Appendix D – Landscape and Visual Impact Assessment

AECOM

Landscape and Visual Impact Assessment

Springdale Solar Farm
Renew Estate

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Glossary

Term	Definition
Landscape Character Zones (LCZ)	These are distinct zones of the landscape that are relatively homogenous in character. They are generic in nature in that they may occur in different areas, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical landuse and settlement pattern, and perceptual and aesthetic attributes.
Photomontage	Computer simulation or other technique to illustrate the appearance of a proposal.
Magnitude	A combination of the scale, extent and duration of an impact.
Sensitivity	Susceptibility of a receptor to a specific type of change.
Visual receptor	Individual and/or a defined groups of people who have the potential to be affected by a proposal.
View	A sight or prospect of some landscape, scene, etc.

1. Introduction

1.1. Overview

AECOM Australia Pty Ltd (AECOM) has been commissioned by Renew Estate Pty Ltd to undertake a Landscape and Visual Impact Assessment (LVIA) for the proposed Springdale Solar Farm (The Project). The LVIA assesses the Project impacts of a solar farm development with regard to potential landscape and visual impacts during the construction and operational stages of the solar farm. The content and structure of this LVIA address the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning and Environment dated 26 September 2017.

1.2. Report structure

The LVIA has been structured into the following Sections:

Table 1: Report Structure

Report Section	Description
1.0 Introduction	This section provides an introductory overview that describes the intent and purpose of the LVIA and description of the report structure.
2.0 Methodology	This section describes the method employed to assess the potential impacts of the Project.
3.0 Legislation, policy and guidelines	This section outlines the legislation, policies and planning guidelines relevant to the Project.
4.0 Project Location and Description	This section describes the site locality and key components of the Springdale Solar Farm.
5.0 Landscape Character Assessment	This section identifies the variations in the character of the landscape within and surrounding the Project and determines the sensitivity and magnitude of the landscape to the proposed change.
6.0 Visual Impact Assessment	This section describes and determines the potential visual impact of the Project from key visual receptor locations and provides an overview of the glint and glare assessment.
7.0 Mitigation Measures	This section considers the application of mitigation measures to minimise potential visual impact.
8.0 Conclusion	Conclusions are made on the overall impact of the Project.

2. Methodology

The following method assesses landscape character and visual amenity impacts arising from the Project and has been derived from an analysis of the preliminary design drawings prepared by Renew Estate (2018). The method:

- analyses the existing landscape character and visual environment;
- determines the extent and nature of potential landscape and visual impacts of the Project on surrounding areas; and
- identifies measures to mitigate and minimise potential landscape and visual impacts.

2.1. Desktop assessment and fieldwork

Key resources have been identified and reviewed as a component of the desktop assessment. This included review of 1:25,000 scale topographic maps and aerial photography of the project site and surrounding landscape. The topographic maps and aerial photography were used to identify the locations of potential receptor locations. The desktop assessment also outlined the visual character of the surrounding landscape including features such as landform, elevation, landcover and distribution of residential properties.

Fieldwork was conducted to determine and confirm the potential extent and visibility of the Project and ancillary structures. Various view locations from which the Project could potentially be visible were also confirmed and determined.

2.2. Assessment of landscape character impacts

Assessment of landscape character deals with the impact of a visible change on the landscape and development on the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. The assessment comprises the combination of the following assessments:

2.2.1. Sensitivity of landscape to visual change

The identification of the sensitivity of the landscape to a specific change encompasses the following components:

Susceptibility to change

The existing landscape receptor is assessed to understand the capacity to accommodate the proposal; without adverse impact on existing landscape character, e.g. based on landform, land use, pattern or scale; and the capacity to achieve landscape planning policy and strategy objectives.

Value of the landscape

This assesses whether the value of the landscape would be affected based on existing landscape character designations (e.g. state, regionally or locally recognised landscapes), and the value of particular landscape elements or notable aesthetic, perceptual or experiential qualities.

These individual criteria are combined to achieve a landscape sensitivity rating that could broadly be defined in Table 2.

Table 2: Sensitivity of landscape to change

Sensitivity of landscape to visible changes	
High	Landscapes of international designation and/or landscapes that have high sensitivity to the type of development proposed which could have a detrimental impact on the landscape character or value. Mitigation measures will be unlikely to reduce all of the impacts of the change.
Moderate	Landscapes of regional designation or valued more locally and tolerant of moderate levels of change. Any change would be unlikely to have a significant adverse impact on the landscape character or value and mitigation would neutralise some of the impacts.
Low	Landscapes of local designation that are more commonplace and potentially tolerant of noticeable change or are undergoing substantial development themselves, with mitigation measures likely to neutralise or improve the landscape character.
Negligible	Landscapes of local designation and/or with low sensitivity to the type of change proposed with mitigation likely to completely neutralise any impacts or not required at all.

2.2.2. Magnitude of landscape impact

The magnitude of landscape impacts is comprised of the following components:

Size or scale of change

An assessment of size or scale of change in the landscape likely to be experienced as a result of the proposed development which may include the extent of loss of existing landscape elements, the degree of alteration to aesthetic or perceptual aspects of the landscape, or change to key characteristics of the landscape.

Geographical extent of impacts

This considers the geographical extent over which the landscape impacts will be felt, and is distinct from the size or scale of the change. This is influenced by site levels, the immediate setting of the site, and landscape character types in the vicinity.

Duration and reversibility of the impacts

Duration is judged on a scale of short term (zero to five years), medium term (five to ten years) and long term (ten to thirty years). Reversibility is a judgement about the prospects of the impact being reversed, for example, a project such as a mine might have a limited life and then be rehabilitated for a new or pre-existing purpose.

These individual criteria are combined to achieve a magnitude of landscape impact that is defined in Table 3:

Table 3: Magnitude of landscape impact

Magnitude of landscape impact	
High	A substantial/obvious change to the landscape due to total loss of, or change to, elements, features or characteristics of the landscape. Change would cause a landscape to be permanently changed and its quality diminished.
Moderate	Discernible changes in the landscape due to partial loss of, or change to key elements, features or characteristics of the landscape which may be partly mitigated. The change would be out of scale with the landscape, at odds with the local character, and would leave an adverse impact on the landscape. The change would partially obstruct or change a view.
Low	Minor loss or alteration to one or more key landscape features or characteristics, or the introduction of elements that may be visible but may not be uncharacteristic within the existing landscape.
Negligible	Almost imperceptible or no change in the landscape or views as there is little or no loss of, or change to the elements, features or characteristics of the landscape.

2.2.3. Overall rating of landscape character impacts

Once the sensitivity of the landscape to visual change and the magnitude of the landscape impact is determined, a rating matrix is used to determine an overall rating of landscape impacts, and rated on the level of significance of the impact, described as being Negligible, Low, Moderate - Low, Moderate, High - Moderate or High, as set out in Table 4.

Table 4: Overall significance of landscape character impacts

		Magnitude of impact			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High - moderate	Moderate	Negligible
	Moderate	High - moderate	Moderate	Moderate - low	Negligible
	Low	Moderate	Moderate - low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

2.3. Assessment of visual impacts

Assessment of visual impacts deals with the impact of changes to the landscapes perceived by individuals or groups of people. This identifies the change or loss of existing elements of the visual landscape and/or introduction of new elements to relevant users.

Receptor Types

The viewpoints have been organised into key receptor types, each of which are considered typically to share defined levels of sensitivity to changes in the context and character of views. The receptor types that form this assessment comprise nearby residential properties and road users.

Visual Envelope Mapping

The likely visibility of the proposed elements of the Project at operation from surrounding areas is broadly mapped to define a visual envelope. This map indicates 'worst case' and is indicative only as it does not consider the impacts of existing vegetation cover.

Photomontages

Photographs of the Project site from nominated receptor locations were used to assist in the analysis process. These photos were taken using a single-lens reflect digital camera using a 28 millimetre full frame lens with no parallax error. The photographs were taken during site visits on 1 November 2017, 6 January 2018 and 15 March 2018. Photomontages for the most affected receptors were then prepared to illustrate the likely visual changes as a result of the Project.

The photographs and photomontages illustrating views of the Project site from private residences have not been included in this report at the request of the residents, due to privacy and confidentiality (except for one photograph which was consented to for inclusion).

The photomontages focussed on viewing the Project in its wider setting, at the view level of a pedestrian at a nominal eye height of 1.7 metres. The materials and finishes used are indicative only and would be further investigated during detailed design.

To prepare photomontages, a 3D model of the Proposal was developed and confirmed against survey information, architectural plans, elevations and sections. Photographs were corrected for distortion using specific camera and lens profiles, and camera coordinates were then merged with the 3D model to allow a 'virtual camera' to be set up using these coordinates. Camera matching was undertaken using reference points common to the 3D model and physical features in the photographs. The model was then rendered with the photographs and edits to the foreground and background elements made as necessary.

2.3.1. Sensitivity of visual receptors

The sensitivity of visual receptors encompasses the components outlined below.

Susceptibility of visual receptors to change

The susceptibility of different visual receptors to changes in views and visual amenity is mainly a function of the activity of people experiencing the view and the extent to which their attention or interest may therefore be focused on the view.

Visual receptors most susceptible to change are generally residents who are likely to occupy these locations for long periods of time, people engaged in outdoor recreational activity, visitors to attractions where the surroundings are part of the experience, and communities where the landscape setting is an important contributor to the amenity of their environment.

Visual receptors with a moderate susceptibility to change are generally travellers on road and rail transport. Where travel involves recognised scenic routes awareness of views may be particularly high.

Visual receptors with less sensitivity to change include people engaged in outdoor sport and people at their place of work where attention is focussed on their activity and the setting is less important to their experience.

Value attached to views

This assessment considers:

- the recognition of the value attached to particular views, either in relation to heritage assets or through planning designations, planning policy or other existing planning or urban design studies
- indications of the value attached to views, either through inclusion in guidebooks or on tourist maps, provision of facilities for their enjoyment such as sign boards and interpretive material
- reference to them in literature or art.

These components are combined to produce a sensitivity assessment that ranges from High to Negligible.

2.3.2. Magnitude of the visual impacts

The magnitude of visual impacts is comprised of the components outlined below.

Size or scale of the change

This assessment takes account of the scale of change in the view with respect to: the loss or addition of features in the view; the degree of contrast or integration of any new features or changes and characteristics in terms of form, scale and mass, line, height, colour and texture; and the nature of the view of the proposal and whether views will be full, partial or glimpses.

Geographical extent of impacts

The geographical extent of a visual impact will vary with different viewpoints and is likely to reflect the horizontal angle of the view, the distance of the viewpoint, and the extent of the area over which changes would be visible.

Duration and reversibility of the impacts

Duration is judged on a scale of short term (zero to five years), medium term (five to ten years) and long term (more than ten years). Reversibility is a professional judgement about the prospects of the impact being reversed, with a solar farm having a good potential to go back to farmland.

These components are combined to produce a magnitude of visual impact assessment that ranges from High to Negligible.

2.3.3. Overall significance of visual impacts

Once the sensitivity of the landscape to visual change and the magnitude of the landscape impact is determined, a rating matrix is used to determine an overall rating of visual impacts, and made on the level of significance of the impact, described as being Negligible, Low, Moderate - Low, Moderate, High - Moderate or High, as set out in Table 5.

Table 5: Overall significance of visual impacts

		Magnitude of impact			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High - moderate	Moderate	Negligible
	Moderate	High - moderate	Moderate	Moderate - low	Negligible
	Low	Moderate	Moderate - low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

3. Legislation, policy and guidelines

3.1. Legislative framework

There is no accepted nationally published guidance on landscape and visual amenity impact assessment specific to Australia. Therefore, the assessment is made with reference to an understanding of techniques set out in documents such as The Guidelines for Landscape and Visual Impact Assessment, Third Edition (2013) developed by the Landscape Institute and Institute for Environmental Management (United Kingdom), and Guideline for Landscape Character and Visual Impact Assessment (v.2) by Transport for NSW - Roads and Maritime Services.

This LVIA addresses and responds to the SEARs dated 26 September 2017 for the assessment of potential visual impacts of the Project. The SEARs are identified in Table 6.

Table 6: SEARs Requirement

SEARs Requirement
An assessment of the likely visual impacts of the development (including glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners.

4. Project location and description

4.1. Project location

The Project is located in Sutton, New South Wales, within Yass Valley Council area and approximately 3.5 kilometres north-east of the Australian Capital Territory border (refer to Figure 1). Sutton Village is approximately eight kilometres south-east of the Project. The Village includes a general store, primary school and sporting facilities.

