Meadow Creek Solar Farm
Landscape Visual Impact Assessment

June 2024

Revision 4

Prepared by Horizon Studio

For Meadow Creek Solar Farm Pty Ltd

Prepared for Meadow Creek Solar Farm Pty Ltd.

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The authors acknowledge the Traditional Owners of the land and waters considered in this report, their connection to Country and their on going contribution to the improving the environment and the health and well-being of all people.

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Executive Summary

This Landscape Visual Impact Assessment, (LVIA), has been prepared by Horizon Studio for Meadow Creek Solar Farm Pty Ltd to support a planning application for the solar farm to be located at 1033 Oxley - Meadow Creek Road, transmission lines running from the solar farm approximately 2 kilometres north to connect with existing transmission lines on the Whorouly - Bobinawarrah Road, and a substation to be located at the junction of the transmission lines.

The purpose of the report is to assess the potential impacts on landscape character and views that may be created by the proposed solar farm and transmission line infrastructure. The report also assesses the potential cumulative impacts on landscape character of the broader region that may arise from the combination of impacts from the proposed Meadow Creek solar farm development and other similar developments in the region.

Zone of theoretical visibility and the study area.

A Zone of theoretical visibility, (ZTV), analysis was undertaken to understand the potential maximum extent to which the solar farm and transmission line infrastructure could be visible. A Vertical Field of View, (FOV), analysis was also carried out to understand the extent to which the proposed infrastructure could be noticeable. These analysis provided the basis for defining the broader study area in which the field study was carried out. On visiting the area it was apparent that due to the flat terrain and the proliferation of trees in the landscape that the proposed development would not be visible at the outer of the ZTV or FOV. A more detailed field assessment was then carried out within a 2.5 kilometre offset from the proposed site.

Landscape Impact Assessment

The baseline assessment identified four Landscape Character types within the study area including:

- Agricultural Plains - LCT 1
- Foothills - LCT 2
- River Valley - LCT 3 and
- Township - LCT 4.

LCT 1 is the dominant character type in the region and is the LCT in which the solar farm and transmission infrastructure is proposed to be located within. The impact on the agricultural plains will be Minor as the presence of the solar farm is restricted to it's immediate surrounds and the presence of new transmission infrastructure although concentrated at the junction with the existing transmission lines, is restricted to the immediate surrounds due to the terrain and proliferation of trees in the landscape.

The impact on LCT 2, Foothills will be Negligible to minor. The proposed infrastructure cannot be seen from this LCT due to the proliferation of trees throughout the valley and the dense native forest in the foothills. The impact on LCT 3, River Valley, will be Minor to moderate. While the proposed infrastructure cannot been seen from this LCT the rating has been given due to the proximity of the proposed infrastructure and the sensitivity of this LCT. The impact on LCT 4, Township, will be Negligible to minor. The proposed infrastructure is can not be seen nor is evident from this LCT.

Visual Impact Assessment

Sixteen viewpoints were established from which to assess the potential visual impacts from the proposed solar farm and transmission infrastructure. The viewpoints were selected following consideration of receptor sensitivity as well as public access around the site on existing roads. Viewpoints 12 - 16 were included to validate the limit of visibility of the proposed infrastructure to the immediate surroundings.

The greatest visual impact of Moderate will be on the sensitive receptors on neighboring properties and those immediately opposite the proposed solar farm, SR-1, SR-2, SR-3 and SR-4. The views for the sensitive receptors identified near to the proposed substation and junction of new and existing transmission lines will also be Moderately impacted as a consequence of the concentration of new infrastructure in this location. Similarly the views for identified sensitive receptors on the Oxley - Meadow Creek Road, SR-11, SR-12, SR-13, SR-14 and SR-15 will be Moderately impacted by the introduction of transmission towers into the landscape. While the transmission towers are well spread out over approximately 2 kilometres and are considered to only present a Noticeable magnitude of change the Moderate rating has been given for these receptors due to the potential frequency and duration of exposure to this view. However this rating is based on the assessment from the representative viewpoint and the impacts for the sensitive receptors which are all on private property may vary to a greater or lesser degree.

The visual impact for other receptors - workers, commuter or visitors using the adjacent roads, has been rated as either Minor or Minor to Moderate depending on the viewpoint location. This is primarily due to the proposed site being partially or completely obscured by existing vegetation which lines the road verges and the fragmentation of the PV arrays by the existing vegetation on site to be retained. The greater rating of Minor to Moderate has been given for these receptors at viewpoints where there are stretches of road with no existing vegetation along the verges.

