Twizel Solar Plant

Glint and glare study

Final Report

Revision 05
April 2026

ENGINEERING | STRATEGY | ANALYTICS | COMPLIANCE

About this report

This report assesses the glint and glare impact of the proposed Twizel Solar Plant located southeast of the town of Twizel, New Zealand This report was commissioned by BTW Company.

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The author, Nicholas Logan, has read the Expert Witness Code of Conduct set out in the Environment Court Practice Note 2023. The author has complied with the Code of Conduct in preparing this report. The content of the report is within the authors area of expertise, and the author has not omitted to consider material facts known to them that might alter or detract from the opinions expressed in the report.

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ABBREVIATIONS

AUD	Australian Dollar
CASA	Civil Aviation Safety Authority
FAA	Federal Aviation Administration (United States)
FP	Flight path receptor
ha	Hectare
ITP	IT Power (Australia) Pty Ltd
kW	Kilowatt, unit of power
kWh	Kilowatt-hour, unit of energy (1 kW generated/used for 1 hour)
kWp	Kilowatt-peak, unit of power for PV panels tested at STC
MW	Megawatt, equivalent to 1,000 kW
MWh	Megawatt-hour, equivalent to 1,000 kWh
MWp	Megawatt-peak, equivalent to 1,000 kWp
OP	Observation point receptor
PV	Photovoltaic
RT	Route receptor
STC	Standard Test Conditions for PV panels (irradiance 1,000 W/m2, cell temperature 25 °C, Atmospheric Mass 1.5)
SGHAT	Solar Glare Hazard Analysis Tool

EXECUTIVE SUMMARY

ITP assessed how potential glare from the proposed Twizel solar plant could affect 26 observation points, eight road routes, and two flight paths in the vicinity of the plant.

The results of the GlareGauge analysis with no mitigation indicated 8 observation points and 4 routes received green glare, while 3 road routes received yellow glare. Yellow glare has the potential to cause after image to observers, while green glare has low potential to cause after image.

McAughtries Road received the most glare, with up to 12 minutes of yellow glare in a single day. Additionally, both car and truck drivers along sections of New Zealand State Highway 8 were subject to yellow glare for up to 6 minutes per day. Max Smith Dr received up to 3 minutes of yellow glare in a day over a few months.

Given the levels of yellow glare experienced by drivers along McAughtries Road and New Zealand State Highway 8, we recommend implementing mitigation measures to reduce the visual impact of the proposed solar plant.

To mitigate the glare impacts of the solar plant, ITP also simulated the solar farm providing for the trackers to have a backtracking limit angle of 5˚. This analysis did not identify any green or yellow glare effects, indicating that this approach provides effective mitigation.

1 INTRODUCTION

1.1 Overview

BTW Company has requested a glint and glare assessment for a solar photovoltaic (PV) installation proposed by Nova Energy, a wholly owned subsidiary of Todd Corporation. This assessment will be submitted as part of the resource consent process for the project. It includes:

- Identification of potential receptors of glint and glare from the proposed solar farm
- Assessment of the glint and glare hazard using the Solar Glare Hazard Analysis Tool (SGHAT) GlareGauge analysis.

1.2 Glint and Glare

The United States Federal Aviation Administration (FAA) defines glint and glare as follows:[1]

- Glint is a momentary flash of bright light
- Glare is a continuous source of excessive brightness relative to ambient lighting.

Glint and glare can occur when light reflected off a surface (reflector) is viewed by a person (receptor). Glint typically occurs when either the receptor or the reflector is moving, while glare typically occurs when the reflector and receptor are completely, or nearly, stationary. For a transparent material (e.g., glass, water) the quantity of light reflected depends on the surface itself (i.e., material and texture), and the angle at which the light intercepts it (angle of incidence). More light is reflected at higher angles of incidence as shown in Figure 1.

[1] Federal Aviation Administration (2018)

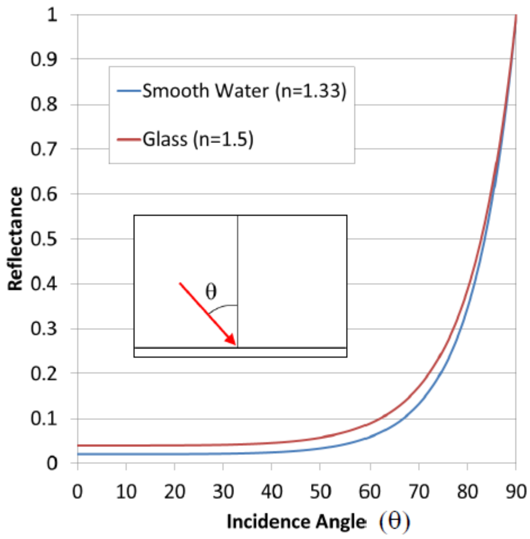

Figure 1: Angles of incidence and increased levels of reflected light

Potential visual impacts from glint and glare include distraction and temporary afterimage; at its worst, it can cause retinal burn. The ocular hazard caused by glint or glare is a function of:

- The intensity of the glare upon the eye (retinal irradiance)
- The subtended angle of the glare source (i.e., the extent to which the glare occupies the receptor's field of vision; dependent on size and distance of the reflector).

The severity of the ocular hazard can be divided into three levels, as shown in Figure 2:

- Green glare, which has low potential to cause temporary afterimage
- Yellow glare, which has potential to cause temporary afterimage
- Red glare, which can cause retinal burn and is not expected for PV.

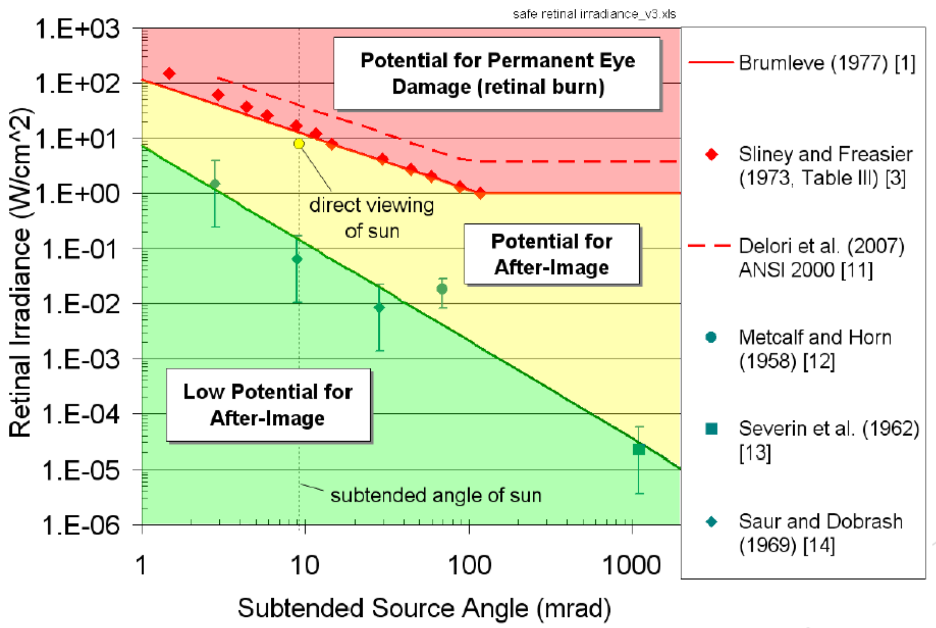

Figure 2: Classification of glare based on severity of ocular effects.