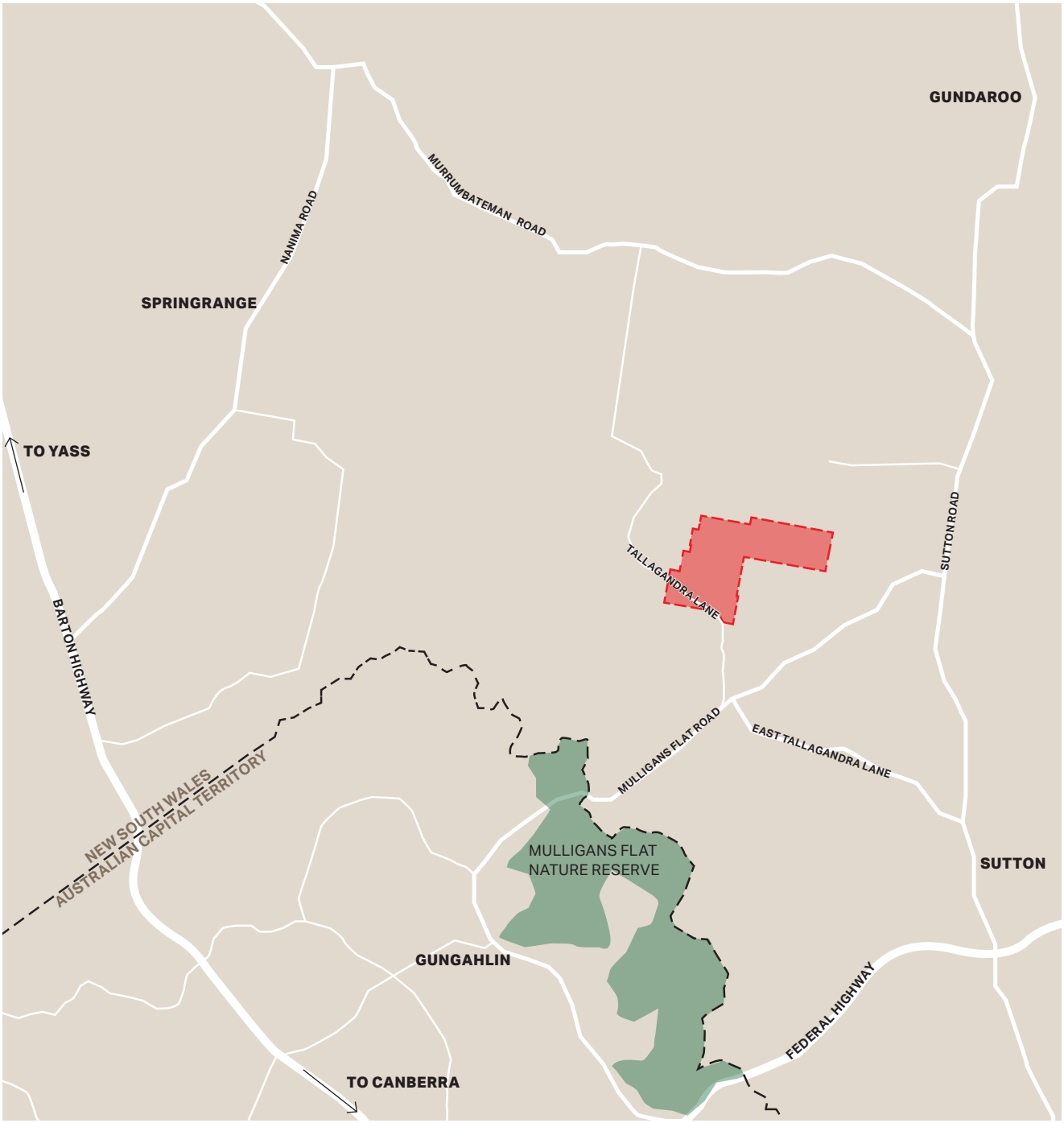


Figure 1: Context Plan

4.2. Site location

The Project site is approximately 370 hectares in size, of which approximately 190 hectares will be occupied by the solar farm and associated infrastructure (the development envelope). The Project Site comprises twelve property lots and a number of unformed Crown roads located adjacent to the boundaries of a number of the lots (Figure 2).

Tallagandra Lane is a public local road which divides the southern portion of the site. The road runs through the Project from the north-west to south-east and connects to Mulligans Flat Road.

The Project Site is a greenfield site comprising large farming paddocks used extensively for grazing sheep and cattle. With the exception of approximately seven hectares of woodland in the western portion of the site, the Project site is largely cleared, with some scattered trees and rows of trees along fence lines.

The topography is gently undulating with a few knolls, ridges and a number of dams and drainage lines which flow towards the north-east.

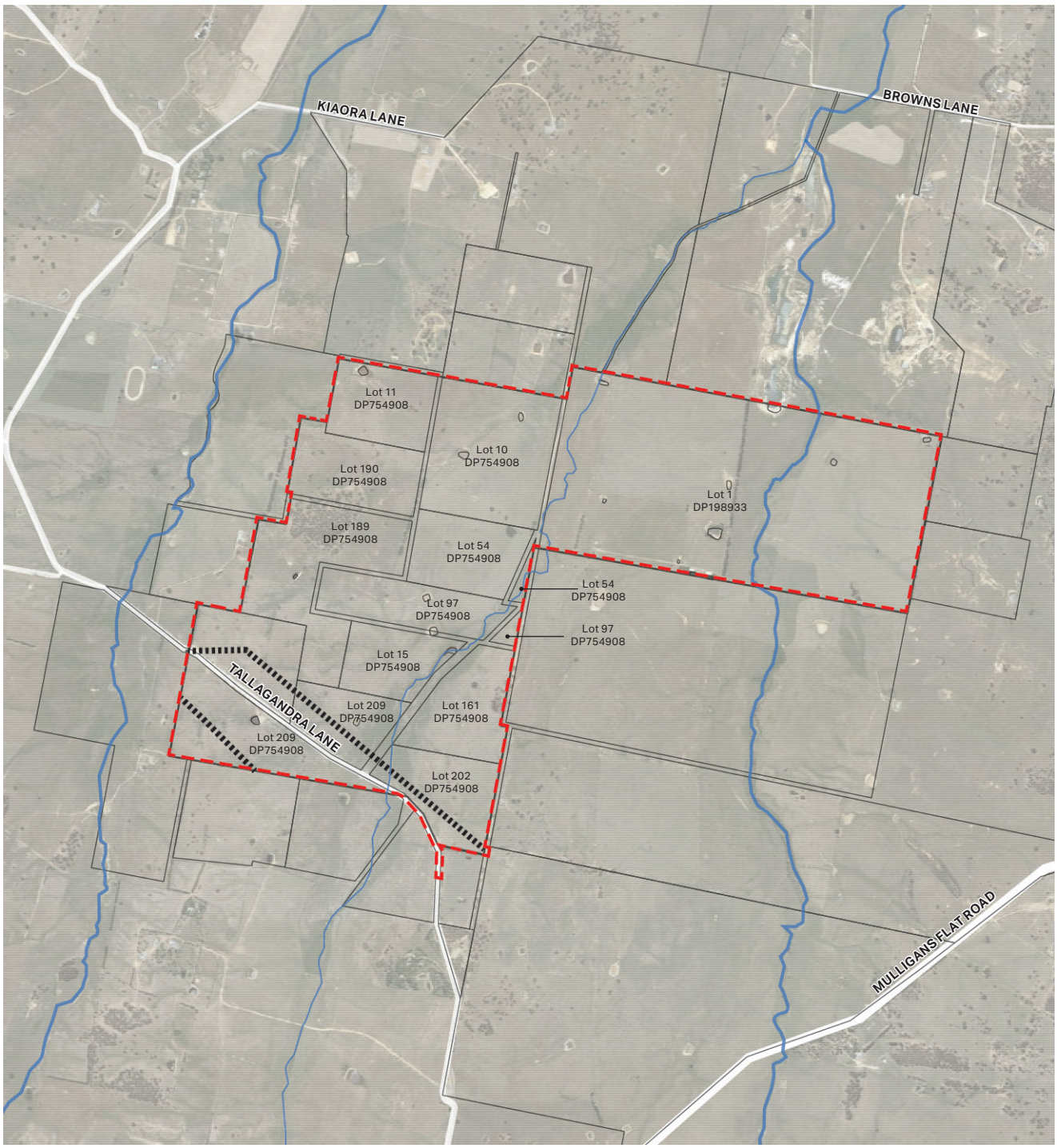
Two existing overhead electricity transmission lines traverse the southern portion of the Project Site in a north-west to south east direction. The transmission lines are both TransGrid owned and operated assets, comprising the Canberra to Capital Wind Farm 330kV circuit and the Canberra to Queanbeyan 132kV circuit.

The Project site is zoned Primary Production (RU1) under the Yass Valley Local Environmental Policy 2013.

4.3. Project Description

The Project can facilitate up to 100 megawatt of solar generation equipment. Detailed design is currently underway. Primary Project components will consist of:

- photovoltaic (PV) solar modules on a single-axis tracking system mounted on steel piles;
- approximately 22 containerised power conversion stations, containing electrical switchgear, inverters and transformers;
- an electrical switchyard and substation that would be connected to the existing 132 kilovolt (kV) TransGrid transmission line that traverses the site;
- DC and AC cabling for electrical reticulation;
- a control building including office, supervisory control and data acquisition (SCADA) systems, operation and maintenance (O&M) facilities, staff amenities, and associated carpark;
- two meteorological stations;
- internal all-weather access tracks;
- security fencing;
- landscaping;



LEGEND

PROJECT SITE

TRANSGRID TRANSMISSION LINE

0 2,000m

Figure 2: Site Plan

Figure 3: Typical example of the photovoltaic solar modules

Figure 4: Typical example of power conversion stations

- only if a Voluntary Planning Agreement is executed with the Yass Valley Council (YVC) including agreement on the relevant works, construction of a new public road connection between Tallagandra Lane and Tintinhull Road (referred to in this EIS as Tintinhull Road re-alignment);
- only if a Voluntary Planning Agreement is executed with the YVC including agreement on the relevant works, subdivision of Lot 202 DP754908 to create a proposed new lot to be dedicated as a public road for the proposed Tintinhull Road re-alignment.

Up to 90 modules will be mounted on each tracker arm in portrait arrangement, with the tracking angle ranging from +60 to -60 degrees to the horizontal each day. The modules will be oriented to face east for first light in the morning, and will track to follow the position of the sun throughout the course of the day. At solar noon, the position of the modules will be zero degrees (parallel to the ground) and they will finish facing west in the late afternoon.

Overnight, and in the event of high winds, the system will automatically stow the trackers into flat position to reduce loading. Local weather conditions including average and gusting wind speeds will be monitored by the onsite meteorological stations 24 hours a day.

The tracking structures will be mounted on piles, which will be screwed or pile driven depending on final geotechnical analysis. This eliminates the need for concrete and foundations which significantly reduces the impact of construction. In turn, this enables the retention of native grasslands and habitats under the array.

This construction methodology keeps ground disturbance to a minimum and allows the final site design to follow the existing lie of the land. The intention of the Project is to maintain the existing vegetation on site and all future vegetation management, as dictated by the final bushfire management and environmental management plans. The Site will be maintained by grazing sheep as much as possible.

The onsite switchyard and substation will have a footprint of approximately 450m² and will lie adjacent to the existing 132kV TransGrid Easement. Final design will be in collaboration with TransGrid and the Australian Energy Market Operator (AEMO), however, there will likely be some civil and earthworks required to meet the transmission substation design guidelines.

Site access will be via the unsealed Tallagandra Lane accessed from the east via Mulligans Flat Road approximately 3km away. The control building and car parking will be located near the access point of Tallagandra Lane. The control building and substation will both have dedicated septic systems and rainwater tanks for water supply.

The construction period is expected to be 10 months in duration, commencing in the third quarter of 2018.

The operational lifetime of the solar farm is 30 years, at which time the site will either be decommissioned or continue to operate subject to further approval and commercial agreements. Decommissioning would remove all above ground infrastructure and rehabilitate the site to return it to its predevelopment condition.

5. Landscape Character Assessment

5.1. Landscape character zones

Three landscape character zones (LCZ) have been identified within the study area, comprising:

- LCZ 1: Open rural landscape
- LCZ 2: Elevated rural landscape
- LCZ 3: Enclosed rural landscape

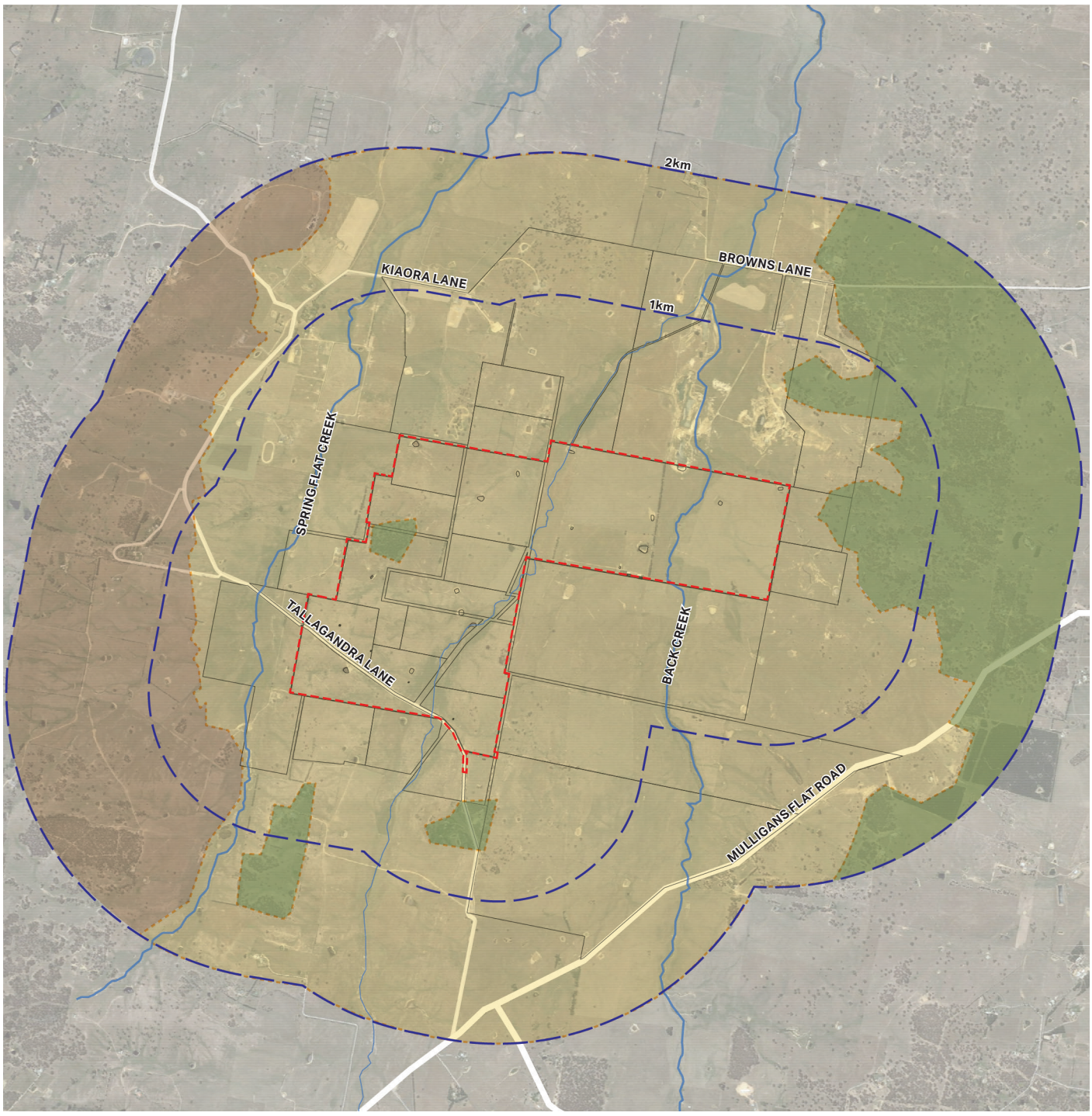
Figure 6 presents the extent of the landscape character zones. For the purpose of this assessment, the key area of focus is considered to be those with a two kilometre offset from the Project. Beyond this area, it it anticipated that the combined impacts of intervening landform and vegetation will combine to substantially limit landscape and visual impacts of the Project.