Cumulative Impact Assessment

There is elevated interest in developing solar energy facilities in the north east of Victoria with the Winton solar farm now operational and a number of proposed solar farms in the region currently under consideration. The Winton solar facility is over twenty kilometres from the proposed Meadow Creek solar farm with the nearest under consideration facility being the Laceby proposal which is fifteen kilometres away.

Given the distance of the proposed Meadow Creek solar facility from current operational, in construction and under consideration facilities in the region the potential for cumulative impacts arising from this development are considered negligible. Furthermore the relative isolation of the location and distance from main transport routes such as the Hume Highway and the Great Alpine Road limit the potential of this development to contribute to cumulative impacts.

Glint and Glare Assessment

A glint and glare assessment was conducted using GlareGauge specialist software licensed by ForgeSolar. The assessment was conducted for the identified neighbouring sensitive visual receptors, selected visual receptors in an easterly and westerly orientation from the proposed PV array, and observation points along each of the adjacent roads representative of drivers using those roads.

The assessment results found that only drivers using the Docker - Carboor road south of the intersection with the Oxley - Meadow Creek Road will potentially be impacted by glare from the proposed solar farm for short periods in the early evenings from spring through summer. None of the sensitive receptors. (residences) or receptors on the other roads adjacent to the proposed solar farm were impacted by glare in the analysis.

Potential Mitigation

Reducing the visual impact from the solar farm can be achieved by implementing screening with selected native vegetation around the perimeter of the proposed facility. Existing vegetation provides effective screening in some locations so the mitigating screening may not be required for the entire perimeter however only in those locations where there are open views to the proposed site, for example along the open stretches of the Oxley - Meadow Creek Road and in proximity to the neighboring sensitive receptors.

The screening vegetation will also mitigate potential impacts from glint and glare along the Docker - Carboor Road. Given that the screening vegetation will take between 3 to 5 years to reach an effective height it is also recommended to implement a temporary screening structure along the exposed section of road frontage until the vegetation reaches an effective height.

The visual impact of the proposed substation can also be mitigated by screening with native vegetation around the perimeter.

Screen vegetation should be selected to compliment the existing surrounding and retained vegetation on site. The screen vegetation should also be arranged to reflect the scattered visual character of the existing vegetation in the study area.

Abbreviations

Abbreviation	Title
AILA	Australian Institute of Landscape Architects
BMO	Bushfire Management Overlay
m	Metres
Km	Kilometre
DEECA	Department of Energy, Environment,and Climate Action
LCT	Landscape Character Type
LPPF	Local Planning Policy Framework
LSIO	Land subject to inundation overlay
LVIA	Landscape and Visual Impact Assessment
FO	Floodway Overlay
FOV	Field Of View
FZ	Farming Zone
HO	Heritage Overlay
PCRZ	Public Conservation and Resource Zone
PUZ	Public Use Zone
PV	Photo Voltaic cells (solar panels)
REAP	Renewable Energy Action Plan
RDZ	Road Zone
SPPF	State Planning Policy Framework
SMO	Salinity Management Overlay
TZ	Township Zone
ZTV	Zone of Theoretical Visibility

1. Introduction

1.1 Purpose of the study

Horizon Studio Landscape Architecture, (Horizon Studio), has been engaged by Meadow Creek Solar Farm Pty Ltd to prepare a Landscape and Visual Impact Assessment, (LVIA), for the proposed Meadow Creek Solar Farm and associated transmission lines and infrastructure. The LVIA is required for the Planning Permit application, for the development of a solar energy facility. The proposed solar farm will be located at 1033 Oxley - Meadow Creek Road, Meadow Creek, will have a peak capacity of 332 Megawatts, (MW), and will cover an area of approximately 566 Hectares. The transmission infrastructure includes towers dispersed over approximately two kilometres and a substation to be located at the connection with the existing transmission lines running parallel with the Whorouly - Bobinawarrah road.

The purpose of this study is to assess the potential for impacts on existing landscape character and visual amenity within the study area associated with the development of the proposed solar farm. The findings of the assessment will inform recommendations for mitigation measures, if required, to remove or reduce identified potential impacts.