1.3 Glare from Solar PV

Solar photovoltaic (PV) cells are designed to absorb as much light as possible to maximise efficiency (generally around 98% of the light received). To limit reflection, solar cells are constructed from dark, light-absorbing material and are treated with an anti-reflective coating. PV modules generate less glare than many other surfaces, as shown in Figure 3.

The small percentage of light reflected from PV modules varies depending on the angle of incidence. Figure 4 shows an example of this with a solar module. A larger angle of incidence will result in a higher percentage of reflected light.

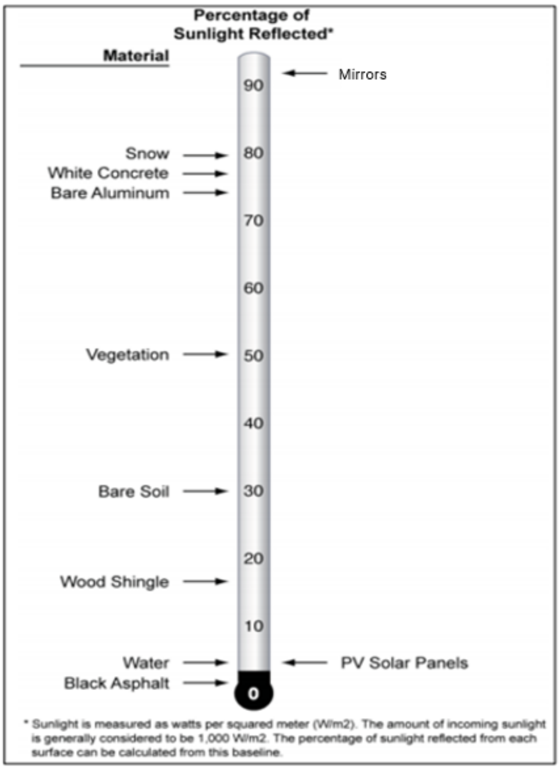

Figure 3: Typical percentage of sunlight reflected from different surfaces.[2]

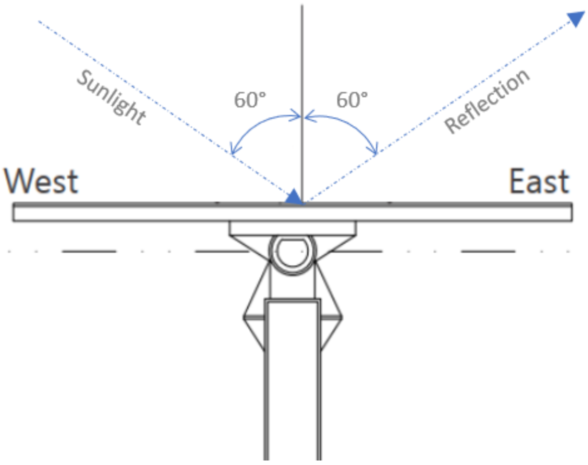

Figure 4: Typical sunlight reflection off the surface of a PV module

The two most common PV mounting structures are fixed tilt and single axis tracking. Fixed tilt arrays are stationary, while single axis tracking arrays rotate the receiving surface of the modules from east to west throughout the day as the sun moves across the sky.

In a fixed tilt PV array, since the sun is moving but the modules are stationary, the angle of incidence varies as the sun moves across the sky. It is smallest around noon when the sun is

[2] Journal of Airport Management, 2014

overhead and largest in the early morning and late afternoon when the sun is near the horizon. There is therefore a higher potential for glare at these times.

The angle of incidence for a single axis tracking system varies less as the reflective surface of the modules rotates on a horizontal axis to follow the sun. Single axis tracking arrays therefore generate less glare than fixed tilt arrays. The tracking varies throughout the year to match seasonal changes in the sun's path (see Figure 5).

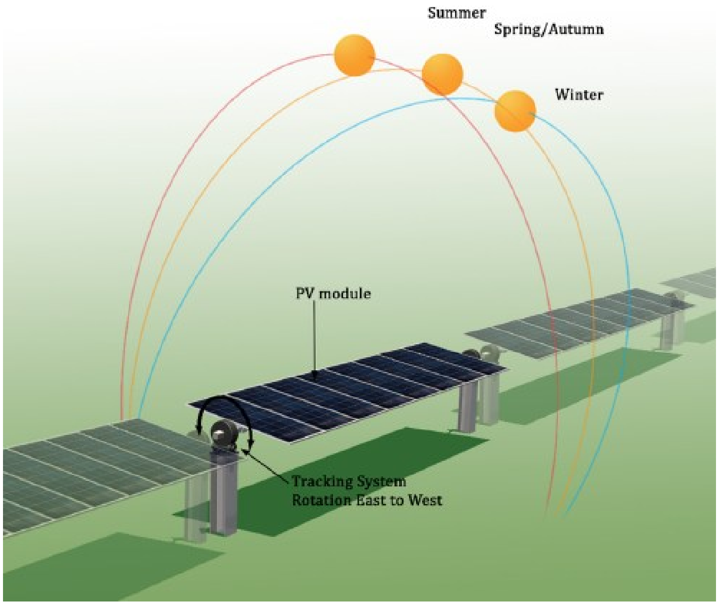

Figure 5: Sun position relative to PV modules on a horizontal single-axis tracking system

The main exception to this tracking approach occurs during very early mornings and late evenings. During these times, the low elevation of the sun causes trackers to cast shadows on each other (known as self-shading), which leads to significant loss of generation. To avoid these losses during these periods, the arrays are programmed not to face the sun directly, but to adopt lower tracking angles to eliminate self-shading. This strategy is called "backtracking". In most cases, the only time glare impact is experienced from tracking arrays is during backtracking as the combination of low sun elevation and near horizontal modules leads to a higher angle of incidence and a higher level of reflection.

