501957	1122.80	16.00
OP 4	4	40.328134	-80.502018	1133.01	6.00

## Obstruction Components

Name: Treeline C1-1

Top height: 35.0 ft



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.322950	-80.507792	976.62
2	40.327063	-80.506903	1044.81
3	40.328355	-80.506452	1058.82
4	40.333085	-80.503883	1077.14
5	40.334344	-80.504355	1045.25



# 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 kWh
			min	hr	min	hr	
C1-1	25.0	180.0	2,163	36.0	57	0.9	-
C1-2	25.0	180.0	994	16.6	0	0.0	-
C1-3	25.0	180.0	356	5.9	0	0.0	-
C1-4	25.0	180.0	1,385	23.1	0	0.0	-
C1-5	25.0	180.0	1,097	18.3	0	0.0	-
C1-6	25.0	180.0	1,133	18.9	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
McCready Rd	0	0.0	0	0.0
State Line Rd	4,738	79.0	57	0.9
OP 1	0	0.0	0	0.0
OP 2	102	1.7	0	0.0
OP 3	161	2.7	0	0.0
OP 4	2,127	35.5	0	0.0

## PV: C1-1 potential temporary after-image

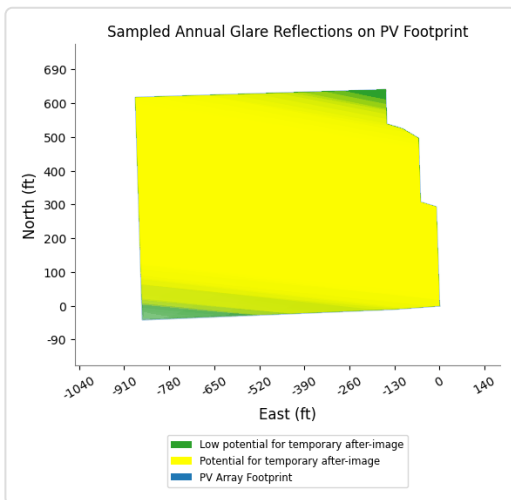
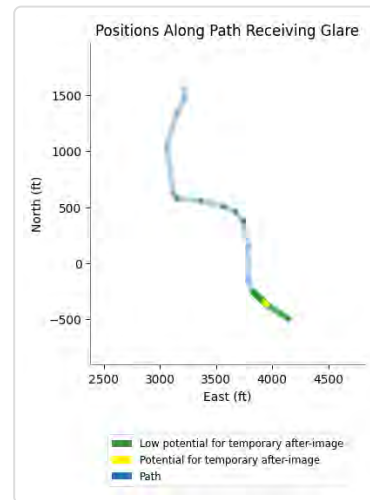
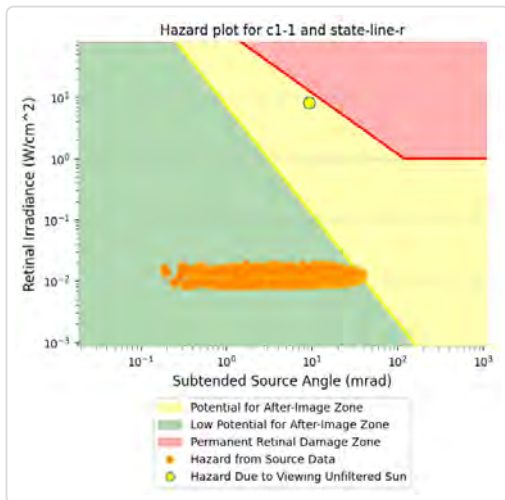
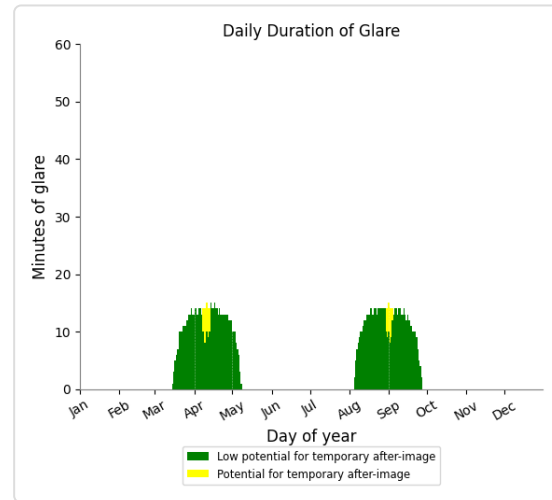
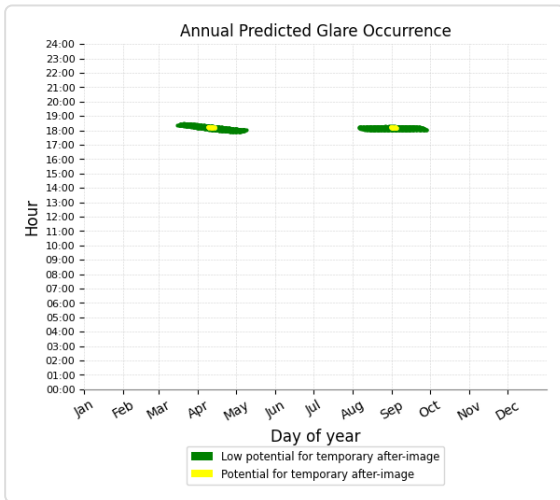
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	1,192	19.9	57	0.9
McCready Rd	0	0.0	0	0.0
OP 2	102	1.7	0	0.0
OP 3	161	2.7	0	0.0
OP 4	708	11.8	0	0.0
OP 1	0	0.0	0	0.0

## C1-1 and Route: State Line Rd

Yellow glare: 57 min.

Green glare: 1,192 min.



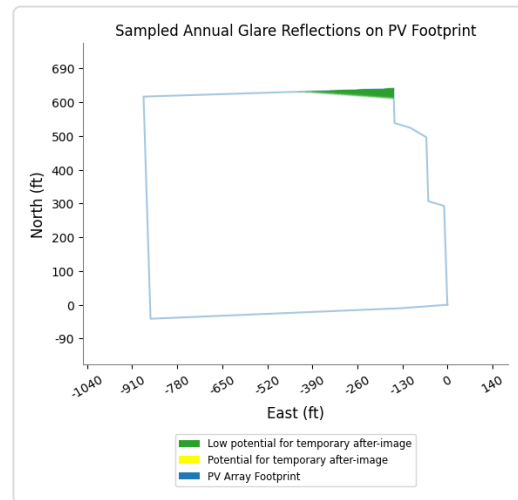
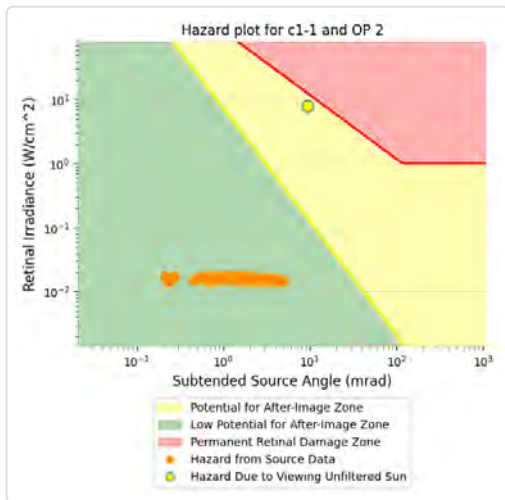
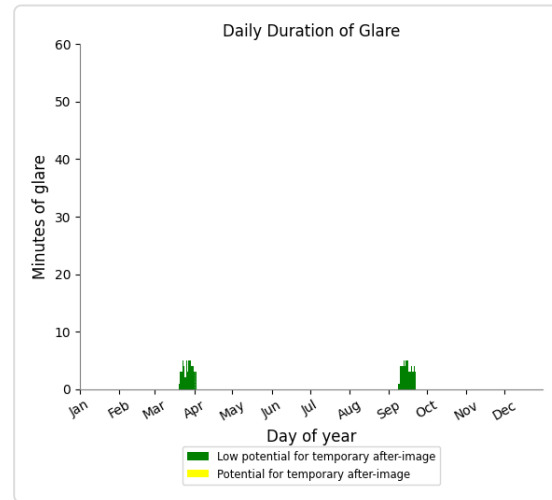
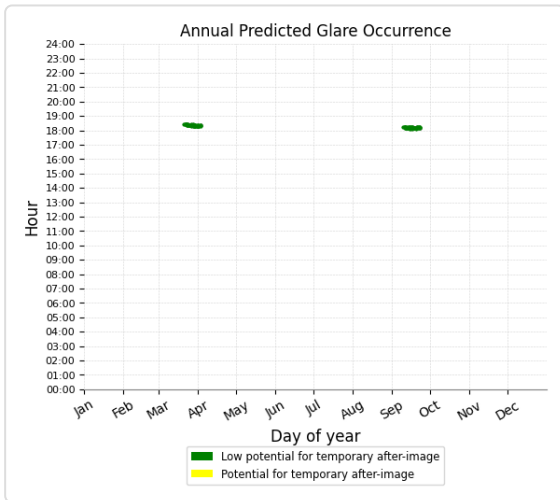
## C1-1 and Route: McCready Rd

No glare found

## C1-1 and OP 2

Yellow glare: none

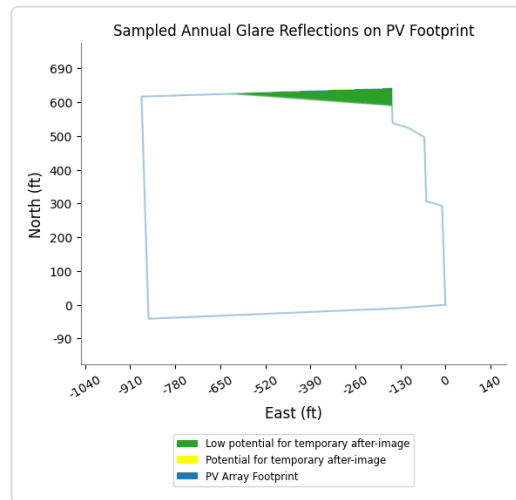
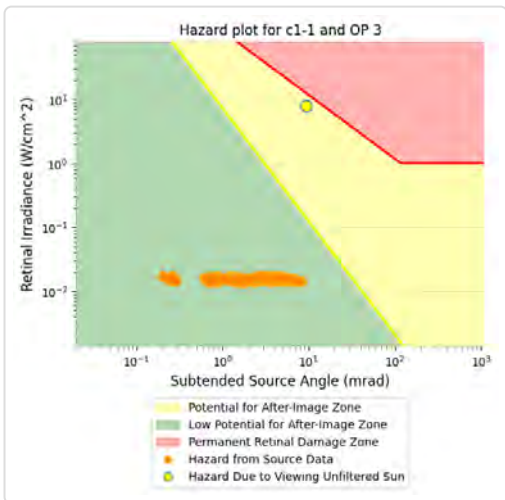
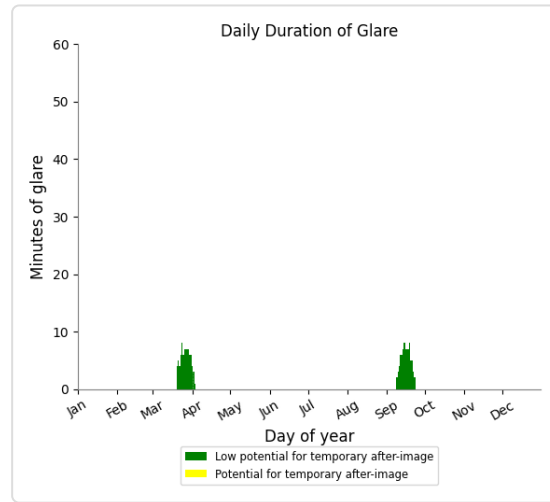
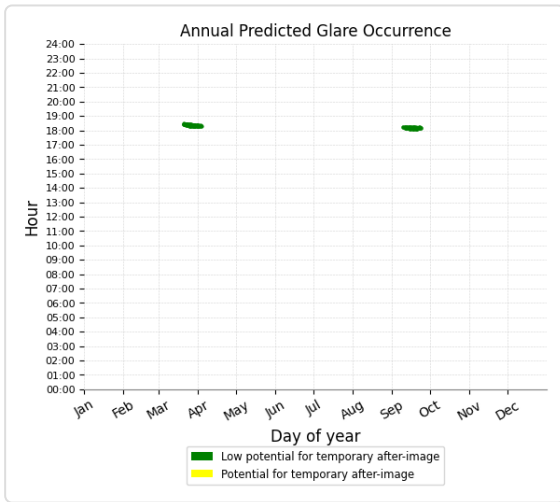
Green glare: 102 min.



# C1-1 and OP 3

Yellow glare: none

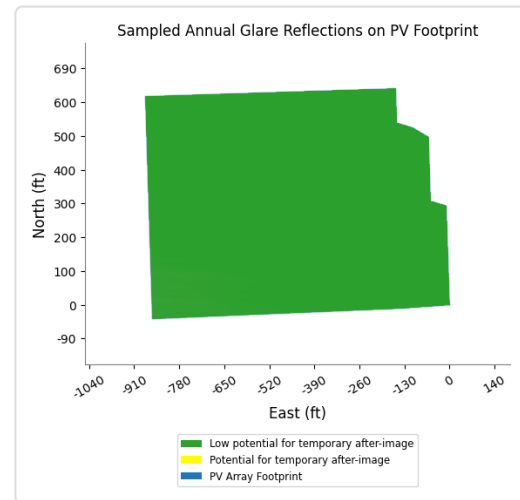
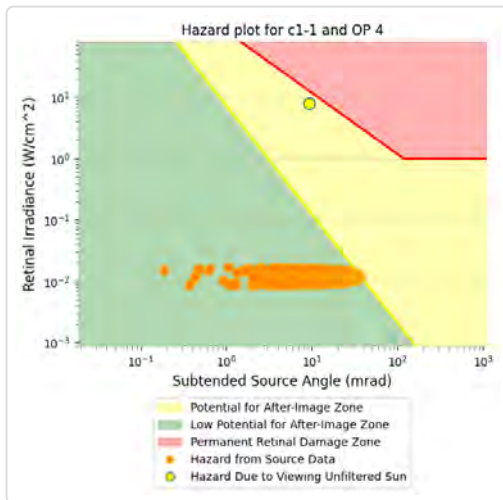
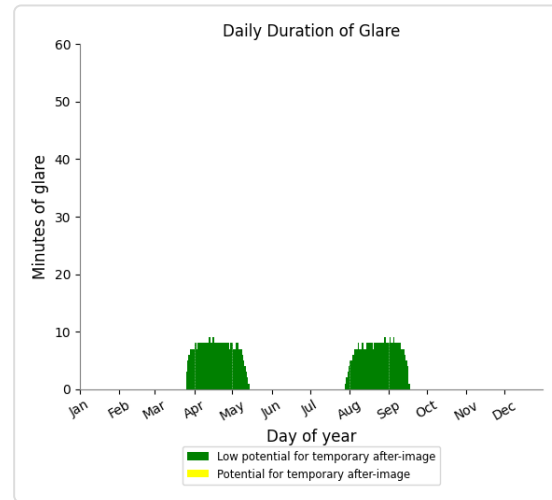
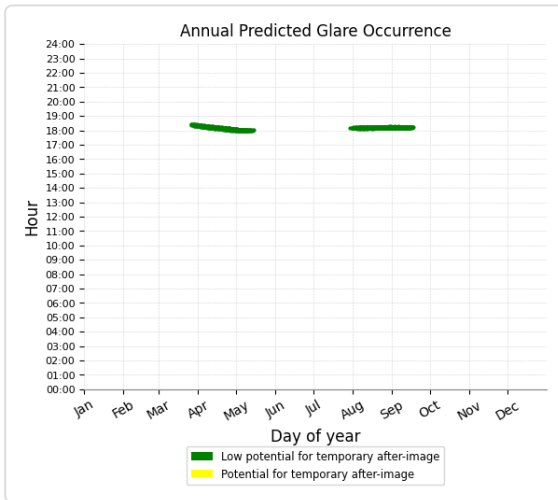
Green glare: 161 min.



## C1-1 and OP 4

Yellow glare: none

Green glare: 708 min.



## C1-1 and OP 1

No glare found

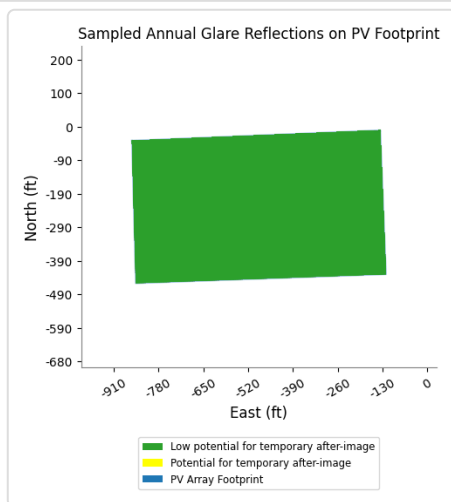
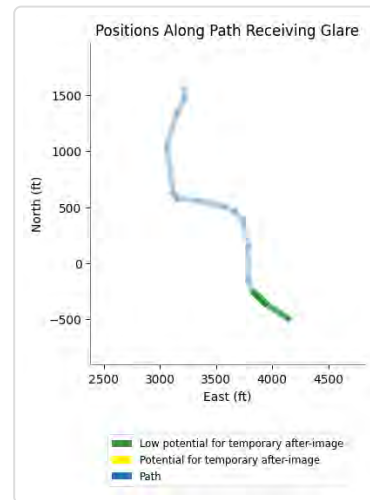
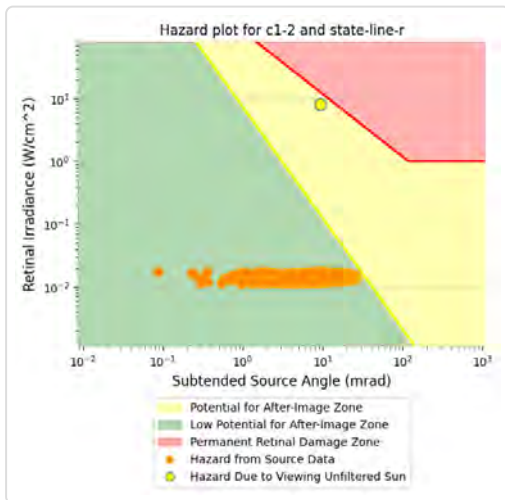
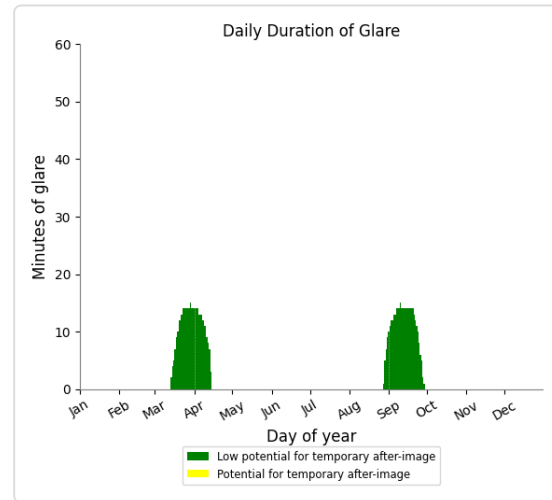
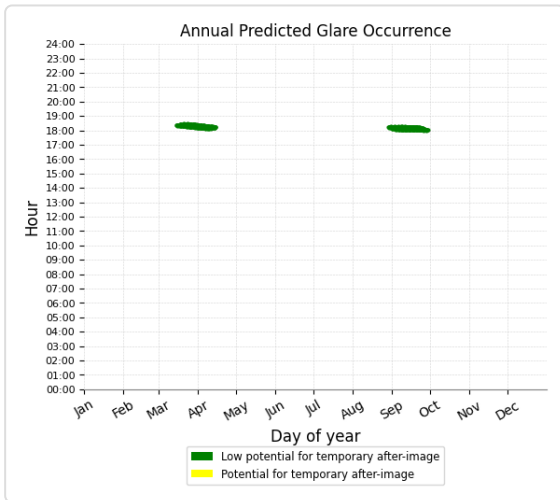
## PV: C1-2 low potential for temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	715	11.9	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	279	4.7	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

## C1-2 and Route: State Line Rd

Yellow glare: none  
Green glare: 715 min.



## C1-2 and Route: McCready Rd

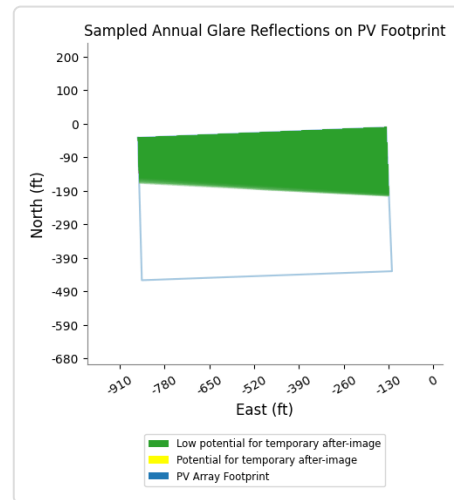
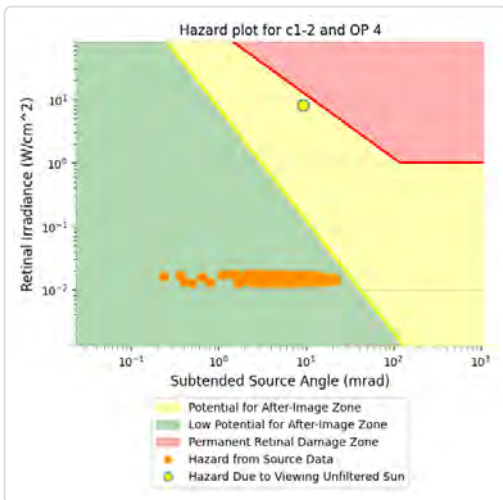
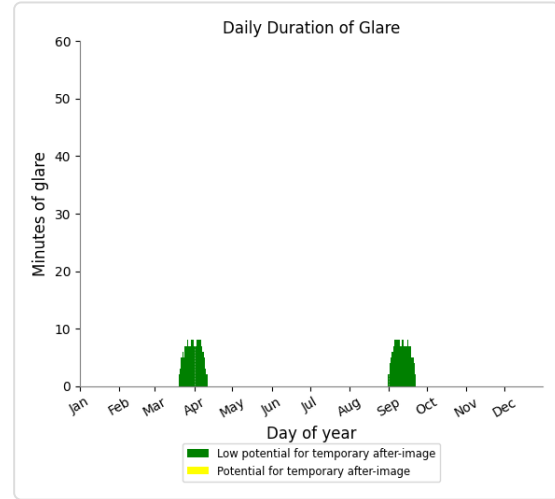
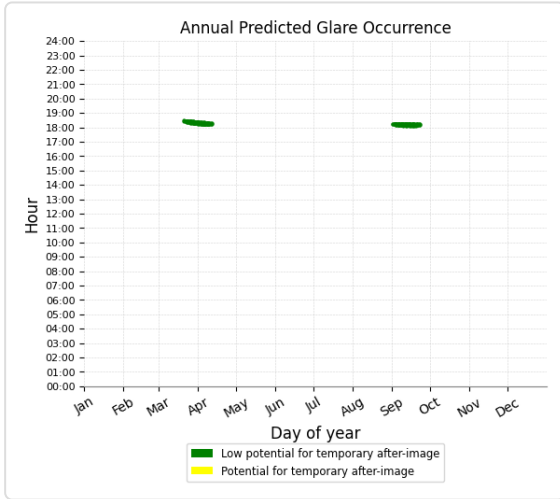
No glare found



## C1-2 and OP 4

Yellow glare: none

Green glare: 279 min.



## C1-2 and OP 1

No glare found

## C1-2 and OP 2

No glare found

## C1-2 and OP 3

No glare found

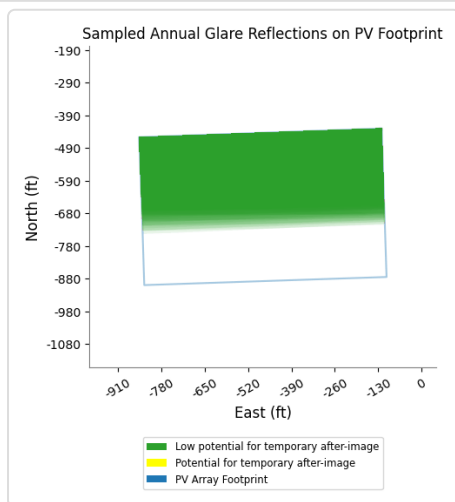
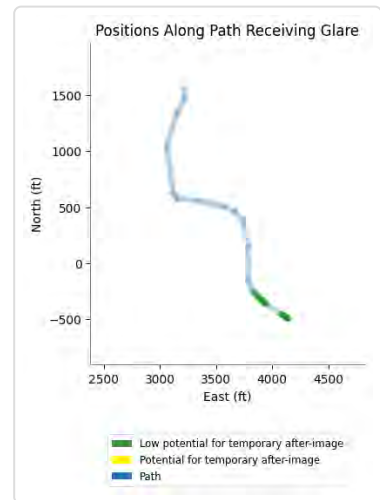
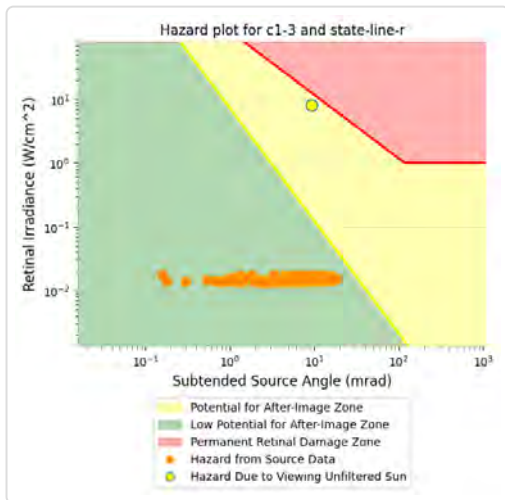
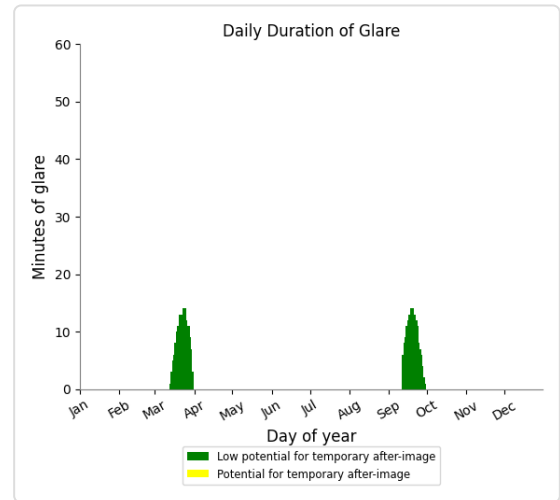
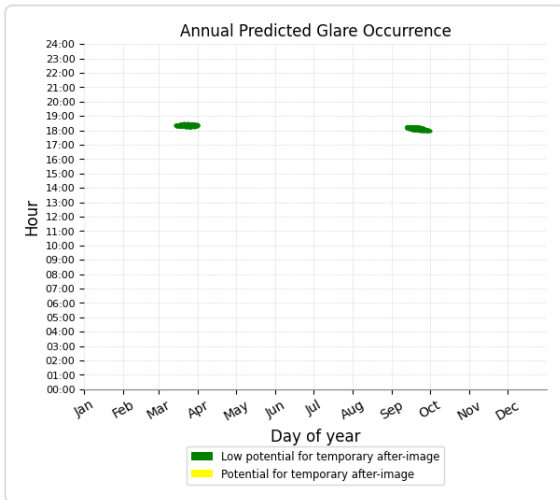
**PV: C1-3** low potential for temporary after-image

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	356	5.9	0	0.0
McCready Rd	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

### C1-3 and Route: State Line Rd

Yellow glare: none  
 Green glare: 356 min.



### C1-3 and Route: McCreedy Rd

No glare found

### C1-3 and OP 1

No glare found

### C1-3 and OP 2

No glare found

### C1-3 and OP 3

No glare found

### C1-3 and OP 4

No glare found

### PV: C1-4 low potential for temporary after-image

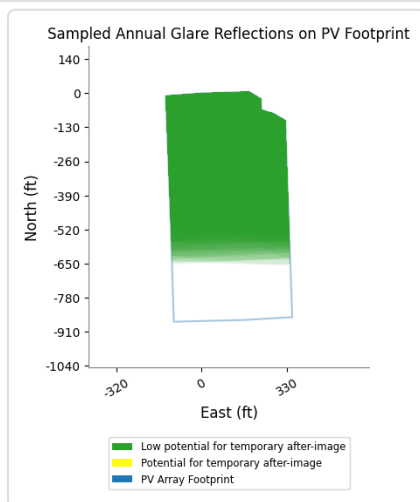
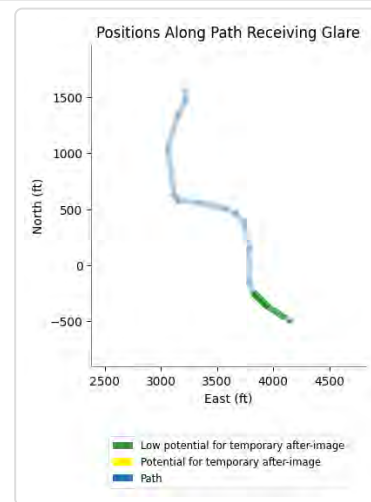
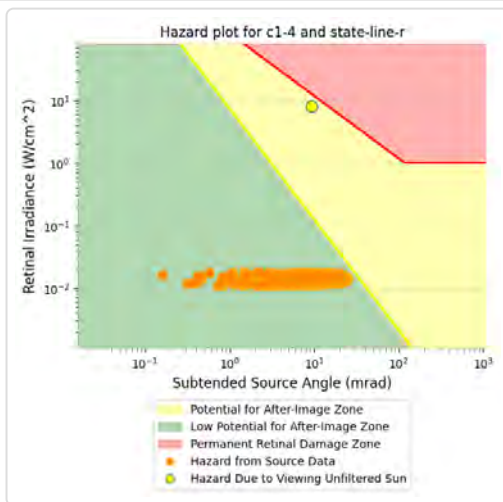
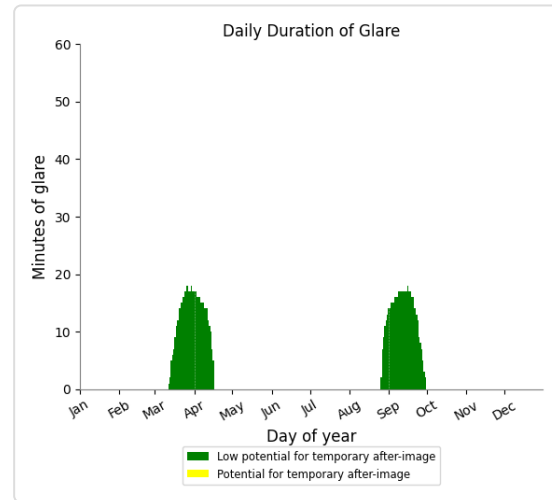
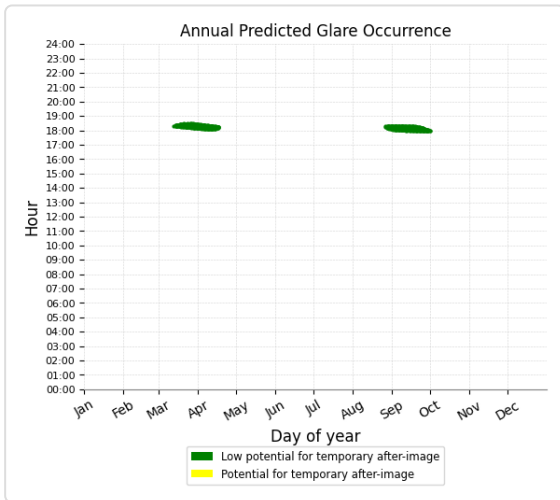
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	929	15.5	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	456	7.6	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

## C1-4 and Route: State Line Rd

Yellow glare: none

Green glare: 929 min.



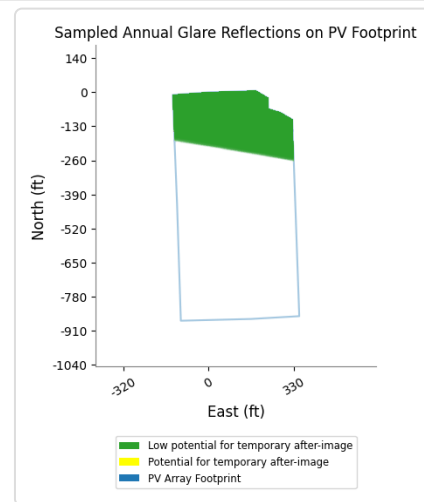
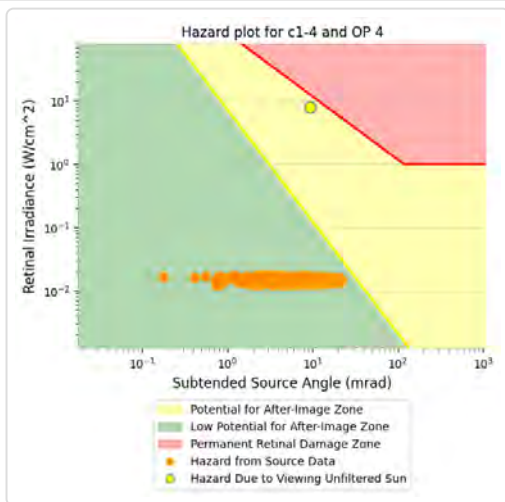
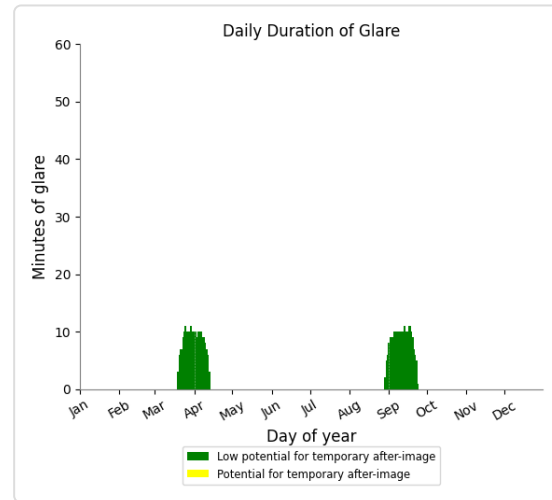
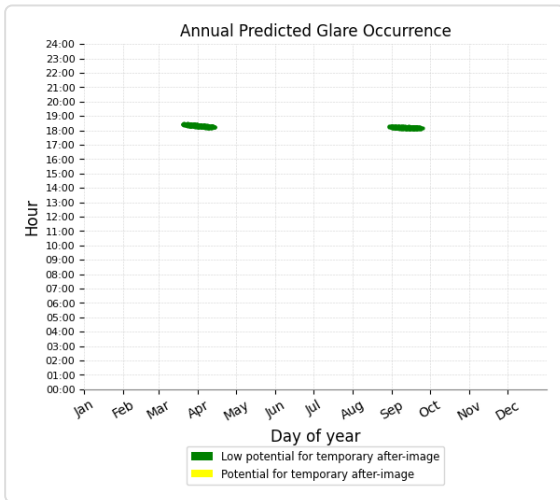
## C1-4 and Route: McCready Rd

No glare found

## C1-4 and OP 4

Yellow glare: none

Green glare: 456 min.



## C1-4 and OP 1

No glare found

## C1-4 and OP 2

No glare found

## C1-4 and OP 3

No glare found



**PV: C1-5** low potential for temporary after-image

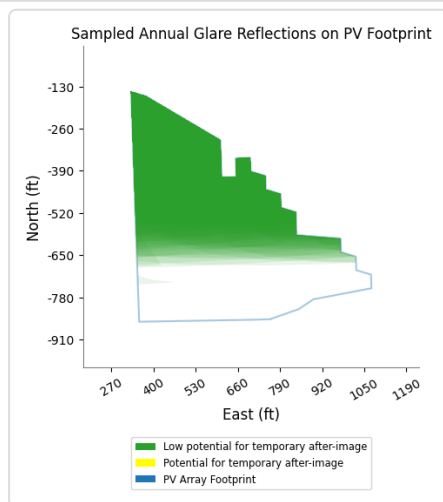
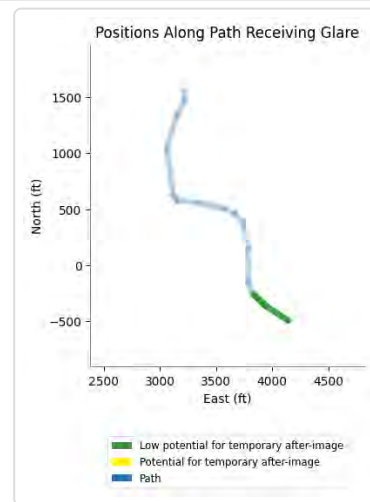
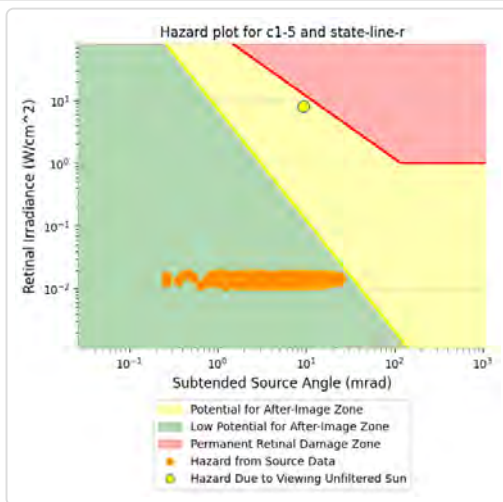
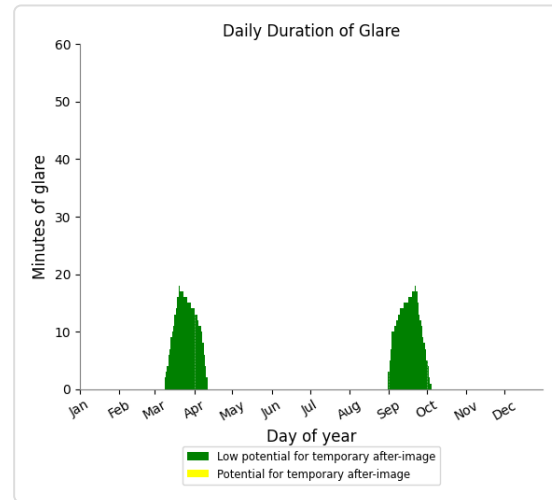
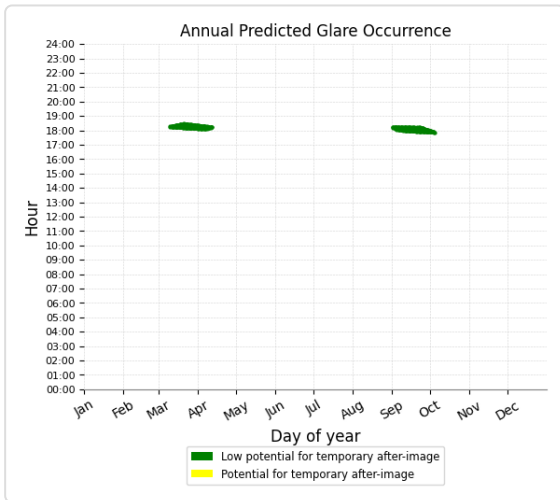
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	778	13.0	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	319	5.3	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

## C1-5 and Route: State Line Rd

Yellow glare: none

Green glare: 778 min.



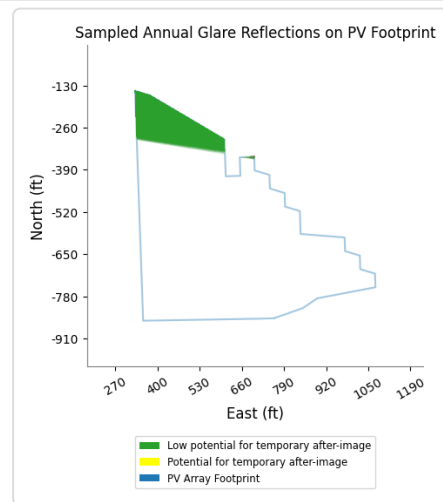
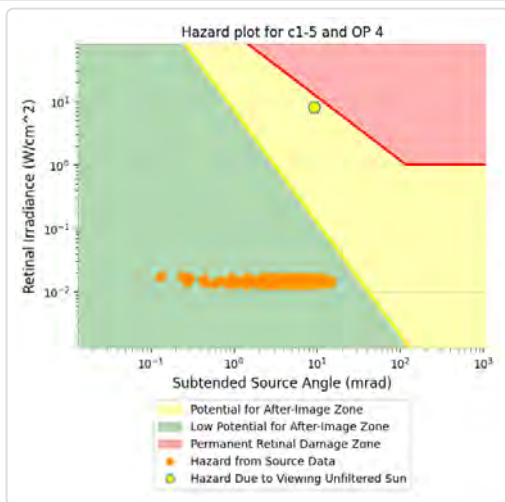
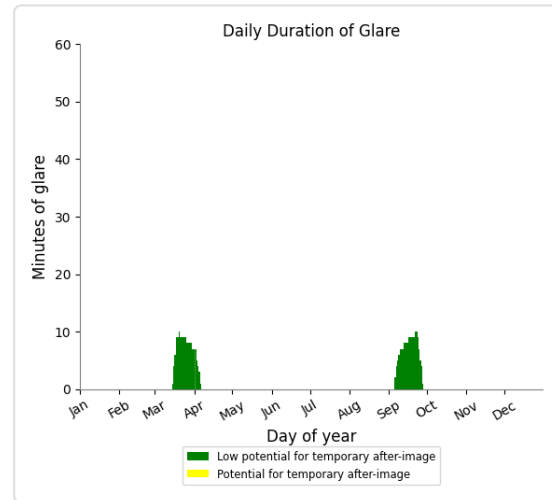
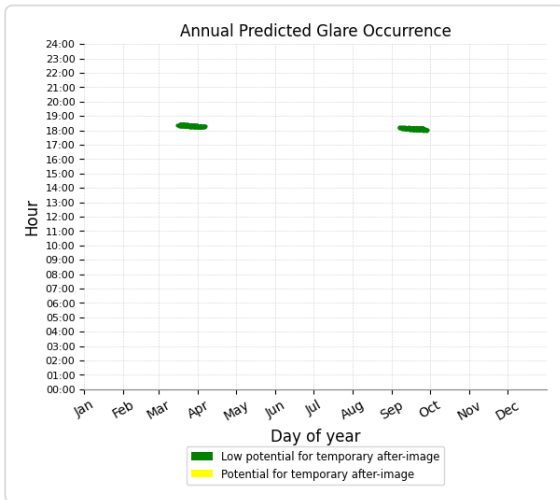
## C1-5 and Route: McCready Rd

No glare found

## C1-5 and OP 4

Yellow glare: none

Green glare: 319 min.



## C1-5 and OP 1

No glare found

## C1-5 and OP 2

No glare found

## C1-5 and OP 3

No glare found

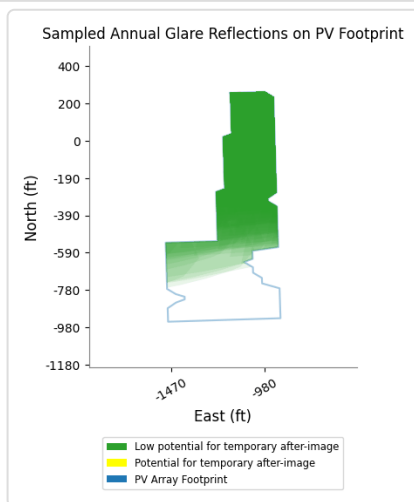
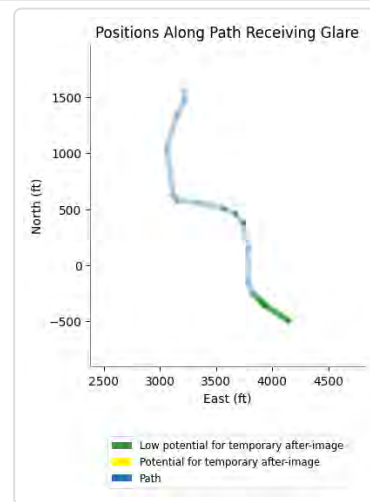
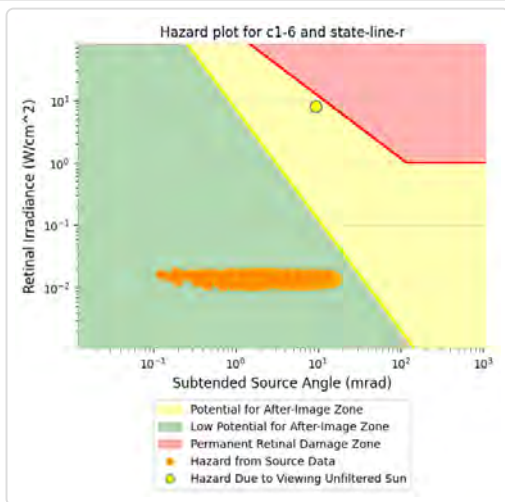
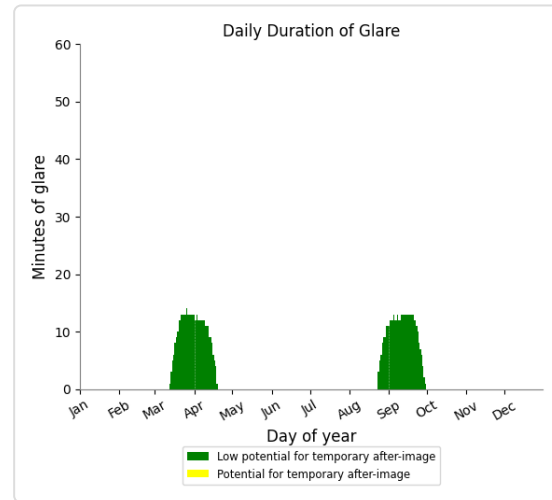
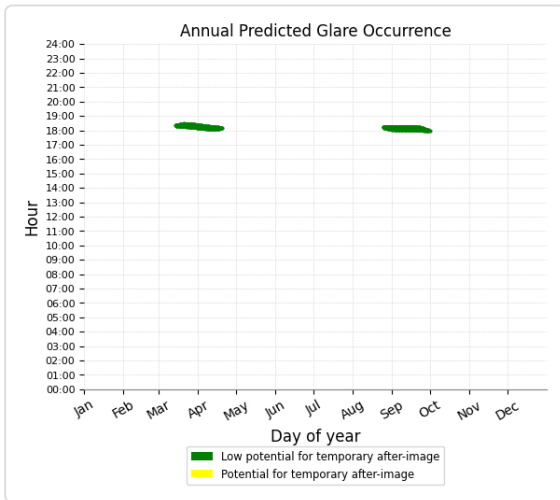
**PV: C1-6** low potential for temporary after-image

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
State Line Rd	768	12.8	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	365	6.1	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

## C1-6 and Route: State Line Rd

Yellow glare: none  
Green glare: 768 min.



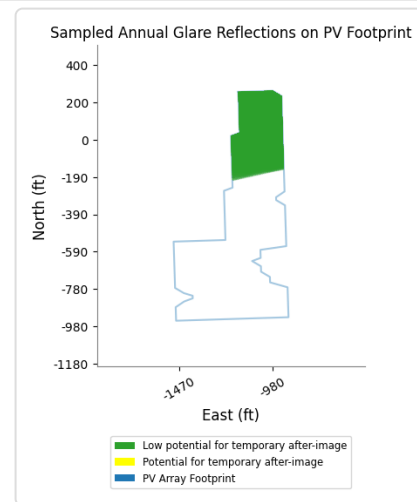
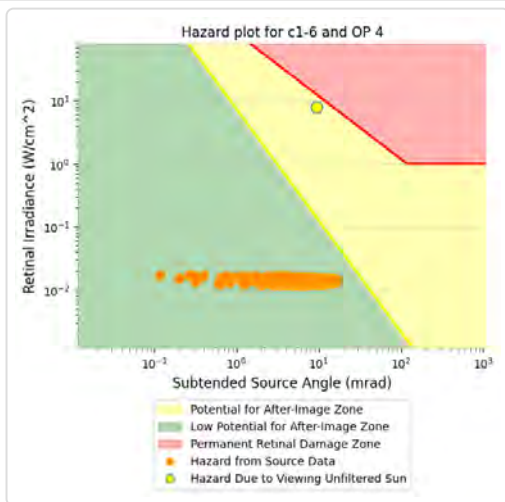
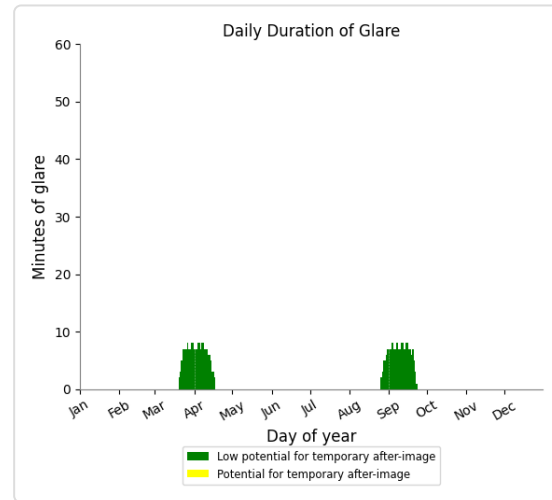
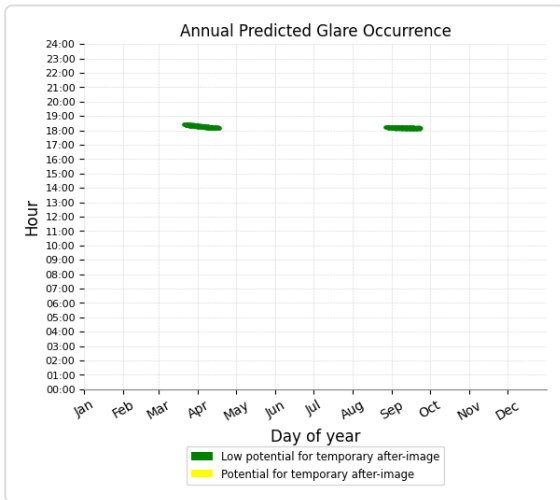
## C1-6 and Route: McCready Rd

No glare found

## C1-6 and OP 4

Yellow glare: none

Green glare: 365 min.



## C1-6 and OP 1

No glare found

## C1-6 and OP 2

No glare found

## C1-6 and OP 3

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/](http://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

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# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar North**

300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section C2\_ Revised**

Client: REV Renewables

Created 20 Sep, 2025

Updated 23 Oct, 2025

Time-step 1 minute

Timezone offset UTC-5

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m<sup>2</sup>

Category 100 MW to 1 GW

Site ID 159917.26057

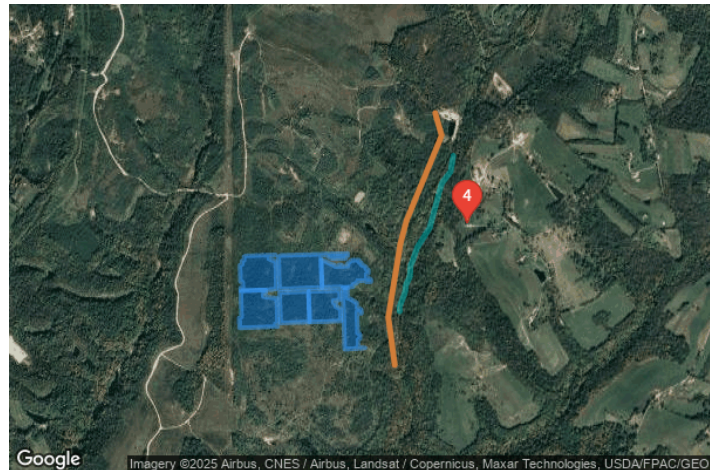
Ocular transmission coefficient 0.5

Pupil diameter 0.002 m

Eye focal length 0.017 m

Sun subtended angle 9.3 mrad

PV analysis methodology V2



## Summary of Results No glare predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
C2-1	25.0	180.0	0	0.0	0	0.0	-
C2-2	25.0	180.0	0	0.0	0	0.0	-
C2-3	25.0	180.0	0	0.0	0	0.0	-
C2-4	25.0	180.0	0	0.0	0	0.0	-
C2-5	25.0	180.0	0	0.0	0	0.0	-
C2-6	25.0	180.0	0	0.0	0	0.0	-
C2-7	25.0	180.0	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
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

# Component Data

## PV Arrays

**Name:** C2-1  
**Axis tracking:** Fixed (no rotation)  
**Tilt:** 25.0°  
**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.326374	-80.518188	1138.39	5.00	1143.39
2	40.326328	-80.518349	1137.42	5.00	1142.42
3	40.326133	-80.518341	1138.36	5.00	1143.36
4	40.326087	-80.518503	1137.81	5.00	1142.81
5	40.325892	-80.518495	1137.81	5.00	1142.81
6	40.325846	-80.518657	1140.11	5.00	1145.11
7	40.324939	-80.518620	1136.33	5.00	1141.33
8	40.324901	-80.518454	1138.93	5.00	1143.93
9	40.324626	-80.518443	1137.70	5.00	1142.70
10	40.324580	-80.518605	1135.88	5.00	1140.88
11	40.324424	-80.518597	1138.13	5.00	1143.13
12	40.324465	-80.516803	1160.40	5.00	1165.40
13	40.324527	-80.515988	1162.29	5.00	1167.29
14	40.325592	-80.516031	1198.18	5.00	1203.18
15	40.326067	-80.516051	1202.38	5.00	1207.38
16	40.326138	-80.516381	1200.56	5.00	1205.56
17	40.326213	-80.516547	1199.18	5.00	1204.18
18	40.326334	-80.516552	1198.35	5.00	1203.35
19	40.326425	-80.516065	1203.44	5.00	1208.44

**Name:** C2-2

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.323394	-80.518556	1135.94	5.00	1140.94
2	40.322961	-80.518539	1133.35	5.00	1138.35
3	40.322915	-80.518700	1129.56	5.00	1134.56
4	40.322354	-80.518679	1133.12	5.00	1138.12
5	40.322428	-80.515902	1144.36	5.00	1149.36
6	40.322466	-80.516067	1146.00	5.00	1151.00
7	40.322583	-80.516072	1146.72	5.00	1151.72
8	40.322628	-80.515910	1147.18	5.00	1152.18
9	40.323219	-80.515934	1156.86	5.00	1161.86
10	40.324010	-80.515967	1162.44	5.00	1167.44
11	40.324070	-80.516787	1160.18	5.00	1165.18
12	40.324108	-80.516952	1160.58	5.00	1165.58
13	40.324224	-80.516957	1160.85	5.00	1165.85
14	40.324270	-80.516795	1160.27	5.00	1165.27
15	40.324465	-80.516803	1160.40	5.00	1165.40
16	40.324424	-80.518597	1138.13	5.00	1143.13

**Name:** C2-3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.324375	-80.513958	1174.20	5.00	1179.20
2	40.324332	-80.515754	1162.07	5.00	1167.07
3	40.322634	-80.515684	1146.73	5.00	1151.73
4	40.322682	-80.513555	1135.15	5.00	1140.15
5	40.324383	-80.513630	1168.22	5.00	1173.22

**Name:** C2-4

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.324383	-80.513630	1168.22	5.00	1173.22
2	40.322682	-80.513555	1135.15	5.00	1140.15
3	40.322739	-80.511275	1149.33	5.00	1154.33
4	40.323409	-80.511302	1149.78	5.00	1154.78
5	40.323485	-80.511469	1151.09	5.00	1156.09
6	40.323523	-80.511634	1151.41	5.00	1156.41
7	40.323718	-80.511642	1148.69	5.00	1153.69
8	40.323756	-80.511807	1149.64	5.00	1154.64
9	40.323872	-80.511812	1149.23	5.00	1154.23
10	40.323926	-80.511323	1141.55	5.00	1146.55
11	40.324359	-80.511341	1135.15	5.00	1140.15
12	40.324434	-80.511507	1137.72	5.00	1142.72

**Name:** C2-5

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.321235	-80.509517	1124.90	5.00	1129.90
2	40.321265	-80.510009	1131.97	5.00	1136.97
3	40.321698	-80.510026	1115.77	5.00	1120.77
4	40.321744	-80.509865	1112.77	5.00	1117.77
5	40.322018	-80.509876	1107.03	5.00	1112.03
6	40.322056	-80.510041	1109.91	5.00	1114.91
7	40.322964	-80.510078	1103.53	5.00	1108.53
8	40.323243	-80.510088	1108.97	5.00	1113.97
9	40.323247	-80.509926	1112.89	5.00	1117.89
10	40.323168	-80.509921	1112.19	5.00	1117.19
11	40.323172	-80.509760	1110.49	5.00	1115.49
12	40.323367	-80.509768	1112.37	5.00	1117.37
13	40.323450	-80.509971	1117.61	5.00	1122.61
14	40.323480	-80.510099	1115.58	5.00	1120.58
15	40.323755	-80.510110	1111.85	5.00	1116.85
16	40.323830	-80.510277	1112.40	5.00	1117.40
17	40.323905	-80.510444	1115.53	5.00	1120.53
18	40.323980	-80.510610	1120.13	5.00	1125.13
19	40.324018	-80.510775	1125.60	5.00	1130.60
20	40.324609	-80.510800	1126.14	5.00	1131.14
21	40.324601	-80.511125	1133.18	5.00	1138.18
22	40.322940	-80.511057	1144.74	5.00	1149.74
23	40.321163	-80.510984	1135.07	5.00	1140.07



**Name:** C2-6

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

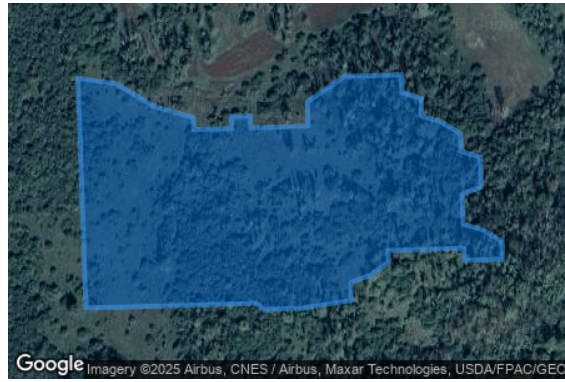
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.324609	-80.510800	1126.14	5.00	1131.14
2	40.324661	-80.510372	1109.30	5.00	1114.30
3	40.324778	-80.510377	1111.72	5.00	1116.72
4	40.324823	-80.510215	1111.36	5.00	1116.36
5	40.324906	-80.510055	1111.62	5.00	1116.62
6	40.324985	-80.510056	1113.82	5.00	1118.82
7	40.325001	-80.509405	1106.20	5.00	1111.20
8	40.324922	-80.509400	1102.34	5.00	1107.34
9	40.324930	-80.509075	1101.76	5.00	1106.76
10	40.325046	-80.509079	1099.53	5.00	1104.53
11	40.325121	-80.509246	1102.54	5.00	1107.54
12	40.325159	-80.509411	1103.94	5.00	1108.94
13	40.325355	-80.509419	1099.91	5.00	1104.91
14	40.325400	-80.509257	1094.41	5.00	1099.41
15	40.325596	-80.509265	1091.88	5.00	1096.88
16	40.325634	-80.509430	1094.04	5.00	1099.04
17	40.325750	-80.509435	1091.29	5.00	1096.29
18	40.325825	-80.509602	1093.75	5.00	1098.75
19	40.325863	-80.509767	1099.83	5.00	1104.83
20	40.325980	-80.509772	1093.78	5.00	1098.78
21	40.326018	-80.509937	1098.64	5.00	1103.64
22	40.326134	-80.509941	1093.36	5.00	1098.36
23	40.326122	-80.510430	1104.06	5.00	1109.06
24	40.326039	-80.510590	1107.94	5.00	1112.94
25	40.325956	-80.510750	1110.57	5.00	1115.57
26	40.325840	-80.510745	1114.74	5.00	1119.74
27	40.325798	-80.510745	1116.17	5.00	1121.17
28	40.325786	-80.511236	1116.60	5.00	1121.60
29	40.325865	-80.511239	1115.97	5.00	1120.97
30	40.325862	-80.511400	1117.75	5.00	1122.75
31	40.325782	-80.511399	1119.37	5.00	1124.37
32	40.325775	-80.511726	1123.75	5.00	1128.75
33	40.325854	-80.511729	1123.47	5.00	1128.47
34	40.325925	-80.512059	1130.58	5.00	1135.58
35	40.326000	-80.512226	1132.87	5.00	1137.87
36	40.326075	-80.512392	1134.96	5.00	1139.96
37	40.326109	-80.512721	1142.70	5.00	1147.70
38	40.324610	-80.512653	1153.02	5.00	1158.02
39	40.324642	-80.511187	1133.93	5.00	1138.93
40	40.324601	-80.511125	1133.18	5.00	1138.18



**Name:** C2-7

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.326109	-80.512721	1142.70	5.00	1147.70
2	40.326384	-80.512732	1139.49	5.00	1144.49
3	40.326426	-80.512732	1138.79	5.00	1143.79
4	40.326437	-80.512244	1139.35	5.00	1144.35
5	40.326358	-80.512238	1138.49	5.00	1143.49
6	40.326283	-80.512072	1133.19	5.00	1138.19
7	40.326208	-80.511905	1127.49	5.00	1132.49
8	40.326231	-80.510927	1107.06	5.00	1112.06
9	40.326348	-80.510931	1105.96	5.00	1110.96
10	40.326394	-80.510770	1102.38	5.00	1107.38
11	40.326510	-80.510775	1102.32	5.00	1107.32
12	40.326490	-80.511591	1127.11	5.00	1132.11
13	40.326440	-80.513714	1183.21	5.00	1188.21
14	40.326393	-80.515674	1205.53	5.00	1210.53
15	40.326310	-80.515835	1205.06	5.00	1210.06
16	40.324532	-80.515762	1162.77	5.00	1167.77
17	40.324610	-80.512653	1153.02	5.00	1158.02