5.1.1. Landscape Character Zone 1 - Open rural landscape

This LCZ is characterised by a predominantly open rural landscape characterised by large rural lot holdings (refer to Figure 5), with a legible loose cadastral 'grid' layout. This 'grid' is reflected with a combination of lot boundary planting, road layout and different pasture management practices. The landscape is dissected by intermittent narrow creek corridors, including Spring Flat Creek and Back Creek. The central portion of this LCZ is proposed for development within the near to medium future as part of this Project.

A key element of this LCZ is the relationship with the closely adjoining elevated rural landscape to the west and and enclosed rural landscape to the east which forms a well vegetated backdrop to the open rural landscape of this area.

Figure 5: The open rural landscape of LCZ 1 comprised of large rural lot holdings.



LEGEND

- PROJECT SITE
- LANDSCAPE CHARACTER ZONE 1 - OPEN RURAL LANDSCAPE
- LANDSCAPE CHARACTER ZONE 2 - ELEVATED RURAL LANDSCAPE
- LANDSCAPE CHARACTER ZONE 3 - ENCLOSED RURAL LANDSCAPE

0 2,000m

Figure 6: Landscape character zones and study area

5.1.2. Landscape Character Zone 2 - Elevated rural landscape

This landscape is characterised by a steep and long ridge line that extends across the rural landscape, north from Nobby Hill (refer to Figure 8) and defines the south to north alignment of the watercourses from this edge, including Spring Flat Creek. The areas within this LCZ contain a rural character with a predominance of rural zoning and areas of steep topography with scattered to moderately dense tree cover.

Figure 7: View looking west from Tallagandra Lane showing typical character of LCZ 2 in background and its association with the open rural landscape of LCZ 1 in the foreground.

Figure 8: View from Kiaora Lane (LZC 1) looking north-west towards Nobby Hill (LCZ 2).

5.1.3. Landscape Character Zone 3 - Enclosed Rural Landscape

This LCZ comprises a gently undulating, enclosed rural landscape characterised by a low number of large rural holdings. Across this landscape a mixed cover of trees is spread throughout, including increasingly large and connected regrowth bushland patches.

A key element of this LCZ is a small isolated patch of endemic woodland located within the Project Site.

5.2. Landscape character impacts

An assessment of landscape character impacts arising from the Project on the identified landscape character zones has been undertaken to determine the significance of potential changes to the character of the landscape.

Table 7: Landscape character impacts assessment - LCZ 1

Landscape Character Zone 1 - Open rural landscape
Anticipated change to LCZ
The Project would comprise a contrasting element across the open, low-lying rural landscape.
Sensitivity to change: Moderate
Susceptibility to change
The LCZ is considered to have a moderate potential to accommodate the proposed change within the context of the open, low-lying landform, but mitigated by the potential to conserve isolated patches of endemic woodland and provision of new screen planting within the Project, as a basis for future landscape integration that is reflected in the broader landscape, drawing upon existing landscape cover patterns.
Value of LCZ
LCZ 1 is considered to be of local value due to the visual amenity associated with the open, low lying rural landscape, with this LCZ present across large areas of the region.
Magnitude of change: Moderate
Size/scale
The scale of change in the landscape would be moderate, given the the size and uncharacteristic form of the solar array within the open rural landscape setting, and other key structures including containerised power conversion stations, electrical switch-yard and substation and control building. However a substantial area of the Project is expected to be reinstated with screening vegetation, with the aim of moving the landscape character from LCZ 1 to LCZ 3.
Geographical extent
The Project comprises a major addition over a broadly localised area, within the context of extensive areas of LCZ 1 well beyond the site.
Duration/reversibility
The Project would comprise a long-term but potentially temporary (30 years) change to the character of the landscape.
Significance of landscape character impact: Moderate

Table 8: Landscape character impacts assessment - LCZ 2

Landscape Character Zone 2 - Elevated rural landscape
Anticipated change to LCZ
The Project would have some impacts on the character of the landscape, however these would be limited to the east orientated and elevated edges of the LCZ overlooking the Project. The Project would introduce new solar infrastructure elements within visual proximity of this LCZ.
Sensitivity to change: Low
Susceptibility to change
The ability of this LCZ to accommodate the proposed change without impacts on its landscape character is considered to be high given its substantial separation from the Project.
Value of LCZ
LCZ 2 is considered to be of local value due to the visual amenity associated with its elevated position and outlook on the adjoining open, low-lying rural landscape, with this LCZ present across large parts of the region.
Magnitude of change: Low
Size/scale
The size of change is considered to be moderate within the context of the proximate form and scale of the Project across the adjoining open, low-lying rural landscape LCZ 1.
Geographical extent
The impact of the Project on this LCZ is locally high, but low within the context of the extent of this LCZ which extends well beyond the study area. The impact is only on the immediate setting the Project.
Duration/reversibility
The Project would comprise a long-term but temporary (30 years) change to the sections of this LCZ that are adjacent to the extent of works, subject to further application to operate at the end of the projected 30 year life of the Project.
Significance of landscape character impact: Low

Table 9: Landscape characterimpacts assessment - LCZ 3

Landscape Character Zone 3 - Open rural landscape
Anticipated change to LCZ
The Project would comprise a contrasting element within visual proximity of the adjoining open, low-lying rural landscape (LCZ 1).
Sensitivity to change: Moderate
Susceptibility to change
The vegetation within LCZ 3 provides a complimentary setting to the landscape character of LCZ 1. The impacts arising from loss of vegetation on the existing character of LCZ 3 are largely isolated to the two retained patches of existing woodland within the Project. The project will provide additional vegetation cover similar to that of LCZ 3, with the aim of extending the LCZ 3 character across much of the Project.
Value of LCZ
LCZ 3 is considered to be of local value due to the contribution of tree planting within rural lots. In addition, the informal and naturalistic nature of endemic regrowth vegetation within the LCZ contributes to the broader landscape character.
Magnitude of change: Low
Size/scale
The scale of change in the landscape would be low within the context of the adjoining LCZ edges, and noting that a substantial area of the Project is expected to be reinstated with screening vegetation which will reflect the character of this LCZ.
Geographical extent
The impact is on the immediate setting of the Project only. Extensive areas of the LCZ occur across the regional landscape.
Duration/reversibility
The Project would comprise a long-term but temporary (30 years) change to the character of the landscape.
Significance of landscape character impact: Moderate - Low

6. Visual Impact Assessment

A total of fifteen visual receptor locations have been identified to represent viewpoints for the assessment of potential impacts on views as a result of the Project, as shown in Figure 9.

6.1. Visual receptor types

The viewpoints have been organized into two key receptor types, each of which are considered to typically share defined sensitivity to changes in the context and character of views.

6.1.1. Residents

Residents are interested in the outlook from their properties and have a sense of proprietary interest in their local environment. Residents typically have regular and prolonged viewing opportunities, so are considered likely to have a high level of sensitivity to the proposed change. All of the viewpoints assessed take into account any curtilage surrounding each residence which may be considered an extension to the dwelling for domestic or social activities.

6.1.2. Road users

Road users may generally have only a passing interest in the quality of their surroundings as they are travelling through the landscape (especially on Tallagandra Lane because it is a local road and therefore it becomes a form of 'work' travel), and the Project comprises only a small component of the landscape through which they are travelling. Additionally, drivers would be expected to have much of their attention focussed on road conditions and so are considered to have moderate to low sensitivity to change. Local road users may have a moderate level of sensitivity to change, given the potential for a sense of proprietary interest in their local environment.

6.2. Visual impact assessment

6.2.1. Construction

There are potential visual impacts that may occur during the construction phases of the Project. The key construction activities that may be visible from areas surrounding the Project include:

- minor civil/earthworks involved in the preparation of the site;
- hardstand areas required for laydown and storage of construction materials;
- temporary site facilities such as parking, toilets and amenities
- temporary site access tracks instated for construction vehicles
- plant and equipment required for the construction of the Project including:
  - medium rigid trucks, utes and light vehicles
  - piling machines
  - forklifts and assisted material handling equipment
  - water trucks for dust suppression

The majority of construction activities which would result in physical changes to the landscape are generally temporary in nature and for the most part are restricted to specific areas within the Project Site.

While extensive earthworks are not proposed, some minor land forming may be undertaken to achieve more consistent gradients. However, the areas of disturbance would be rehabilitated and the surrounding groundcover would be retained. Areas of earthworks would be subject to dust control measures that would aim to minimise any airborne dust that could affect local visibility.

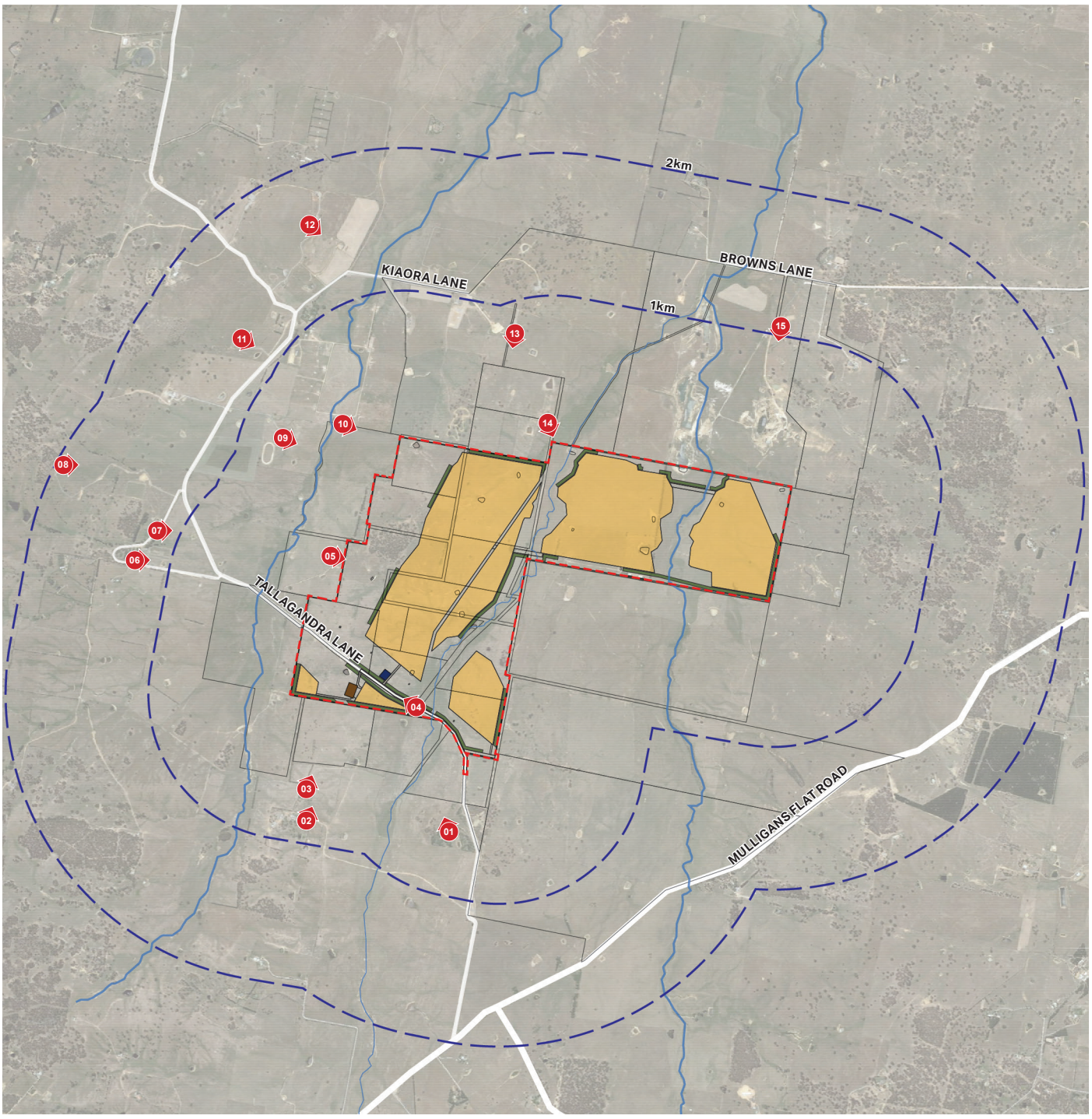
The majority of construction activities would be unlikely to result in an unacceptable level of visual impact due to the relatively short duration (approximately 8 months) and temporary nature of the works.