1.4 Mitigation measures

Unacceptable levels of glare can be mitigated through a combination of the following strategies:

- Optimising the orientation and tilt angle of fixed-tilt arrays to reduce glare occurrences.
- Blocking the line-of-sight between solar farm and receptor, typically by planting screening vegetation.

- Limiting the backtracking angle of single-axis tracking arrays (e.g. to 5°).
- Removing or relocating targeted sections of the array as a last resort.

1.5 Receptors

We assess how glare affects different potential receptors around a site. The most common receptors are:

- **Observation points (OP):** which are discrete points typically used to model dwellings and are assessed for long-term visual impact.
- **Routes:** which are continuous paths typically used to model roads and railways. They assess glare received within the forward field of view of the driver. Significant glare may be a hazard to road and rail users.
- **Flight paths:** which are used to model take-off and landing from runways. They assess glare received within the forward field of view of the pilot. Significant glare may be a hazard to pilots.

2 PROJECT DESCRIPTION

2.1 Site Overview

Nova Energy is proposing a solar farm at the location described in Table 1. The site is located southeast of the town of Twizel, New Zealand and adjacent to the Twizel Substation. The location is shown in Figure 6.

Table 1: Site information

Item	Description
Address	Accessed via an existing entry road off State Highway 8
Council	Mackenzie District Council

Figure 6: Twizel Solar Plant location

2.2 Solar Farm Details

Table 2 summarises the details of the proposed solar farm. An indicative layout is shown in Figure 7.[3] Minor changes to the layout will not affect the validity of this study.

Table 2: Basic solar farm information

Item	Description
Project name	Twizel Solar Plant
Capacity	339.4 MWp
Mounting system	Single-axis tracking tables running north to south
Project area	868 ha

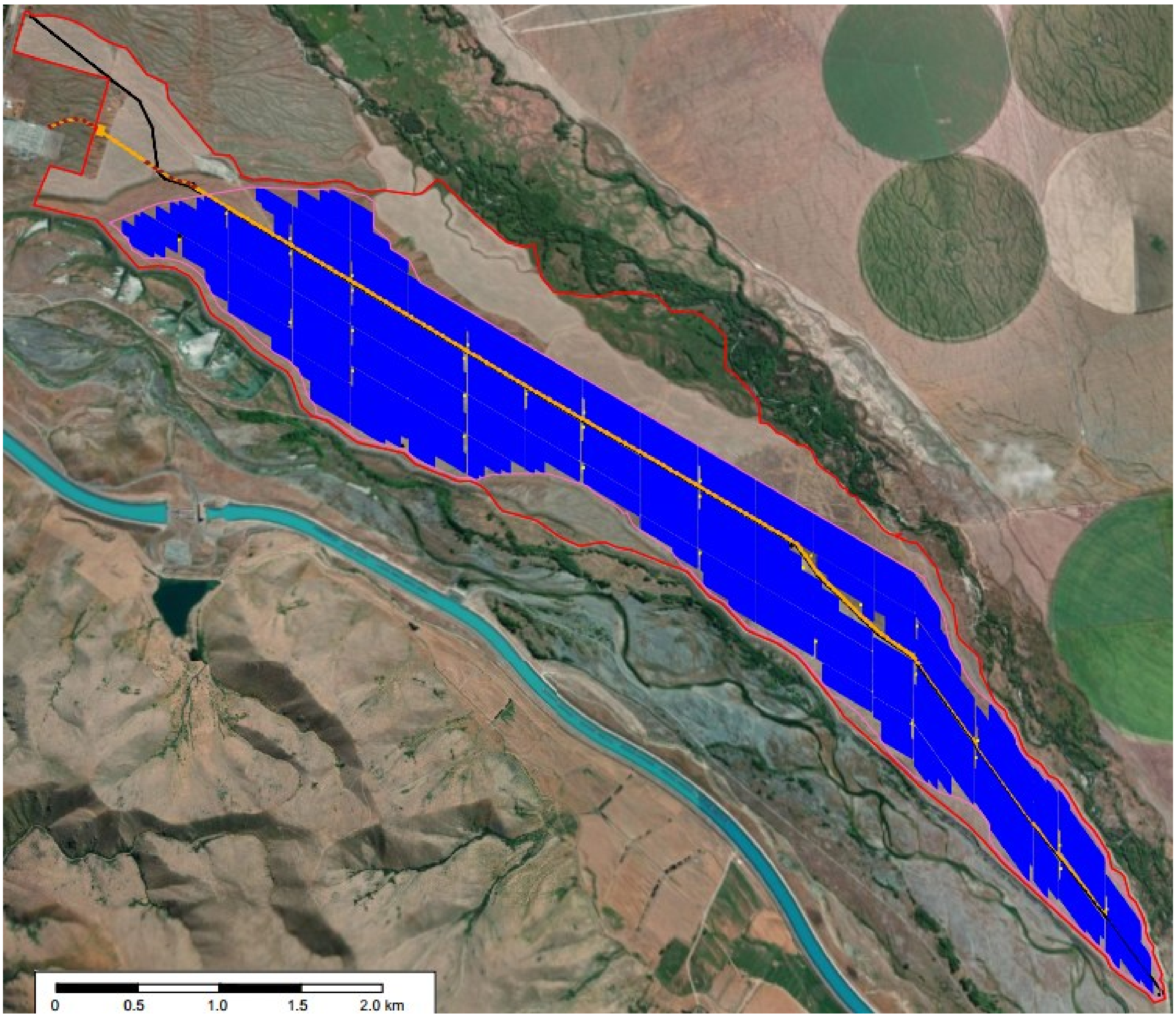

Figure 7: Twizel Solar Farm indicative layout

[3] Based on "Twizel layout_20240219-[B].dwg" provided by BTW

3 ANALYSIS

3.1 Solar Glare Hazard Analysis Tool

The Solar Glare Hazard Analysis Tool (SGHAT) was developed by Sandia National Laboratories to evaluate glare resulting from solar farms at different viewpoints, based on the location, orientation, and specifications of the PV modules. This tool was required by the United States FAA for glare hazard analysis near airports until 2021 and is also recognised by the Australian Government Civil Aviation Safety Authority (CASA).

ForgeSolar's GlareGauge tool uses SGHAT to provide an indication of the type of glare expected at each potential receptor. It runs with a simulation timestep of one minute. Glint lasting for less than one minute is unlikely to occur from the sun on PV modules due to their slow movement.