1.2 Study methodology

Landscape and Visual Impact Assessments require the comparison of existing landscape and visual values against the potential changed conditions of the proposed development. There are no absolute guidelines for carrying out an LVIA in Victoria however there are a number of references that are widely acknowledged as providing appropriate guidance for conducting LVIA's including:

- The Australian Institute of Landscape Architects, (AILA), (2018), Guidance Note for Landscape and Visual Assessment.
- The Landscape Institute (LI) and the Institute of Environmental Management and Assessment (IEMA), UK, (2002) Guidelines for Landscape and Visual Impact Assessment, Third Edition.

This report has also been prepared in accordance with the Solar Energy Facilities Design and Development Guidelines, Victorian Department of Environment, Land, Water and Planning, (October, 2022).

Landscape and Visual Impact Assessments include::

1. Landscape Impact Assessment - evaluation of the impacts associated with the proposed development on existing landscape character and values. This assessment is focused on the broader landscape context.
2. Visual Impact Assessment - comparing views from representative viewpoints with visualisations of the proposed development from the same viewpoints. This assessment is focused on the site specific and surrounding context.
3. Cumulative Impact Assessment - consideration of other developments within the same landscape or region that may also impact on landscape character and visual amenity. This assessment is focused on the broader regional context.
4. Glint and Glare Assessment - using specialist software to determine if the proposed materials and layout will create glint or glare that could be hazardous or a nuisance.

The process for conducting an LVIA include the following steps. This process has been used for the conducting the LVIA for the proposed Meadow Creek Solar Farm.

Step 1 - Understanding the proposal

- Review the proposed development including footprint, the physical dimensions of the proposed infrastructure, layout, access ways and existing on site features and vegetation to be retained.
- Review site context at the state, regional and local context.
- Review the planning framework relevant to the proposal.

Step 2 - Establishing the study area

- Mapping the Zone of Theoretical Visual Influence, (ZTV),
- Determining the Vertical Field Of View, (FOV),

Step 3 - Field study

- Visit the site and surrounds to understand the landscape setting and values, identify potential visual receptors, identify viewpoints and take photos to be used for the comparison of existing and potential views.

Step 4 - Establishing baseline for landscape character.

- Through desktop and field study, establish the Landscape Character Types, (LCT's) and existing landscape and visual quality as the baseline for assessing the potential landscape and visual impacts associated with the proposed solar farm development.

Step 5 - Establish the assessment criteria.

- Landscape sensitivity to change
- Visual, (View), sensitivity to change.
- Magnitude of change - dependent on the size and scale of the proposed change in context of the landscape setting.
- Landscape character impact rating
- Visual, (view), impact rating.

Step 6 - Visualisations

- Prepare visualisations / photmontages, that show the likely visual impact of the proposed solar farm development on the landscape within the study area.

Step 7 - Evaluation of potential impacts

- Landscape character impact assessment - using the established criteria to compare the baseline characteristic to the potential changes associated with the proposed development.
- Visual impact assessment - using the established criteria, compare existing views to the potential views as depicted in the photo-montages to assessment the possible impact
- Cumulative impact assessment - review existing and proposed developments within the region that may have potential to have similar impacts on the existing landscape character and view
- Glint and glare assessment - of the proposed solar farm development using ForgeSolar - GlareGauge software

Step 8 - Mitigation measures

- Make recommendation for reducing identified impacts if required.

2. The proposed development

The proposed development is for a solar farm with a peak capacity of 332 Megawatts, (MW), covering an approximate area of 566 Hectares, transmission lines and associated power poles spanning 2.2 kilometres north of the solar farm site to connect with existing the existing transmission lines running parallel with the Whorouly - Bobinawarrah Road. Proposed infrastructure includes arrays of photo voltaic, (PV), modules, clusters of battery storage units, a substation at the transmission line junction on Whorouly - Bobinawarrah Road, security fencing, sealed and unsealed roadways.

