

ADDENDUM 2023-12-11

An updated glare assessment has been prepared based on the current proposed layout, Revision 21 dated 2023-11-15. See **Figure 1** below.



Figure 1: Mokoan Solar Farm – Proposed layout Rev 21 – 2023-11-15

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The glint and glare modelling has been run against the four identified proposed PV areas, based on the areas shown in **Figure 2** below.



Figure 2: Proposed PV Areas and Project receptors & routes (note : airports out of range - not shown)

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Based on the updated modelling results for the current layout there is no glare predicted from any assessed receptor when the project is configured with a resting angle of 3° or greater, as was found previously. For more detailed results, refer to the report outputs from the ForeSolar GlareGauge software provided.

See **Table 1** for a summary of predicted glare for all assessed scenarios based on a range of resting angles.

Table 1 – Summary results: Total predicted glare based on resting angle.

Resting Angle	Green Glare (min/year)			Yellow Glare (min/year)		
	Combined	Mokoan 1	Mokoan 2	Combined	Mokoan 1	Mokoan 2
0 degrees	22073	7247	14826	11259	3059	8200
1 degree	9441	2857	6584	1429	226	1203
2 degrees	404	0	404	0	0	0
3 degrees	0	0	0	0	0	0
5 degrees	0	0	0	0	0	0
15 degrees	0	0	0	0	0	0
30 degrees	0	0	0	0	0	0
45 degrees	0	0	0	0	0	0
60 degrees	0	0	0	0	0	0

Under the worst-case scenario, with the project configured with a resting angle of 0°, this resulted in predicted green or yellow glare of up to 20 minutes daily during the late afternoon to evening, between the hours of 4:20pm and 7:35pm (AEST) under the current proposed layout. This is a 45min increase compared to the previous window of between 5:00pm and 7:30pm (AEST) under the previously assessed layout.

The proposed plan should therefore be updated with the note to reflect the latest findings:

- Tracker resting angle will be set to 3 degrees or greater between 4:20-7:35pm (AEST) to avoid glare and glint impacts.

In summary, we recommend that the Resting Angle for the Project is configured to 3° or greater to avoid any predicted glare and that the window for the resting angle be between 4:20pm and 7:35pm (AEST).

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FORGESOLAR GLAREGAUGE ANALYSIS RESULTS - RESTING ANGLE AT 3°

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FORGESOLAR GLARE ANALYSIS

Project: **P0033010 Mokoan Solar Farm - Post Consent**

Site configuration: **Layout20231115_03deg**

Created 11 Dec, 2023

Updated 11 Dec, 2023

Time-step 1 minute

Timezone offset UTC10

Minimum sun altitude 0.0 deg

DNI peaks at 1,166.0 W/m²

Category 10 MW to 100 MW

Site ID 107590.11973

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 °	Orientation	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
PV Array 1A - Mokoan 1 East	SA tracking	SA tracking	0	0.0	0	0.0	-
PV Array 1B - Mokoan 1 West	SA tracking	SA tracking	0	0.0	0	0.0	-
PV Array 2A - Mokoan 2 South	SA tracking	SA tracking	0	0.0	0	0.0	-
PV Array 2B - Mokoan 2 North	SA tracking	SA tracking	0	0.0	0	0.0	-

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

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1 - Melbourne-Sydney Railway Line	0	0.0	0	0.0
Route 2 - Hume Fwy - Eastbound	0	0.0	0	0.0
Route 3 - Hume Fwy - Westbound	0	0.0	0	0.0
Route 4 - Winton-Glenrowan Road	0	0.0	0	0.0
Route 5 - Lee Road	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 6 - Nelson Road	0	0.0	0	0.0
Route 7 - Bowers Road	0	0.0	0	0.0
FP 1 - Benalla West 08	0	0.0	0	0.0
FP 2 - Benalla East 26	0	0.0	0	0.0
FP 3 - Wangaratta South 36	0	0.0	0	0.0
FP 4 - Wangaratta North 18	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 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0

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Component Data

PV Arrays

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Name: PV Array 1A - Mokoan 1 East