3.2 Assumptions

The visual impact of solar farms depends on the scale and type of infrastructure, the prominence and topography of the site relative to the surrounding environment, and any proposed screening measures to reduce visibility of the site. Some potential viewpoints were discounted because of significant existing features (such as trees or buildings), however, minor screening—such as roadside vegetation—was not assessed in detail. The GlareGauge analysis results are therefore considered conservative as the model assumes there is no screening unless explicitly included as an obstruction object.

Atmospheric conditions such as cloud cover influence light reflection and the resulting impact on visual receptors. GlareGauge does not model varying atmospheric conditions; instead, the model assumes clear sky conditions, with a peak direct normal irradiance (DNI) of 1,000 W/m^2 which varies throughout the day.

Table 3 list key input parameters for the SGHAT model. GlareGauge default settings were adopted for the analysis time interval, direct normal irradiance, observer eye characteristics and slope error.

Table 3: SGHAT specification inputs

Parameter	Value
Time zone	UTC+12:00
Module surface material	Smooth glass with ARC (anti-reflective coating)
Module tracking	Single-axis tracking with backtracking
Maximum tilt angle	±60˚

Parameter	Value
Module axis orientation	0°
Height of modules above ground	1.85 m
Height of observation point	1.65 m
Car driver eye level	1.5 m
Truck / tractor driver eye level	2.5 m
Flight path glide slope	3°

3.3 Model Construction

3.3.1 Study area

This assessment considers potential visual receptors (e.g., residences and road users) within 3 km of the site. There is no formal guidance on the maximum distance for glint and glare assessments; however, the significance of a reflection decreases with distance for two main reasons:

- The solar farm appears smaller (smaller subtended angle), and glare has less impact
- Visual obstructions (e.g., terrain, vegetation) may block the view of the solar farm.

Glint and glare impacts beyond 3 km are highly unlikely. This choice of distance is conservative and is based on existing studies and assessment experience.

3.3.2 Model components

The model (see Figure 8) was constructed as follows:

- The array was divided into 6 separate PV objects based on the indicative layout (Figure 7 above).
- Discrete observation point (OP) receptors were placed at 20 dwellings, and a local camping site. On the advice of Nova's independent landscape architect, [redacted] of Rough Milne Mitchell, additional OPs were placed at the Ohau hydro dam walls, and the local wildlife sanctuary (OP 10, 16, and 17), as shown in Figure 9. Two observation points (OP25 and 26) were placed outside the study area at local lookouts as shown in Figure 10 to align with views included in the landscape assessment.
- Route receptors were placed along seven nearby roads, with one route receptor for car drivers and one for truck and tractor drivers. Labelled routes are shown in Figure 11.
- Flight path receptors were placed on two the approaches to Pukaki-Twizel Airport. Each flight path extends approximately 3 km from the threshold of the runway, with a

slope of 3°. We did not assess general aviation activity outside these flight paths. This is in line with standard industry practice.

- No obstruction objects were included in this model.

In some instances, a single observation point is used in the model to denote a few buildings located close together, as the received glare is generally not very sensitive to precise locations (assuming that line of sight is not impacted by obstructions). We also excluded buildings in the town that are not on the edge facing the solar farm, as their line of sight is obstructed by surrounding buildings.

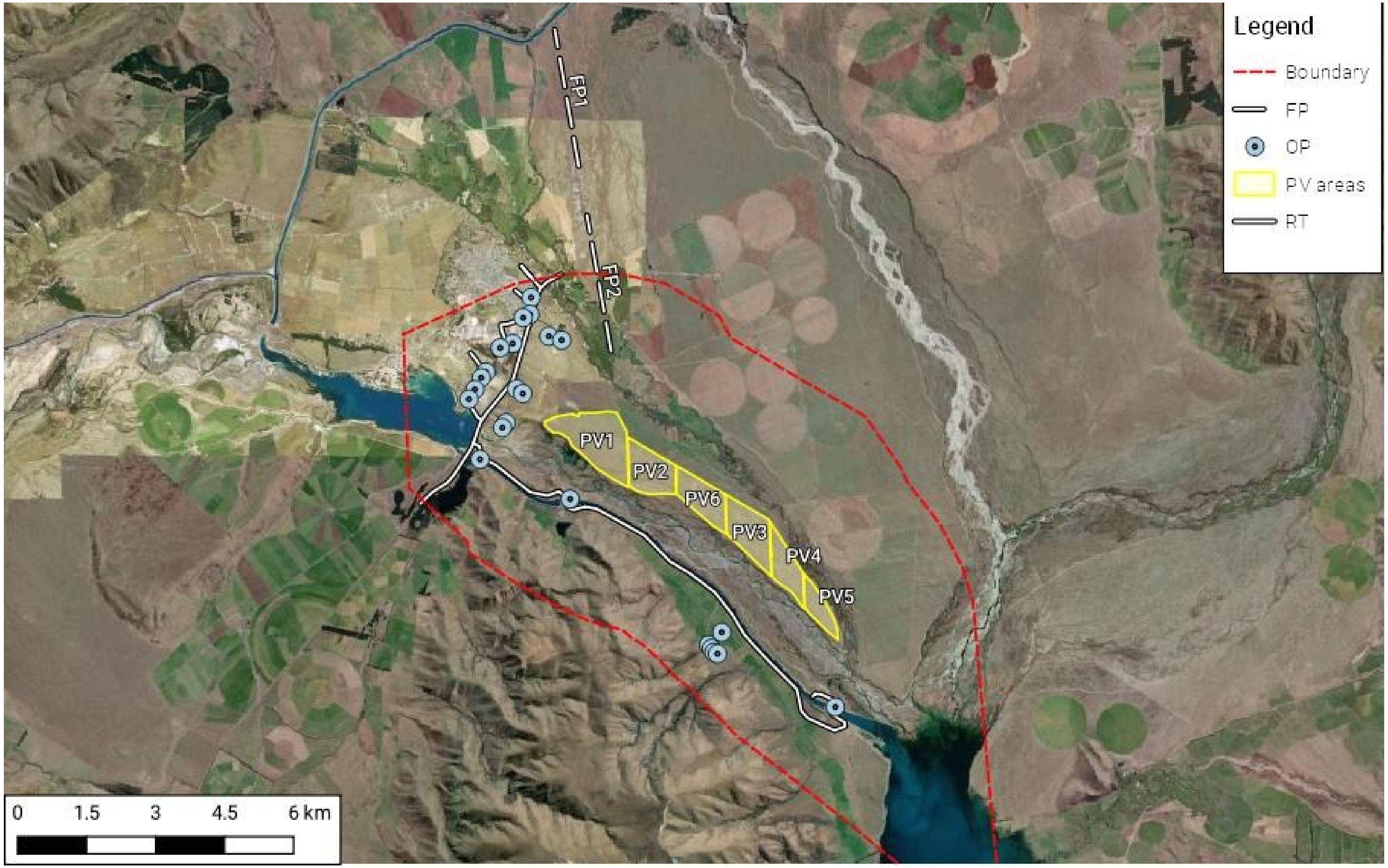

Figure 8: Model overview, excluding OP 25 and OP 26.

