



Centerpoint Solar Glare Study Summary

Component Data (pages#3-32): Input data for the array and nearby 'receptors' that have been identified (*coordinates & elevations*). Output data of glare projections for each receptor location.

Receptors: The study of the solar array to be installed highlighted (9) potential locations for potential glare. These locations are defined as 'receptors' and named (*Eastbound Hwy, Northbound Exit Ramp, Westbound Exit Ramp, Westbound Highway, FP 1, FP 2, OP 1, OP 2, OP*). These receptors are defined and highlighted on map from pg5- pg10.

Statement of Results: Page 11&12 displays the results for the annual amount of glare (*both 'green' and 'yellow' as defined on page 53*) projected for each receptor site in regards to the solar array. The results for each receptor site is broken down on pages 13-18. Pages 19-52 show the results for glare in regards to the building and tanks at the site (*not required to be reviewed, simply for comparison of glare caused by existing structures*).

Muska Statement: Yellow Glare to be made aware of occurs in receptor sites (*eastbound hwy, west bound entrance ramp, westbound hwy*). The maximum reported yellow glare for any of these sites is limited to 1,725 minutes per year. This glare is expected to be present from April-September annually; resulting in a window of roughly 10 minutes per day for potential glare. No yellow glare detected for the flight paths (*FP1, FP2*). The OP receptor location results are of no concern as they pose no effect on traffic or neighbors.

Sincerely,

Muska Electric Company

Michael Ahmann

Project Manager & Estimator

FORGESOLAR GLARE ANALYSIS

Project: **Centerpoint (Muska)**

Site configuration: **Centerpoint Ground Mount-temp-1**

Calculated via ForgeSolar Radiometric Physics Engine v3.1.2

Client: Muska Electric

Created 10 Apr, 2026

Updated 10 Apr, 2026

Time-step 1 minute

Timezone offset UTC-6

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m²

Category 1 MW to 5 MW

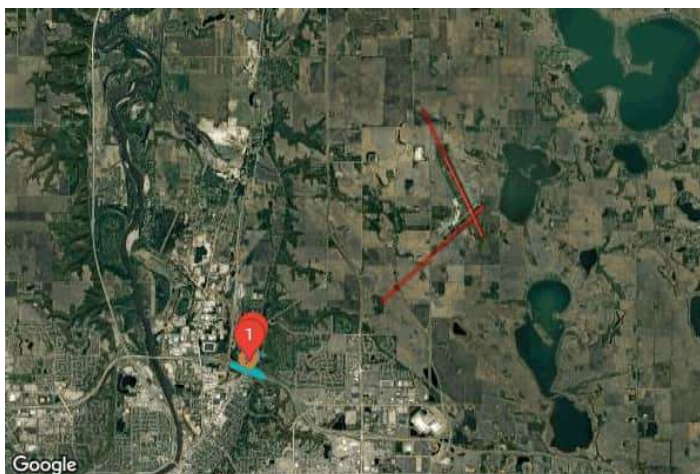
Site ID 175642.28976

Ocular transmission coefficient 0.5

Pupil diameter 0.002 m

Eye focal length 0.017 m

Sun subtended angle 9.3 mrad



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	
PV array 1	20.0	180.0	7,253	120.9	7,932	132.2	-

Vertical Surface	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Building	46,138	769.0	0	0.0
Tanks	18,316	305.3	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
Eastbound Hwy	4,215	70.2	1,232	20.5
Northbound Exit Ramp	19,889	331.5	0	0.0
West Bound Entrance Ramp	20,644	344.1	1,370	22.8
Westbound Hwy	4,376	72.9	1,725	28.8
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	1,164	19.4	2,208	36.8
OP 2	16,638	277.3	563	9.4

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 3	4,781	79.7	834	13.9

Component Data

PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 20.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass with AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	44.190575	-93.983609	836.70	2.00	838.70
2	44.192036	-93.982746	842.45	2.00	844.45
3	44.192025	-93.982129	844.98	2.00	846.98
4	44.190875	-93.982740	843.07	2.00	845.07
5	44.190590	-93.982386	842.83	2.00	844.83
6	44.190328	-93.982842	837.15	2.00	839.15
7	44.190355	-93.983577	835.78	2.00	837.78

Vertical Surfaces

Name: Building
Material profile: >
Lower edge height: 0 ft
Upper edge height: 30 ft
Surface glare contribution: evaluate single side

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	44.190721	-93.981673	851.12
2	44.190563	-93.981160	854.59
3	44.190830	-93.981010	856.53
4	44.190900	-93.981227	854.70
5	44.191017	-93.981163	855.48
6	44.191107	-93.981455	852.15
7	44.190721	-93.981673	851.12

Name: Tanks
Material profile: >
Lower edge height: 15 ft
Upper edge height: 32 ft
Surface glare contribution: evaluate single side

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	44.191482	-93.982015	849.56
2	44.191385	-93.981706	850.73
3	44.191797	-93.981460	849.87
4	44.191889	-93.981773	848.12
5	44.191482	-93.982015	849.56

Route Receptors

Name: Eastbound Hwy

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	44.189684	-93.986985	832.63	5.00	837.63
2	44.187323	-93.978069	907.92	5.00	912.92

Name: Northbound Exit Ramp

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	44.188000	-93.978649	892.90	5.00	897.90
2	44.188727	-93.980306	863.84	5.00	868.84
3	44.188992	-93.981218	846.25	5.00	851.25
4	44.189304	-93.981336	849.11	5.00	854.11
5	44.189761	-93.981068	849.06	5.00	854.06
6	44.190188	-93.980607	858.91	5.00	863.91
7	44.191323	-93.979791	879.92	5.00	884.92
8	44.191985	-93.979523	885.30	5.00	890.30

Name: West Bound Entrance Ramp

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	44.192531	-93.979453	887.85	5.00	892.85
2	44.191569	-93.979877	880.35	5.00	885.35
3	44.190627	-93.980505	861.17	5.00	866.17
4	44.189657	-93.981288	848.42	5.00	853.42
5	44.189373	-93.981760	848.14	5.00	853.14
6	44.189342	-93.982608	848.54	5.00	853.54
7	44.189381	-93.983536	840.13	5.00	845.13
8	44.189573	-93.985193	835.55	5.00	840.55
9	44.189846	-93.986320	834.47	5.00	839.47

Name: Westbound Hwy

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	44.187592	-93.978091	906.92	5.00	911.92
2	44.189900	-93.986867	832.08	5.00	837.08

Flight Path Receptors

Name: FP 1

Description:

Threshold height: 50 ft

Direction: 46.9°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	44.222743	-93.913877	1018.25	50.00	1068.25
Two-mile	44.202991	-93.943375	993.58	628.09	1621.68

Name: FP 2

Description:

Threshold height: 50 ft

Direction: 154.7°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	44.216884	-93.913877	1015.33	50.00	1065.33
Two-mile	44.243023	-93.931137	993.14	625.62	1618.76

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	44.190225	-93.981860	851.74	6.00
OP 2	2	44.190594	-93.981396	853.71	6.00
OP 3	3	44.191725	-93.980908	856.24	6.00

Obstruction Components

Name: Blvd Trees 1

Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	44.191791	-93.979974	876.56
2	44.191674	-93.980051	874.56

Name: Blvd Trees 2

Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	44.191362	-93.980242	868.97
2	44.191243	-93.980338	864.61

Name: Blvd Trees 3

Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	44.190960	-93.980515	863.98
2	44.190576	-93.980843	855.82

Name: Field Trees SW

Top height: 45.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	44.190504	-93.983841	834.68
2	44.190209	-93.983766	833.68

Name: Field Trees W

Top height: 32.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	44.191915	-93.984399	831.90
2	44.190681	-93.984410	833.86

Name: Lot Trees

Top height: 35.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	44.191217	-93.981486	851.62
2	44.190656	-93.981806	850.48

Name: Lot Trees SE

Top height: 30,0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	44.189679	-93.982219	848.15
2	44.189634	-93.981777	852.54
3	44.189978	-93.981393	854.64

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	
PV array 1	20.0	180.0	7,253	120.9	7,932	132.2	-

Vertical Surface	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Building	46,138	769.0	0	0.0
Tanks	18,316	305.3	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
Eastbound Hwy	4,215	70.2	1,232	20.5
Northbound Exit Ramp	19,889	331.5	0	0.0
West Bound Entrance Ramp	20,644	344.1	1,370	22.8
Westbound Hwy	4,376	72.9	1,725	28.8
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	1,164	19.4	2,208	36.8
OP 2	16,638	277.3	563	9.4
OP 3	4,781	79.7	834	13.9

PV: PV array 1 potential temporary after-image

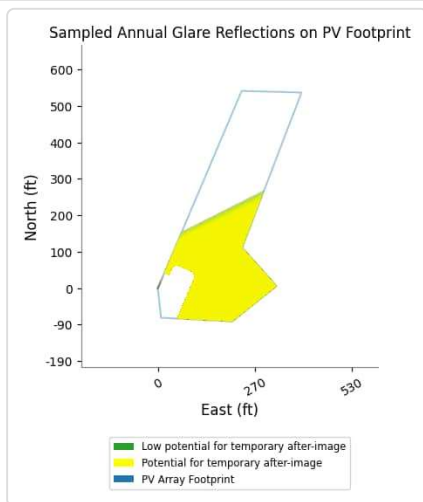
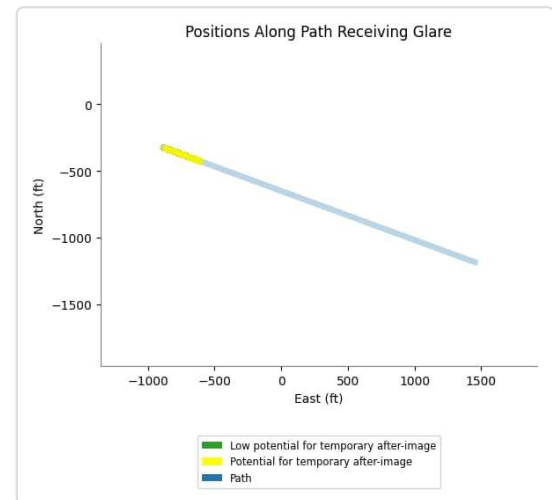
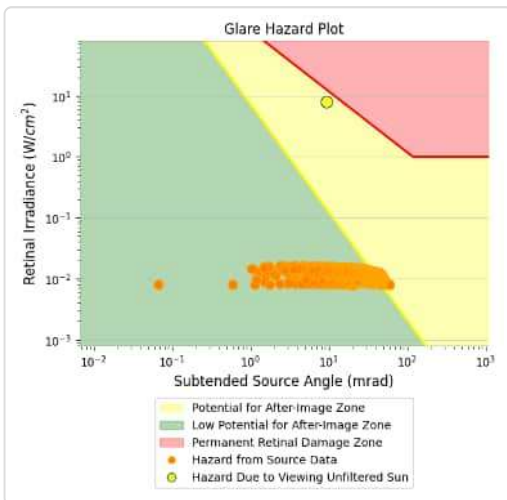
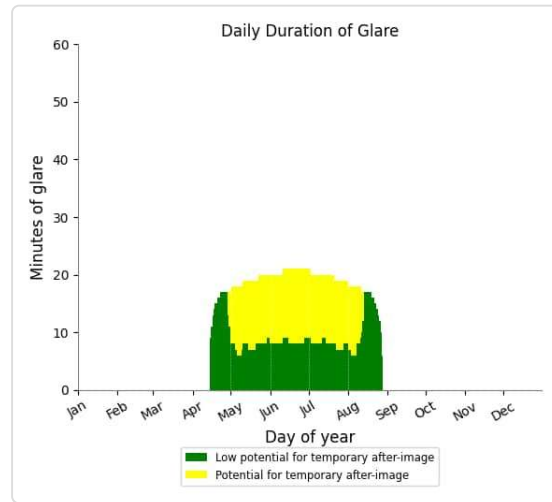
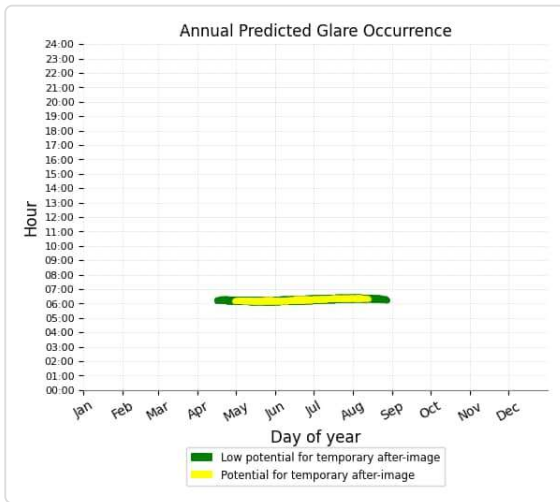
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	1,284	21.4	1,232	20.5
West Bound Entrance Ramp	1,132	18.9	1,370	22.8
Westbound Hwy	1,242	20.7	1,725	28.8
Northbound Exit Ramp	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	1,164	19.4	2,208	36.8
OP 2	1,111	18.5	563	9.4
OP 3	1,320	22.0	834	13.9

PV array 1 and Route: Eastbound Hwy

Yellow glare: 1,232 min.