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 0.0°

Max tracking angle: 60.0°

Resting angle: 3.0°

Ground Coverage Ratio: 0.458

Rated power: -

Panel material: Smooth glass with AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.490282	146.129913	180.87	1.49	182.35
2	-36.491508	146.126996	177.12	1.49	178.61
3	-36.491508	146.126912	176.78	1.49	178.26
4	-36.491455	146.126332	174.24	1.49	175.73
5	-36.490866	146.126338	172.36	1.49	173.84
6	-36.490299	146.126461	171.06	1.49	172.55
7	-36.490315	146.126635	171.72	1.49	173.21
8	-36.489620	146.126643	170.08	1.49	171.57
9	-36.489620	146.126701	170.23	1.49	171.71
10	-36.489047	146.126707	169.99	1.49	171.47
11	-36.489061	146.126823	170.14	1.49	171.63
12	-36.488444	146.126830	170.01	1.49	171.50
13	-36.487880	146.126952	170.02	1.49	171.51
14	-36.487880	146.127010	170.07	1.49	171.55
15	-36.487831	146.127127	170.16	1.49	171.65
16	-36.487169	146.127134	170.00	1.49	171.48
17	-36.486861	146.127861	170.99	1.49	172.47
18	-36.487526	146.127854	171.34	1.49	172.83
19	-36.487403	146.128146	171.02	1.49	173.41
20	-36.487692	146.128142	172.21	1.49	173.70
21	-36.487299	146.129075	174.12	1.49	175.60
22	-36.487585	146.129072	174.55	1.49	176.04
23	-36.487536	146.129189	174.78	1.49	176.26
24	-36.488153	146.129182	175.89	1.49	177.38
25	-36.487883	146.129824	176.98	1.49	178.47
26	-36.488172	146.129820	177.53	1.49	179.02
27	-36.488098	146.129995	177.77	1.49	179.26
28	-36.488384	146.129992	178.30	1.49	179.79
29	-36.488335	146.130109	178.44	1.49	179.92
30	-36.488936	146.130102	179.40	1.49	180.89
31	-36.489010	146.129927	179.28	1.49	180.77
32	-36.489279	146.129924	179.65	1.49	181.13
33	-36.489005	146.130566	179.84	1.49	181.33
34	-36.489291	146.130563	180.01	1.49	181.50
35	-36.489241	146.130679	180.02	1.49	181.50
36	-36.489842	146.130672	180.68	1.49	182.17
37	-36.490166	146.129914	180.68	1.49	182.16
38	-36.490282	146.129913	180.87	1.49	182.35

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Name: PV Array 1B - Mokoan 1 West
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 0.0°
Max tracking angle: 60.0°
Resting angle: 3.0°
Ground Coverage Ratio: 0.458
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.490299	146.124008	169.85	1.49	171.34
2	-36.490223	146.124183	169.86	1.49	171.35
3	-36.490512	146.124180	169.89	1.49	171.37
4	-36.490361	146.124530	169.90	1.49	171.38
5	-36.490977	146.124523	169.98	1.49	171.46
6	-36.490927	146.124639	169.97	1.49	171.46
7	-36.491213	146.124636	170.10	1.49	171.58
8	-36.491036	146.125045	170.14	1.49	171.63
9	-36.491325	146.125041	170.51	1.49	172.00
10	-36.491212	146.125301	170.66	1.49	172.14
11	-36.490587	146.125425	169.99	1.49	171.48
12	-36.489971	146.125431	169.89	1.49	171.38
13	-36.489920	146.125548	169.87	1.49	171.35
14	-36.488674	146.125562	169.53	1.49	171.03
15	-36.488563	146.125824	169.54	1.49	171.02
16	-36.488249	146.125828	169.49	1.49	170.98
17	-36.488249	146.125886	169.50	1.49	170.98
18	-36.487362	146.125896	169.48	1.49	170.97
19	-36.487436	146.126721	169.45	1.49	170.94
20	-36.486816	146.125728	169.43	1.49	170.91
21	-36.486816	146.125670	169.41	1.49	170.90
22	-36.486543	146.125673	169.37	1.49	170.86
23	-36.486617	146.125498	169.35	1.49	170.84
24	-36.486328	146.125501	169.27	1.49	170.76
25	-36.487500	146.122733	169.81	1.49	171.29
26	-36.488090	146.122726	169.85	1.49	171.34
27	-36.488090	146.122784	169.84	1.49	171.32
28	-36.488362	146.122781	169.80	1.49	171.29
29	-36.488313	146.122898	169.79	1.49	171.27
30	-36.488602	146.122894	169.76	1.49	171.24
31	-36.488404	146.123361	169.71	1.49	171.19
32	-36.489322	146.123351	169.73	1.49	171.22
33	-36.489248	146.123526	169.73	1.49	171.21
34	-36.489537	146.123523	169.75	1.49	171.24
35	-36.489327	146.124019	169.75	1.49	171.23
36	-36.490299	146.124008	169.85	1.49	171.34