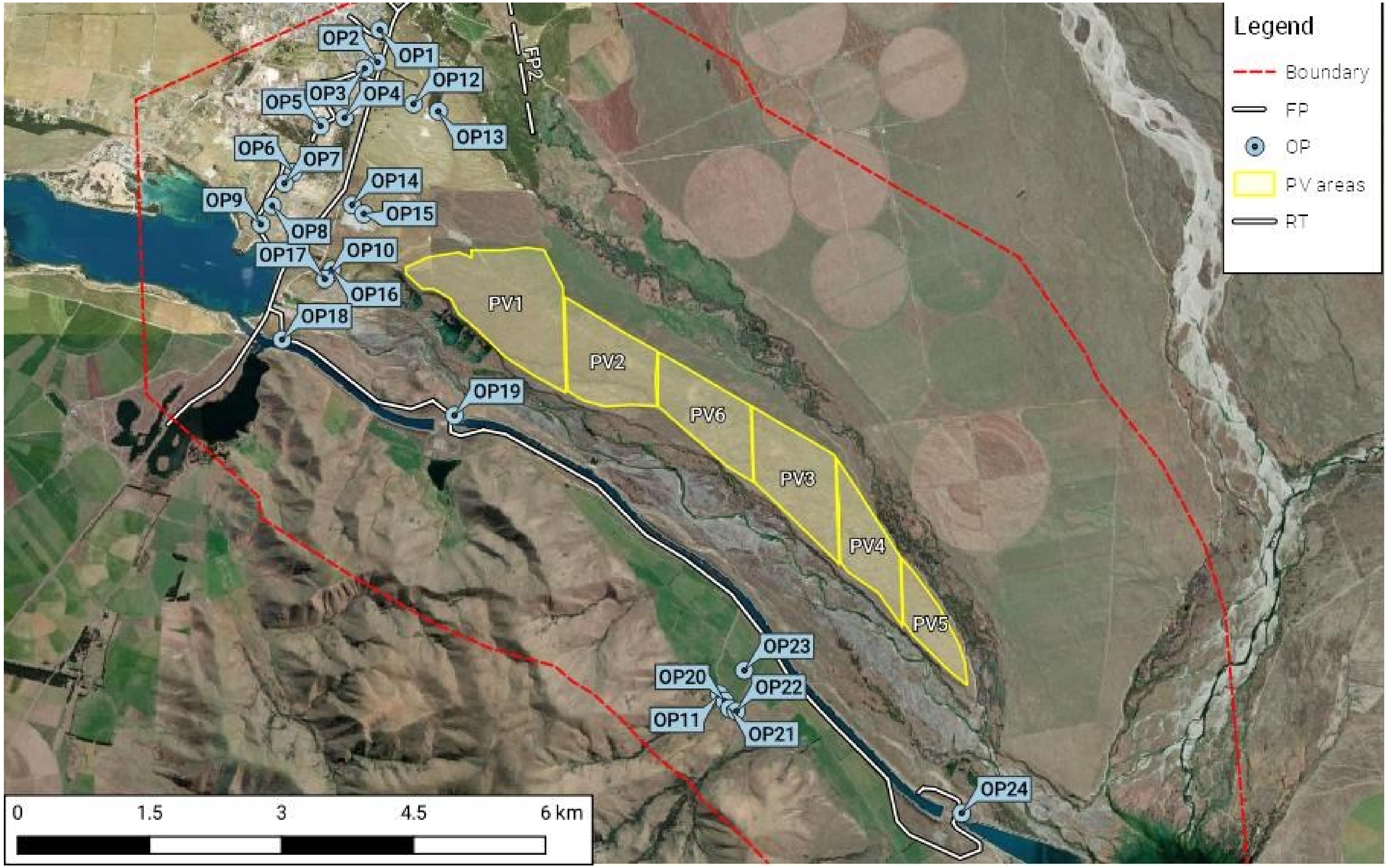

Figure 9: Modelled observation points

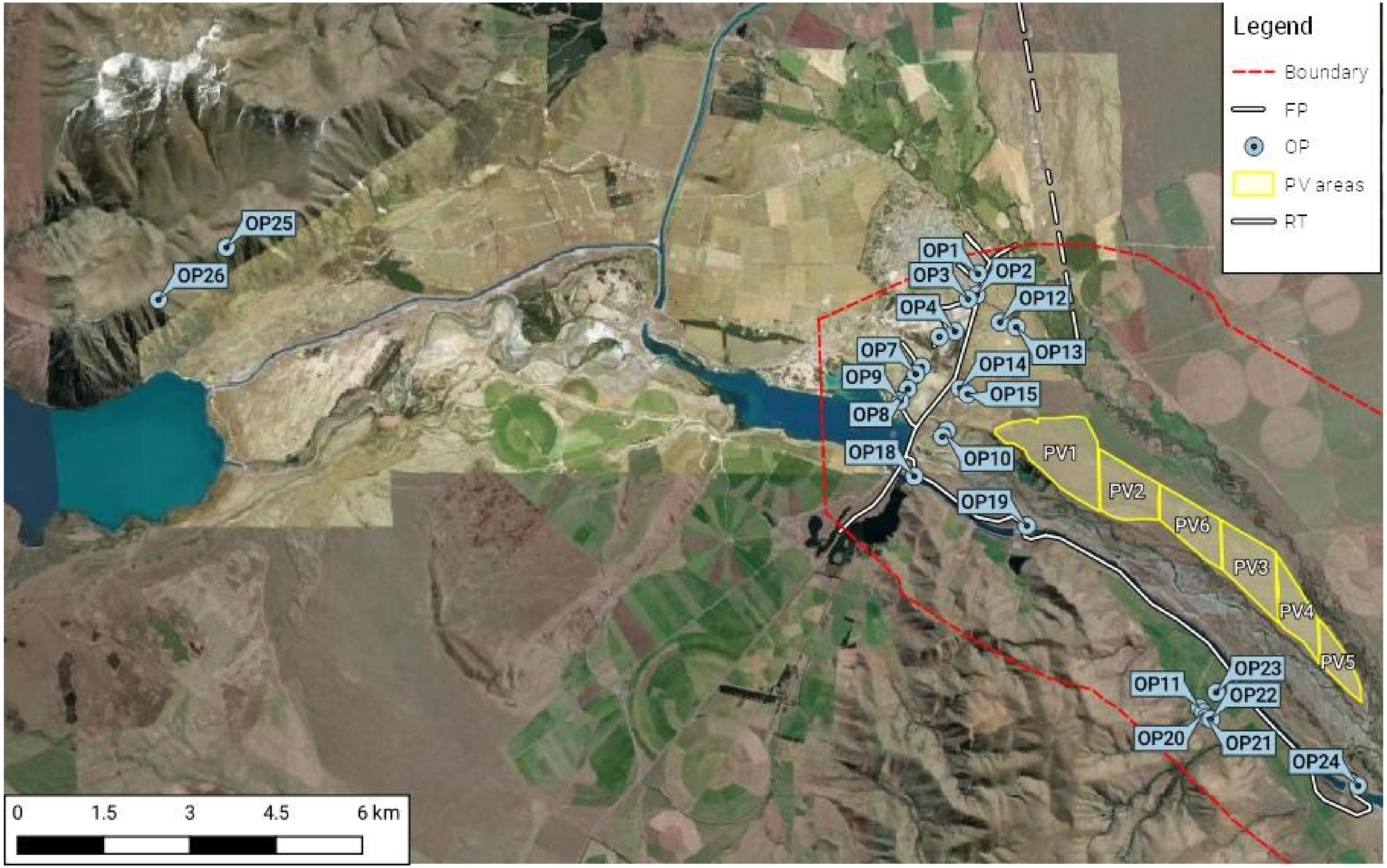

Figure 10: Observation points including the lookouts at OP25 and OP26.

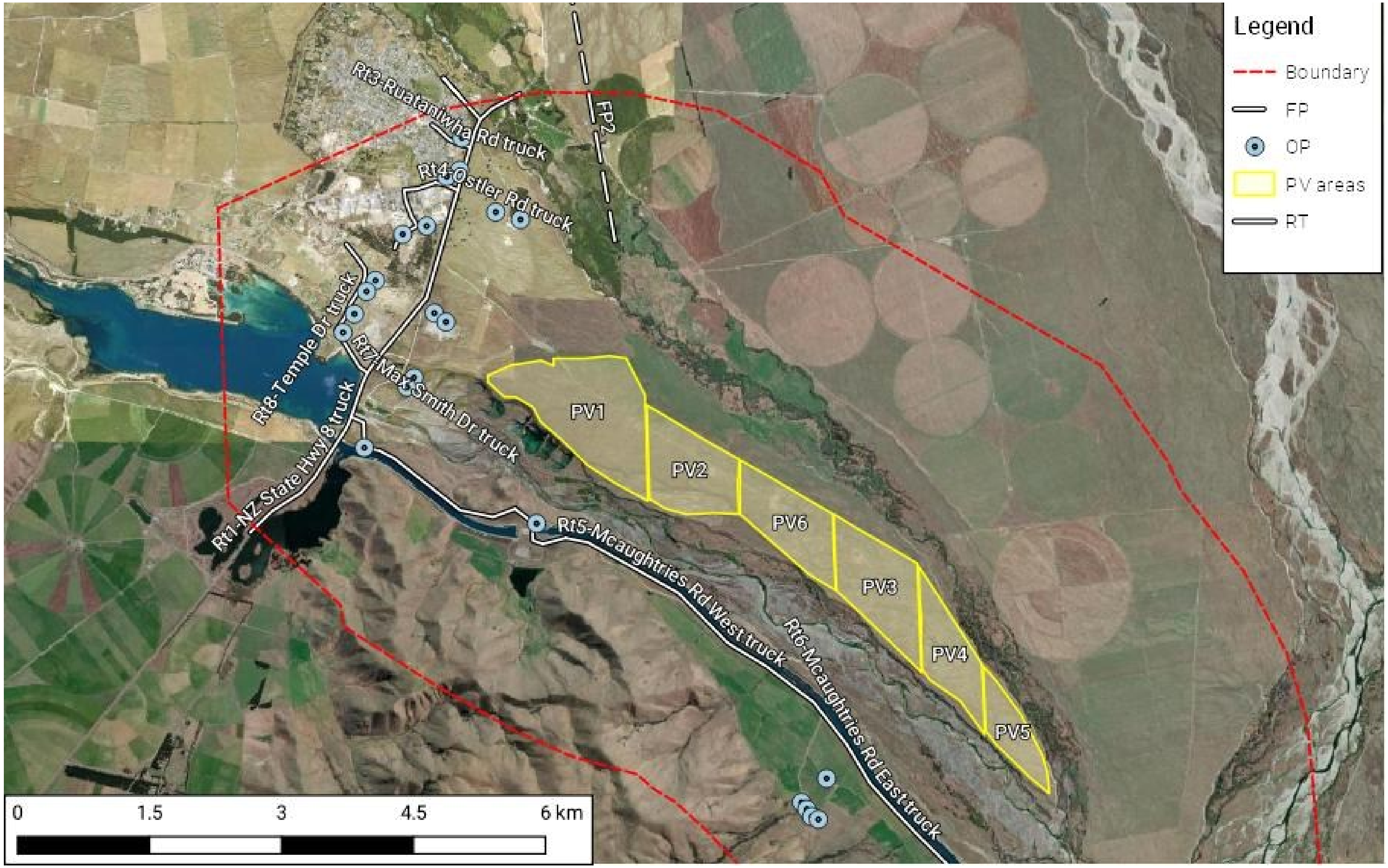

Figure 11: Modelled routes. Note that McAughtries road extends further southeast as shown in Figure 8.

3.4 Results

3.4.1 Interpretation

The results should be interpreted in conjunction with the Landscape Assessment Report.[4] All glare timings are quoted in UTC+12:00 and do not account for daylight savings. Some glare effects may coincide with direct glare from the Sun.

3.4.2 Summary

The results of the GlareGauge analysis for are summarised in Table 4. The glare received each day varied across the year. For observation points where some glare occurred, we have described the impact qualitatively. The time of day at which glare was observed varied between observation points and across the year. In general, most glare occurred in the early mornings or late evenings, when the array is backtracking and close to horizontal.

Over one year, the analysis identified ~150 hours of cumulative green glare, and ~50 hours of cumulative yellow glare spread across 4 routes and 8 observation points. No observation points or routes received more than 12 minutes of yellow glare in any single day.