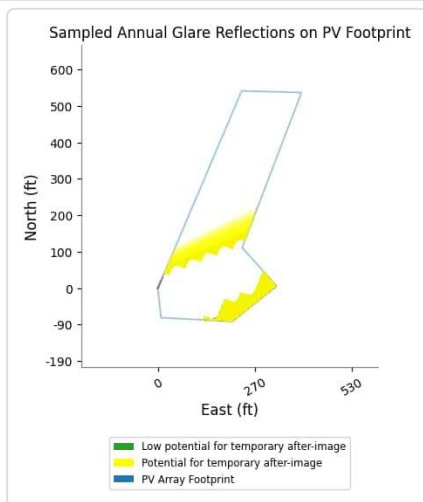
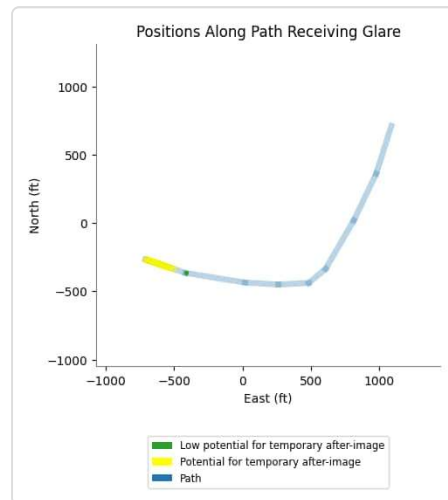
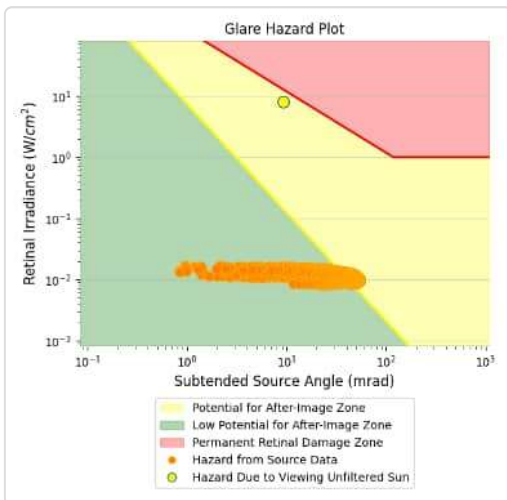
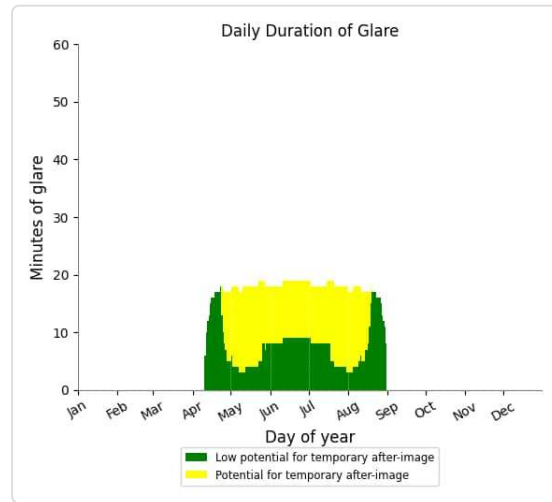
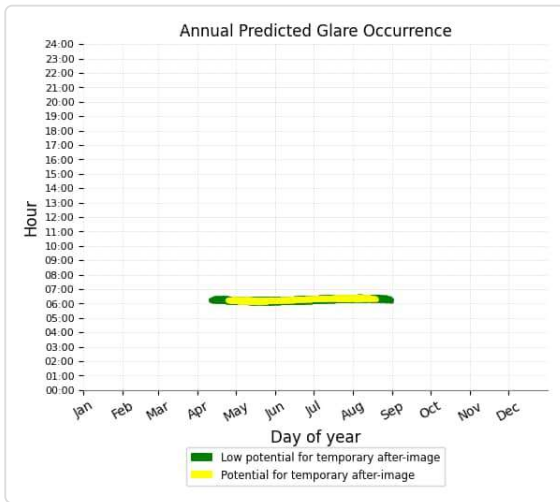
Green glare: 1,284 min.



PV array 1 and Route: West Bound Entrance Ramp

Yellow glare: 1,370 min.

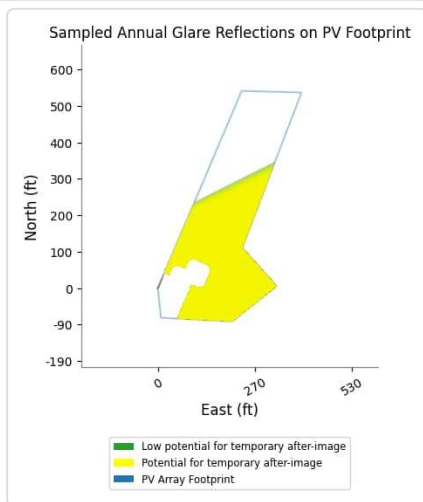
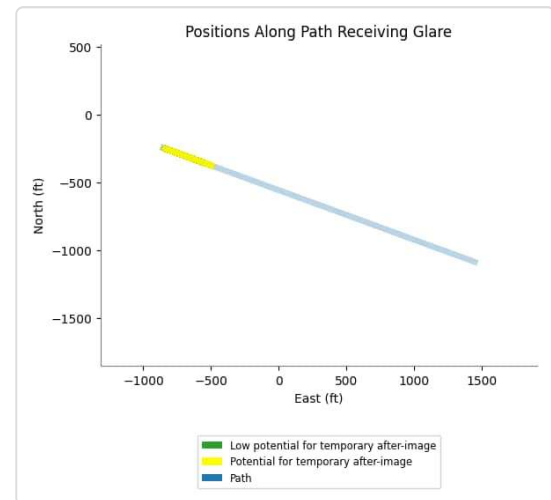
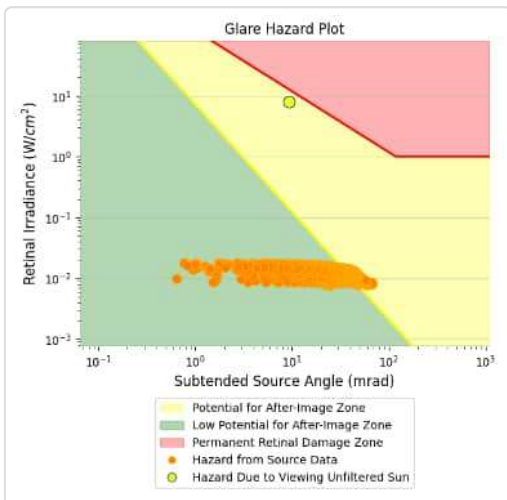
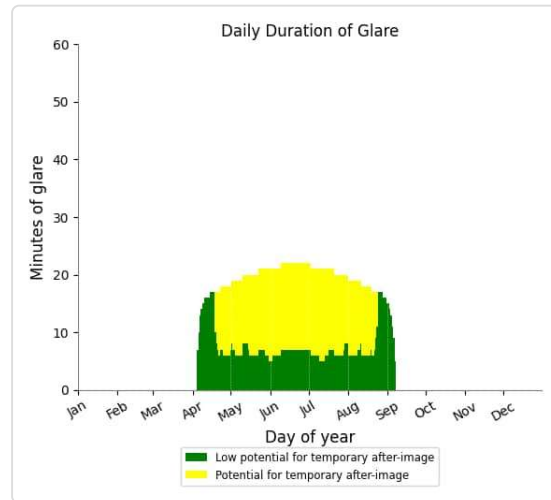
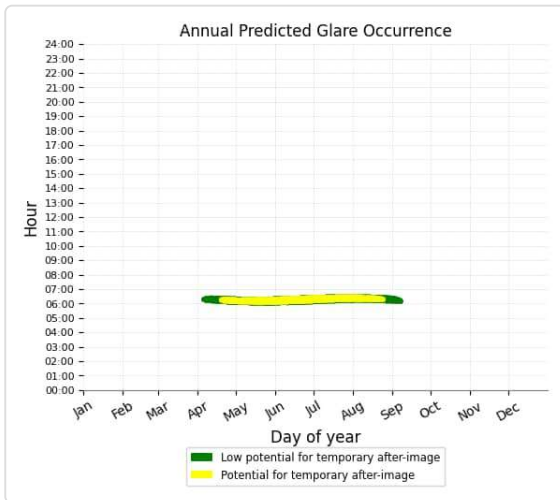
Green glare: 1,132 min.



PV array 1 and Route: Westbound Hwy

Yellow glare: 1,725 min.

Green glare: 1,242 min.



PV array 1 and Route: Northbound Exit Ramp

No glare found

PV array 1 and FP: FP 1

No glare found

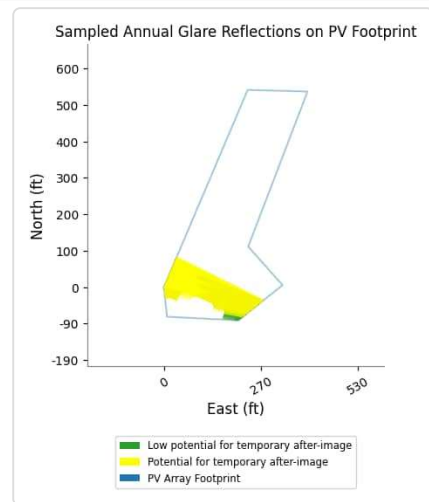
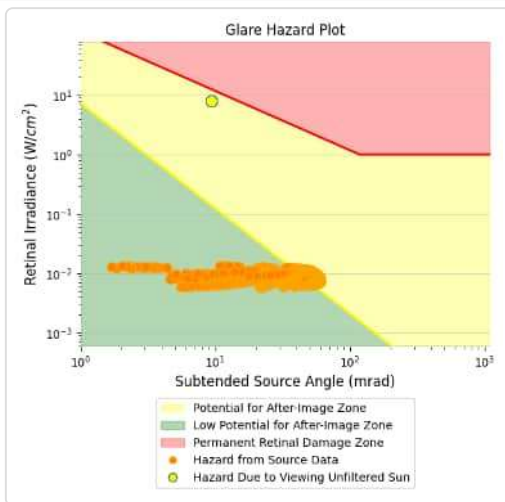
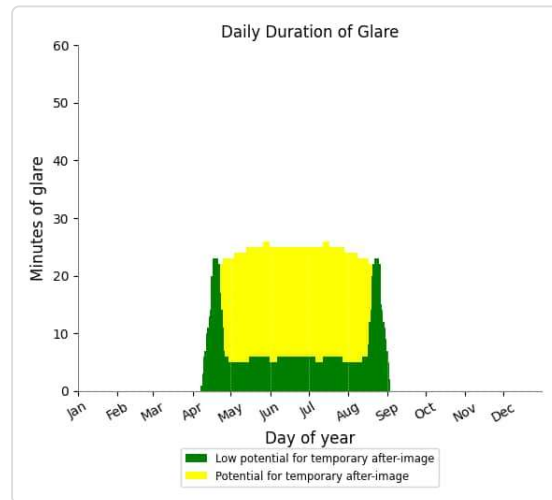
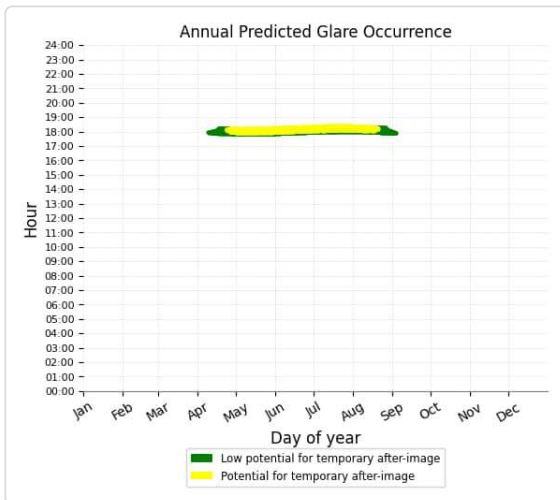
PV array 1 and FP: FP 2

No glare found

PV array 1 and OP 1

Yellow glare: 2,208 min.