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Name: PV Array 2A - Mokoan 2 South

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 0.0°

Max tracking angle: 60.0°

Resting angle: 3.0°

Ground Coverage Ratio: 0.458

Rated power: -

Panel material: Smooth glass with AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.489599	146.114649	167.84	1.49	169.32
2	-36.489599	146.114622	167.83	1.49	169.32
3	-36.488723	146.114632	167.88	1.49	169.36
4	-36.488687	146.114693	167.90	1.49	169.39
5	-36.488470	146.115216	168.13	1.49	169.62
6	-36.488181	146.115219	168.10	1.49	169.59
7	-36.488127	146.115278	168.12	1.49	169.60
8	-36.488088	146.115336	168.15	1.49	169.63
9	-36.483798	146.125454	168.30	1.49	169.78
10	-36.484685	146.125444	168.81	1.49	170.30
11	-36.484759	146.125269	168.86	1.49	170.35
12	-36.485048	146.125266	169.01	1.49	170.50
13	-36.489253	146.115350	168.07	1.49	169.56
14	-36.489346	146.115232	168.06	1.49	169.54
15	-36.489563	146.114710	167.83	1.49	169.32
16	-36.489599	146.114649	167.84	1.49	169.32

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Name: PV Array 2B - Mokoan 2 North

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 0.0°

Max tracking angle: 60.0°

Resting angle: 3.0°

Ground Coverage Ratio: 0.458

Rated power: -

Panel material: Smooth glass with AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.484092	146.123679	168.48	1.49	169.96
2	-36.484832	146.122054	168.81	1.49	170.30
3	-36.486164	146.118903	168.77	1.49	170.26
4	-36.487780	146.115027	168.07	1.49	169.56
5	-36.489134	146.113553	167.49	1.49	168.98
6	-36.488520	146.113560	167.51	1.49	169.00
7	-36.488303	146.113796	167.60	1.49	169.08
8	-36.488018	146.113799	167.62	1.49	169.11
9	-36.486834	146.115088	167.68	1.49	169.16
10	-36.486584	146.115091	167.57	1.49	169.05
11	-36.486438	146.115441	167.64	1.49	169.13
12	-36.485740	146.115449	167.44	1.49	168.92
13	-36.485667	146.115624	167.45	1.49	168.94
14	-36.485381	146.115627	167.41	1.49	168.89
15	-36.485333	146.115744	167.43	1.49	168.91
16	-36.485044	146.115747	167.44	1.49	168.92
17	-36.484387	146.117322	167.75	1.49	169.24
18	-36.483485	146.117332	167.47	1.49	168.96
19	-36.483071	146.118324	167.64	1.49	169.02
20	-36.482782	146.118327	167.47	1.49	168.95
21	-36.480983	146.122554	167.38	1.49	168.87
22	-36.481271	146.122550	167.59	1.49	169.08
23	-36.481192	146.122725	167.48	1.49	168.97
24	-36.481478	146.122722	167.62	1.49	169.10
25	-36.481371	146.122955	167.51	1.49	168.99
26	-36.481985	146.122949	167.64	1.49	169.13
27	-36.481802	146.123357	167.56	1.49	169.05
28	-36.482076	146.123354	167.62	1.49	169.11
29	-36.482077	146.123412	167.61	1.49	169.10
30	-36.483048	146.123401	168.01	1.49	169.50
31	-36.482995	146.123518	167.95	1.49	169.44
32	-36.483284	146.123514	168.11	1.49	169.59
33	-36.483204	146.123689	168.06	1.49	169.54
34	-36.484092	146.123679	168.48	1.49	169.96