6.2.2. Operational impacts

A total of fifteen visual receptor locations have been identified to represent viewpoints for the assessment of potential impacts on views as a result of the Project during operation, as shown in Figure 9. The assessment is provided in Table 10 on the following pages.

6.2.3. Visual envelope mapping

The likely visibility of the proposed elements of the Project during operation from surrounding areas has been broadly mapped to define a visual envelope (refer to Figure 10). This provides an indication of where the Project is potentially visible from. This map indicates 'worst case' and is indicative only as it does not consider the impacts of existing vegetation cover.



LEGEND

PROJECT SITE

VISUAL RECEPTOR LOCATION

SOLAR FIELD AREA INCLUDING INTERNAL ROADS

SCREEN PLANTING

SUBSTATION AREA

CONTROL BUILDING AREA

0 2,000m

Figure 9: Visual receptor locations

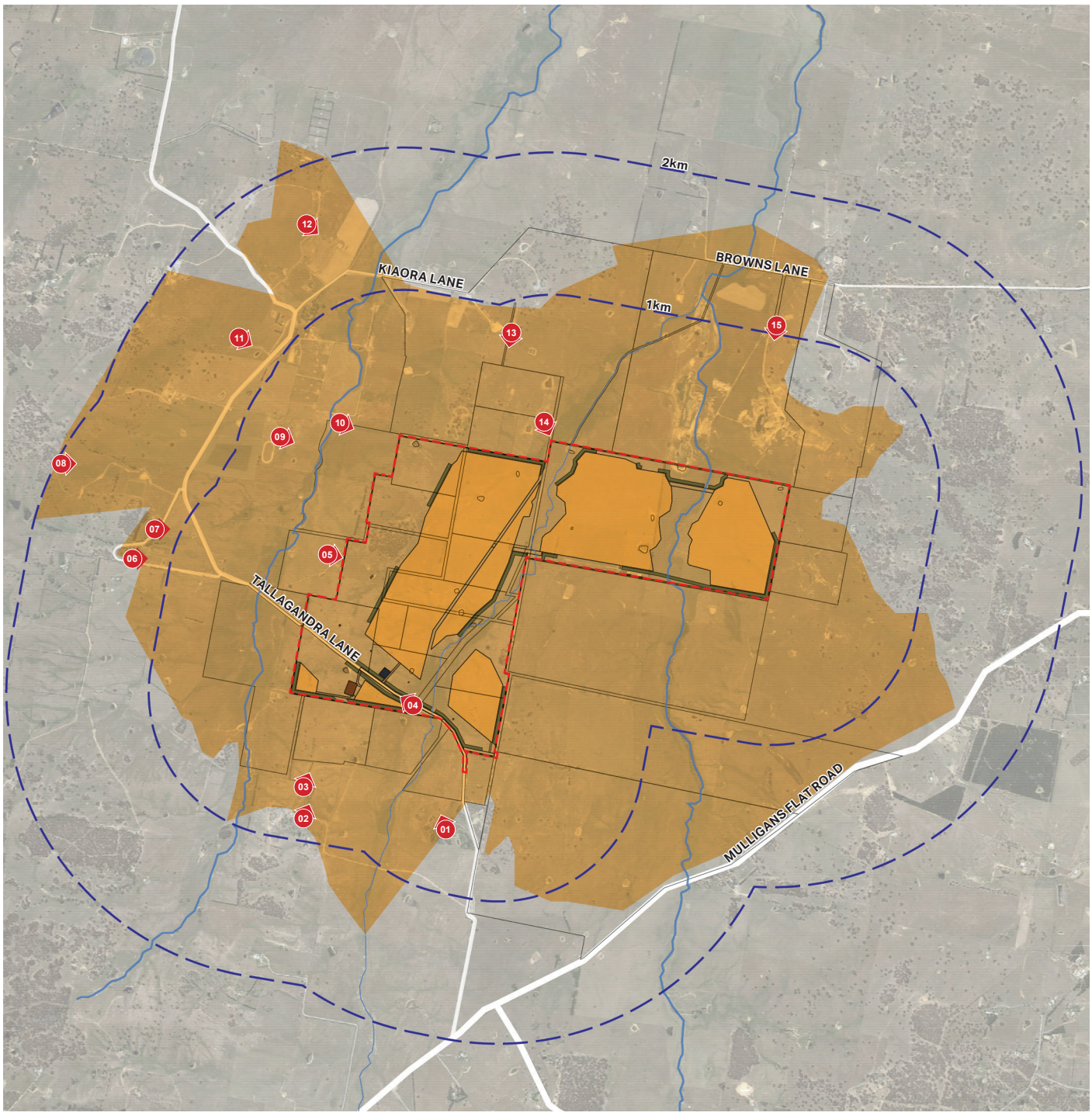


Figure 10: Visual envelope map

Table 10: Visual impact assessment

V01: Resident
Anticipated change to view
Views north-west towards the Project from the resident and immediate property curtilage will be partially screened by existing vegetation (Refer to Figure 9 for resident location V01).
Sensitivity to change: Moderate
Susceptibility of resident to proposed change
The susceptibility of the resident to the proposed change in their view and visual amenity is moderate. This is due to the resident facing out onto the Project. However, there is existing vegetation located along side the north and north-west side of the residence which appears to provide partial screening of the view towards the Project.
Value attached to view
The view is considered to be of a moderate value due to the partial screen planting along the north-west edge of the residence which breaks up the view and appears to screen the Project.
Magnitude of change: Low
Size/scale
The scale of change is conservatively considered to be moderate, notwithstanding the potential extent of screening along the north-west boundary.
Geographical extent
The viewpoint is located approximately 520 metres from the Project, resulting in low visual detail due to the existing vegetation cover.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: Moderate - Low

V02: Resident

Existing view

Anticipated change to view

Views north to north-east towards the project from the resident and immediate property curtilage will be screened by existing vegetation cover and landform which falls away from the residence. Indirect views will extend toward the Project from a section of the driveway (Refer to Figure 9 for resident location V02).

Sensitivity to change: Low

Susceptibility of resident to proposed change

The susceptibility of the resident to the proposed change in their view and visual amenity is low. This is due to the resident facing south-west rather than facing out onto the Project. Indirect views from the driveway will likely occur over a short duration from a moving vehicle while on their approach to the house.

Value attached to view

The view is considered to be of a moderate value due to the partial screen planting and landform which breaks up and screens the Project.

Magnitude of change: Low

Size/scale

The scale of change will be minimal given the partial view of the Project at this location.

Geographical extent

The viewpoint is located approximately 800 metres from the Project, resulting in negligible visual detail due to existing vegetation cover and landform which screens views.

Duration/reversibility

The duration of impacts would be expected to be long term.

Significance of visual impact: Low

V03: Resident
Anticipated change to view
Views north to north-west towards the Project from the resident and immediate property curtilage will be partially screened by existing vegetation and cultural planting (Refer to Figure 9 for resident location V03).
Sensitivity to change: Low
Susceptibility of resident to proposed change
The susceptibility of the resident to the proposed change in their view and visual amenity is low. This is due to the resident facing west rather than facing north onto the Project. Further, the existing vegetation located within this property provides partial screening of views to the north.
Value attached to view
The view is considered to be of a moderate value, notwithstanding the partial screen planting which breaks up and screens the Project.
Magnitude of change: Negligible
Size/scale
The scale of change will be minimal given the partial view of the Project at this location and proposed intervening screening.
Geographical extent
The viewpoint is located approximately 600 metres from the Project, resulting in negligible visual detail due to the existing and proposed vegetation cover.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: Negligible

V04: Road user

Existing view

Photomontage of proposed view at project completion (day one of operation)

Anticipated change to view

Views north-west across Tallagandra Lane towards the Project would comprise immediate views of the proposed screen planting, control building area and solar field areas north of Tallagandra Lane. To the south of Tallagandra Lane views would comprise screen planting, with substation and solar field areas in the background (Refer to Figure 9 for road user location V04).

Sensitivity to change: Moderate

Susceptibility of road user to proposed change

The susceptibility of motorists travelling on Tallagandra Lane is low due to the transient nature of the view and infrequent number of motorists that would be likely impacted by both day and night time views of the Project.

Value attached to view

The value attached to the view for motorists travelling along Tallagandra Lane is considered moderate, given the proprietary interest they could be expected to have with regard to changes in their rural views, seen across a relatively quiet road with minimal screening.

Magnitude of change: Moderate

Size/scale

The scale of change from this receptor is moderate given the broad change in view with respect to the addition of new elements including the control building, substation, and solar field areas.

Geographical extent

The viewpoint is located within the immediate surrounds of the development envelope, with a broad portion of the view occupied by new elements.

Duration/reversibility

The duration of impacts would be expected to be long term.

Significance of visual impact: Moderate

V05: Resident
Anticipated change to view
Views to the east towards the Project would comprise long distance views of the solar field areas and would be partially screened by the intervening landform (Refer to Figure 9 for resident location V05).
Sensitivity to change: High
Susceptibility of resident to proposed change
The susceptibility of the resident to the proposed change in their view and visual amenity is high due to the close proximity of the Project.
Value attached to view
The value attached to the view is considered high given the sense of proprietary interest they would be expected to have within the environment of their residential property.
Magnitude of change: Moderate
Size/scale
The size and scale of change is considered to be moderate, within the context of the visually incongruent scale, mass, form, line, and materials of the Project, which would interrupt the existing moderate distance views across the rural landscape.
Geographical extent
The viewpoint is located approximately 40 metres from the site boundary; however, Project elements are viewed at a distance of 410 metres minimum and extend for up to 1,250 metres.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: High - Moderate

V06: Resident
Anticipated change to view
Potential distant views east from this resident towards the Project are partially screened by vegetation within and surrounding the property boundary (Refer to Figure 9 for resident location V06).
Sensitivity to change: Low
Susceptibility of resident to proposed change
While the resident will have high amenity views across the landscape which the house focusses on, the sensitivity of this resident is considered to be Low due to the distance to the Project and intervening vegetation.
Value attached to view
The view is considered to be of a moderate value due to the partial screen planting which breaks up and screens the Project and provides a 'natural' green element.
Magnitude of change: Low
Size/scale
The scale of change from this resident will be low given the partial view of the Project from this location.
Geographical extent
This view point is located approximately 1,200 metres from the Project resulting in low visual detail to the proposed changed.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: Low

V07: Resident
Anticipated change to view
Potential distant views east from this resident toward the Project are partially screened by vegetation within and surrounding the property boundary (Refer to Figure 9 for resident location V07).
Sensitivity to change: Low
Susceptibility of resident to proposed change
While the resident will have high amenity views across the landscape, the sensitivity of this resident is considered to be Low due to the distance to the Project and intervening vegetation.
Value attached to view
The view is considered to be of a moderate value due to the partial screen planting which breaks up and screens the Project and provides a 'natural' green element.
Magnitude of change: Low
Size/scale
The scale of change from this resident will be low given the partial view of the Project from this location.
Geographical extent
This view point is located approximately 1,300 metres from the Project resulting in low visual detail to the proposed changed.
Duration/reversability
The duration of impacts would be expected to be long term.
Significance of visual impact: Low

V08: Resident
Anticipated change to view
The resident will have an elevated view east overlooking the Project. Views will be on a landscape scale and as such have an appreciation of the extent of the Project (Refer to Figure 9 for resident location V08).
Sensitivity to change: Moderate
Susceptibility of resident to proposed change
The susceptibility of the resident to the proposed change in their view and visual amenity is moderate, given the high level of proprietary interest they would be expected to have with regards to changes in their rural view
Value attached to view
The view is considered to be of high value due to the elevated rural setting within which the resident is located.
Magnitude of change: Moderate
Size/scale
The scale of change is considered Moderate, noting the scale of the Project but also the relatively small area of which the Project is located within the broader view.
Geographical extent
The viewing distance is approximately 2,000 metres, with views of the Project being seen within the context of an extensive view across the open rural landscape.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: Moderate

V09: Resident
Anticipated change to view:
This receptor does not currently have a direct view of the Project due to the presence of intervening vegetation, despite views from this receptor being theoretically possible on the basis of landform only (i.e ignoring existing vegetation). As such there would no change to the existing view from the receptor as a result of the project (Refer to Figure 9 for resident location V09).
Sensitivity to change: Negligible
Susceptibility of resident to proposed change
While the resident will have high amenity views across the landscape, the sensitivity of this resident is considered to be negligible due to the distance to the Project and intervening vegetation.
Value attached to view
The value attached to the view is considered high given the sense of proprietary interest they would be expected to have within the environment of their residential property.
Magnitude of change: Negligible
Size/scale
The project would not be visible from this receptor due to the presence of intervening vegetation and hence consideration of the size and/or scale of change is not relevant.
Geographical extent
The viewpoint is located approximately 630 metres from the development envelope though no views of the Project are possible due to the presence of intervening vegetation.
Duration/reversibility
The project would not be visible from this receptor due to the presence of intervening vegetation and hence consideration of the duration of change is not relevant.
Significance of visual impact: Negligible