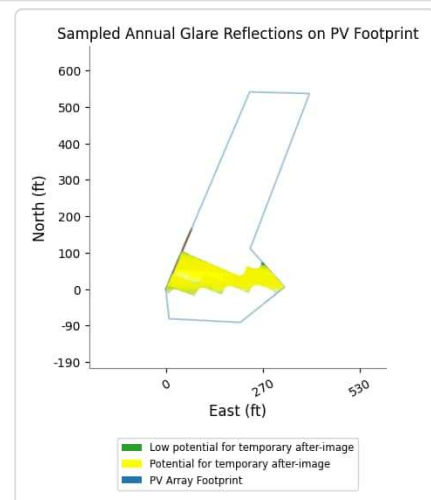
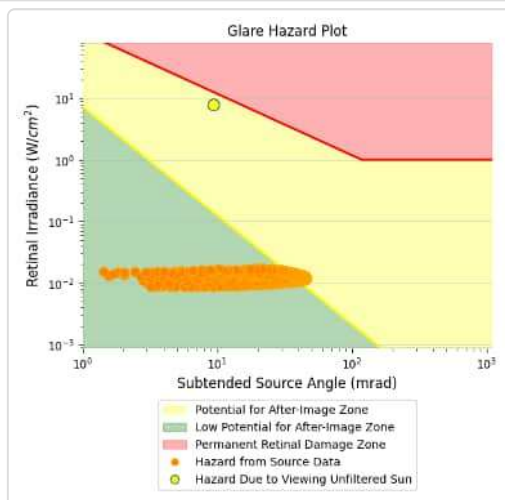
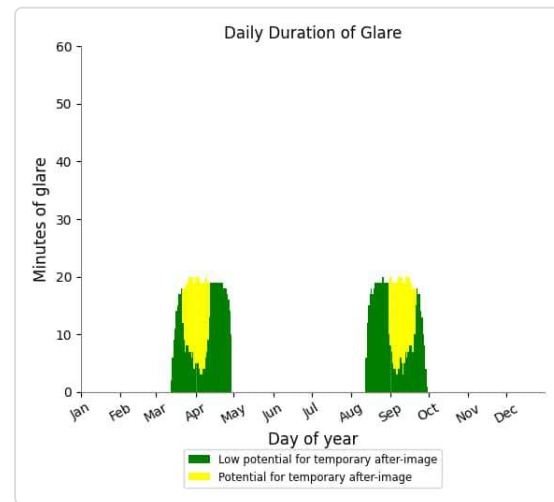
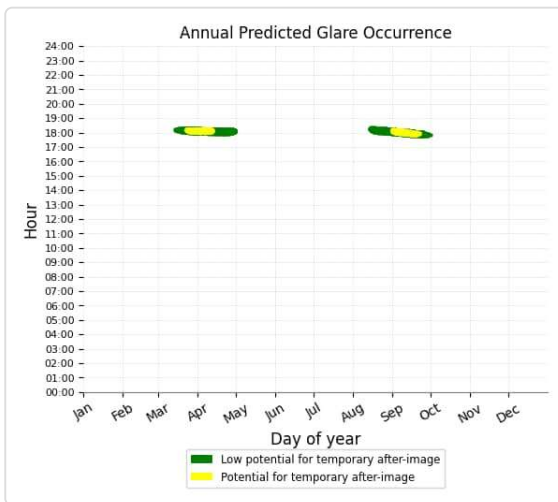
Green glare: 1,164 min.



PV array 1 and OP 2

Yellow glare: 563 min.

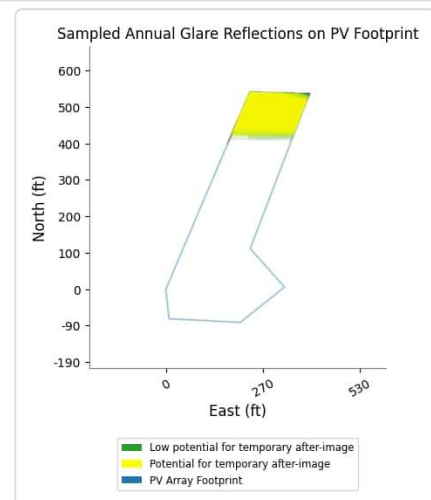
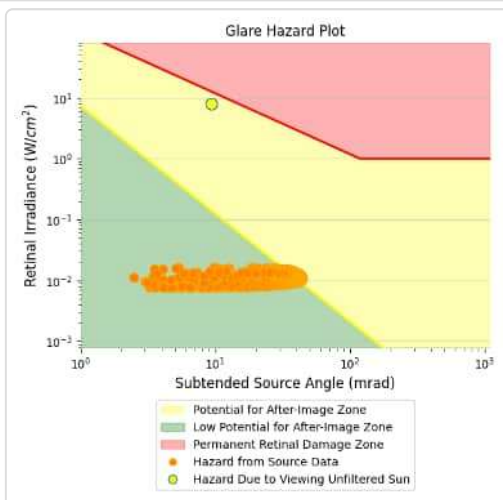
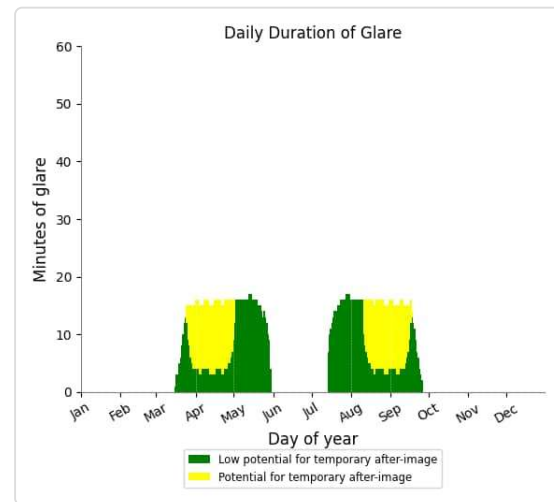
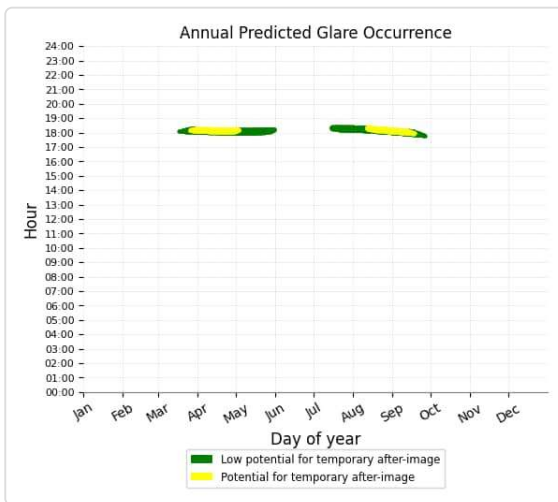
Green glare: 1,111 min.



PV array 1 and OP 3

Yellow glare: 834 min.

Green glare: 1,320 min.



VS: Building

VS Face: 1-2 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	0	0.0	0	0.0
Northbound Exit Ramp	0	0.0	0	0.0
West Bound Entrance Ramp	0	0.0	0	0.0
Westbound Hwy	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

No glare found

Northbound Exit Ramp

Receptor type: Route

No glare found

West Bound Entrance Ramp

Receptor type: Route

No glare found

Westbound Hwy

Receptor type: Route

No glare found

FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

No glare found

OP 1

Receptor type: Observation Point

No glare found

OP 2

Receptor type: Observation Point

No glare found

OP 3

Receptor type: Observation Point

No glare found

VS Face: 2-3 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	0	0.0	0	0.0
Northbound Exit Ramp	0	0.0	0	0.0
West Bound Entrance Ramp	0	0.0	0	0.0
Westbound Hwy	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

No glare found

Northbound Exit Ramp

Receptor type: Route

No glare found

West Bound Entrance Ramp

Receptor type: Route

No glare found

Westbound Hwy

Receptor type: Route

No glare found

FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

No glare found

OP 1

Receptor type: Observation Point

No glare found

OP 2

Receptor type: Observation Point

No glare found

OP 3

Receptor type: Observation Point

No glare found

VS Face: 3-4 low potential for temporary after-image

Receptor results ordered by category of glare

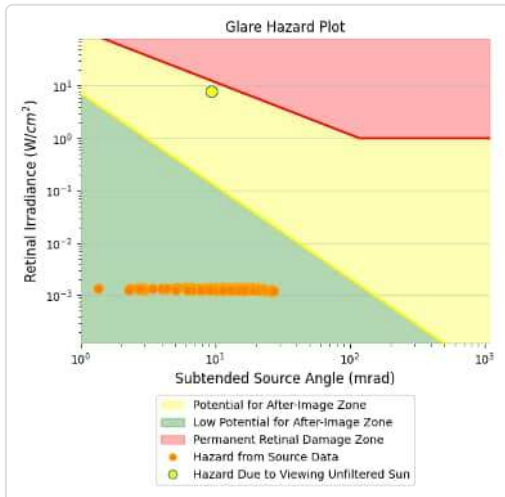
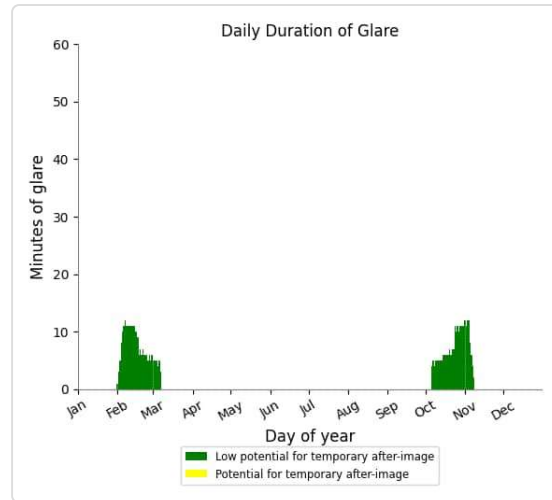
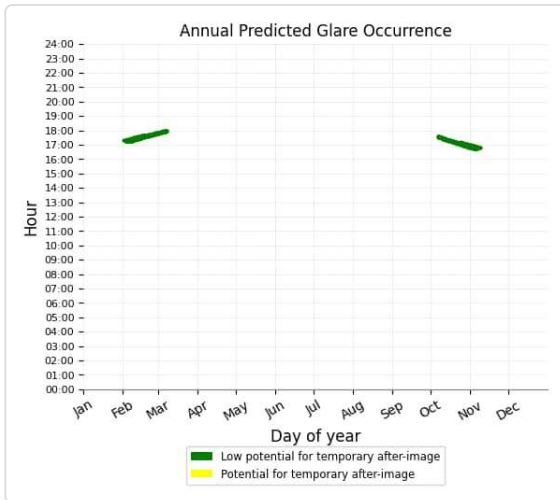
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	507	8.4	0	0.0
Northbound Exit Ramp	5,934	98.9	0	0.0
West Bound Entrance Ramp	6,819	113.7	0	0.0
Westbound Hwy	540	9.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

0 minutes of yellow glare

507 minutes of green glare

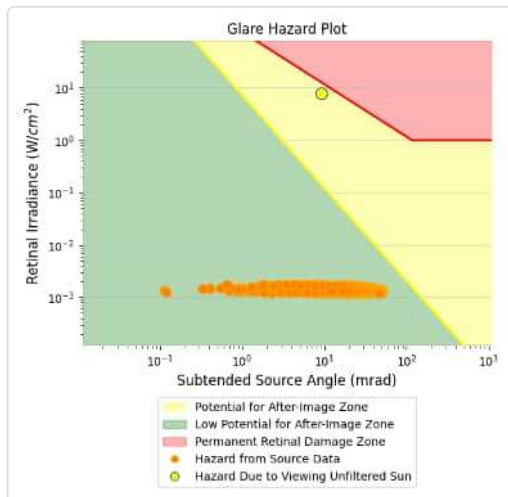
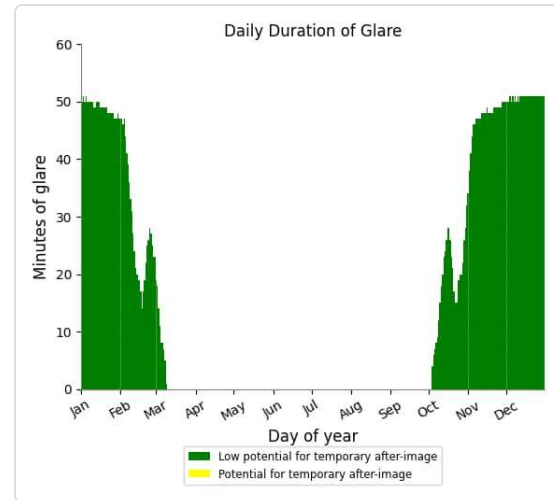
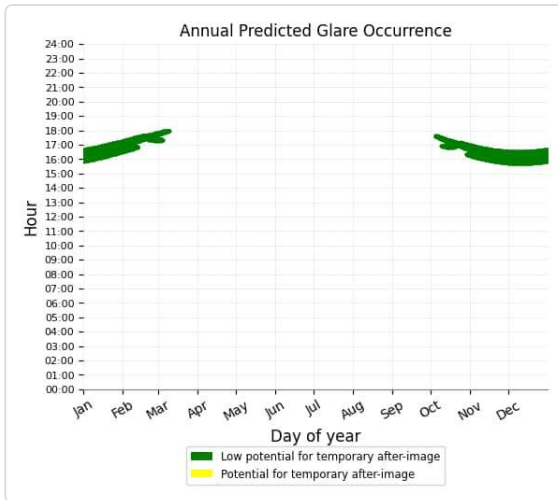