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Route Receptors

Name: Route 1 - Melbourne-Sydney Railway Line

Path type: Two-way

Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.494739	146.104295	171.60	2.42	174.02
2	-36.493727	146.106664	169.80	2.42	172.22
3	-36.492897	146.108650	170.20	2.42	172.62
4	-36.492057	146.110630	169.90	2.42	172.32
5	-36.491218	146.112608	169.70	2.42	172.12
6	-36.490378	146.114586	169.70	2.42	172.12
7	-36.489544	146.116568	169.90	2.42	172.32
8	-36.488707	146.118549	169.90	2.42	172.32
9	-36.487868	146.120527	170.20	2.42	172.62
10	-36.487034	146.122509	169.70	2.42	172.12
11	-36.486195	146.124486	169.20	2.42	171.62
12	-36.485350	146.126466	169.60	2.42	172.02
13	-36.484512	146.128448	170.30	2.42	172.72
14	-36.484088	146.129441	171.70	2.42	174.12
15	-36.483683	146.130436	173.40	2.42	175.82
16	-36.483302	146.131449	175.60	2.42	178.02
17	-36.482968	146.132486	178.40	2.42	180.82
18	-36.482684	146.133548	179.80	2.42	182.22
19	-36.482114	146.135665	187.00	2.42	189.42
20	-36.481457	146.138184	189.90	2.42	192.32

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Name: Route 2 - Hume Fwy - Eastbound
Path type: One-way (toward increasing index)
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.498530	146.109800	187.90	1.50	189.40
2	-36.497808	146.112638	178.70	1.50	180.20
3	-36.497108	146.115056	177.90	1.50	179.40
4	-36.496454	146.117100	176.40	1.50	177.90
5	-36.495613	146.119510	172.70	1.50	174.20
6	-36.494948	146.121237	171.30	1.50	172.80
7	-36.494437	146.122501	171.00	1.50	172.50
8	-36.493694	146.124261	172.00	1.50	173.50
9	-36.492354	146.127430	179.40	1.50	180.90
10	-36.490441	146.131932	184.40	1.50	185.90
11	-36.489407	146.134366	184.70	1.50	186.20
12	-36.488989	146.135336	185.20	1.50	186.70
13	-36.488753	146.135866	185.20	1.50	186.70
14	-36.488009	146.137640	184.60	1.50	186.10
15	-36.487219	146.139519	186.40	1.50	187.90
16	-36.486778	146.140553	187.40	1.50	188.90
17	-36.486308	146.141638	188.10	1.50	189.60

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Name: Route 3 - Hume Fwy - Westbound
Path type: One-way (toward increasing index)
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.486573	146.141789	188.30	1.50	189.80
2	-36.487234	146.140258	187.80	1.50	189.30
3	-36.487823	146.138853	186.30	1.50	187.80
4	-36.488919	146.136264	186.20	1.50	187.70
5	-36.489717	146.134407	186.10	1.50	187.60
6	-36.491158	146.131020	184.50	1.50	186.00
7	-36.492598	146.127611	180.00	1.50	181.50
8	-36.493826	146.124731	172.80	1.50	174.30
9	-36.494712	146.122623	171.20	1.60	172.80
10	-36.495362	146.120999	171.60	1.50	173.10
11	-36.496015	146.119264	173.50	1.50	175.00
12	-36.496759	146.117136	177.00	1.50	178.50
13	-36.497445	146.114979	178.80	1.50	180.30
14	-36.498044	146.112899	179.20	1.50	180.70
15	-36.498696	146.110404	181.50	1.50	183.00

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Name: Route 4 - Winton-Glenrowan Road
Path type: Two-way
Observer view angle: 50.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.499110	146.114754	190.80	1.50	192.30
2	-36.497946	146.117478	179.10	1.50	180.60
3	-36.496590	146.120688	173.00	1.50	174.50
4	-36.494697	146.125109	174.20	1.50	175.70
5	-36.492846	146.129469	188.20	1.50	189.70
6	-36.491378	146.132917	189.30	1.50	190.80
7	-36.489825	146.136601	189.00	1.50	190.50
8	-36.489155	146.138125	188.70	1.50	190.20
9	-36.487441	146.142200	189.10	1.50	190.60