The specifications of the proposed solar panel units are:
- Height - 3.24 metres at maximum tilt, 60 degrees from horizontal.
- Pitch - 5.0 metres
- Tilt range - 60 degrees from horizontal in either direction

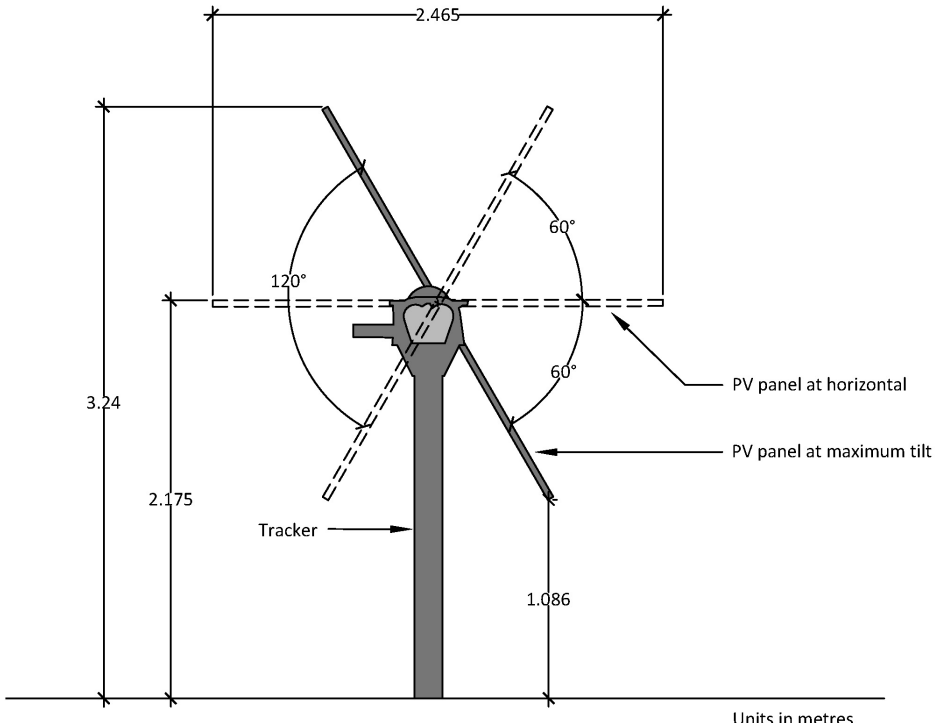


Figure 1. Proposed PV module dimensions

New transmission lines run from the north west corner of the solar farm over approximately 2.2 kilometres north west to a substation located on the Whorouly - Bobinawarrah Road to connect with the existing transmission lines. Transmission tower height varies from 23.8 metres to 52.49 metres.

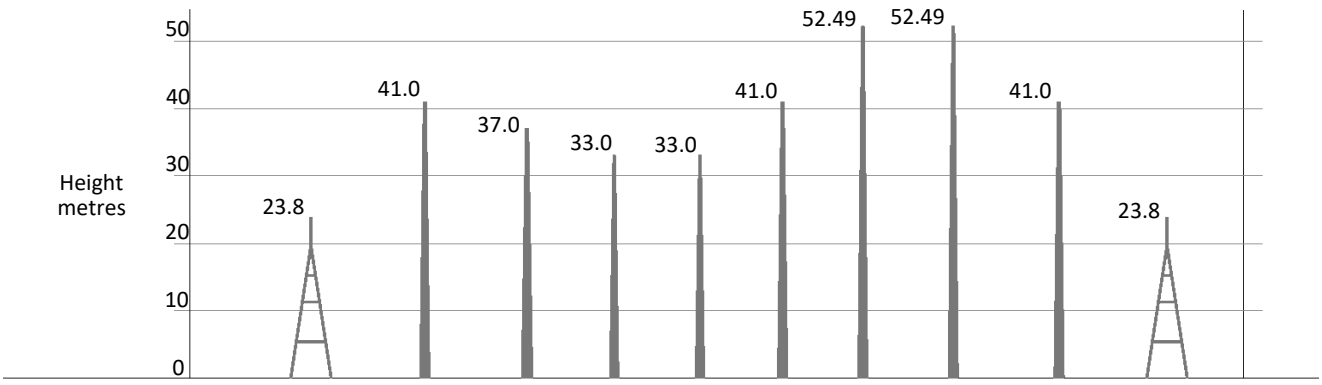


Figure 2. Proposed transmission tower heights

2.1 Site context

Meadow Creek is located in the Upper King Valley, north east Victoria, and is approximately 27 kilometers south east of Wangaratta, the closest regional centre.