Northbound Exit Ramp

Receptor type: Route

0 minutes of yellow glare

5,934 minutes of green glare

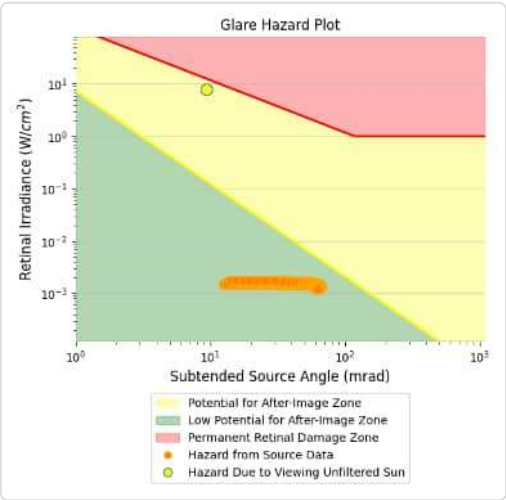
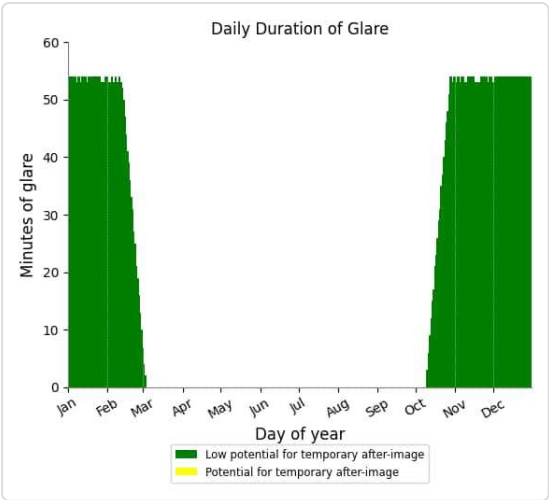
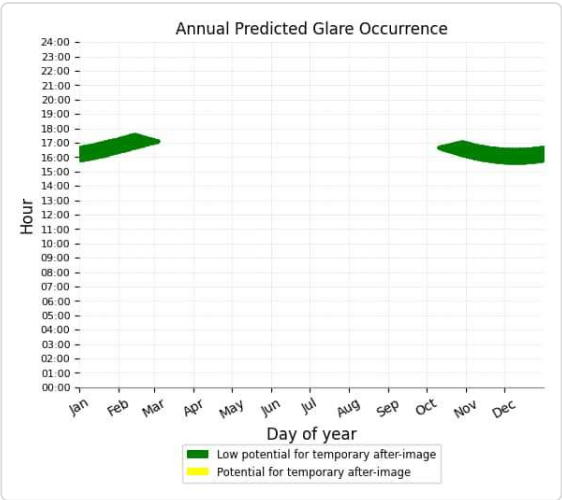


West Bound Entrance Ramp

Receptor type: Route

0 minutes of yellow glare

6,819 minutes of green glare

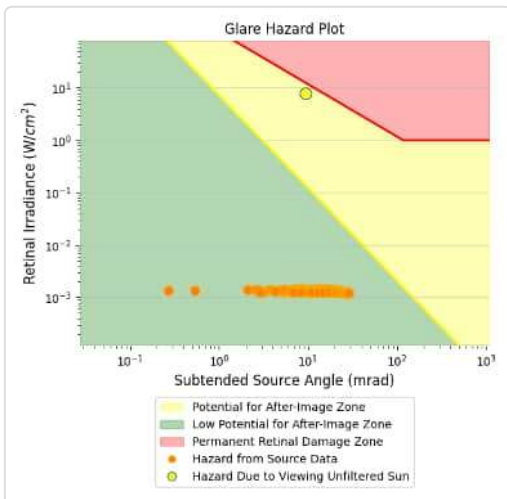
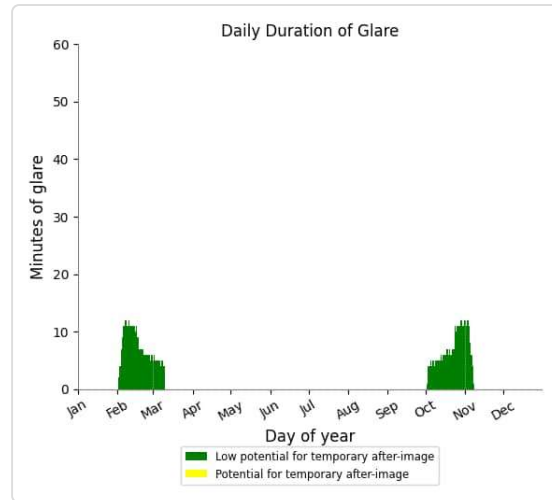
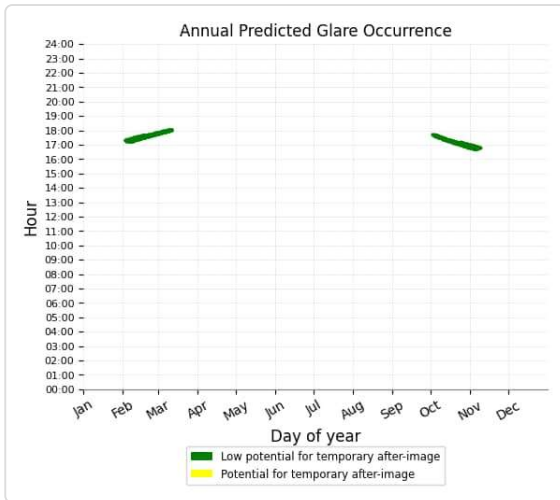


Westbound Hwy

Receptor type: Route

0 minutes of yellow glare

540 minutes of green glare



FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

No glare found

OP 1

Receptor type: Observation Point

No glare found

OP 2

Receptor type: Observation Point

No glare found

OP 3

Receptor type: Observation Point

No glare found

VS Face: 4-5 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	0	0.0	0	0.0
Northbound Exit Ramp	0	0.0	0	0.0
West Bound Entrance Ramp	0	0.0	0	0.0
Westbound Hwy	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

No glare found

Northbound Exit Ramp

Receptor type: Route

No glare found

West Bound Entrance Ramp

Receptor type: Route

No glare found

Westbound Hwy

Receptor type: Route

No glare found

FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

No glare found

OP 1

Receptor type: Observation Point

No glare found

OP 2

Receptor type: Observation Point

No glare found

OP 3

Receptor type: Observation Point

No glare found

VS Face: 5-6 low potential for temporary after-image

Receptor results ordered by category of glare

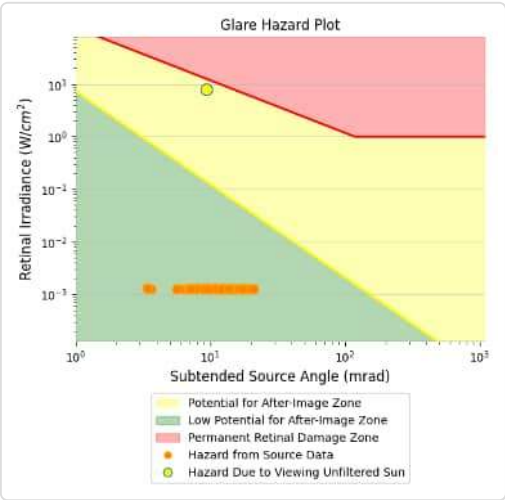
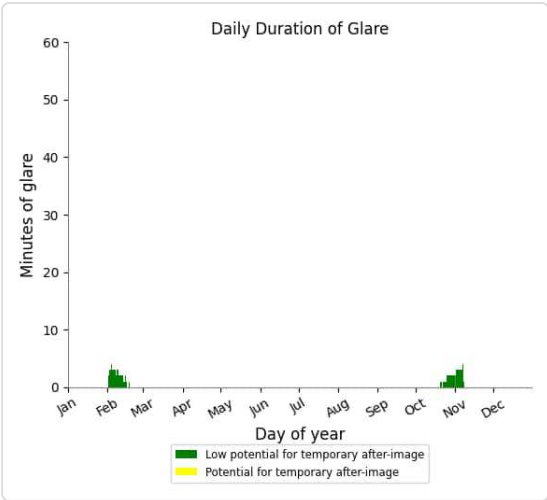
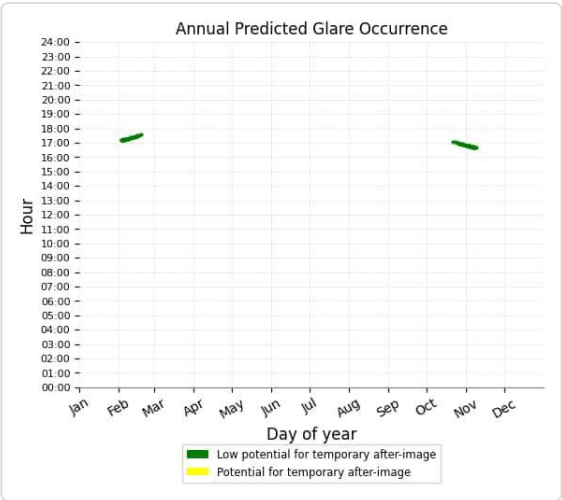
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	74	1.2	0	0.0
Northbound Exit Ramp	3,655	60.9	0	0.0
West Bound Entrance Ramp	4,141	69.0	0	0.0
Westbound Hwy	80	1.3	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 2	1,640	27.3	0	0.0
OP 1	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

0 minutes of yellow glare

74 minutes of green glare

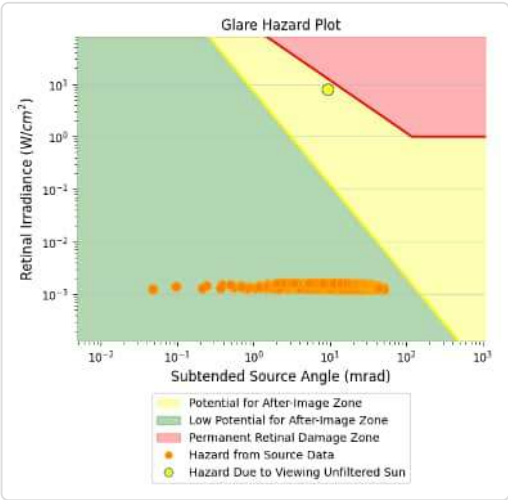
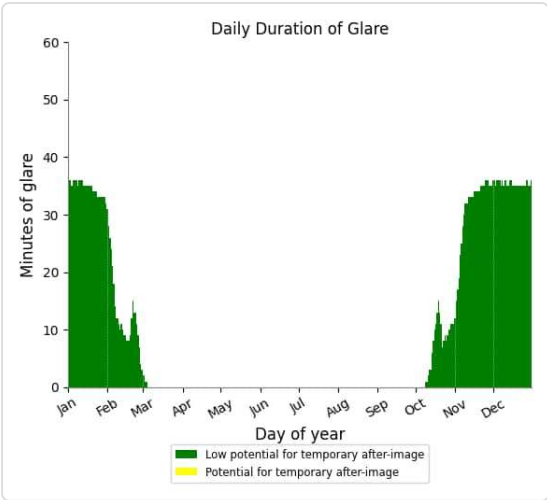
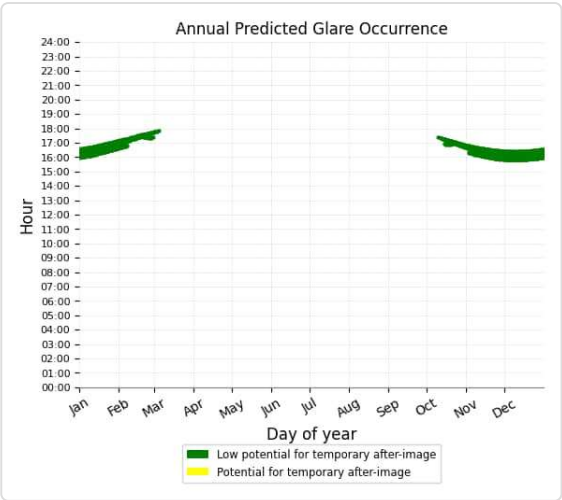


Northbound Exit Ramp

Receptor type: Route

0 minutes of yellow glare

3,655 minutes of green glare

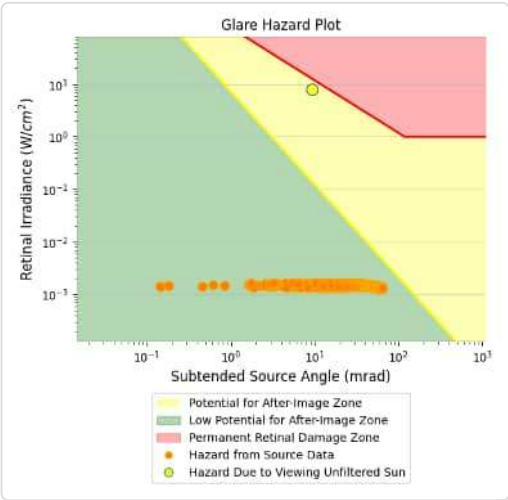
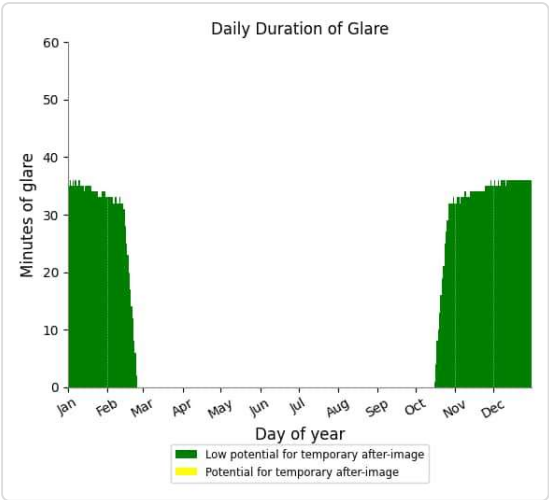
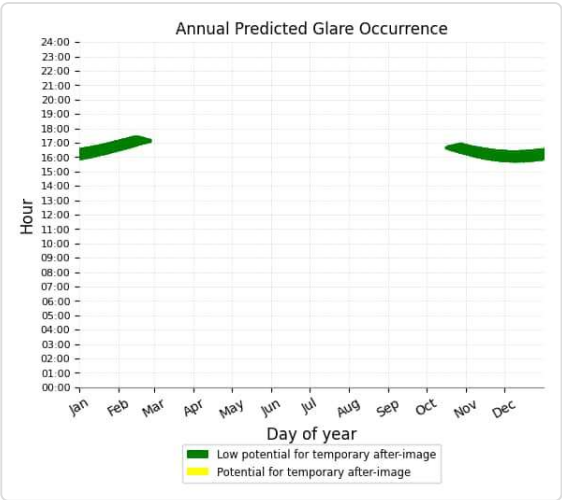