Name: Route 5 - Lee Road

Path type: Two-way

Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.495028	146.104500	171.10	1.50	172.60
2	-36.493484	146.108171	169.30	1.50	170.80
3	-36.492191	146.111218	169.60	1.50	171.10
4	-36.490914	146.114267	168.30	1.50	169.80
5	-36.489856	146.116693	168.40	1.50	169.90
6	-36.489694	146.116913	168.90	1.50	170.40
7	-36.488707	146.119201	169.60	1.50	171.10
8	-36.487392	146.122325	169.80	1.50	171.30
9	-36.486273	146.124973	169.20	1.50	170.70
10	-36.485309	146.127252	169.90	1.50	171.40
11	-36.484545	146.129050	171.20	1.50	172.70
12	-36.483938	146.130495	173.70	1.50	175.20
13	-36.483614	146.131341	175.60	1.50	177.10
14	-36.483287	146.132290	177.80	1.50	179.30
15	-36.483010	146.133268	179.60	1.50	181.10
16	-36.482518	146.135115	181.90	1.50	183.40
17	-36.481657	146.138365	189.80	1.50	191.30

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Name: Route 6 - Nelson Road

Path type: Two-way

Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.494474	146.104090	169.70	1.50	171.20
2	-36.494169	146.104765	168.90	1.50	170.40
3	-36.494022	146.104986	168.60	1.50	170.10
4	-36.493789	146.105470	167.90	1.50	169.40
5	-36.493247	146.106734	167.50	1.50	169.00
6	-36.492850	146.107684	168.30	1.50	169.80
7	-36.492442	146.108653	168.80	1.50	170.30
8	-36.491746	146.110336	169.00	1.50	170.50
9	-36.490998	146.112101	168.20	1.50	169.70
10	-36.490578	146.113083	168.00	1.50	169.50
11	-36.490031	146.114349	167.80	1.50	169.30
12	-36.489756	146.115025	167.90	1.50	169.40
13	-36.489482	146.115681	168.10	1.50	169.60
14	-36.489328	146.116116	168.20	1.50	169.70
15	-36.489176	146.116631	168.40	1.50	169.90
16	-36.488679	146.117829	169.00	1.50	170.50
17	-36.487715	146.120065	169.60	1.50	171.10
18	-36.486763	146.122350	169.60	1.50	171.10
19	-36.486128	146.123845	169.40	1.50	170.90
20	-36.484928	146.126722	169.40	1.50	170.90
21	-36.483650	146.129700	172.10	1.50	173.60
22	-36.483288	146.130619	173.90	1.50	175.40
23	-36.483033	146.131311	175.30	1.50	176.80
24	-36.482812	146.131987	176.90	1.50	178.40
25	-36.482556	146.132827	179.50	1.50	181.00
26	-36.482213	146.134125	180.90	1.50	182.40
27	-36.481983	146.134923	184.20	1.50	185.70
28	-36.481658	146.136178	190.00	1.50	191.50
29	-36.481215	146.137899	190.00	1.50	191.50

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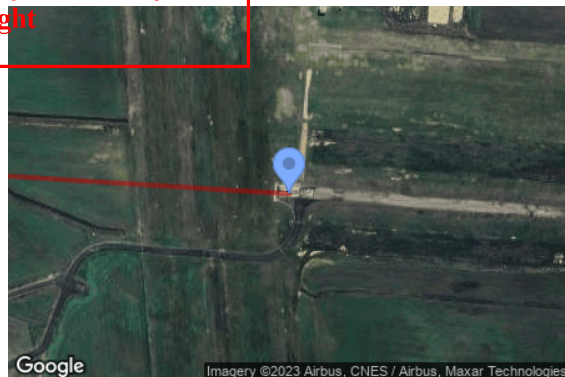
Name: Route 7 - Bowers Road
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-36.496419	146.121087	172.60	1.50	174.10
2	-36.495589	146.120581	172.10	1.50	173.60
3	-36.495081	146.120197	171.80	1.50	173.30
4	-36.493567	146.119254	170.70	1.50	172.20
5	-36.491889	146.118127	169.90	1.50	171.40
6	-36.491576	146.117956	169.60	1.50	171.10
7	-36.491153	146.117672	169.20	1.50	170.70
8	-36.490230	146.117027	168.60	1.50	170.10
9	-36.489904	146.116825	168.60	1.50	170.10
10	-36.489846	146.116810	168.60	1.50	170.10
11	-36.489765	146.116817	168.90	1.50	170.40

Flight Path Receptors

Name: FP 1 - Benalla West 08
Description: None
Threshold height: 15 m
Direction: 93.6°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	-36.551962	146.006961	171.50	15.30	186.80
Two-mile	-36.550147	145.970999	169.60	185.80	355.40

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Name: FP 2 - Benalla East 26