## Route Receptors

**Name:** McCreedy Rd

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.331953	-80.503034	992.48	4.50	996.98
2	40.331070	-80.503227	989.19	4.50	993.69
3	40.330449	-80.503850	985.83	4.50	990.33
4	40.330056	-80.504021	986.50	4.50	991.00
5	40.327946	-80.504751	977.65	4.50	982.15
6	40.326833	-80.505673	969.60	4.50	974.10
7	40.326081	-80.506017	964.17	4.50	968.67
8	40.325843	-80.506156	962.07	4.50	966.57
9	40.325213	-80.506210	960.77	4.50	965.27
10	40.324747	-80.506499	960.01	4.50	964.51
11	40.324313	-80.506574	956.49	4.50	960.99
12	40.323536	-80.506971	955.33	4.50	959.83
13	40.323275	-80.506961	958.24	4.50	962.74

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 4	4	40.328134	-80.502018	1133.01	6.00

## Obstruction Components

Name: Treeline C2-2

Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.320281	-80.507317	969.08
2	40.322950	-80.507792	976.62
3	40.327063	-80.506903	1044.81
4	40.328355	-80.506452	1058.82
5	40.333085	-80.503883	1077.14
6	40.334344	-80.504355	1045.25

# Glare Analysis Results

## Summary of Results No glare predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
C2-1	25.0	180.0	0	0.0	0	0.0	-
C2-2	25.0	180.0	0	0.0	0	0.0	-
C2-3	25.0	180.0	0	0.0	0	0.0	-
C2-4	25.0	180.0	0	0.0	0	0.0	-
C2-5	25.0	180.0	0	0.0	0	0.0	-
C2-6	25.0	180.0	0	0.0	0	0.0	-
C2-7	25.0	180.0	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
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

## PV: C2-1 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

## C2-1 and Route: McCready Rd

No glare found

## C2-1 and OP 4

No glare found

**PV: C2-2** no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

**C2-2 and Route: McCready Rd**

No glare found

**C2-2 and OP 4**

No glare found

**PV: C2-3** no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

**C2-3 and Route: McCready Rd**

No glare found

**C2-3 and OP 4**

No glare found

**PV: C2-4** no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

## C2-4 and Route: McCready Rd

No glare found

## C2-4 and OP 4

No glare found

## PV: C2-5 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

## C2-5 and Route: McCready Rd

No glare found

## C2-5 and OP 4

No glare found

## PV: C2-6 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

## C2-6 and Route: McCready Rd

No glare found

## C2-6 and OP 4

No glare found

**PV: C2-7** no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

**C2-7 and Route: McCready Rd**

No glare found

**C2-7 and OP 4**

No glare found



# Assumptions

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"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/](http://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

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## Group D

# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar North**

300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section D\_revised**

Client: REV Renewables

Created 20 Sep, 2025

Updated 23 Oct, 2025

Time-step 1 minute

Timezone offset UTC-5

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m<sup>2</sup>

Category 100 MW to 1 GW

Site ID 159918.26057

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 low potential for temporary after-image predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
D1	25.0	180.0	1,197	19.9	0	0.0	-
D10	25.0	180.0	0	0.0	0	0.0	-
D2	25.0	180.0	198	3.3	0	0.0	-
D3	25.0	180.0	143	2.4	0	0.0	-
D4	25.0	180.0	472	7.9	0	0.0	-
D5	25.0	180.0	1,528	25.5	0	0.0	-
D6	25.0	180.0	1,000	16.7	0	0.0	-
D7	25.0	180.0	1,176	19.6	0	0.0	-
D8	25.0	180.0	0	0.0	0	0.0	-
D9	25.0	180.0	566	9.4	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
Bethel Ridge Rd	3,008	50.1	0	0.0
Bethel Ridge Rd Trucks	3,272	54.5	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

# Component Data

## PV Arrays

**Name:** D1

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.317662	-80.508390	1088.61	5.00	1093.61
2	40.318411	-80.508420	1085.95	5.00	1090.95
3	40.318441	-80.508912	1104.06	5.00	1109.06
4	40.318874	-80.508930	1093.98	5.00	1098.98
5	40.318870	-80.509092	1095.34	5.00	1100.34
6	40.318712	-80.509087	1099.84	5.00	1104.84
7	40.318708	-80.509248	1108.37	5.00	1113.37
8	40.318945	-80.509260	1106.61	5.00	1111.61
9	40.318983	-80.509425	1112.79	5.00	1117.79
10	40.319179	-80.509433	1109.71	5.00	1114.71
11	40.319217	-80.509598	1113.99	5.00	1118.99
12	40.319966	-80.509629	1105.26	5.00	1110.26
13	40.320004	-80.509794	1110.92	5.00	1115.92
14	40.320278	-80.509805	1108.55	5.00	1113.55
15	40.320316	-80.509970	1117.20	5.00	1122.20
16	40.320512	-80.509978	1126.43	5.00	1131.43
17	40.320557	-80.509816	1122.98	5.00	1127.98
18	40.320753	-80.509824	1126.66	5.00	1131.66
19	40.320799	-80.509663	1123.91	5.00	1128.91
20	40.321073	-80.509674	1127.86	5.00	1132.86
21	40.321119	-80.509512	1123.84	5.00	1128.84
22	40.321235	-80.509517	1124.90	5.00	1129.90
23	40.321163	-80.510984	1135.07	5.00	1140.07
24	40.319697	-80.510924	1137.59	5.00	1142.59
25	40.318553	-80.510877	1114.52	5.00	1119.52
26	40.317641	-80.510840	1114.79	5.00	1119.79

**Name:** D10

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

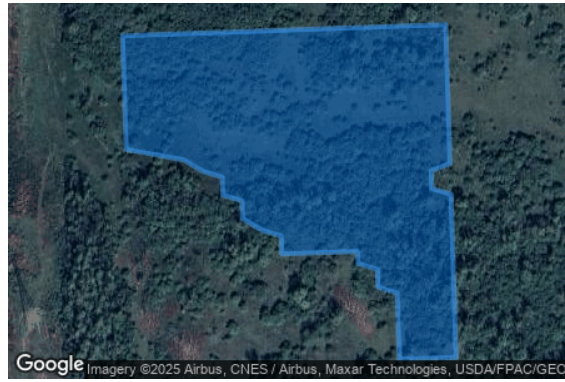
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.321613	-80.518647	1114.60	5.00	1119.60
2	40.321545	-80.518153	1116.80	5.00	1121.80
3	40.321470	-80.517987	1115.43	5.00	1120.43
4	40.321432	-80.517822	1116.10	5.00	1121.10
5	40.321316	-80.517817	1114.80	5.00	1119.80
6	40.321278	-80.517652	1116.74	5.00	1121.74
7	40.321162	-80.517647	1114.32	5.00	1119.32
8	40.321086	-80.517480	1117.12	5.00	1122.12
9	40.321048	-80.517315	1119.85	5.00	1124.85
10	40.320932	-80.517311	1118.38	5.00	1123.38
11	40.320948	-80.516659	1126.30	5.00	1131.30
12	40.320869	-80.516654	1125.40	5.00	1130.40
13	40.320831	-80.516489	1127.98	5.00	1132.98
14	40.320714	-80.516484	1126.89	5.00	1131.89
15	40.320676	-80.516319	1126.90	5.00	1131.90
16	40.320244	-80.516301	1124.13	5.00	1129.13
17	40.320255	-80.515813	1128.45	5.00	1133.45
18	40.320609	-80.515827	1132.29	5.00	1137.29
19	40.321005	-80.515844	1134.26	5.00	1139.26
20	40.321321	-80.515857	1139.89	5.00	1144.89
21	40.321359	-80.516022	1140.24	5.00	1145.24
22	40.321475	-80.516026	1141.37	5.00	1146.37
23	40.321521	-80.515865	1142.46	5.00	1147.46
24	40.322428	-80.515902	1144.36	5.00	1149.36
25	40.322354	-80.518679	1133.12	5.00	1138.12

**Name:** D2

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.320656	-80.515603	1133.31	5.00	1138.31
2	40.320656	-80.515602	1133.31	5.00	1138.31
3	40.320676	-80.514788	1135.80	5.00	1140.80
4	40.320775	-80.513974	1125.70	5.00	1130.70
5	40.320854	-80.513976	1125.84	5.00	1130.84
6	40.320865	-80.513488	1121.43	5.00	1126.43
7	40.320786	-80.513483	1121.14	5.00	1126.14
8	40.320748	-80.513317	1120.62	5.00	1125.62
9	40.322562	-80.513396	1133.74	5.00	1138.74
10	40.322513	-80.515679	1144.90	5.00	1149.90
11	40.320694	-80.515605	1133.43	5.00	1138.43

**Name:** D3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.320748	-80.513317	1120.62	5.00	1125.62
2	40.320553	-80.513309	1120.23	5.00	1125.23
3	40.320515	-80.513144	1120.43	5.00	1125.43
4	40.320320	-80.513136	1119.31	5.00	1124.31
5	40.320244	-80.512970	1118.65	5.00	1123.65
6	40.320169	-80.512803	1118.45	5.00	1123.45
7	40.320131	-80.512638	1118.49	5.00	1123.49
8	40.320166	-80.511169	1136.58	5.00	1141.58
9	40.320366	-80.511178	1136.85	5.00	1141.85
10	40.322539	-80.511266	1148.15	5.00	1153.15
11	40.322615	-80.511433	1151.30	5.00	1156.30
12	40.322562	-80.513396	1133.74	5.00	1138.74



**Name:** D4

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

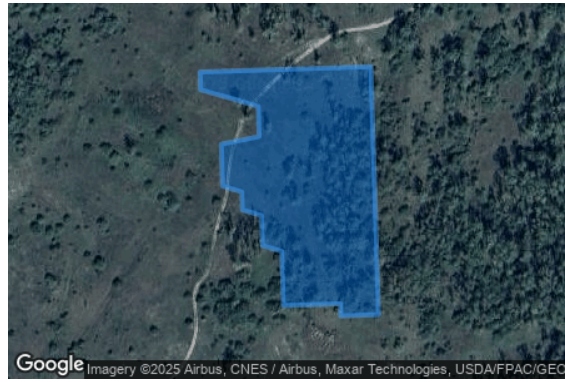
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.320131	-80.512638	1118.49	5.00	1123.49
2	40.320015	-80.512633	1117.49	5.00	1122.49
3	40.319944	-80.512303	1117.59	5.00	1122.59
4	40.319906	-80.512138	1117.96	5.00	1122.96
5	40.319710	-80.512130	1117.04	5.00	1122.04
6	40.319661	-80.512455	1116.06	5.00	1121.06
7	40.319386	-80.512444	1115.70	5.00	1120.70
8	40.319348	-80.512279	1116.23	5.00	1121.23
9	40.319232	-80.512274	1116.31	5.00	1121.31
10	40.319194	-80.512109	1116.77	5.00	1121.77
11	40.318998	-80.512101	1116.28	5.00	1121.28
12	40.318960	-80.511936	1115.35	5.00	1120.35
13	40.318607	-80.511922	1113.23	5.00	1118.23
14	40.318619	-80.511432	1115.81	5.00	1120.81
15	40.318539	-80.511428	1115.28	5.00	1120.28
16	40.318547	-80.511103	1114.64	5.00	1119.64
17	40.320166	-80.511169	1136.58	5.00	1141.58

**Name:** D5

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.316570	-80.511023	1076.05	5.00	1081.05
2	40.316571	-80.510960	1075.83	5.00	1080.83
3	40.316500	-80.510630	1076.02	5.00	1081.02
4	40.316462	-80.510465	1077.50	5.00	1082.50
5	40.316346	-80.510460	1077.54	5.00	1082.54
6	40.316271	-80.510294	1078.52	5.00	1083.52
7	40.316195	-80.510127	1083.90	5.00	1088.90
8	40.316120	-80.509960	1083.37	5.00	1088.37
9	40.316045	-80.509794	1081.15	5.00	1086.15
10	40.315970	-80.509627	1082.59	5.00	1087.59
11	40.315895	-80.509461	1076.26	5.00	1081.26
12	40.315902	-80.509136	1079.55	5.00	1084.55
13	40.316019	-80.509140	1080.90	5.00	1085.90
14	40.316064	-80.508979	1084.51	5.00	1089.51
15	40.316418	-80.508993	1090.91	5.00	1095.91
16	40.316464	-80.508832	1084.72	5.00	1089.72
17	40.316580	-80.508836	1087.43	5.00	1092.43
18	40.316626	-80.508675	1084.76	5.00	1089.76
19	40.317217	-80.508699	1096.77	5.00	1101.77
20	40.317533	-80.508712	1099.60	5.00	1104.60
21	40.317579	-80.508550	1088.48	5.00	1093.48
22	40.317662	-80.508390	1088.61	5.00	1093.61
23	40.317641	-80.510840	1114.79	5.00	1119.79
24	40.317366	-80.510829	1113.74	5.00	1118.74
25	40.317320	-80.510991	1113.88	5.00	1118.88
26	40.317319	-80.511053	1113.65	5.00	1118.65

**Name:** D6

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

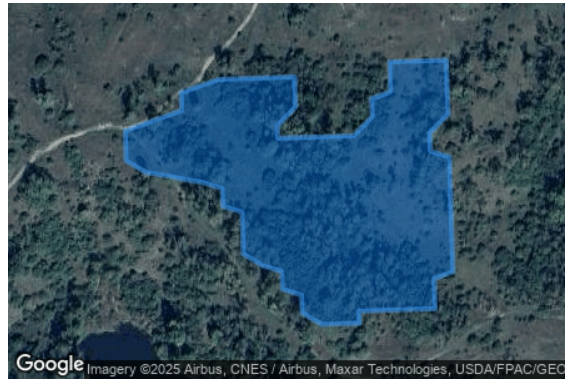
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.317521	-80.512533	1117.06	5.00	1122.06
2	40.317646	-80.512375	1113.23	5.00	1118.23
3	40.317841	-80.512383	1112.82	5.00	1117.82
4	40.317826	-80.513034	1108.58	5.00	1113.58
5	40.317739	-80.513358	1105.40	5.00	1110.40
6	40.317622	-80.513353	1109.12	5.00	1114.12
7	40.317490	-80.513838	1097.60	5.00	1102.60
8	40.317294	-80.513830	1093.33	5.00	1098.33
9	40.317219	-80.513664	1094.05	5.00	1099.05
10	40.317152	-80.513170	1107.31	5.00	1112.31
11	40.317114	-80.513005	1112.11	5.00	1117.11
12	40.316997	-80.513001	1108.21	5.00	1113.21
13	40.316960	-80.512835	1112.19	5.00	1117.19
14	40.316685	-80.512824	1103.84	5.00	1108.84
15	40.316610	-80.512658	1107.50	5.00	1112.50
16	40.316572	-80.512493	1112.03	5.00	1117.03
17	40.316456	-80.512488	1107.79	5.00	1112.79
18	40.316418	-80.512323	1110.15	5.00	1115.15
19	40.316301	-80.512318	1104.42	5.00	1109.42
20	40.316226	-80.512151	1105.14	5.00	1110.14
21	40.316234	-80.511826	1105.16	5.00	1110.16
22	40.316313	-80.511828	1107.02	5.00	1112.02
23	40.316321	-80.511503	1096.85	5.00	1101.85
24	40.316329	-80.511176	1083.24	5.00	1088.24
25	40.316524	-80.511184	1078.88	5.00	1083.88
26	40.316570	-80.511023	1076.05	5.00	1081.05
27	40.317319	-80.511053	1113.65	5.00	1118.65
28	40.317357	-80.511218	1112.99	5.00	1117.99
29	40.317473	-80.511223	1112.81	5.00	1117.81
30	40.317598	-80.511065	1113.77	5.00	1118.77
31	40.317952	-80.511079	1114.31	5.00	1119.31
32	40.317940	-80.511567	1113.42	5.00	1118.42
33	40.317745	-80.511559	1113.48	5.00	1118.48
34	40.317699	-80.511721	1113.36	5.00	1118.36
35	40.317582	-80.511716	1112.46	5.00	1117.46
36	40.317458	-80.511875	1111.08	5.00	1116.08
37	40.317442	-80.512528	1115.86	5.00	1120.86
38	40.317484	-80.512532	1115.81	5.00	1120.81

**Name:** D7

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.316321	-80.511503	1096.85	5.00	1101.85
2	40.316083	-80.511491	1086.47	5.00	1091.47
3	40.316038	-80.511653	1090.12	5.00	1095.12
4	40.315959	-80.511652	1086.62	5.00	1091.62
5	40.315935	-80.512630	1074.69	5.00	1079.69
6	40.315819	-80.512625	1073.01	5.00	1078.01
7	40.315744	-80.512459	1077.72	5.00	1082.72
8	40.315668	-80.512292	1079.71	5.00	1084.71
9	40.315631	-80.512127	1083.64	5.00	1088.64
10	40.315514	-80.512122	1079.61	5.00	1084.61
11	40.315476	-80.511957	1083.27	5.00	1088.27
12	40.315360	-80.511952	1080.51	5.00	1085.51
13	40.315322	-80.511787	1083.80	5.00	1088.80
14	40.315126	-80.511779	1082.15	5.00	1087.15
15	40.315089	-80.511614	1084.75	5.00	1089.75
16	40.314972	-80.511610	1087.82	5.00	1092.82
17	40.314942	-80.511118	1080.49	5.00	1085.49
18	40.314826	-80.511113	1082.41	5.00	1087.41
19	40.314830	-80.510951	1079.80	5.00	1084.80
20	40.314913	-80.510791	1074.72	5.00	1079.72
21	40.315187	-80.510803	1064.32	5.00	1069.32
22	40.315258	-80.511132	1066.20	5.00	1071.20
23	40.315292	-80.511461	1073.11	5.00	1078.11
24	40.315488	-80.511469	1075.78	5.00	1080.78
25	40.315541	-80.510981	1066.85	5.00	1071.85
26	40.316291	-80.511011	1078.07	5.00	1083.07
27	40.316329	-80.511176	1083.24	5.00	1088.24

Name: D8

Axis tracking: Fixed (no rotation)

Tilt: 25.0°

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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.317868	-80.516308	1123.81	5.00	1128.81
2	40.317853	-80.516960	1110.88	5.00	1115.88
3	40.318003	-80.517293	1111.93	5.00	1116.93
4	40.318078	-80.517460	1106.52	5.00	1111.52
5	40.318353	-80.517471	1112.91	5.00	1117.91
6	40.318391	-80.517636	1110.33	5.00	1115.33
7	40.318507	-80.517641	1113.51	5.00	1118.51
8	40.318545	-80.517806	1109.11	5.00	1114.11
9	40.319178	-80.517832	1108.55	5.00	1113.55
10	40.319769	-80.517856	1107.79	5.00	1112.79
11	40.319814	-80.517695	1111.07	5.00	1116.07
12	40.320247	-80.517712	1109.50	5.00	1114.50
13	40.320288	-80.517775	1108.34	5.00	1113.34
14	40.320483	-80.517783	1108.32	5.00	1113.32
15	40.320523	-80.517867	1107.41	5.00	1112.41
16	40.320601	-80.517903	1107.96	5.00	1112.96
17	40.320638	-80.517904	1107.89	5.00	1112.89
18	40.320719	-80.517850	1108.43	5.00	1113.43
19	40.320799	-80.517796	1107.91	5.00	1112.91
20	40.320803	-80.517634	1110.87	5.00	1115.87
21	40.320727	-80.517525	1113.48	5.00	1118.48
22	40.320650	-80.517416	1116.92	5.00	1121.92
23	40.320572	-80.517380	1117.55	5.00	1122.55
24	40.320495	-80.517295	1120.14	5.00	1125.14
25	40.320420	-80.517128	1123.62	5.00	1128.62
26	40.320344	-80.516961	1124.57	5.00	1129.57
27	40.320267	-80.516897	1125.55	5.00	1130.55
28	40.320150	-80.516892	1126.19	5.00	1131.19
29	40.320112	-80.516727	1126.03	5.00	1131.03
30	40.320037	-80.516561	1125.69	5.00	1130.69
31	40.319958	-80.516558	1126.15	5.00	1131.15
32	40.319974	-80.515904	1125.42	5.00	1130.42
33	40.319304	-80.515877	1119.14	5.00	1124.14
34	40.319258	-80.516038	1122.41	5.00	1127.41
35	40.318825	-80.516021	1120.27	5.00	1125.27
36	40.318780	-80.516182	1122.39	5.00	1127.39
37	40.318189	-80.516158	1126.89	5.00	1131.89
38	40.318143	-80.516320	1127.82	5.00	1132.82
39	40.318026	-80.516315	1127.04	5.00	1132.04
40	40.317906	-80.516310	1124.71	5.00	1129.71

**Name:** D9

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.317391	-80.514654	1098.57	5.00	1103.57
2	40.317379	-80.515142	1102.37	5.00	1107.37
3	40.317288	-80.515629	1111.37	5.00	1116.37
4	40.317198	-80.516116	1104.20	5.00	1109.20
5	40.317115	-80.516276	1095.02	5.00	1100.02
6	40.316761	-80.516261	1084.39	5.00	1089.39
7	40.316784	-80.515283	1101.83	5.00	1106.83
8	40.316867	-80.515123	1101.84	5.00	1106.84
9	40.316984	-80.515128	1102.79	5.00	1107.79
10	40.317030	-80.514966	1101.46	5.00	1106.46
11	40.317146	-80.514971	1102.41	5.00	1107.41
12	40.317192	-80.514809	1099.96	5.00	1104.96
13	40.317308	-80.514814	1100.20	5.00	1105.20
14	40.317354	-80.514652	1097.98	5.00	1102.98



# Route Receptors

**Name:** Bethel Ridge Rd

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.307159	-80.507179	1136.77	4.50	1141.27
2	40.307989	-80.505371	1185.78	4.50	1190.28
3	40.308345	-80.504379	1204.10	4.50	1208.60
4	40.309008	-80.503810	1220.23	4.50	1224.73
5	40.309200	-80.503091	1208.90	4.50	1213.40
6	40.309342	-80.502737	1208.23	4.50	1212.73
7	40.310309	-80.501482	1193.94	4.50	1198.44
8	40.310927	-80.501018	1203.04	4.50	1207.54
9	40.311463	-80.500441	1211.06	4.50	1215.56
10	40.312322	-80.498360	1205.25	4.50	1209.75
11	40.312997	-80.496233	1211.83	4.50	1216.33
12	40.313251	-80.494836	1214.62	4.50	1219.12
13	40.312780	-80.493371	1197.66	4.50	1202.16
14	40.312997	-80.492786	1197.93	4.50	1202.43
15	40.314249	-80.491746	1205.36	4.50	1209.86



Name: Bethel Ridge Rd Trucks

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.307159	-80.507179	1136.77	9.00	1145.77
2	40.307989	-80.505372	1185.78	9.00	1194.78
3	40.308345	-80.504379	1204.10	9.00	1213.10
4	40.309008	-80.503810	1220.23	9.00	1229.23
5	40.309200	-80.503091	1208.90	9.00	1217.90
6	40.309342	-80.502737	1208.23	9.00	1217.23
7	40.310309	-80.501482	1193.94	9.00	1202.94
8	40.310927	-80.501018	1203.04	9.00	1212.04
9	40.311463	-80.500441	1211.06	9.00	1220.06
10	40.312322	-80.498360	1205.25	9.00	1214.25
11	40.312997	-80.496233	1211.83	9.00	1220.83
12	40.313251	-80.494836	1214.62	9.00	1223.62
13	40.312780	-80.493371	1197.66	9.00	1206.66
14	40.312997	-80.492786	1197.93	9.00	1206.93
15	40.314249	-80.491746	1205.36	9.00	1214.36

Name: McCready Rd

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.325843	-80.506156	962.07	4.50	966.57
2	40.325213	-80.506210	960.77	4.50	965.27
3	40.324747	-80.506499	960.01	4.50	964.51
4	40.324313	-80.506574	956.49	4.50	960.99
5	40.323536	-80.506971	955.33	4.50	959.83
6	40.323275	-80.506961	958.24	4.50	962.74

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 4	4	40.328134	-80.502018	1133.01	6.00
OP 11	11	40.308790	-80.502148	1255.54	6.00
OP 12	12	40.308790	-80.502148	1255.54	16.00
OP 13	13	40.308103	-80.503014	1256.77	6.00
OP 14	14	40.308103	-80.503014	1256.77	16.00
OP 15	15	40.306317	-80.510210	1120.12	6.00
OP 16	16	40.305690	-80.509559	1141.77	6.00
OP 17	17	40.305690	-80.509559	1141.77	16.00

## Obstruction Components

Name: Treeline D1  
Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.309141	-80.514820	1022.72
2	40.309272	-80.505164	1195.43
3	40.314639	-80.495938	1116.69
4	40.319842	-80.494307	986.71

Name: Treeline D3  
Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.314063	-80.510653	1066.52
2	40.315732	-80.506855	921.53
3	40.320281	-80.507317	969.08
4	40.322950	-80.507792	976.62
5	40.327063	-80.506903	1044.81
6	40.328355	-80.506452	1058.82

# Glare Analysis Results

## Summary of Results Glare with low potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
D1	25.0	180.0	1,197	19.9	0	0.0	-
D10	25.0	180.0	0	0.0	0	0.0	-
D2	25.0	180.0	198	3.3	0	0.0	-
D3	25.0	180.0	143	2.4	0	0.0	-
D4	25.0	180.0	472	7.9	0	0.0	-
D5	25.0	180.0	1,528	25.5	0	0.0	-
D6	25.0	180.0	1,000	16.7	0	0.0	-
D7	25.0	180.0	1,176	19.6	0	0.0	-
D8	25.0	180.0	0	0.0	0	0.0	-
D9	25.0	180.0	566	9.4	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
Bethel Ridge Rd	3,008	50.1	0	0.0
Bethel Ridge Rd Trucks	3,272	54.5	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

**PV: D1** low potential for temporary after-image

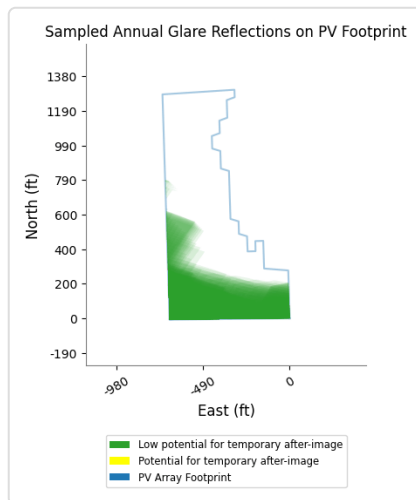
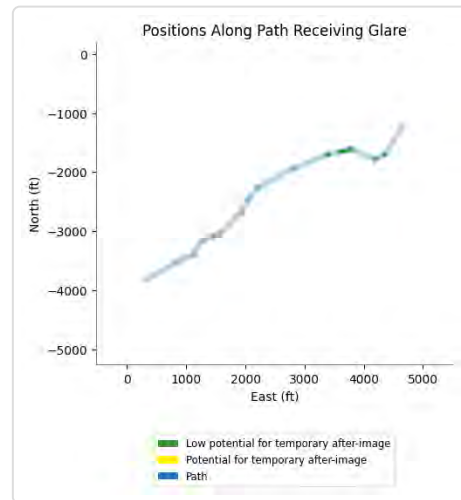
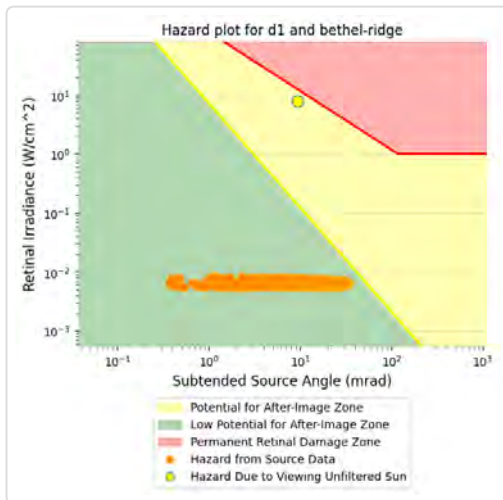
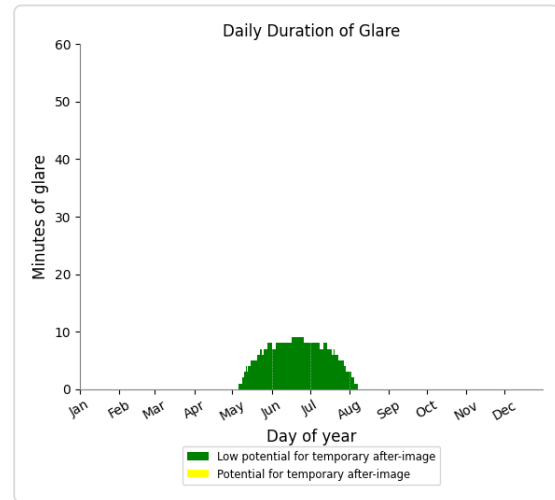
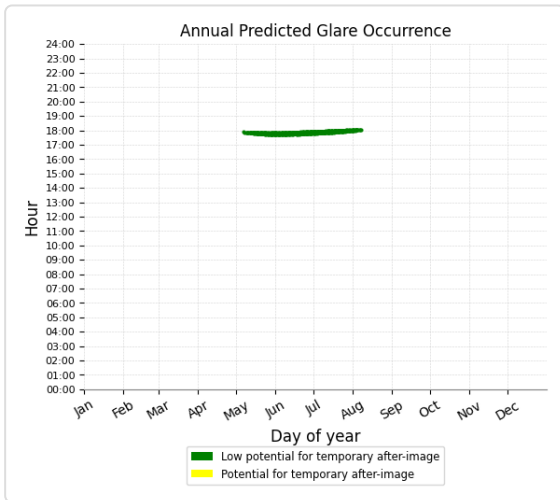
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	589	9.8	0	0.0
Bethel Ridge Rd Trucks	608	10.1	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

# D1 and Route: Bethel Ridge Rd

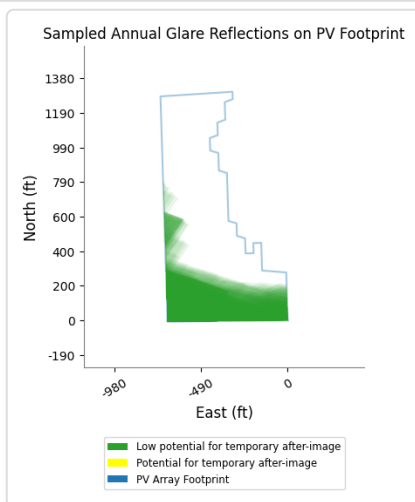
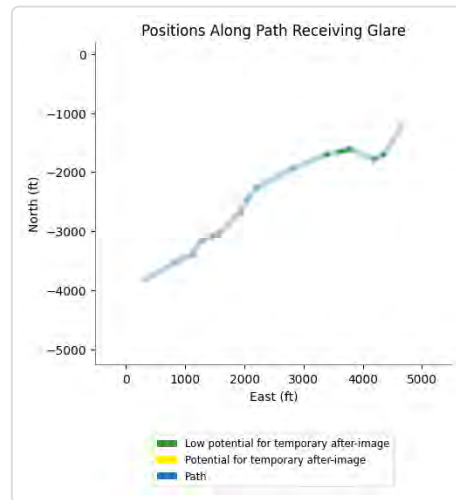
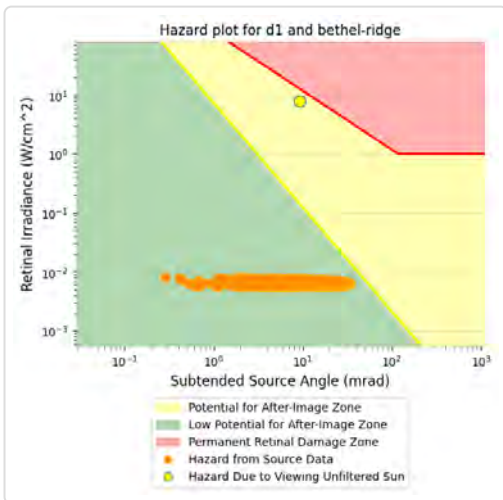
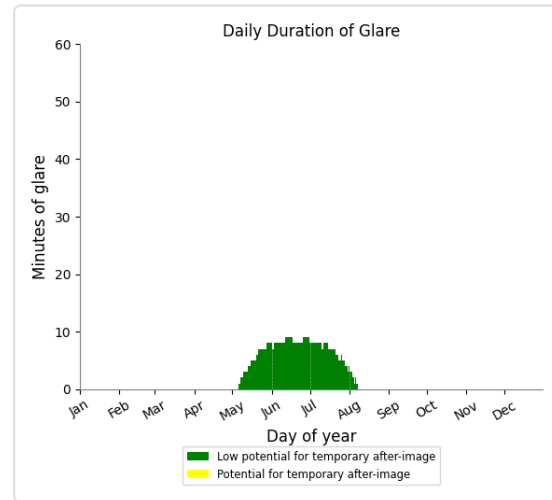
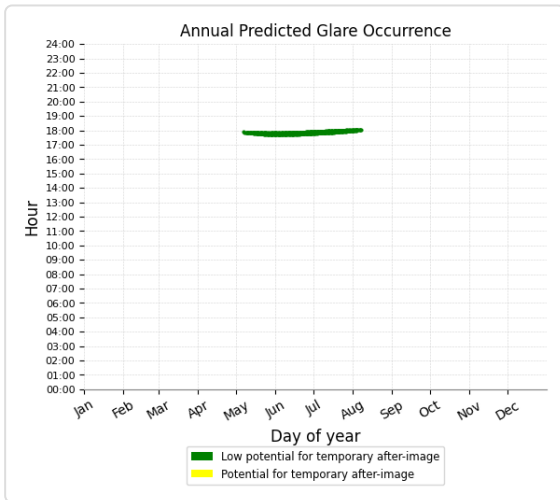
Yellow glare: none

Green glare: 589 min.



## D1 and Route: Bethel Ridge Rd Trucks

Yellow glare: none  
Green glare: 608 min.



## D1 and Route: McCreedy Rd

No glare found



## D1 and OP 4

No glare found

## D1 and OP 11

No glare found

## D1 and OP 12

No glare found

## D1 and OP 13

No glare found

## D1 and OP 14

No glare found

## D1 and OP 15

No glare found

## D1 and OP 16

No glare found

## D1 and OP 17

No glare found

## PV: D10 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	0	0.0	0	0.0
Bethel Ridge Rd Trucks	0	0.0	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

**D10 and Route: Bethel Ridge Rd**

No glare found

**D10 and Route: Bethel Ridge Rd Trucks**

No glare found

**D10 and Route: McCready Rd**

No glare found

**D10 and OP 4**

No glare found

**D10 and OP 11**

No glare found

**D10 and OP 12**

No glare found

**D10 and OP 13**

No glare found

**D10 and OP 14**

No glare found

**D10 and OP 15**

No glare found

**D10 and OP 16**

No glare found

**D10 and OP 17**

No glare found

**PV: D2** low potential for temporary after-image

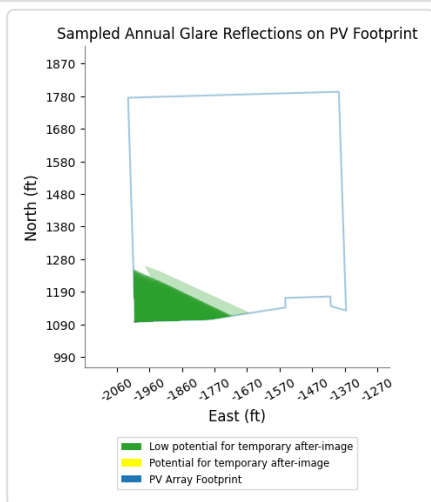
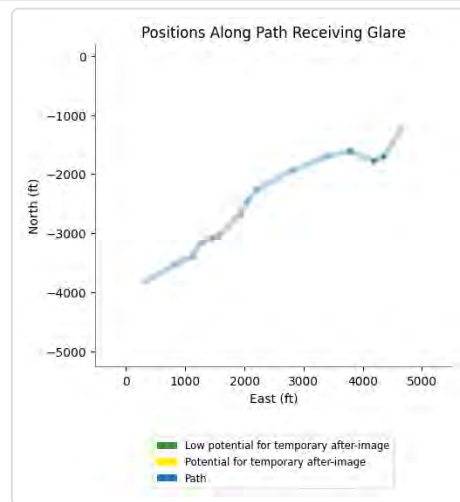
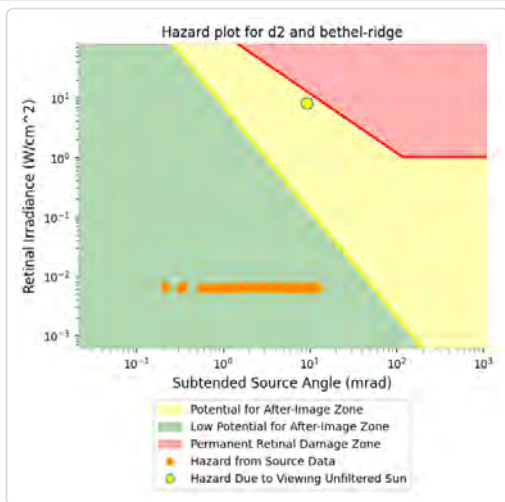
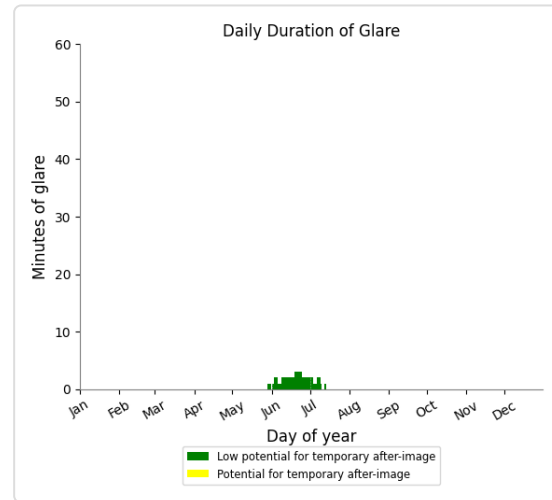
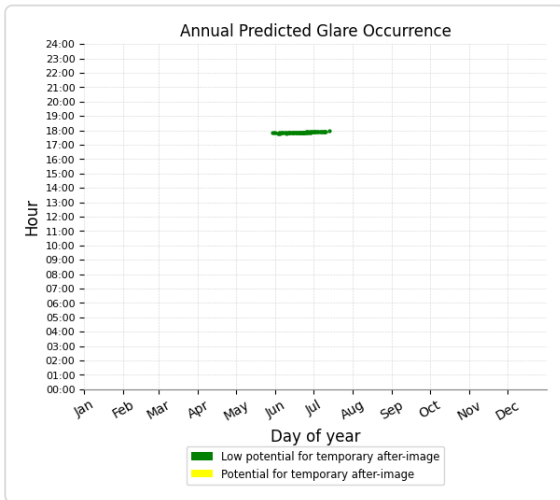
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	80	1.3	0	0.0
Bethel Ridge Rd Trucks	118	2.0	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

## D2 and Route: Bethel Ridge Rd

Yellow glare: none

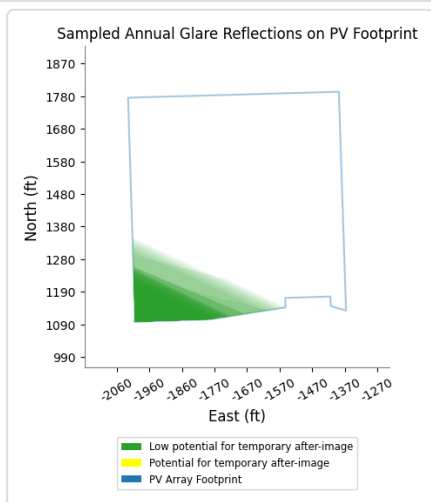
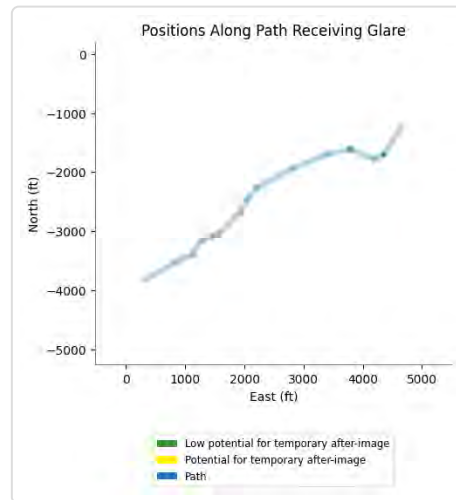
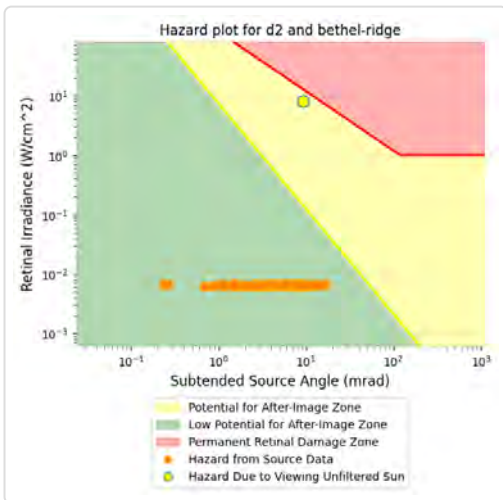
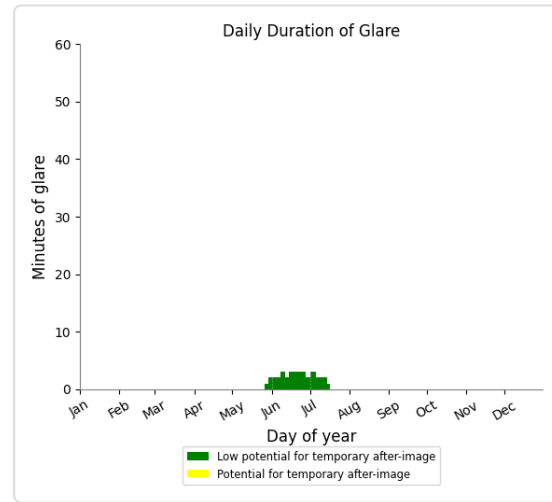
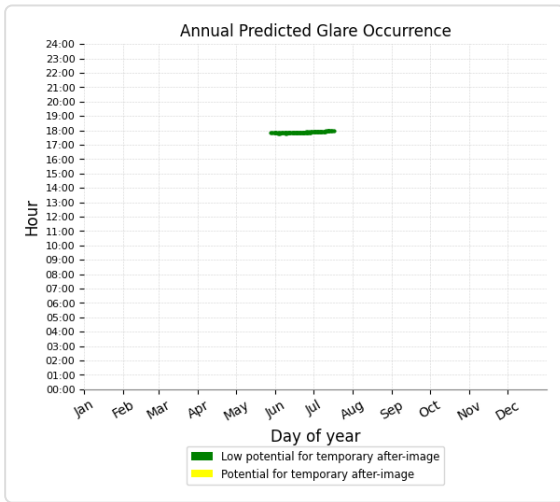
Green glare: 80 min.



## D2 and Route: Bethel Ridge Rd Trucks

Yellow glare: none

Green glare: 118 min.



## D2 and Route: McCreedy Rd

No glare found

## D2 and OP 4

No glare found

## D2 and OP 11

No glare found

## D2 and OP 12

No glare found

## D2 and OP 13

No glare found

## D2 and OP 14

No glare found

## D2 and OP 15

No glare found

## D2 and OP 16

No glare found

## D2 and OP 17

No glare found

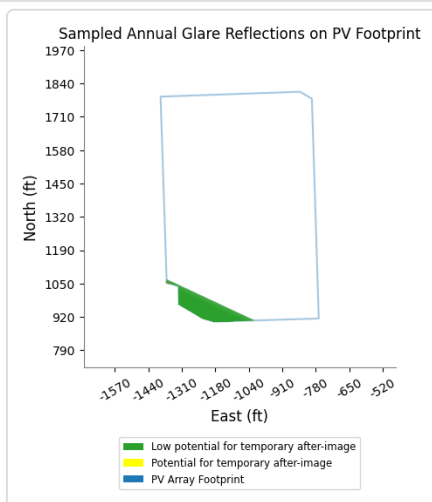
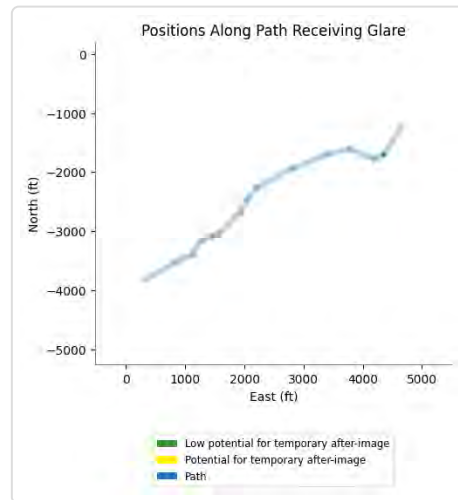
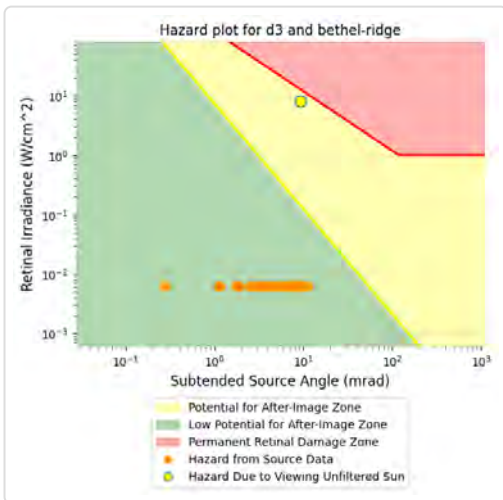
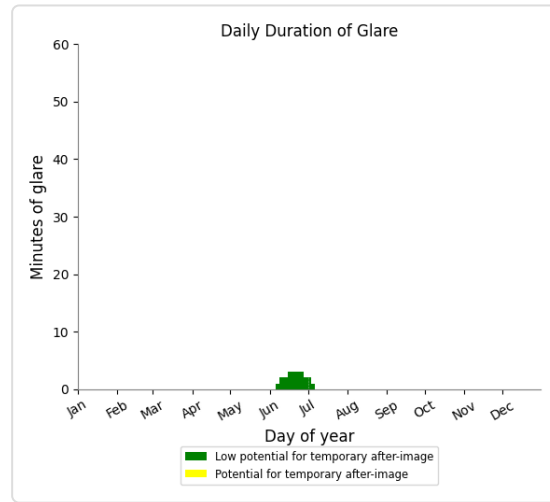
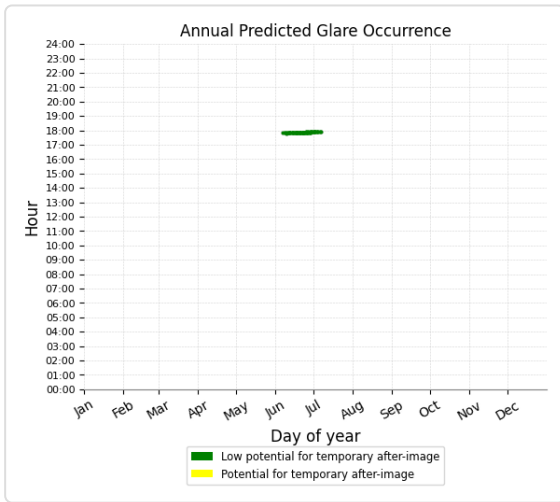
## PV: D3 low potential for temporary after-image

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	68	1.1	0	0.0
Bethel Ridge Rd Trucks	75	1.2	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

### D3 and Route: Bethel Ridge Rd

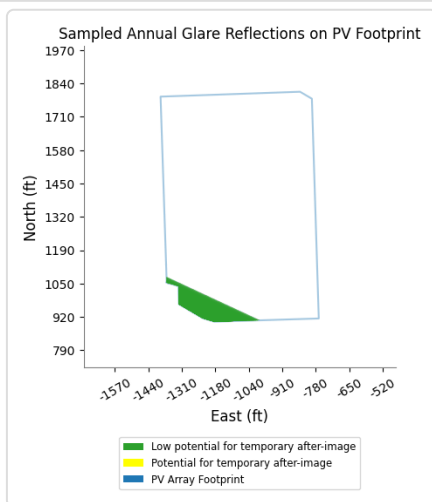
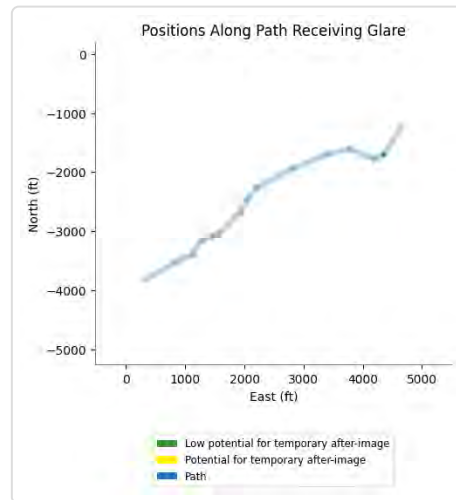
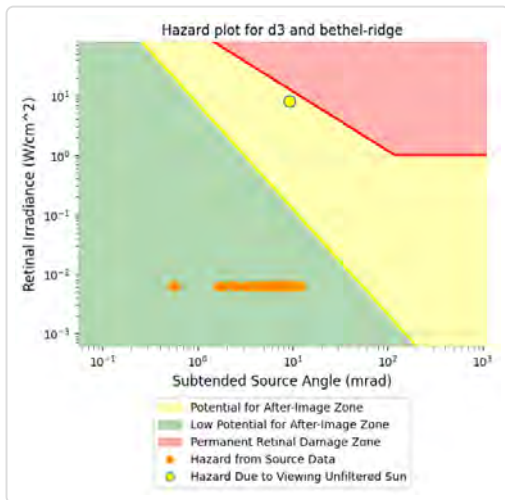
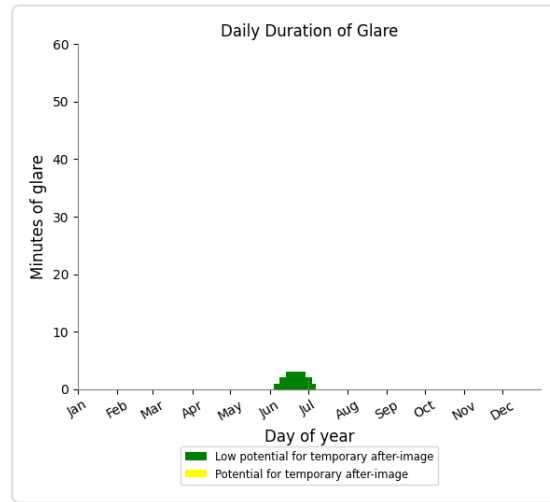
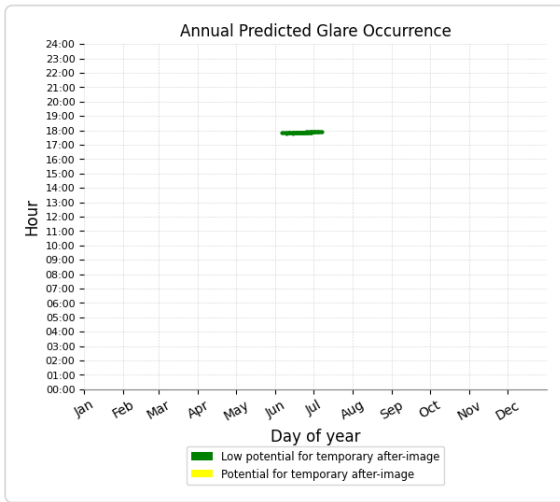
Yellow glare: none  
 Green glare: 68 min.





### D3 and Route: Bethel Ridge Rd Trucks

Yellow glare: none  
 Green glare: 75 min.



### D3 and Route: McCready Rd

No glare found

### D3 and OP 4

No glare found

### D3 and OP 11

No glare found

### D3 and OP 12

No glare found

### D3 and OP 13

No glare found

### D3 and OP 14

No glare found

### D3 and OP 15

No glare found

### D3 and OP 16

No glare found

### D3 and OP 17

No glare found

### PV: D4 low potential for temporary after-image

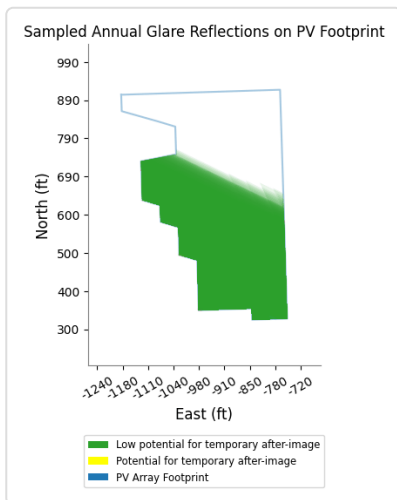
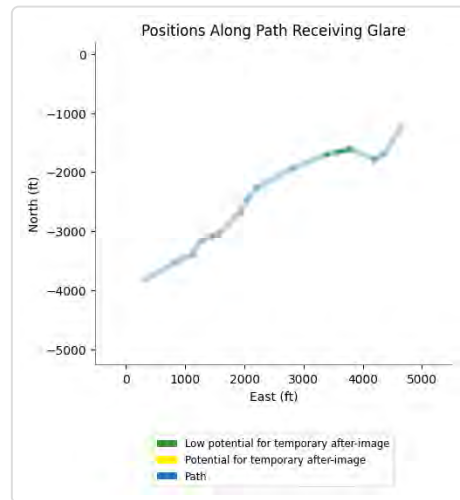
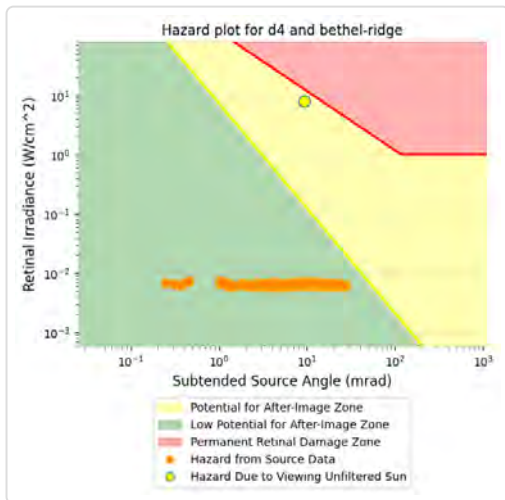
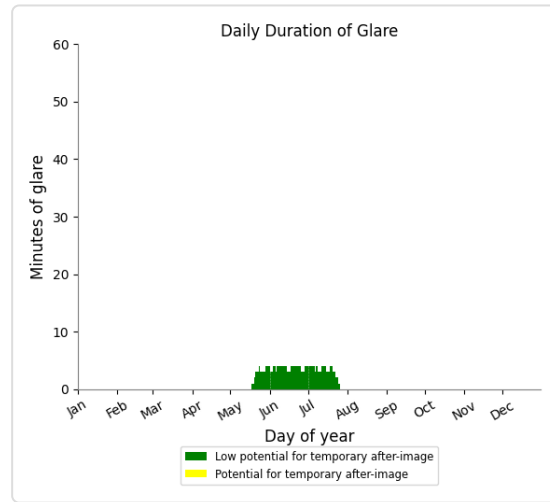
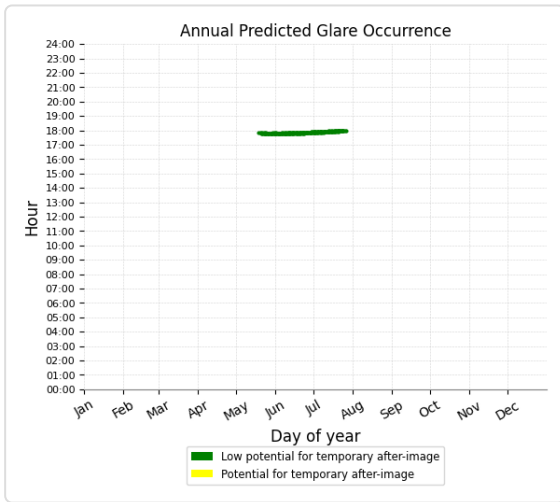
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	237	4.0	0	0.0
Bethel Ridge Rd Trucks	235	3.9	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

## D4 and Route: Bethel Ridge Rd

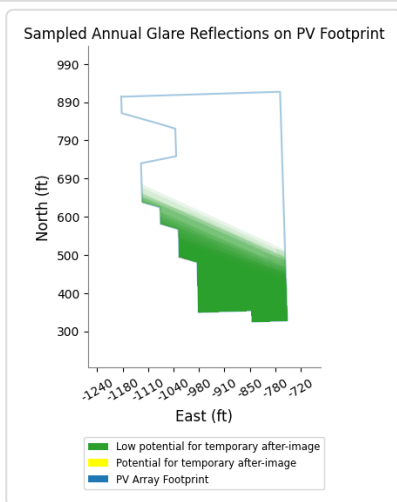
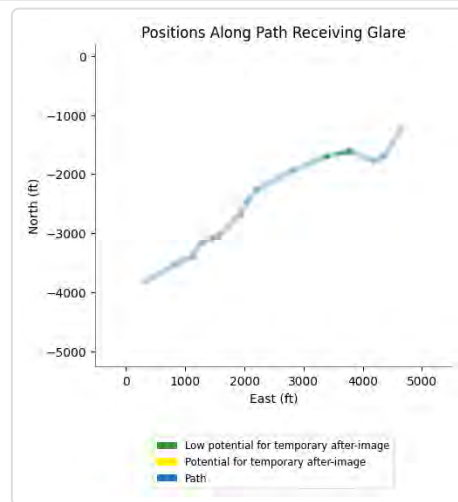
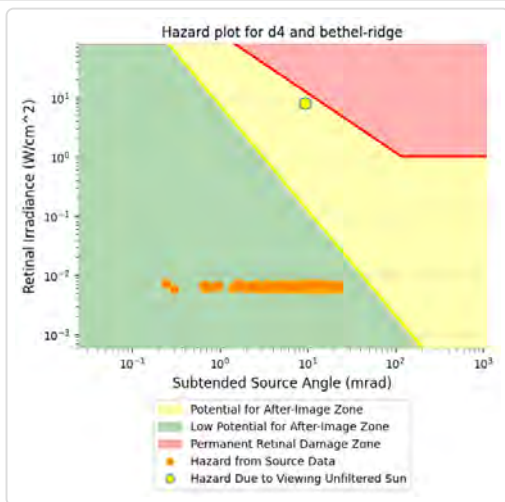
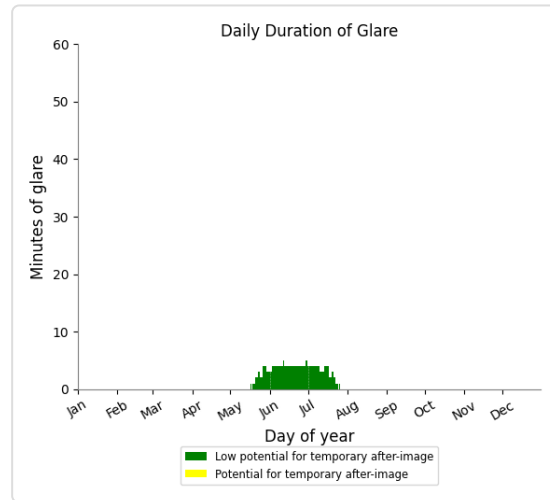
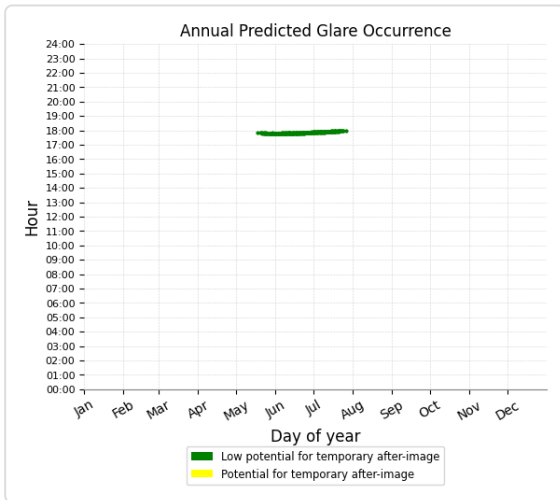
Yellow glare: none

Green glare: 237 min.



## D4 and Route: Bethel Ridge Rd Trucks

Yellow glare: none  
 Green glare: 235 min.