West Bound Entrance Ramp

Receptor type: Route

0 minutes of yellow glare

4,141 minutes of green glare

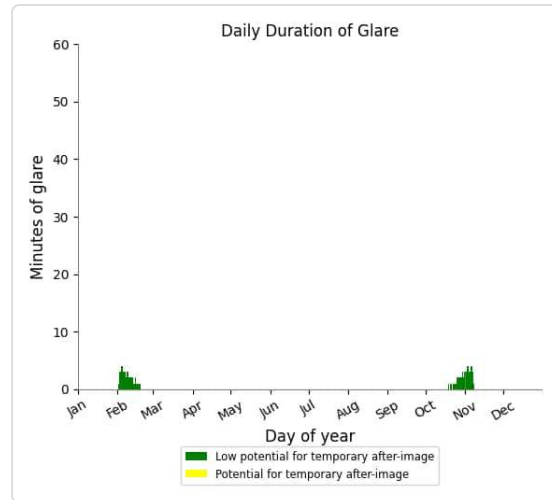
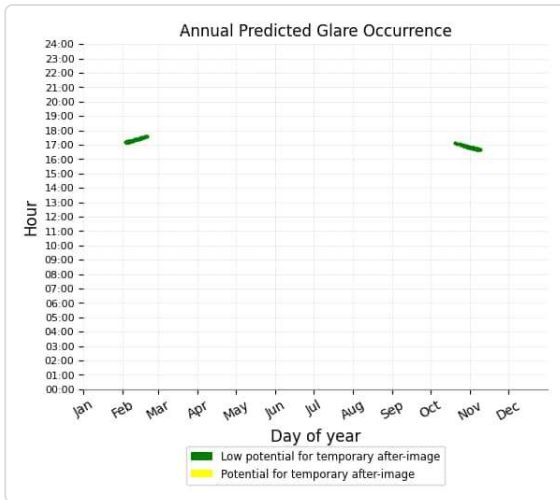


Westbound Hwy

Receptor type: Route

0 minutes of yellow glare

80 minutes of green glare



FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

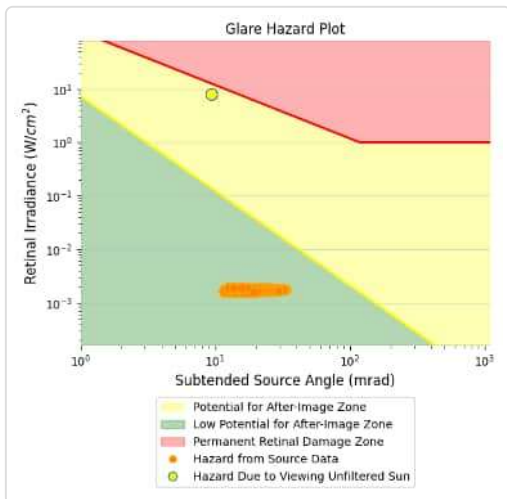
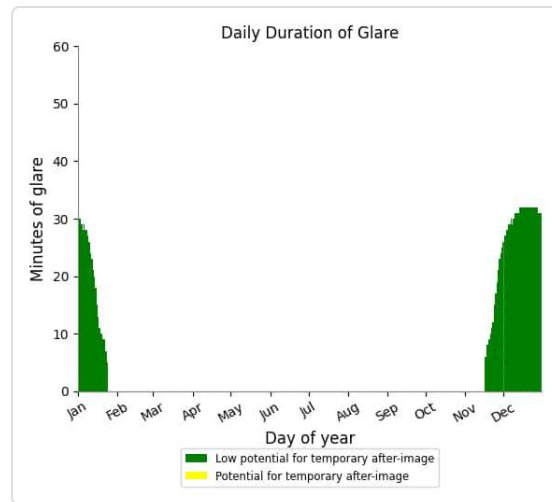
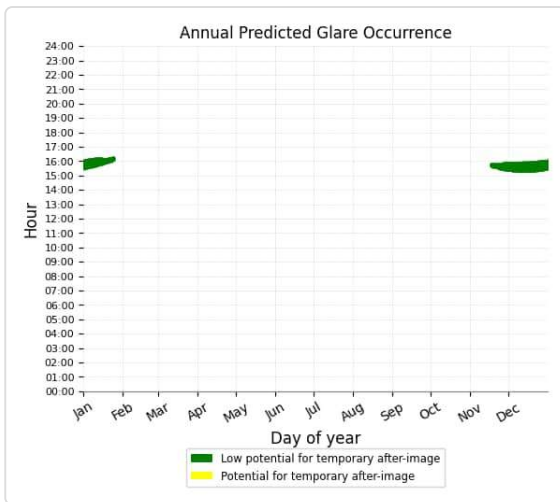
No glare found

OP 2

Receptor type: Observation Point

0 minutes of yellow glare

1,640 minutes of green glare



OP 1

Receptor type: Observation Point

No glare found

OP 3

Receptor type: Observation Point

No glare found

VS Face: 6-7 low potential for temporary after-image

Receptor results ordered by category of glare

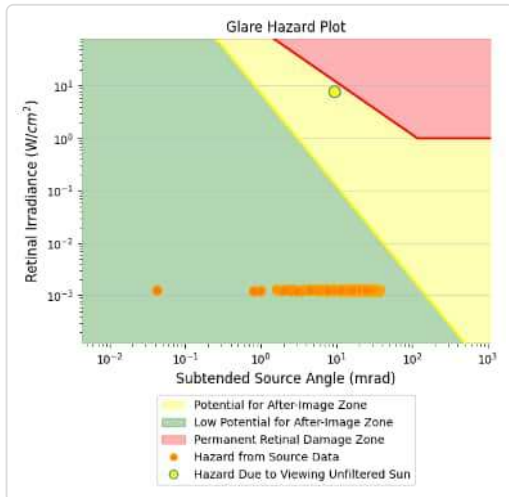
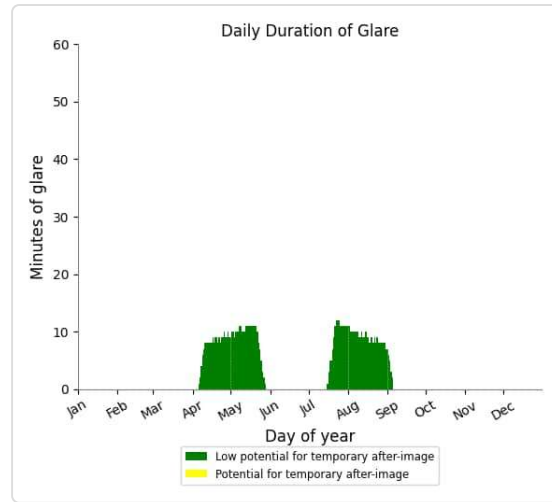
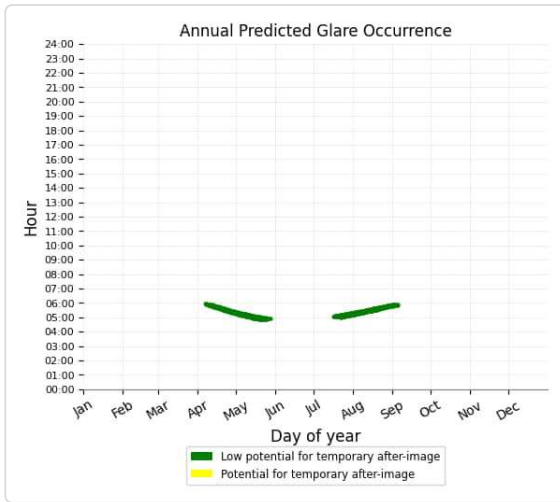
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	895	14.9	0	0.0
Northbound Exit Ramp	4,371	72.8	0	0.0
West Bound Entrance Ramp	2,951	49.2	0	0.0
Westbound Hwy	954	15.9	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 2	13,577	226.3	0	0.0
OP 1	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

0 minutes of yellow glare

895 minutes of green glare

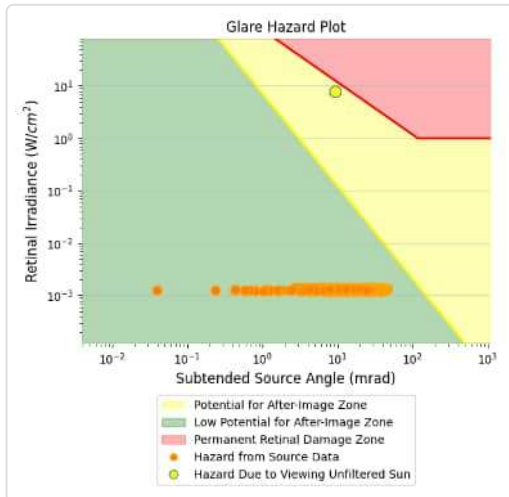
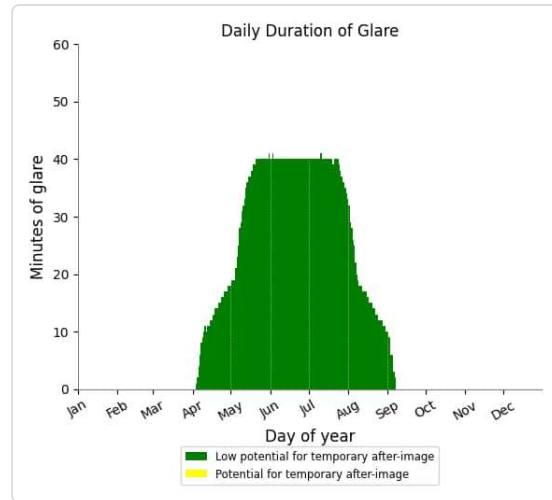
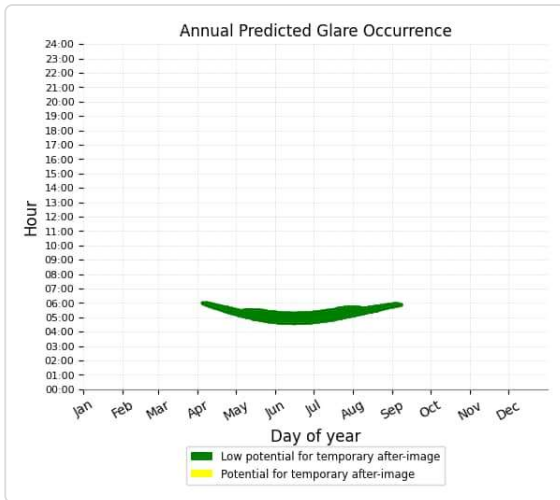


Northbound Exit Ramp

Receptor type: Route

0 minutes of yellow glare

4,371 minutes of green glare

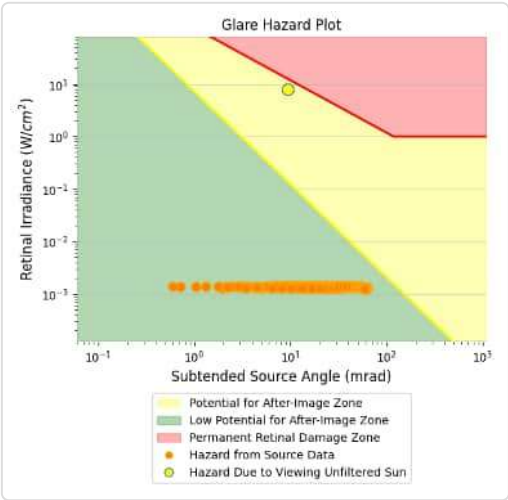
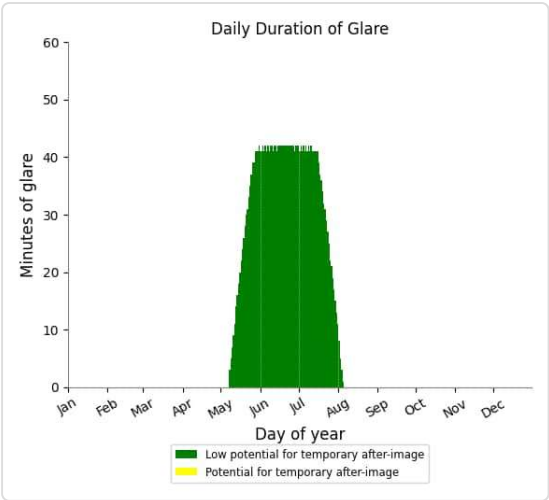
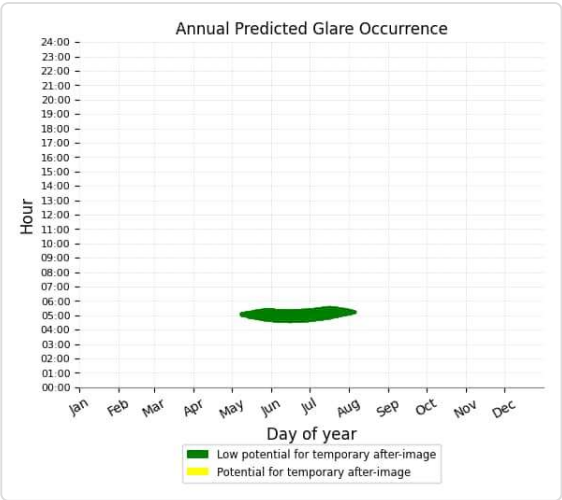