McAughtries Road received the most glare, with up to 12 minutes of yellow glare in a single day. Additionally, both car and truck drivers along sections of New Zealand State Highway 8 were subject to yellow glare for up to 6 minutes per day.

[4] Rough Milne Mitchell Landscape Architects Limited. *Landscape Assessment Report. Proposed Solar Farm. Nova Energy Ltd, Mackenzie Basin*. 29 October 2024.

Table 4: Glare potential at each receptor

Receptor	Location	Green (hr/yr)	Yellow (hr/yr)	Daily glare potential
OP01	7 Dobson Place, (-44.2591, 170.1042)	0.0	0.0	None
OP02	15 Wairepo Road, (-44.2624, 170.1037)	0.0	0.0	None
OP03	20 Wairepo Road, (-44.263, 170.1018)	0.0	0.0	None
OP04	21 Aoraki Crescent, (-44.268, 170.0987)	0.0	0.0	None
OP05	9 Hydro Avenue, (-44.2688, 170.0953)	0.0	0.0	None
OP06	29B Temple Drive, (-44.2734, 170.0911)	0.0	0.0	None
OP07	4 Neuman Road, (-44.2745, 170.0898)	0.0	0.0	None
OP08	43 Temple Drive, (-44.2767, 170.088)	0.0	0.0	None
OP09	49 Temple Drive, (-44.2786, 170.0863)	0.0	0.0	None
OP10	6199 Tekapo-Twizel Road, (-44.2839, 170.0957)	0.0	0.0	None
OP11	684 McAughtries Road, (-44.3283, 170.1492)	6.0	0.0	Up to 11 minutes of green glare between 7:58 am and 8:29 am, from 8 May to 18 May. Up to 11 minutes of green glare between 8:09 am and 8:50 am, from 24 June to 1 August.
OP12	-44.2668, 170.1086	0.0	0.0	None
OP13	-44.2677, 170.1121	0.0	0.0	None
OP14	-44.2769, 170.0994	0.0	0.0	None
OP15	-44.2779, 170.101	0.0	0.0	None
OP16	6199 Tekapo-Twizel Road, (-44.2834, 170.0962)	0.0	0.0	None
OP17	6199 Tekapo-Twizel Road, (-44.2844, 170.0951)	0.0	0.0	None
OP18	-44.2904, 170.0887	5.3	0.0	Up to 10 minutes of green glare between 7:50 am and 8:13 am, from 8 May to 21 May. Up to 10 minutes of green glare between 7:44 am and 8:24 am, from 17 July to 12 August.
OP19	-44.2988, 170.1129	0.0	0.0	None
OP20	684 McAughtries Road, (-44.329, 170.1499)	7.0	0.0	Up to 11 minutes of green glare between 7:58 am and 8:29 am, from 8 May to 18 May. Up to 11 minutes of green glare between 8:09 am and 8:56 am, from 24 June to 1 August.
OP21	684 McAughtries Road, (-44.3298, 170.1506)	7.4	0.0	Up to 11 minutes of green glare between 8:00 am and 8:29 am, from 9 May to 18 May. Up to 11 minutes of green glare between 8:07 am and 8:59 am, from 24 June to 2 August.
OP22	684 McAughtries Road, (-44.3301, 170.1515)	7.4	0.0	Up to 12 minutes of green glare between 7:58 am and 8:29 am, from 8 May to 18 May. Up to 12 minutes of green glare between 8:12 am and 9:00 am, from 23 June to 30 July.
OP23	684 McAughtries Road, (-44.3259, 170.1529)	4.9	0.0	Up to 9 minutes of green glare between 7:32 am and 8:46 am, from 4 July to 22 August.
OP24	-44.3413, 170.1832	0.0	0.0	None
OP25	-44.2507, 169.9406	2.4	0.0	Up to 9 minutes of green glare between 6:03 am and 6:17 am, from 15 February to 21 February. Up to 9 minutes of green glare between 5:13 am and 5:46 am, from 16 October to 7 November.

Receptor	Location	Green (hr/yr)	Yellow (hr/yr)	Daily glare potential
OP26	-44.2585, 169.9254	3.9	0.0	Up to 11 minutes of green glare between 6:00 am and 6:25 am, from 13 February to 28 February. Up to 11 minutes of green glare between 5:24 am and 5:58 am, from 10 October to 30 October.
RT01C	NZ State Hwy 8 car	18.4	3.3	Up to 6 minutes of yellow glare between 6:36 am and 7:51 am, from 11 March to 2 May. Up to 6 minutes of yellow glare between 6:17 am and 8:00 am, from 9 August to 29 September.
RT01T	NZ State Hwy 8 truck	18.7	3.3	Up to 6 minutes of yellow glare between 6:36 am and 7:49 am, from 11 March to 2 May. Up to 6 minutes of yellow glare between 6:17 am and 7:57 am, from 10 August to 29 September.
RT02C	Glen Lyon Rd car	0.0	0.0	None
RT02T	Glen Lyon Rd truck	0.0	0.0	None
RT03C	Ruataniwha Rd car	0.0	0.0	None
RT03T	Ruataniwha Rd truck	0.0	0.0	None
RT04C	Ostler Rd car	0.0	0.0	None
RT04T	Ostler Rd truck	0.0	0.0	None
RT05C	McAughtries Rd West car	31.2	18.0	Up to 11 minutes of yellow glare between 6:15 am and 8:54 am, from 8 March to 30 September.
RT05T	McAughtries Rd West truck	31.0	22.5	Up to 12 minutes of yellow glare between 6:11 am and 8:53 am, from 8 March to 2 October.
RT06C	McAughtries Rd East car	1.5	0.0	Up to 5 minutes of green glare between 6:36 am and 7:01 am, from 12 March to 28 March. Up to 5 minutes of green glare between 6:17 am and 6:51 am, from 12 September to 28 September.
RT06T	McAughtries Rd East truck	1.1	0.0	Up to 3 minutes of green glare between 6:36 am and 6:57 am, from 12 March to 26 March. Up to 3 minutes of green glare between 6:17 am and 6:46 am, from 14 September to 28 September.
RT07C	Max Smith Dr car	1.1	1.8	Up to 3 minutes of yellow glare between 6:11 am and 6:53 am, from 22 February to 22 March. Up to 3 minutes of yellow glare between 5:46 am and 6:41 am, from 18 September to 15 October.
RT07T	Max Smith Dr truck	1.4	1.8	Up to 3 minutes of yellow glare between 6:11 am and 6:53 am, from 22 February to 22 March. Up to 3 minutes of yellow glare between 5:46 am and 6:39 am, from 19 September to 15 October.
RT08C	Temple Dr car	0.0	0.0	None
RT08T	Temple Dr truck	0.0	0.0	None
Flight Path 1	Pukaki-Twizel Airport northern runway	0.0	0.0	None
Flight Path 2	Pukaki-Twizel Airport southern runway	0.0	0.0	None
Total		**148.6**	**50.8**	

3.5 Mitigation Measures

Given the levels of yellow glare experienced by drivers along McAughtries Road and New Zealand State Highway 8, we recommend implementing mitigation measures to reduce the visual impact of the proposed solar plant. Two common mitigation measures are described briefly below:

1. **Vegetation screens**, which involve planting vegetation along the boundaries of the solar array to obstruct the visibility of the array for surrounding receptors.
2. **Altering the rest angle of the trackers**, which involves changing the rest angle set point of the trackers during backtracking and stow periods to a non-zero value. This reduces the angle of incidence, which can reduce glare effects.