Description: None

Threshold height: 15 m

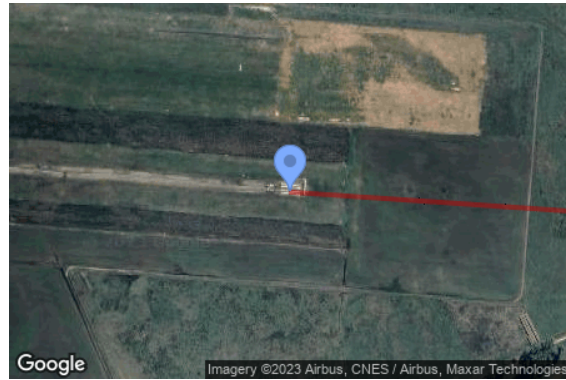
Direction: 273.9°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	-36.552663	146.018115	172.70	15.20	187.90
Two-mile	-36.554620	146.054067	177.50	179.10	356.60

Name: FP 3 - Wangaratta South 36

Description: None

Threshold height: 15 m

Direction: 8.6°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



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Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	-36.422679	146.307067	153.50	15.20	168.70
Two-mile	-36.451265	146.301676	156.00	181.40	337.40

Name: FP 4 - Wangaratta North 18

Description: None

Threshold height: 15 m

Direction: 187.5°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	-36.408501	146.309633	153.50	15.20	168.70
Two-mile	-36.379834	146.314309	156.00	181.40	337.40

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	-36.486587	146.128915	172.80	1.65
OP 2	2	-36.495534	146.128247	191.10	1.65
OP 3	3	-36.494341	146.120144	171.20	1.65
OP 4	4	-36.494207	146.117408	171.50	1.65
OP 5	5	-36.497697	146.107437	189.10	1.65
OP 6	6	-36.481969	146.140345	190.00	1.65
OP 7	7	-36.471548	146.140420	180.60	1.65

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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	
PV Array 1A - Mokoan 1 East	SA tracking	SA tracking	0	0.0	0	0.0	-
PV Array 1B - Mokoan 1 West	SA tracking	SA tracking	0	0.0	0	0.0	-
PV Array 2A - Mokoan 2 South	SA tracking	SA tracking	0	0.0	0	0.0	-
PV Array 2B - Mokoan 2 North	SA tracking	SA tracking	0	0.0	0	0.0	-

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

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1 - Melbourne-Sydney Railway Line	0	0.0	0	0.0
Route 2 - Hume Fwy - Eastbound	0	0.0	0	0.0
Route 3 - Hume Fwy - Westbound	0	0.0	0	0.0
Route 4 - Winton-Glenrowan Road	0	0.0	0	0.0
Route 5 - Lee Road	0	0.0	0	0.0
Route 6 - Nelson Road	0	0.0	0	0.0
Route 7 - Bowers Road	0	0.0	0	0.0
FP 1 - Benalla West 08	0	0.0	0	0.0
FP 2 - Benalla East 26	0	0.0	0	0.0
FP 3 - Wangaratta South 36	0	0.0	0	0.0
FP 4 - Wangaratta North 18	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 5	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0

PV: PV Array 1A - Mokoan 1 East no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1 - Melbourne-Sydney Railway Line	0	0.0	0	0.0
Route 2 - Hume Fwy - Eastbound	0	0.0	0	0.0
Route 3 - Hume Fwy - Westbound	0	0.0	0	0.0
Route 4 - Winton-Glenrowan Road	0	0.0	0	0.0
Route 5 - Lee Road	0	0.0	0	0.0
Route 6 - Nelson Road	0	0.0	0	0.0
Route 7 - Bowers Road	0	0.0	0	0.0
FP 1 - Benalla West 08	0	0.0	0	0.0
FP 2 - Benalla East 26	0	0.0	0	0.0
FP 3 - Wangaratta South 36	0	0.0	0	0.0
FP 4 - Wangaratta North 18	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 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0

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PV Array 1A - Mokoan 1 East and Route: Route 1 - Melbourne-Sydney Railway Line

No glare found

PV Array 1A - Mokoan 1 East and Route: Route 2 - Hume Fwy - Eastbound

No glare found

PV Array 1A - Mokoan 1 East and Route: Route 3 - Hume Fwy - Westbound

No glare found

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PV Array 1A - Mokoan 1 East and Route: Route 4 - Winton-Glenrowan Road