West Bound Entrance Ramp

Receptor type: Route

0 minutes of yellow glare

2,951 minutes of green glare

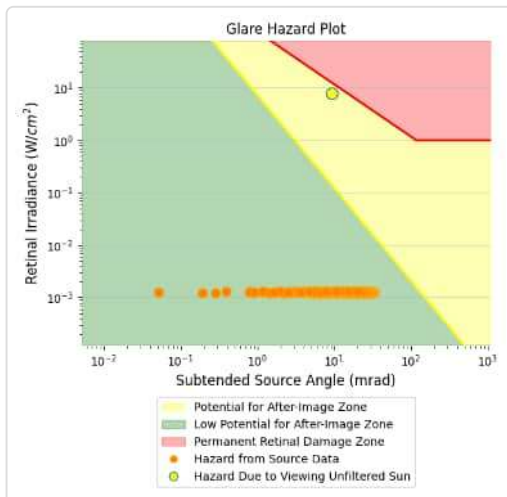
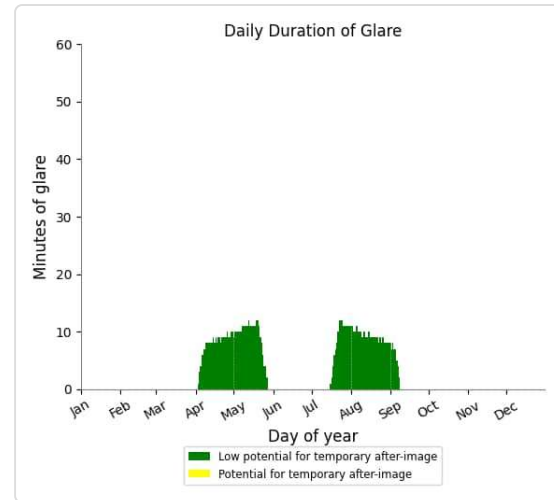
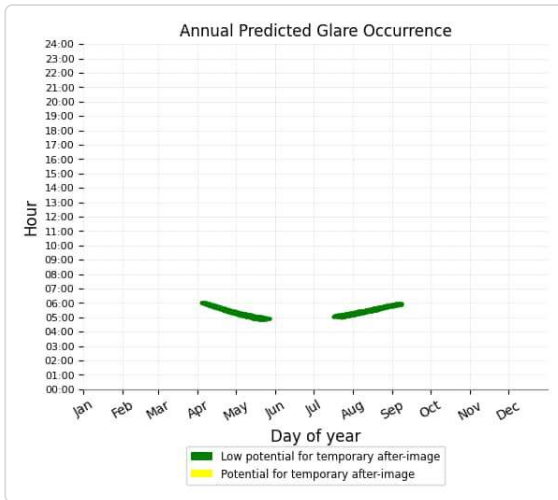


Westbound Hwy

Receptor type: Route

0 minutes of yellow glare

954 minutes of green glare



FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

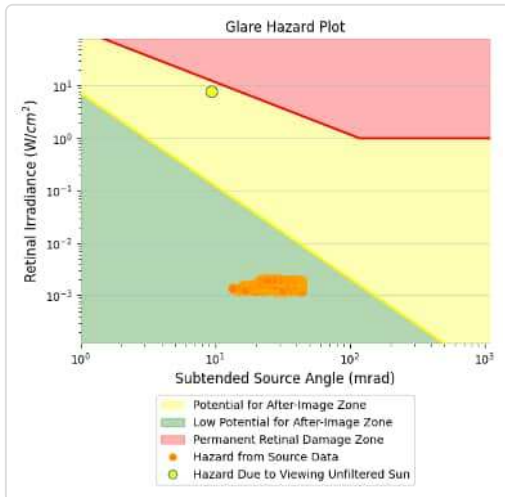
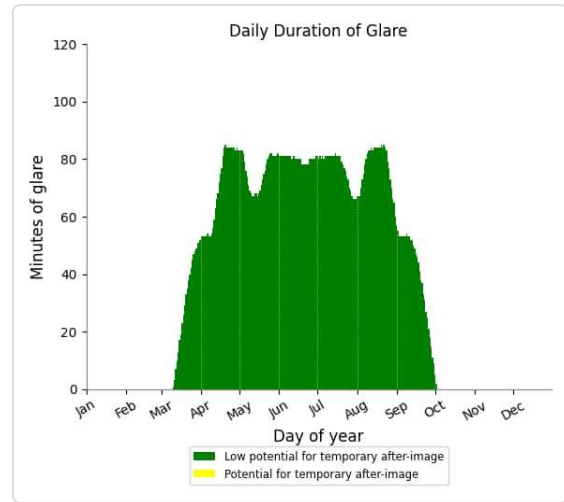
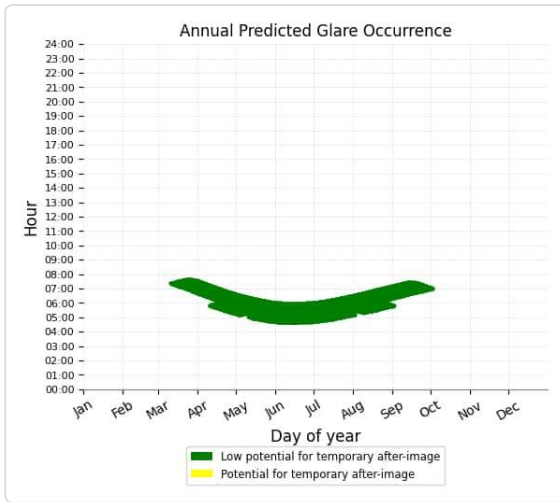
No glare found

OP 2

Receptor type: Observation Point

0 minutes of yellow glare

13,577 minutes of green glare



OP 1

Receptor type: Observation Point

No glare found

OP 3

Receptor type: Observation Point

No glare found

VS: Tanks

VS Face: 1-2 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	0	0.0	0	0.0
Northbound Exit Ramp	0	0.0	0	0.0
West Bound Entrance Ramp	0	0.0	0	0.0
Westbound Hwy	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

No glare found

Northbound Exit Ramp

Receptor type: Route

No glare found

West Bound Entrance Ramp

Receptor type: Route

No glare found

Westbound Hwy

Receptor type: Route

No glare found

FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

No glare found

OP 1

Receptor type: Observation Point

No glare found

OP 2

Receptor type: Observation Point

No glare found

OP 3

Receptor type: Observation Point

No glare found

VS Face: 2-3 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	0	0.0	0	0.0
Northbound Exit Ramp	0	0.0	0	0.0
West Bound Entrance Ramp	0	0.0	0	0.0
Westbound Hwy	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

No glare found

Northbound Exit Ramp

Receptor type: Route

No glare found

West Bound Entrance Ramp

Receptor type: Route

No glare found

Westbound Hwy

Receptor type: Route

No glare found

FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

No glare found

OP 1

Receptor type: Observation Point

No glare found

OP 2

Receptor type: Observation Point

No glare found

OP 3

Receptor type: Observation Point

No glare found

VS Face: 3-4 low potential for temporary after-image

Receptor results ordered by category of glare

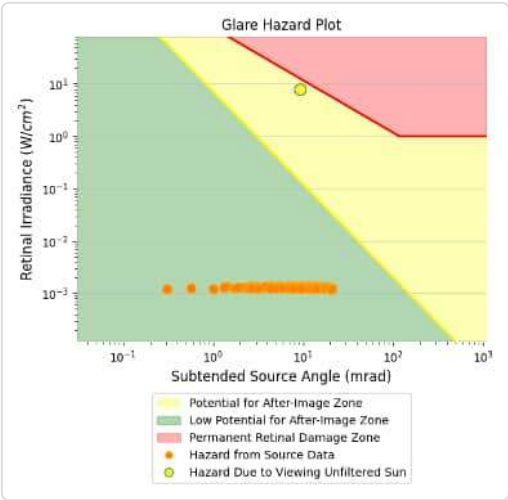
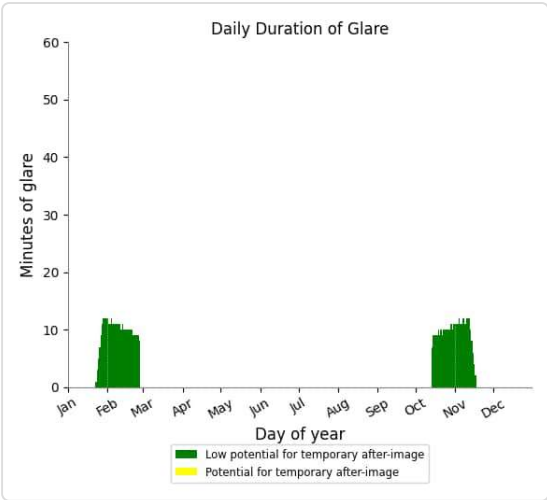
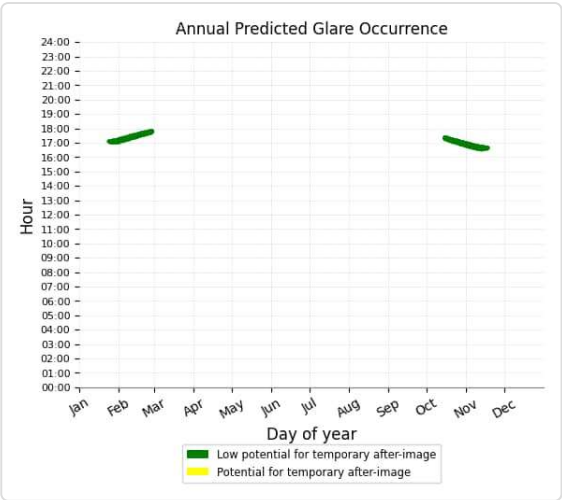
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	680	11.3	0	0.0
Northbound Exit Ramp	3,501	58.4	0	0.0
West Bound Entrance Ramp	3,129	52.1	0	0.0
Westbound Hwy	727	12.1	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 2	310	5.2	0	0.0
OP 1	0	0.0	0	0.0
OP 3	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

0 minutes of yellow glare

680 minutes of green glare

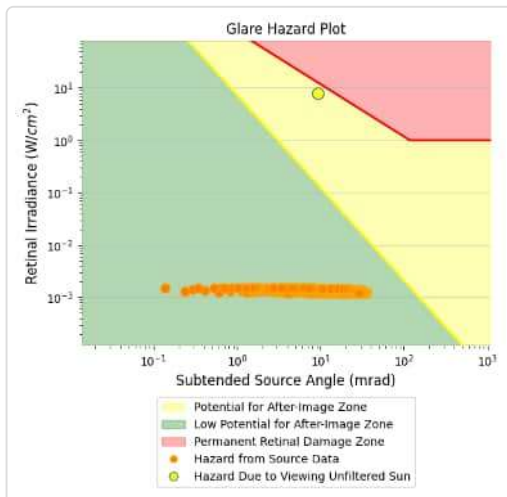
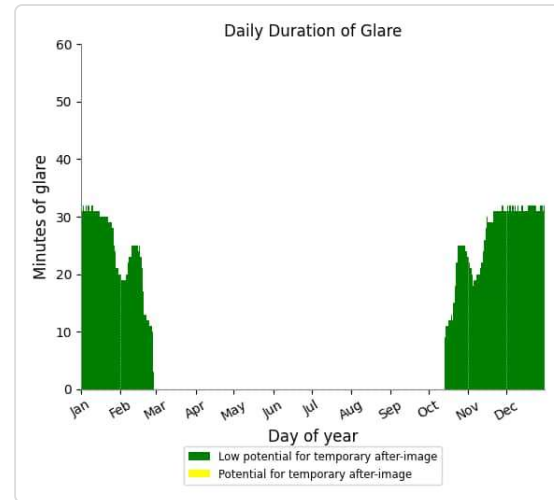
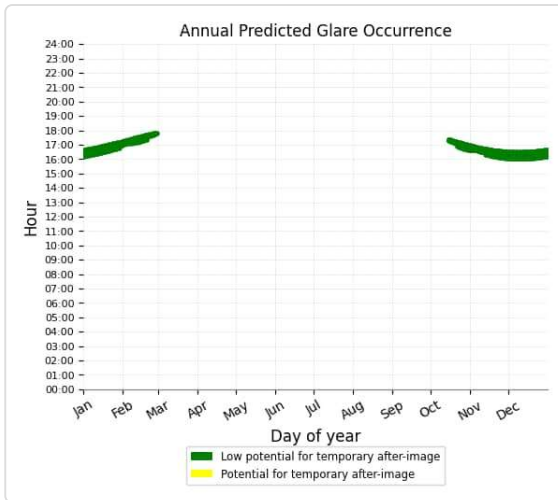