## D4 and Route: McCready Rd

No glare found

## D4 and OP 4

No glare found

## D4 and OP 11

No glare found

## D4 and OP 12

No glare found

## D4 and OP 13

No glare found

## D4 and OP 14

No glare found

## D4 and OP 15

No glare found

## D4 and OP 16

No glare found

## D4 and OP 17

No glare found

## PV: D5 low potential for temporary after-image

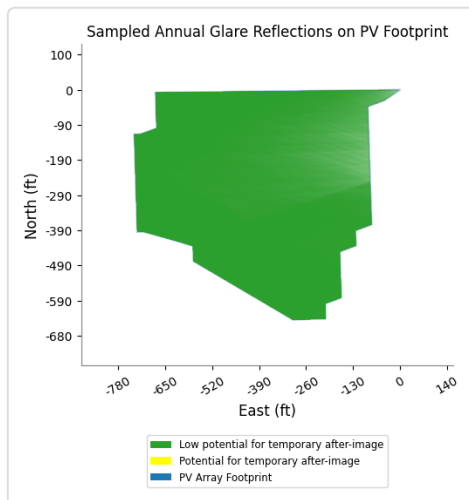
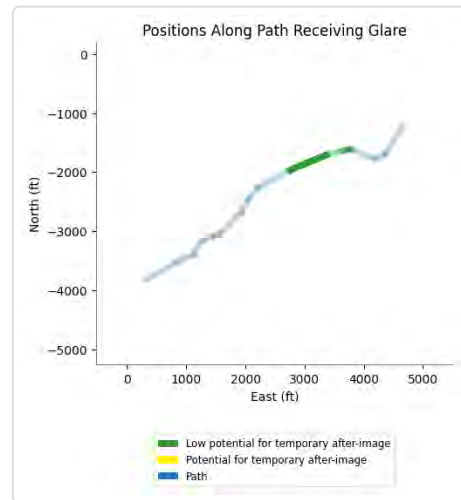
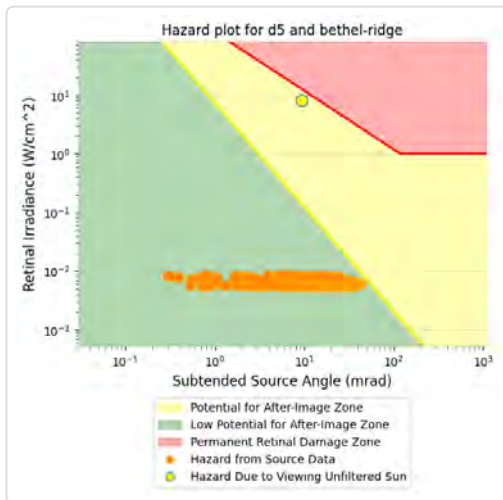
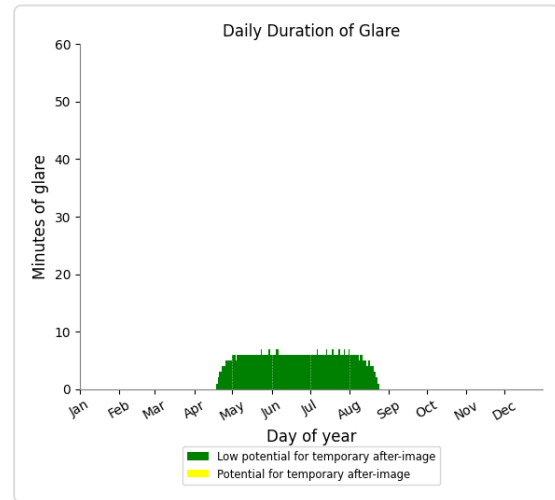
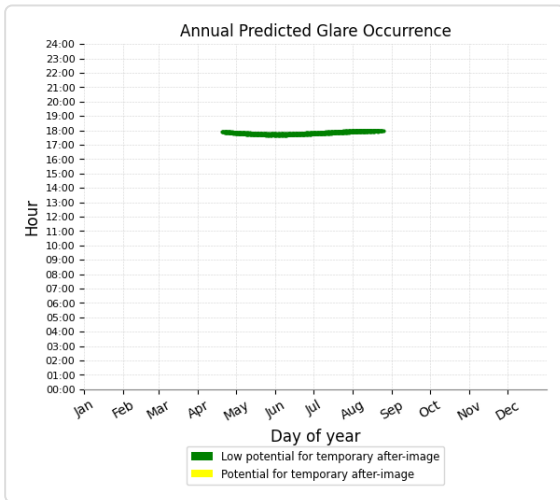
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	721	12.0	0	0.0
Bethel Ridge Rd Trucks	807	13.4	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

## D5 and Route: Bethel Ridge Rd

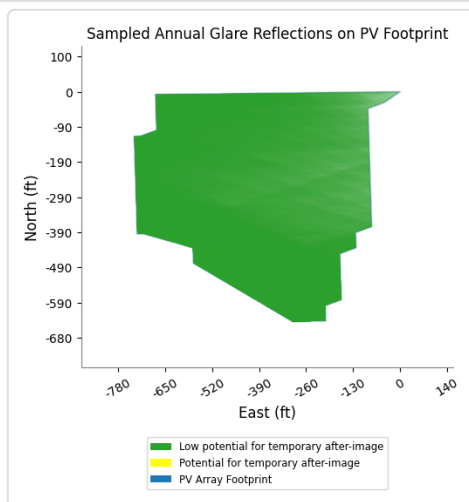
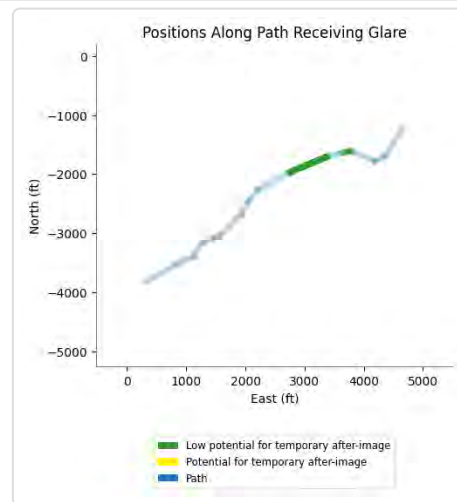
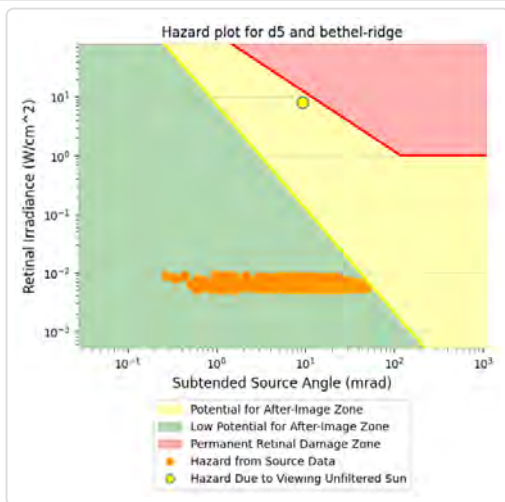
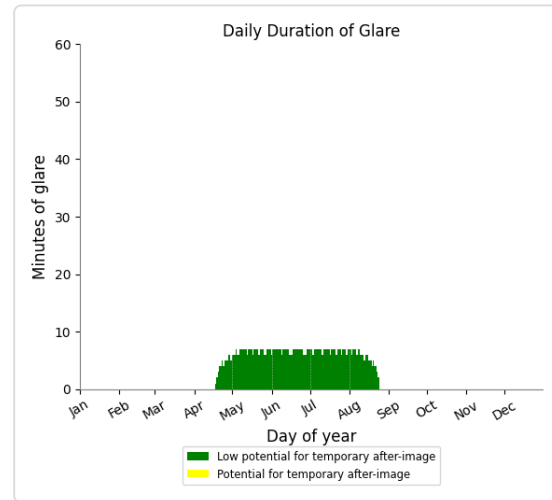
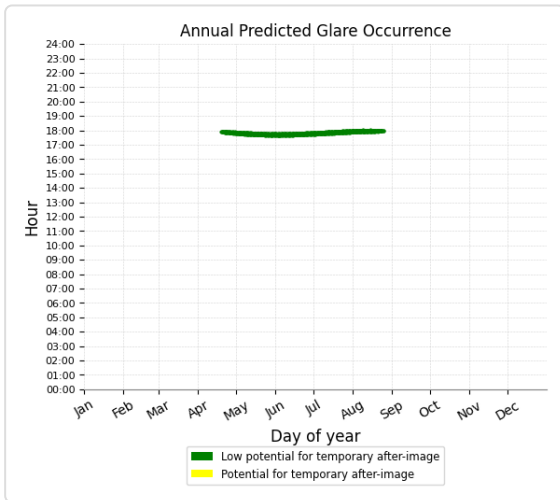
Yellow glare: none

Green glare: 721 min.



## D5 and Route: Bethel Ridge Rd Trucks

Yellow glare: none  
 Green glare: 807 min.



## D5 and Route: McCready Rd

No glare found



## D5 and OP 4

No glare found

## D5 and OP 11

No glare found

## D5 and OP 12

No glare found

## D5 and OP 13

No glare found

## D5 and OP 14

No glare found

## D5 and OP 15

No glare found

## D5 and OP 16

No glare found

## D5 and OP 17

No glare found

## PV: D6 low potential for temporary after-image

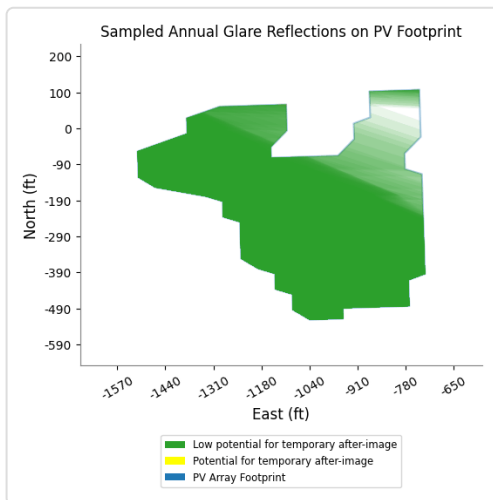
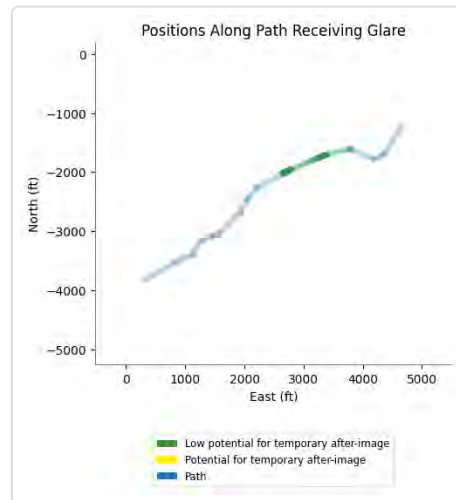
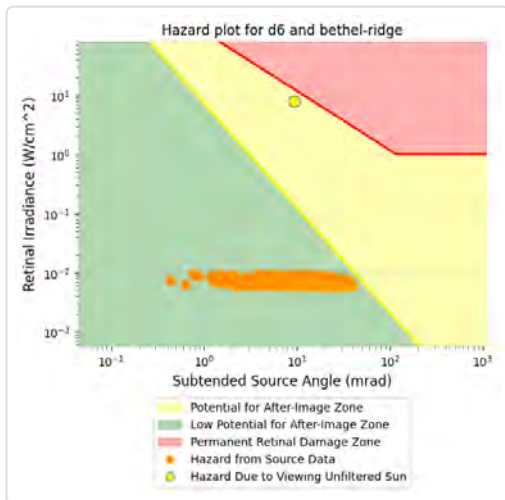
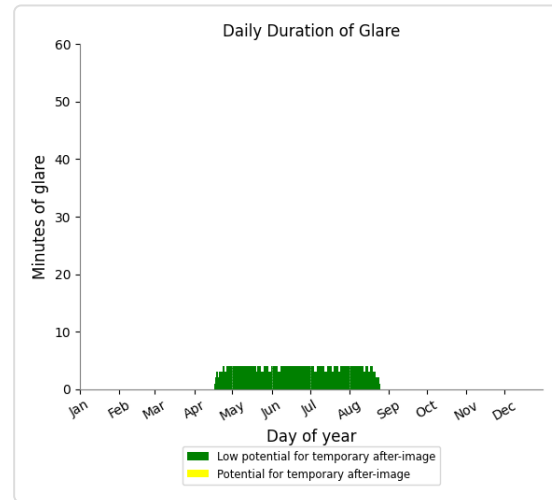
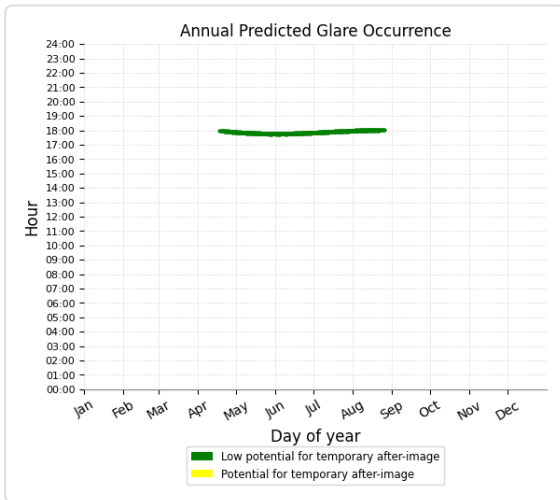
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	484	8.1	0	0.0
Bethel Ridge Rd Trucks	516	8.6	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

## D6 and Route: Bethel Ridge Rd

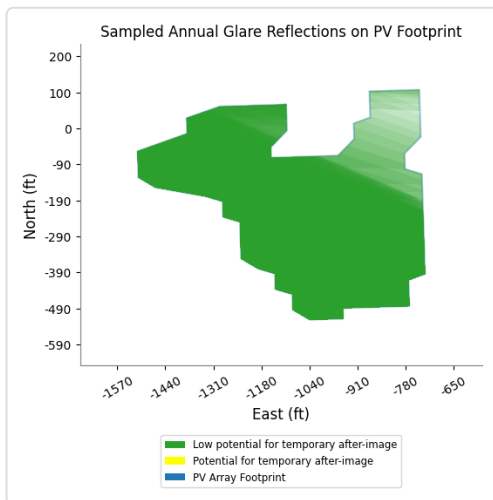
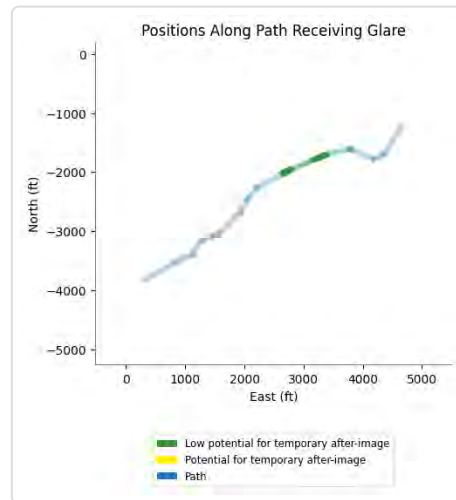
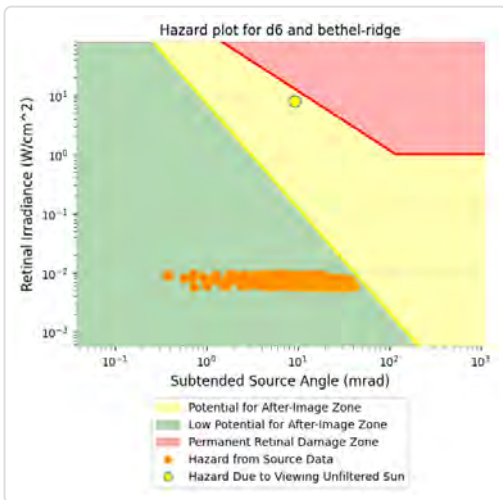
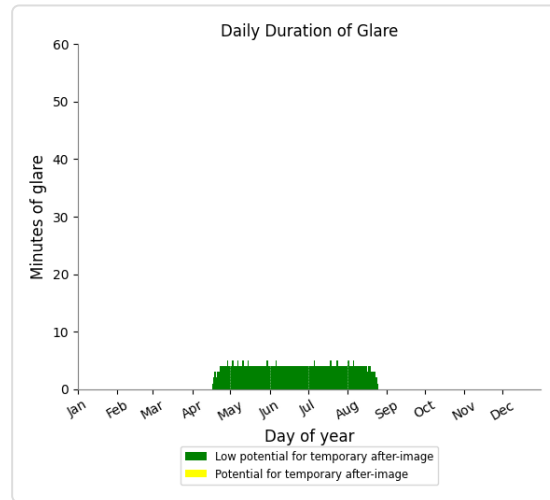
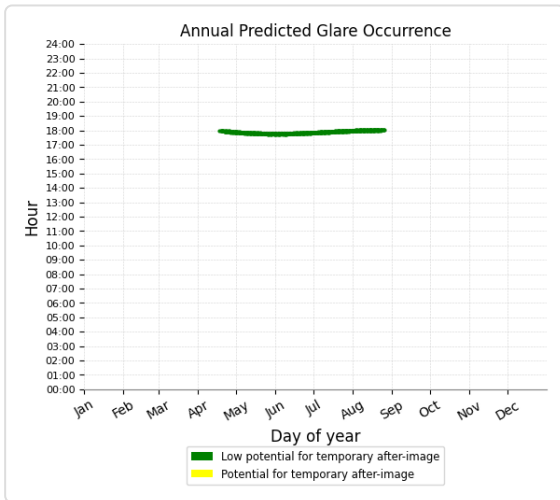
Yellow glare: none

Green glare: 484 min.



## D6 and Route: Bethel Ridge Rd Trucks

Yellow glare: none  
 Green glare: 516 min.



## D6 and Route: McCready Rd

No glare found

## D6 and OP 4

No glare found

## D6 and OP 11

No glare found

## D6 and OP 12

No glare found

## D6 and OP 13

No glare found

## D6 and OP 14

No glare found

## D6 and OP 15

No glare found

## D6 and OP 16

No glare found

## D6 and OP 17

No glare found

## PV: D7 **low potential for temporary after-image**

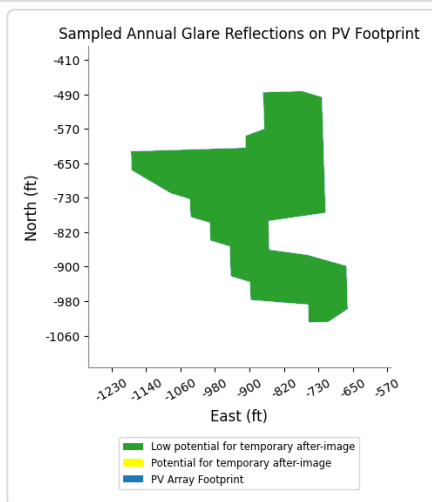
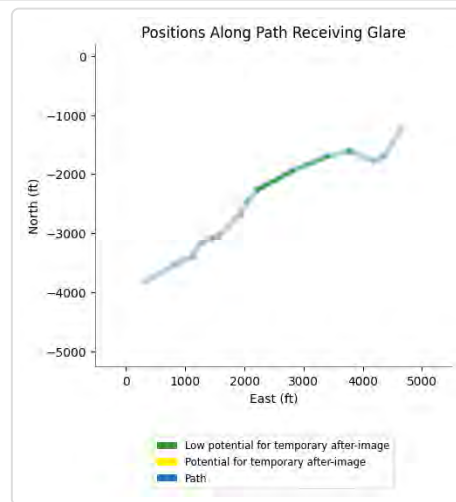
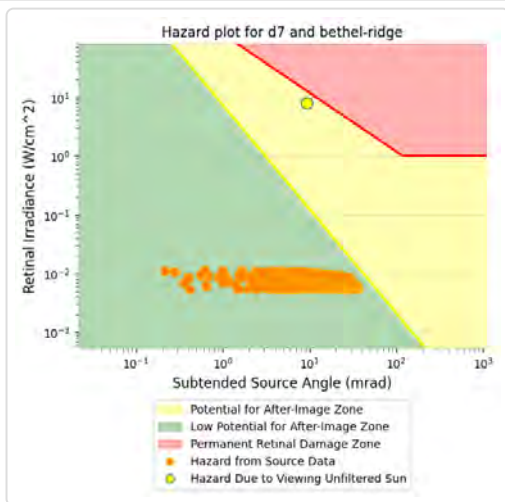
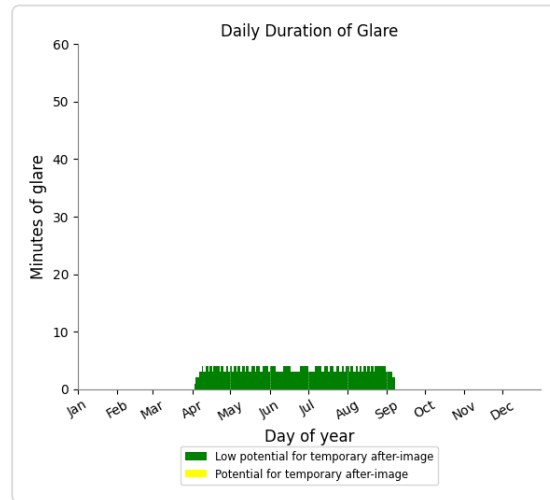
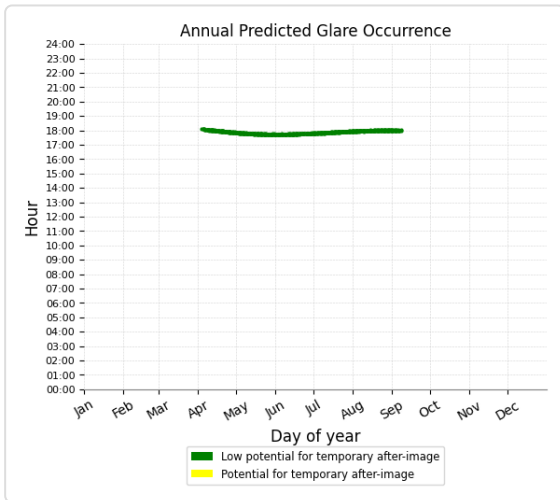
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	557	9.3	0	0.0
Bethel Ridge Rd Trucks	619	10.3	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

## D7 and Route: Bethel Ridge Rd

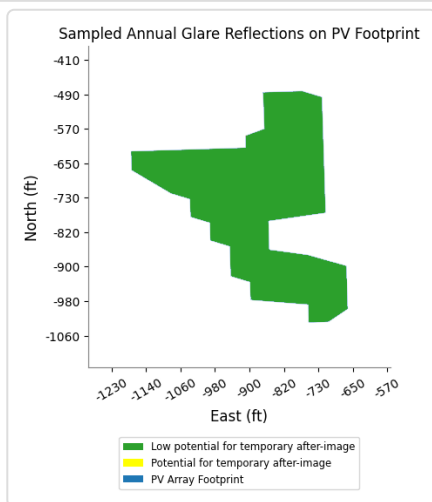
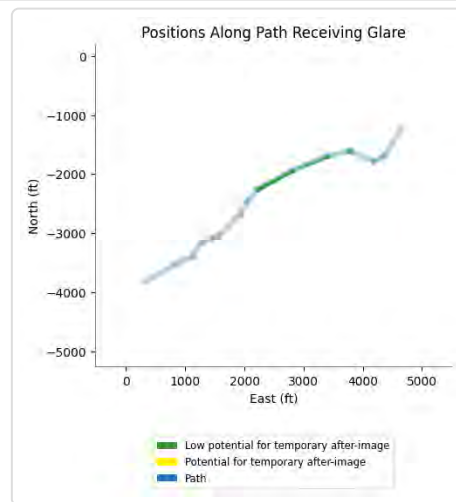
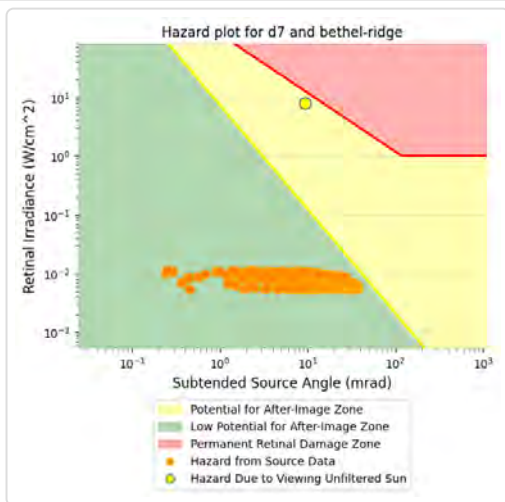
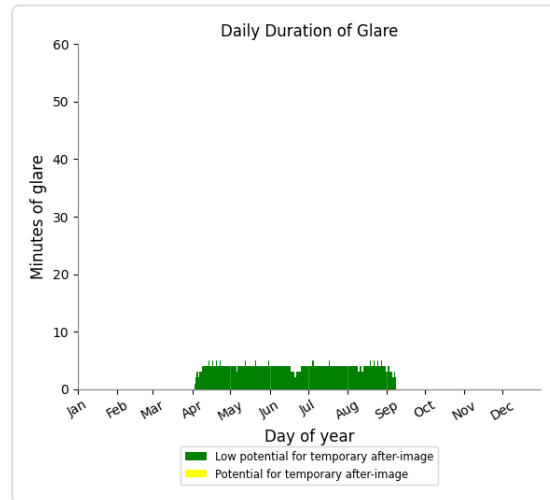
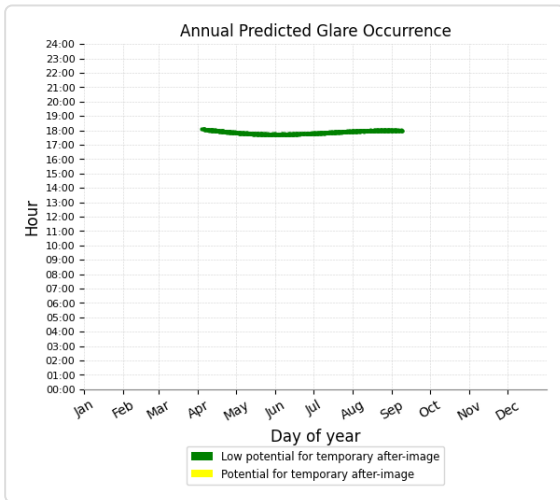
Yellow glare: none

Green glare: 557 min.



## D7 and Route: Bethel Ridge Rd Trucks

Yellow glare: none  
 Green glare: 619 min.



## D7 and Route: McCreedy Rd

No glare found

## D7 and OP 4

No glare found

## D7 and OP 11

No glare found

## D7 and OP 12

No glare found

## D7 and OP 13

No glare found

## D7 and OP 14

No glare found

## D7 and OP 15

No glare found

## D7 and OP 16

No glare found

## D7 and OP 17

No glare found

## PV: D8 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	0	0.0	0	0.0
Bethel Ridge Rd Trucks	0	0.0	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0



**D8 and Route: Bethel Ridge Rd**

No glare found

**D8 and Route: Bethel Ridge Rd Trucks**

No glare found

**D8 and Route: McCready Rd**

No glare found

**D8 and OP 4**

No glare found

**D8 and OP 11**

No glare found

**D8 and OP 12**

No glare found

**D8 and OP 13**

No glare found

**D8 and OP 14**

No glare found

**D8 and OP 15**

No glare found

**D8 and OP 16**

No glare found

**D8 and OP 17**

No glare found

**PV: D9** low potential for temporary after-image

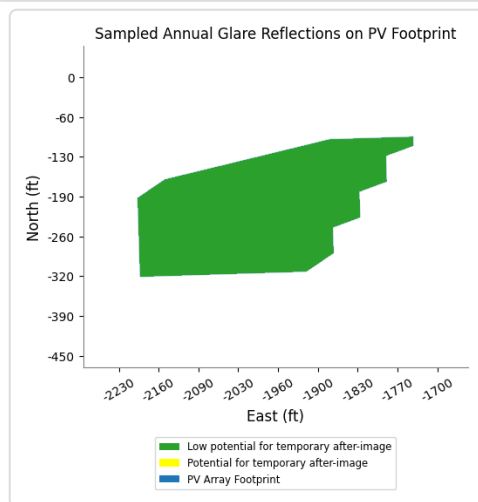
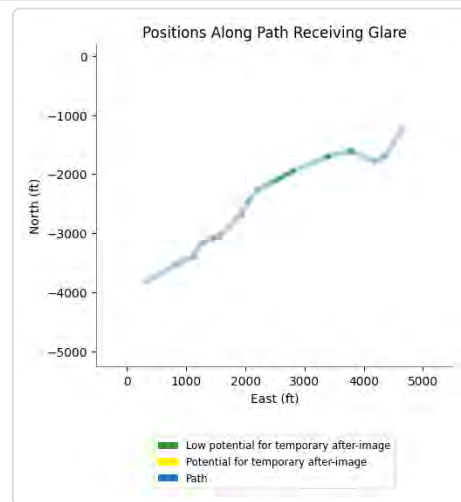
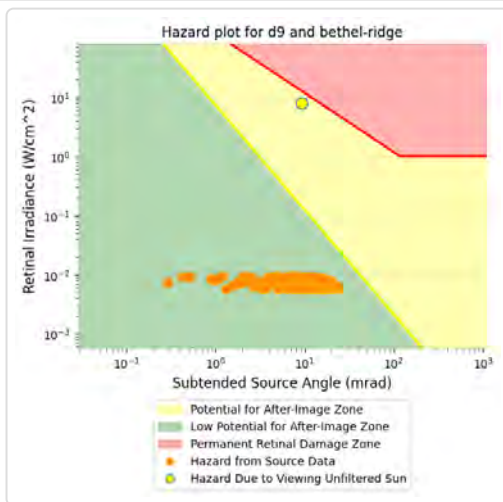
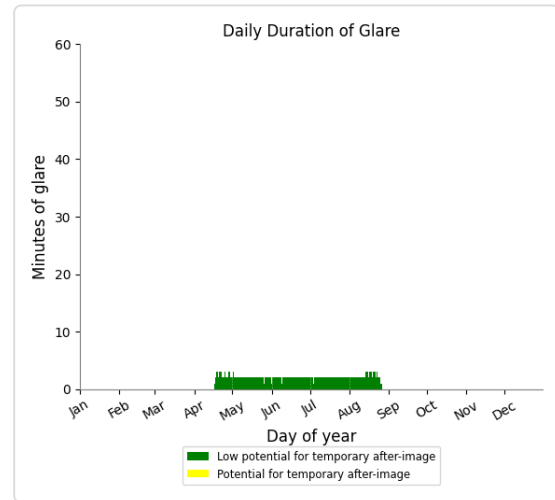
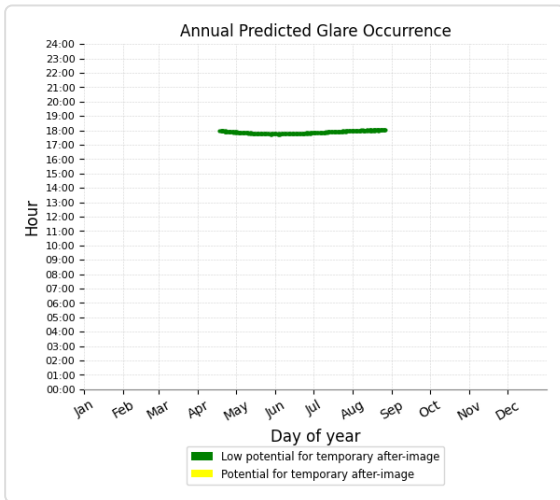
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	272	4.5	0	0.0
Bethel Ridge Rd Trucks	294	4.9	0	0.0
McCready Rd	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

# D9 and Route: Bethel Ridge Rd

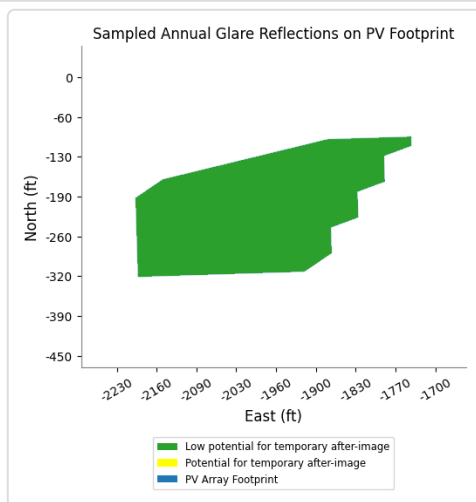
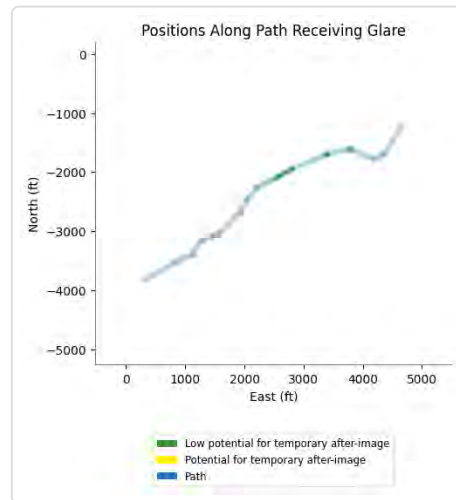
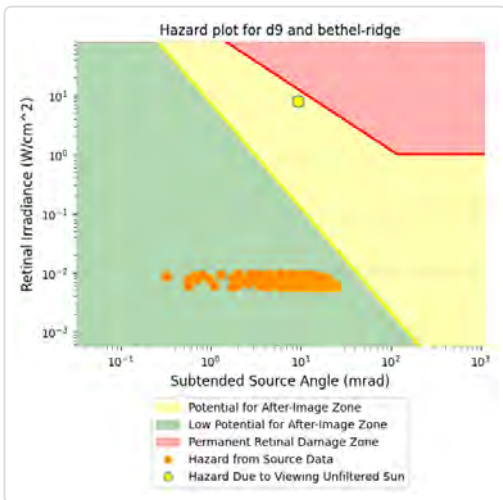
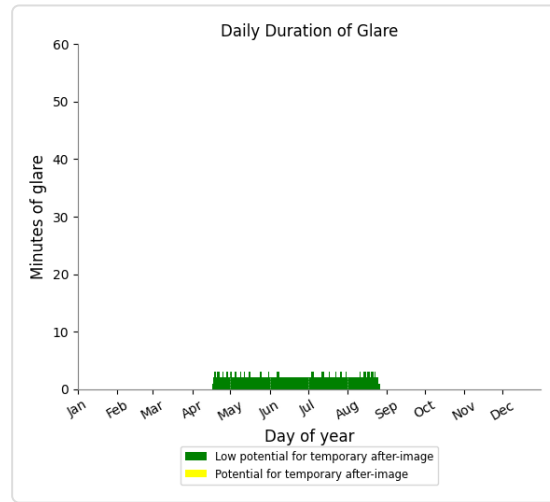
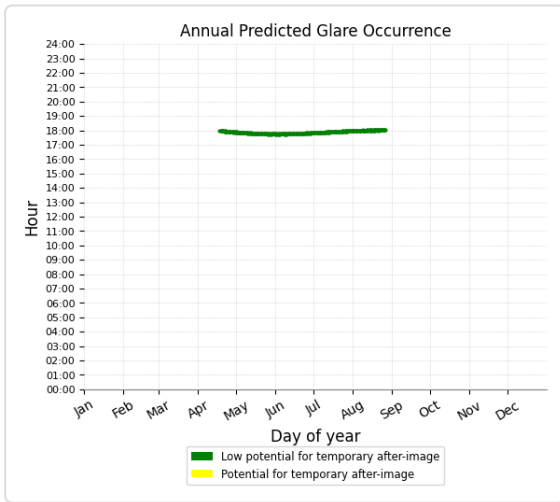
Yellow glare: none

Green glare: 272 min.



## D9 and Route: Bethel Ridge Rd Trucks

Yellow glare: none  
 Green glare: 294 min.



## D9 and Route: McCready Rd

No glare found

**D9 and OP 4**

No glare found

**D9 and OP 11**

No glare found

**D9 and OP 12**

No glare found

**D9 and OP 13**

No glare found

**D9 and OP 14**

No glare found

**D9 and OP 15**

No glare found

**D9 and OP 16**

No glare found

**D9 and OP 17**

No glare found

# Assumptions

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"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/](http://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

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## Group E



# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar North**

300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section E\_Revised**

Client: REV Renewables

Created 20 Sep, 2025

Updated 23 Oct, 2025

Time-step 1 minute

Timezone offset UTC-5

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m<sup>2</sup>

Category 100 MW to 1 GW

Site ID 159919.26057

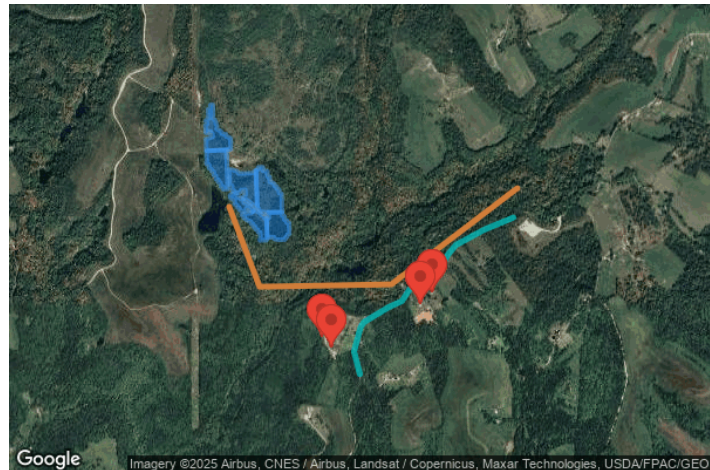
Ocular transmission coefficient 0.5

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 low potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy kWh
	°	°	min	hr	min	hr	
E1	25.0	180.0	1,017	16.9	0	0.0	-
E2	25.0	180.0	627	10.4	0	0.0	-
E3	25.0	180.0	1,936	32.3	0	0.0	-
E4	25.0	180.0	169	2.8	0	0.0	-
E5	25.0	180.0	7,120	118.7	0	0.0	-
E6	25.0	180.0	866	14.4	0	0.0	-
E7	25.0	180.0	1,232	20.5	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
Bethel Ridge Rd	4,078	68.0	0	0.0
Bethel Ridge Rd Trucks	4,292	71.5	0	0.0
OP 11	2,076	34.6	0	0.0
OP 12	2,326	38.8	0	0.0
OP 13	0	0.0	0	0.0
OP 14	195	3.2	0	0.0
OP 15	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

# Component Data

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## PV Arrays

Name: E1

Axis tracking: Fixed (no rotation)

Tilt: 25.0°

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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.317372	-80.518739	1091.95	5.00	1096.95
2	40.317505	-80.518254	1106.30	5.00	1111.30
3	40.317700	-80.518262	1106.37	5.00	1111.37
4	40.317738	-80.518427	1105.52	5.00	1110.52
5	40.317817	-80.518430	1108.21	5.00	1113.21
6	40.317813	-80.518594	1107.50	5.00	1112.50
7	40.317734	-80.518592	1105.00	5.00	1110.00
8	40.317730	-80.518754	1108.06	5.00	1113.06
9	40.318163	-80.518772	1116.94	5.00	1121.94
10	40.318207	-80.518674	1115.40	5.00	1120.40
11	40.318324	-80.518679	1118.35	5.00	1123.35
12	40.318364	-80.518730	1121.87	5.00	1126.87
13	40.318402	-80.518732	1123.73	5.00	1128.73
14	40.318483	-80.518648	1121.85	5.00	1126.85
15	40.318527	-80.518559	1118.18	5.00	1123.18
16	40.318801	-80.518570	1119.55	5.00	1124.55
17	40.318843	-80.518564	1119.47	5.00	1124.47
18	40.319039	-80.518572	1122.62	5.00	1127.62
19	40.319085	-80.518411	1113.47	5.00	1118.47
20	40.319280	-80.518419	1114.55	5.00	1119.55
21	40.319284	-80.518257	1108.11	5.00	1113.11
22	40.318851	-80.518239	1108.92	5.00	1113.92
23	40.318809	-80.518246	1108.82	5.00	1113.82
24	40.318535	-80.518234	1108.72	5.00	1113.72
25	40.318495	-80.518160	1107.04	5.00	1112.04
26	40.318417	-80.518080	1105.94	5.00	1110.94
27	40.318339	-80.518028	1106.25	5.00	1111.25
28	40.318223	-80.518023	1108.16	5.00	1113.16
29	40.318183	-80.517957	1107.24	5.00	1112.24
30	40.317908	-80.517945	1108.74	5.00	1113.74
31	40.317870	-80.517780	1108.32	5.00	1113.32
32	40.317795	-80.517614	1109.76	5.00	1114.76
33	40.317679	-80.517609	1112.70	5.00	1117.70
34	40.317645	-80.517280	1109.18	5.00	1114.18
35	40.317528	-80.517276	1113.53	5.00	1118.53
36	40.317490	-80.517111	1109.11	5.00	1114.11
37	40.317415	-80.516944	1102.64	5.00	1107.64
38	40.316824	-80.516920	1095.36	5.00	1100.36
39	40.316775	-80.517245	1098.11	5.00	1103.11
40	40.316726	-80.518707	1044.67	5.00	1049.67

**Name:** E2

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.315193	-80.517180	1066.83	5.00	1071.83
2	40.314837	-80.517165	1065.32	5.00	1070.32
3	40.314602	-80.517156	1062.93	5.00	1067.93
4	40.314594	-80.517481	1059.33	5.00	1064.33
5	40.314710	-80.517486	1061.88	5.00	1066.88
6	40.314748	-80.517651	1060.29	5.00	1065.29
7	40.314944	-80.517659	1064.18	5.00	1069.18
8	40.314982	-80.517824	1061.55	5.00	1066.55
9	40.315098	-80.517828	1064.41	5.00	1069.41
10	40.315136	-80.517994	1063.11	5.00	1068.11
11	40.315331	-80.518002	1065.35	5.00	1070.35
12	40.315369	-80.518167	1064.09	5.00	1069.09
13	40.315565	-80.518175	1066.74	5.00	1071.74
14	40.315603	-80.518340	1065.22	5.00	1070.22
15	40.315719	-80.518344	1069.43	5.00	1074.43
16	40.315757	-80.518510	1069.53	5.00	1074.53
17	40.315952	-80.518518	1075.29	5.00	1080.29
18	40.315990	-80.518683	1074.49	5.00	1079.49
19	40.316726	-80.518707	1044.67	5.00	1049.67
20	40.316775	-80.517245	1098.11	5.00	1103.11
21	40.315946	-80.517211	1058.07	5.00	1063.07
22	40.315235	-80.517182	1067.28	5.00	1072.28

**Name:** E3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.314880	-80.517002	1065.89	5.00	1070.89
2	40.315318	-80.517020	1068.97	5.00	1073.97
3	40.315671	-80.517034	1070.40	5.00	1075.40
4	40.315675	-80.516873	1068.88	5.00	1073.88
5	40.315604	-80.516543	1066.05	5.00	1071.05
6	40.315529	-80.516376	1067.39	5.00	1072.39
7	40.315450	-80.516371	1070.53	5.00	1075.53
8	40.315477	-80.515228	1079.54	5.00	1084.54
9	40.315556	-80.515231	1075.82	5.00	1080.82
10	40.315639	-80.515071	1077.29	5.00	1082.29
11	40.313624	-80.514988	1076.60	5.00	1081.60
12	40.313696	-80.515318	1076.32	5.00	1081.32
13	40.313850	-80.515488	1075.56	5.00	1080.56
14	40.313925	-80.515655	1072.87	5.00	1077.87
15	40.314000	-80.515821	1069.50	5.00	1074.50
16	40.314076	-80.515988	1068.08	5.00	1073.08
17	40.314192	-80.515993	1066.63	5.00	1071.63
18	40.314275	-80.515833	1066.74	5.00	1071.74
19	40.314554	-80.515846	1068.76	5.00	1073.76
20	40.314546	-80.516172	1069.17	5.00	1074.17
21	40.314467	-80.516169	1066.62	5.00	1071.62
22	40.314384	-80.516329	1065.00	5.00	1070.00
23	40.314380	-80.516491	1065.23	5.00	1070.23
24	40.314455	-80.516658	1065.84	5.00	1070.84
25	40.314610	-80.516827	1065.00	5.00	1070.00
26	40.314768	-80.516834	1065.77	5.00	1070.77
27	40.314843	-80.517000	1065.72	5.00	1070.72

**Name:** E4

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.315639	-80.515071	1077.29	5.00	1082.29
2	40.315685	-80.514909	1077.99	5.00	1082.99
3	40.315801	-80.514914	1071.74	5.00	1076.74
4	40.315809	-80.514589	1070.28	5.00	1075.28
5	40.315614	-80.514581	1079.48	5.00	1084.48
6	40.315580	-80.514253	1074.11	5.00	1079.11
7	40.315305	-80.514241	1083.58	5.00	1088.58
8	40.315267	-80.514076	1083.19	5.00	1088.19
9	40.314993	-80.514065	1088.39	5.00	1093.39
10	40.314955	-80.513900	1091.12	5.00	1096.12
11	40.314879	-80.513733	1094.54	5.00	1099.54
12	40.314763	-80.513729	1097.80	5.00	1102.80
13	40.314725	-80.513563	1097.65	5.00	1102.65
14	40.314609	-80.513559	1099.91	5.00	1104.91
15	40.314571	-80.513394	1097.38	5.00	1102.38
16	40.314375	-80.513386	1097.11	5.00	1102.11
17	40.314338	-80.513221	1096.33	5.00	1101.33
18	40.313826	-80.513200	1091.16	5.00	1096.16
19	40.313299	-80.513177	1094.81	5.00	1099.81
20	40.313286	-80.514157	1075.96	5.00	1080.96
21	40.313316	-80.514649	1077.40	5.00	1082.40
22	40.313391	-80.514815	1077.00	5.00	1082.00
23	40.313624	-80.514988	1076.60	5.00	1081.60



**Name:** E5

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.313114	-80.513171	1095.09	5.00	1100.09
2	40.313076	-80.513006	1096.43	5.00	1101.43
3	40.312880	-80.512998	1094.59	5.00	1099.59
4	40.312843	-80.512832	1095.02	5.00	1100.02
5	40.312726	-80.512828	1093.57	5.00	1098.57
6	40.312688	-80.512663	1088.85	5.00	1093.85
7	40.312097	-80.512638	1070.44	5.00	1075.44
8	40.312052	-80.512800	1070.16	5.00	1075.16
9	40.311935	-80.512795	1067.47	5.00	1072.47
10	40.311889	-80.512957	1068.24	5.00	1073.24
11	40.311773	-80.512952	1067.95	5.00	1072.95
12	40.311761	-80.513441	1065.36	5.00	1070.36
13	40.311833	-80.513770	1061.97	5.00	1066.97
14	40.311912	-80.513774	1066.00	5.00	1071.00
15	40.311900	-80.514264	1063.91	5.00	1068.91
16	40.312963	-80.514309	1074.31	5.00	1079.31
17	40.312969	-80.514144	1073.85	5.00	1078.85
18	40.313286	-80.514157	1075.96	5.00	1080.96
19	40.313299	-80.513177	1094.81	5.00	1099.81

**Name:** E6

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.311900	-80.514264	1063.91	5.00	1068.91
2	40.311821	-80.514262	1060.05	5.00	1065.05
3	40.311741	-80.514306	1058.58	5.00	1063.58
4	40.311729	-80.514795	1066.23	5.00	1071.23
5	40.311766	-80.514796	1065.65	5.00	1070.65
6	40.311809	-80.514751	1065.78	5.00	1070.78
7	40.312163	-80.514765	1068.65	5.00	1073.65
8	40.312201	-80.514930	1068.62	5.00	1073.62
9	40.312317	-80.514935	1072.19	5.00	1077.19
10	40.312355	-80.515100	1074.05	5.00	1079.05
11	40.312471	-80.515105	1076.57	5.00	1081.57
12	40.312509	-80.515270	1077.18	5.00	1082.18
13	40.312626	-80.515275	1077.16	5.00	1082.16
14	40.312664	-80.515440	1076.87	5.00	1081.87
15	40.312780	-80.515444	1077.72	5.00	1082.72
16	40.312818	-80.515609	1078.33	5.00	1083.33
17	40.312893	-80.515776	1079.17	5.00	1084.17
18	40.312968	-80.515943	1077.60	5.00	1082.60
19	40.313085	-80.515947	1077.54	5.00	1082.54
20	40.313122	-80.516112	1073.34	5.00	1078.34
21	40.313160	-80.516114	1073.21	5.00	1078.21
22	40.313254	-80.515464	1076.83	5.00	1081.83
23	40.313337	-80.515304	1077.03	5.00	1082.03
24	40.313418	-80.515245	1076.30	5.00	1081.30
25	40.313345	-80.514979	1076.22	5.00	1081.22
26	40.313270	-80.514812	1077.82	5.00	1082.82
27	40.313116	-80.514642	1078.28	5.00	1083.28
28	40.313041	-80.514476	1076.73	5.00	1081.73
29	40.312962	-80.514471	1075.80	5.00	1080.80
30	40.312963	-80.514309	1074.31	5.00	1079.31

**Name:** E7

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

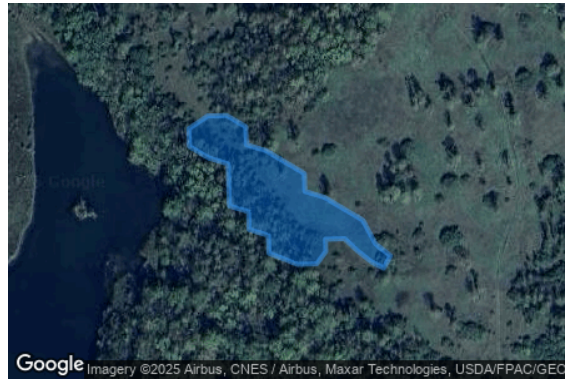
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.313337	-80.515304	1077.03	5.00	1082.03
2	40.313377	-80.515405	1077.36	5.00	1082.36
3	40.313453	-80.515533	1076.91	5.00	1081.91
4	40.313530	-80.515639	1076.72	5.00	1081.72
5	40.313526	-80.515804	1076.46	5.00	1081.46
6	40.313447	-80.515800	1077.03	5.00	1082.03
7	40.313366	-80.515878	1077.62	5.00	1082.62
8	40.313362	-80.516039	1076.34	5.00	1081.34
9	40.313435	-80.516289	1066.33	5.00	1071.33
10	40.313551	-80.516293	1071.77	5.00	1076.77
11	40.313589	-80.516459	1068.16	5.00	1073.16
12	40.313706	-80.516463	1069.72	5.00	1074.72
13	40.313743	-80.516628	1067.23	5.00	1072.23
14	40.314018	-80.516640	1066.33	5.00	1071.33
15	40.314056	-80.516805	1064.38	5.00	1069.38
16	40.314131	-80.516971	1063.15	5.00	1068.15
17	40.314247	-80.516976	1063.20	5.00	1068.20
18	40.314330	-80.516816	1063.73	5.00	1068.73
19	40.314334	-80.516654	1064.61	5.00	1069.61
20	40.314259	-80.516488	1064.64	5.00	1069.64
21	40.314143	-80.516483	1065.95	5.00	1070.95
22	40.314105	-80.516318	1067.07	5.00	1072.07
23	40.314030	-80.516151	1069.28	5.00	1074.28
24	40.313955	-80.515985	1070.47	5.00	1075.47
25	40.313838	-80.515980	1074.26	5.00	1079.26
26	40.313800	-80.515815	1075.41	5.00	1080.41
27	40.313725	-80.515648	1076.74	5.00	1081.74
28	40.313650	-80.515482	1076.41	5.00	1081.41
29	40.313494	-80.515373	1076.64	5.00	1081.64
30	40.313418	-80.515245	1076.30	5.00	1081.30

# Route Receptors

**Name:** Bethel Ridge Rd

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.304254	-80.507469	1099.72	4.50	1104.22
2	40.305521	-80.507901	1100.85	4.50	1105.35
3	40.306901	-80.507410	1129.57	4.50	1134.07
4	40.307159	-80.507179	1136.77	4.50	1141.27
5	40.307989	-80.505371	1185.78	4.50	1190.28
6	40.308345	-80.504379	1204.22	4.50	1208.72
7	40.309008	-80.503810	1220.23	4.50	1224.73
8	40.309200	-80.503091	1208.90	4.50	1213.40
9	40.309342	-80.502737	1208.23	4.50	1212.73
10	40.310309	-80.501482	1193.94	4.50	1198.44
11	40.310927	-80.501018	1203.04	4.50	1207.54
12	40.311463	-80.500441	1211.06	4.50	1215.56
13	40.312322	-80.498360	1205.25	4.50	1209.75
14	40.312997	-80.496233	1211.83	4.50	1216.33

**Name:** Bethel Ridge Rd Trucks  
**Path type:** Two-way  
**Azimuthal view angle:** 50.0°  
**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.304254	-80.507469	1099.72	9.00	1108.72
2	40.305521	-80.507901	1100.85	9.00	1109.85
3	40.306901	-80.507410	1129.57	9.00	1138.57
4	40.307159	-80.507179	1136.77	9.00	1145.77
5	40.307989	-80.505371	1185.78	9.00	1194.78
6	40.308345	-80.504379	1204.10	9.00	1213.10
7	40.309008	-80.503810	1220.23	9.00	1229.23
8	40.309200	-80.503091	1208.90	9.00	1217.90
9	40.309342	-80.502737	1208.23	9.00	1217.23
10	40.310309	-80.501482	1193.94	9.00	1202.94
11	40.310927	-80.501018	1203.04	9.00	1212.04
12	40.311463	-80.500441	1211.06	9.00	1220.06
13	40.312322	-80.498360	1205.25	9.00	1214.25
14	40.312997	-80.496233	1211.83	9.00	1220.83

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 11	11	40.308790	-80.502148	1255.54	6.00
OP 12	12	40.308790	-80.502148	1255.54	16.00
OP 13	13	40.308103	-80.503014	1256.77	6.00
OP 14	14	40.308103	-80.503014	1256.77	16.00
OP 15	15	40.306317	-80.510210	1120.12	6.00
OP 16	16	40.305690	-80.509559	1141.77	6.00
OP 17	17	40.305690	-80.509559	1141.77	16.00

## Obstruction Components

Name: Treeline E1  
Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.313602	-80.517048	1016.81
2	40.309141	-80.514820	1022.72
3	40.309272	-80.505164	1195.43
4	40.314639	-80.495938	1116.69

# Glare Analysis Results

## Summary of Results Glare with low potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
E1	25.0	180.0	1,017	16.9	0	0.0	-
E2	25.0	180.0	627	10.4	0	0.0	-
E3	25.0	180.0	1,936	32.3	0	0.0	-
E4	25.0	180.0	169	2.8	0	0.0	-
E5	25.0	180.0	7,120	118.7	0	0.0	-
E6	25.0	180.0	866	14.4	0	0.0	-
E7	25.0	180.0	1,232	20.5	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
Bethel Ridge Rd	4,078	68.0	0	0.0
Bethel Ridge Rd Trucks	4,292	71.5	0	0.0
OP 11	2,076	34.6	0	0.0
OP 12	2,326	38.8	0	0.0
OP 13	0	0.0	0	0.0
OP 14	195	3.2	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0



**PV: E1** low potential for temporary after-image

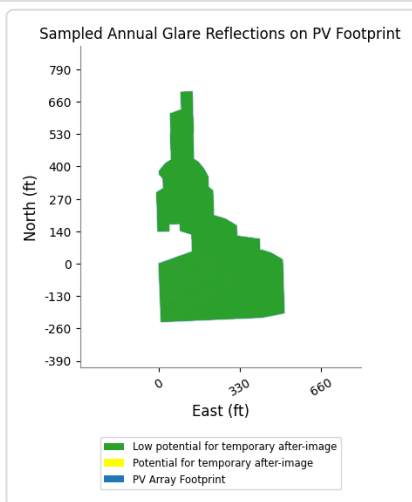
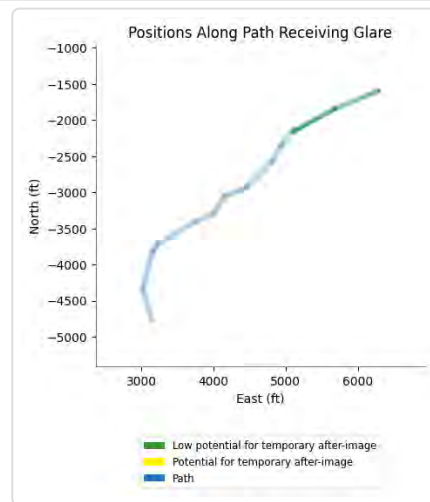
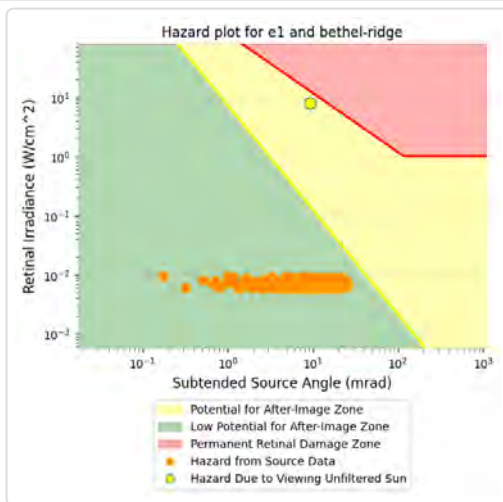
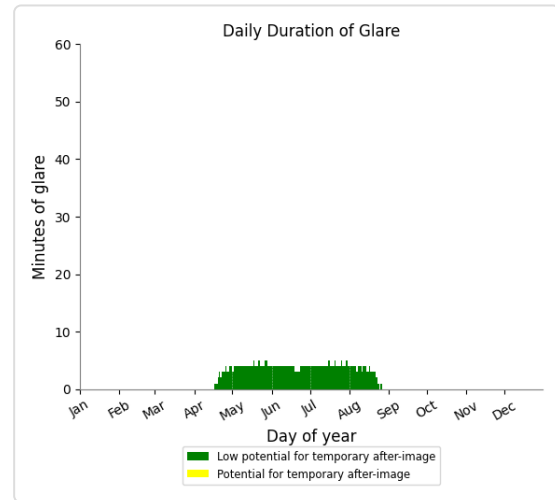
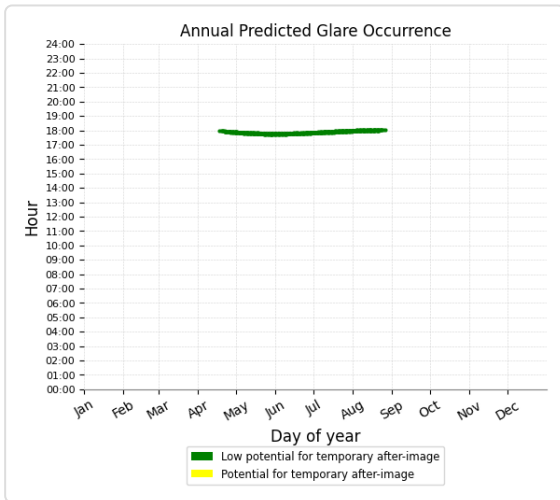
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	488	8.1	0	0.0
Bethel Ridge Rd Trucks	529	8.8	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

# E1 and Route: Bethel Ridge Rd

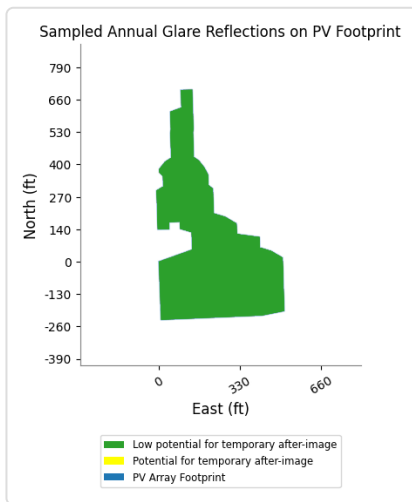
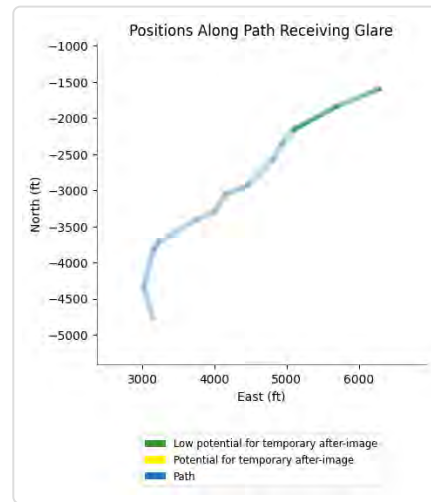
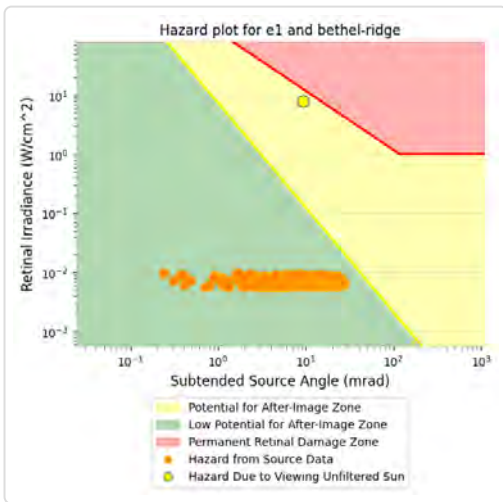
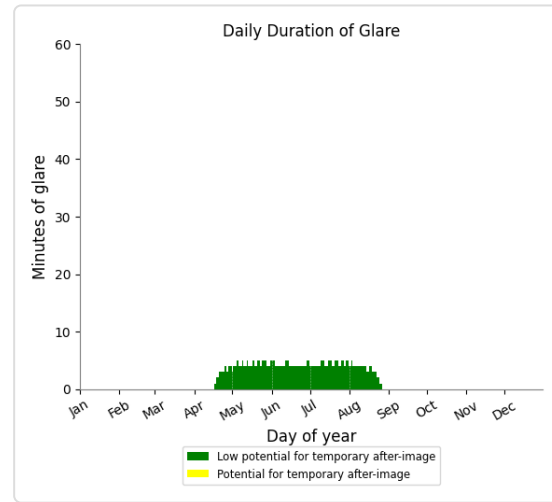
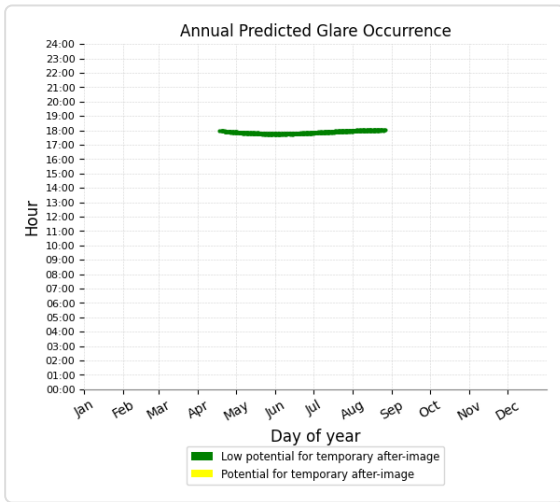
Yellow glare: none

Green glare: 488 min.



# E1 and Route: Bethel Ridge Rd Trucks

Yellow glare: none  
 Green glare: 529 min.