V10: Resident
Anticipated change to view
This receptor does not currently have a direct view of the Project due to the presence of intervening vegetation, despite views from this receptor being theoretically possible on the basis of landform only (i.e ignoring existing vegetation). As such there would no change to the existing view from the receptor as a result of the project (Refer to Figure 9 for resident location V10).
Sensitivity to change: Negligible
Susceptibility of resident to proposed change
While the resident will have high amenity views across the landscape, the sensitivity of this resident is considered to be negligible due to the intervening vegetation.
Value attached to view
The value attached to the view is considered high given the sense of proprietary interest they would be expected to have within the environment of their residential property.
Magnitude of change: Negligible
Size/scale
The project would not be visible from this receptor due to the presence of intervening vegetation and hence consideration of the size and/or scale of change is not relevant.
Geographical extent
The viewpoint is located approximately 415 metres from the development envelope though no views of the Project are possible due to the presence of intervening vegetation.
Duration/reversibility
The project would not be visible from this receptor due to the presence of intervening vegetation and hence consideration of the duration of change is not relevant.
Significance of visual impact: Negligible

V11: Resident
Anticipated change to view
The anticipated change from this elevated location overlooking the Project would potentially have views on a landscape scale and as such have an appreciation of the extent of the Project (Refer to Figure 9 for resident location V11).
Sensitivity to change: Moderate
Susceptibility of resident to proposed change
The susceptibility of the resident to the proposed change in their view and visual amenity is moderate, given the high level of proprietary interest they would be expected to have with regards to changes in their rural view.
Value attached to view
The view is considered to be of high value due to the elevated rural setting within which the resident is located.
Magnitude of change: Moderate
Size/scale
The scale of change is considered to be moderate, noting the scale of the Project, but also the relatively small area of change within the context of the broader view.
Geographical extent
The viewing distance is approximately 1,250 metres, with views of the Project being seen within the context of an extensive view across the open rural landscape.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: Moderate

V12: Resident
Anticipated change to view
The anticipated change from this elevated location overlooking the Project would potentially have views on a landscape scale and as such have an appreciation of the extent of the Project (Refer to Figure 9 for resident location V12).
Sensitivity to change: Moderate
Susceptibility of resident to proposed change
The susceptibility of the resident to the proposed change in their view and visual amenity is moderate, given the high level of proprietary interest they would be expected to have with regards to changes in their rural view.
Value attached to view
The view is considered to be of high value due to the elevated rural setting within which the resident is located.
Magnitude of change: Moderate
Size/scale
The scale of change is considered to be moderate, noting the scale of the Project, but also the relatively small area of change within the context of the broader view.
Geographical extent
The viewing distance is approximately 1,575 metres, with views of the Project being seen within the context of an extensive view across the open rural landscape.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: Moderate

V13: Resident
Anticipated change to view
Views to the south towards the Project would comprise distant views of the solar field areas and would be partially screened by the proposed screen planting (Refer to Figure 9 for resident location V13).
Sensitivity to change: High
Susceptibility of resident to proposed change
The susceptibility of the resident to the proposed change in their view and visual amenity is high due to the proximity of the Project.
Value attached to view
The value attached to the view is considered high given the sense of proprietary interest they would be expected to have within the environment of their residential property.
Magnitude of change: Moderate
Size/scale
The size and scale of change are considered to be moderate, within the context of the visually incongruent scale, mass, form, line, and materials of the Project, which would interrupt the existing moderate distance views across the rural landscape.
Geographical extent
The viewing distance is approximately 830 metres, with views of the Project being seen within the context of an extensive view across the open rural landscape.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: High - Moderate

V14: Resident
Anticipated change to view
Views to the south towards the Project would comprise distant views of the solar field areas and would be partially screened by the proposed screen planting (Refer to Figure 9 for resident location V14).
Sensitivity to change: High
Susceptibility of resident to proposed change
The susceptibility of the resident to the proposed change in their view and visual amenity is high due to the close proximity of the Project.
Value attached to view
The value attached to the view is considered high given the sense of proprietary interest they would be expected to have within the environment of their residential property.
Magnitude of change: High
Size/scale
The size and scale of change are considered to be high, within the context of the visually incongruent scale, mass, form, line, and materials of the Project, which would be seen in great levels of detail, and significantly interrupt the existing moderate distance views across the rural landscape.
Geographical extent
The viewing distance is approximately 150 metres, with views of the Project being seen within the context of an extensive view across the open rural landscape.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: High

V15: Resident
Anticipated change to view
Views south from this resident toward the Project would potentially have views on a landscape scale and as such have an appreciation of the extent of the Project (Refer to Figure 9 for resident location V15).
Sensitivity to change: Moderate
Susceptibility of resident to proposed change
While the resident will have high amenity views across the landscape, the sensitivity of this resident is considered to be moderate due to the distance from the Project.
Value attached to view
The view is considered to be of a moderate value due to the partial screen planting which breaks up and screens the Project.
Magnitude of change: Low
Size/scale
The scale of change from this resident will be low given the relatively small area of the Project within the context of the broader view.
Geographical extent
This viewpoint is located approximately 1,100 metres from the Project resulting in low visual detail to the proposed changed.
Duration/reversibility
The duration of impacts would be expected to be long term.
Significance of visual impact: Moderate - Low

6.2.4. Night Lighting

There will no night lighting except for sensor lighting for security associated with the operation and maintenance facilities and electrical switchyard and substation. It may be necessary to undertake maintenance on the solar panels and power conversion stations at night time when the Solar Farm is not generating electricity. In such cases, localised temporary lighting may be required to ensure safe conduct of the maintenance work.

A small number of existing night time light sources occur in the vicinity of the Project. Localised lighting is associated with a small number of residential dwellings located in close proximity to the Project, but lighting is unlikely to be visually prominent and does not emit any significant illumination to the immediate areas surrounding the residential dwellings. Lights from intermittent vehicles travelling along the local roads provide temporary and periodic sources of light.

The categories of potential view locations that would be impacted by temporary night lighting include residents and road users. Irrespective of the total number of visible light sources associated with the Project, intermittent lighting is more likely to be noticeable from exterior areas surrounding residences rather than from inside residential dwellings where at night time room lights tend to reflect and mirror internal views in windows, or curtains and blinds tend to be drawn.

Night time lighting associated with the Project is unlikely to have a significant visual impact on road users travelling along the local roads; as no permanent lighting is proposed the duration of visibility would tend to be occasional and temporary.

6.3. Glint and Glare

The results of the desktop glare hazard analysis identified that for the Proposal, there is no glare hazard predicted to be generated as a result of the operation of the proposed single axis tracking array configuration as outlined in Appendix B.

The glare model developed for this study is considered a 'worst case' situation, whereby it is assumed that the solar arrays are installed across the entire Project Site and the entire area of the solar panel arrays are considered a potential glare source. In addition the model includes conservative assumptions including a high irradiance and the model does not consider any existing vegetation, buildings or landform that may exist between the solar panel arrays and the observation points.

Currently the GlareGauge model does not account for the 'backtracking' operation which commonly occurs on single axis tracking systems. During the early morning and late afternoon when the backtracking procedure would operate the angle of incidence of the sun relative to the PV module may differ to that predicted in the modelling. Given the limited period of operation in backtracking mode and the lower direct normal irradiance (DNI) that occurs during backtracking operation the resulting potential for glare hazard is not expected to be significant during backtracking operation.

Given there is no glare predicted at the modelled observation points, there are no recommended measures to mitigate glare from the Project.

7. Mitigation Measures

Mitigation measures should be considered to minimise the level of residual visual impacts during construction and operation. The mitigation measures generally involve reducing the extent of visual contrast between the visible portions of the proposed structures and the surrounding landscape, and/or screening direct views towards the Project.

7.1. Detail Design

Mitigation measures during the detailed design process should consider:

- further refinement in the design and layout which may assist in the mitigation of bulk and height of proposed structures;
- a review of materials and colour finishes for selected components including the use of non-reflective finishes to structures where possible.

7.1.1. Draft Landscape Plan

The SEARs set out a requirement to prepare a draft landscape plan developed in consultation with affected landowners and is included in Appendix A. This LVIA where possible has determined that a planted buffer area is prescribed to the boundary of sensitive visual receptors for the purpose of mitigating visual impacts to those land owners.

The draft landscape plan provides well integrated planted buffer areas of a minimum width of twenty metres along the Project boundaries to minimize the extent of the solar array when seen from surrounding receptor locations. The buffer areas contain random plantings of a variety of endemic tree and shrub species of differing growth habits typically at spacing's of two to five metres, and a groundlayer of grasses and low growing species at closer spacings. The intention is to reinstate screening vegetation with characteristics of local plant communities to maintain a consistent landscape character. Screen planting could not be placed in some locations due to conflicts with the location of Golden Sun Moth habitat.

7.2. Construction

Mitigation measures during the construction period should consider:

- minimise tree removal where possible;
- avoidance of temporary light spill beyond the construction site where temporary lighting is required;
- rehabilitation of disturbed areas; and
- protection of endemic vegetation within the Project where retained.

7.3. Operation

Mitigation measures during the operational period should consider:

- ongoing maintenance and repair of constructed elements to maintain the visual appearance of the Project;
- long term maintenance (and replacement as necessary) of screen planting within the Project to maintain visual filtering and screening of external views where appropriate.

8. Conclusion

This landscape and visual impact assessment has been undertaken to assess the impacts of the Springdale Solar Farm.

A total of three landscape character zones (LCZs) were identified as having the potential to be impacted by the project. The LCZs reflect the natural and cultural influences that shape the rural landscape of the Project and are identified as sharing broadly homogenous characteristics or spatial qualities. The assessment found that no LCZs would be subject to High impacts and that Moderate impacts would occur for LCZ 1 – Open rural landscape, comprising a contrasting element across the open, low lying rural landscape.

A total of fifteen visual receptor locations were assessed for visual impacts. Potential impacts on visual amenity were considered across two different receptor types comprising: residents and road users. The assessment found that one residential receptor would have High impacts due to the close proximity of the Project and changes to their rural view and visual amenity. Two residential receptors were identified as having High – Moderate impacts due to the sense of proprietary interest they would be expected to have within the environment of their residential property and rural outlook. The assessment found that the Project would generally have moderate, low and negligible impacts of change on views to the remaining receptors and their visual amenity.

In the detailed design, there are potential mitigation approaches that may be used to further reduce the visual impacts of the Project. Ratings of impact could generally be expected to improve once a greater level of design development is in place.

Appendix A: Draft Landscape Plan

GENERAL NOTES

- Refer to L02 for indicative plant schedule. Plant species to be sourced from local suppliers and locally collected seed where possible.
- Refer to Detail 3 of L02 for typical planting procedure.
- Temporary stock proof fence to be provided around screen planting if grazing is to occur during planting establishment.
- Existing endemic vegetation and tree cover to be retained and protected
- During planting establishment period, provide continual weed control and apply approved non-residual herbicide if appropriate.

KEY

- 20 metre wide screen planting zone
- Golden Sun Moth habitat (low quality) in improved paddocks to be retained and protected
- Golden Sun Moth habitat (moderate quality) in improved paddocks to be retained and protected
- Solar field area including internal roads
- Internal road
- Project Site

0 500m

AECOM

Client: Renew Estate **Project Name:** Springdale Solar Farm EIS

Date: 14/03/18 **Landscape and Visual Impact Assessment**

Draft Landscape Plan L01

INDICATIVE SCREEN PLANTING SCHEDULE

BOTANICAL NAME	COMMON NAME	POT SIZE	MATURE HEIGHT (m)	MATURE SPREAD (m)
Trees				
Allocasuarina verticillata	Drooping Sheoak	100mm	8	7
Eucalyptus albens	White Box	5 Litre	20	10
Eucalyptus mannifera	Red Spotted Gum	5 Litre	20	10
Eucalyptus melliodora	Yellow Box	5 Litre	30	15
Eucalyptus nortonii	Bundy	5 Litre	15	10
Eucalyptus polyanthemos	Red Box	5 Litre	20	10
Shrubs				
Acacia pravissima	Oven's Wattle	Viro tube	5.0	3.0
Acacia rubida	Red-stemmed Wattle	Viro tube	5.0	5.0
Callistemon linearis	Narrow Leaved Bottlebrush	Viro tube	3.0	3.0
Grevillea sericea	Silk Spider Flower	Viro tube	2.0	1.5
Kunzea ericoides	Burgan	Viro tube	2.0	2.0
Westringia fruticosa	Coastal Rosemary	Viro tube	1.5	1.5
Grasses and Groundcovers				
Austrodanthonia caespitosa	Common Wallaby Grass	Viro tube	0.5	0.1
Austrodanthonia tenuior	Wallaby Grass	Viro tube	1.1	0.4
Chrysocephalum apiculatum	Yellow Buttons	Viro tube	0.6	0.5
Dianella revoluta	Blue Flax Lily	Viro tube	0.5	0.5
Eragrostis brownii	Browns Love Grass	Viro tube	0.8	0.6
Grevillea rosmarinifolia	Rosemary Grevillea	Viro tube	0.8	0.8
Hardenbergia violacea	False Sarsparilla	Viro tube	0.5	0.6
Imperata cylindrica	Blady grass	Viro tube	1.0	1.0
Lomandra longifolia	Mat Rush	Viro tube	0.5	0.6
Poa labillardieri	Tussock Grass	Viro tube	0.5	0.1
Poa sieberiana var. sieberiana	Snowgrass	Viro tube	1.0	0.5
Stypandra glauca	Nodding Blue Lily	Viro tube	0.3	0.4
Themeda australis	Kangaroo Grass	Viro tube	1.2	0.6