Northbound Exit Ramp

Receptor type: Route

0 minutes of yellow glare

3,501 minutes of green glare

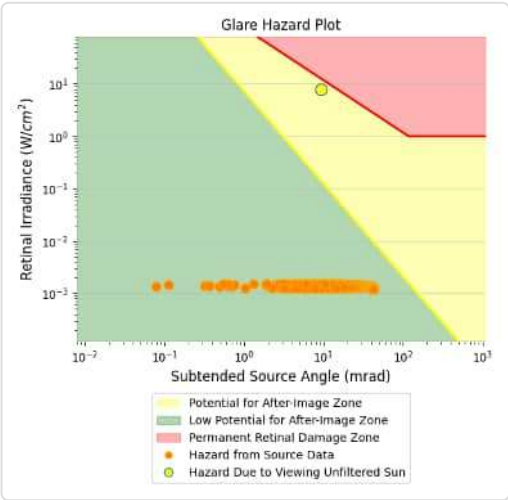
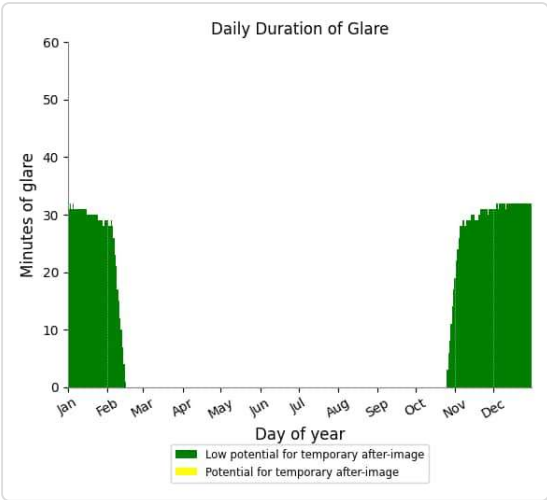
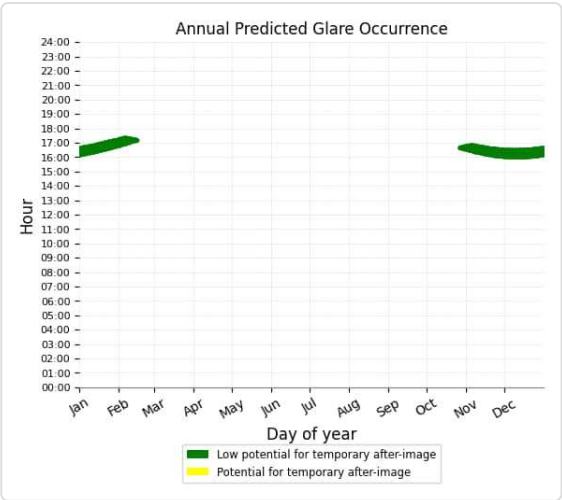


West Bound Entrance Ramp

Receptor type: Route

0 minutes of yellow glare

3,129 minutes of green glare

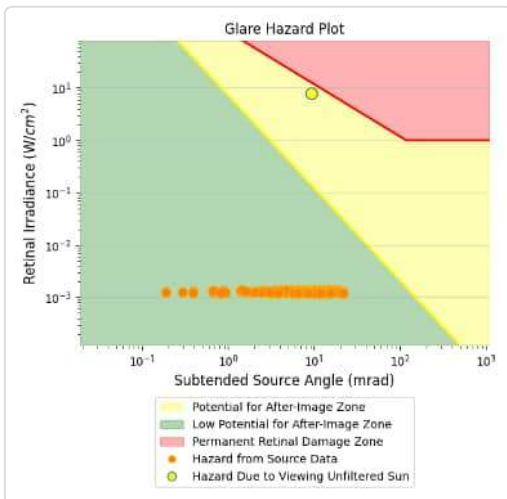
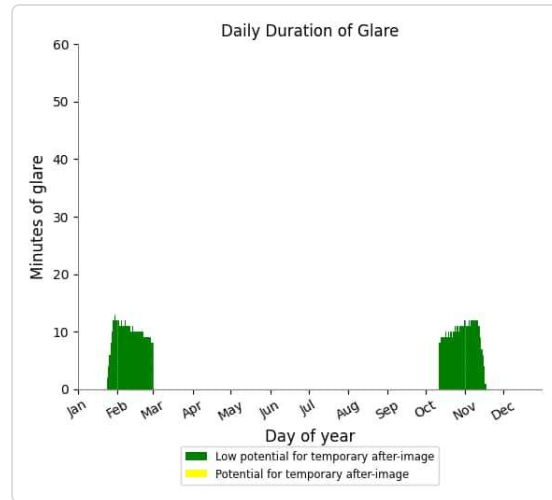
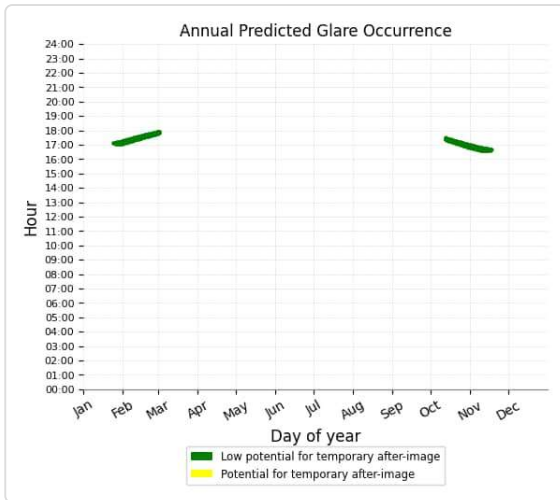


Westbound Hwy

Receptor type: Route

0 minutes of yellow glare

727 minutes of green glare



FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

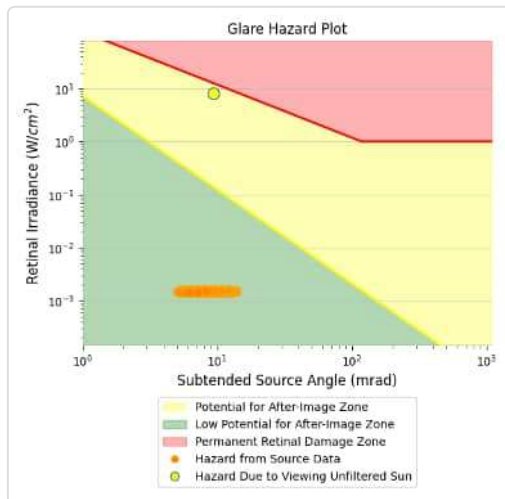
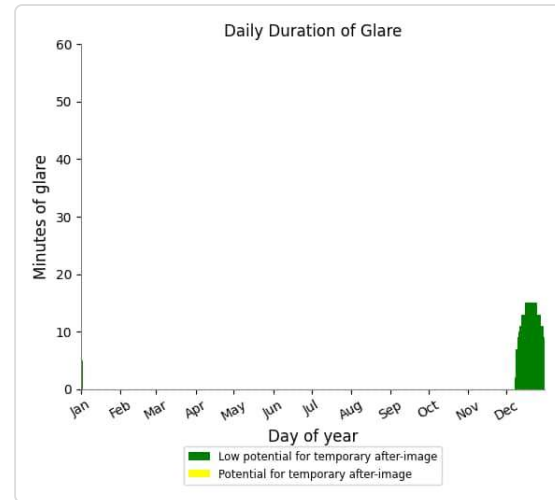
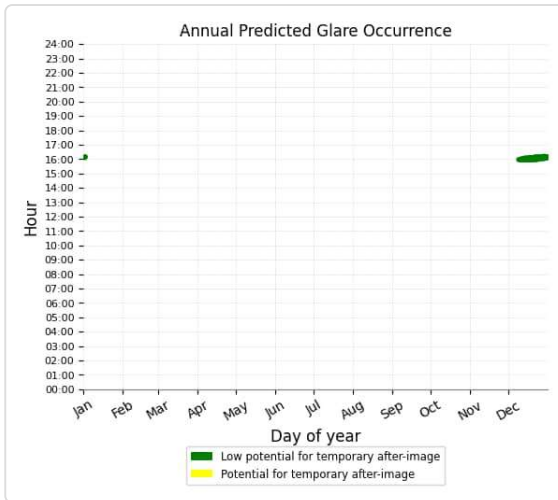
No glare found

OP 2

Receptor type: Observation Point

0 minutes of yellow glare

310 minutes of green glare



OP 1

Receptor type: Observation Point

No glare found

OP 3

Receptor type: Observation Point

No glare found

VS Face: 4-5 low potential for temporary after-image

Receptor results ordered by category of glare

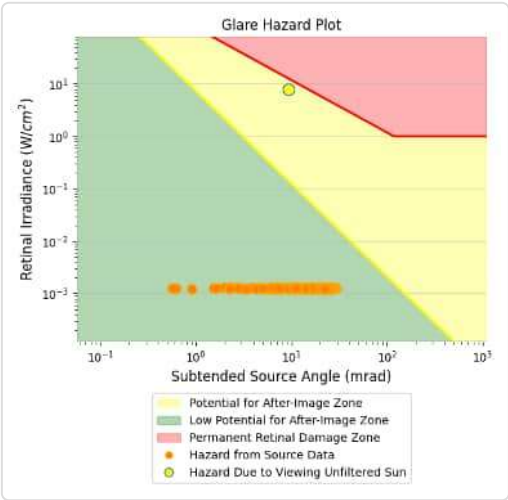
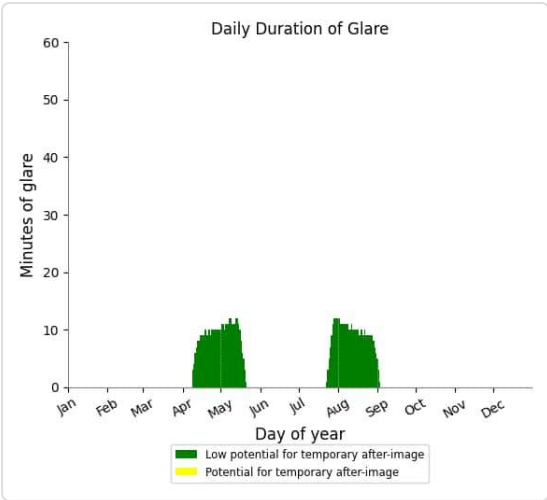
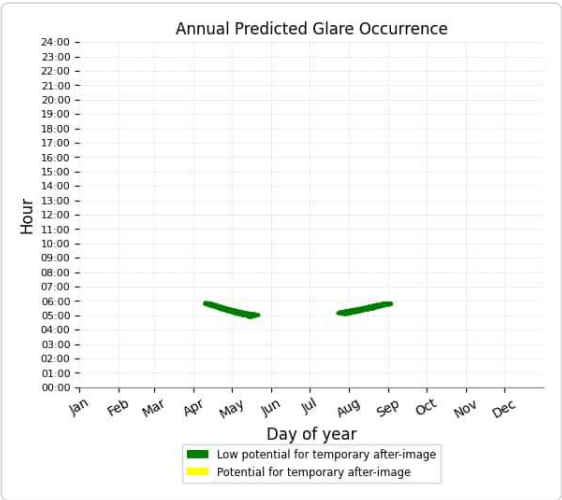
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Eastbound Hwy	775	12.9	0	0.0
Northbound Exit Ramp	2,428	40.5	0	0.0
West Bound Entrance Ramp	2,472	41.2	0	0.0
Westbound Hwy	833	13.9	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 3	3,461	57.7	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0

Eastbound Hwy

Receptor type: Route

0 minutes of yellow glare

775 minutes of green glare

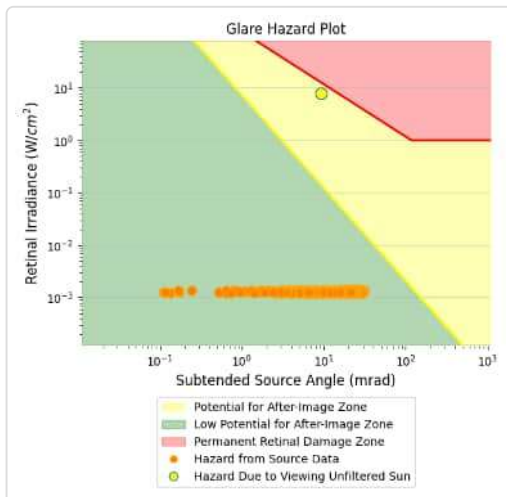
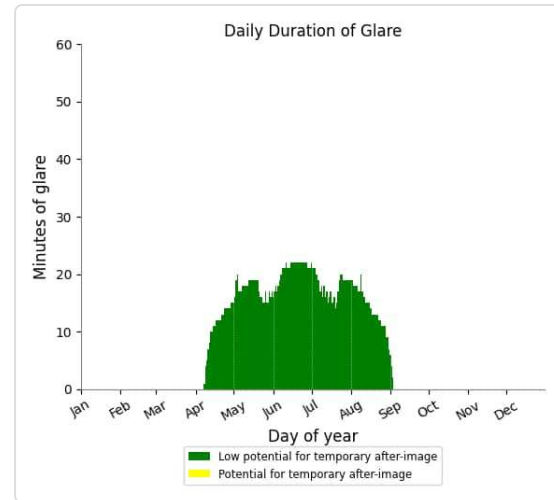
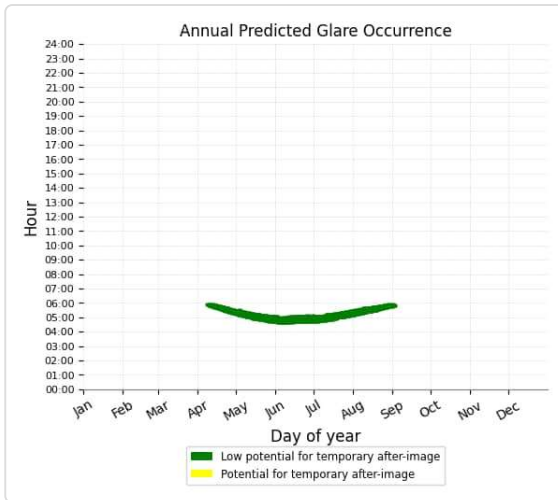