# E1 and OP 11

No glare found

## E1 and OP 12

No glare found

## E1 and OP 13

No glare found

## E1 and OP 14

No glare found

## E1 and OP 15

No glare found

## E1 and OP 16

No glare found

## E1 and OP 17

No glare found

## PV: E2 low potential for temporary after-image

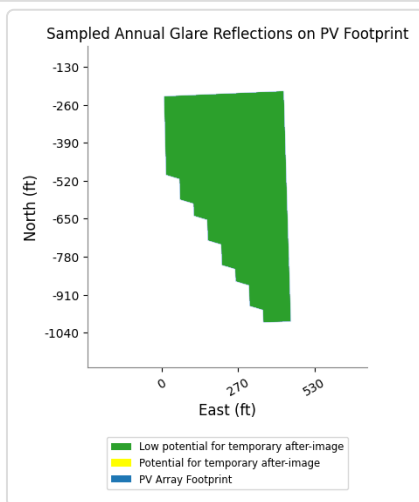
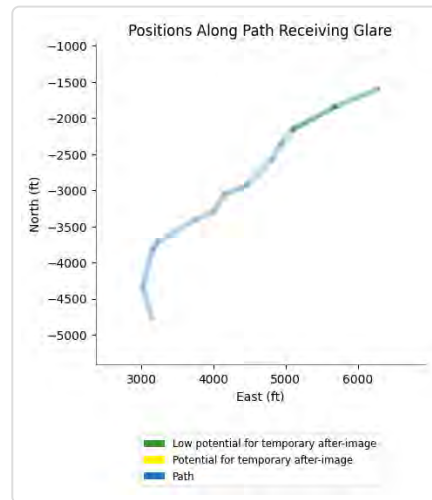
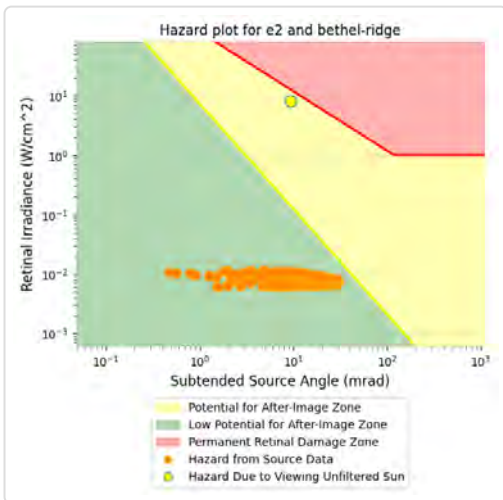
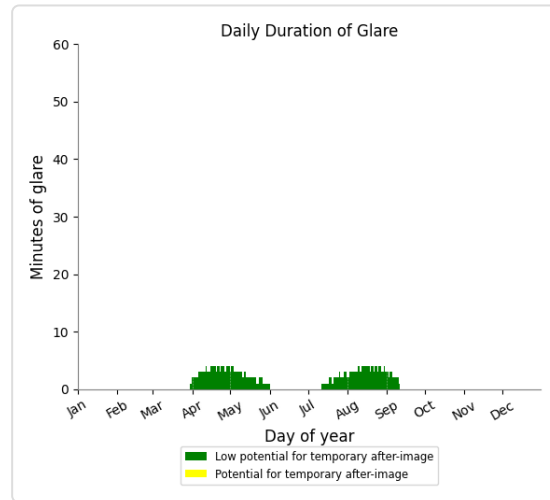
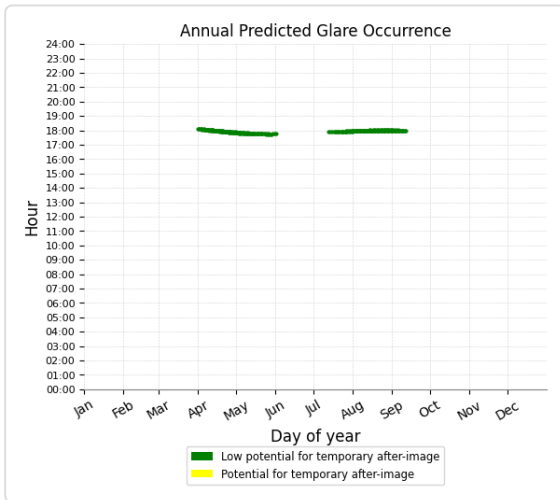
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	334	5.6	0	0.0
Bethel Ridge Rd Trucks	293	4.9	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

## E2 and Route: Bethel Ridge Rd

Yellow glare: none

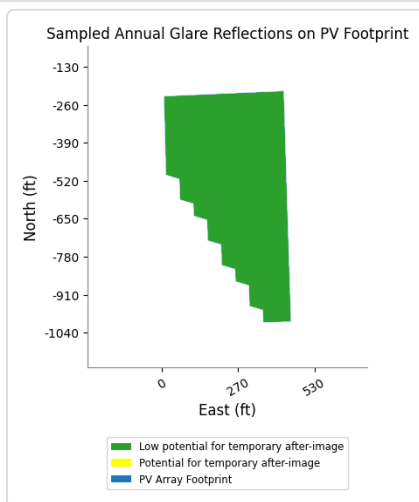
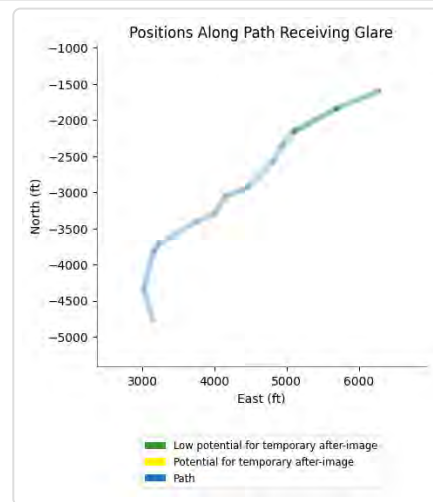
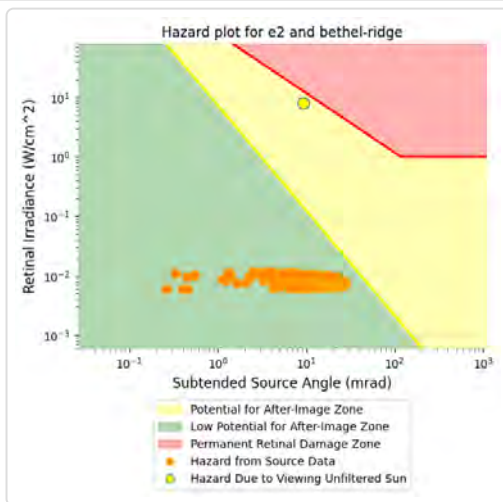
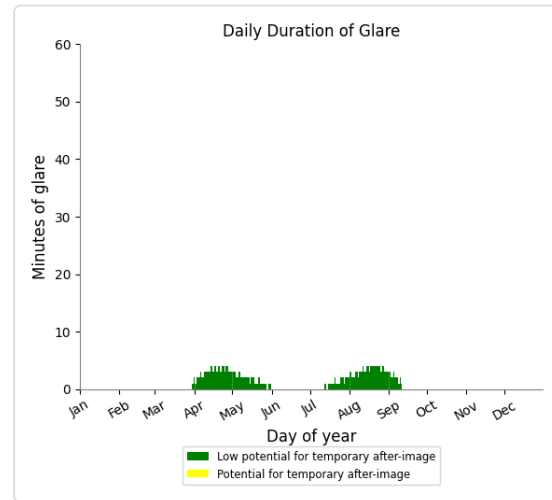
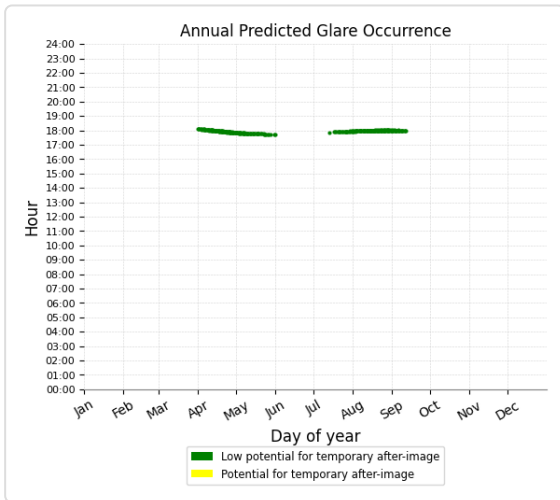
Green glare: 334 min.



## E2 and Route: Bethel Ridge Rd Trucks

Yellow glare: none

Green glare: 293 min.



## E2 and OP 11

No glare found

## E2 and OP 12

No glare found

## E2 and OP 13

No glare found

## E2 and OP 14

No glare found

## E2 and OP 15

No glare found

## E2 and OP 16

No glare found

## E2 and OP 17

No glare found

## PV: E3 low potential for temporary after-image

*Receptor results ordered by category of glare*

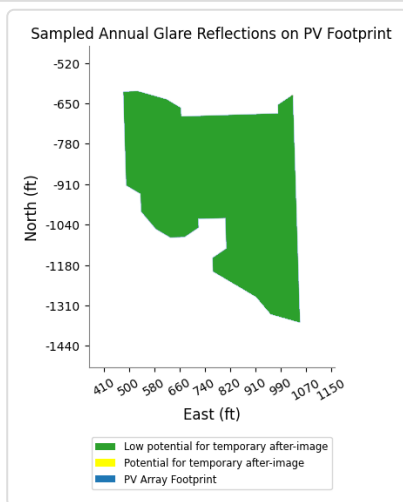
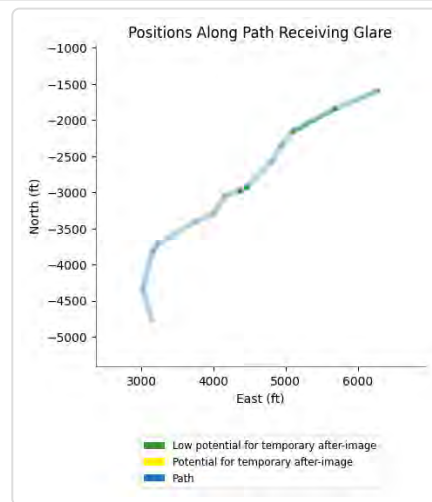
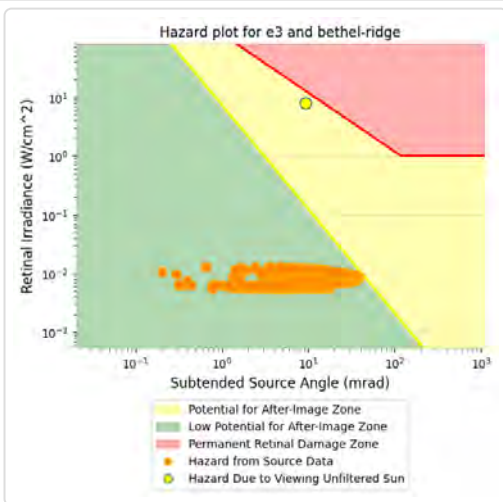
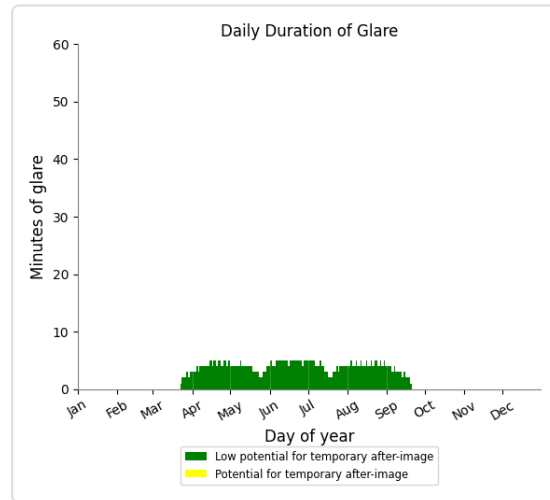
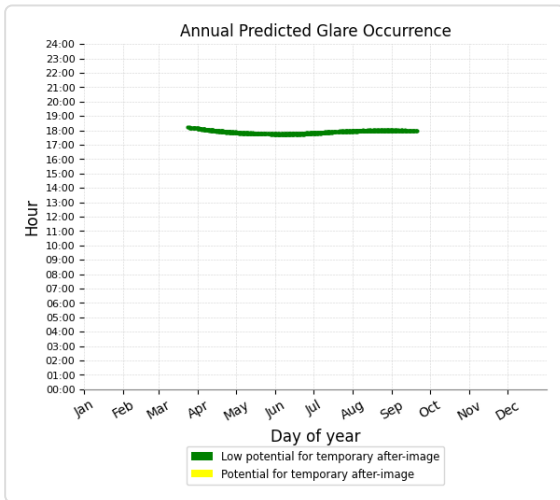
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	704	11.7	0	0.0
Bethel Ridge Rd Trucks	780	13.0	0	0.0
OP 11	223	3.7	0	0.0
OP 12	229	3.8	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0



# E3 and Route: Bethel Ridge Rd

Yellow glare: none

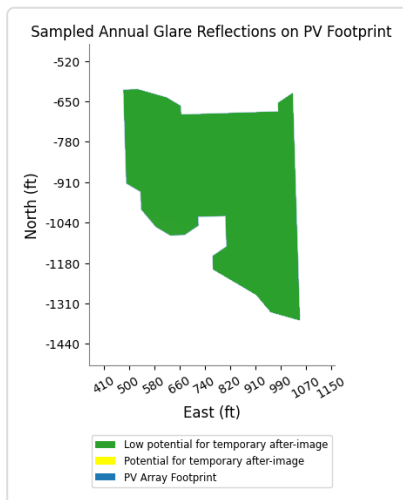
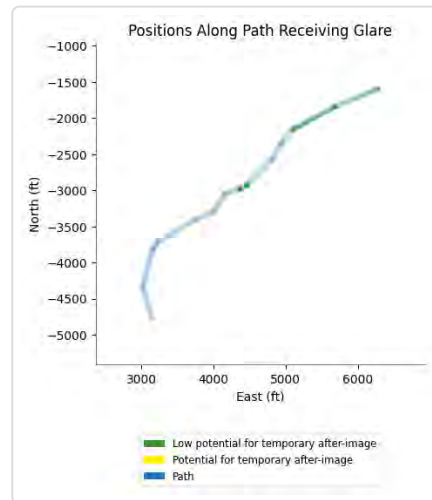
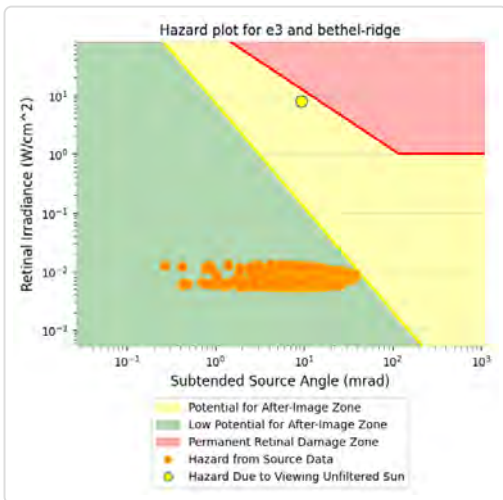
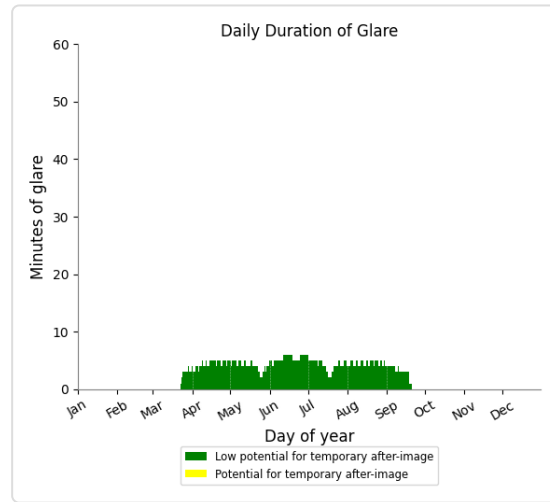
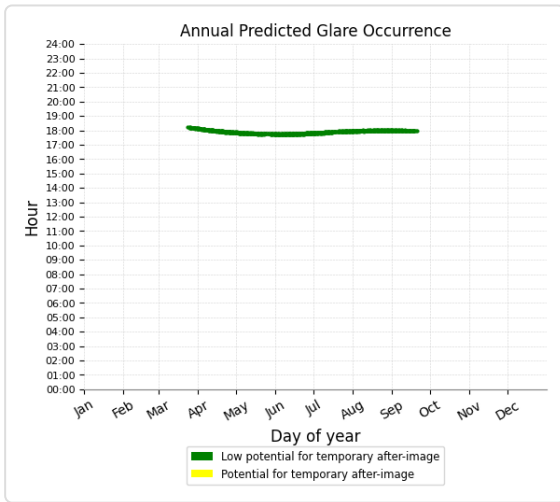
Green glare: 704 min.



# E3 and Route: Bethel Ridge Rd Trucks

Yellow glare: none

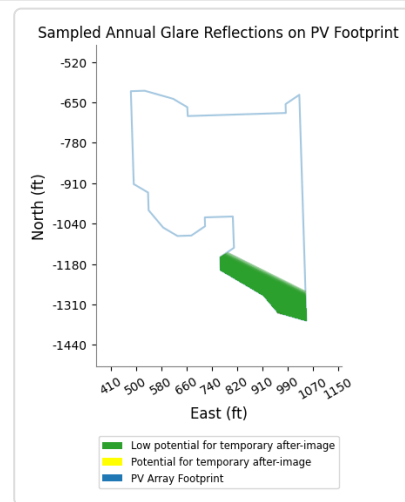
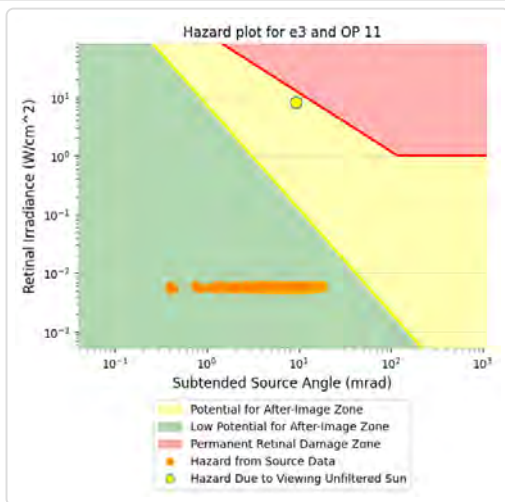
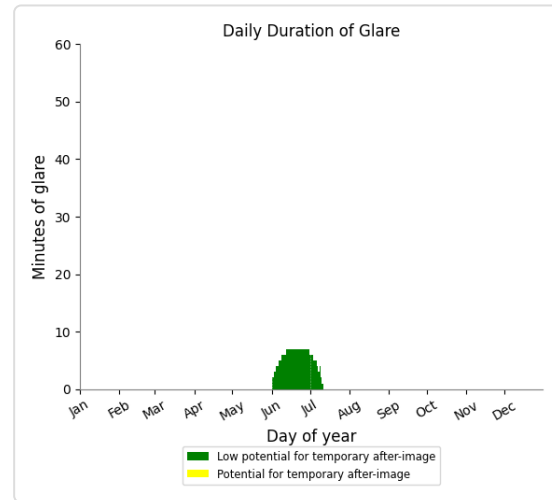
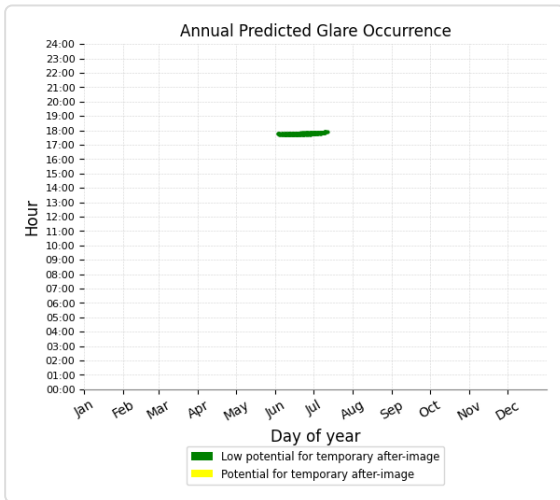
Green glare: 780 min.



# E3 and OP 11

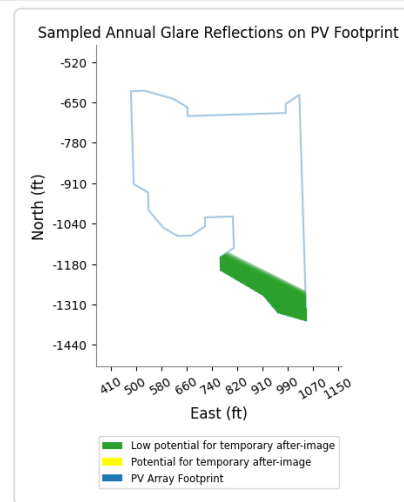
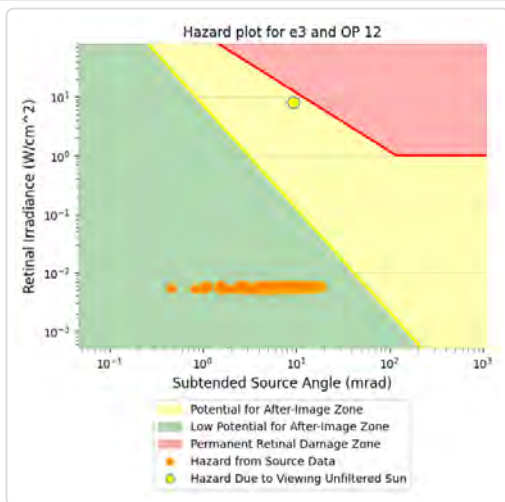
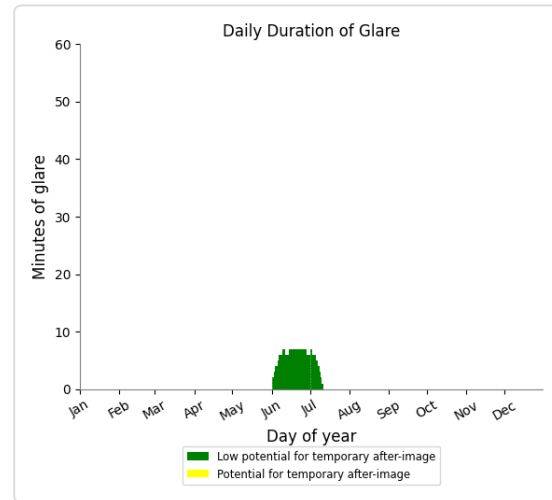
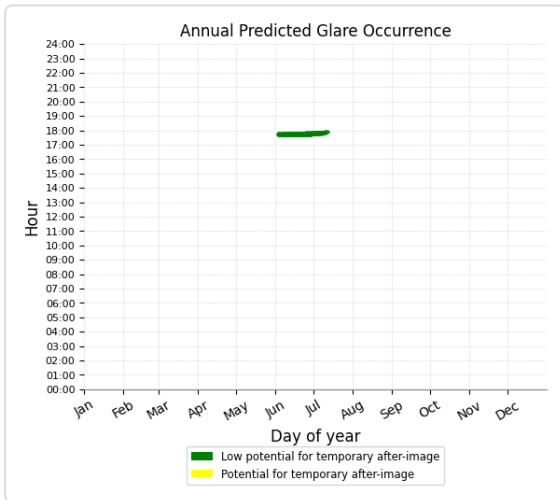
Yellow glare: none

Green glare: 223 min.



### E3 and OP 12

Yellow glare: none  
Green glare: 229 min.



### E3 and OP 13

No glare found

### E3 and OP 14

No glare found

### E3 and OP 15

No glare found

### E3 and OP 16

No glare found

### E3 and OP 17

No glare found

**PV: E4** low potential for temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	0	0.0	0	0.0
Bethel Ridge Rd Trucks	0	0.0	0	0.0
OP 11	81	1.4	0	0.0
OP 12	88	1.5	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

**E4 and Route: Bethel Ridge Rd**

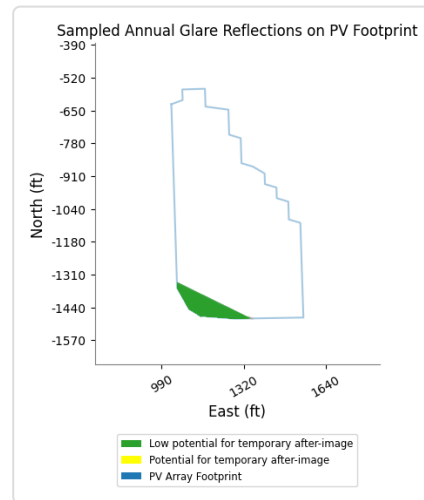
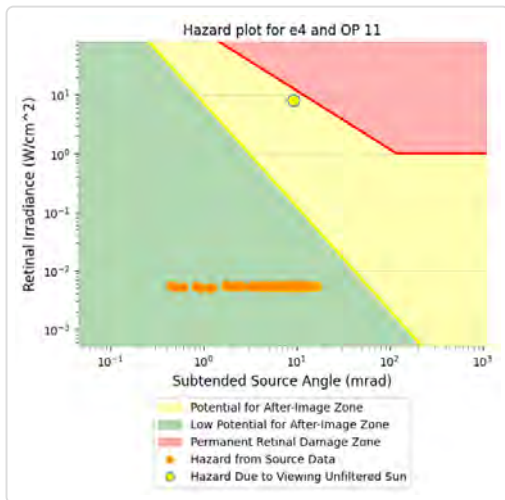
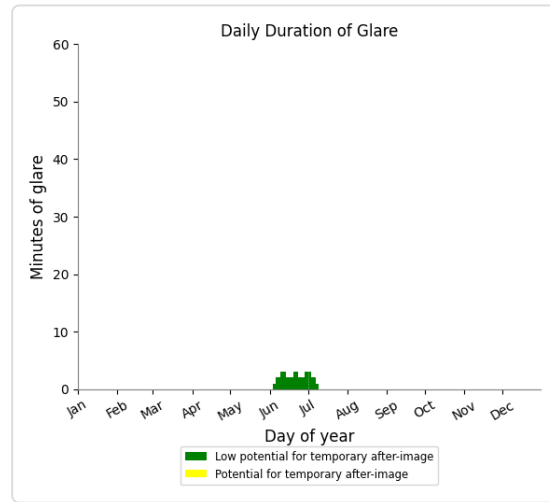
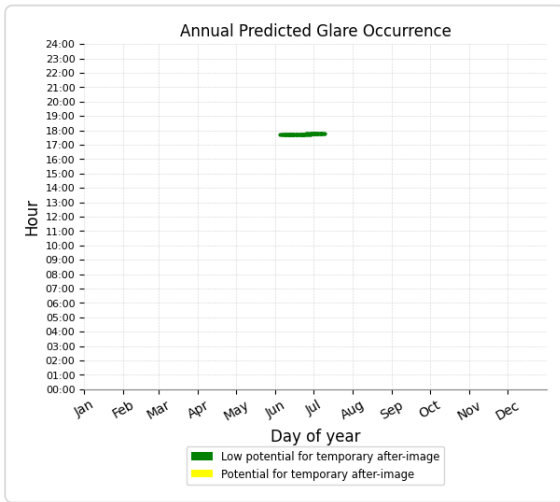
No glare found

**E4 and Route: Bethel Ridge Rd Trucks**

No glare found

# E4 and OP 11

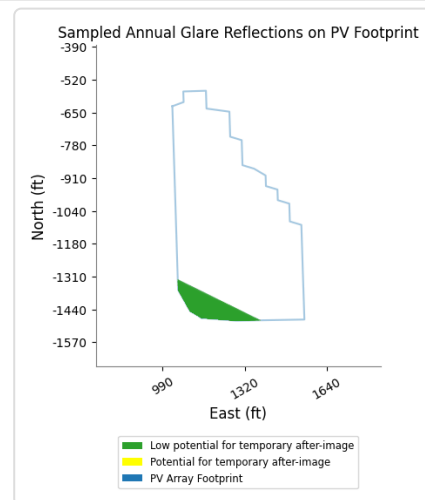
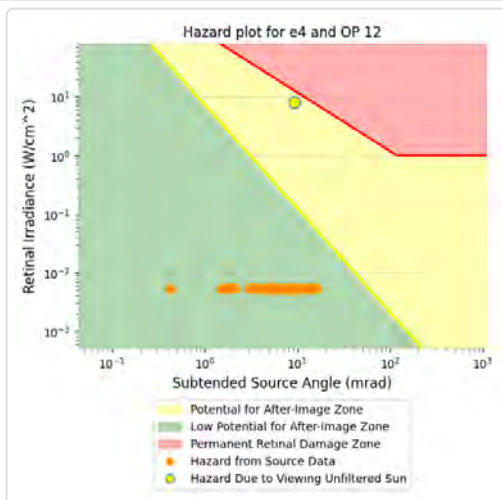
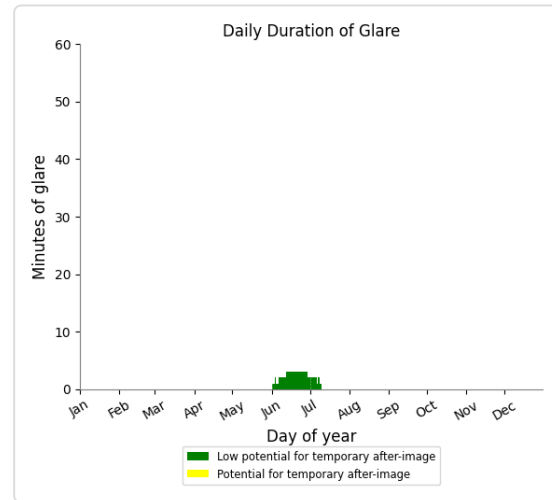
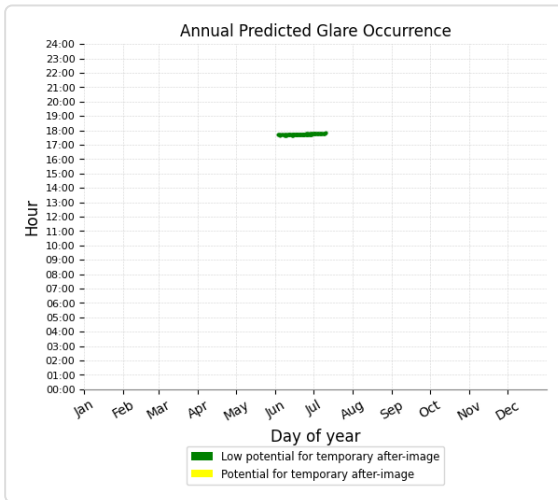
Yellow glare: none  
 Green glare: 81 min.



## E4 and OP 12

Yellow glare: none

Green glare: 88 min.



## E4 and OP 13

No glare found

## E4 and OP 14

No glare found

## E4 and OP 15

No glare found

## E4 and OP 16

No glare found

## E4 and OP 17

No glare found



**PV: E5** low potential for temporary after-image

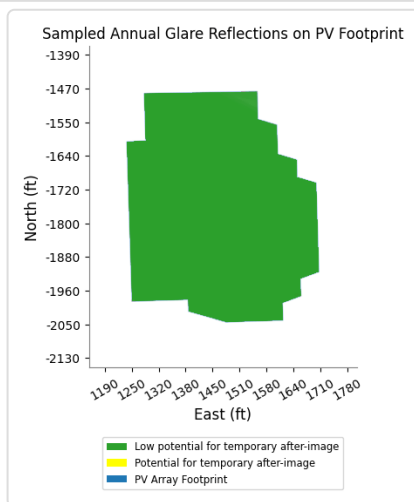
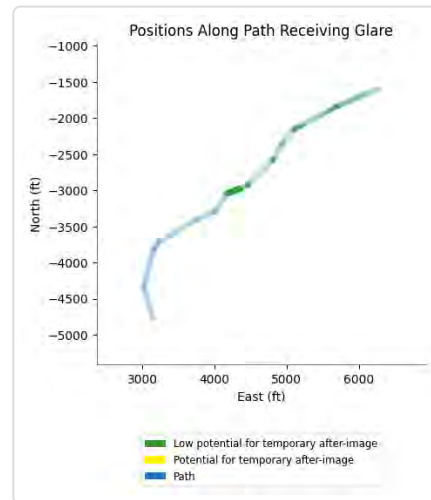
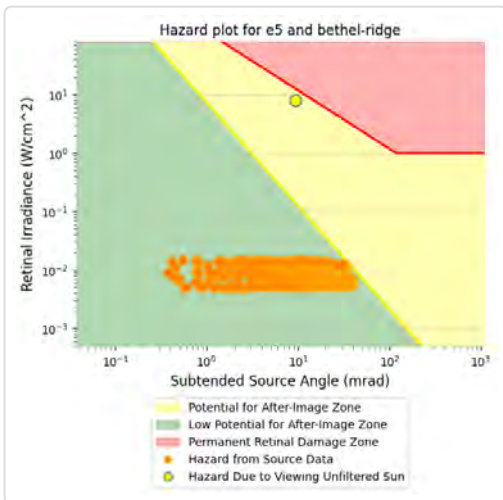
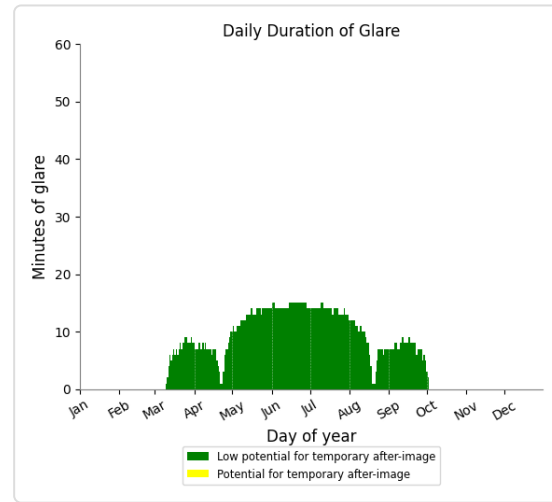
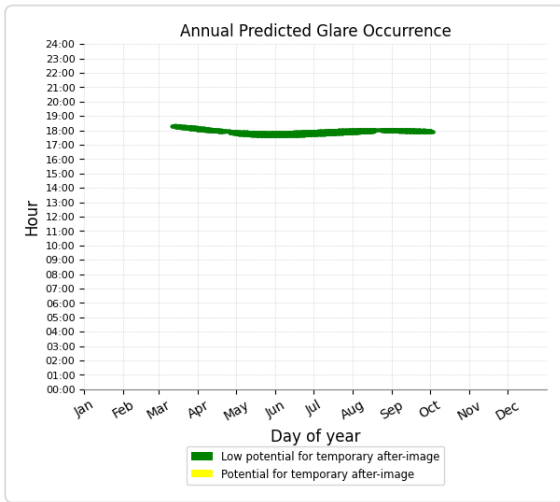
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	2,068	34.5	0	0.0
Bethel Ridge Rd Trucks	2,076	34.6	0	0.0
OP 11	1,420	23.7	0	0.0
OP 12	1,504	25.1	0	0.0
OP 14	52	0.9	0	0.0
OP 13	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

# E5 and Route: Bethel Ridge Rd

Yellow glare: none

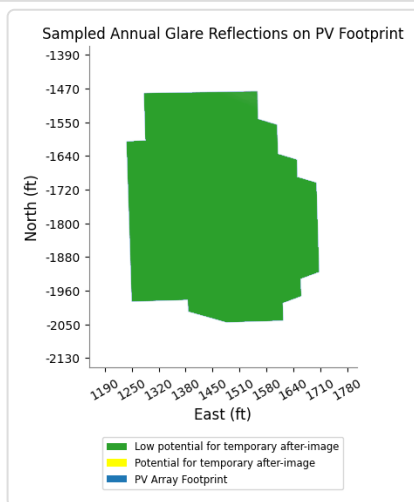
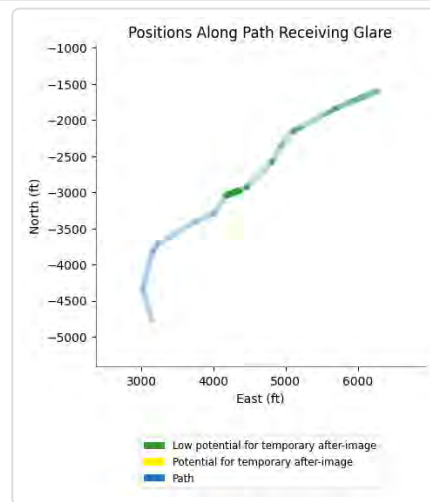
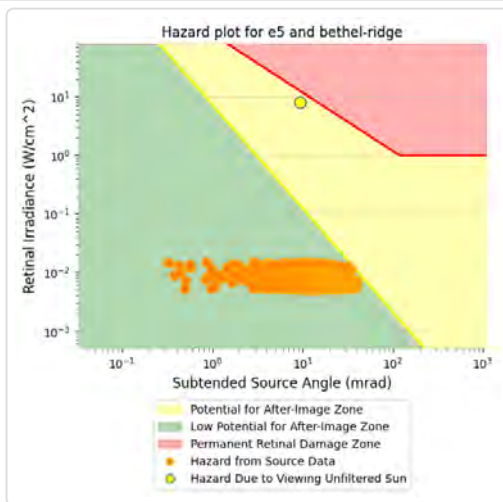
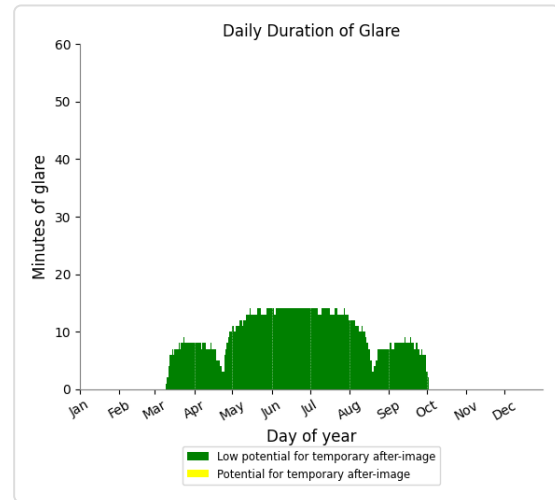
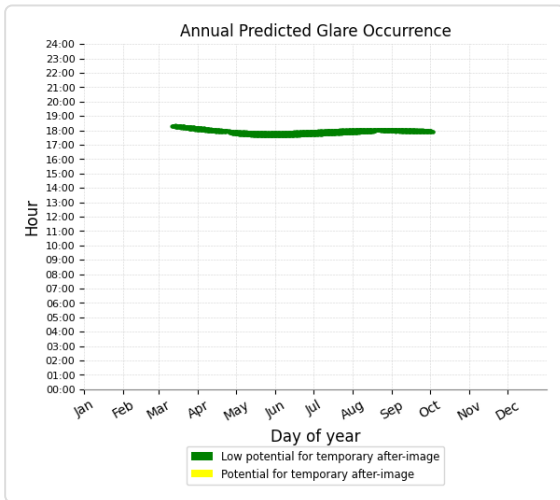
Green glare: 2,068 min.



# E5 and Route: Bethel Ridge Rd Trucks

Yellow glare: none

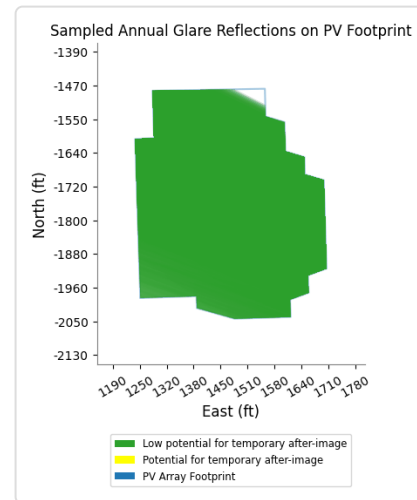
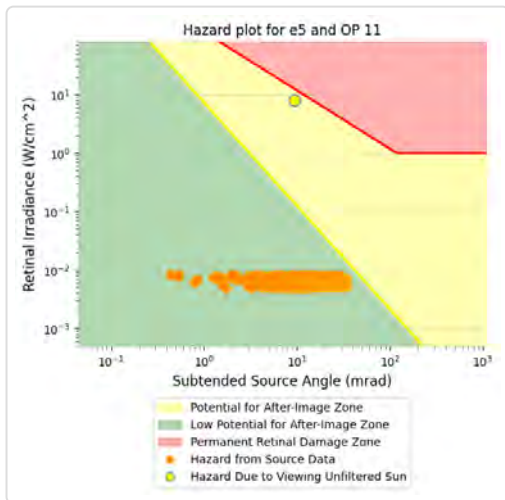
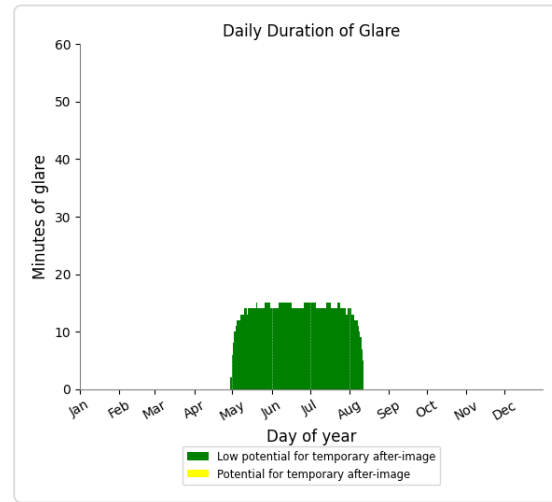
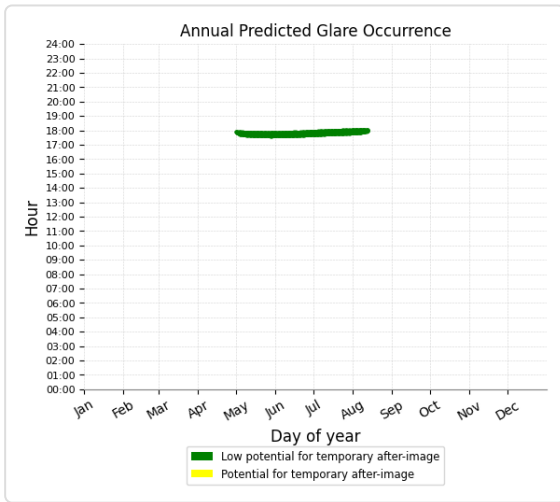
Green glare: 2,076 min.



## E5 and OP 11

Yellow glare: none

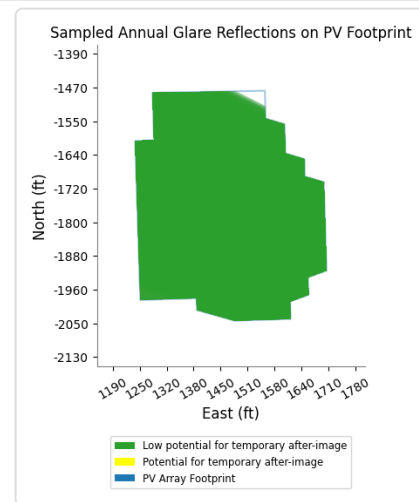
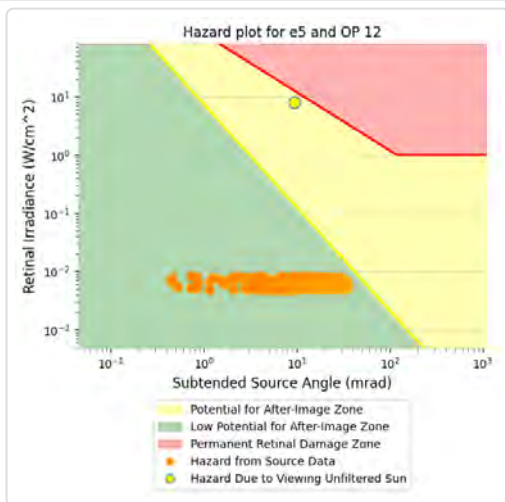
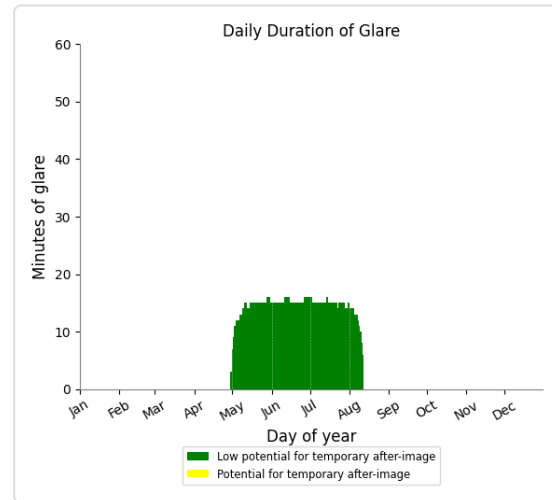
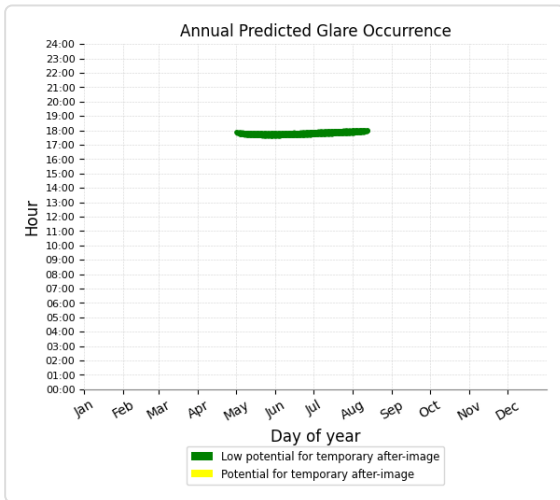
Green glare: 1,420 min.



## E5 and OP 12

Yellow glare: none

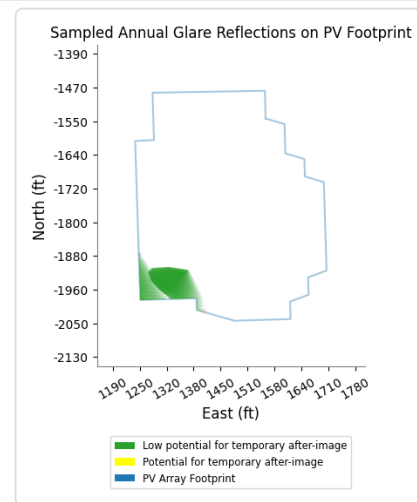
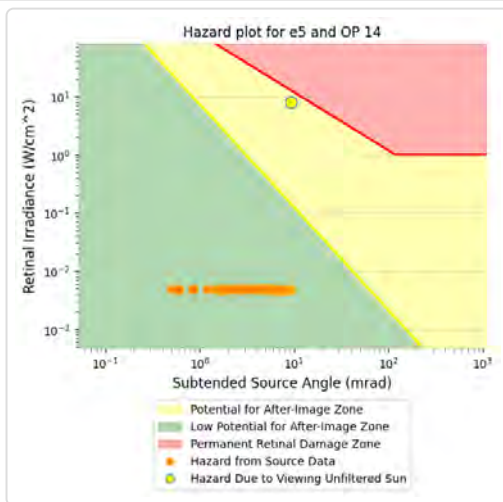
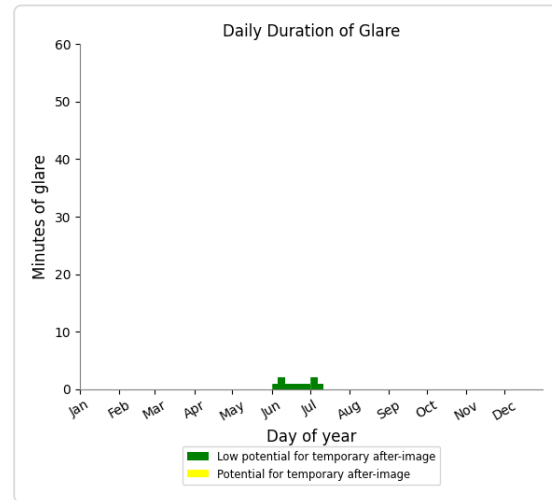
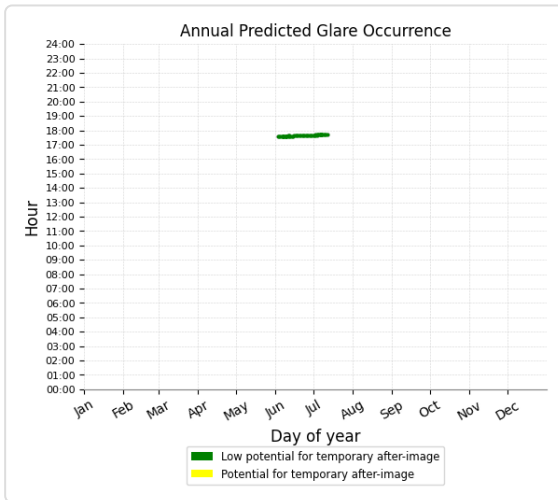
Green glare: 1,504 min.



## E5 and OP 14

Yellow glare: none

Green glare: 52 min.



## E5 and OP 13

No glare found

## E5 and OP 15

No glare found

## E5 and OP 16

No glare found

## E5 and OP 17

No glare found

**PV: E6** low potential for temporary after-image

*Receptor results ordered by category of glare*

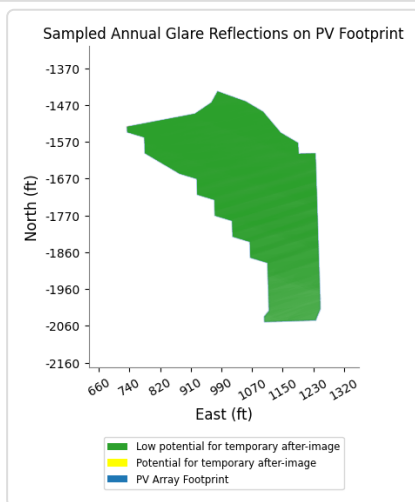
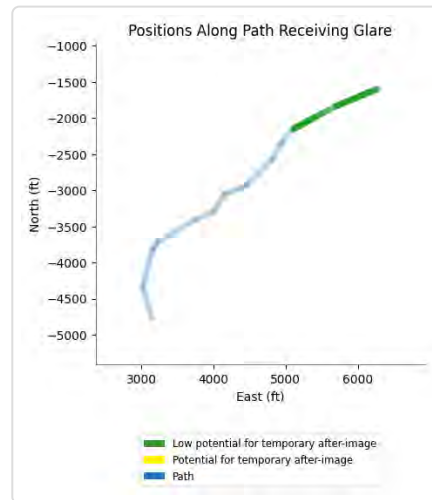
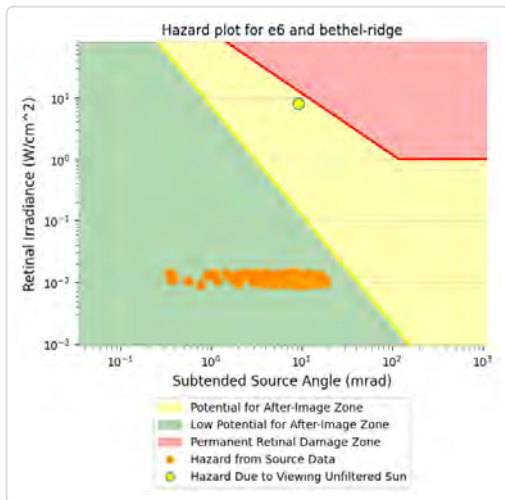
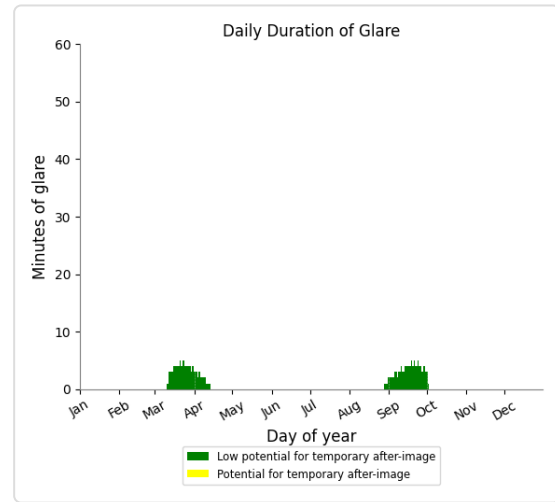
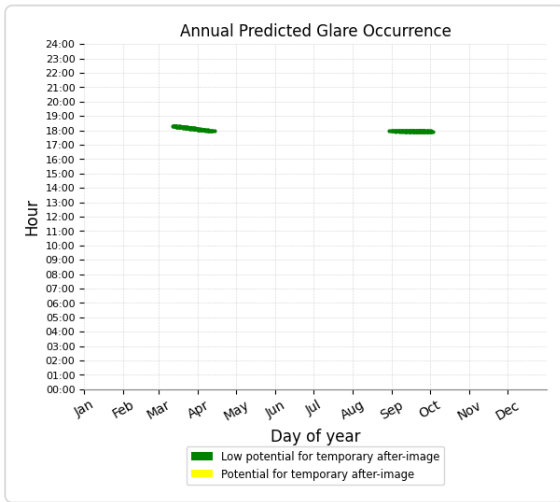
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	215	3.6	0	0.0
Bethel Ridge Rd Trucks	230	3.8	0	0.0
OP 11	86	1.4	0	0.0
OP 12	192	3.2	0	0.0
OP 14	143	2.4	0	0.0
OP 13	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0



# E6 and Route: Bethel Ridge Rd

Yellow glare: none

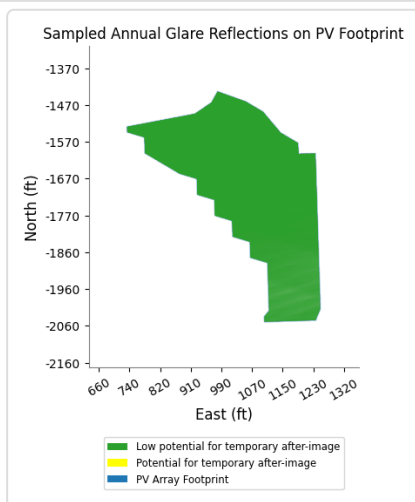
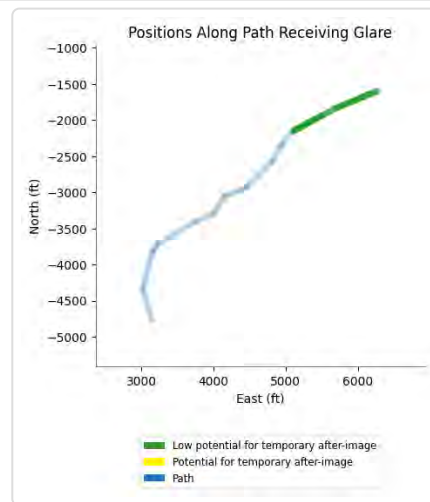
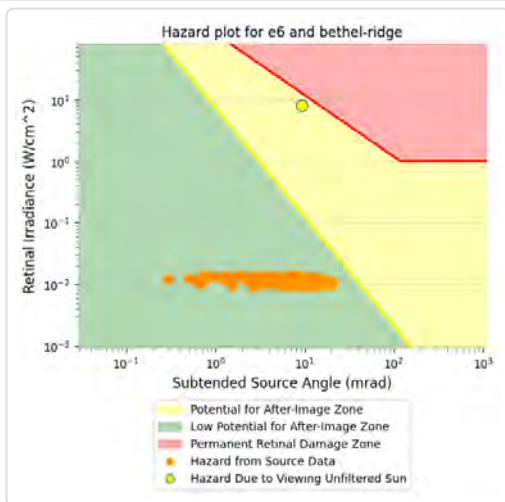
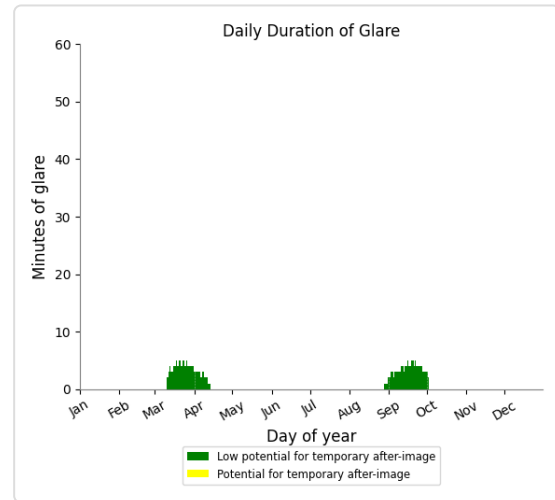
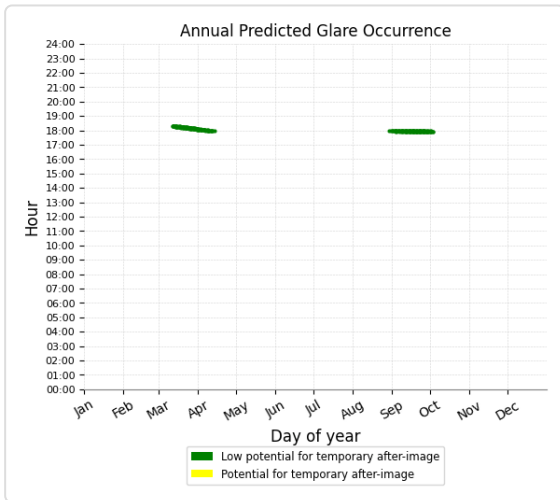
Green glare: 215 min.



# E6 and Route: Bethel Ridge Rd Trucks

Yellow glare: none

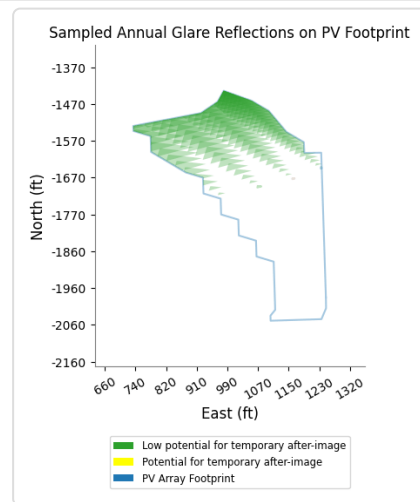
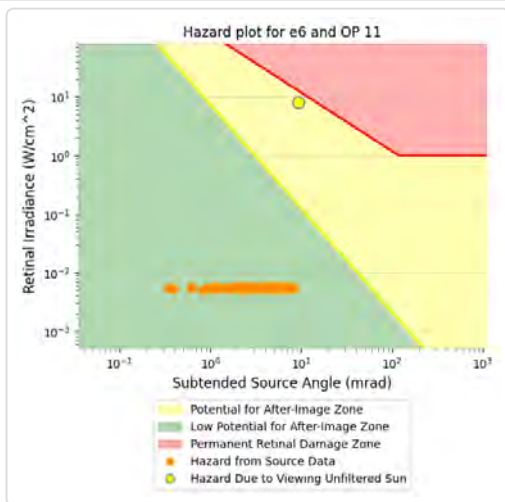
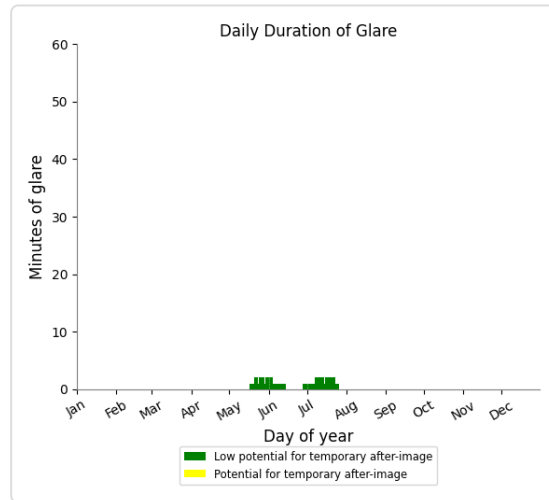
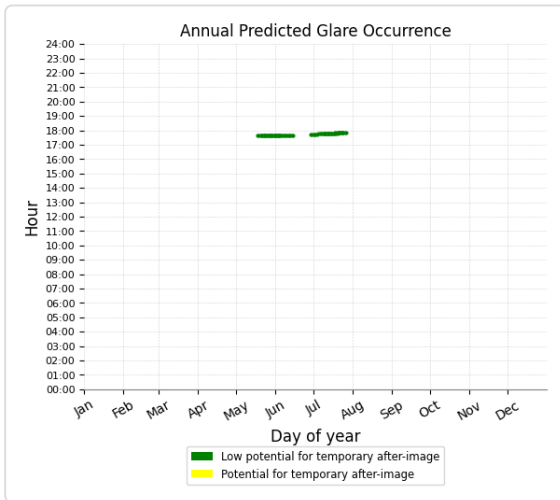
Green glare: 230 min.



## E6 and OP 11

Yellow glare: none

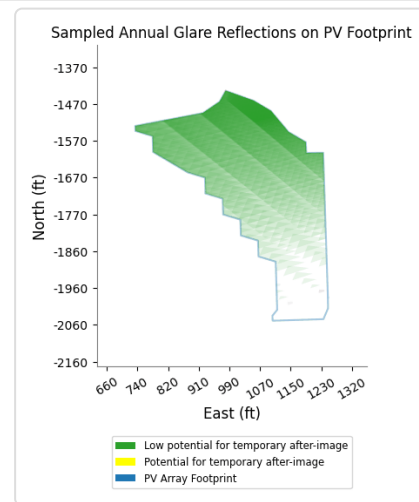
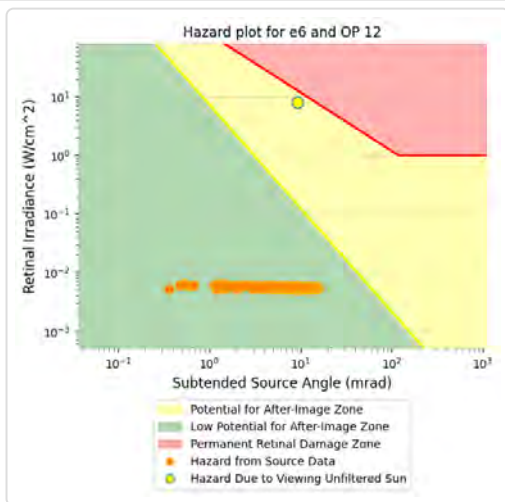
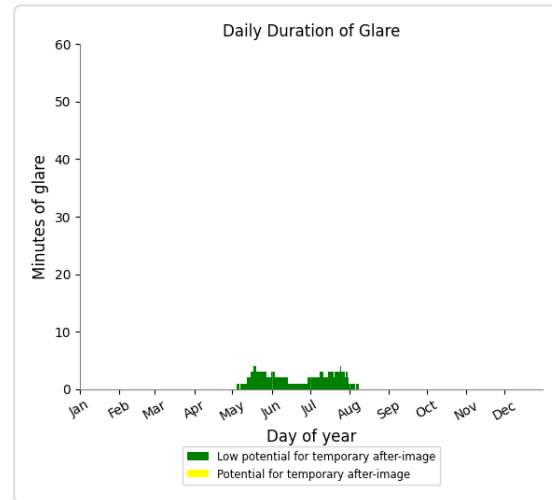
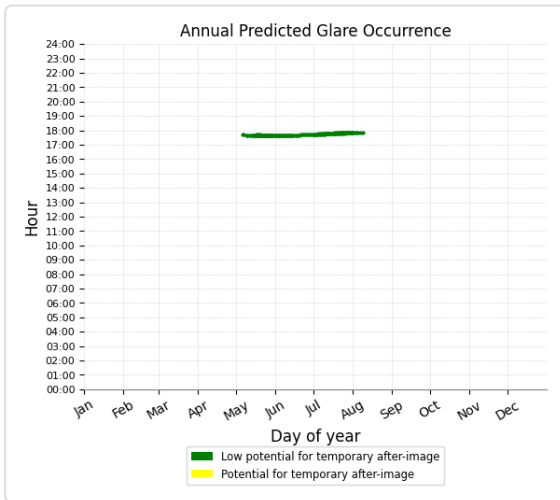
Green glare: 86 min.