No glare found

PV Array 1A - Mokoan 1 East and Route: Route 5 - Lee Road

No glare found

PV Array 1A - Mokoan 1 East and Route: Route 6 - Nelson Road

No glare found

PV Array 1A - Mokoan 1 East and Route: Route 7 - Bowers Road

No glare found

PV Array 1A - Mokoan 1 East and FP: FP 1 - Benalla West 08

No glare found

PV Array 1A - Mokoan 1 East and FP: FP 2 - Benalla East 26

No glare found

PV Array 1A - Mokoan 1 East and FP: FP 3 - Wangaratta South 36

No glare found

PV Array 1A - Mokoan 1 East and FP: FP 4 - Wangaratta North 18

No glare found

PV Array 1A - Mokoan 1 East and OP 1

No glare found

PV Array 1A - Mokoan 1 East and OP 2

No glare found

PV Array 1A - Mokoan 1 East and OP 3

No glare found

PV Array 1A - Mokoan 1 East and OP 4

No glare found

PV Array 1A - Mokoan 1 East and OP 5

No glare found

PV Array 1A - Mokoan 1 East and OP 6

No glare found

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PV Array 1A - Mokoan 1 East and OP 7

No glare found

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PV: PV Array 1B - Mokoan 1 West no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1 - Melbourne-Sydney Railway Line	0	0.0	0	0.0
Route 2 - Hume Fwy - Eastbound	0	0.0	0	0.0
Route 3 - Hume Fwy - Westbound	0	0.0	0	0.0
Route 4 - Winton-Glenrowan Road	0	0.0	0	0.0
Route 5 - Lee Road	0	0.0	0	0.0
Route 6 - Nelson Road	0	0.0	0	0.0
Route 7 - Bowers Road	0	0.0	0	0.0
FP 1 - Benalla West 08	0	0.0	0	0.0
FP 2 - Benalla East 26	0	0.0	0	0.0
FP 3 - Wangaratta South 36	0	0.0	0	0.0
FP 4 - Wangaratta North 18	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 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0

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PV Array 1B - Mokoan 1 West and Route: Route 1 - Melbourne-Sydney Railway Line

No glare found

PV Array 1B - Mokoan 1 West and Route: Route 2 - Hume Fwy - Eastbound

No glare found

PV Array 1B - Mokoan 1 West and Route: Route 3 - Hume Fwy - Westbound

No glare found

PV Array 1B - Mokoan 1 West and Route: Route 4 - Winton-Glenrowan Road

No glare found

PV Array 1B - Mokoan 1 West and Route: Route 5 - Lee Road

No glare found

PV Array 1B - Mokoan 1 West and Route: Route 6 - Nelson Road

No glare found

PV Array 1B - Mokoan 1 West and Route: Route 7 - Bowers Road

No glare found

PV Array 1B - Mokoan 1 West and FP: FP 1 - Benalla West 08

No glare found

PV Array 1B - Mokoan 1 West and FP: FP 2 - Benalla East 26

No glare found

PV Array 1B - Mokoan 1 West and FP: FP 3 - Wangaratta South 36

No glare found

PV Array 1B - Mokoan 1 West and FP: FP 4 - Wangaratta North 18

No glare found

PV Array 1B - Mokoan 1 West and OP 1

No glare found

PV Array 1B - Mokoan 1 West and OP 2

No glare found

PV Array 1B - Mokoan 1 West and OP 3

No glare found

PV Array 1B - Mokoan 1 West and OP 4

No glare found

PV Array 1B - Mokoan 1 West and OP 5

No glare found

PV Array 1B - Mokoan 1 West and OP 6

No glare found

PV Array 1B - Mokoan 1 West and OP 7

No glare found

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PV: PV Array 2A - Mokoan 2 South no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1 - Melbourne-Sydney Railway Line	0	0.0	0	0.0
Route 2 - Hume Fwy - Eastbound	0	0.0	0	0.0
Route 3 - Hume Fwy - Westbound	0	0.0	0	0.0
Route 4 - Winton-Glenrowan Road	0	0.0	0	0.0
Route 5 - Lee Road	0	0.0	0	0.0
Route 6 - Nelson Road	0	0.0	0	0.0
Route 7 - Bowers Road	0	0.0	0	0.0
FP 1 - Benalla West 08	0	0.0	0	0.0
FP 2 - Benalla East 26	0	0.0	0	0.0
FP 3 - Wangaratta South 36	0	0.0	0	0.0
FP 4 - Wangaratta North 18	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 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0