Northbound Exit Ramp

Receptor type: Route

0 minutes of yellow glare

2,428 minutes of green glare

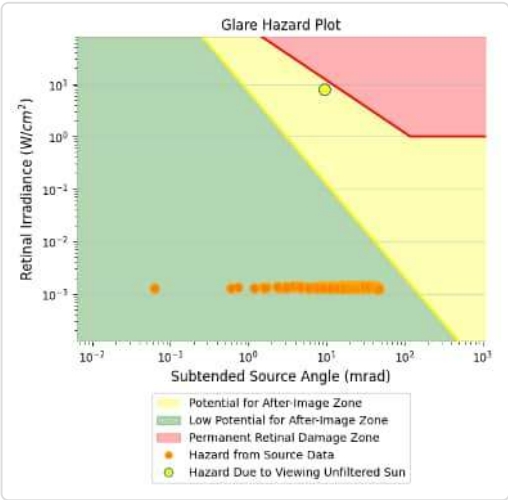
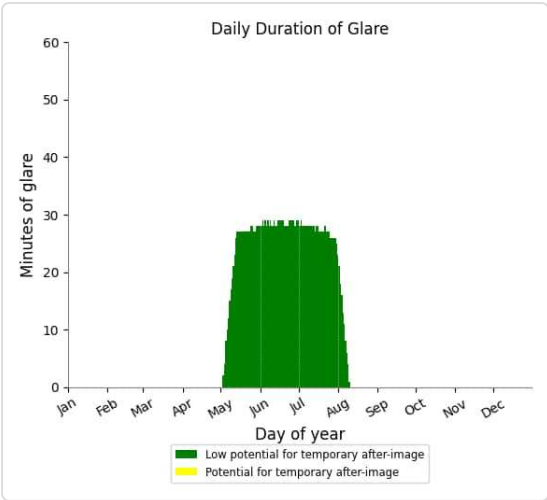
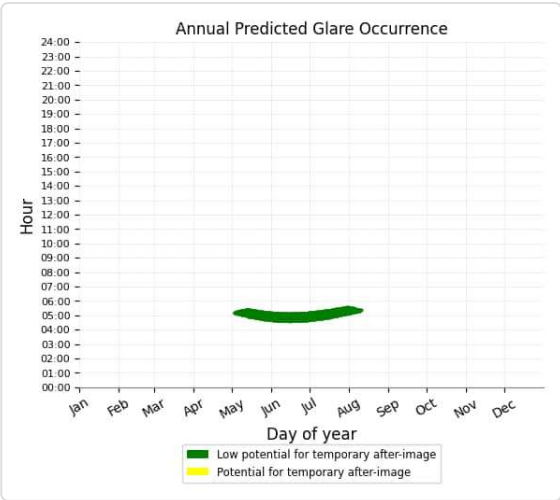


West Bound Entrance Ramp

Receptor type: Route

0 minutes of yellow glare

2,472 minutes of green glare

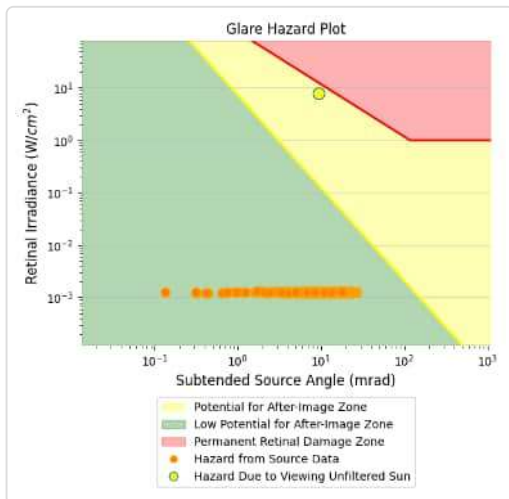
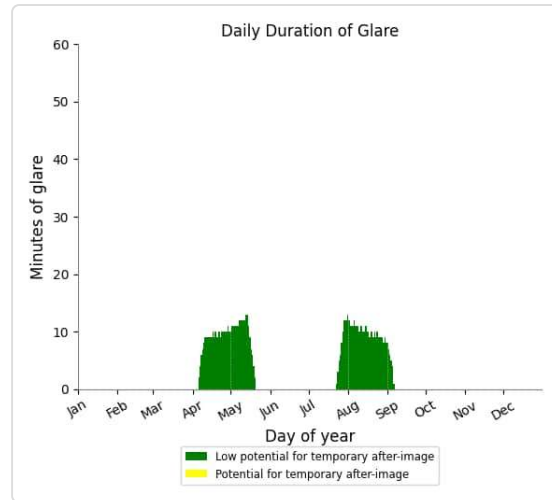
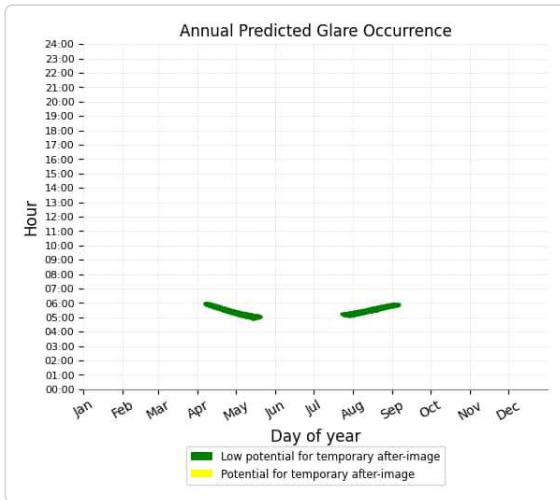


Westbound Hwy

Receptor type: Route

0 minutes of yellow glare

833 minutes of green glare



FP 1

Receptor type: 2-mile Flight Path

No glare found

FP 2

Receptor type: 2-mile Flight Path

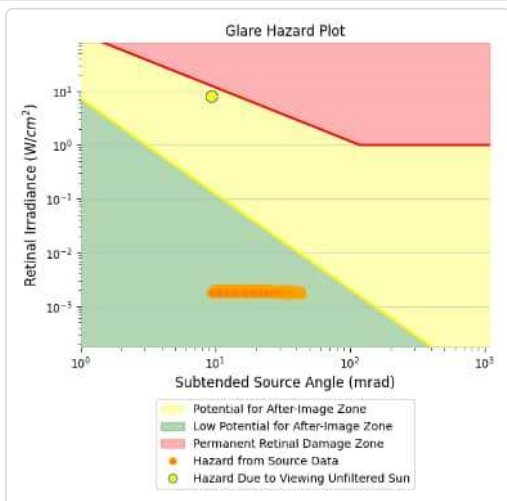
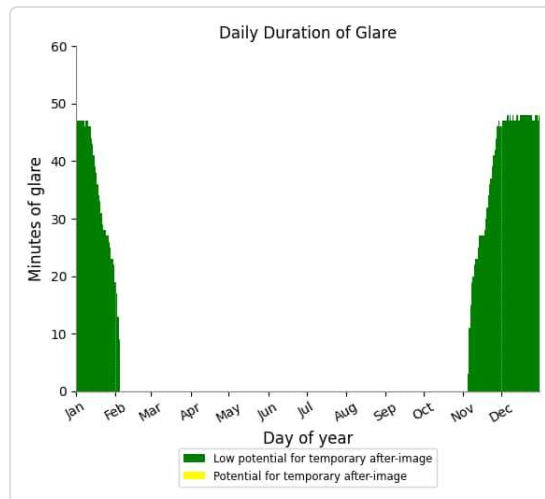
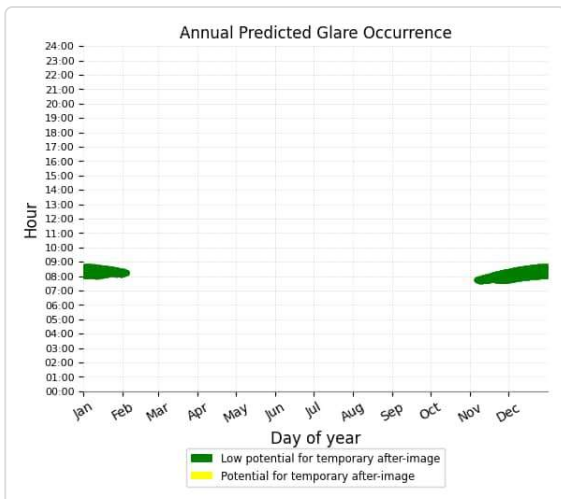
No glare found

OP 3

Receptor type: Observation Point

0 minutes of yellow glare

3,461 minutes of green glare



OP 1

Receptor type: Observation Point

No glare found

OP 2

Receptor type: Observation Point

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.

Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.

The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.

The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)

The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.

The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.

The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.

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

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

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

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

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

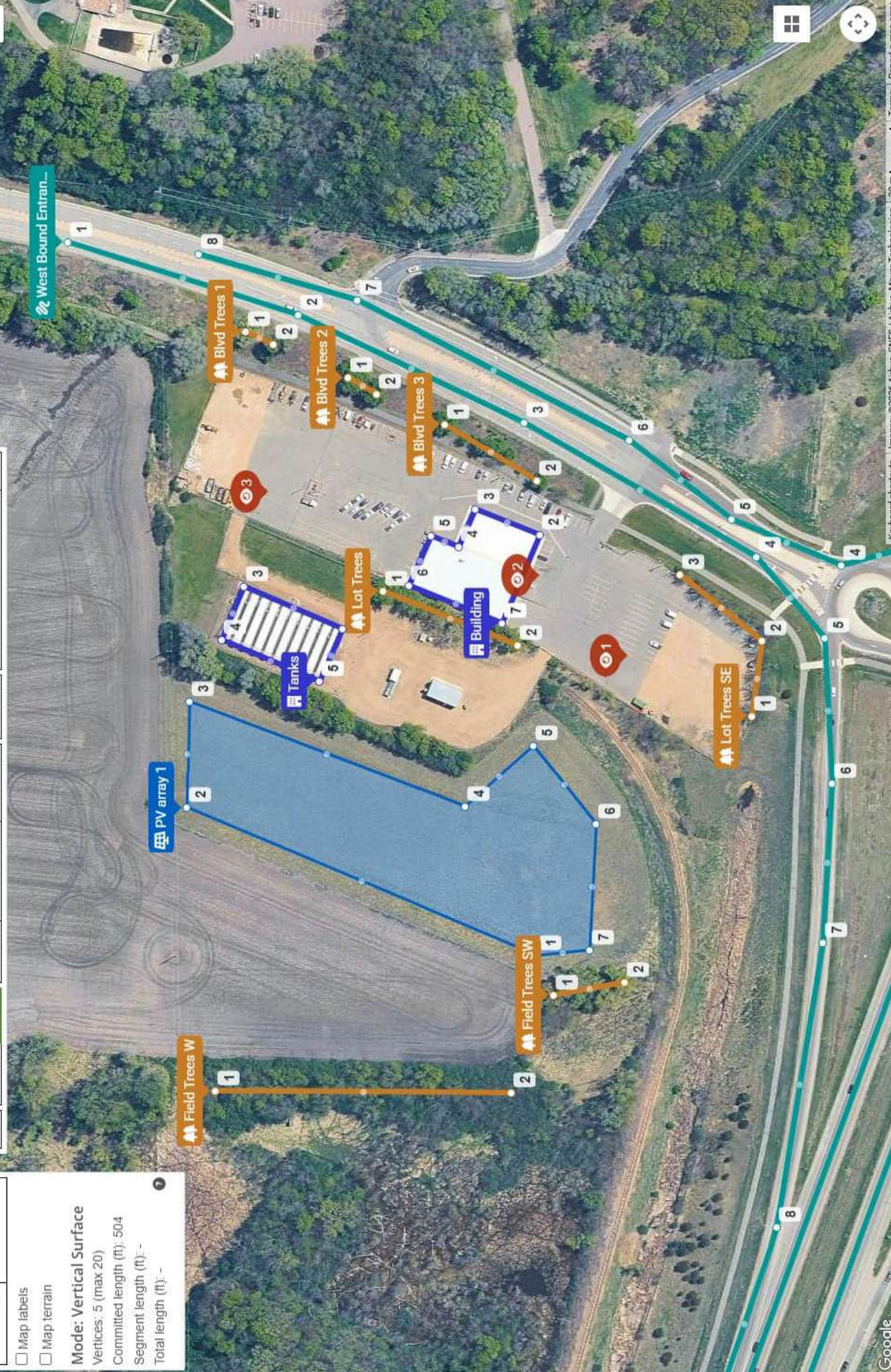
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This analysis was conducted using the best available radiometric modeling at the time of generation. Future updates to the modeling methodology may yield different results.

 Map	 Satellite
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☐ Map labels
☐ Map terrain

Mode: Vertical Surface
 Vertices: 5 (max 20)
 Committed length (ft): 504
 Segment length (ft): -
 Total length (ft): -



OE/AAA Pre-screening Results

Thu Apr 16 2026 15:13:06 GMT-0500 (Central Daylight Time)

Structure: Solar Panel

Latitude	Longitude	Height	Site Elevation	AMSL
44.190328	-93.982842	10	838	848
44.19355	-93.983577	10	827	837
44.192036	-93.982746	10	835	845
44.192025	-93.982129	10	840	850

Based on the information you provided, you are not required to file notice with the FAA.