SCREEN PLANTING PALETTE


Eucalyptus mannifera


Eucalyptus melliodora

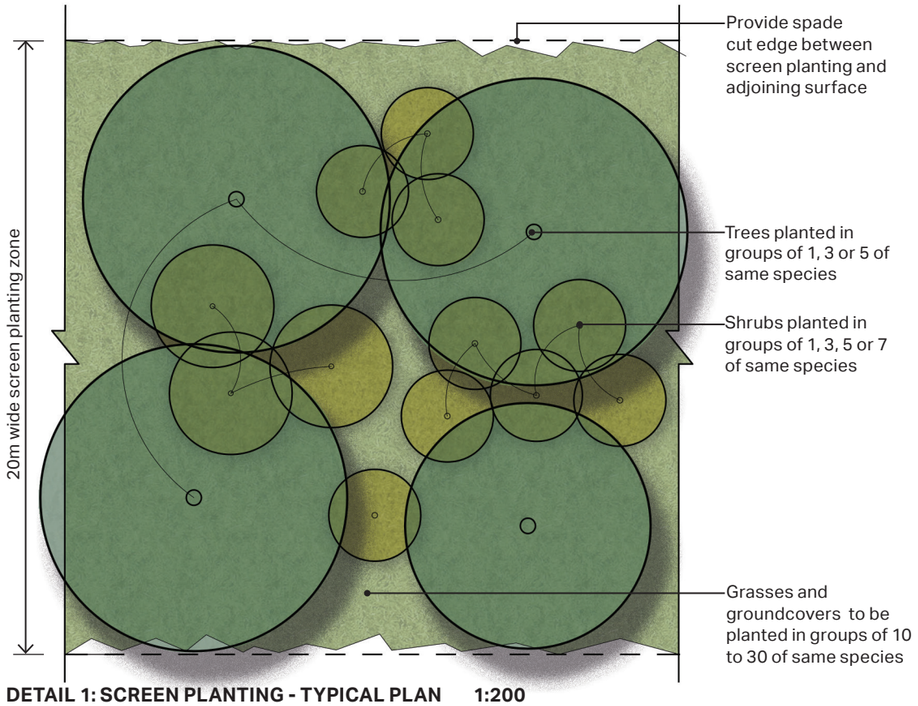

Eucalyptus polyanthemos


Grevillea sericea


Allocasuarina verticillata

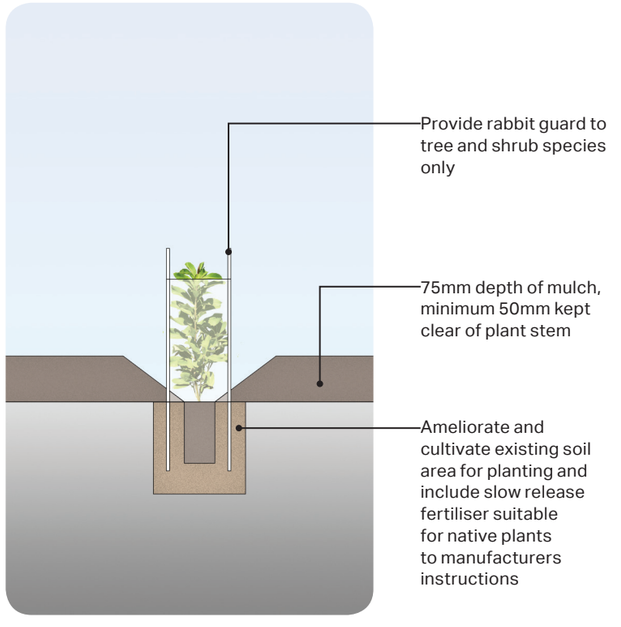

Acacia rubida


Themeda australis



DETAIL 1: SCREEN PLANTING - TYPICAL PLAN 1:200

DETAIL 2: SCREEN PLANTING - TYPICAL SECTION 1:200



DETAIL 3: PLANTING DETAIL - VIRO TUBE 1:10

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Client: Renew Estate **Project Name:** Springdale Solar Farm EIS

Date: 14/03/18 **Landscape and Visual Impact Assessment**

Draft Screen Planting Schedule and Details

L02

Appendix B: Glint and Glare Assessment

AECOM Imagine it. Delivered.

Renew Estate
21-Feb-2018

Glint and Glare Assessment

Springdale Solar Farm

Glint and Glare Assessment

Springdale Solar Farm

Client: Renew Estate

ABN: 21 617 855 311

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Quality Information

Document Glint and Glare Assessment

Date 21-Feb-2018

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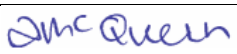
Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
0	21-Feb-2018	Issue	Abbie McQueen Principal Consultant - Energy Advisory	
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1.0 Introduction

1.1 Background

AECOM Australia Pty Ltd (AECOM) has been commissioned by Renew Estate Pty Ltd to undertake a Landscape and Visual Impact Assessment (LVIA) for the proposed Springdale Solar Farm (the Project). The LVIA assesses the impact of solar farm development with regard to potential landscape and visual impacts during the construction and operational stages of the solar farm.

As part of the LVIA a Glint and Glare assessment has been be undertaken to determine the likely impact of glint and glare from the Project on nearby sensitive receptors and identifies appropriate, feasible and reasonable glint and glare mitigation strategies as required.

The objectives of this study are as follows:

- Conduct a glare potential analysis of the proposed Springdale Solar Farm;
- Identify potential glare impacts at nominated observation points nearby the Springdale Solar Farm, based on a single axis tracking system and;
- Recommend improvements or mitigation options available to Renew Estate to reduce glare issues that may impact the public.

This report details the key inputs, methodology and the results of this glare assessment.

1.2 Glint and glare from solar panels

Glint and glare (referred to collectively in this report as glare) are caused by a significant contrast between a light source and background illuminance. Glare occurs over a continuous period while glint is a brief flash of light. Glint and glare can be hazardous when they affect critical operations like aviation. Aside from causing discomfort to the viewer, glare can be a source of distraction and can leave after-images in the viewer's vision.

The visual or ocular impact caused by glare is a function of the intensity of the glare source upon the retina (retinal irradiance) and the portion of a viewer's field of vision that the glare occupies (subtended source angle). This function is described in the glare hazard plot (**Figure** 1), which plots the risk of looking directly at the sun as a comparison.

Results of the glare assessment undertaken for this report are shown graphically in the same manner.

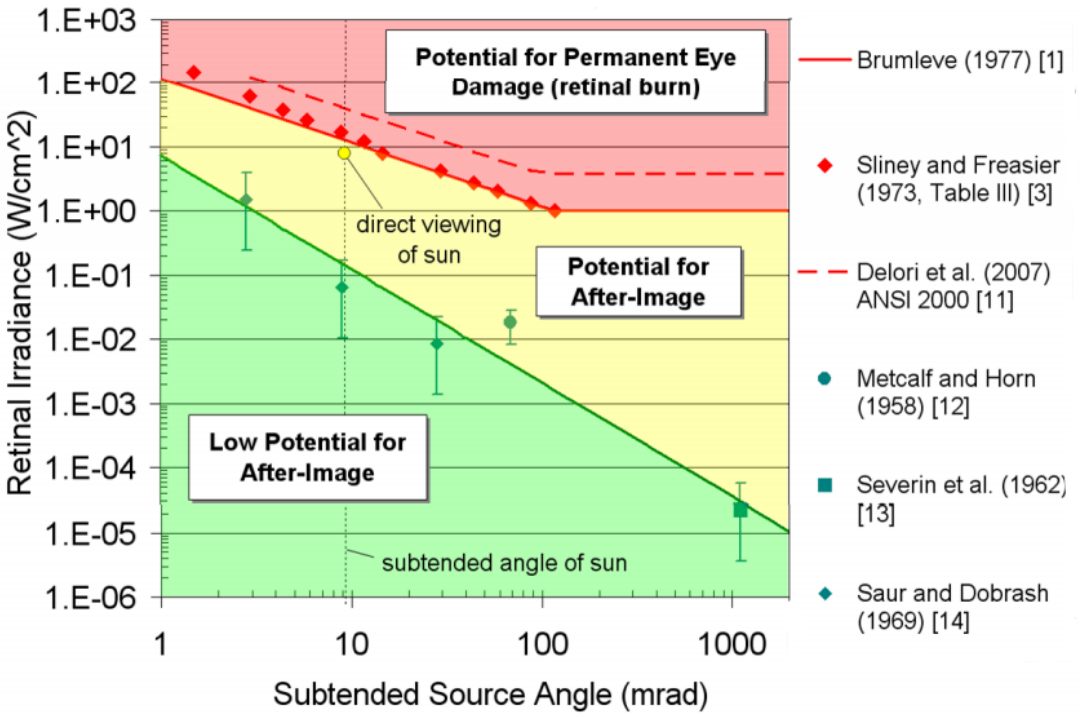


Figure 1 Glare hazard plot illustrating ocular impact as a function of retinal irradiance and subtended source angle[2]

1.3 Civil Aviation Safety Authority requirements

The Civil Aviation Safety Regulations require that air traffic control towers are protected from glare. Through consultation with Air Services Australia (ASA) and the Civil Aviation Safety Authority (CASA), AECOM has been advised that there are no rules or regulations guiding the assessment of such glare. CASA therefore recommends that proponents of solar PV systems within or near airports use guidance from the US Federal Aviation Administration (FAA) in making their assessments.

The FAA recommends that any proposed solar farms that are below the direct approach paths to an airport (aligned with a runway) and within a distance of around 5 nautical miles (approximately 10kms) from a runway end should be referred for assessment.

The FAA requires the use of Solar Glare Hazard Assessment Tool (SGHAT, currently marketed as GlareGauge) to demonstrate the impact of glare caused by PV systems proposed for installation on airports in the US[3]. CASA will typically not object to a solar farm if the glare analysis indicates that air traffic control (ATC) towers experience no glare and runway approaches experience at most “low potential for after-image” glare.

Given the distance of the proposed Springdale Solar Farm from the nearest airstrip (Canberra Airport is approximately 19 km to the south) it is considered unlikely that the solar farm will create any significant glare issues for pilots on approach to or on departure from the nearest airstrips. Accordingly it is not deemed necessary to perform a specific assessment of aircraft flight paths in this study.

[2] Ho, C.K., Sims, C.A., Yellowhair, J., Bush, E. (2014), *Solar Glare Hazard Analysis Tool (SGHAT) Technical Reference Manual)*, Sandia National Laboratories and US Department of Energy.
[3] *Technical Guidance for Evaluating Selected Solar Technologies on Airports*, 2010, Federal Aviation Administration

2.0 Site Overview

2.1 Springdale Solar Farm

The Project is located in Sutton, New South Wales, within Yass Valley Council area and approximately 3.5 kilometres north east of the Australian Capital Territory border. Sutton Village is approximately eight kilometres south east of the Project.

The Project site is approximately 370 hectares in size, of which approximately 190 hectares would be occupied by the solar farm and associated infrastructure (the development envelope), as in Figure 2. Two existing overhead electricity transmission lines traverse the southern portion of the Project in a north-west to south east direction. The transmission lines are both TransGrid owned and operated assets and comprised of the Canberra to Capital Wind Farm 330 kV circuit and the Canberra to Queanbeyan 132 kV circuit.

Coordinates of the proposed solar farm development area are provided in Appendix A.

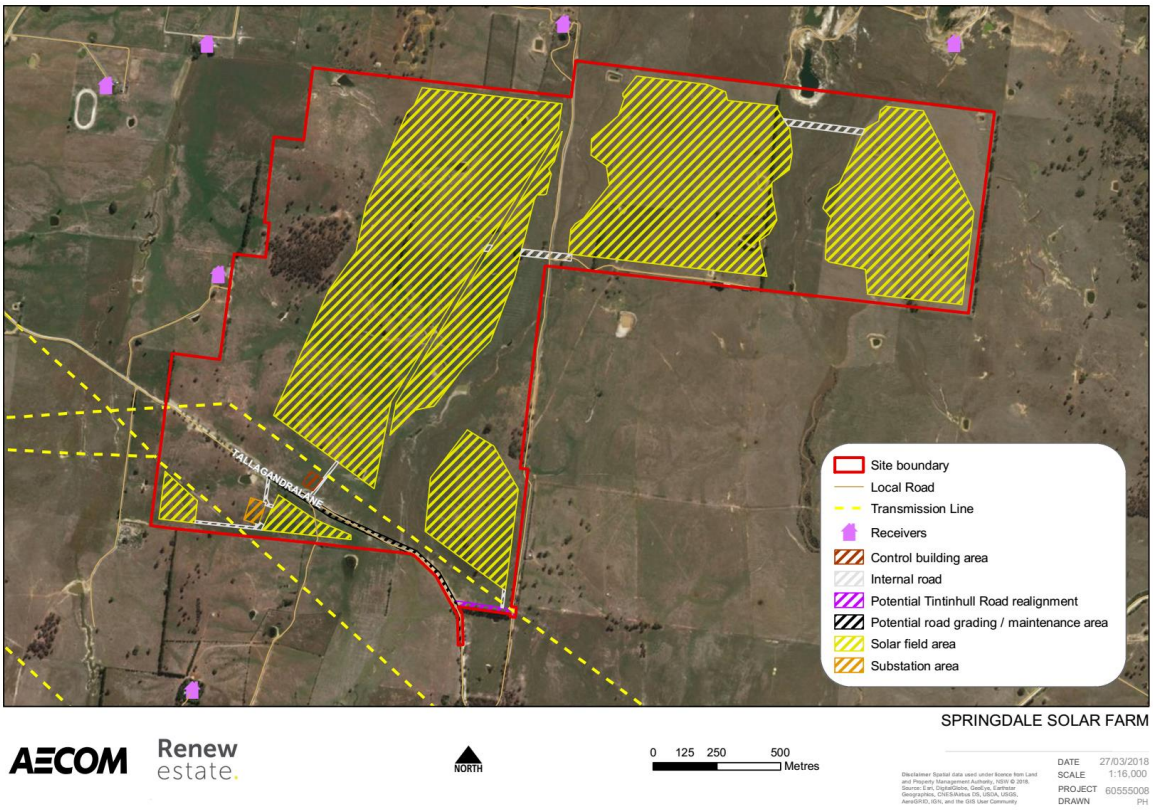


Figure 2 Springdale Solar Farm development area including transmission lines

2.2 Mounting structure

Springdale Solar Farm will use single axis tracking technology; comprising of the key parameters outlined in Table 1.