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PV Array 2A - Mokoan 2 South and Route: Route 1 - Melbourne-Sydney Railway Line

No glare found

PV Array 2A - Mokoan 2 South and Route: Route 2 - Hume Fwy - Eastbound

No glare found

PV Array 2A - Mokoan 2 South and Route: Route 3 - Hume Fwy - Westbound

No glare found

PV Array 2A - Mokoan 2 South and Route: Route 4 - Winton-Glenrowan Road

No glare found

PV Array 2A - Mokoan 2 South and Route: Route 5 - Lee Road

No glare found

PV Array 2A - Mokoan 2 South and Route: Route 6 - Nelson Road

No glare found

PV Array 2A - Mokoan 2 South and Route: Route 7 - Bowers Road

No glare found

PV Array 2A - Mokoan 2 South and FP: FP 1 - Benalla West 08

No glare found

PV Array 2A - Mokoan 2 South and FP: FP 2 - Benalla East 26

No glare found

PV Array 2A - Mokoan 2 South and FP: FP 3 - Wangaratta South 36

No glare found

PV Array 2A - Mokoan 2 South and FP: FP 4 - Wangaratta North 18

No glare found

PV Array 2A - Mokoan 2 South and OP 1

No glare found

PV Array 2A - Mokoan 2 South and OP 2

No glare found

PV Array 2A - Mokoan 2 South and OP 3

No glare found

PV Array 2A - Mokoan 2 South and OP 4

No glare found

PV Array 2A - Mokoan 2 South and OP 5

No glare found

PV Array 2A - Mokoan 2 South and OP 6

No glare found

PV Array 2A - Mokoan 2 South and OP 7

No glare found

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PV: PV Array 2B - Mokoan 2 North no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1 - Melbourne-Sydney Railway Line	0	0.0	0	0.0
Route 2 - Hume Fwy - Eastbound	0	0.0	0	0.0
Route 3 - Hume Fwy - Westbound	0	0.0	0	0.0
Route 4 - Winton-Glenrowan Road	0	0.0	0	0.0
Route 5 - Lee Road	0	0.0	0	0.0
Route 6 - Nelson Road	0	0.0	0	0.0
Route 7 - Bowers Road	0	0.0	0	0.0
FP 1 - Benalla West 08	0	0.0	0	0.0
FP 2 - Benalla East 26	0	0.0	0	0.0
FP 3 - Wangaratta South 36	0	0.0	0	0.0
FP 4 - Wangaratta North 18	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 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0

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PV Array 2B - Mokoan 2 North and Route: Route 1 - Melbourne-Sydney Railway Line

No glare found

PV Array 2B - Mokoan 2 North and Route: Route 2 - Hume Fwy - Eastbound

No glare found

PV Array 2B - Mokoan 2 North and Route: Route 3 - Hume Fwy - Westbound

No glare found

PV Array 2B - Mokoan 2 North and Route: Route 4 - Winton-Glenrowan Road

No glare found

PV Array 2B - Mokoan 2 North and Route: Route 5 - Lee Road

No glare found

PV Array 2B - Mokoan 2 North and Route: Route 6 - Nelson Road

No glare found

PV Array 2B - Mokoan 2 North and Route: Route 7 - Bowers Road

No glare found

PV Array 2B - Mokoan 2 North and FP: FP 1 - Benalla West 08

No glare found

PV Array 2B - Mokoan 2 North and FP: FP 2 - Benalla East 26

No glare found

PV Array 2B - Mokoan 2 North and FP: FP 3 - Wangaratta South 36

No glare found

PV Array 2B - Mokoan 2 North and FP: FP 4 - Wangaratta North 18

No glare found

PV Array 2B - Mokoan 2 North and OP 1

No glare found

PV Array 2B - Mokoan 2 North and OP 2

No glare found

PV Array 2B - Mokoan 2 North and OP 3

No glare found

PV Array 2B - Mokoan 2 North and OP 4

No glare found

PV Array 2B - Mokoan 2 North and OP 5

No glare found

PV Array 2B - Mokoan 2 North and OP 6

No glare found

PV Array 2B - Mokoan 2 North and OP 7

No glare found

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Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.

The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.

Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.

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

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

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

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

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

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

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

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

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

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

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

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