## E6 and OP 12

Yellow glare: none

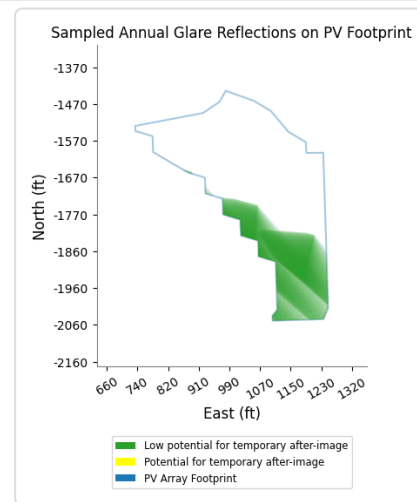
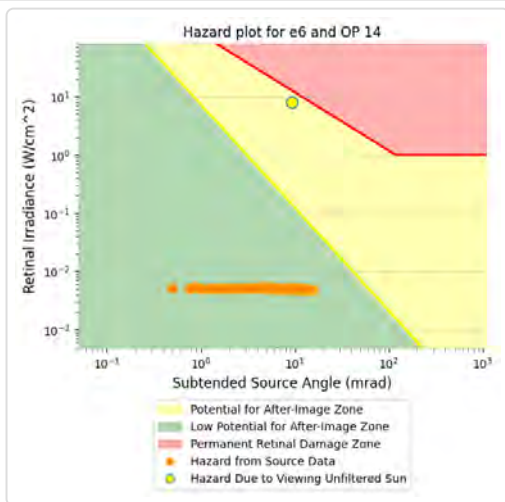
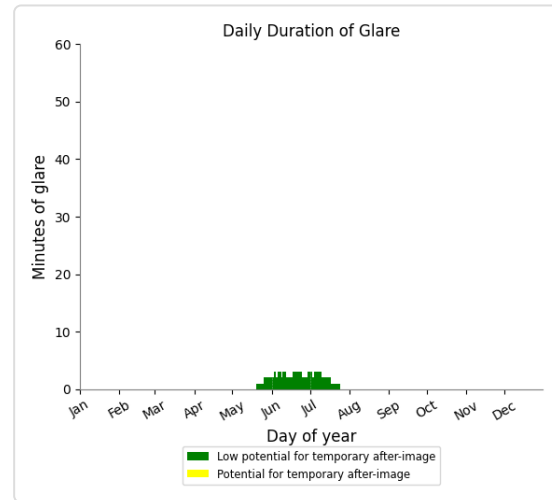
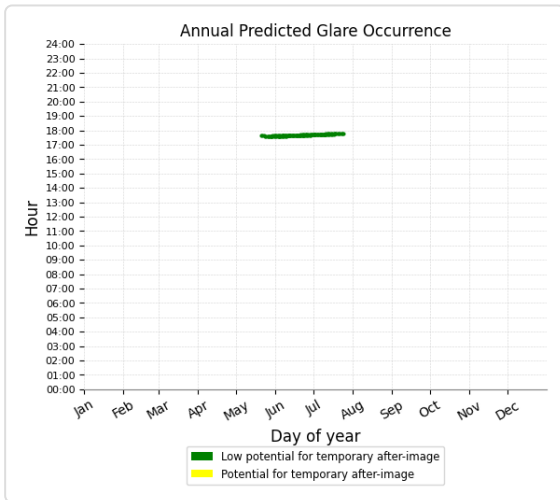
Green glare: 192 min.



## E6 and OP 14

Yellow glare: none

Green glare: 143 min.



## E6 and OP 13

No glare found

## E6 and OP 15

No glare found

## E6 and OP 16

No glare found

## E6 and OP 17

No glare found

**PV: E7** low potential for temporary after-image

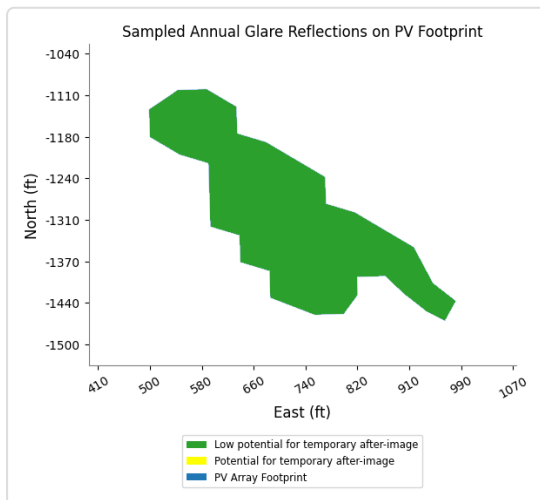
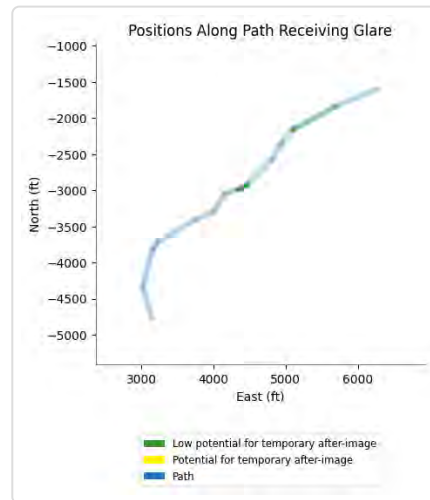
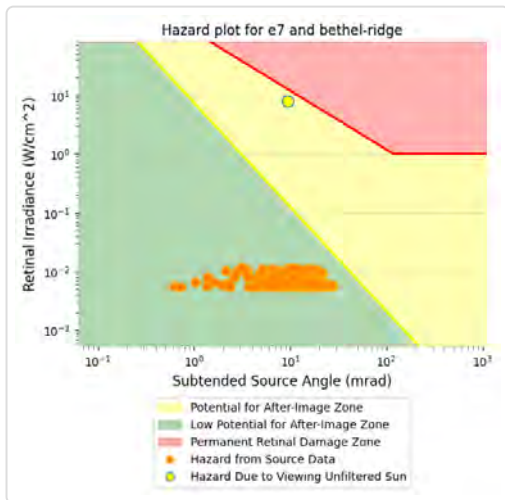
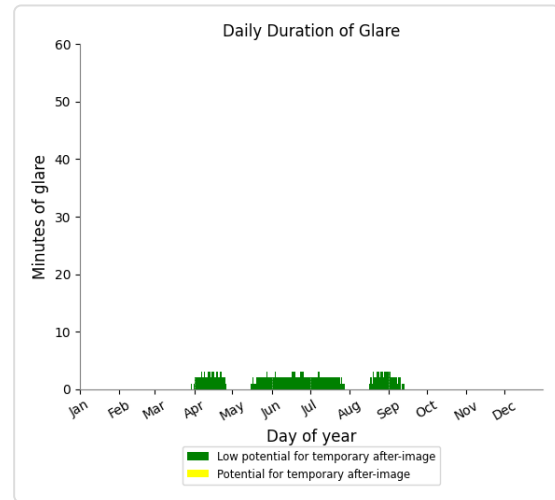
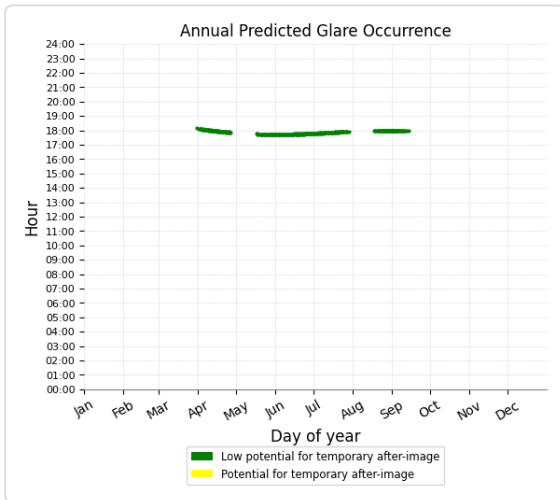
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	269	4.5	0	0.0
Bethel Ridge Rd Trucks	384	6.4	0	0.0
OP 11	266	4.4	0	0.0
OP 12	313	5.2	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

# E7 and Route: Bethel Ridge Rd

Yellow glare: none

Green glare: 269 min.

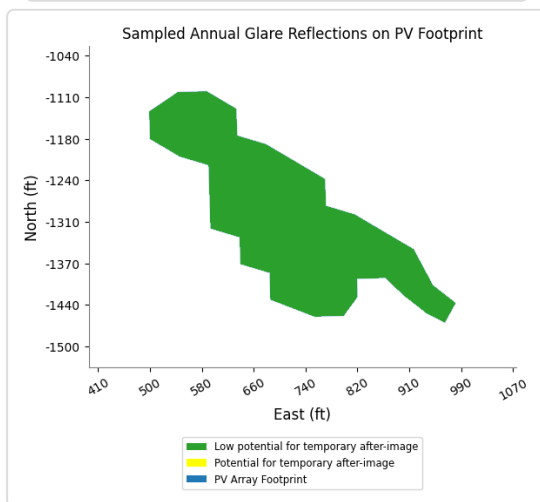
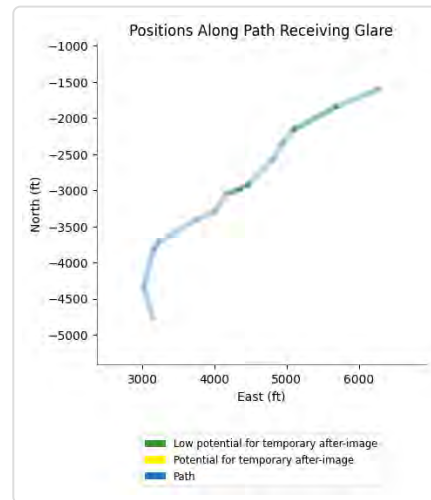
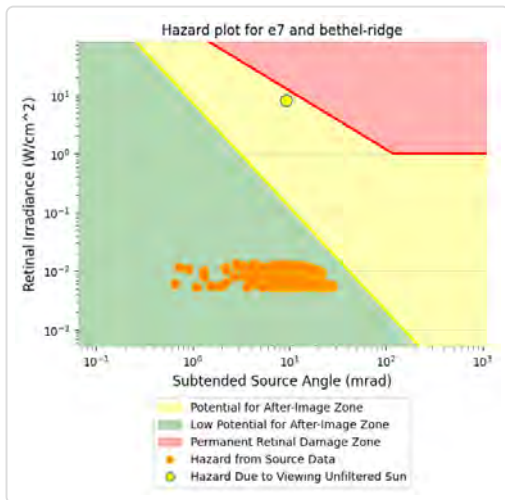
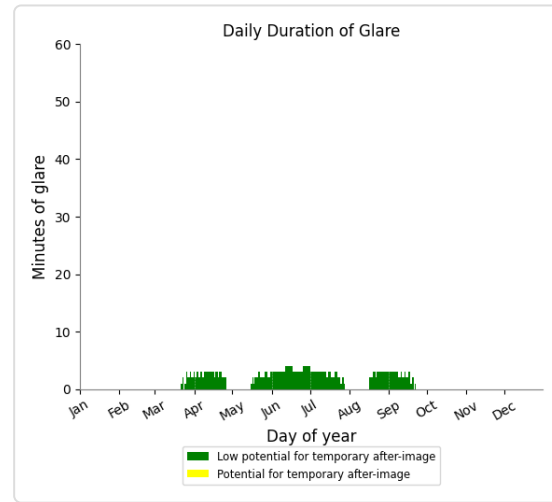
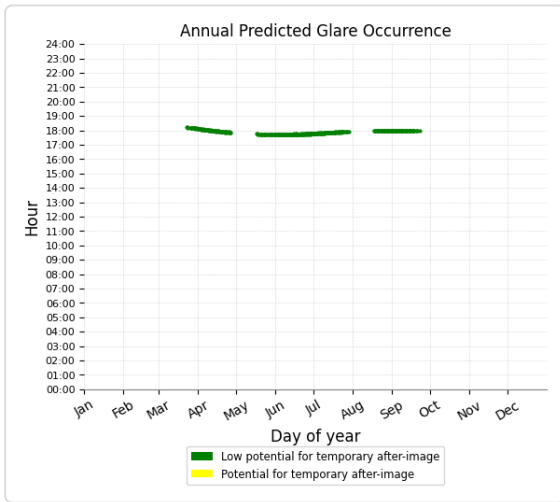




# E7 and Route: Bethel Ridge Rd Trucks

Yellow glare: none

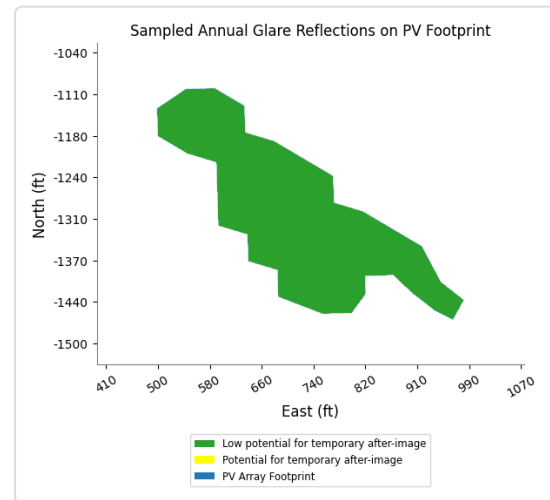
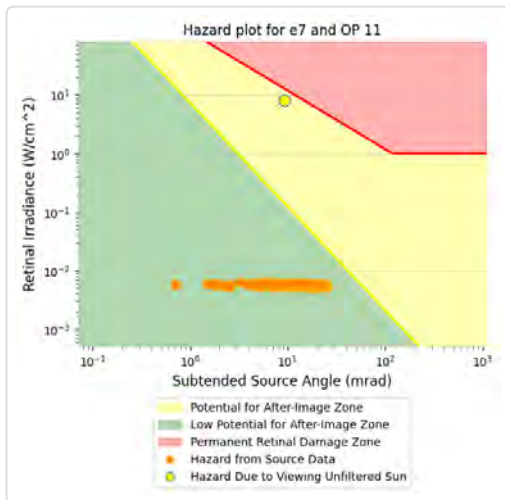
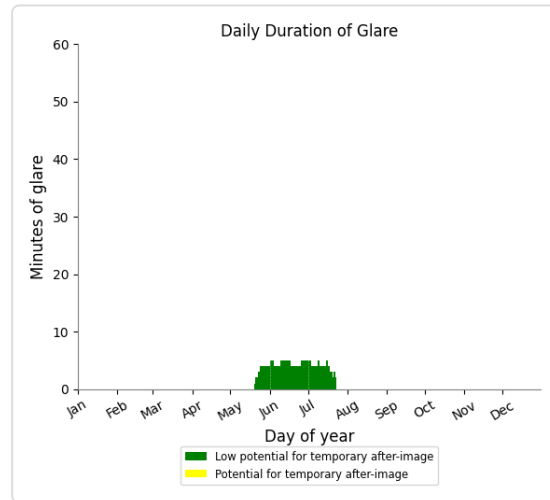
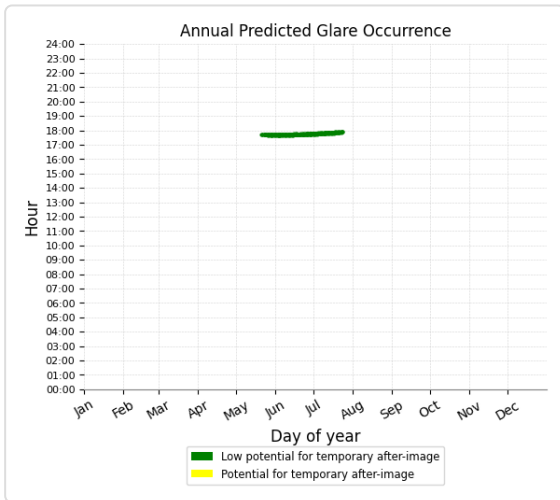
Green glare: 384 min.



## E7 and OP 11

Yellow glare: none

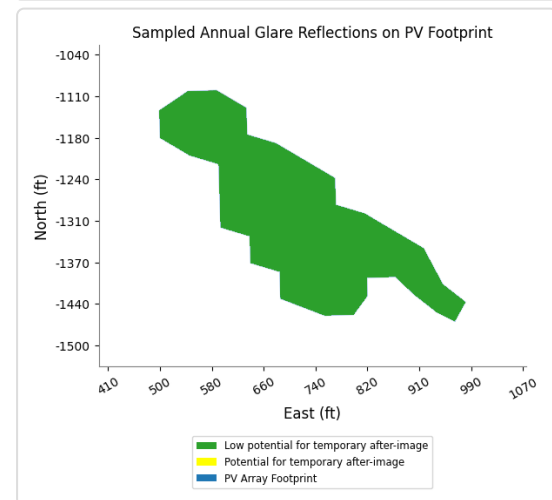
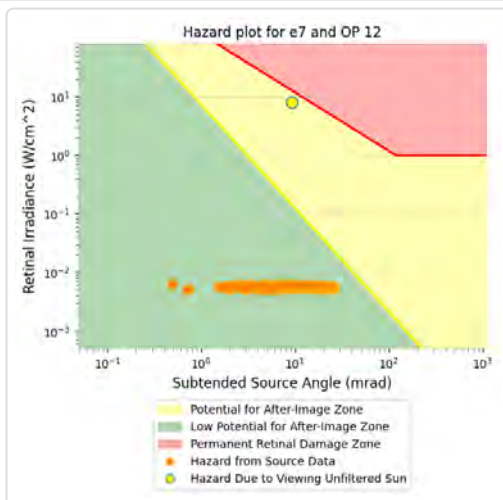
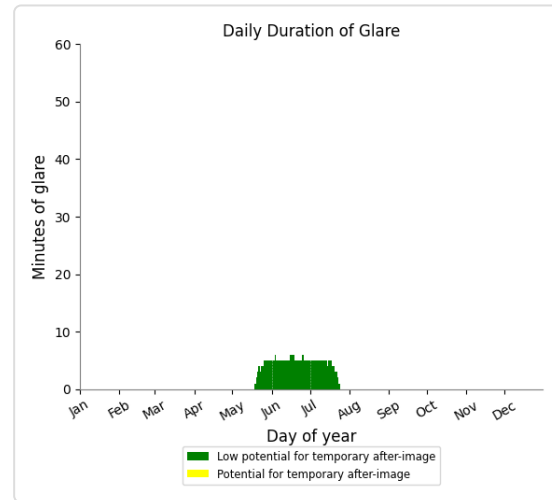
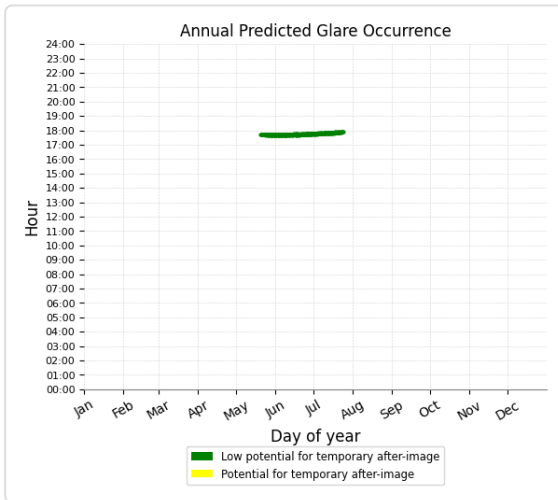
Green glare: 266 min.



## E7 and OP 12

Yellow glare: none

Green glare: 313 min.



## E7 and OP 13

No glare found

## E7 and OP 14

No glare found

## E7 and OP 15

No glare found

## E7 and OP 16

No glare found

## E7 and OP 17

No glare found

# Assumptions

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"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/](http://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

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## Group F

# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar South**

300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section F\_revised**

**Client:** REV Renewables

**Created** 20 Sep, 2025

**Updated** 23 Oct, 2025

**Time-step** 1 minute

**Timezone offset** UTC-5

**Minimum sun altitude** 0.0 deg

**DNI** peaks at 1,000.0 W/m<sup>2</sup>

**Category** 100 MW to 1 GW

**Site ID** 159920.26194

**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 low potential for temporary after-image predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
F1	25.0	180.0	362	6.0	0	0.0	-
F2	25.0	180.0	480	8.0	0	0.0	-
F3	25.0	180.0	65	1.1	0	0.0	-
F4	25.0	180.0	3,339	55.6	0	0.0	-
F5	25.0	180.0	151	2.5	0	0.0	-
F6	25.0	180.0	1,631	27.2	0	0.0	-
F7	25.0	180.0	716	11.9	0	0.0	-
F8	25.0	180.0	101	1.7	0	0.0	-
F9	25.0	180.0	1,142	19.0	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
Bethel Ridge Rd	793	13.2	0	0.0
Bethel Ridge Road Trucks	1,762	29.4	0	0.0
Locust Rd	0	0.0	0	0.0
Miller Rd	3,094	51.6	0	0.0
OP 7	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	1,024	17.1	0	0.0
OP 22	1,314	21.9	0	0.0



# Component Data

## PV Arrays

**Name:** F1

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.304250	-80.500690	1202.67	5.00	1207.67
2	40.304524	-80.500701	1204.05	5.00	1209.05
3	40.304562	-80.500866	1197.51	5.00	1202.51
4	40.304837	-80.500877	1201.94	5.00	1206.94
5	40.304875	-80.501042	1196.26	5.00	1201.26
6	40.305307	-80.501060	1196.21	5.00	1201.21
7	40.305465	-80.501066	1194.95	5.00	1199.95
8	40.305473	-80.500741	1210.21	5.00	1215.21
9	40.305410	-80.500085	1236.02	5.00	1241.02
10	40.305346	-80.499428	1206.81	5.00	1211.81
11	40.305271	-80.499262	1199.20	5.00	1204.20
12	40.304522	-80.499231	1222.53	5.00	1227.53
13	40.304285	-80.499222	1231.82	5.00	1236.82
14	40.304265	-80.500038	1237.95	5.00	1242.95

**Name:** F2

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.300799	-80.500876	1193.48	5.00	1198.48
2	40.301036	-80.500886	1201.68	5.00	1206.68
3	40.301082	-80.500724	1209.97	5.00	1214.97
4	40.302226	-80.500771	1226.52	5.00	1231.52
5	40.302264	-80.500936	1225.34	5.00	1230.34
6	40.302697	-80.500954	1216.26	5.00	1221.26
7	40.302735	-80.501119	1209.93	5.00	1214.93
8	40.302930	-80.501127	1204.09	5.00	1209.09
9	40.302976	-80.500965	1210.04	5.00	1215.04
10	40.303055	-80.500986	1207.47	5.00	1212.47
11	40.303092	-80.500988	1206.88	5.00	1211.88
12	40.303172	-80.500973	1206.96	5.00	1211.96
13	40.303255	-80.500813	1213.39	5.00	1218.39
14	40.303571	-80.500826	1210.50	5.00	1215.50
15	40.303617	-80.500664	1217.48	5.00	1222.48
16	40.304129	-80.500685	1204.71	5.00	1209.71
17	40.304250	-80.500690	1202.67	5.00	1207.67
18	40.304265	-80.500038	1237.95	5.00	1242.95
19	40.303949	-80.500025	1238.25	5.00	1243.25
20	40.303903	-80.500187	1235.29	5.00	1240.29
21	40.303707	-80.500179	1235.51	5.00	1240.51
22	40.303662	-80.500341	1232.34	5.00	1237.34
23	40.303387	-80.500330	1228.80	5.00	1233.80
24	40.303341	-80.500491	1225.04	5.00	1230.04
25	40.303146	-80.500483	1224.58	5.00	1229.58
26	40.303066	-80.500498	1224.13	5.00	1229.13
27	40.303021	-80.500642	1220.84	5.00	1225.84
28	40.302588	-80.500624	1224.47	5.00	1229.47
29	40.301756	-80.500590	1223.39	5.00	1228.39
30	40.301244	-80.500569	1217.54	5.00	1222.54
31	40.301206	-80.500404	1218.28	5.00	1223.28
32	40.300773	-80.500387	1207.74	5.00	1212.74

**Name:** F3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.299390	-80.500165	1190.12	5.00	1195.12
2	40.299431	-80.500237	1188.04	5.00	1193.04
3	40.299509	-80.500280	1187.51	5.00	1192.51
4	40.299587	-80.500337	1185.27	5.00	1190.27
5	40.299782	-80.500345	1187.27	5.00	1192.27
6	40.299822	-80.500427	1183.10	5.00	1188.10
7	40.299859	-80.500429	1183.90	5.00	1188.90
8	40.299903	-80.500349	1188.90	5.00	1193.90
9	40.299980	-80.500423	1186.58	5.00	1191.58
10	40.300057	-80.500519	1182.33	5.00	1187.33
11	40.300136	-80.500548	1182.69	5.00	1187.69
12	40.300213	-80.500635	1180.04	5.00	1185.04
13	40.300290	-80.500728	1177.56	5.00	1182.56
14	40.300367	-80.500810	1175.88	5.00	1180.88
15	40.300445	-80.500862	1176.31	5.00	1181.31
16	40.300799	-80.500876	1193.48	5.00	1198.48
17	40.300773	-80.500387	1207.74	5.00	1212.74
18	40.300735	-80.500222	1211.74	5.00	1216.74
19	40.300540	-80.500214	1208.85	5.00	1213.85
20	40.300502	-80.500049	1213.56	5.00	1218.56
21	40.300424	-80.499997	1215.13	5.00	1220.13
22	40.300347	-80.499915	1217.45	5.00	1222.45
23	40.300270	-80.499822	1219.89	5.00	1224.89
24	40.300193	-80.499734	1221.64	5.00	1226.64
25	40.300114	-80.499706	1222.60	5.00	1227.60
26	40.300037	-80.499610	1224.93	5.00	1229.93
27	40.299960	-80.499536	1225.92	5.00	1230.92
28	40.299883	-80.499451	1226.51	5.00	1231.51
29	40.299805	-80.499366	1226.51	5.00	1231.51
30	40.299689	-80.499362	1225.19	5.00	1230.19
31	40.299651	-80.499197	1224.38	5.00	1229.38
32	40.299573	-80.499140	1222.44	5.00	1227.44
33	40.299495	-80.499097	1219.45	5.00	1224.45
34	40.299418	-80.499024	1214.96	5.00	1219.96

**Name:** F4

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

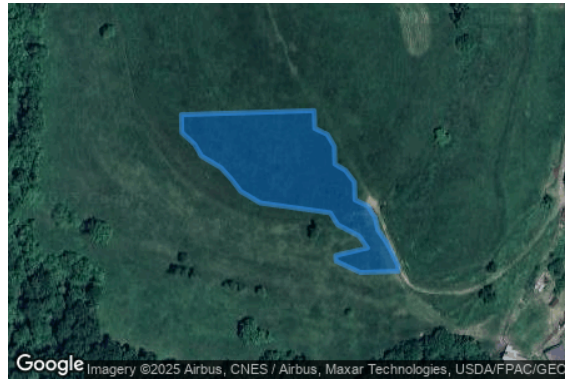
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.298368	-80.498302	1160.62	5.00	1165.62
2	40.298361	-80.498627	1157.54	5.00	1162.54
3	40.298435	-80.498837	1160.25	5.00	1165.25
4	40.298472	-80.498838	1162.61	5.00	1167.61
5	40.298520	-80.498565	1167.44	5.00	1172.44
6	40.298598	-80.498637	1172.63	5.00	1177.63
7	40.298673	-80.498823	1176.92	5.00	1181.92
8	40.298750	-80.498885	1181.32	5.00	1186.32
9	40.298815	-80.499488	1181.74	5.00	1186.74
10	40.298890	-80.499654	1182.94	5.00	1187.94
11	40.298968	-80.499733	1185.41	5.00	1190.41
12	40.299045	-80.499824	1187.18	5.00	1192.18
13	40.299120	-80.499991	1186.56	5.00	1191.56
14	40.299198	-80.500051	1188.24	5.00	1193.24
15	40.299274	-80.500160	1186.78	5.00	1191.78
16	40.299390	-80.500165	1190.12	5.00	1195.12
17	40.299418	-80.499024	1214.96	5.00	1219.96
18	40.299301	-80.499019	1210.48	5.00	1215.48
19	40.299262	-80.498911	1207.43	5.00	1212.43
20	40.299184	-80.498851	1201.70	5.00	1206.70
21	40.299068	-80.498846	1195.57	5.00	1200.57
22	40.299028	-80.498756	1192.23	5.00	1197.23
23	40.298951	-80.498678	1187.94	5.00	1192.94
24	40.298835	-80.498673	1183.67	5.00	1188.67
25	40.298795	-80.498562	1180.60	5.00	1185.60
26	40.298718	-80.498499	1177.62	5.00	1182.62
27	40.298639	-80.498477	1174.23	5.00	1179.23
28	40.298562	-80.498405	1169.62	5.00	1174.62
29	40.298484	-80.498350	1165.68	5.00	1170.68
30	40.298406	-80.498304	1162.24	5.00	1167.24

**Name:** F5

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.305141	-80.498087	1158.77	5.00	1163.77
2	40.305085	-80.497104	1123.29	5.00	1128.29
3	40.305010	-80.496937	1118.80	5.00	1123.80
4	40.304419	-80.496913	1120.94	5.00	1125.94
5	40.303232	-80.496865	1122.78	5.00	1127.78
6	40.302362	-80.496830	1109.35	5.00	1114.35
7	40.302354	-80.497154	1112.07	5.00	1117.07
8	40.302430	-80.497321	1116.19	5.00	1121.19
9	40.302501	-80.497651	1125.41	5.00	1130.41
10	40.302576	-80.497817	1131.42	5.00	1136.42
11	40.302651	-80.497984	1137.38	5.00	1142.38

**Name:** F6

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.305200	-80.498905	1186.88	5.00	1191.88
2	40.305200	-80.498901	1186.71	5.00	1191.71
3	40.305216	-80.498254	1163.89	5.00	1168.89
4	40.305141	-80.498087	1158.77	5.00	1163.77
5	40.302651	-80.497984	1137.38	5.00	1142.38
6	40.302727	-80.498151	1145.23	5.00	1150.23
7	40.302802	-80.498317	1153.68	5.00	1158.68
8	40.302881	-80.498322	1158.85	5.00	1163.85
9	40.302850	-80.499627	1194.06	5.00	1199.06
10	40.304153	-80.499680	1239.81	5.00	1244.81
11	40.304210	-80.499028	1225.90	5.00	1230.90
12	40.304247	-80.499030	1225.01	5.00	1230.01
13	40.304293	-80.498868	1216.36	5.00	1221.36
14	40.304409	-80.498873	1213.69	5.00	1218.69
15	40.304447	-80.499038	1218.37	5.00	1223.37
16	40.304722	-80.499049	1207.74	5.00	1212.74
17	40.305117	-80.499065	1194.67	5.00	1199.67
18	40.305163	-80.498904	1187.83	5.00	1192.83

**Name:** F7

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.302850	-80.499627	1194.06	5.00	1199.06
2	40.302059	-80.499597	1189.73	5.00	1194.73
3	40.301742	-80.499584	1189.40	5.00	1194.40
4	40.301704	-80.499419	1181.74	5.00	1186.74
5	40.300718	-80.499379	1188.97	5.00	1193.97
6	40.300680	-80.499214	1185.62	5.00	1190.62
7	40.300609	-80.498884	1181.43	5.00	1186.43
8	40.300492	-80.498879	1187.57	5.00	1192.57
9	40.300454	-80.498714	1184.77	5.00	1189.77
10	40.300379	-80.498547	1183.27	5.00	1188.27
11	40.300304	-80.498381	1182.14	5.00	1187.14
12	40.300277	-80.499522	1217.50	5.00	1222.50
13	40.300315	-80.499687	1218.11	5.00	1223.11
14	40.300431	-80.499692	1213.61	5.00	1218.61
15	40.300469	-80.499857	1214.56	5.00	1219.56
16	40.300585	-80.499862	1211.68	5.00	1216.68
17	40.300623	-80.500027	1212.52	5.00	1217.52
18	40.301019	-80.500043	1209.99	5.00	1214.99
19	40.301094	-80.500209	1214.94	5.00	1219.94
20	40.301569	-80.500229	1218.22	5.00	1223.22
21	40.301644	-80.500395	1222.35	5.00	1227.35
22	40.301918	-80.500407	1222.05	5.00	1227.05
23	40.302868	-80.500445	1223.31	5.00	1228.31
24	40.302913	-80.500284	1219.88	5.00	1224.88
25	40.303188	-80.500295	1224.61	5.00	1229.61
26	40.303234	-80.500133	1223.04	5.00	1228.04
27	40.303429	-80.500141	1228.51	5.00	1233.51
28	40.303475	-80.499979	1226.46	5.00	1231.46
29	40.303749	-80.499991	1235.51	5.00	1240.51
30	40.303795	-80.499829	1234.38	5.00	1239.38
31	40.304070	-80.499840	1239.90	5.00	1244.90
32	40.304153	-80.499680	1239.81	5.00	1244.81



**Name:** F8

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

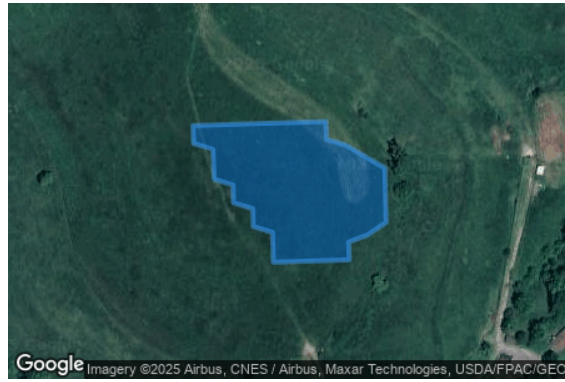
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.300304	-80.498381	1182.14	5.00	1187.14
2	40.300188	-80.498376	1187.44	5.00	1192.44
3	40.300150	-80.498211	1182.57	5.00	1187.57
4	40.300074	-80.498045	1178.11	5.00	1183.11
5	40.299999	-80.497874	1172.34	5.00	1177.34
6	40.299646	-80.497864	1172.25	5.00	1177.25
7	40.299563	-80.498024	1179.04	5.00	1184.04
8	40.299517	-80.498185	1186.21	5.00	1191.21
9	40.299400	-80.498181	1185.07	5.00	1190.07
10	40.299385	-80.498832	1209.98	5.00	1214.98
11	40.299580	-80.498840	1215.08	5.00	1220.08
12	40.299618	-80.499005	1220.60	5.00	1225.60
13	40.299735	-80.499010	1221.86	5.00	1226.86
14	40.299773	-80.499175	1225.14	5.00	1230.14
15	40.299889	-80.499180	1224.63	5.00	1229.63
16	40.299927	-80.499341	1226.48	5.00	1231.48
17	40.300122	-80.499353	1221.22	5.00	1226.22
18	40.300160	-80.499518	1222.92	5.00	1227.92
19	40.300277	-80.499522	1217.50	5.00	1222.50

**Name:** F9

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.299400	-80.498181	1185.07	5.00	1190.07
2	40.299360	-80.498108	1181.22	5.00	1186.22
3	40.299323	-80.498106	1180.68	5.00	1185.68
4	40.299278	-80.498242	1185.79	5.00	1190.79
5	40.299200	-80.498172	1181.37	5.00	1186.37
6	40.299123	-80.498112	1176.68	5.00	1181.68
7	40.299085	-80.498110	1175.39	5.00	1180.39
8	40.299040	-80.498247	1180.15	5.00	1185.15
9	40.299003	-80.498245	1179.36	5.00	1184.36
10	40.298966	-80.498033	1169.57	5.00	1174.57
11	40.298889	-80.497950	1164.88	5.00	1169.88
12	40.298811	-80.497896	1162.39	5.00	1167.39
13	40.298734	-80.497827	1160.18	5.00	1165.18
14	40.298659	-80.497656	1151.95	5.00	1156.95
15	40.298621	-80.497654	1151.90	5.00	1156.90
16	40.298539	-80.497766	1156.09	5.00	1161.09
17	40.298459	-80.497815	1155.80	5.00	1160.80
18	40.298376	-80.497975	1157.94	5.00	1162.94
19	40.298372	-80.498137	1161.24	5.00	1166.24
20	40.298489	-80.498142	1165.12	5.00	1170.12
21	40.298528	-80.498254	1168.04	5.00	1173.04
22	40.298606	-80.498305	1171.45	5.00	1176.45
23	40.298685	-80.498313	1174.62	5.00	1179.62
24	40.298762	-80.498383	1177.01	5.00	1182.01
25	40.298840	-80.498437	1179.95	5.00	1184.95
26	40.298917	-80.498520	1184.07	5.00	1189.07
27	40.298995	-80.498570	1187.57	5.00	1192.57
28	40.299074	-80.498599	1190.88	5.00	1195.88
29	40.299152	-80.498659	1195.01	5.00	1200.01
30	40.299229	-80.498728	1200.65	5.00	1205.65
31	40.299308	-80.498758	1205.17	5.00	1210.17
32	40.299385	-80.498832	1209.98	5.00	1214.98

# Route Receptors

**Name:** Bethel Ridge Rd

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.294488	-80.511585	1001.93	4.50	1006.43
2	40.294810	-80.510333	1034.86	4.50	1039.36
3	40.294968	-80.508921	1089.52	4.50	1094.02
4	40.295018	-80.508292	1087.17	4.50	1091.67
5	40.295362	-80.507633	1082.94	4.50	1087.44
6	40.295712	-80.507539	1085.60	4.50	1090.10
7	40.296274	-80.507759	1092.35	4.50	1096.85
8	40.296967	-80.508177	1109.38	4.50	1113.88
9	40.298345	-80.509259	1122.82	4.50	1127.32
10	40.298586	-80.509333	1130.77	4.50	1135.27
11	40.299743	-80.508086	1123.00	4.50	1127.50
12	40.300202	-80.507798	1119.23	4.50	1123.73
13	40.300537	-80.507737	1118.60	4.50	1123.10
14	40.300908	-80.507804	1121.14	4.50	1125.64
15	40.301672	-80.508109	1119.52	4.50	1124.02
16	40.302704	-80.508111	1117.69	4.50	1122.19
17	40.303572	-80.507483	1113.78	4.50	1118.28
18	40.303935	-80.507407	1107.68	4.50	1112.18
19	40.304289	-80.507445	1098.95	4.50	1103.45
20	40.304254	-80.507469	1099.72	4.50	1104.22
21	40.305521	-80.507901	1100.85	4.50	1105.35
22	40.306901	-80.507410	1129.57	4.50	1134.07
23	40.307159	-80.507179	1136.77	4.50	1141.27
24	40.307989	-80.505371	1185.78	4.50	1190.28
25	40.308345	-80.504379	1204.22	4.50	1208.72
26	40.309008	-80.503810	1220.23	4.50	1224.73

Name: Bethel Ridge Road Trucks

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.294488	-80.511585	1001.93	9.00	1010.93
2	40.294812	-80.510333	1034.86	9.00	1043.86
3	40.294968	-80.508921	1089.52	9.00	1098.52
4	40.295018	-80.508292	1087.17	9.00	1096.17
5	40.295362	-80.507633	1082.94	9.00	1091.94
6	40.295712	-80.507539	1085.60	9.00	1094.60
7	40.296274	-80.507759	1092.35	9.00	1101.35
8	40.296967	-80.508177	1109.38	9.00	1118.38
9	40.298345	-80.509259	1122.50	9.00	1131.50
10	40.298586	-80.509333	1130.77	9.00	1139.77
11	40.299743	-80.508086	1123.00	9.00	1132.00
12	40.300202	-80.507798	1119.23	9.00	1128.23
13	40.300537	-80.507737	1118.60	9.00	1127.60
14	40.300908	-80.507804	1121.14	9.00	1130.14
15	40.301672	-80.508109	1119.52	9.00	1128.52
16	40.302704	-80.508111	1117.69	9.00	1126.69
17	40.303572	-80.507483	1113.78	9.00	1122.78
18	40.303935	-80.507407	1107.56	9.00	1116.56
19	40.304290	-80.507450	1098.95	9.00	1107.95
20	40.304254	-80.507469	1099.72	9.00	1108.72
21	40.305521	-80.507901	1100.85	9.00	1109.85
22	40.306901	-80.507410	1129.57	9.00	1138.57
23	40.307159	-80.507179	1136.77	9.00	1145.77
24	40.307989	-80.505371	1185.78	9.00	1194.78
25	40.308345	-80.504379	1204.22	9.00	1213.22
26	40.309008	-80.503810	1220.23	9.00	1229.23

**Name:** Locust Rd

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.304103	-80.504575	1103.39	4.50	1107.89
2	40.303984	-80.505401	1101.90	4.50	1106.40
3	40.303526	-80.505991	1066.48	4.50	1070.98
4	40.303358	-80.506597	1060.62	4.50	1065.12
5	40.303464	-80.506876	1073.06	4.50	1077.56
6	40.304148	-80.507289	1100.02	4.50	1104.52
7	40.304289	-80.507446	1098.95	4.50	1103.45

Name: Miller Rd

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.307767	-80.489094	1221.46	4.50	1225.96
2	40.307138	-80.488730	1218.81	4.50	1223.31
3	40.306121	-80.488312	1248.59	4.50	1253.09
4	40.305053	-80.488027	1232.46	4.50	1236.96
5	40.303927	-80.487813	1219.25	4.50	1223.75
6	40.302470	-80.488344	1189.77	4.50	1194.27
7	40.300703	-80.489133	1204.57	4.50	1209.07
8	40.299885	-80.489470	1190.18	4.50	1194.68
9	40.298821	-80.489503	1157.03	4.50	1161.53
10	40.297675	-80.490189	1110.10	4.50	1114.60
11	40.297698	-80.490358	1103.08	4.50	1107.58
12	40.297822	-80.490494	1097.23	4.50	1101.73
13	40.298284	-80.490635	1084.83	4.50	1089.33
14	40.298276	-80.490825	1084.75	4.50	1089.25
15	40.297596	-80.491309	1066.90	4.50	1071.40
16	40.297076	-80.492307	1030.77	4.50	1035.27
17	40.296864	-80.492996	1011.56	4.50	1016.06
18	40.296767	-80.493742	988.58	4.50	993.08
19	40.296833	-80.493939	982.66	4.50	987.16
20	40.297127	-80.494209	978.22	4.50	982.72
21	40.297949	-80.494784	1007.60	4.50	1012.10
22	40.298045	-80.495003	1018.45	4.50	1022.95
23	40.297873	-80.495439	1046.63	4.50	1051.13
24	40.297453	-80.495403	1061.35	4.50	1065.85
25	40.296616	-80.495840	1078.82	4.50	1083.32
26	40.295437	-80.496552	1089.13	4.50	1093.63
27	40.294873	-80.497131	1086.27	4.50	1090.77
28	40.294500	-80.497914	1088.84	4.50	1093.34
29	40.292782	-80.499395	1083.71	4.50	1088.21

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 7	7	40.306584	-80.492920	1195.86	6.00
OP 8	8	40.306584	-80.492920	1195.86	16.00
OP 9	9	40.304346	-80.494431	1101.51	6.00
OP 11	11	40.308790	-80.502148	1255.54	6.00
OP 12	12	40.308790	-80.502148	1255.54	16.00
OP 13	13	40.308103	-80.503014	1256.77	6.00
OP 14	14	40.308103	-80.503014	1256.77	16.00
OP 15	15	40.306317	-80.510210	1120.12	6.00
OP 16	16	40.305690	-80.509559	1141.77	6.00
OP 17	17	40.305690	-80.509559	1141.77	16.00
OP 18	18	40.304209	-80.505241	1112.80	6.00
OP 19	19	40.304233	-80.503486	1106.46	6.00
OP 20	20	40.304233	-80.503486	1106.46	16.00
OP 21	21	40.301862	-80.511098	1139.29	6.00
OP 22	22	40.301862	-80.511098	1139.29	16.00

## Obstruction Components

Name: Obstruction 2

Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.304721	-80.494733	1094.85
2	40.304185	-80.494658	1095.05
3	40.304214	-80.493891	1072.44



**Name:** treeline  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.305608	-80.501319	1179.63
2	40.304585	-80.501201	1178.31
3	40.302924	-80.501651	1181.45

**Name:** treeline  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.308198	-80.504453	1205.67
2	40.306390	-80.506153	1160.15
3	40.305547	-80.507537	1101.30
4	40.304250	-80.507269	1097.95

**Name:** treeline  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.303874	-80.507242	1105.76
2	40.303587	-80.507296	1106.87
3	40.302700	-80.507972	1103.38
4	40.300237	-80.507403	1096.66
5	40.298473	-80.509066	1116.48
6	40.294656	-80.506427	1009.16

**Name:** treeline  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.297591	-80.499108	1078.55
2	40.297696	-80.500675	1074.30
3	40.298760	-80.501790	1094.98
4	40.301231	-80.501533	1186.01

Name: Tree Line  
Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.307730	-80.489301	1218.20
2	40.303950	-80.488207	1206.96
3	40.299957	-80.489966	1175.78
4	40.297796	-80.491340	1090.27
5	40.296953	-80.493636	988.32
6	40.298238	-80.494859	1000.83
7	40.298025	-80.495577	1029.97

# Glare Analysis Results

## Summary of Results Glare with low potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
F1	25.0	180.0	362	6.0	0	0.0	-
F2	25.0	180.0	480	8.0	0	0.0	-
F3	25.0	180.0	65	1.1	0	0.0	-
F4	25.0	180.0	3,339	55.6	0	0.0	-
F5	25.0	180.0	151	2.5	0	0.0	-
F6	25.0	180.0	1,631	27.2	0	0.0	-
F7	25.0	180.0	716	11.9	0	0.0	-
F8	25.0	180.0	101	1.7	0	0.0	-
F9	25.0	180.0	1,142	19.0	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
Bethel Ridge Rd	793	13.2	0	0.0
Bethel Ridge Road Trucks	1,762	29.4	0	0.0
Locust Rd	0	0.0	0	0.0
Miller Rd	3,094	51.6	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	1,024	17.1	0	0.0
OP 22	1,314	21.9	0	0.0

**PV: F1** low potential for temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	0	0.0	0	0.0
Bethel Ridge Road Trucks	0	0.0	0	0.0
Locust Rd	0	0.0	0	0.0
Miller Rd	0	0.0	0	0.0
OP 21	133	2.2	0	0.0
OP 22	229	3.8	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0

**F1 and Route: Bethel Ridge Rd**

No glare found

**F1 and Route: Bethel Ridge Road Trucks**

No glare found

**F1 and Route: Locust Rd**

No glare found

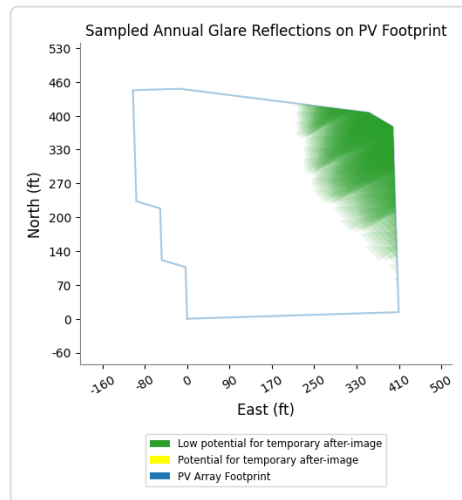
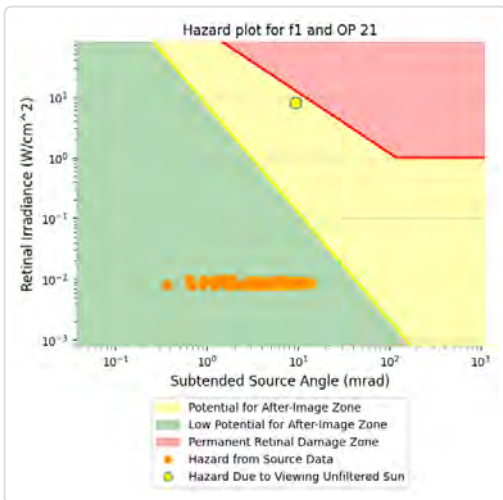
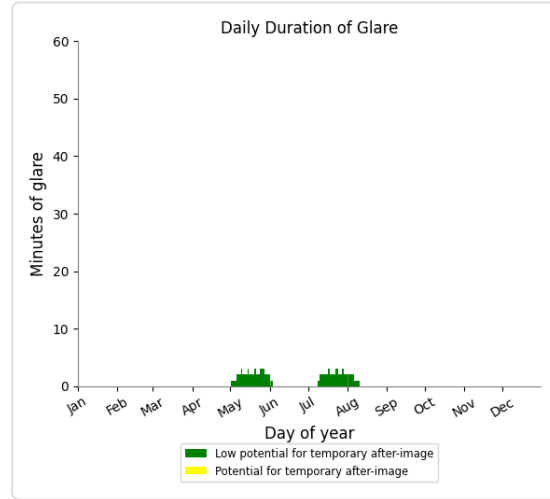
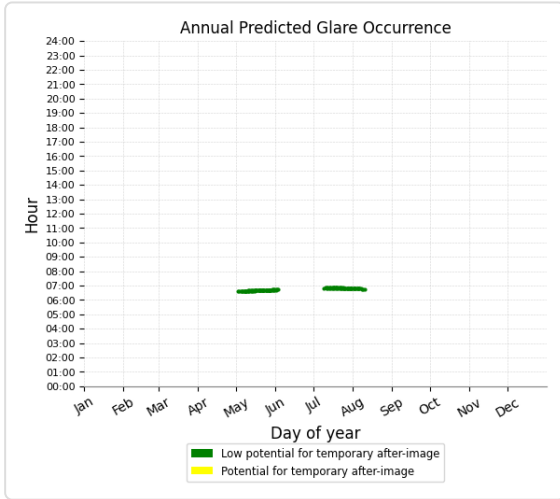
**F1 and Route: Miller Rd**

No glare found

# F1 and OP 21

Yellow glare: none

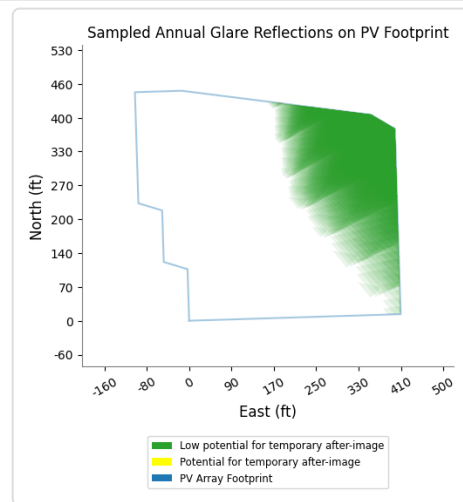
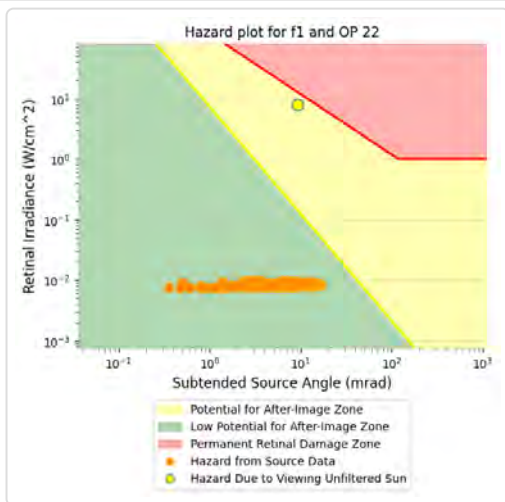
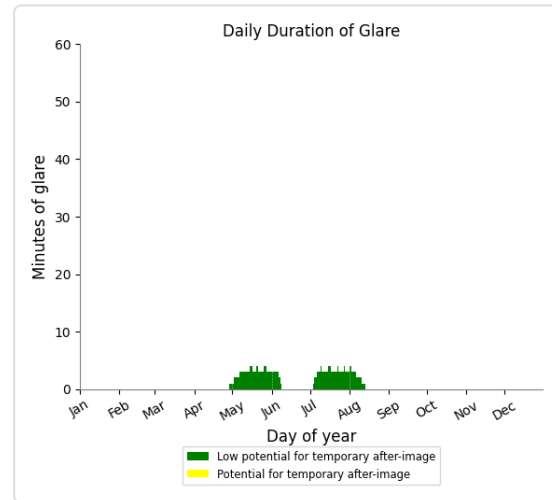
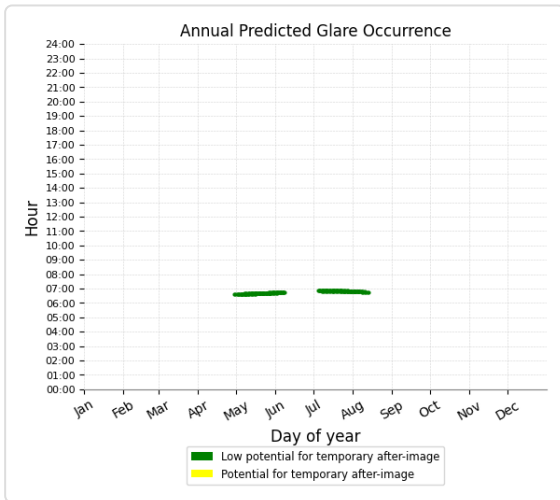
Green glare: 133 min.



## F1 and OP 22

Yellow glare: none

Green glare: 229 min.



## F1 and OP 7

No glare found

## F1 and OP 8

No glare found

## F1 and OP 9

No glare found

## F1 and OP 11

No glare found

## F1 and OP 12

No glare found



**F1 and OP 13**

No glare found

**F1 and OP 14**

No glare found

**F1 and OP 15**

No glare found

**F1 and OP 16**

No glare found

**F1 and OP 17**

No glare found

**F1 and OP 18**

No glare found

**F1 and OP 19**

No glare found

**F1 and OP 20**

No glare found

**PV: F2** low potential for temporary after-image

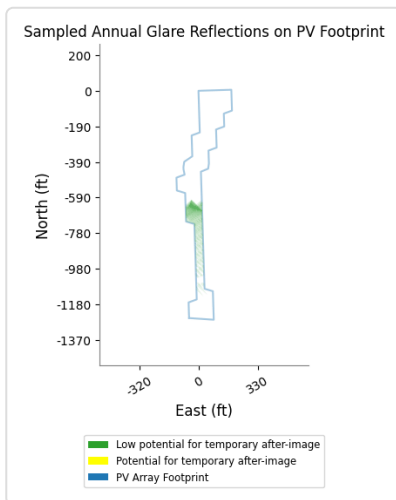
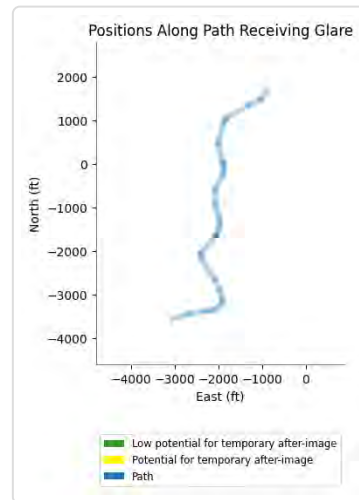
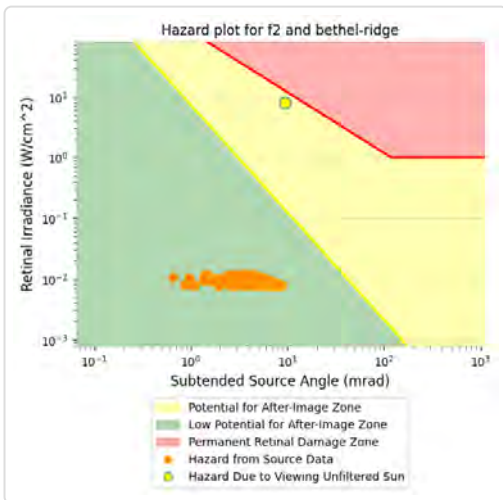
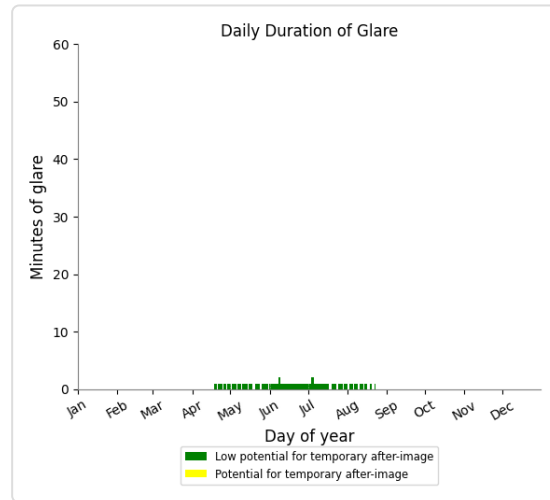
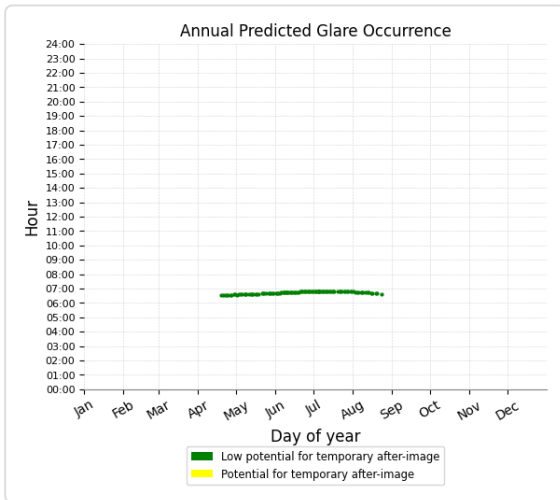
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Road Trucks	108	1.8	0	0.0
Bethel Ridge Rd	0	0.0	0	0.0
Locust Rd	0	0.0	0	0.0
Miller Rd	0	0.0	0	0.0
OP 21	163	2.7	0	0.0
OP 22	209	3.5	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0

## F2 and Route: Bethel Ridge Road Trucks

Yellow glare: none

Green glare: 108 min.



## F2 and Route: Bethel Ridge Rd

No glare found

## F2 and Route: Locust Rd

No glare found

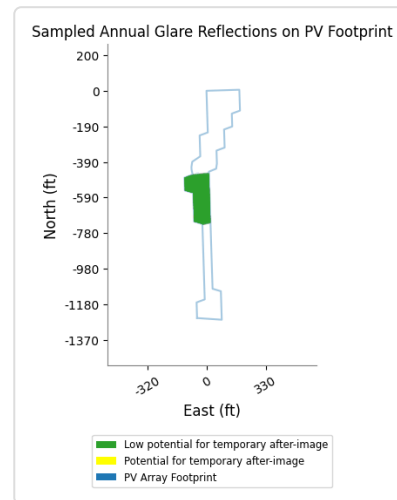
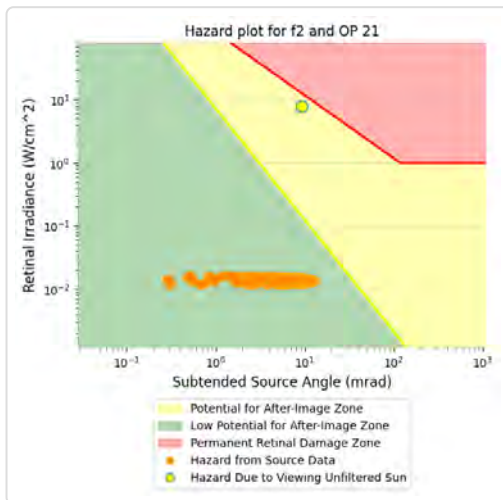
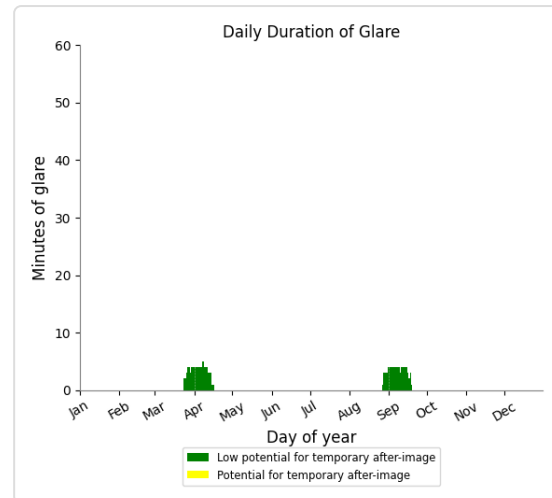
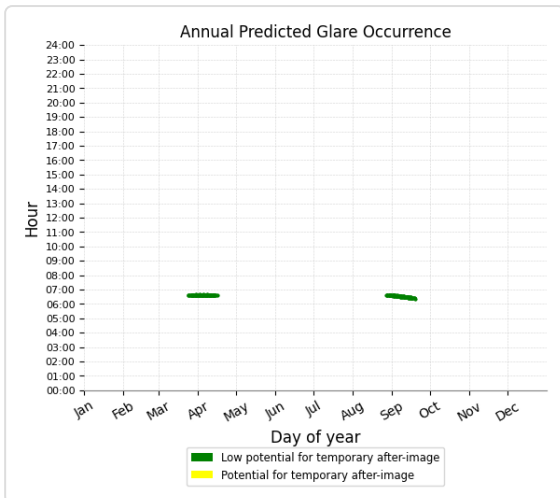
## F2 and Route: Miller Rd

No glare found

## F2 and OP 21

Yellow glare: none

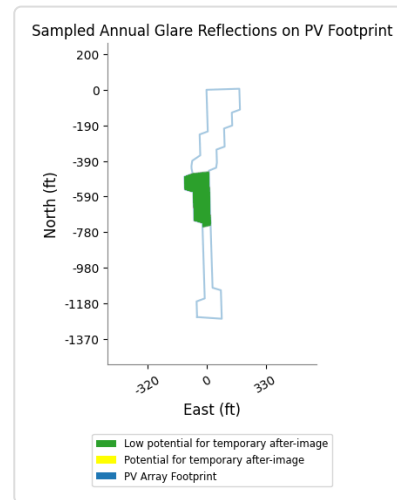
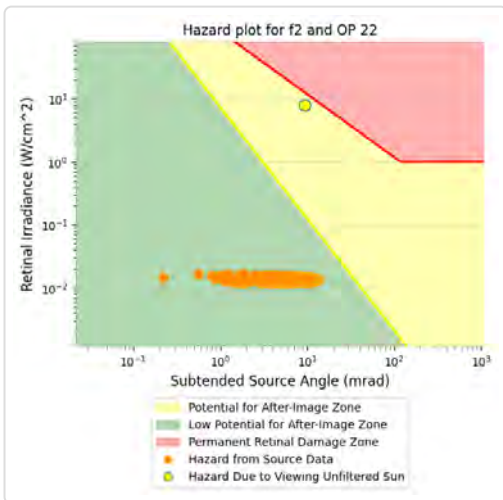
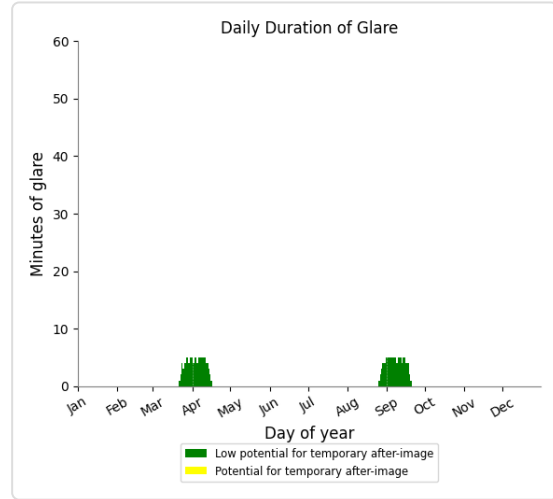
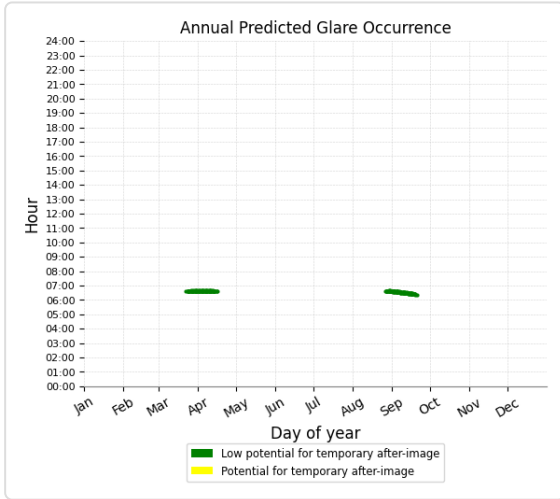
Green glare: 163 min.