To assess the glare impacts of the solar plant using the second mitigation method above, ITP simulated the solar farm with a backtracking limit angle of 5˚. This analysis did not identify any green or yellow glare effects, indicating that this approach provides effective mitigation.

Table 5: Glare results with the backtracking limit angle set to 5°.

Receptor	Location	Green (hr/yr)	Yellow (hr/yr)	Daily glare potential
OP01	7 Dobson Place, (-44.2591, 170.1042)	0.0	0.0	None
OP02	15 Wairepo Road, (-44.2624, 170.1037)	0.0	0.0	None
OP03	20 Wairepo Road, (-44.263, 170.1018)	0.0	0.0	None
OP04	21 Aoraki Crescent, (-44.268, 170.0987)	0.0	0.0	None
OP05	9 Hydro Avenue, (-44.2688, 170.0953)	0.0	0.0	None
OP06	29B Temple Drive, (-44.2734, 170.0911)	0.0	0.0	None
OP07	4 Neuman Road, (-44.2745, 170.0898)	0.0	0.0	None
OP08	43 Temple Drive, (-44.2767, 170.088)	0.0	0.0	None
OP09	49 Temple Drive, (-44.2786, 170.0863)	0.0	0.0	None
OP10	6199 Tekapo-Twizel Road, (-44.2839, 170.0957)	0.0	0.0	None
OP11	684 McAughtries Road, (-44.3283, 170.1492)	0.0	0.0	None
OP12	-44.2668, 170.1086	0.0	0.0	None
OP13	-44.2677, 170.1121	0.0	0.0	None
OP14	-44.2769, 170.0994	0.0	0.0	None
OP15	-44.2779, 170.101	0.0	0.0	None

Receptor	Location	Green (hr/yr)	Yellow (hr/yr)	Daily glare potential
OP16	6199 Tekapo-Twizel Road, (-44.2834, 170.0962)	0.0	0.0	None
OP17	6199 Tekapo-Twizel Road, (-44.2844, 170.0951)	0.0	0.0	None
OP18	-44.2904, 170.0887	0.0	0.0	None
OP19	-44.2988, 170.1129	0.0	0.0	None
OP20	684 McAughtries Road, (-44.329, 170.1499)	0.0	0.0	None
OP21	684 McAughtries Road, (-44.3298, 170.1506)	0.0	0.0	None
OP22	684 McAughtries Road, (-44.3301, 170.1515)	0.0	0.0	None
OP23	684 McAughtries Road, (-44.3259, 170.1529)	0.0	0.0	None
OP24	-44.3413, 170.1832	0.0	0.0	None
OP25	-44.2507, 169.9406	0.0	0.0	None
OP26	-44.2585, 169.9254	0.0	0.0	None
RT01C	NZ State Hwy 8 car	0.0	0.0	None
RT01T	NZ State Hwy 8 truck	0.0	0.0	None
RT02C	Glen Lyon Rd car	0.0	0.0	None
RT02T	Glen Lyon Rd truck	0.0	0.0	None
RT03C	Ruataniwha Rd car	0.0	0.0	None
RT03T	Ruataniwha Rd truck	0.0	0.0	None
RT04C	Ostler Rd car	0.0	0.0	None
RT04T	Ostler Rd truck	0.0	0.0	None
RT05C	McAughtries Rd West car	0.0	0.0	None
RT05T	McAughtries Rd West truck	0.0	0.0	None
RT06C	McAughtries Rd East car	0.0	0.0	None
RT06T	McAughtries Rd East truck	0.0	0.0	None
RT07C	Max Smith Dr car	0.0	0.0	None
RT07T	Max Smith Dr truck	0.0	0.0	None
RT08C	Temple Dr car	0.0	0.0	None

Receptor	Location	Green (hr/yr)	Yellow (hr/yr)	Daily glare potential
RT08T	Temple Dr truck	0.0	0.0	None
Flight Path 1	Pukaki-Twizel Airport northern runway	0.0	0.0	None
Flight Path 2	Pukaki-Twizel Airport southern runway	0.0	0.0	None
Total		**0.0**	**0.0**	

4 CONCLUSIONS

The results of the GlareGauge analysis with no mitigation indicated 8 observation points and 4 routes received green glare, while 3 road routes received yellow glare. Yellow glare has the potential to cause after image to observers, while green glare has low potential to cause after image.

McAughtries Road received the most glare, with up to 12 minutes of yellow glare in a single day. Additionally, both car and truck drivers along sections of New Zealand State Highway 8 were subject to yellow glare for up to 6 minutes per day. We consider the glare impact on McAughtries Road and State Highway 8 to be moderate and recommend implementing mitigation measures. Max Smith Dr received up to 3 minutes of yellow glare in a day over a few months. We consider the glare impact on Max Smith Dr to be minor due to the low cumulative duration of yellow glare, and it does not require mitigation.

Given the levels of yellow glare experienced by drivers along McAughtries Road and New Zealand State Highway 8, we recommend implementing mitigation measures to reduce the visual impact of the proposed solar plant.

To mitigate the glare impacts of the solar plant, ITP also simulated the solar farm providing for the trackers to have a backtracking limit angle of 5˚. This analysis did not identify any green or yellow glare effects, indicating that this approach provides effective mitigation for all receptors.

APPENDIX A. FORGESOLAR ANALYSIS

We have provided the following analysis reports exported from ForgeSolar separately:

- Twizel Solar Plant ForgeSolar Analysis Report – ForgeSolar analysis conducted with no mitigation measures
- Twizel Solar Plant ForgeSolar Analysis Report_5deg Rest Angle – ForgeSolar analysis conducted with an array rest angle of 5˚

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