Table 1 Springdale Solar Farm tracking parameters

Parameter	Value
Mounting Type	Single axis tracking
Panel Row Orientation	North – South (tracking East-West)
Tracking Rotation Angle	±60º (range of 120º)

A graphical representation of a proposed solar farm configuration is presented below in and .

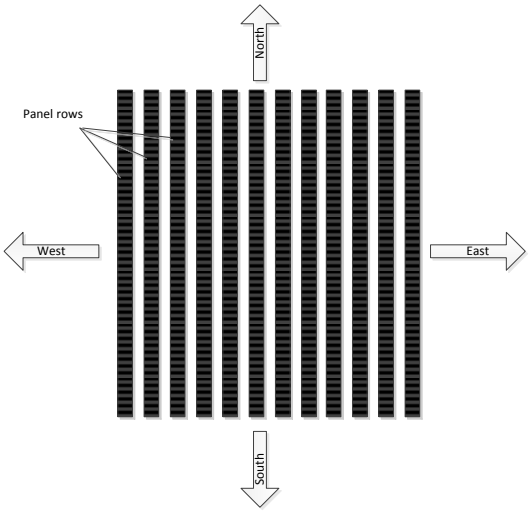


Figure 3 Overview of solar farm panel rows orientation along north-south axis.

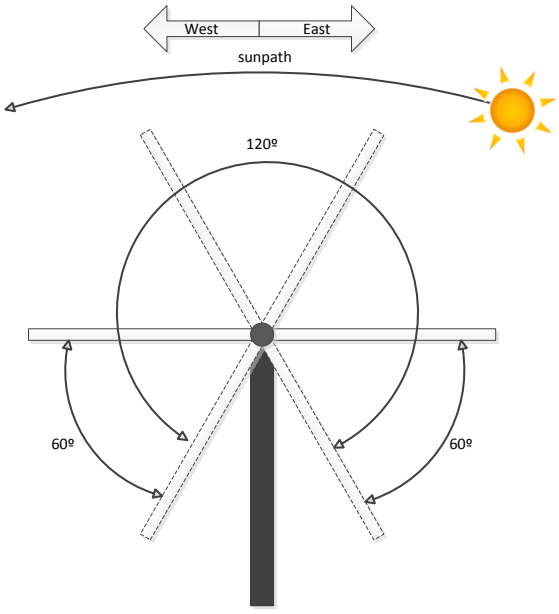


Figure 4 Overview of single axis tracking system and rotation angles to east and west

It is noted that for the purposes of this study, fixed tilt array and dual axis tracking configurations are not evaluated.

4.0 Glare analysis software

4.1 Overview

AECOM has used the GlareGauge software marketed by ForgeSolar to undertake this glare analysis. GlareGauge's algorithms were developed by Sandia National Laboratories in its Solar Glare Hazard Analysis Tool (SGHAT).

GlareGauge employs an interactive Google Maps interface whereby the outline of the solar array can be manually drafted. It simulates an annual sun path based on the chosen location, to calculate sun positions and vectors. GlareGauge requires a number of inputs regarding the characteristics of the solar PV systems including panel orientation, tracking type, slope and height above ground.

Glare hazard is determined based on the retinal irradiance and subtended angle described in Section 1.2. Glare hazards are defined according to the potential of the glare to impact vision as defined in Table 2.

Table 2 Glare impact definitions

Colour Coding	Glare Impact Category	Definition
Not shown on glare hazard plot	No Glare Predicted	Indicates that no glare is expected at the observation points for the site configuration.
		This category is not shown on the glare hazard plot.
Not shown on glare hazard plot	Glare beyond 50 degrees from pilot line-of-site on approach	Indicates that glare is present but will not cause a safety hazard to pilots according to recent research and flight simulator testing.
		This category is not shown on the glare hazard plot.
Green	Low potential for after image	Indicates there is glare present however only a low potential for a temporary after-image (a lingering image of the glare in the field of view).
		This category is shown green on the glare hazard plot.
Yellow	Potential for after image	Indicates that there is glare present with the potential to leave a temporary after-image of the glare.
		This hazard is shown yellow on the glare hazard plot.
Red	Potential for permanent eye damage	Indicates that there is glare present with the potential for permanent eye damage if observed.
		This hazard is shown red on the glare hazard plot.

4.2 Assumptions

Glare hazard is difficult to define and is not the same for every person. It is dependent on a number of factors including reflectance parameters (light intensity, angle of reflectance etc.), the size of the glare source and the observer's distance from it, and ocular/eye parameters (pupil diameter, distance from the pupil to the retina etc). Therefore the following standard assumptions (default values within GlareGauge) have been made through the course of the analysis:

- The model assumes flat reflective surfaces and that light reflected by the solar panels is specular (i.e. the angle of incidence = the angle of reflection).
- The average subtended angle of the sun as viewed from earth is ~9.3 mrad or 0.5°.
- The ocular transmission coefficient accounts for radiation that is absorbed in the eye before reaching the retina. A value of 0.5 is typical[4].

[4] Solar Glare Hazard Analysis Tool (SGHAT) User's Manual v. 2H, Clifford K. Ho, Cianan A. Sims, Julius E. Yellowhair Sandia National Laboratories Updated 22/07/2015

- Diameter of the pupil – the size impacts the amount of light entering the eye and reaching the retina. The typical value is 0.002 m for daylight-adjusted eyes[2].
- Eye focal length: This value is used to determine the projected image size on the retina for a given subtended angle of the glare source. A typical value of 0.017 m was used[2].

4.3 Limitations

GlareGauge has the following limitations:

- the detailed geometry of the solar panel arrays is not rigorously represented, e.g. gaps between panels, detailed variations in height of the array and support structures.
- obstacles (e.g. trees, vegetation buffers, structures or earth) between the observation points and the solar panel arrays that may obstruct observed glare are not considered.
- directional viewpoints from each observation point are not defined. Instead the cumulative impact of the entire solar panel array on each observation point is calculated. In specific circumstances, this may lead to an overestimation of the extent of glare at a particular observation point.
- a typical clear-day solar irradiance profile (worst-case for glare) is used. The model profile has a lower irradiance level in the mornings and evenings and a maximum at solar noon. Actual irradiance levels and profile on any given day can be affected by cloud cover and other environmental factors, however is not considered in this model.
- does not account for the ‘backtracking’ operation which commonly occurs on single axis tracking systems

5.0 GlareGauge Inputs

The sections below detail the inputs applied by AECOM for analysis in GlareGauge. All azimuth values are relative to true north and all tilt angles relative to horizontal.

5.1 PV system parameters

Inputs which apply across all simulations are shown in Table 3. An overview of the input data used for the modelling of the Springdale Solar Farm system is shown in the following sections. The whole project site was modelled in the software, shown by the blue shape in Figure 5, however it is noted the actual solar array has a much smaller footprint; <190ha.

Table 3 General PV system inputs for GlareGauge

Input Data	Units	Value	Comment
General Project Parameters			
Reflectivity calculations	-	Varies with incident angle	As incident angle increases, the reflectance increases.
Reflection diffusion	-	Correlated to module surface type	Calculates the spread of the reflected beam according to the glass texturing and ARC.
Timezone	UTC	+10	NSW time zone
Peak DNI	W/m^2	1,181	Obtained from meteonorm data
Orientation of array	degrees	0	Rows aligned in north-south direction.
Solar panel surface material	-	Smooth glass with Anti-Reflective Coating (ARC)	Renew Estate has not finalised exact module type and model; AECOM has been told to assume there will be an ARC on the glass.
Time interval	mins	1	Model interval throughout the year.
Single Axis Tracking Parameters			
Tilt of tracking axis	degrees	0	0° = Facing upwards. Panels rotate during operation according to single axis tracking operation.
Orientation of tracking axis	degrees	0	0°= Rows aligned north-south
Offset angle of panel	degrees	0	Angle between tracking axis and panel.
Tracking Range	degrees	±60º (range of 120º)	
Height of panel above ground	m	4.0	Typical maximum expected height of module and aligned with Renew Estate assumptions.

5.2 Observation Point Locations

The observer locations termed Observation Points (OPs) are shown as red markers in Figure 5. A table of OP coordinates is provided in Appendix B. These points were chosen to represent potential areas where glint and glare could impact the residents. AECOM's 'Figure 29 Air Quality Receptors' indicates sensitive residences within 2 kilometres of the Project. OP's have been chosen from the results of this desktop review. Glare was assessed at each of the observation points, with the height set to 1.5 m above ground which was assumed to be the typical viewing height whilst standing.

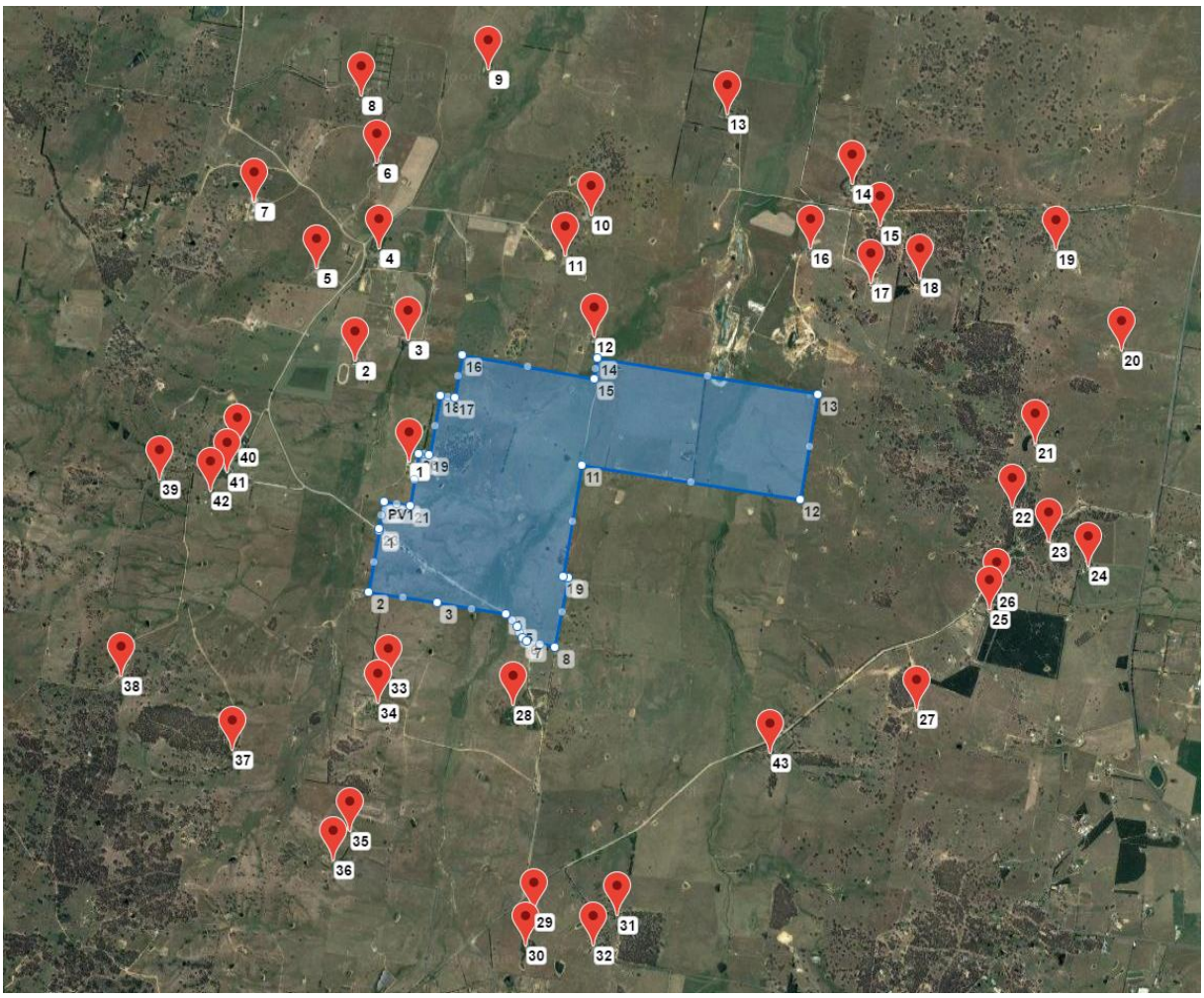


Figure 5 Observation points analysed

6.0 Results

6.1 Summary of results

An overview of the results from the glare analysis, presented as **total annual minutes of glare** for each observation point, is provided in Table 4. No glare has been predicted for any observation point analysed.