## F2 and OP 22

Yellow glare: none

Green glare: 209 min.



## F2 and OP 7

No glare found

## F2 and OP 8

No glare found

## F2 and OP 9

No glare found

## F2 and OP 11

No glare found

## F2 and OP 12

No glare found

**F2 and OP 13**

No glare found

**F2 and OP 14**

No glare found

**F2 and OP 15**

No glare found

**F2 and OP 16**

No glare found

**F2 and OP 17**

No glare found

**F2 and OP 18**

No glare found

**F2 and OP 19**

No glare found

**F2 and OP 20**

No glare found

**PV: F3** low potential for temporary after-image

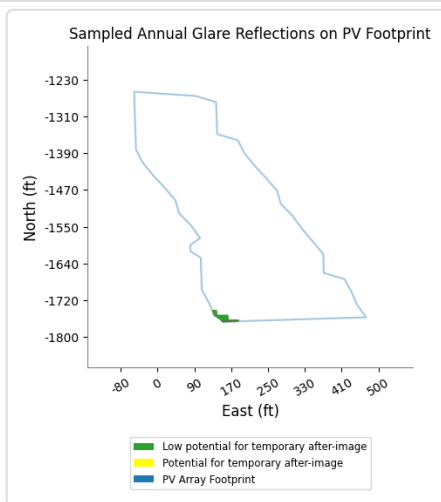
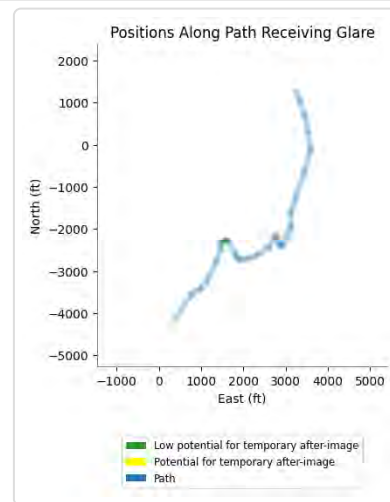
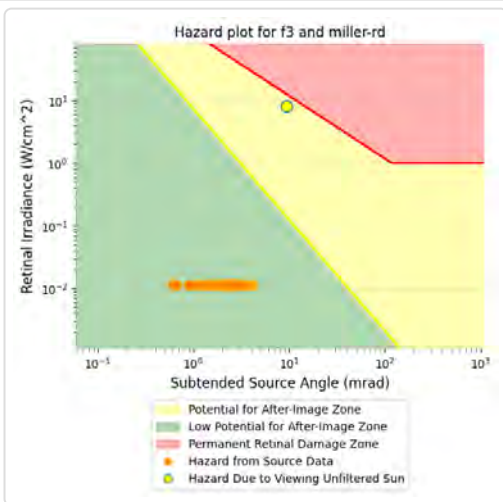
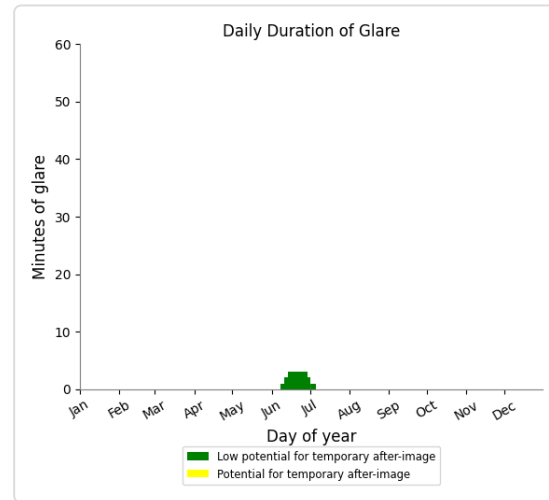
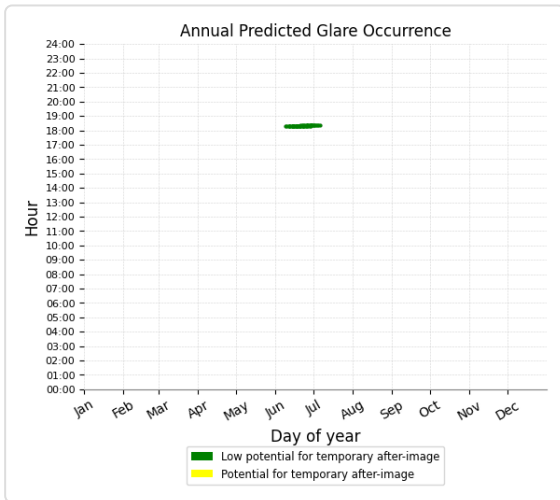
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	65	1.1	0	0.0
Bethel Ridge Rd	0	0.0	0	0.0
Bethel Ridge Road Trucks	0	0.0	0	0.0
Locust Rd	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0



### F3 and Route: Miller Rd

Yellow glare: none  
 Green glare: 65 min.



### F3 and Route: Bethel Ridge Rd

No glare found

### **F3 and Route: Bethel Ridge Road Trucks**

No glare found

### **F3 and Route: Locust Rd**

No glare found

### **F3 and OP 7**

No glare found

### **F3 and OP 8**

No glare found

### **F3 and OP 9**

No glare found

### **F3 and OP 11**

No glare found

### **F3 and OP 12**

No glare found

### **F3 and OP 13**

No glare found

### **F3 and OP 14**

No glare found

### **F3 and OP 15**

No glare found

### **F3 and OP 16**

No glare found

### **F3 and OP 17**

No glare found

### **F3 and OP 18**

No glare found

### **F3 and OP 19**

No glare found

### F3 and OP 20

No glare found

### F3 and OP 21

No glare found

### F3 and OP 22

No glare found

### PV: F4 low potential for temporary after-image

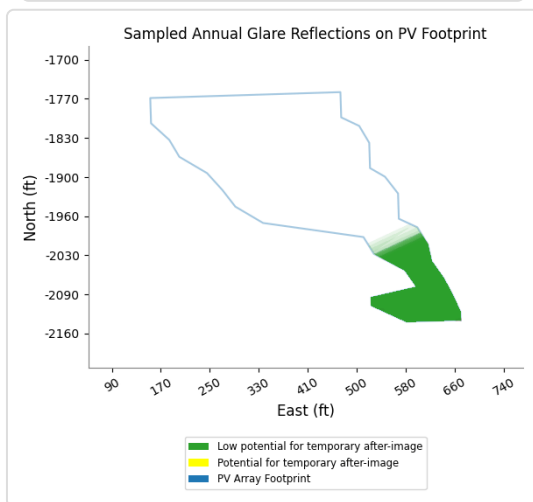
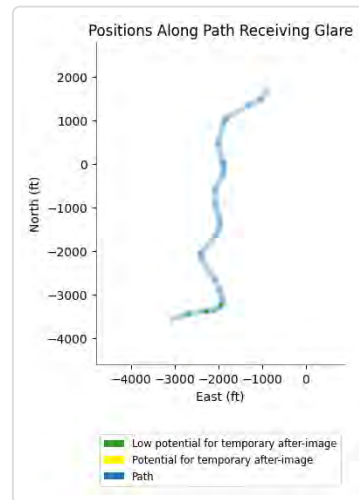
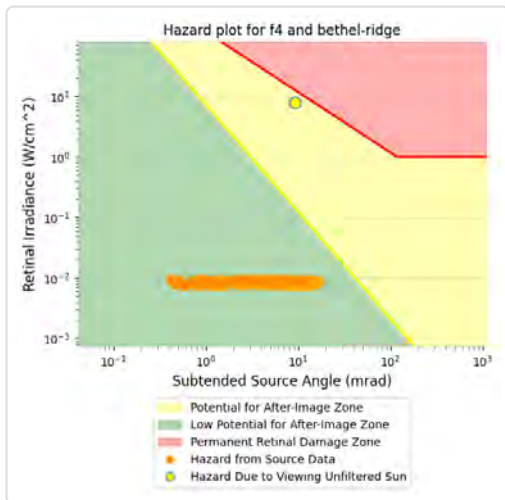
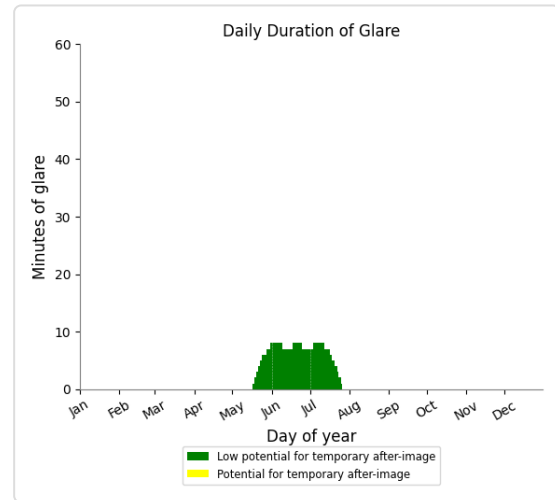
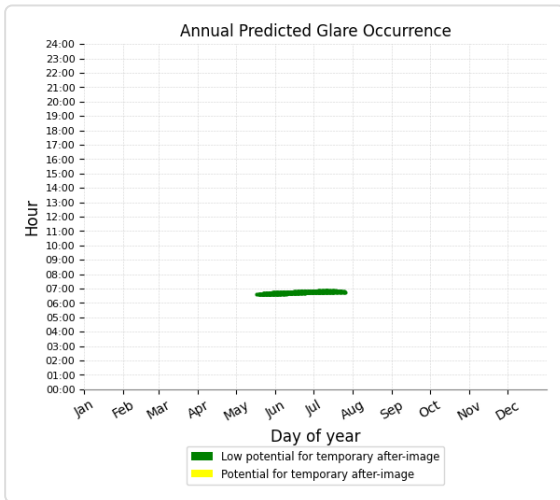
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	456	7.6	0	0.0
Bethel Ridge Road Trucks	479	8.0	0	0.0
Miller Rd	2,404	40.1	0	0.0
Locust Rd	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0

# F4 and Route: Bethel Ridge Rd

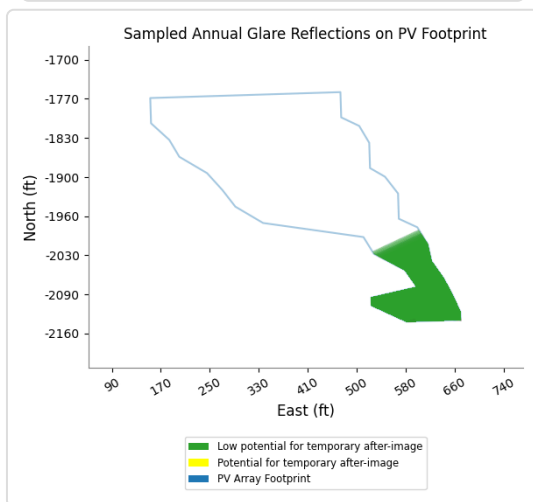
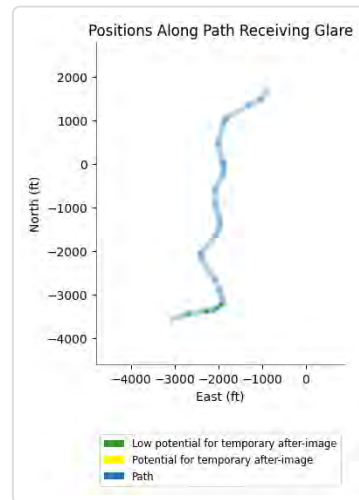
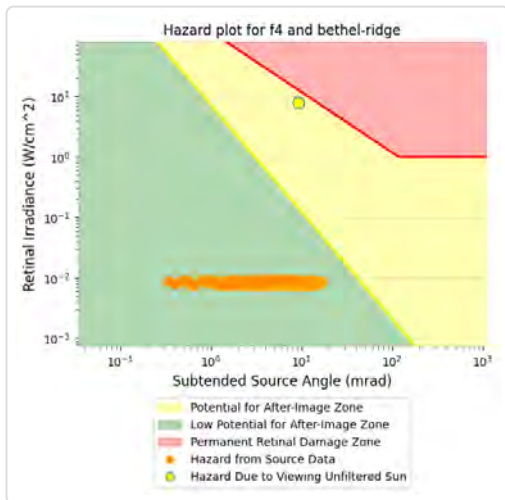
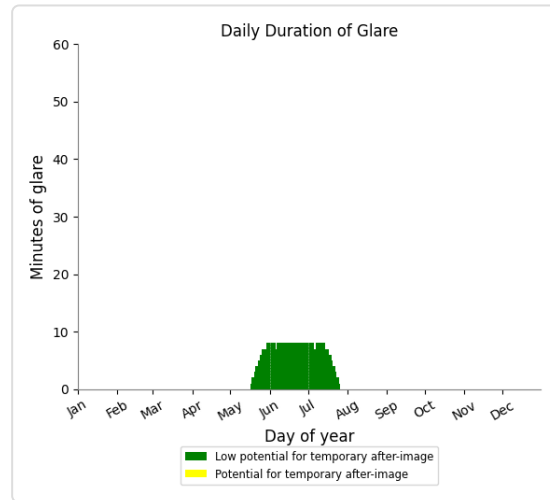
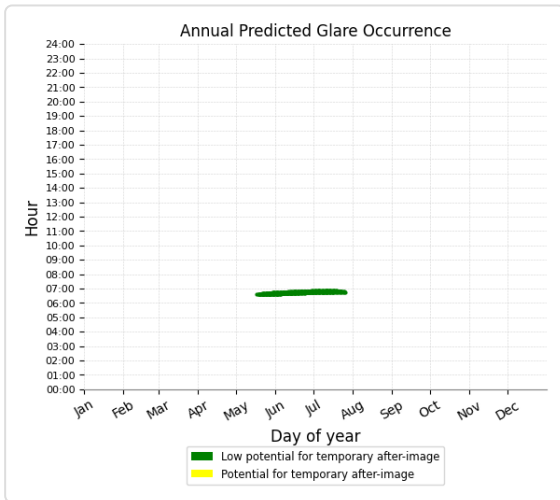
Yellow glare: none

Green glare: 456 min.



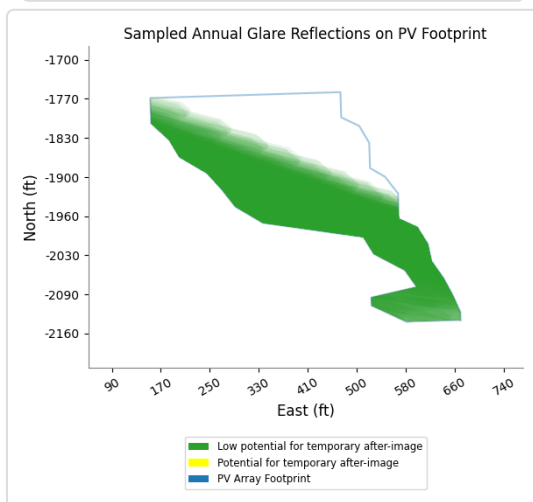
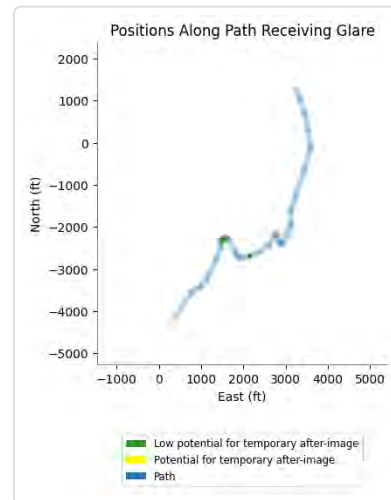
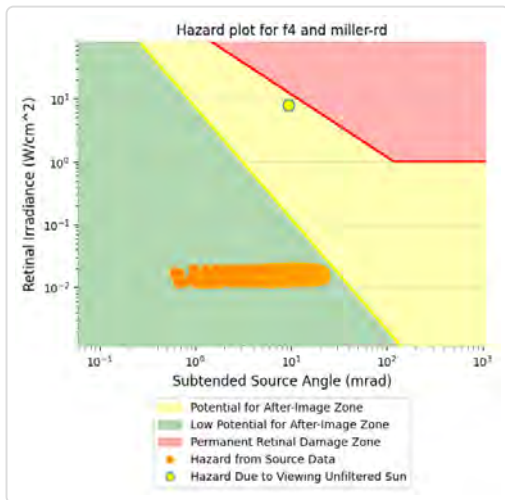
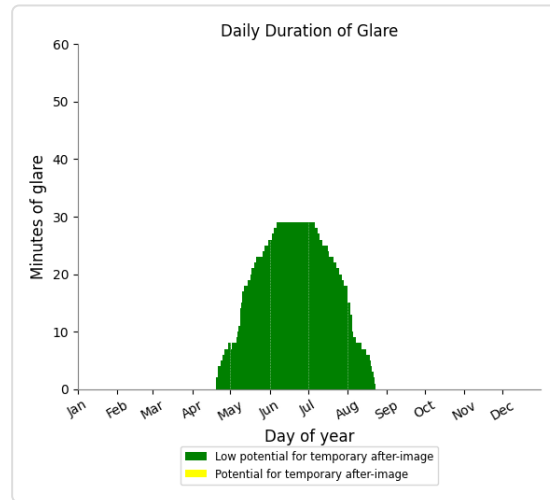
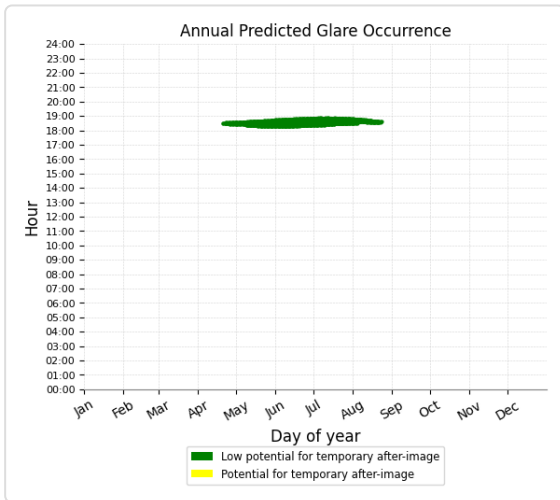
# F4 and Route: Bethel Ridge Road Trucks

Yellow glare: none  
 Green glare: 479 min.



## F4 and Route: Miller Rd

Yellow glare: none  
 Green glare: 2,404 min.



## F4 and Route: Locust Rd

No glare found

**F4 and OP 7**

No glare found

**F4 and OP 8**

No glare found

**F4 and OP 9**

No glare found

**F4 and OP 11**

No glare found

**F4 and OP 12**

No glare found

**F4 and OP 13**

No glare found

**F4 and OP 14**

No glare found

**F4 and OP 15**

No glare found

**F4 and OP 16**

No glare found

**F4 and OP 17**

No glare found

**F4 and OP 18**

No glare found

**F4 and OP 19**

No glare found

**F4 and OP 20**

No glare found

**F4 and OP 21**

No glare found

## F4 and OP 22

No glare found

## PV: F5 low potential for temporary after-image

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	0	0.0	0	0.0
Bethel Ridge Road Trucks	0	0.0	0	0.0
Locust Rd	0	0.0	0	0.0
Miller Rd	0	0.0	0	0.0
OP 21	61	1.0	0	0.0
OP 22	90	1.5	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0

## F5 and Route: Bethel Ridge Rd

No glare found

## F5 and Route: Bethel Ridge Road Trucks

No glare found

## F5 and Route: Locust Rd

No glare found

## F5 and Route: Miller Rd

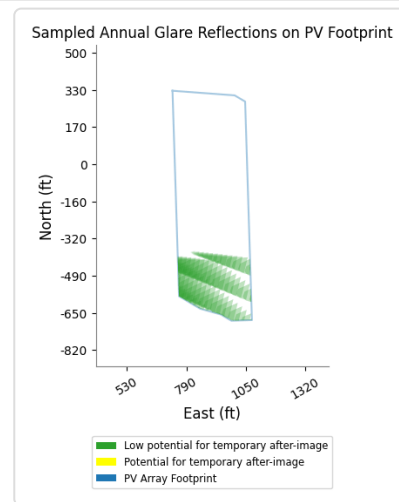
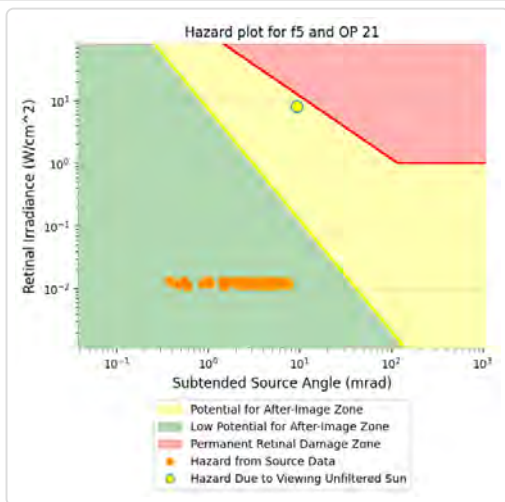
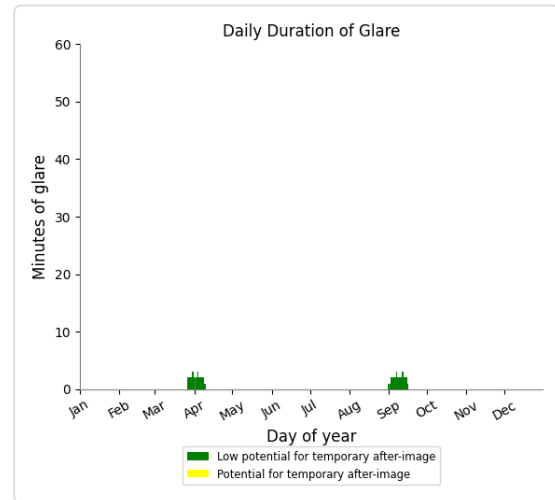
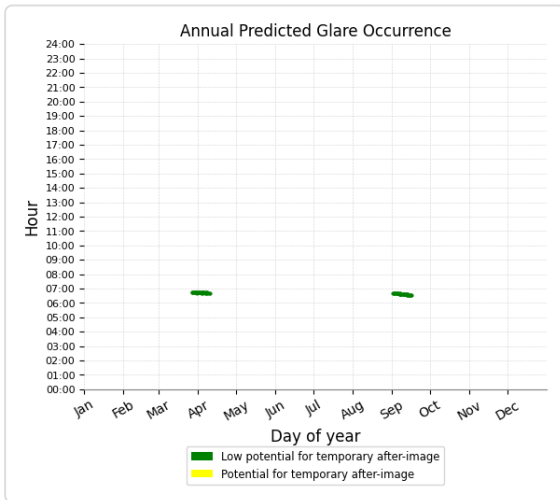
No glare found



## F5 and OP 21

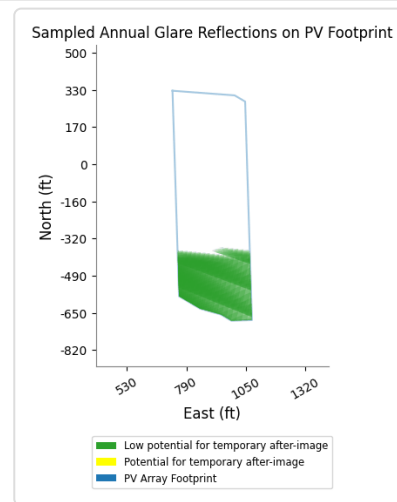
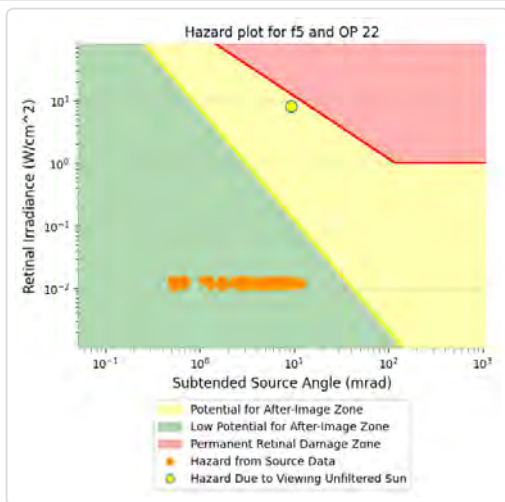
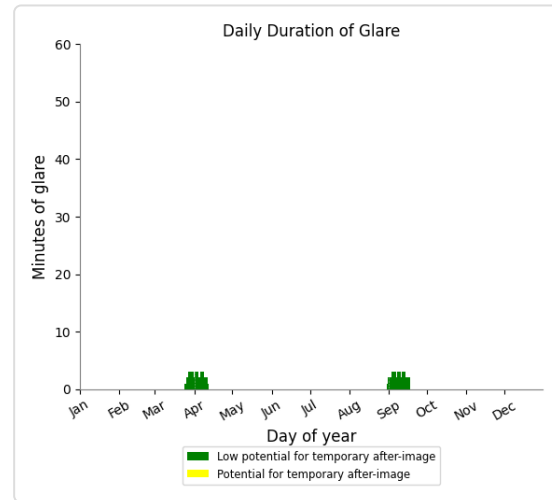
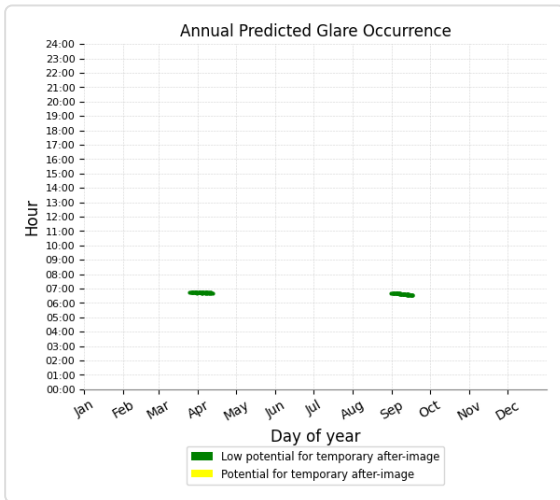
Yellow glare: none

Green glare: 61 min.



## F5 and OP 22

Yellow glare: none  
Green glare: 90 min.



## F5 and OP 7

No glare found

## F5 and OP 8

No glare found

## F5 and OP 9

No glare found

## F5 and OP 11

No glare found

## F5 and OP 12

No glare found

**F5 and OP 13**

No glare found

**F5 and OP 14**

No glare found

**F5 and OP 15**

No glare found

**F5 and OP 16**

No glare found

**F5 and OP 17**

No glare found

**F5 and OP 18**

No glare found

**F5 and OP 19**

No glare found

**F5 and OP 20**

No glare found

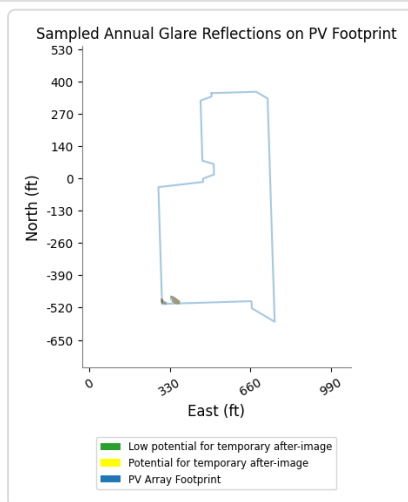
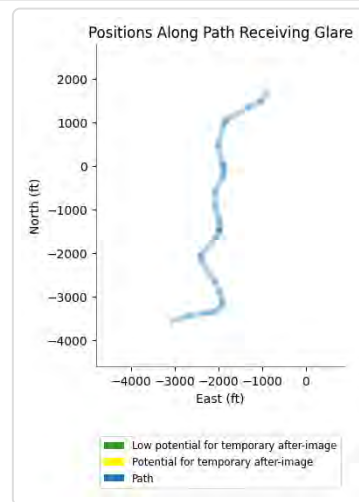
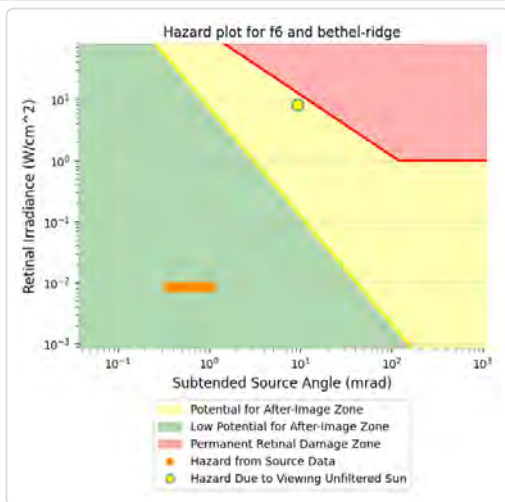
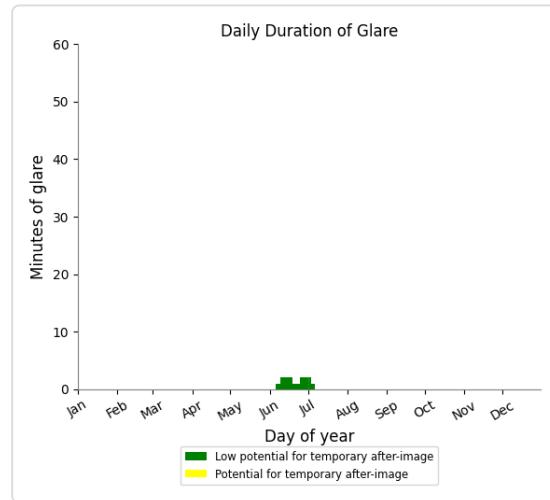
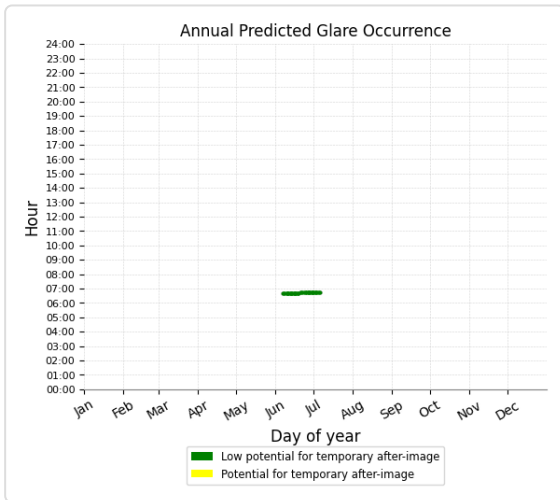
**PV: F6** low potential for temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	49	0.8	0	0.0
Bethel Ridge Road Trucks	568	9.5	0	0.0
Locust Rd	0	0.0	0	0.0
Miller Rd	0	0.0	0	0.0
OP 21	474	7.9	0	0.0
OP 22	540	9.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0

# F6 and Route: Bethel Ridge Rd

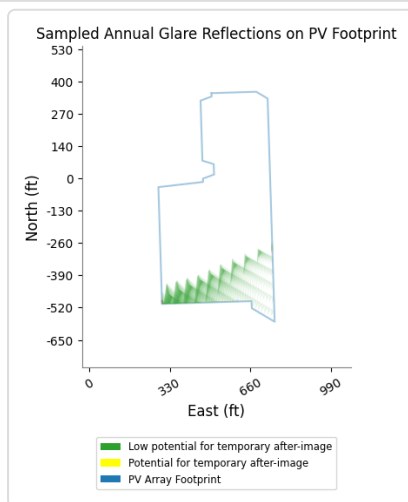
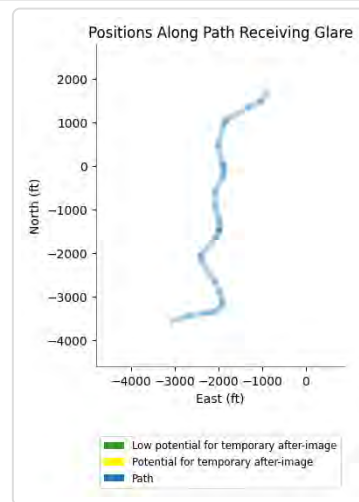
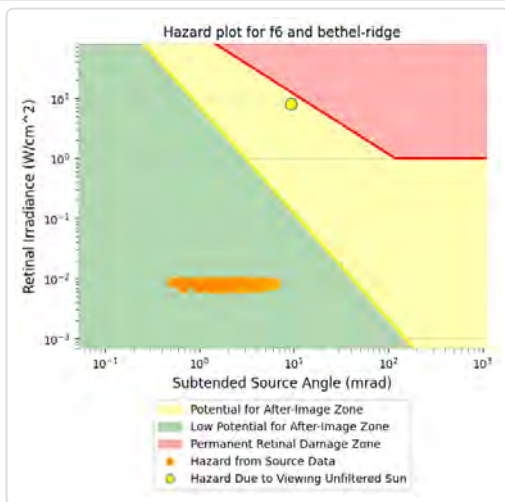
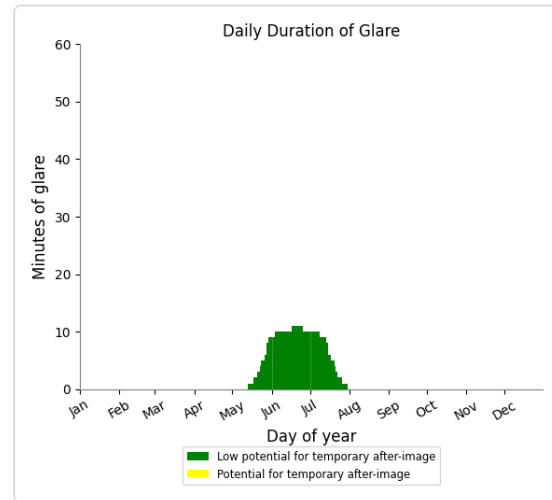
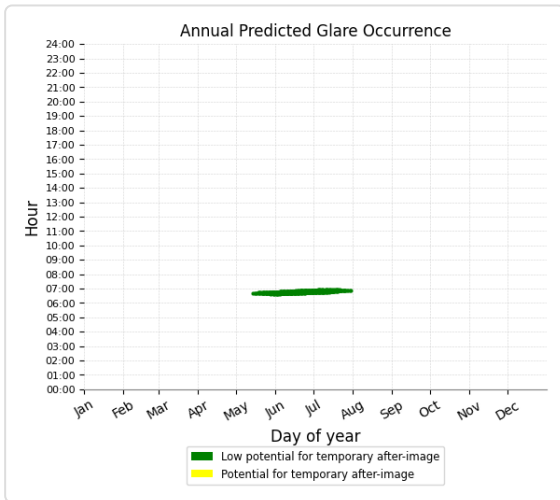
Yellow glare: none  
 Green glare: 49 min.



## F6 and Route: Bethel Ridge Road Trucks

Yellow glare: none

Green glare: 568 min.



## F6 and Route: Locust Rd

No glare found

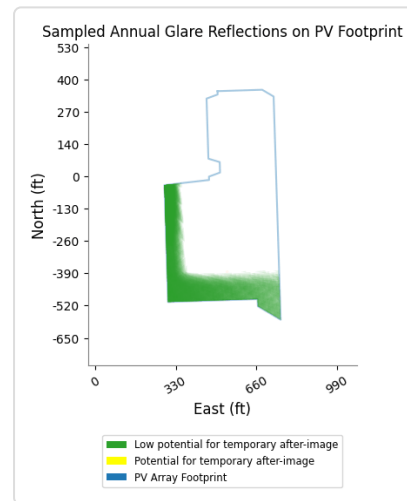
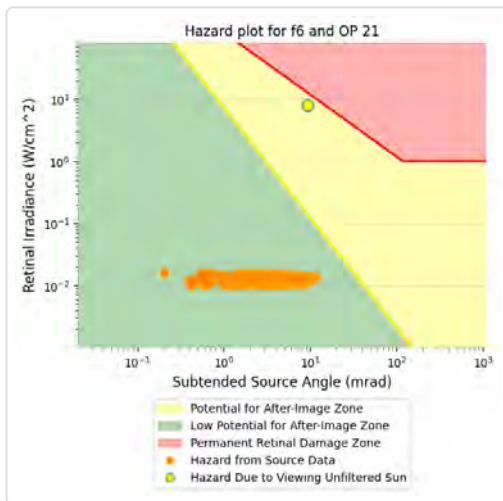
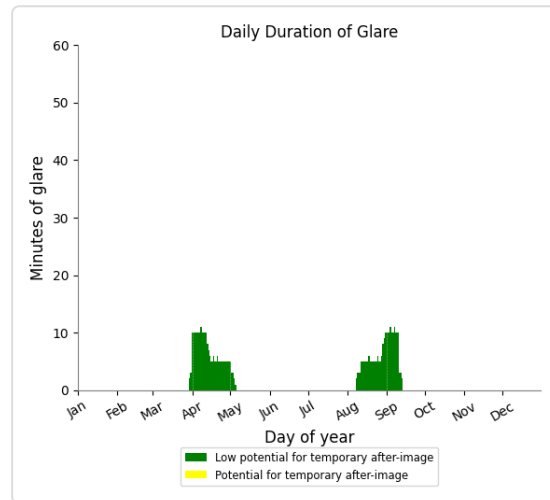
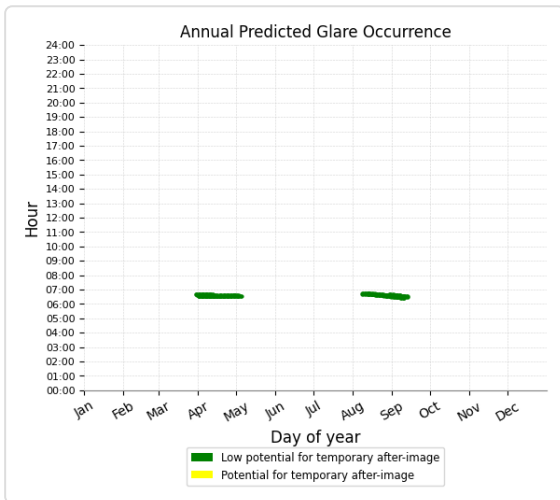
## F6 and Route: Miller Rd

No glare found

## F6 and OP 21

Yellow glare: none

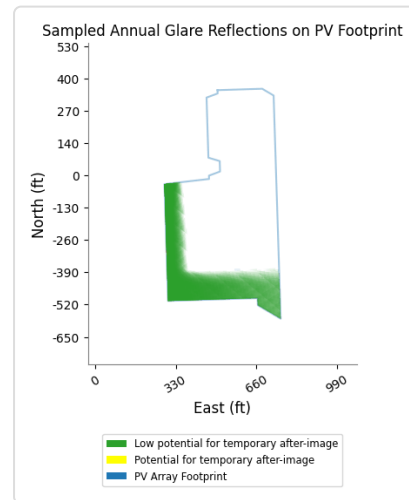
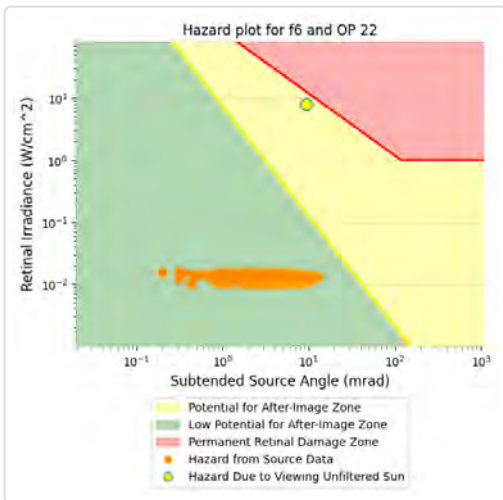
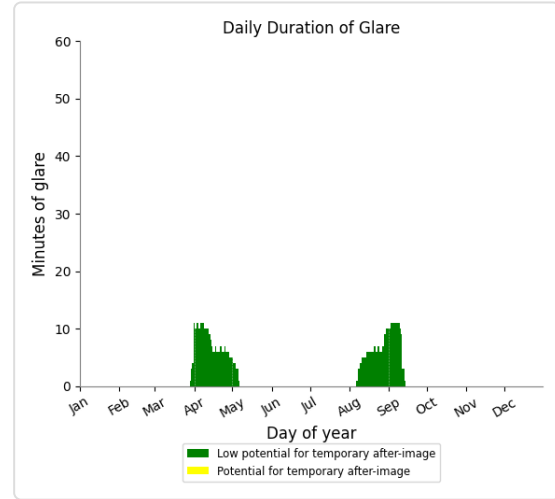
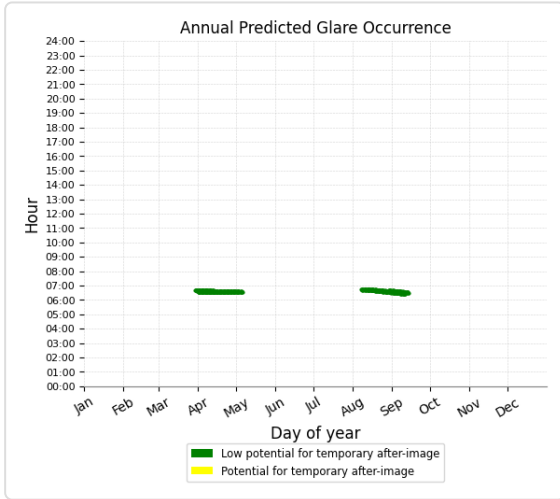
Green glare: 474 min.



## F6 and OP 22

Yellow glare: none

Green glare: 540 min.



## F6 and OP 7

No glare found

## F6 and OP 8

No glare found

## F6 and OP 9

No glare found

## F6 and OP 11

No glare found

## F6 and OP 12

No glare found



**F6 and OP 13**

No glare found

**F6 and OP 14**

No glare found

**F6 and OP 15**

No glare found

**F6 and OP 16**

No glare found

**F6 and OP 17**

No glare found

**F6 and OP 18**

No glare found

**F6 and OP 19**

No glare found

**F6 and OP 20**

No glare found

**PV: F7** low potential for temporary after-image

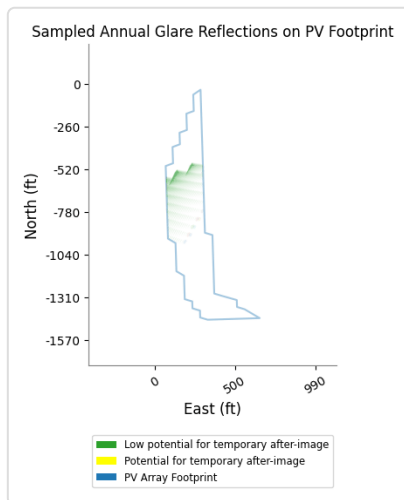
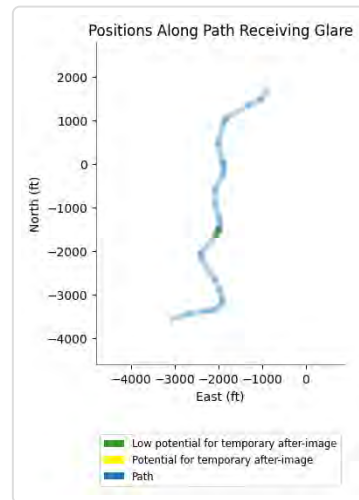
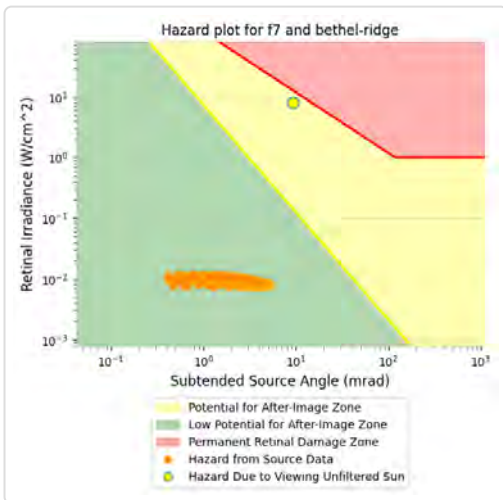
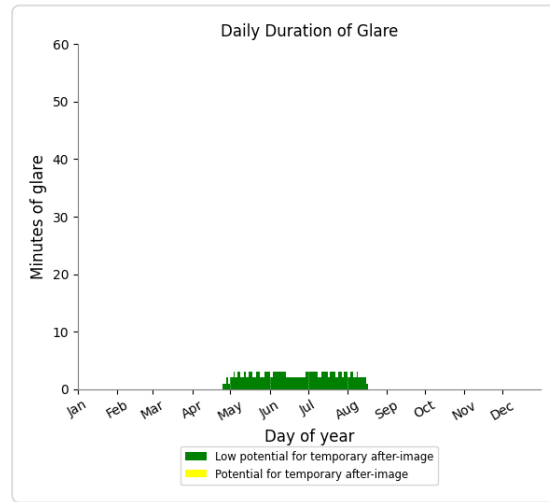
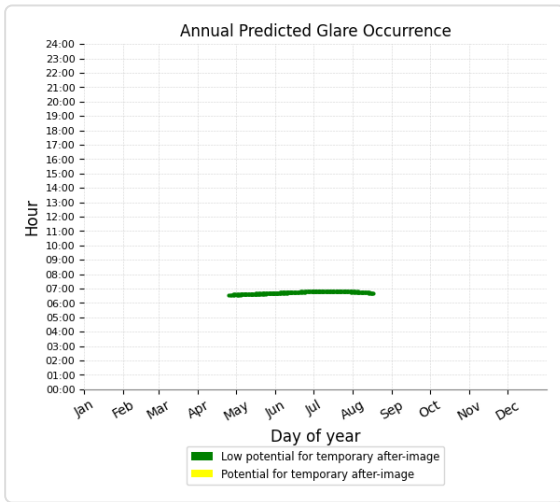
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Road Trucks	277	4.6	0	0.0
Bethel Ridge Rd	0	0.0	0	0.0
Locust Rd	0	0.0	0	0.0
Miller Rd	0	0.0	0	0.0
OP 21	193	3.2	0	0.0
OP 22	246	4.1	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0

## F7 and Route: Bethel Ridge Road Trucks

Yellow glare: none

Green glare: 277 min.



## F7 and Route: Bethel Ridge Rd

No glare found

## F7 and Route: Locust Rd

No glare found

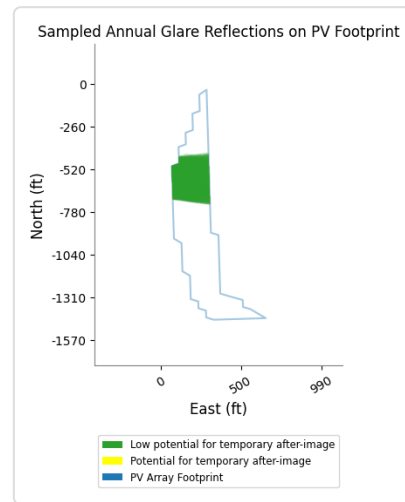
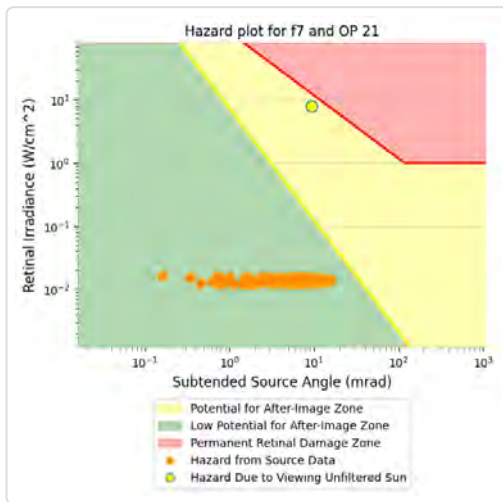
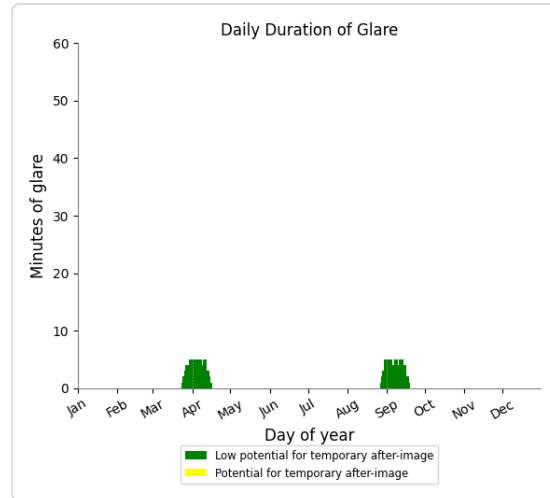
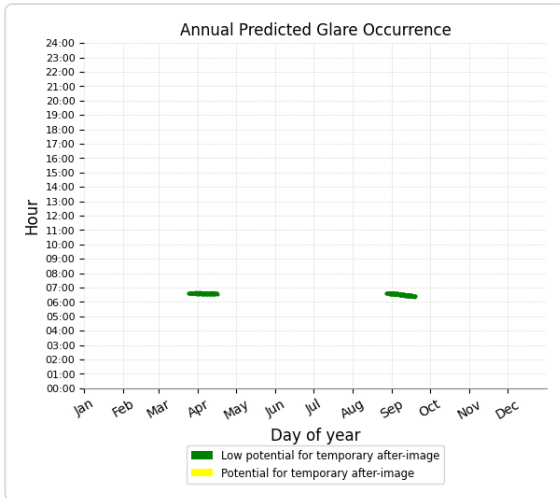
## F7 and Route: Miller Rd

No glare found

## F7 and OP 21

Yellow glare: none

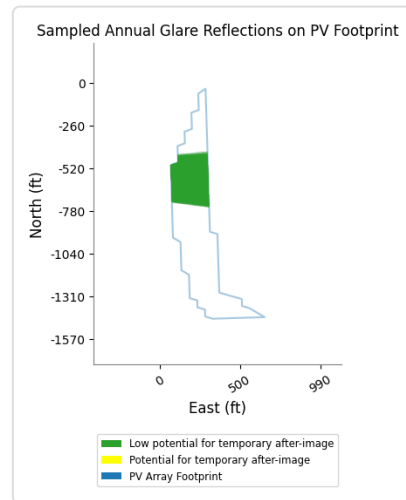
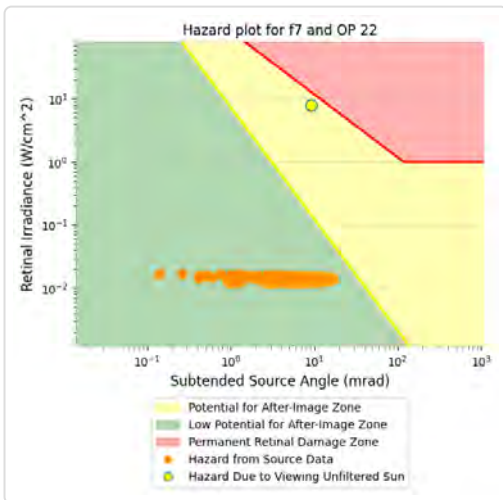
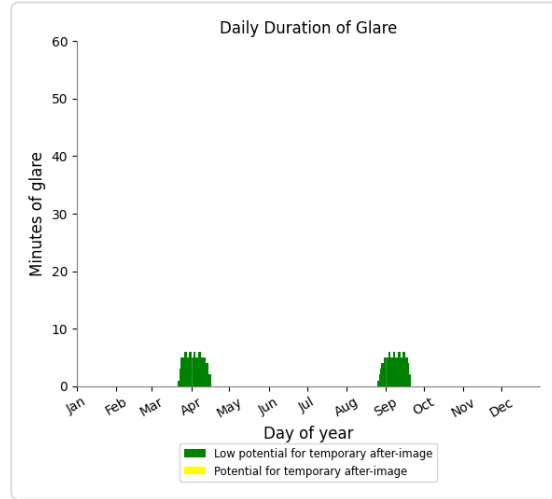
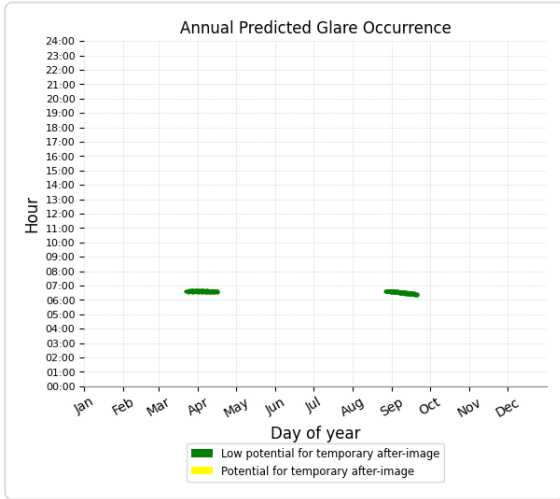
Green glare: 193 min.



## F7 and OP 22

Yellow glare: none

Green glare: 246 min.



## F7 and OP 7

No glare found

## F7 and OP 8

No glare found

## F7 and OP 9

No glare found

## F7 and OP 11

No glare found

## F7 and OP 12

No glare found

**F7 and OP 13**

No glare found

**F7 and OP 14**

No glare found

**F7 and OP 15**

No glare found

**F7 and OP 16**

No glare found

**F7 and OP 17**

No glare found

**F7 and OP 18**

No glare found

**F7 and OP 19**

No glare found

**F7 and OP 20**

No glare found

**PV: F8** low potential for temporary after-image

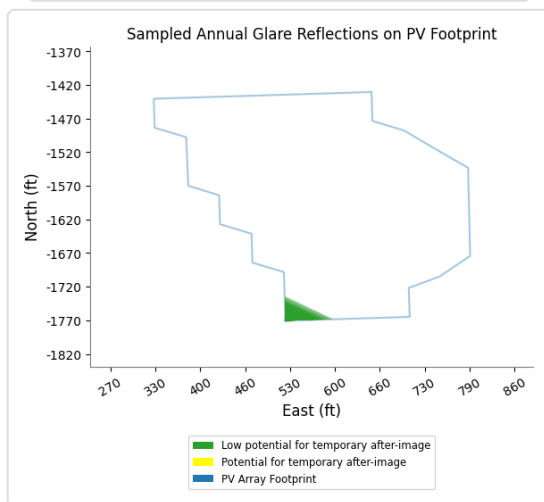
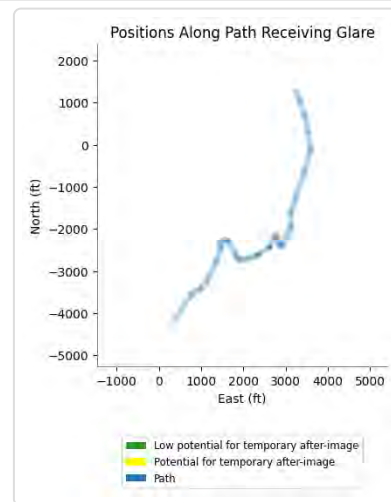
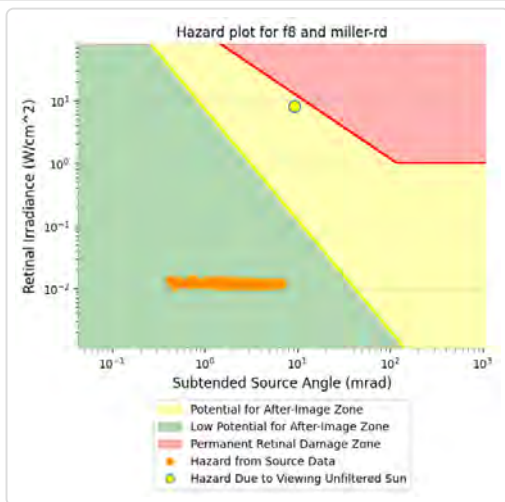
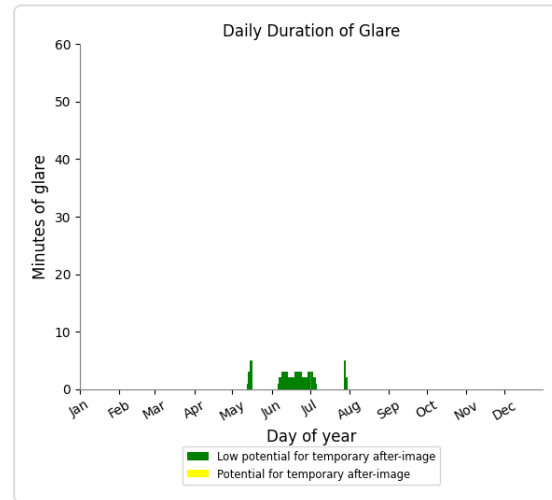
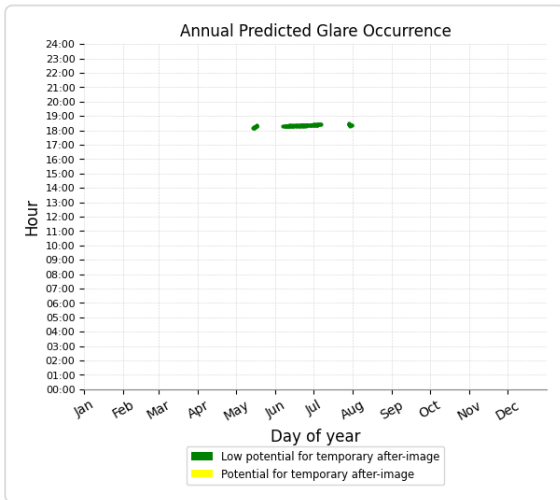
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	101	1.7	0	0.0
Bethel Ridge Rd	0	0.0	0	0.0
Bethel Ridge Road Trucks	0	0.0	0	0.0
Locust Rd	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0

## F8 and Route: Miller Rd

Yellow glare: none

Green glare: 101 min.



## F8 and Route: Bethel Ridge Rd

No glare found



## **F8 and Route: Bethel Ridge Road Trucks**

No glare found

## **F8 and Route: Locust Rd**

No glare found

## **F8 and OP 7**

No glare found

## **F8 and OP 8**

No glare found

## **F8 and OP 9**

No glare found

## **F8 and OP 11**

No glare found

## **F8 and OP 12**

No glare found

## **F8 and OP 13**

No glare found

## **F8 and OP 14**

No glare found

## **F8 and OP 15**

No glare found

## **F8 and OP 16**

No glare found

## **F8 and OP 17**

No glare found

## **F8 and OP 18**

No glare found

## **F8 and OP 19**

No glare found

## F8 and OP 20

No glare found

## F8 and OP 21

No glare found

## F8 and OP 22

No glare found

## PV: F9 low potential for temporary after-image

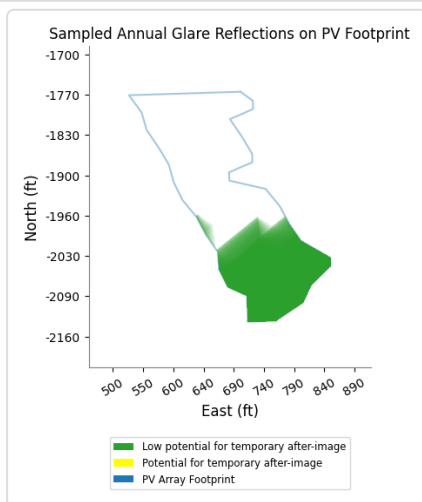
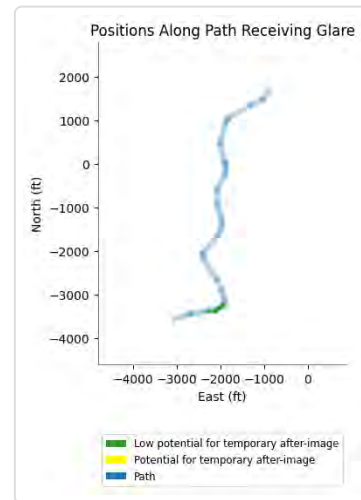
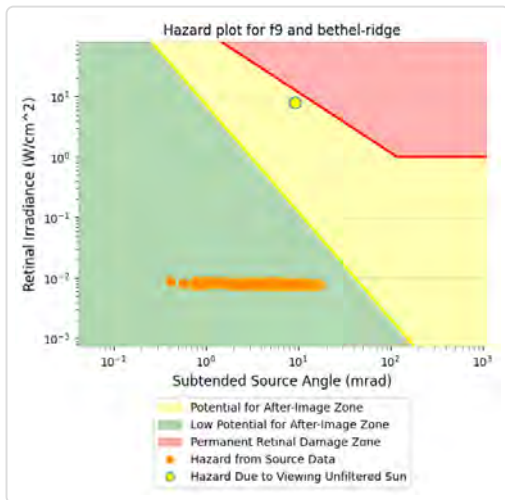
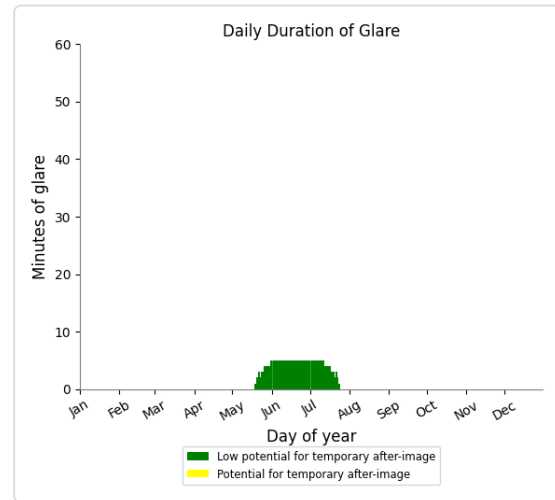
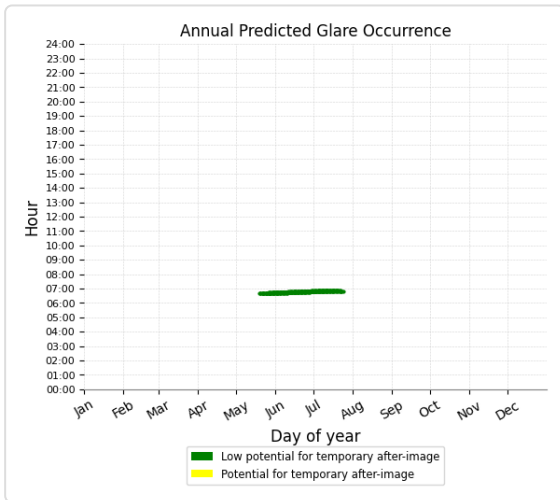
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Rd	288	4.8	0	0.0
Bethel Ridge Road Trucks	330	5.5	0	0.0
Miller Rd	524	8.7	0	0.0
Locust Rd	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0

# F9 and Route: Bethel Ridge Rd

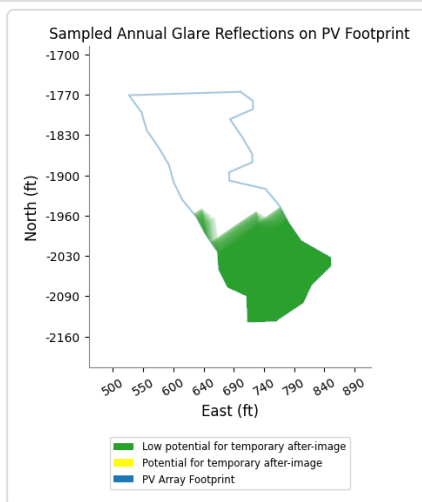
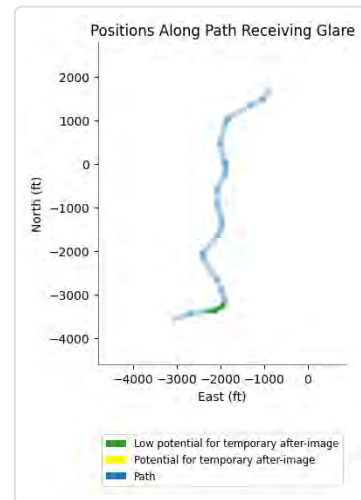
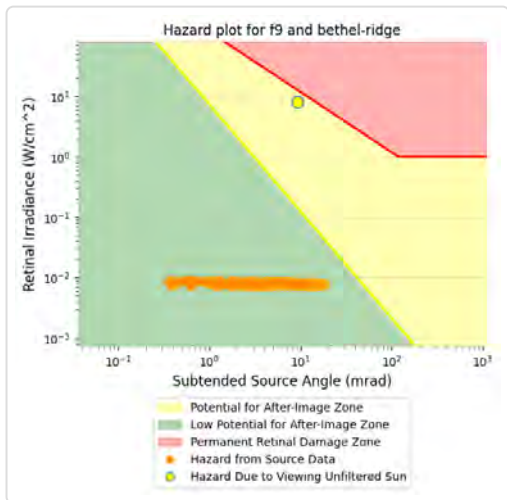
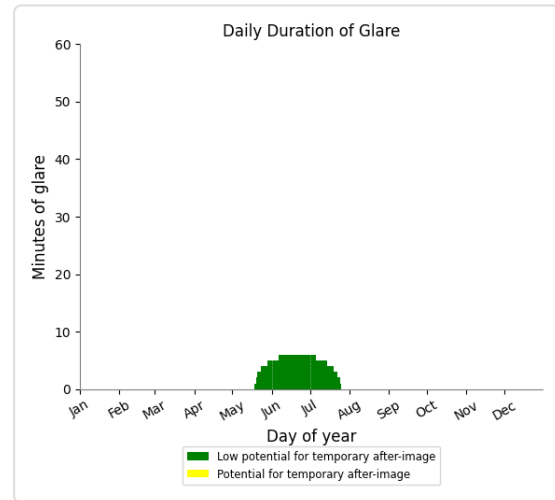
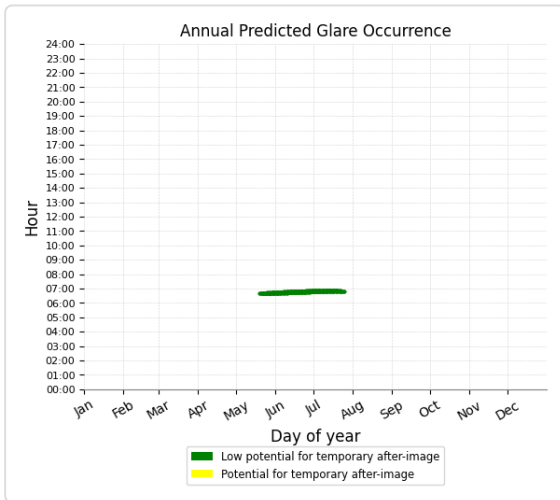
Yellow glare: none

Green glare: 288 min.



# F9 and Route: Bethel Ridge Road Trucks

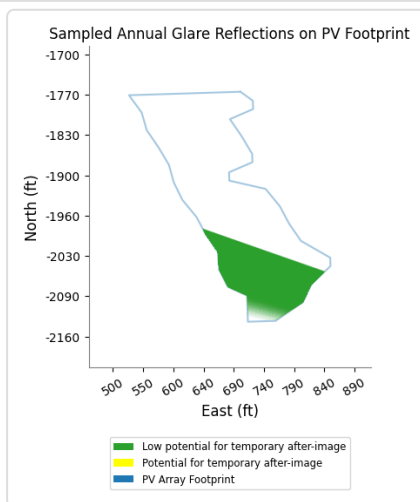
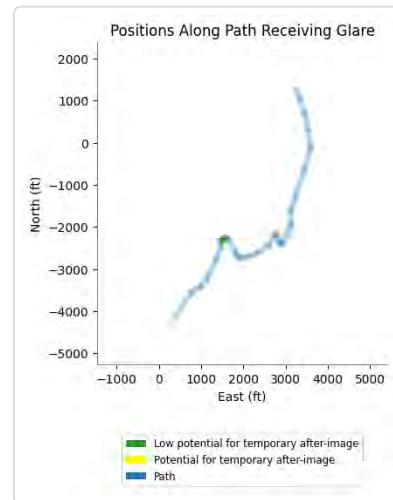
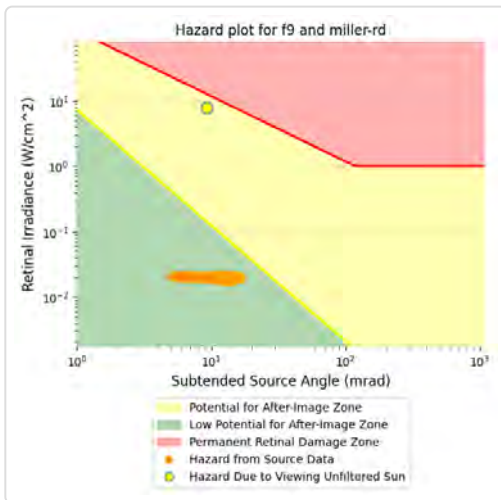
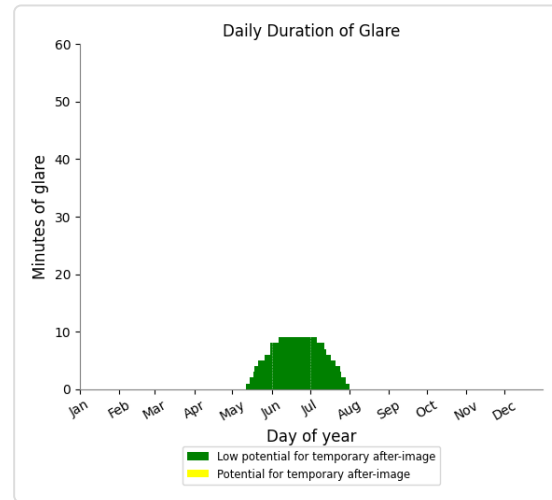
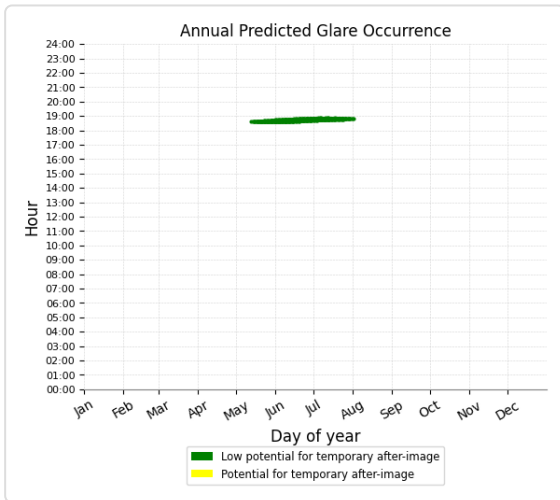
Yellow glare: none  
 Green glare: 330 min.



## F9 and Route: Miller Rd

Yellow glare: none

Green glare: 524 min.



## F9 and Route: Locust Rd

No glare found

**F9 and OP 7**

No glare found

**F9 and OP 8**

No glare found

**F9 and OP 9**

No glare found

**F9 and OP 11**

No glare found

**F9 and OP 12**

No glare found

**F9 and OP 13**

No glare found

**F9 and OP 14**

No glare found

**F9 and OP 15**

No glare found

**F9 and OP 16**

No glare found

**F9 and OP 17**

No glare found

**F9 and OP 18**

No glare found

**F9 and OP 19**

No glare found

**F9 and OP 20**

No glare found

**F9 and OP 21**

No glare found

## F9 and OP 22

No glare found

# Assumptions

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"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/](http://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

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## Group G



# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar South**  
 300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section G\_revised**

Client: REV Renewables

Created 20 Sep, 2025  
 Updated 23 Oct, 2025  
 Time-step 1 minute  
 Timezone offset UTC-5  
 Minimum sun altitude 0.0 deg  
 DNI peaks at 1,000.0 W/m<sup>2</sup>  
 Category 100 MW to 1 GW  
 Site ID 159921.26194

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 kWh
			min	hr	min	hr	
G1	25.0	180.0	1,553	25.9	0	0.0	-
G2	25.0	180.0	1,760	29.3	142	2.4	-
G3	25.0	180.0	1,153	19.2	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
Bethel Ridge Road	1,455	24.2	0	0.0
Bethel Ridge Road Trucks	1,777	29.6	0	0.0
Miller Road	1,234	20.6	142	2.4
OP 23	0	0.0	0	0.0

# Component Data

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## PV Arrays

**Name:** G1

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

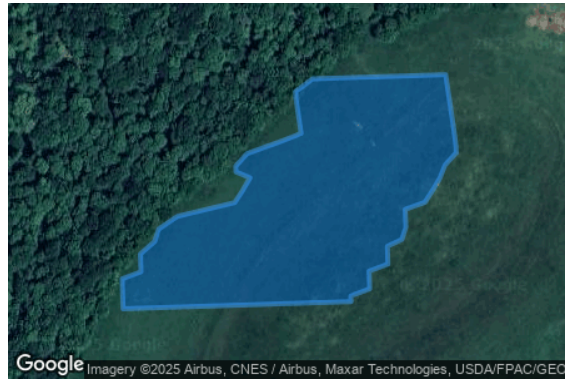
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.295677	-80.500831	1107.09	5.00	1112.09
2	40.295873	-80.500839	1105.43	5.00	1110.43
3	40.295918	-80.500678	1106.31	5.00	1111.31
4	40.296035	-80.500683	1105.45	5.00	1110.45
5	40.296117	-80.500560	1105.22	5.00	1110.22
6	40.296197	-80.500526	1105.62	5.00	1110.62
7	40.296280	-80.500366	1104.97	5.00	1109.97
8	40.296371	-80.499872	1115.18	5.00	1120.18
9	40.296452	-80.499803	1113.10	5.00	1118.10
10	40.296532	-80.499741	1110.44	5.00	1115.44
11	40.296571	-80.499862	1105.92	5.00	1110.92
12	40.296608	-80.499864	1105.00	5.00	1110.00
13	40.296690	-80.499766	1104.96	5.00	1109.96
14	40.296777	-80.499452	1109.67	5.00	1114.67
15	40.296822	-80.499302	1113.53	5.00	1118.53
16	40.296901	-80.499318	1108.39	5.00	1113.39
17	40.296980	-80.499333	1105.63	5.00	1110.63
18	40.297059	-80.499348	1105.52	5.00	1110.52
19	40.297096	-80.499350	1100.29	5.00	1105.29
20	40.297178	-80.499202	1104.63	5.00	1109.63
21	40.297206	-80.498060	1147.77	5.00	1152.77
22	40.297127	-80.498045	1152.20	5.00	1157.20
23	40.297048	-80.498030	1157.57	5.00	1162.57
24	40.296890	-80.497999	1165.59	5.00	1170.59
25	40.296812	-80.497984	1171.12	5.00	1176.12
26	40.296733	-80.497971	1174.66	5.00	1179.66
27	40.296695	-80.497970	1175.59	5.00	1180.59
28	40.296614	-80.498067	1176.23	5.00	1181.23
29	40.296534	-80.498108	1176.69	5.00	1181.69
30	40.296453	-80.498170	1176.65	5.00	1181.65
31	40.296372	-80.498239	1176.86	5.00	1181.86
32	40.296326	-80.498408	1177.21	5.00	1182.21
33	40.296210	-80.498403	1178.07	5.00	1183.07
34	40.296130	-80.498437	1178.50	5.00	1183.50
35	40.296085	-80.498561	1178.96	5.00	1183.96
36	40.295969	-80.498556	1179.41	5.00	1184.41
37	40.295923	-80.498718	1179.78	5.00	1184.78
38	40.295807	-80.498713	1179.81	5.00	1184.81
39	40.295761	-80.498875	1179.66	5.00	1184.66
40	40.295724	-80.498873	1179.70	5.00	1184.70

**Name:** G2

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

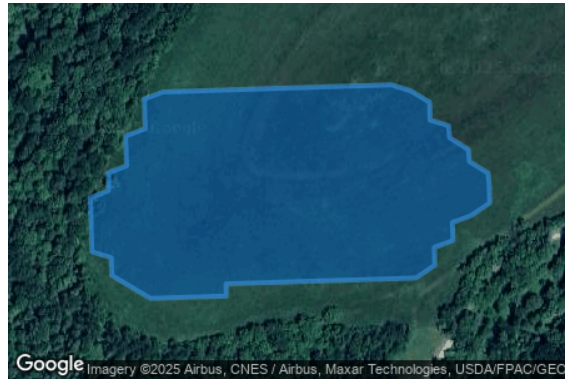
**Orientation:** 180.0°

**Rated power:** -

**Panel material:** Smooth glass with AR coating

**Reflectivity:** Vary with sun

**Slope error:** correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.294952	-80.498025	1116.88	5.00	1121.88
2	40.294869	-80.498185	1117.49	5.00	1122.49
3	40.294824	-80.498346	1119.84	5.00	1124.84
4	40.294707	-80.498340	1114.08	5.00	1119.08
5	40.294662	-80.498502	1115.99	5.00	1120.99
6	40.294545	-80.498497	1111.35	5.00	1116.35
7	40.294462	-80.498659	1109.68	5.00	1114.68
8	40.294423	-80.500290	1119.76	5.00	1124.76
9	40.294344	-80.500289	1115.29	5.00	1120.29
10	40.294329	-80.500940	1113.67	5.00	1118.67
11	40.294404	-80.501107	1112.68	5.00	1117.68
12	40.294479	-80.501273	1109.68	5.00	1114.68
13	40.294595	-80.501278	1110.00	5.00	1115.00
14	40.294633	-80.501443	1107.31	5.00	1112.31
15	40.294987	-80.501457	1100.08	5.00	1105.08
16	40.295033	-80.501302	1106.00	5.00	1111.00
17	40.295149	-80.501300	1106.43	5.00	1111.43
18	40.295195	-80.501146	1108.44	5.00	1113.44
19	40.295390	-80.501154	1105.90	5.00	1110.90
20	40.295436	-80.500985	1107.47	5.00	1112.47
21	40.295631	-80.500993	1105.36	5.00	1110.36
22	40.295677	-80.500831	1107.09	5.00	1112.09
23	40.295724	-80.498873	1179.70	5.00	1184.70
24	40.295686	-80.498708	1179.60	5.00	1184.60
25	40.295611	-80.498542	1174.58	5.00	1179.58
26	40.295494	-80.498537	1167.85	5.00	1172.85
27	40.295456	-80.498379	1160.29	5.00	1165.29
28	40.295377	-80.498369	1157.82	5.00	1162.82
29	40.295302	-80.498209	1145.38	5.00	1150.38
30	40.295223	-80.498199	1139.05	5.00	1144.05
31	40.295148	-80.498040	1128.79	5.00	1133.79
32	40.295069	-80.498029	1124.35	5.00	1129.35
33	40.294990	-80.498026	1119.15	5.00	1124.15

**Name:** G3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.297055	-80.497740	1158.63	5.00	1163.63
2	40.296980	-80.497554	1159.82	5.00	1164.82
3	40.296905	-80.497374	1161.08	5.00	1166.08
4	40.296830	-80.497206	1159.55	5.00	1164.55
5	40.296755	-80.497034	1155.33	5.00	1160.33
6	40.296680	-80.496867	1145.26	5.00	1150.26
7	40.296611	-80.496432	1114.88	5.00	1119.88
8	40.296495	-80.496428	1113.37	5.00	1118.37
9	40.296449	-80.496589	1121.60	5.00	1126.60
10	40.296333	-80.496585	1118.17	5.00	1123.17
11	40.296254	-80.496545	1114.10	5.00	1119.10
12	40.296174	-80.496578	1114.01	5.00	1119.01
13	40.296129	-80.496740	1120.75	5.00	1125.75
14	40.295933	-80.496730	1114.49	5.00	1119.49
15	40.295888	-80.496893	1119.67	5.00	1124.67
16	40.295771	-80.496887	1114.90	5.00	1119.90
17	40.295726	-80.497049	1120.30	5.00	1125.30
18	40.295530	-80.497042	1112.12	5.00	1117.12
19	40.295484	-80.497229	1117.47	5.00	1122.47
20	40.295367	-80.497222	1112.56	5.00	1117.56
21	40.295322	-80.497373	1116.22	5.00	1121.22
22	40.295206	-80.497369	1111.62	5.00	1116.62
23	40.295122	-80.497530	1112.52	5.00	1117.52
24	40.295115	-80.497855	1121.69	5.00	1126.69
25	40.295231	-80.497860	1128.26	5.00	1133.26
26	40.295269	-80.498025	1135.46	5.00	1140.46
27	40.295348	-80.498039	1141.86	5.00	1146.86
28	40.295464	-80.498044	1150.80	5.00	1155.80
29	40.295503	-80.498184	1158.21	5.00	1163.21
30	40.295578	-80.498350	1166.92	5.00	1171.92
31	40.296011	-80.498368	1178.24	5.00	1183.24
32	40.296056	-80.498206	1177.78	5.00	1182.78
33	40.296173	-80.498211	1177.46	5.00	1182.46
34	40.296253	-80.498178	1177.35	5.00	1182.35
35	40.296414	-80.498057	1176.85	5.00	1181.85
36	40.296576	-80.497901	1176.50	5.00	1181.50
37	40.296657	-80.497845	1176.17	5.00	1181.17
38	40.296698	-80.497847	1175.71	5.00	1180.71
39	40.296777	-80.497856	1174.26	5.00	1179.26
40	40.296856	-80.497860	1170.08	5.00	1175.08
41	40.296935	-80.497878	1164.78	5.00	1169.78
42	40.297014	-80.497900	1160.66	5.00	1165.66
43	40.297051	-80.497902	1159.15	5.00	1164.15

# Route Receptors

**Name:** Bethel Ridge Road

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.294488	-80.511585	1001.93	4.50	1006.43
2	40.294810	-80.510333	1034.86	4.50	1039.36
3	40.294968	-80.508921	1089.52	4.50	1094.02
4	40.295018	-80.508292	1087.17	4.50	1091.67
5	40.295362	-80.507633	1082.94	4.50	1087.44
6	40.295712	-80.507539	1085.60	4.50	1090.10
7	40.296274	-80.507759	1092.35	4.50	1096.85
8	40.296967	-80.508177	1109.38	4.50	1113.88
9	40.298345	-80.509259	1122.82	4.50	1127.32
10	40.298586	-80.509333	1130.77	4.50	1135.27
11	40.299743	-80.508086	1123.00	4.50	1127.50
12	40.300202	-80.507798	1119.23	4.50	1123.73
13	40.300537	-80.507737	1118.60	4.50	1123.10
14	40.300908	-80.507804	1121.14	4.50	1125.64
15	40.301672	-80.508109	1119.52	4.50	1124.02
16	40.302704	-80.508111	1117.69	4.50	1122.19

**Name:** Bethel Ridge Road Trucks

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.294488	-80.511585	1001.93	9.00	1010.93
2	40.294810	-80.510333	1034.86	9.00	1043.86
3	40.294968	-80.508921	1089.52	9.00	1098.52
4	40.295018	-80.508292	1087.17	9.00	1096.17
5	40.295362	-80.507633	1082.94	9.00	1091.94
6	40.295712	-80.507539	1085.60	9.00	1094.60
7	40.296274	-80.507759	1092.35	9.00	1101.35
8	40.296967	-80.508177	1109.38	9.00	1118.38
9	40.298345	-80.509259	1122.82	9.00	1131.82
10	40.298586	-80.509333	1130.77	9.00	1139.77
11	40.299743	-80.508086	1123.00	9.00	1132.00
12	40.300202	-80.507798	1119.23	9.00	1128.23
13	40.300537	-80.507737	1118.60	9.00	1127.60
14	40.300908	-80.507804	1121.14	9.00	1130.14
15	40.301672	-80.508109	1119.52	9.00	1128.52
16	40.302704	-80.508111	1117.69	9.00	1126.69



**Name:** Miller Road  
**Path type:** Two-way  
**Azimuthal view angle:** 50.0°  
**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.296833	-80.493939	982.66	4.50	987.16
2	40.297127	-80.494209	978.22	4.50	982.72
3	40.297949	-80.494784	1007.60	4.50	1012.10
4	40.298045	-80.495003	1018.45	4.50	1022.95
5	40.297873	-80.495439	1046.63	4.50	1051.13
6	40.297453	-80.495403	1061.35	4.50	1065.85
7	40.296616	-80.495840	1078.82	4.50	1083.32
8	40.295437	-80.496552	1089.13	4.50	1093.63
9	40.294873	-80.497131	1086.27	4.50	1090.77
10	40.294500	-80.497914	1088.84	4.50	1093.34
11	40.292782	-80.499395	1083.71	4.50	1088.21

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 23	23	40.291354	-80.498542	1104.61	6.00

## Obstruction Components

**Name:** Landscape 2  
**Top height:** 6.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.295755	-80.496582	1105.79
2	40.295114	-80.497076	1097.50
3	40.294878	-80.497548	1106.53

**Name:** Landscaping 1  
**Top height:** 6.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.296738	-80.496093	1102.85
2	40.296104	-80.496294	1102.36
3	40.295927	-80.496438	1105.68

Name: Landscaping 3

Top height: 6.0 ft



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.294870	-80.497787	1109.21
2	40.294741	-80.498049	1109.51
3	40.294522	-80.498346	1107.70
4	40.294374	-80.498358	1104.51
5	40.294276	-80.498540	1106.19
6	40.294199	-80.499337	1106.92

Name: Treeline

Top height: 35.0 ft



Google Imagery ©2025 Airbus, CNES / Airbus, Maxar Technologies, USDA/FPAC/GEO

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.303874	-80.507242	1105.76
2	40.303587	-80.507296	1106.87
3	40.302700	-80.507972	1103.38
4	40.300237	-80.507403	1096.66
5	40.298473	-80.509066	1116.48
6	40.294656	-80.506427	1009.16

**Name:** Treeline  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.297383	-80.499124	1092.94
2	40.296364	-80.500701	1089.30
3	40.295096	-80.501661	1083.40
4	40.294433	-80.501720	1094.97
5	40.294061	-80.501398	1104.68
6	40.293926	-80.500819	1106.48
7	40.294065	-80.498861	1105.72

**Name:** Treeline  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.292722	-80.499118	1098.40
2	40.292248	-80.497391	1068.25

# 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 kWh
			min	hr	min	hr	
G1	25.0	180.0	1,553	25.9	0	0.0	-
G2	25.0	180.0	1,760	29.3	142	2.4	-
G3	25.0	180.0	1,153	19.2	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
Bethel Ridge Road	1,455	24.2	0	0.0
Bethel Ridge Road Trucks	1,777	29.6	0	0.0
Miller Road	1,234	20.6	142	2.4
OP 23	0	0.0	0	0.0

## PV: G1 low potential for temporary after-image

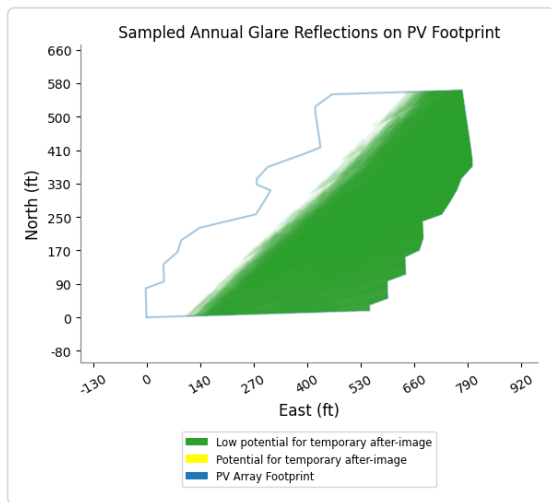
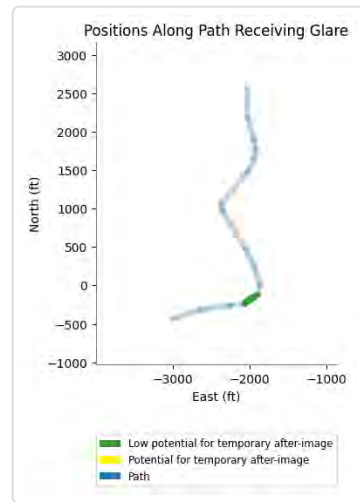
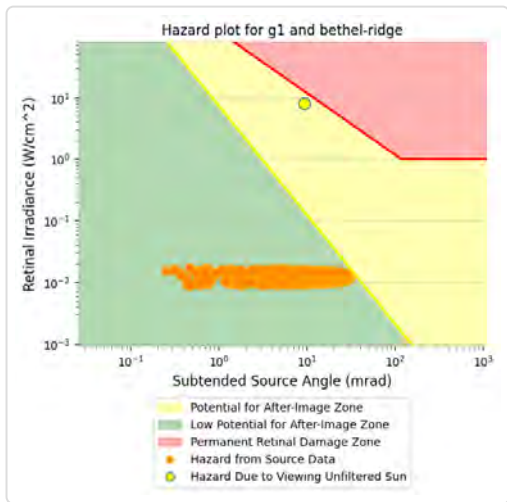
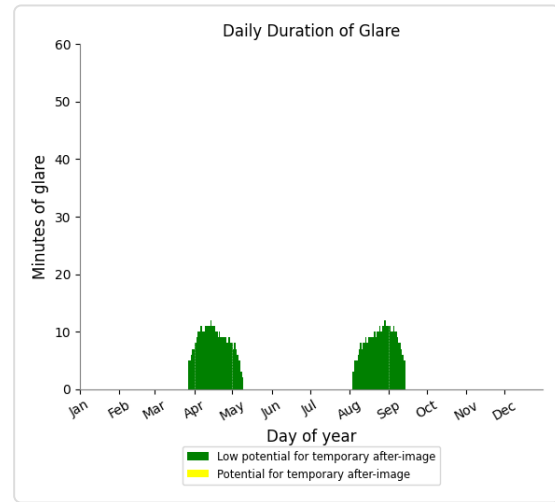
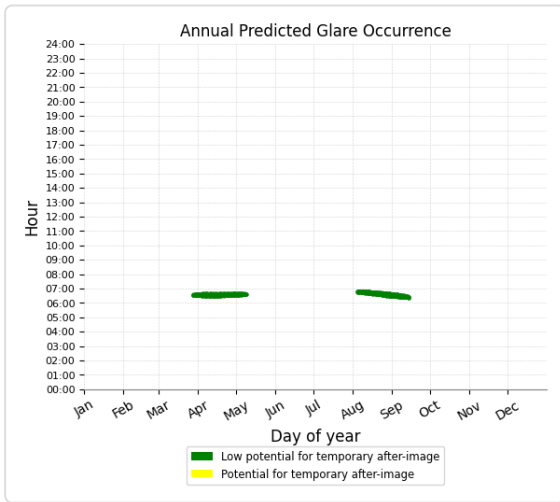
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Road	728	12.1	0	0.0
Bethel Ridge Road Trucks	825	13.8	0	0.0
Miller Road	0	0.0	0	0.0
OP 23	0	0.0	0	0.0

# G1 and Route: Bethel Ridge Road

Yellow glare: none

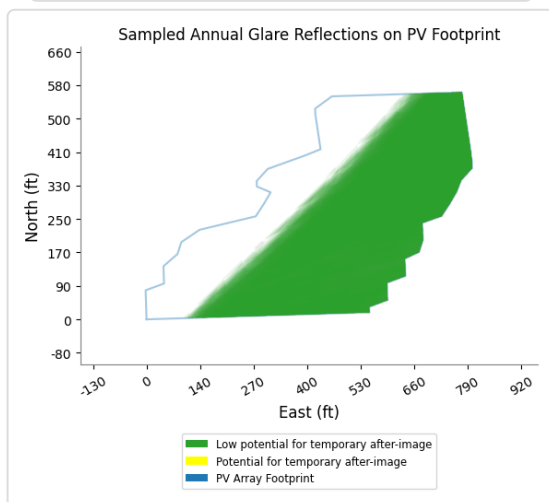
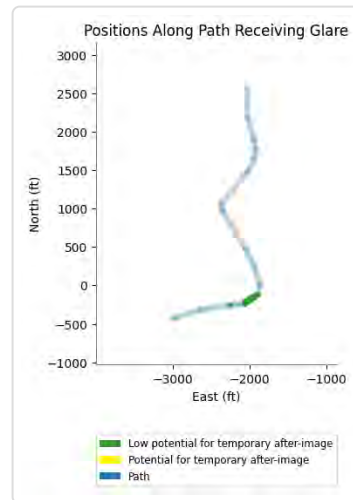
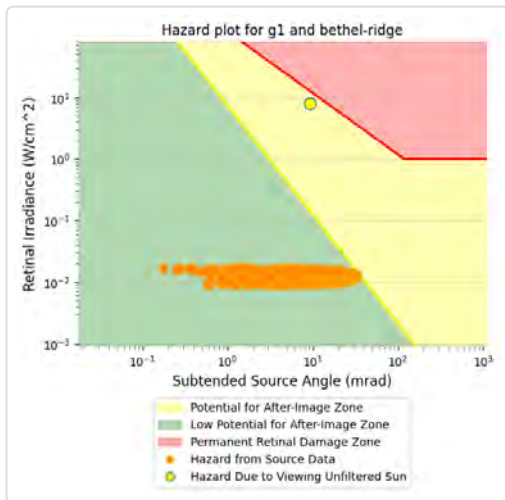
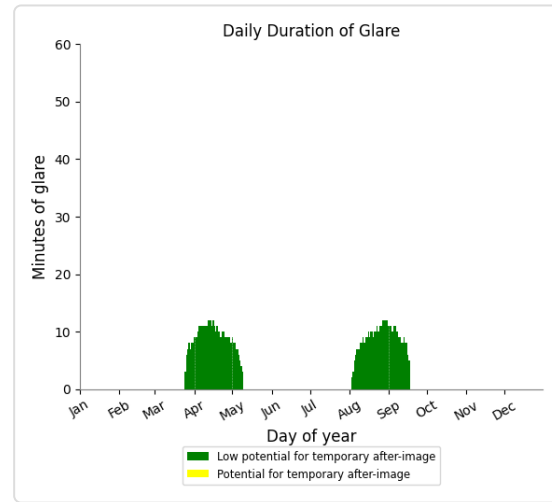
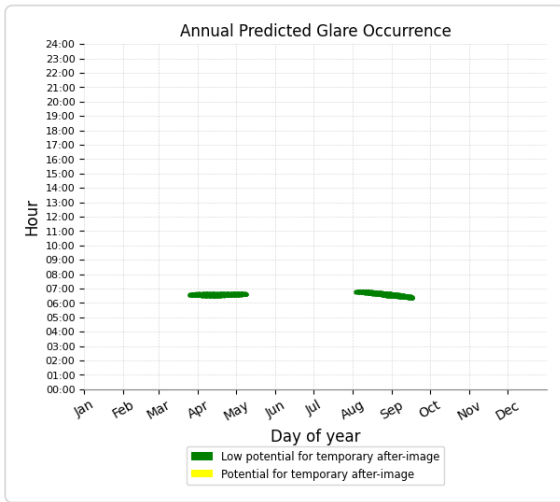
Green glare: 728 min.





## G1 and Route: Bethel Ridge Road Trucks

Yellow glare: none  
Green glare: 825 min.



## G1 and Route: Miller Road

No glare found

## G1 and OP 23

No glare found

## PV: G2 potential temporary after-image

*Receptor results ordered by category of glare*

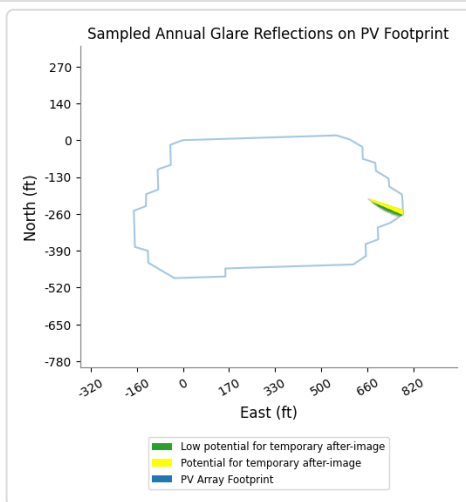
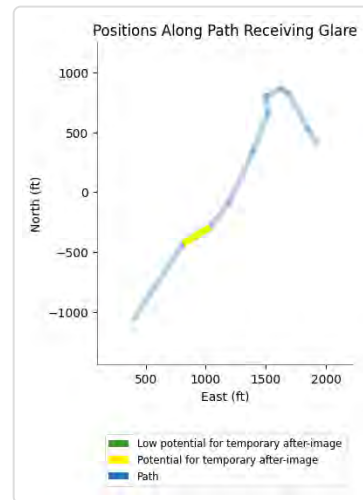
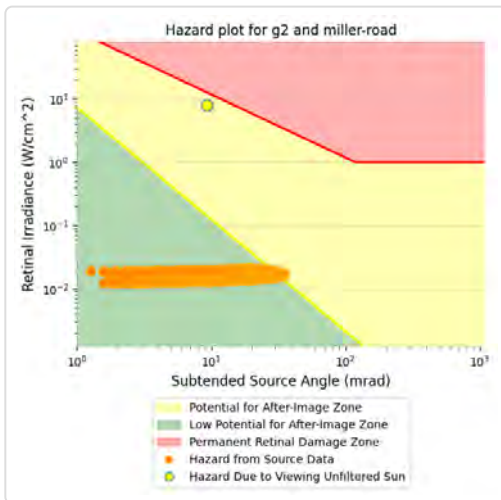
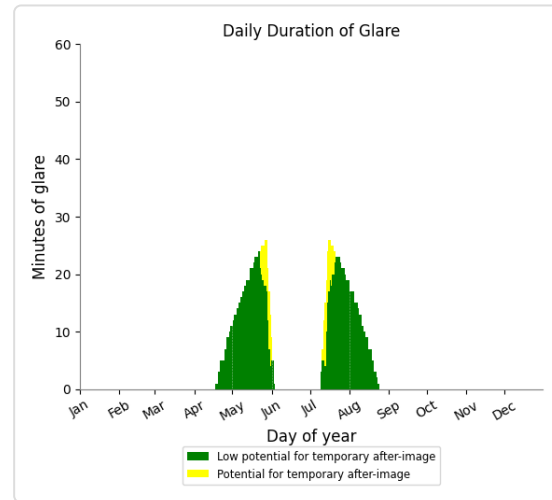
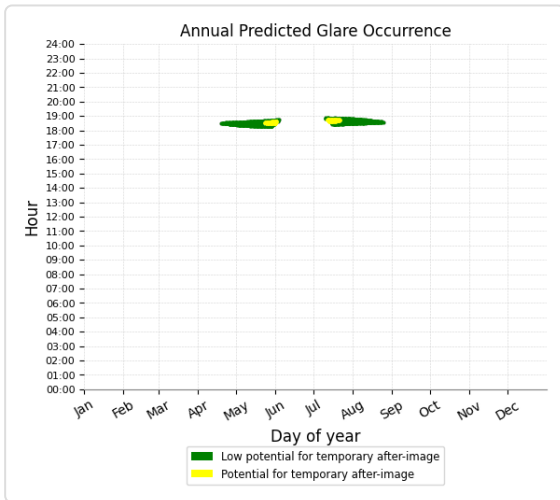
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Road	1,234	20.6	142	2.4
Bethel Ridge Road	202	3.4	0	0.0
Bethel Ridge Road Trucks	324	5.4	0	0.0
OP 23	0	0.0	0	0.0



## G2 and Route: Miller Road

Yellow glare: 142 min.

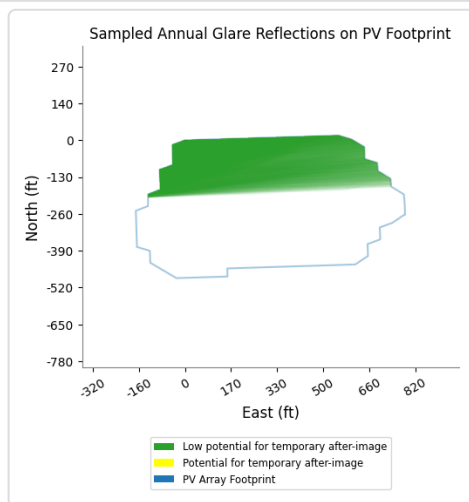
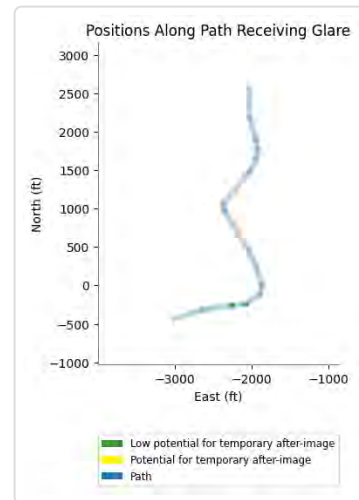
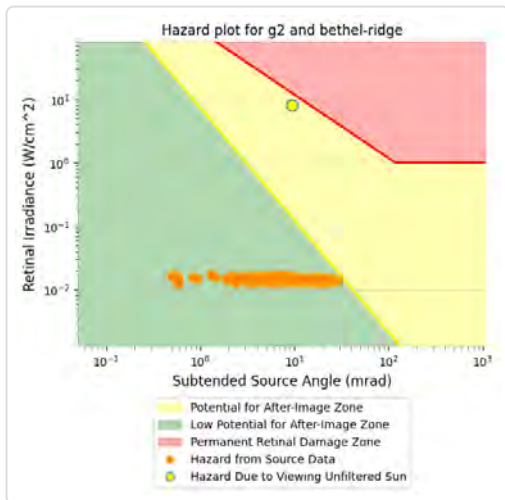
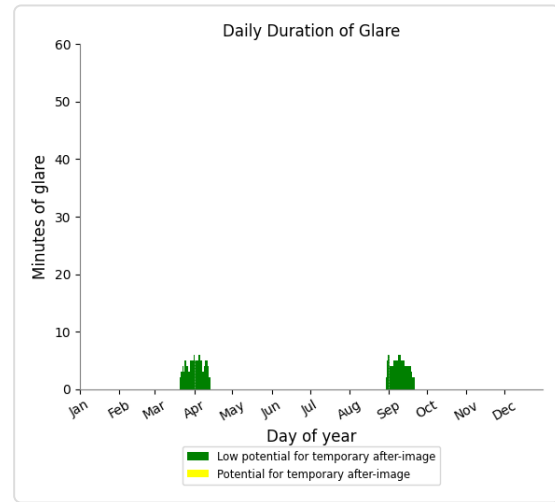
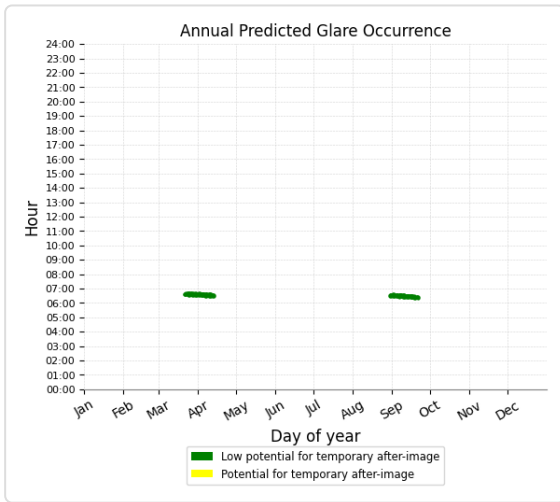
Green glare: 1,234 min.



## G2 and Route: Bethel Ridge Road

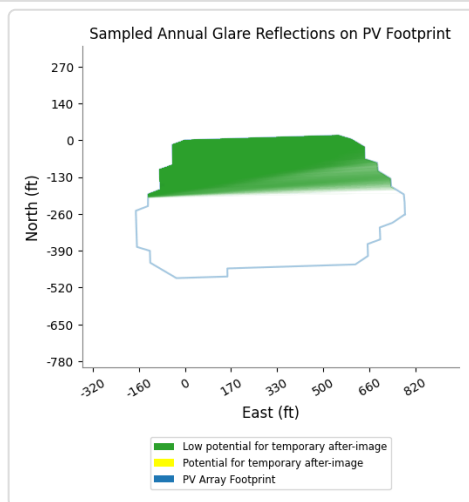
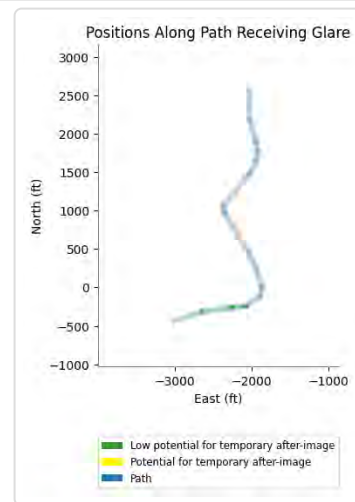
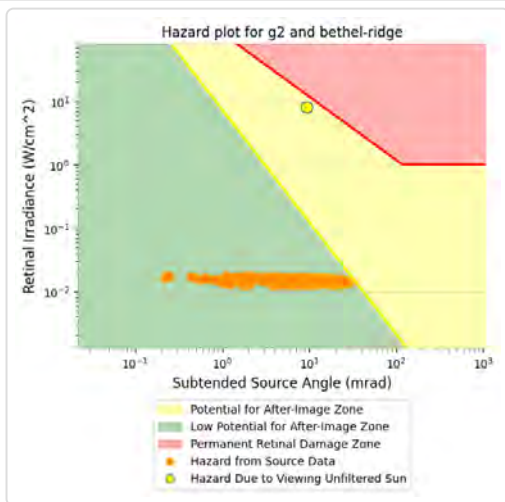
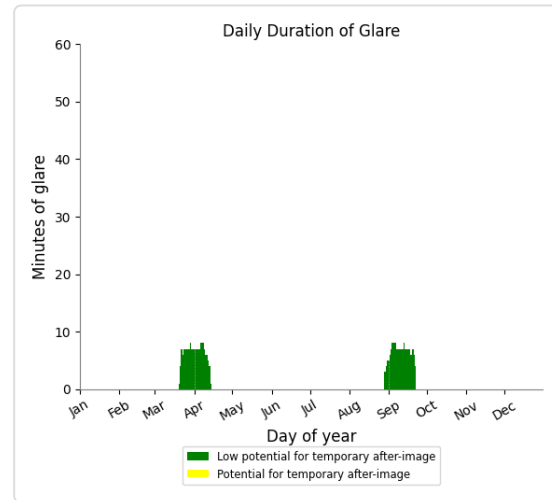
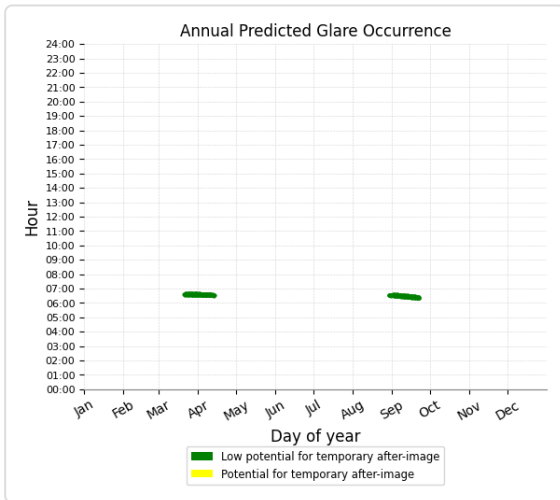
Yellow glare: none

Green glare: 202 min.



## G2 and Route: Bethel Ridge Road Trucks

Yellow glare: none  
 Green glare: 324 min.



## G2 and OP 23

No glare found

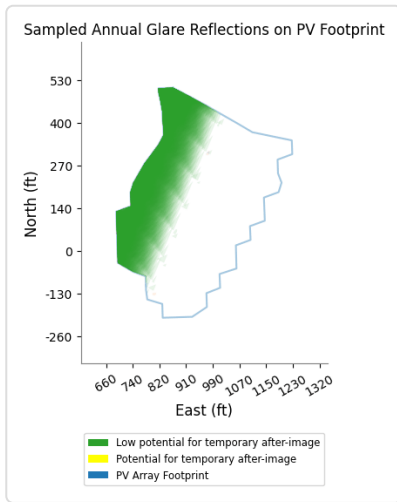
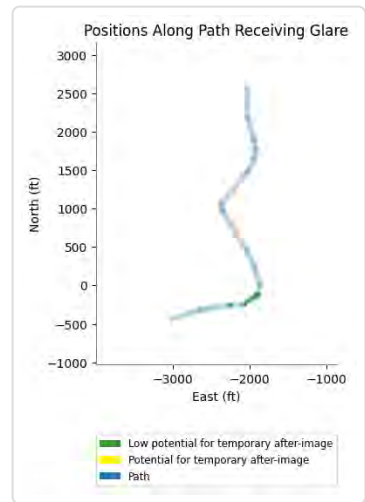
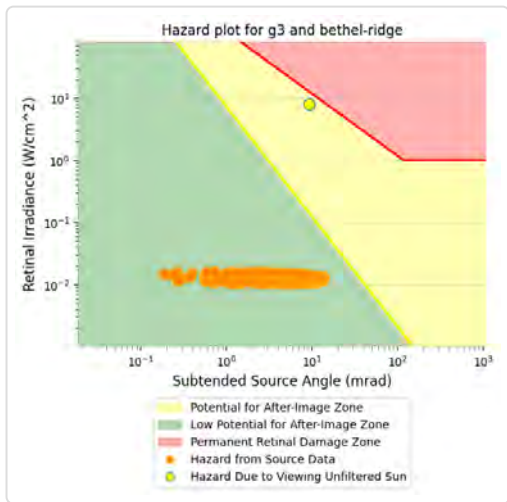
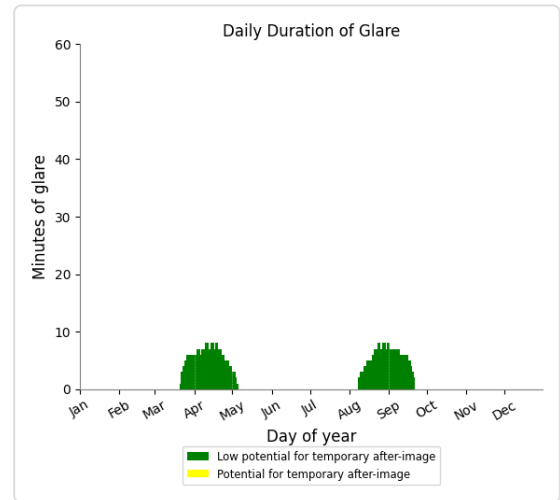
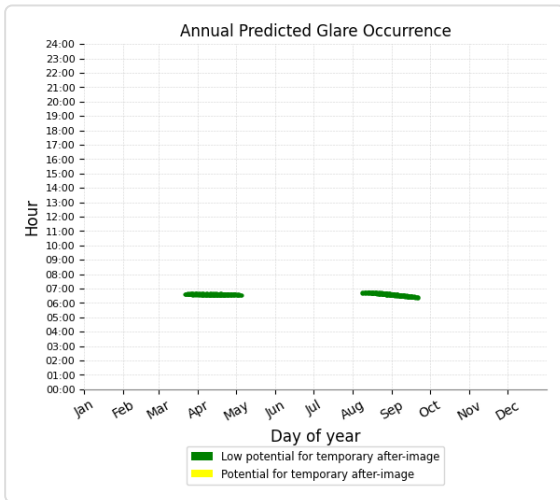
**PV: G3** low potential for temporary after-image

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Bethel Ridge Road	525	8.8	0	0.0
Bethel Ridge Road Trucks	628	10.5	0	0.0
Miller Road	0	0.0	0	0.0
OP 23	0	0.0	0	0.0

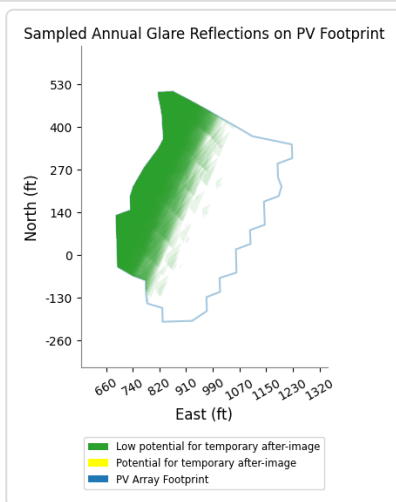
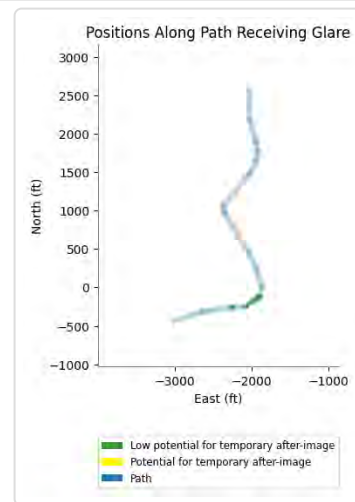
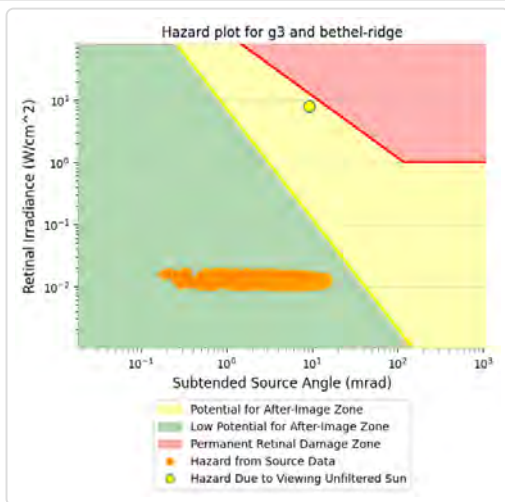
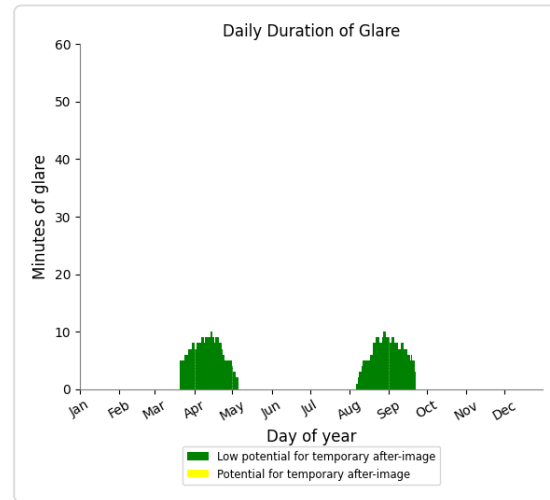
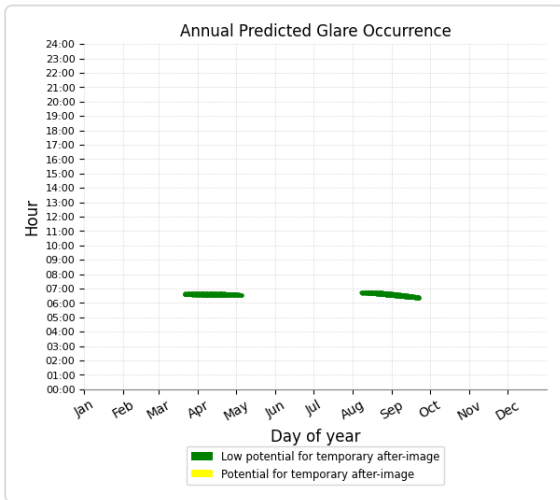
### G3 and Route: Bethel Ridge Road

Yellow glare: none  
 Green glare: 525 min.



### G3 and Route: Bethel Ridge Road Trucks

Yellow glare: none  
 Green glare: 628 min.