Table 4 Total annual minutes of glare caused by the solar farm to each observation point

Observation Point	Low potential for after image (min)	Potential for after image (min)	Potential for permanent eye damage (min)	Hazard Summary
OP-1	0	0	0	No glare predicted
OP-2	0	0	0	No glare predicted
OP-3	0	0	0	No glare predicted
OP-4	0	0	0	No glare predicted
OP-5	0	0	0	No glare predicted
OP-6	0	0	0	No glare predicted

Observation Point	Low potential for after image (min)	Potential for after image (min)	Potential for permanent eye damage (min)	Hazard Summary
OP-7	0	0	0	No glare predicted
OP-8	0	0	0	No glare predicted
OP-9	0	0	0	No glare predicted
OP-10	0	0	0	No glare predicted
OP-11	0	0	0	No glare predicted
OP-12	0	0	0	No glare predicted
OP-13	0	0	0	No glare predicted
OP-14	0	0	0	No glare predicted
OP-15	0	0	0	No glare predicted
OP-16	0	0	0	No glare predicted
OP-17	0	0	0	No glare predicted
OP-18	0	0	0	No glare predicted
OP-19	0	0	0	No glare predicted
OP-20	0	0	0	No glare predicted
OP-21	0	0	0	No glare predicted
OP-22	0	0	0	No glare predicted
OP-23	0	0	0	No glare predicted
OP-24	0	0	0	No glare predicted
OP-25	0	0	0	No glare predicted
OP-26	0	0	0	No glare predicted
OP-27	0	0	0	No glare predicted
OP-28	0	0	0	No glare predicted
OP-29	0	0	0	No glare predicted
OP-30	0	0	0	No glare predicted
OP-31	0	0	0	No glare predicted
OP-32	0	0	0	No glare predicted
OP-33	0	0	0	No glare predicted
OP-34	0	0	0	No glare predicted
OP-35	0	0	0	No glare predicted
OP-36	0	0	0	No glare predicted
OP-37	0	0	0	No glare predicted
OP-38	0	0	0	No glare predicted
OP-39	0	0	0	No glare predicted
OP-40	0	0	0	No glare predicted
OP-41	0	0	0	No glare predicted

Observation Point	Low potential for after image (min)	Potential for after image (min)	Potential for permanent eye damage (min)	Hazard Summary
OP-42	0	0	0	No glare predicted
OP-43	0	0	0	No glare predicted

The full GlareGauge report is provided in Appendix C.

6.2 Conclusions

The results of the desktop glare hazard analysis identified that, for the proposed Springdale Solar Farm site, there is no glare hazard predicted to be generated as a result of the operation of the proposed single axis tracking array configuration as outlined in this report.

The glare model developed for this study is considered a 'worst case' situation, whereby it is assumed that the solar arrays are installed across the entire project site and the entire area of the solar panel arrays are considered a potential glare source. In addition the model includes conservative assumptions of peak irradiance values, and is unable to consider any existing vegetation, buildings or topographical features (such as hills or changes in terrain height) that may exist between the solar panel arrays and the observation points.

Currently the GlareGauge model does not account for the 'backtracking' operation which commonly occurs on single axis tracking systems. During the early morning and late afternoon when the backtracking procedure would operate the angle of incidence of the sun relative to the PV module may differ to that predicted in the modelling. Given the limited period of operation in backtracking mode and the lower direct normal irradiance (DNI) that occurs during backtracking operation the resulting potential for glare hazard is not expected to be significant during backtracking operation.

Given there is no glare predicted at the modelled observation points, there are no recommended measures to mitigate glare from Springdale Solar Farm.

Appendix A

Solar Farm Coordinates

Table 5 Coordinates of solar farm project site

id	Latitude	Longitude	Ground Elevation (m)
1	-35.11174	149.18285	632.152
2	-35.11593	149.18200	631.465
3	-35.11662	149.18767	616.973
4	-35.11737	149.19334	610.520
5	-35.11824	149.19424	615.999
6	-35.11900	149.19469	619.301
7	-35.11919	149.19501	621.938
8	-35.11959	149.19737	619.668
9	-35.11495	149.19846	616.101
10	-35.11486	149.19804	616.952
11	-35.10734	149.19957	604.567
12	-35.10965	149.21761	613.559
13	-35.10253	149.21909	605.928
14	-35.10011	149.20086	602.045
15	-35.10150	149.20060	601.830
16	-35.09987	149.18971	616.127
17	-35.10278	149.18911	636.236
18	-35.10266	149.18789	628.635
19	-35.10664	149.18700	625.460
20	-35.10654	149.18613	622.365
21	-35.11008	149.18543	631.570
22	-35.10980	149.18323	628.686
23	-35.11160	149.18288	632.188

Appendix B

Observation Points

Table 6 Observation Points

Observation Point	Latitude	Longitude	Ground Elevation	Height Above Ground	Total Elevation
OP 1	-35.107116	149.185363	628.99	1.50	630.49
OP 2	-35.100288	149.180850	617.72	1.50	619.22
OP 3	-35.098928	149.185250	611.10	1.50	612.60
OP 4	-35.092700	149.182833	613.47	1.50	614.97
OP 5	-35.094052	149.177731	639.51	1.50	641.01
OP 6	-35.086984	149.182657	653.80	1.50	655.30
OP 7	-35.089587	149.172557	656.76	1.50	658.26
OP 8	-35.082382	149.181371	626.52	1.50	628.02
OP 9	-35.080677	149.191885	608.23	1.50	609.73
OP 10	-35.090457	149.200380	625.78	1.50	627.28
OP 11	-35.093218	149.198180	618.82	1.50	620.32
OP 12	-35.098730	149.200635	612.17	1.50	613.67
OP 13	-35.083697	149.211607	602.96	1.50	604.46
OP 14	-35.088354	149.221913	607.35	1.50	608.85
OP 15	-35.091211	149.224199	618.89	1.50	620.39
OP 16	-35.092702	149.218494	606.44	1.50	607.94
OP 17	-35.095052	149.223451	622.54	1.50	624.04
OP 18	-35.094730	149.227494	638.62	1.50	640.12
OP 19	-35.092772	149.238713	639.09	1.50	640.59
OP 20	-35.099620	149.244089	619.42	1.50	620.92
OP 21	-35.105883	149.236986	645.05	1.50	646.55
OP 22	-35.110223	149.235075	668.77	1.50	670.27
OP 23	-35.112514	149.238125	644.52	1.50	646.02
OP 24	-35.114141	149.241363	627.47	1.50	628.97
OP 25	-35.117119	149.233198	656.39	1.50	657.89
OP 26	-35.115927	149.233819	649.65	1.50	651.15
OP 27	-35.123853	149.227190	651.82	1.50	653.32
OP 28	-35.123551	149.193907	636.98	1.50	638.48
OP 29	-35.137494	149.195595	639.93	1.50	641.43
OP 30	-35.139797	149.194949	648.08	1.50	649.58

OP 31	-35.137711	149.202500	643.00	1.50	644.50
OP 32	-35.139797	149.200549	656.59	1.50	658.09
OP 33	-35.121720	149.183595	659.52	1.50	661.02
OP 34	-35.123391	149.182753	648.03	1.50	649.53
OP 35	-35.132044	149.180469	641.47	1.50	642.97
OP 36	-35.133985	149.179106	644.66	1.50	646.16
OP 37	-35.126590	149.170721	664.06	1.50	665.56
OP 38	-35.121621	149.161559	699.37	1.50	700.87
OP 39	-35.108343	149.164716	673.66	1.50	675.16
OP 40	-35.106124	149.171136	643.86	1.50	645.36
OP 41	-35.107802	149.170272	642.67	1.50	644.17
OP 42	-35.109113	149.168913	643.54	1.50	645.04
OP 43	-35.126816	149.215152	628.89	1.50	630.39

Appendix C

GlareGauge Report

GlareGauge Glare Analysis Results

Site Configuration: Springdale Solar Farm

Project site configuration details and results.

Created **Feb. 13, 2018 7:12 p.m.**
Updated **March 26, 2018 9:26 p.m.**
DNI **varies** and peaks at **1,181.0 W/m^2**
Analyze every **1** minute(s)
0.5 ocular transmission coefficient
0.002 m pupil diameter
0.017 m eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 14817.2398

Summary of Results No glare predicted!

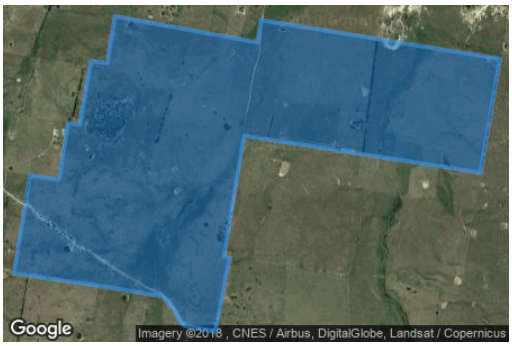
PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	SA tracking	SA tracking	0	0	-

Component Data

PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0 deg
Tracking axis tilt: 0.0 deg
Tracking axis panel offset: 0.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 60.0 deg
Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-35.111744	149.182850	632.15	4.00	636.15
2	-35.115929	149.181998	631.46	4.00	635.46
3	-35.116623	149.187670	616.97	4.00	620.97
4	-35.117370	149.193343	610.52	4.00	614.52
5	-35.118238	149.194239	616.00	4.00	620.00
6	-35.118998	149.194692	619.30	4.00	623.30
7	-35.119186	149.195006	621.94	4.00	625.94
8	-35.119590	149.197367	619.67	4.00	623.67
9	-35.114948	149.198457	616.10	4.00	620.10
10	-35.114861	149.198038	616.95	4.00	620.95
11	-35.107337	149.199574	604.57	4.00	608.57
12	-35.109646	149.217608	613.56	4.00	617.56
13	-35.102528	149.219088	605.93	4.00	609.93
14	-35.100107	149.200865	602.05	4.00	606.05
15	-35.101499	149.200595	601.83	4.00	605.83
16	-35.099867	149.189706	616.13	4.00	620.13
17	-35.102783	149.189108	636.24	4.00	640.24
18	-35.102656	149.187888	628.64	4.00	632.64
19	-35.106643	149.186999	625.46	4.00	629.46
20	-35.106537	149.186130	622.37	4.00	626.37
21	-35.110083	149.185432	631.57	4.00	635.57
22	-35.109805	149.183234	628.69	4.00	632.69
23	-35.111599	149.182877	632.19	4.00	636.19



Discrete Observation Receptors

Number	Latitude	Longitude	Ground elevation	Height above ground	Total Elevation
	deg	deg	m	m	m
OP 1	-35.107116	149.185363	628.99	1.50	630.49
OP 2	-35.100288	149.180850	617.72	1.50	619.22
OP 3	-35.098928	149.185250	611.10	1.50	612.60
OP 4	-35.092700	149.182833	613.47	1.50	614.97
OP 5	-35.094052	149.177731	639.51	1.50	641.01
OP 6	-35.086984	149.182657	653.80	1.50	655.30
OP 7	-35.089587	149.172557	656.76	1.50	658.26
OP 8	-35.082382	149.181371	626.52	1.50	628.02
OP 9	-35.080677	149.191885	608.23	1.50	609.73
OP 10	-35.090457	149.200380	625.78	1.50	627.28
OP 11	-35.093218	149.198180	618.82	1.50	620.32
OP 12	-35.098730	149.200635	612.17	1.50	613.67
OP 13	-35.083697	149.211607	602.96	1.50	604.46
OP 14	-35.088354	149.221913	607.35	1.50	608.85
OP 15	-35.091211	149.224199	618.89	1.50	620.39
OP 16	-35.092702	149.218494	606.44	1.50	607.94
OP 17	-35.095052	149.223451	622.54	1.50	624.04
OP 18	-35.094730	149.227494	638.62	1.50	640.12
OP 19	-35.092772	149.238713	639.09	1.50	640.59
OP 20	-35.099620	149.244089	619.42	1.50	620.92
OP 21	-35.105883	149.236986	645.05	1.50	646.55
OP 22	-35.110223	149.235075	668.77	1.50	670.27
OP 23	-35.112514	149.238125	644.52	1.50	646.02
OP 24	-35.114141	149.241363	627.47	1.50	628.97
OP 25	-35.117119	149.233198	656.39	1.50	657.89
OP 26	-35.115927	149.233819	649.65	1.50	651.15
OP 27	-35.123853	149.227190	651.82	1.50	653.32
OP 28	-35.123551	149.193907	636.98	1.50	638.48
OP 29	-35.137494	149.195595	639.93	1.50	641.43
OP 30	-35.139797	149.194949	648.08	1.50	649.58
OP 31	-35.137711	149.202500	643.00	1.50	644.50
OP 32	-35.139797	149.200549	656.59	1.50	658.09
OP 33	-35.121720	149.183595	659.52	1.50	661.02
OP 34	-35.123391	149.182753	648.03	1.50	649.53
OP 35	-35.132044	149.180469	641.47	1.50	642.97
OP 36	-35.133985	149.179106	644.66	1.50	646.16
OP 37	-35.126590	149.170721	664.06	1.50	665.56
OP 38	-35.121621	149.161559	699.37	1.50	700.87
OP 39	-35.108343	149.164716	673.66	1.50	675.16
OP 40	-35.106124	149.171136	643.86	1.50	645.36
OP 41	-35.107802	149.170272	642.67	1.50	644.17
OP 42	-35.109113	149.168913	643.54	1.50	645.04
OP 43	-35.126816	149.215152	628.89	1.50	630.39

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)
OP: OP 1	0	0
OP: OP 2	0	0
OP: OP 3	0	0
OP: OP 4	0	0
OP: OP 5	0	0
OP: OP 6	0	0
OP: OP 7	0	0
OP: OP 8	0	0
OP: OP 9	0	0
OP: OP 10	0	0
OP: OP 11	0	0
OP: OP 12	0	0
OP: OP 13	0	0
OP: OP 14	0	0
OP: OP 15	0	0
OP: OP 16	0	0
OP: OP 17	0	0
OP: OP 18	0	0
OP: OP 19	0	0
OP: OP 20	0	0
OP: OP 21	0	0
OP: OP 22	0	0
OP: OP 23	0	0
OP: OP 24	0	0
OP: OP 25	0	0
OP: OP 26	0	0
OP: OP 27	0	0
OP: OP 28	0	0
OP: OP 29	0	0
OP: OP 30	0	0
OP: OP 31	0	0
OP: OP 32	0	0
OP: OP 33	0	0
OP: OP 34	0	0
OP: OP 35	0	0
OP: OP 36	0	0
OP: OP 37	0	0
OP: OP 38	0	0
OP: OP 39	0	0
OP: OP 40	0	0
OP: OP 41	0	0
OP: OP 42	0	0
OP: OP 43	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

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