### G3 and Route: Miller Road

No glare found

## G3 and OP 23

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/](http://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

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## Group H



# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar South**

300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section H\_revised**

Client: REV Renewables

Created 23 Oct, 2025

Updated 23 Oct, 2025

Time-step 1 minute

Timezone offset UTC-5

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m<sup>2</sup>

Category 100 MW to 1 GW

Site ID 162668.26194

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 kWh
			min	hr	min	hr	
H1	25.0	180.0	119	2.0	120	2.0	-
H2	25.0	180.0	0	0.0	0	0.0	-
H3	25.0	180.0	1,480	24.7	808	13.5	-
H4	25.0	180.0	0	0.0	0	0.0	-
H5	25.0	180.0	0	0.0	0	0.0	-
H6	25.0	180.0	0	0.0	0	0.0	-
H7	25.0	180.0	2,760	46.0	302	5.0	-
H8	25.0	180.0	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
Miller Rd	4,359	72.7	1,230	20.5
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

# Component Data

## PV Arrays

**Name:** H1  
**Axis tracking:** Fixed (no rotation)  
**Tilt:** 25.0°  
**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.307412	-80.488361	1218.81	5.00	1223.81
2	40.307887	-80.488380	1216.21	5.00	1221.21
3	40.307910	-80.487402	1174.39	5.00	1179.39
4	40.307835	-80.487236	1172.15	5.00	1177.15
5	40.307764	-80.486906	1167.46	5.00	1172.46
6	40.307689	-80.486739	1166.17	5.00	1171.17
7	40.307613	-80.486573	1166.97	5.00	1171.97
8	40.307497	-80.486568	1173.06	5.00	1178.06
9	40.307459	-80.486403	1169.87	5.00	1174.87
10	40.307263	-80.486395	1176.32	5.00	1181.32
11	40.307226	-80.486230	1174.39	5.00	1179.39
12	40.307150	-80.486063	1172.49	5.00	1177.49
13	40.306085	-80.486020	1181.41	5.00	1186.41
14	40.306047	-80.485855	1175.40	5.00	1180.40
15	40.305377	-80.485828	1204.46	5.00	1209.46
16	40.305339	-80.485663	1201.55	5.00	1206.55
17	40.305267	-80.485333	1194.92	5.00	1199.92
18	40.305200	-80.484840	1188.50	5.00	1193.50
19	40.305084	-80.484835	1195.30	5.00	1200.30
20	40.305050	-80.484507	1189.85	5.00	1194.85
21	40.304933	-80.484502	1196.96	5.00	1201.96
22	40.304863	-80.487440	1242.43	5.00	1247.43
23	40.305534	-80.487468	1252.87	5.00	1257.87
24	40.305571	-80.487633	1252.21	5.00	1257.21
25	40.306242	-80.487660	1261.11	5.00	1266.11
26	40.306279	-80.487825	1260.36	5.00	1265.36
27	40.306950	-80.487852	1237.73	5.00	1242.73
28	40.306987	-80.488017	1234.28	5.00	1239.28
29	40.307183	-80.488025	1225.72	5.00	1230.72
30	40.307221	-80.488190	1224.37	5.00	1229.37
31	40.307337	-80.488195	1220.65	5.00	1225.65
32	40.307375	-80.488360	1219.67	5.00	1224.67

**Name:** H2

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.304762	-80.486619	1222.13	5.00	1227.13
2	40.304743	-80.487436	1236.65	5.00	1241.65
3	40.304626	-80.487431	1232.86	5.00	1237.86
4	40.304547	-80.487414	1230.58	5.00	1235.58
5	40.304469	-80.487379	1227.84	5.00	1232.84
6	40.304393	-80.487258	1221.93	5.00	1226.93
7	40.303444	-80.487219	1209.10	5.00	1214.10
8	40.303366	-80.487146	1206.67	5.00	1211.67
9	40.303291	-80.486967	1200.03	5.00	1205.03
10	40.303214	-80.486883	1197.30	5.00	1202.30
11	40.303218	-80.486722	1190.95	5.00	1195.95
12	40.303255	-80.486723	1190.35	5.00	1195.35
13	40.303332	-80.486807	1193.26	5.00	1198.26
14	40.303411	-80.486823	1193.37	5.00	1198.37
15	40.303489	-80.486896	1195.38	5.00	1200.38
16	40.304438	-80.486935	1210.94	5.00	1215.94
17	40.304514	-80.487056	1219.54	5.00	1224.54
18	40.304592	-80.487091	1224.84	5.00	1229.84
19	40.304649	-80.486453	1211.02	5.00	1216.02
20	40.304766	-80.486457	1219.83	5.00	1224.83

**Name:** H3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.302848	-80.487197	1202.92	5.00	1207.92
2	40.302836	-80.487685	1212.23	5.00	1217.23
3	40.302757	-80.487710	1210.73	5.00	1215.73
4	40.302677	-80.487723	1208.72	5.00	1213.72
5	40.302482	-80.487715	1201.55	5.00	1206.55
6	40.302437	-80.487833	1200.76	5.00	1205.76
7	40.302083	-80.487818	1195.89	5.00	1200.89
8	40.302038	-80.487980	1200.76	5.00	1205.76
9	40.301763	-80.487969	1203.78	5.00	1208.78
10	40.301717	-80.488130	1206.76	5.00	1211.76
11	40.301364	-80.488116	1210.16	5.00	1215.16
12	40.301318	-80.488278	1212.90	5.00	1217.90
13	40.301043	-80.488267	1221.24	5.00	1226.24
14	40.300998	-80.488428	1222.49	5.00	1227.49
15	40.300723	-80.488417	1227.61	5.00	1232.61
16	40.300677	-80.488579	1225.65	5.00	1230.65
17	40.300324	-80.488564	1230.02	5.00	1235.02
18	40.300286	-80.488399	1229.90	5.00	1234.90
19	40.300011	-80.488388	1227.70	5.00	1232.70
20	40.299973	-80.488223	1228.69	5.00	1233.69
21	40.299699	-80.488212	1227.11	5.00	1232.11
22	40.299659	-80.488125	1227.84	5.00	1232.84
23	40.299463	-80.488117	1225.66	5.00	1230.66
24	40.299475	-80.487629	1211.84	5.00	1216.84
25	40.299671	-80.487637	1216.67	5.00	1221.67
26	40.299714	-80.487561	1212.24	5.00	1217.24
27	40.301175	-80.487620	1192.80	5.00	1197.80
28	40.301966	-80.487652	1190.90	5.00	1195.90
29	40.302024	-80.487000	1153.71	5.00	1158.71
30	40.302456	-80.487018	1182.81	5.00	1187.81
31	40.302497	-80.487064	1186.77	5.00	1191.77
32	40.302693	-80.487072	1195.30	5.00	1200.30
33	40.302735	-80.487057	1196.49	5.00	1201.49
34	40.302772	-80.487058	1197.75	5.00	1202.75
35	40.302811	-80.487196	1202.01	5.00	1207.01

**Name:** H4

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.300588	-80.487431	1190.30	5.00	1195.30
2	40.299639	-80.487392	1205.31	5.00	1210.31
3	40.299647	-80.487068	1190.83	5.00	1195.83
4	40.299730	-80.486907	1182.87	5.00	1187.87
5	40.299813	-80.486747	1173.09	5.00	1178.09
6	40.299896	-80.486587	1163.37	5.00	1168.37
7	40.299979	-80.486427	1148.20	5.00	1153.20
8	40.300491	-80.486448	1131.90	5.00	1136.90
9	40.300528	-80.486613	1141.40	5.00	1146.40
10	40.301199	-80.486640	1131.03	5.00	1136.03
11	40.301233	-80.486968	1154.47	5.00	1159.47
12	40.301903	-80.486995	1150.50	5.00	1155.50
13	40.301891	-80.487484	1183.82	5.00	1188.82
14	40.300625	-80.487432	1189.88	5.00	1194.88

**Name:** H5

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.304899	-80.484174	1193.33	5.00	1198.33
2	40.304783	-80.484169	1199.22	5.00	1204.22
3	40.304749	-80.483841	1192.91	5.00	1197.91
4	40.304673	-80.483674	1192.05	5.00	1197.05
5	40.304598	-80.483508	1191.54	5.00	1196.54
6	40.304523	-80.483341	1191.39	5.00	1196.39
7	40.304407	-80.483336	1197.25	5.00	1202.25
8	40.304372	-80.483008	1187.83	5.00	1192.83
9	40.304305	-80.482515	1172.83	5.00	1177.83
10	40.304110	-80.482507	1178.98	5.00	1183.98
11	40.304072	-80.482342	1174.64	5.00	1179.64
12	40.303996	-80.482175	1170.10	5.00	1175.10
13	40.303801	-80.482168	1174.54	5.00	1179.54
14	40.303762	-80.482045	1169.57	5.00	1174.57
15	40.303646	-80.482040	1171.26	5.00	1176.26
16	40.303605	-80.481996	1169.59	5.00	1174.59
17	40.303367	-80.481987	1168.19	5.00	1173.19
18	40.303329	-80.483618	1150.75	5.00	1155.75
19	40.303374	-80.483456	1159.57	5.00	1164.57
20	40.303649	-80.483468	1174.47	5.00	1179.47
21	40.303701	-80.483022	1189.03	5.00	1194.03
22	40.303739	-80.483023	1190.48	5.00	1195.48
23	40.303774	-80.483309	1186.91	5.00	1191.91
24	40.303890	-80.483314	1192.73	5.00	1197.73
25	40.303928	-80.483479	1192.88	5.00	1197.88
26	40.304154	-80.483978	1195.80	5.00	1200.80
27	40.304439	-80.485298	1198.39	5.00	1203.39
28	40.304507	-80.485791	1198.54	5.00	1203.54
29	40.304578	-80.486121	1203.95	5.00	1208.95
30	40.304615	-80.486122	1206.16	5.00	1211.16
31	40.304661	-80.485961	1208.60	5.00	1213.60
32	40.304856	-80.485969	1219.19	5.00	1224.19

**Name:** H6

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.303367	-80.481987	1168.19	5.00	1173.19
2	40.303383	-80.481333	1127.84	5.00	1132.84
3	40.303541	-80.481338	1124.22	5.00	1129.22
4	40.303560	-80.480523	1100.70	5.00	1105.70
5	40.303640	-80.480524	1096.63	5.00	1101.63
6	40.303651	-80.480036	1088.77	5.00	1093.77
7	40.303218	-80.480019	1089.85	5.00	1094.85
8	40.303135	-80.480179	1096.92	5.00	1101.92
9	40.302819	-80.480166	1090.41	5.00	1095.41
10	40.302732	-80.480489	1103.12	5.00	1108.12
11	40.302337	-80.480473	1089.83	5.00	1094.83
12	40.302325	-80.480962	1102.21	5.00	1107.21
13	40.302400	-80.481128	1107.18	5.00	1112.18
14	40.302479	-80.481131	1111.21	5.00	1116.21
15	40.302460	-80.481948	1115.17	5.00	1120.17
16	40.302381	-80.481947	1110.86	5.00	1115.86
17	40.302290	-80.482433	1107.46	5.00	1112.46
18	40.302283	-80.482758	1106.48	5.00	1111.48
19	40.302399	-80.482763	1107.24	5.00	1112.24
20	40.302445	-80.482601	1112.15	5.00	1117.15
21	40.302640	-80.482609	1115.76	5.00	1120.76
22	40.302678	-80.482774	1114.65	5.00	1119.65
23	40.302757	-80.482779	1117.69	5.00	1122.69
24	40.302742	-80.483433	1118.18	5.00	1123.18
25	40.302662	-80.483429	1113.45	5.00	1118.45
26	40.302655	-80.483754	1112.50	5.00	1117.50
27	40.302730	-80.483921	1113.97	5.00	1118.97
28	40.302805	-80.484087	1114.41	5.00	1119.41
29	40.302922	-80.484092	1116.36	5.00	1121.36
30	40.302967	-80.483930	1120.84	5.00	1125.84
31	40.303084	-80.483935	1123.85	5.00	1128.85
32	40.303129	-80.483773	1133.06	5.00	1138.06
33	40.303246	-80.483778	1139.79	5.00	1144.79
34	40.303329	-80.483618	1150.75	5.00	1155.75



**Name:** H7

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.300070	-80.484140	1111.69	5.00	1116.69
2	40.300033	-80.484139	1110.75	5.00	1115.75
3	40.299995	-80.483986	1113.04	5.00	1118.04
4	40.299957	-80.483985	1111.79	5.00	1116.79
5	40.299920	-80.483811	1114.10	5.00	1119.10
6	40.299803	-80.483802	1110.38	5.00	1115.38
7	40.299762	-80.483801	1109.73	5.00	1114.73
8	40.299645	-80.483796	1105.09	5.00	1110.09
9	40.299269	-80.482963	1109.07	5.00	1114.07
10	40.299198	-80.482634	1108.26	5.00	1113.26
11	40.299122	-80.482467	1106.17	5.00	1111.17
12	40.299047	-80.482301	1106.72	5.00	1111.72
13	40.298889	-80.482294	1101.52	5.00	1106.52
14	40.298851	-80.482129	1106.92	5.00	1111.92
15	40.298735	-80.482124	1103.20	5.00	1108.20
16	40.298742	-80.481800	1101.10	5.00	1106.10
17	40.299492	-80.481830	1114.29	5.00	1119.29
18	40.299537	-80.481668	1109.74	5.00	1114.74
19	40.299733	-80.481676	1112.78	5.00	1117.78
20	40.299775	-80.481678	1112.81	5.00	1117.81
21	40.299782	-80.481351	1097.52	5.00	1102.52
22	40.299703	-80.481346	1095.82	5.00	1100.82
23	40.299711	-80.481021	1091.95	5.00	1096.95
24	40.300302	-80.481045	1084.60	5.00	1089.60
25	40.300290	-80.481533	1093.64	5.00	1098.64
26	40.300053	-80.481524	1102.32	5.00	1107.32
27	40.300049	-80.481687	1110.16	5.00	1115.16
28	40.300091	-80.481676	1108.83	5.00	1113.83
29	40.300208	-80.481681	1104.56	5.00	1109.56
30	40.300283	-80.481858	1106.84	5.00	1111.84
31	40.300358	-80.482025	1106.89	5.00	1111.89
32	40.300425	-80.482516	1115.81	5.00	1120.81
33	40.300501	-80.482681	1114.95	5.00	1119.95
34	40.300539	-80.482848	1116.82	5.00	1121.82
35	40.300655	-80.482856	1109.62	5.00	1114.62
36	40.300956	-80.483518	1115.36	5.00	1120.36
37	40.300994	-80.483685	1120.48	5.00	1125.48
38	40.301110	-80.483690	1114.77	5.00	1119.77
39	40.301185	-80.483865	1118.24	5.00	1123.24
40	40.301335	-80.484209	1124.61	5.00	1129.61



Name: H8

Axis tracking: Fixed (no rotation)

Tilt: 25.0°

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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.301966	-80.486071	1153.20	5.00	1158.20
2	40.301887	-80.486068	1147.24	5.00	1152.24
3	40.301809	-80.486054	1142.62	5.00	1147.62
4	40.301733	-80.485885	1143.78	5.00	1148.78
5	40.301696	-80.485715	1146.99	5.00	1151.99
6	40.301421	-80.485693	1132.77	5.00	1137.77
7	40.301383	-80.485523	1135.88	5.00	1140.88
8	40.301346	-80.485521	1134.54	5.00	1139.54
9	40.301308	-80.485362	1135.33	5.00	1140.33
10	40.301113	-80.485346	1124.00	5.00	1129.00
11	40.301067	-80.485503	1116.19	5.00	1121.19
12	40.301030	-80.485501	1114.41	5.00	1119.41
13	40.300955	-80.485333	1116.21	5.00	1121.21
14	40.300917	-80.485166	1119.18	5.00	1124.18
15	40.300800	-80.485161	1114.19	5.00	1119.19
16	40.300762	-80.485002	1116.86	5.00	1121.86
17	40.300646	-80.484997	1111.58	5.00	1116.58
18	40.300608	-80.484830	1114.18	5.00	1119.18
19	40.300492	-80.484826	1108.08	5.00	1113.08
20	40.300416	-80.484657	1110.70	5.00	1115.70
21	40.300379	-80.484490	1113.84	5.00	1118.84
22	40.300299	-80.484494	1110.46	5.00	1115.46
23	40.300262	-80.484493	1108.90	5.00	1113.90
24	40.300224	-80.484326	1112.14	5.00	1117.14
25	40.300187	-80.484325	1110.33	5.00	1115.33
26	40.300145	-80.484309	1108.76	5.00	1113.76
27	40.300108	-80.484307	1107.05	5.00	1112.05
28	40.300070	-80.484140	1111.69	5.00	1116.69
29	40.301335	-80.484209	1124.61	5.00	1129.61
30	40.301411	-80.484370	1127.59	5.00	1132.59
31	40.301449	-80.484541	1133.67	5.00	1138.67
32	40.301565	-80.484546	1129.00	5.00	1134.00
33	40.301640	-80.484725	1133.31	5.00	1138.31
34	40.301715	-80.484893	1137.78	5.00	1142.78
35	40.301790	-80.485065	1139.44	5.00	1144.44
36	40.301865	-80.485233	1143.63	5.00	1148.63
37	40.301903	-80.485411	1150.51	5.00	1155.51
38	40.302019	-80.485415	1147.95	5.00	1152.95
39	40.302008	-80.485907	1162.19	5.00	1167.19
40	40.302004	-80.486072	1157.16	5.00	1162.16

## Route Receptors

**Name:** Miller Rd

**Path type:** Two-way

**Azimuthal view angle:** 50.0°

**Downward view angle:** 90.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.310598	-80.490014	1249.37	4.50	1253.87
2	40.310420	-80.489921	1249.63	4.50	1254.13
3	40.309878	-80.489915	1245.67	4.50	1250.17
4	40.308844	-80.490170	1257.89	4.50	1262.39
5	40.308636	-80.490157	1262.15	4.50	1266.65
6	40.308452	-80.490009	1263.23	4.50	1267.73
7	40.307767	-80.489094	1221.46	4.50	1225.96
8	40.307138	-80.488730	1218.81	4.50	1223.31
9	40.306121	-80.488312	1248.59	4.50	1253.09
10	40.305053	-80.488027	1232.46	4.50	1236.96
11	40.303927	-80.487813	1219.25	4.50	1223.75
12	40.302470	-80.488344	1189.77	4.50	1194.27
13	40.300703	-80.489133	1204.57	4.50	1209.07
14	40.299885	-80.489470	1189.92	4.50	1194.42
15	40.298821	-80.489503	1157.03	4.50	1161.53
16	40.297675	-80.490189	1110.10	4.50	1114.60
17	40.297698	-80.490358	1103.08	4.50	1107.58
18	40.297822	-80.490494	1097.23	4.50	1101.73
19	40.298284	-80.490635	1084.83	4.50	1089.33
20	40.298276	-80.490825	1084.75	4.50	1089.25
21	40.297596	-80.491309	1066.90	4.50	1071.40

**Name:** Shades of Death Rd  
**Path type:** Two-way  
**Azimuthal view angle:** 50.0°  
**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.311879	-80.483886	1132.82	4.50	1137.32
2	40.310910	-80.482158	1099.21	4.50	1103.71
3	40.308238	-80.477373	1064.77	4.50	1069.27
4	40.308320	-80.476644	1052.76	4.50	1057.26
5	40.309515	-80.474863	1009.77	4.50	1014.27

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 5	5	40.310676	-80.489203	1260.05	6.00
OP 6	6	40.308396	-80.490930	1257.11	6.00
OP 7	7	40.306584	-80.492920	1195.86	6.00
OP 8	8	40.306584	-80.492920	1195.86	16.00
OP 9	9	40.304346	-80.494431	1101.51	6.00

## Obstruction Components

**Name:** Landscaping 1  
**Top height:** 6.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.308429	-80.488727	1245.14
2	40.308267	-80.489103	1251.31
3	40.307973	-80.488951	1232.78
4	40.307634	-80.488836	1220.08
5	40.306440	-80.488148	1252.90
6	40.304872	-80.487789	1239.40

**Name:** Landscaping 2  
**Top height:** 6.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.304721	-80.487767	1235.37
2	40.304420	-80.487717	1229.81
3	40.303582	-80.487497	1217.63

Name: Landscaping 3

Top height: 6.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.303488	-80.487705	1217.09
2	40.303053	-80.487917	1210.24
3	40.302646	-80.488017	1203.97
4	40.301825	-80.488393	1199.66
5	40.301238	-80.488621	1206.82
6	40.301013	-80.488763	1210.63
7	40.300835	-80.488759	1215.95
8	40.300695	-80.488870	1214.67
9	40.300352	-80.488875	1221.98

Name: Treeline

Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.304518	-80.494202	1104.07
2	40.304214	-80.493891	1072.44



Name: Treeline  
 Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.308216	-80.487818	1196.09
2	40.308044	-80.486841	1153.72
3	40.307422	-80.485795	1141.25
4	40.307197	-80.485538	1140.53
5	40.306301	-80.485479	1146.32
6	40.306215	-80.484738	1110.11
7	40.305749	-80.483247	1105.69
8	40.304783	-80.481316	1088.41

Name: Treeline  
 Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.307730	-80.489301	1218.20
2	40.303950	-80.488207	1206.96
3	40.299957	-80.489966	1175.78
4	40.297796	-80.491340	1090.27
5	40.296953	-80.493636	988.32

Name: Treeline  
Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.300370	-80.489122	1210.48
2	40.298782	-80.488274	1220.40

# 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
H1	25.0	180.0	119	2.0	120	2.0	-
H2	25.0	180.0	0	0.0	0	0.0	-
H3	25.0	180.0	1,480	24.7	808	13.5	-
H4	25.0	180.0	0	0.0	0	0.0	-
H5	25.0	180.0	0	0.0	0	0.0	-
H6	25.0	180.0	0	0.0	0	0.0	-
H7	25.0	180.0	2,760	46.0	302	5.0	-
H8	25.0	180.0	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
Miller Rd	4,359	72.7	1,230	20.5
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

## PV: H1 potential temporary after-image

Receptor results ordered by category of glare

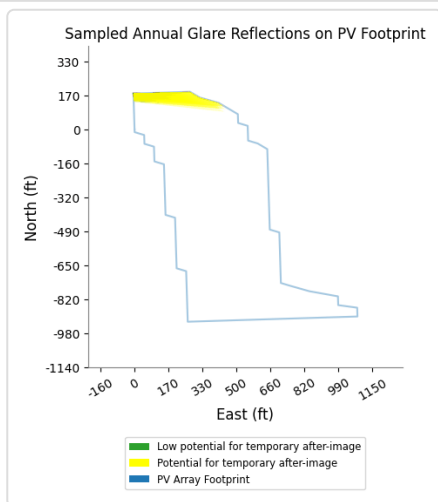
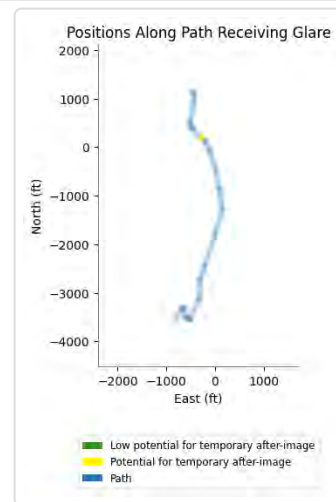
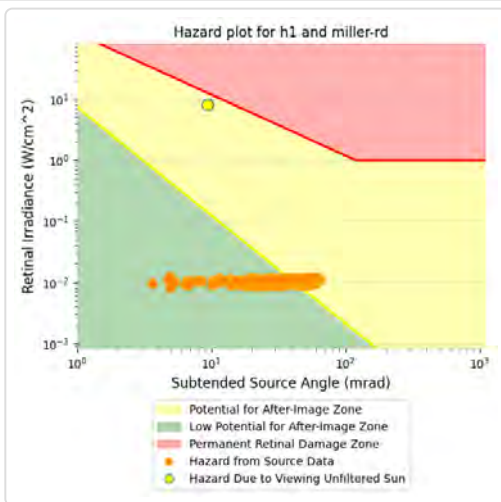
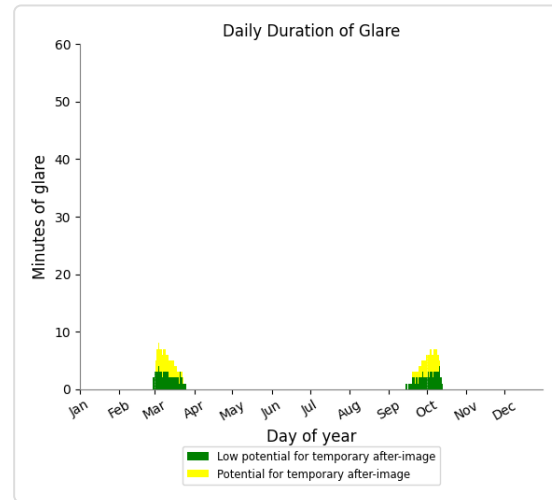
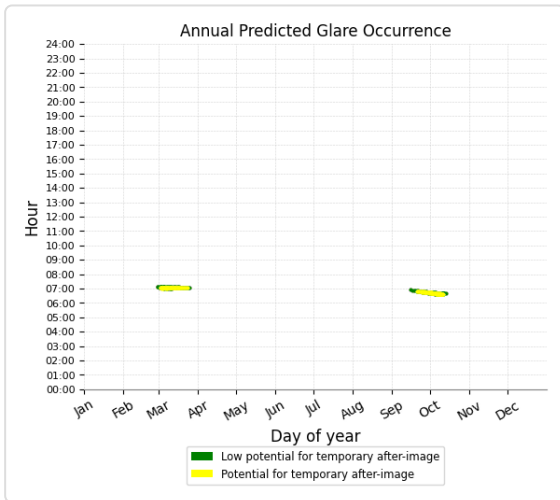
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	119	2.0	120	2.0
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0



# H1 and Route: Miller Rd

Yellow glare: 120 min.

Green glare: 119 min.



# H1 and Route: Shades of Death Rd

No glare found

## H1 and OP 5

No glare found

## H1 and OP 6

No glare found

## H1 and OP 7

No glare found

## H1 and OP 8

No glare found

## H1 and OP 9

No glare found

## PV: H2 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	0	0.0	0	0.0
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

## H2 and Route: Miller Rd

No glare found

## H2 and Route: Shades of Death Rd

No glare found

## H2 and OP 5

No glare found

## H2 and OP 6

No glare found

## H2 and OP 7

No glare found

## H2 and OP 8

No glare found

## H2 and OP 9

No glare found

## PV: H3 potential temporary after-image

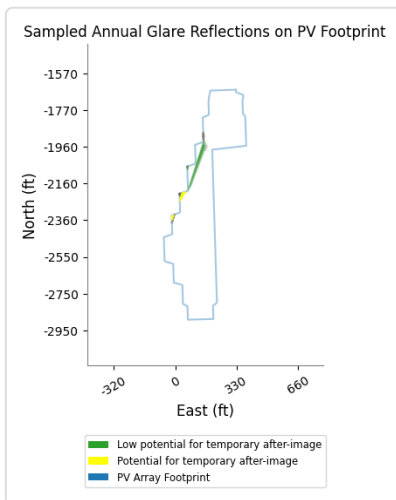
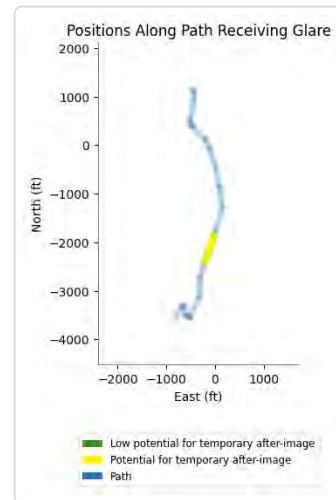
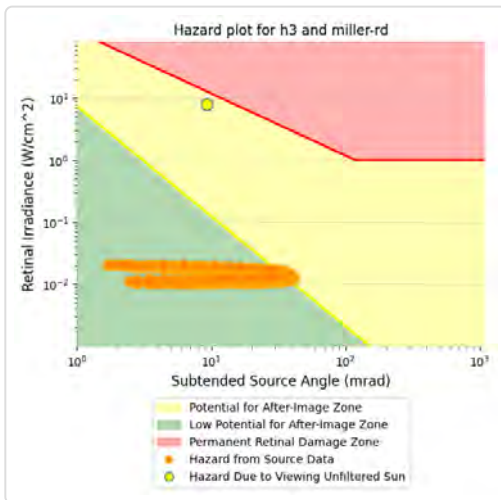
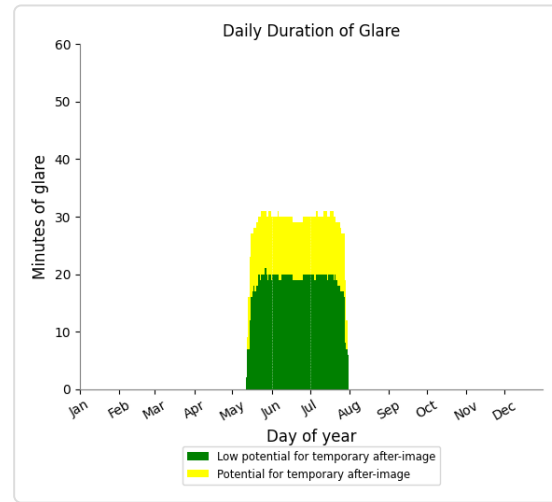
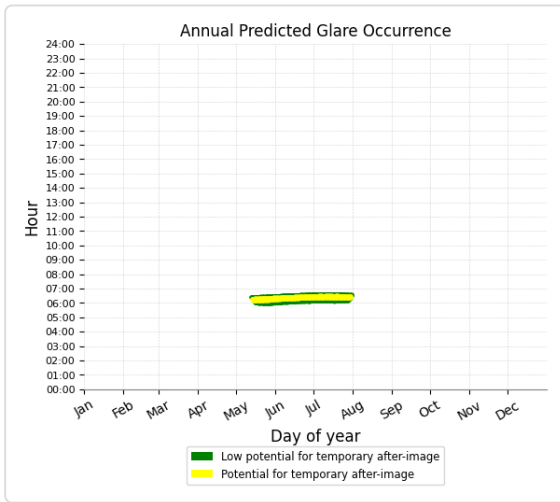
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	1,480	24.7	808	13.5
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

### H3 and Route: Miller Rd

Yellow glare: 808 min.

Green glare: 1,480 min.



### H3 and Route: Shades of Death Rd

No glare found

### H3 and OP 5

No glare found

### H3 and OP 6

No glare found

### H3 and OP 7

No glare found

### H3 and OP 8

No glare found

### H3 and OP 9

No glare found

### PV: H4 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	0	0.0	0	0.0
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

### H4 and Route: Miller Rd

No glare found

### H4 and Route: Shades of Death Rd

No glare found

### H4 and OP 5

No glare found

### H4 and OP 6

No glare found

## H4 and OP 7

No glare found

## H4 and OP 8

No glare found

## H4 and OP 9

No glare found

## PV: H5 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	0	0.0	0	0.0
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

## H5 and Route: Miller Rd

No glare found

## H5 and Route: Shades of Death Rd

No glare found

## H5 and OP 5

No glare found

## H5 and OP 6

No glare found

## H5 and OP 7

No glare found

## H5 and OP 8

No glare found

## H5 and OP 9

No glare found

## PV: H6 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	0	0.0	0	0.0
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

## H6 and Route: Miller Rd

No glare found

## H6 and Route: Shades of Death Rd

No glare found

## H6 and OP 5

No glare found

## H6 and OP 6

No glare found

## H6 and OP 7

No glare found

## H6 and OP 8

No glare found

## H6 and OP 9

No glare found

**PV: H7** potential temporary after-image

*Receptor results ordered by category of glare*

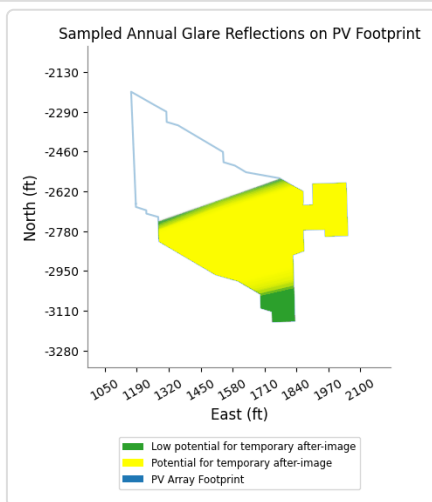
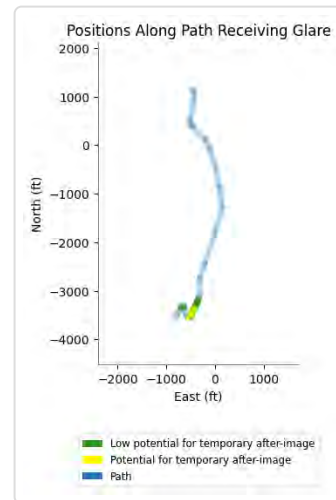
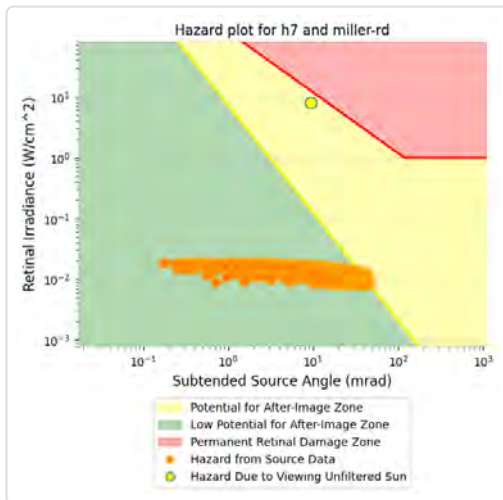
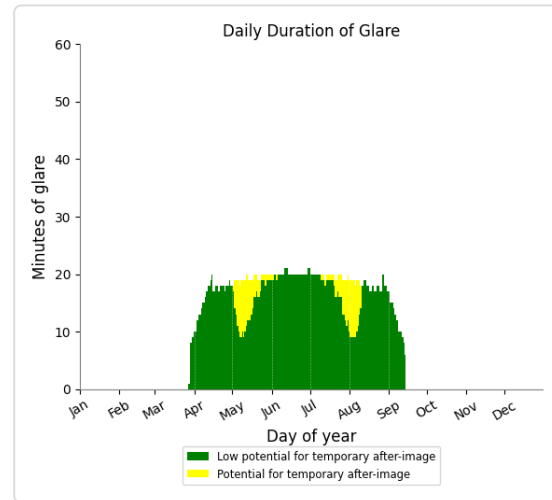
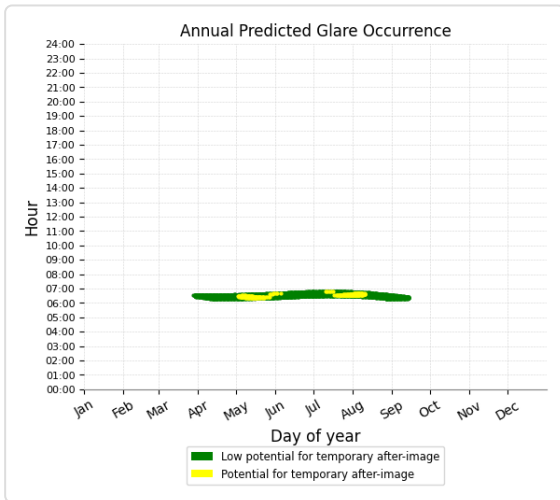
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	2,760	46.0	302	5.0
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0



## H7 and Route: Miller Rd

Yellow glare: 302 min.

Green glare: 2,760 min.



## H7 and Route: Shades of Death Rd

No glare found

## H7 and OP 5

No glare found

## H7 and OP 6

No glare found

## H7 and OP 7

No glare found

## H7 and OP 8

No glare found

## H7 and OP 9

No glare found

## PV: H8 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	0	0.0	0	0.0
Shades of Death Rd	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

## H8 and Route: Miller Rd

No glare found

## H8 and Route: Shades of Death Rd

No glare found

## H8 and OP 5

No glare found

## H8 and OP 6

No glare found

## **H8 and OP 7**

No glare found

## **H8 and OP 8**

No glare found

## **H8 and OP 9**

No glare found

# Assumptions

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"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/](http://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

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## Group I

# FORGESOLAR GLARE ANALYSIS

Project: **REV Cornerstone Solar South**

300 MW Solar Project in Jefferson TWP, Washington County, PA

Site configuration: **Cornerstone Section I\_revised**

Client: REV Renewables

Created 20 Sep, 2025

Updated 23 Oct, 2025

Time-step 1 minute

Timezone offset UTC-5

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m<sup>2</sup>

Category 100 MW to 1 GW

Site ID 159922.26194

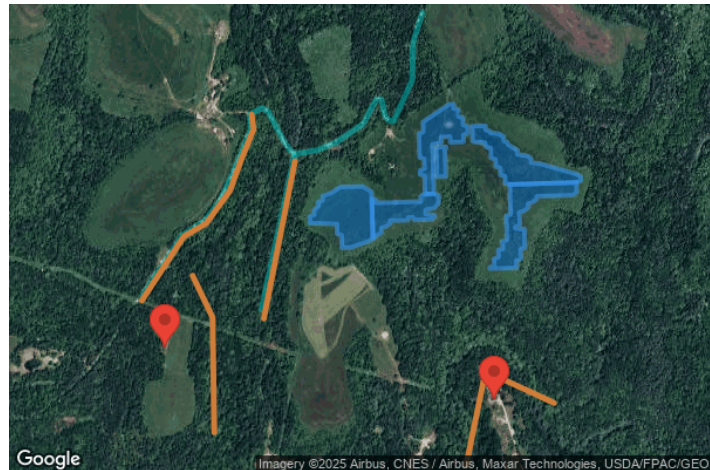
Ocular transmission coefficient 0.5

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 kWh
			min	hr	min	hr	
I1	25.0	180.0	1,010	16.8	0	0.0	-
I2	25.0	180.0	0	0.0	0	0.0	-
I3	25.0	180.0	0	0.0	0	0.0	-
I4	25.0	180.0	212	3.5	3	0.1	-
I5	25.0	180.0	735	12.2	0	0.0	-
I6	25.0	180.0	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
Miller Rd	1,346	22.4	3	0.1
Village Rd	0	0.0	0	0.0
OP 23	611	10.2	0	0.0
OP 24	0	0.0	0	0.0

# Component Data

## PV Arrays

**Name:** I1

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.298158	-80.487988	1220.26	5.00	1225.26
2	40.298041	-80.487983	1222.20	5.00	1227.20
3	40.298004	-80.487818	1215.95	5.00	1220.95
4	40.297808	-80.487810	1220.76	5.00	1225.76
5	40.297770	-80.487645	1214.93	5.00	1219.93
6	40.297575	-80.487638	1219.01	5.00	1224.01
7	40.297537	-80.487473	1211.75	5.00	1216.75
8	40.297341	-80.487465	1206.28	5.00	1211.28
9	40.297296	-80.487626	1210.23	5.00	1215.23
10	40.297100	-80.487618	1199.18	5.00	1204.18
11	40.297088	-80.488106	1204.25	5.00	1209.25
12	40.297247	-80.488115	1215.41	5.00	1220.41
13	40.297239	-80.488440	1214.70	5.00	1219.70
14	40.297081	-80.488435	1205.00	5.00	1210.00
15	40.297031	-80.488760	1195.65	5.00	1200.65
16	40.296994	-80.488758	1194.51	5.00	1199.51
17	40.296477	-80.488737	1186.31	5.00	1191.31
18	40.296124	-80.488723	1180.08	5.00	1185.08
19	40.295649	-80.488704	1166.91	5.00	1171.91
20	40.295641	-80.489029	1162.36	5.00	1167.36
21	40.296153	-80.489049	1175.24	5.00	1180.24
22	40.296191	-80.489214	1169.81	5.00	1174.81
23	40.296308	-80.489219	1170.68	5.00	1175.68
24	40.296353	-80.489058	1180.06	5.00	1185.06
25	40.296628	-80.489069	1182.51	5.00	1187.51
26	40.296666	-80.489234	1176.53	5.00	1181.53
27	40.297336	-80.489261	1176.62	5.00	1181.62
28	40.297382	-80.489099	1185.97	5.00	1190.97
29	40.297656	-80.489110	1185.19	5.00	1190.19
30	40.297739	-80.488950	1191.92	5.00	1196.92
31	40.297822	-80.488790	1199.51	5.00	1204.51
32	40.297905	-80.488630	1206.74	5.00	1211.74
33	40.297988	-80.488470	1214.18	5.00	1219.18
34	40.298071	-80.488310	1221.36	5.00	1226.36
35	40.298154	-80.488150	1224.01	5.00	1229.01

**Name:** I2

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.296964	-80.488267	1196.56	5.00	1201.56
2	40.296956	-80.488592	1196.22	5.00	1201.22
3	40.296876	-80.488627	1193.02	5.00	1198.02
4	40.296127	-80.488597	1178.09	5.00	1183.09
5	40.296134	-80.488272	1166.50	5.00	1171.50
6	40.296884	-80.488303	1191.98	5.00	1196.98
7	40.296926	-80.488265	1193.86	5.00	1198.86



**Name:** I3

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.295649	-80.488704	1166.91	5.00	1171.91
2	40.295611	-80.488539	1161.38	5.00	1166.38
3	40.295416	-80.488531	1155.61	5.00	1160.61
4	40.295335	-80.488599	1153.70	5.00	1158.70
5	40.295254	-80.488688	1151.45	5.00	1156.45
6	40.295204	-80.489013	1152.55	5.00	1157.55
7	40.295088	-80.489008	1144.97	5.00	1149.97
8	40.295054	-80.488680	1137.45	5.00	1142.45
9	40.295016	-80.488678	1135.18	5.00	1140.18
10	40.294935	-80.488775	1133.34	5.00	1138.34
11	40.294919	-80.489427	1131.61	5.00	1136.61
12	40.294997	-80.489493	1136.04	5.00	1141.04
13	40.294993	-80.489658	1135.33	5.00	1140.33
14	40.294914	-80.489655	1131.28	5.00	1136.28
15	40.294898	-80.490306	1149.01	5.00	1154.01
16	40.294819	-80.490305	1150.82	5.00	1155.82
17	40.294736	-80.490465	1156.60	5.00	1161.60
18	40.294691	-80.490627	1158.87	5.00	1163.87
19	40.294574	-80.490622	1155.77	5.00	1160.77
20	40.294491	-80.490782	1156.58	5.00	1161.58
21	40.294408	-80.490942	1158.26	5.00	1163.26
22	40.295516	-80.490987	1111.26	5.00	1116.26
23	40.295478	-80.490822	1112.65	5.00	1117.65
24	40.295399	-80.490817	1119.14	5.00	1124.14
25	40.295437	-80.489186	1154.52	5.00	1159.52
26	40.295596	-80.489190	1156.17	5.00	1161.17
27	40.295641	-80.489029	1162.36	5.00	1167.36

**Name:** l4

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.294408	-80.490942	1158.26	5.00	1163.26
2	40.294325	-80.491102	1159.15	5.00	1164.15
3	40.294238	-80.491426	1165.91	5.00	1170.91
4	40.294152	-80.491749	1176.24	5.00	1181.24
5	40.294144	-80.492074	1175.90	5.00	1180.90
6	40.294498	-80.492088	1171.44	5.00	1176.44
7	40.294535	-80.492253	1162.53	5.00	1167.53
8	40.294810	-80.492264	1149.49	5.00	1154.49
9	40.294829	-80.493246	1099.53	5.00	1104.53
10	40.295024	-80.493254	1095.43	5.00	1100.43
11	40.295070	-80.493092	1100.80	5.00	1105.80
12	40.295186	-80.493097	1097.41	5.00	1102.41
13	40.295267	-80.493008	1097.97	5.00	1102.97
14	40.295311	-80.492939	1099.25	5.00	1104.25
15	40.295427	-80.492943	1094.74	5.00	1099.74
16	40.295473	-80.492782	1097.25	5.00	1102.25
17	40.295589	-80.492786	1091.91	5.00	1096.91
18	40.295676	-80.492463	1094.14	5.00	1099.14
19	40.295759	-80.492303	1092.44	5.00	1097.44
20	40.295842	-80.492143	1090.21	5.00	1095.21
21	40.295862	-80.491328	1092.77	5.00	1097.77
22	40.295786	-80.491161	1095.29	5.00	1100.29
23	40.295711	-80.490995	1099.64	5.00	1104.64
24	40.295516	-80.490987	1111.26	5.00	1116.26

Name: I5

Axis tracking: Fixed (no rotation)

Tilt: 25.0°

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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.295911	-80.485934	1186.87	5.00	1191.87
2	40.295948	-80.486099	1183.81	5.00	1188.81
3	40.296144	-80.486107	1186.86	5.00	1191.86
4	40.296182	-80.486272	1183.79	5.00	1188.79
5	40.296377	-80.486279	1187.40	5.00	1192.40
6	40.296415	-80.486444	1185.22	5.00	1190.22
7	40.296611	-80.486452	1188.21	5.00	1193.21
8	40.296649	-80.486617	1187.33	5.00	1192.33
9	40.296923	-80.486629	1191.15	5.00	1196.15
10	40.296961	-80.486794	1191.82	5.00	1196.82
11	40.296999	-80.486795	1192.15	5.00	1197.15
12	40.297039	-80.486839	1192.69	5.00	1197.69
13	40.297077	-80.486840	1192.50	5.00	1197.50
14	40.297108	-80.487290	1195.09	5.00	1200.09
15	40.297541	-80.487307	1202.61	5.00	1207.61
16	40.297552	-80.486819	1181.44	5.00	1186.44
17	40.297436	-80.486815	1185.68	5.00	1190.68
18	40.297398	-80.486650	1182.86	5.00	1187.86
19	40.297361	-80.486648	1184.56	5.00	1189.56
20	40.297327	-80.486320	1175.66	5.00	1180.66
21	40.297251	-80.486153	1173.68	5.00	1178.68
22	40.297135	-80.486148	1179.87	5.00	1184.87
23	40.297096	-80.486025	1178.30	5.00	1183.30
24	40.297018	-80.485980	1181.50	5.00	1186.50
25	40.296943	-80.485814	1180.12	5.00	1185.12
26	40.296867	-80.485647	1179.86	5.00	1184.86
27	40.296751	-80.485642	1185.58	5.00	1190.58
28	40.296717	-80.485314	1179.50	5.00	1184.50
29	40.296642	-80.485148	1178.51	5.00	1183.51
30	40.296525	-80.485143	1185.18	5.00	1190.18
31	40.296491	-80.484815	1176.61	5.00	1181.61
32	40.296420	-80.484485	1164.05	5.00	1169.05
33	40.296349	-80.484155	1141.52	5.00	1146.52
34	40.296277	-80.483825	1121.70	5.00	1126.70
35	40.296206	-80.483495	1111.40	5.00	1116.40
36	40.296131	-80.483329	1109.52	5.00	1114.52
37	40.296014	-80.483324	1110.13	5.00	1115.13
38	40.295969	-80.483486	1113.63	5.00	1118.63

**Name:** I6

**Axis tracking:** Fixed (no rotation)

**Tilt:** 25.0°

**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 (ft)	Height above ground (ft)	Total elevation (ft)
1	40.293597	-80.486657	1106.95	5.00	1111.95
2	40.293643	-80.486496	1108.83	5.00	1113.83
3	40.293838	-80.486504	1109.73	5.00	1114.73
4	40.293884	-80.486342	1111.45	5.00	1116.45
5	40.294080	-80.486350	1111.62	5.00	1116.62
6	40.294125	-80.486188	1114.63	5.00	1119.63
7	40.294321	-80.486196	1117.10	5.00	1122.10
8	40.294367	-80.486035	1121.93	5.00	1126.93
9	40.294641	-80.486046	1132.07	5.00	1137.07
10	40.295037	-80.486062	1144.89	5.00	1149.89
11	40.295082	-80.485900	1152.43	5.00	1157.43
12	40.295911	-80.485934	1186.87	5.00	1191.87
13	40.295969	-80.483486	1113.63	5.00	1118.63
14	40.295694	-80.483475	1112.62	5.00	1117.62
15	40.295611	-80.483635	1116.37	5.00	1121.37
16	40.295580	-80.484939	1168.17	5.00	1173.17
17	40.295501	-80.484938	1164.40	5.00	1169.40
18	40.295418	-80.485098	1165.59	5.00	1170.59
19	40.295372	-80.485260	1167.64	5.00	1172.64
20	40.295256	-80.485255	1161.04	5.00	1166.04
21	40.295173	-80.485415	1160.98	5.00	1165.98
22	40.295127	-80.485577	1162.11	5.00	1167.11
23	40.294774	-80.485562	1140.36	5.00	1145.36
24	40.294728	-80.485724	1138.43	5.00	1143.43
25	40.294691	-80.485723	1136.80	5.00	1141.80
26	40.294657	-80.485394	1127.21	5.00	1132.21
27	40.294145	-80.485374	1107.38	5.00	1112.38
28	40.294099	-80.485535	1109.36	5.00	1114.36
29	40.293824	-80.485524	1102.92	5.00	1107.92
30	40.293779	-80.485686	1105.70	5.00	1110.70
31	40.293583	-80.485678	1102.71	5.00	1107.71
32	40.293564	-80.486494	1108.37	5.00	1113.37
33	40.293560	-80.486656	1107.05	5.00	1112.05

# Route Receptors

Name: Miller Rd

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.300703	-80.489133	1204.57	4.50	1209.07
2	40.299885	-80.489470	1189.92	4.50	1194.42
3	40.298821	-80.489503	1157.03	4.50	1161.53
4	40.297675	-80.490189	1110.10	4.50	1114.60
5	40.297698	-80.490358	1103.08	4.50	1107.58
6	40.297822	-80.490494	1097.23	4.50	1101.73
7	40.298284	-80.490635	1084.83	4.50	1089.33
8	40.298276	-80.490825	1084.75	4.50	1089.25
9	40.297596	-80.491309	1066.90	4.50	1071.40
10	40.297076	-80.492307	1030.77	4.50	1035.27
11	40.296864	-80.492996	1011.56	4.50	1016.06
12	40.296767	-80.493742	988.58	4.50	993.08
13	40.296833	-80.493939	982.66	4.50	987.16
14	40.297127	-80.494209	978.22	4.50	982.72
15	40.297949	-80.494784	1007.60	4.50	1012.10
16	40.298045	-80.495003	1018.45	4.50	1022.95
17	40.297873	-80.495439	1046.63	4.50	1051.13
18	40.297453	-80.495403	1061.35	4.50	1065.85
19	40.296616	-80.495840	1078.82	4.50	1083.32
20	40.295437	-80.496552	1089.13	4.50	1093.63
21	40.294873	-80.497131	1086.27	4.50	1090.77
22	40.294500	-80.497914	1088.84	4.50	1093.34
23	40.292782	-80.499395	1083.71	4.50	1088.21

**Name:** Village Rd  
**Path type:** Two-way  
**Azimuthal view angle:** 50.0°  
**Downward view angle:** 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.296716	-80.493819	987.11	4.50	991.61
2	40.292420	-80.495020	1002.57	4.50	1007.07

## Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 23	23	40.291354	-80.498542	1104.61	6.00
OP 24	24	40.289917	-80.486468	905.87	6.00

## Obstruction Components

**Name:** Treeline  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.297862	-80.495383	1049.31
2	40.297450	-80.495312	1055.13
3	40.296597	-80.495767	1073.37
4	40.295733	-80.496181	1080.19
5	40.295408	-80.496494	1084.47
6	40.294825	-80.497049	1079.07
7	40.294458	-80.497867	1079.17
8	40.292674	-80.499406	1088.59



Name: Treeline  
Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.296555	-80.493800	983.13
2	40.292170	-80.494937	1008.39

Name: Treeline I5  
Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.293365	-80.497546	1070.93
2	40.292203	-80.496816	1002.74
3	40.288995	-80.496752	971.79

**Name:** Treeline I6  
**Top height:** 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.289813	-80.484306	845.56
2	40.290697	-80.486817	893.74
3	40.288078	-80.487525	872.27



# 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 kWh
			min	hr	min	hr	
I1	25.0	180.0	1,010	16.8	0	0.0	-
I2	25.0	180.0	0	0.0	0	0.0	-
I3	25.0	180.0	0	0.0	0	0.0	-
I4	25.0	180.0	212	3.5	3	0.1	-
I5	25.0	180.0	735	12.2	0	0.0	-
I6	25.0	180.0	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
Miller Rd	1,346	22.4	3	0.1
Village Rd	0	0.0	0	0.0
OP 23	611	10.2	0	0.0
OP 24	0	0.0	0	0.0

## PV: I1 low potential for temporary after-image

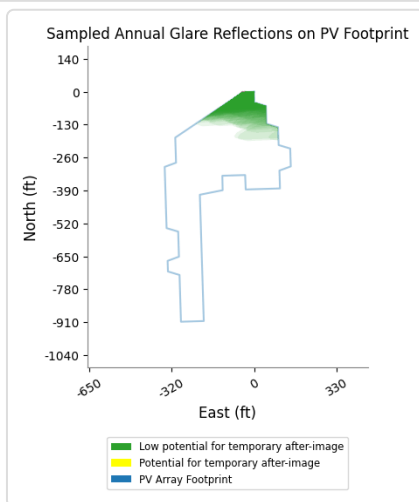
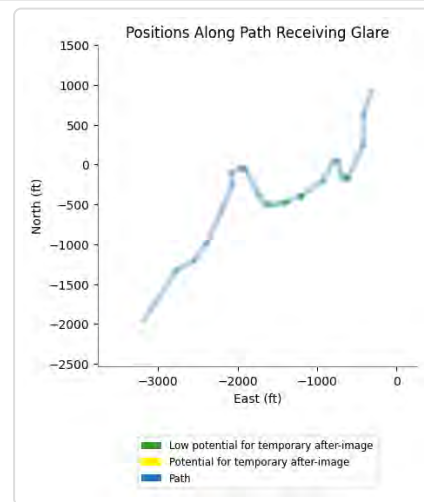
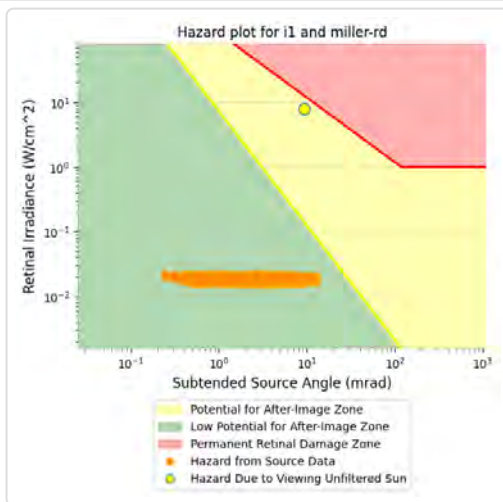
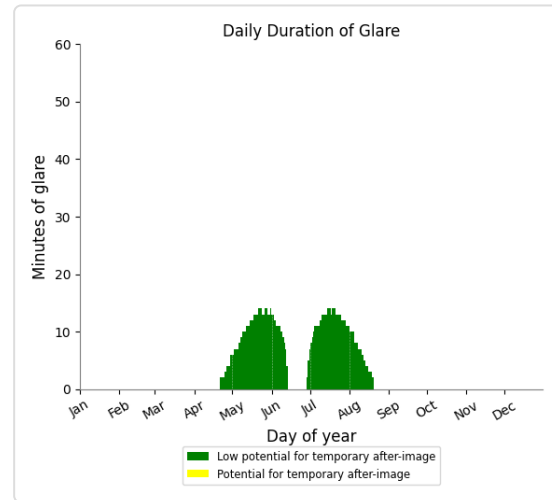
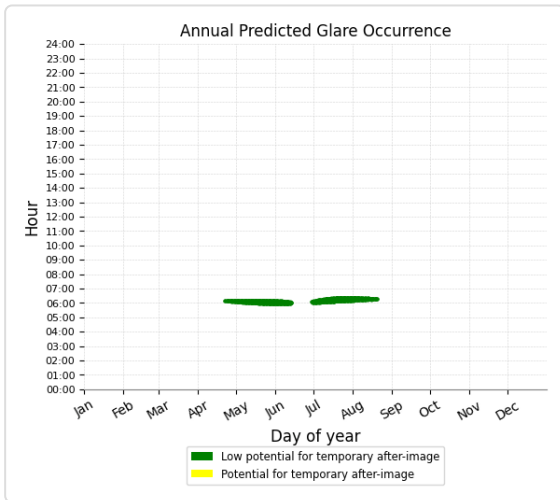
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	1,010	16.8	0	0.0
Village Rd	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0

## I1 and Route: Miller Rd

Yellow glare: none

Green glare: 1,010 min.



## I1 and Route: Village Rd

No glare found

## I1 and OP 23

No glare found

## I1 and OP 24

No glare found

## PV: I2 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	0	0.0	0	0.0
Village Rd	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0

## I2 and Route: Miller Rd

No glare found

## I2 and Route: Village Rd

No glare found

## I2 and OP 23

No glare found

## I2 and OP 24

No glare found

## PV: I3 no glare found

*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	0	0.0	0	0.0
Village Rd	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0

### I3 and Route: Miller Rd

No glare found

### I3 and Route: Village Rd

No glare found

### I3 and OP 23

No glare found

### I3 and OP 24

No glare found

### PV: I4 potential temporary after-image

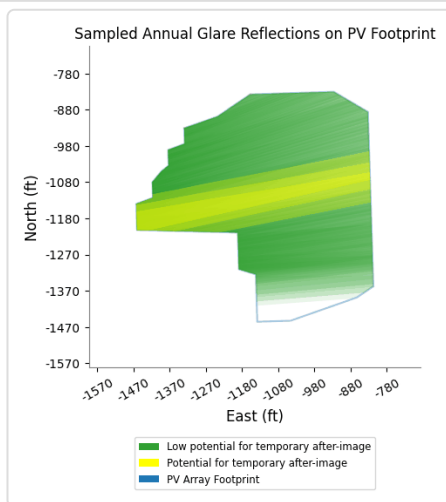
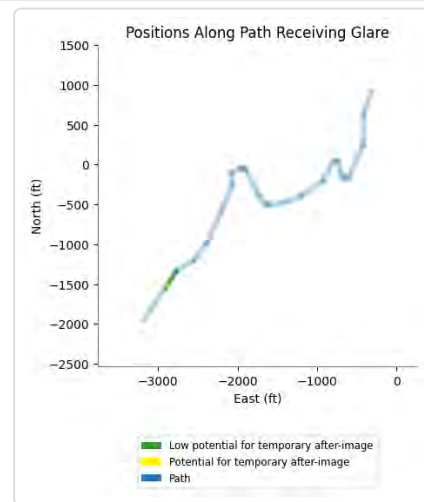
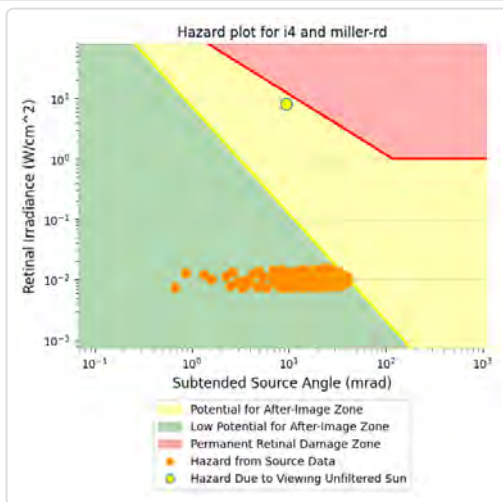
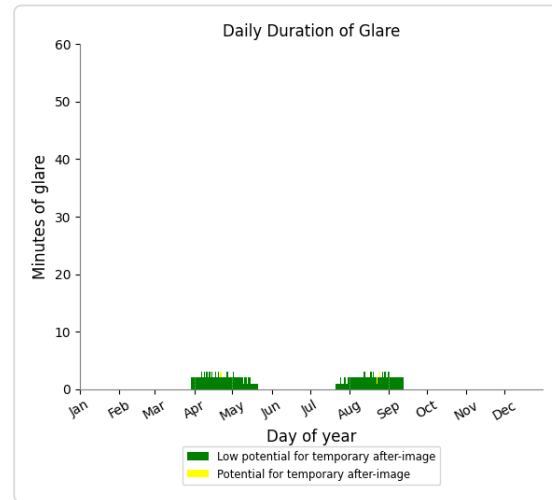
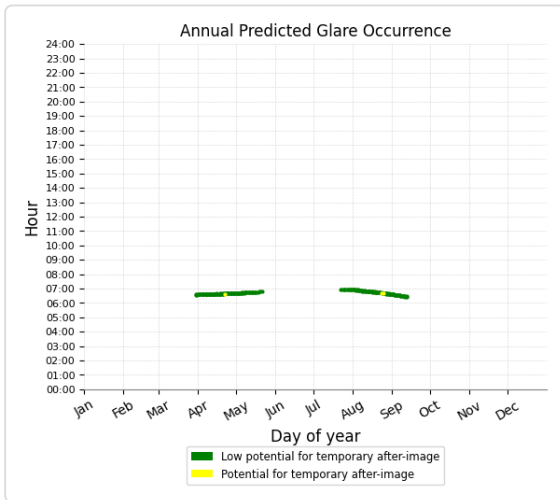
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	212	3.5	3	0.1
Village Rd	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0

## I4 and Route: Miller Rd

Yellow glare: 3 min.

Green glare: 212 min.



## I4 and Route: Village Rd

No glare found

## I4 and OP 23

No glare found

## I4 and OP 24

No glare found

## PV: I5 **low potential for temporary after-image**

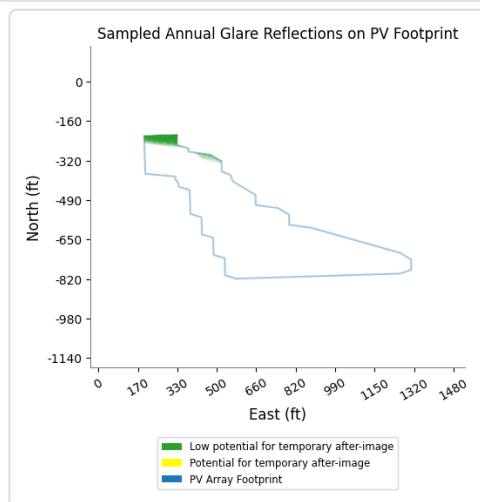
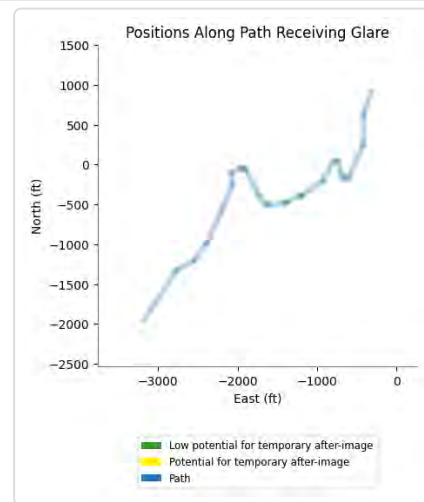
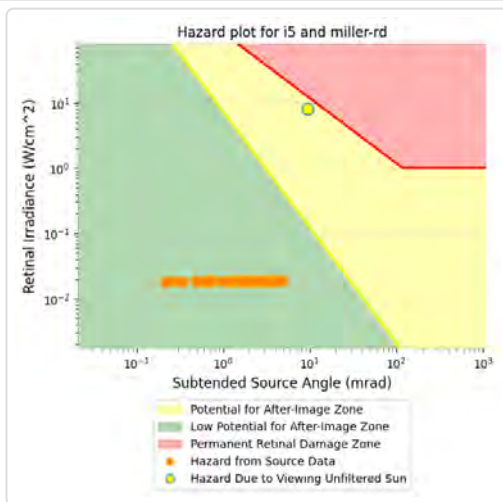
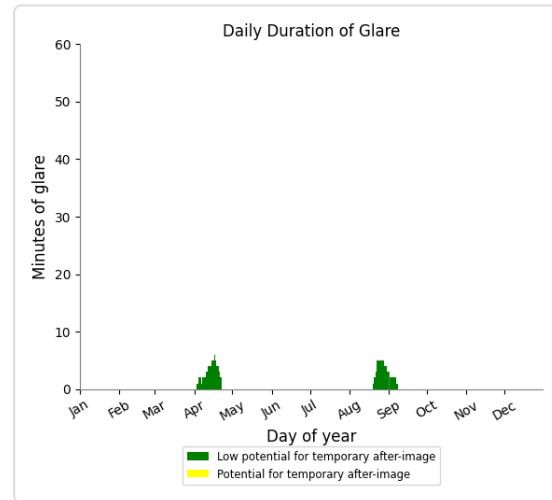
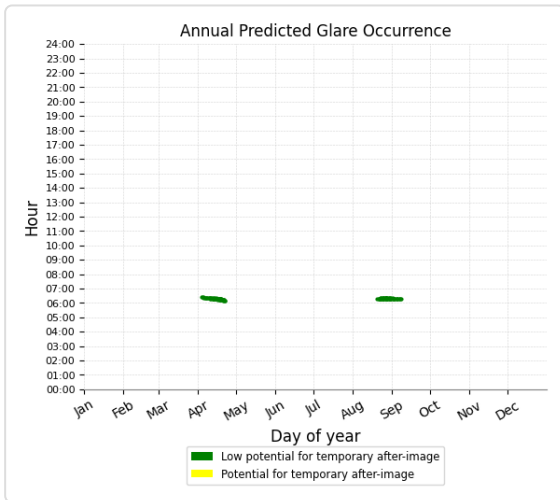
*Receptor results ordered by category of glare*

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	124	2.1	0	0.0
Village Rd	0	0.0	0	0.0
OP 23	611	10.2	0	0.0
OP 24	0	0.0	0	0.0

## I5 and Route: Miller Rd

Yellow glare: none

Green glare: 124 min.



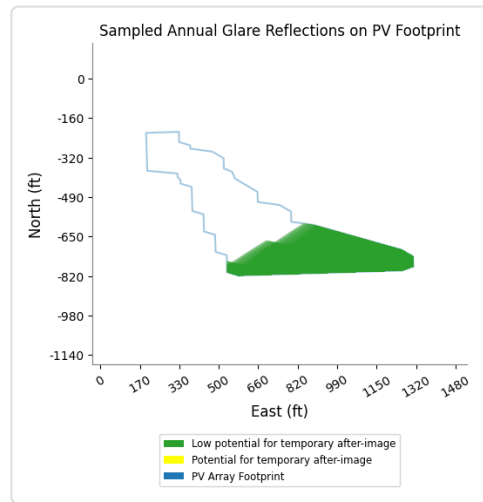
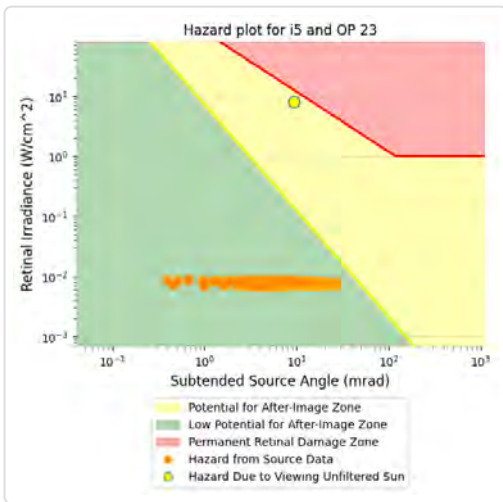
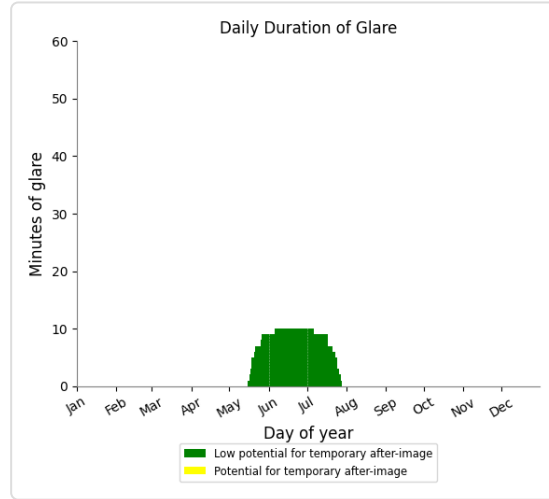
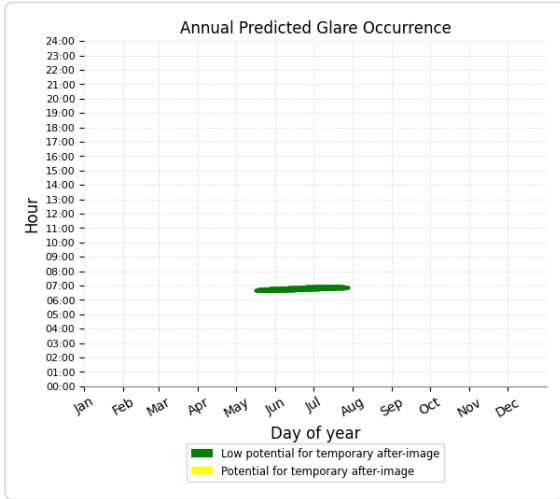
## I5 and Route: Village Rd

No glare found

## I5 and OP 23

Yellow glare: none

Green glare: 611 min.



## I5 and OP 24

No glare found

**PV: I6** no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Miller Rd	0	0.0	0	0.0
Village Rd	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0



**I6 and Route: Miller Rd**

No glare found

**I6 and Route: Village Rd**

No glare found

**I6 and OP 23**

No glare found

**I6 and OP 24**

No glare found

# Assumptions

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"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/](http://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

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