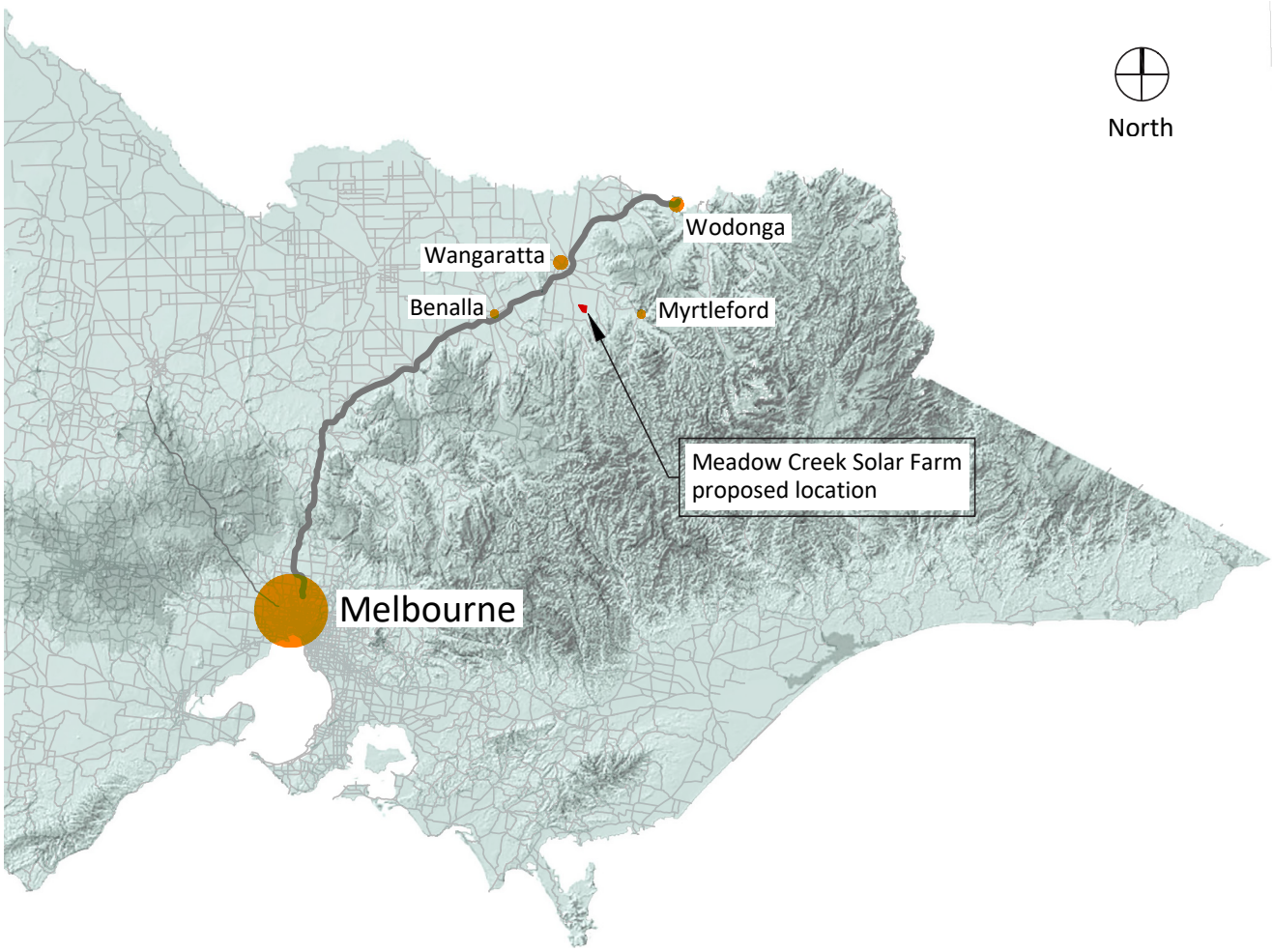


Figure 3. State context

Agriculture is the primary activity in the region with tourism also being a significant contributor to the regional economy. Nearby settlements include Moyhu, Oxley and Whitfield with clusters of dwellings scattered throughout the surrounding rural landscape. The King valley is also home to a number of renowned wineries and food producers and the natural environment supports a range of activities including bush walking, cycling, horse riding, paddling and other activities. Notable features in the Meadow Creek area include the King River and the Carboor State forest with Moyhu being the closest settlement.

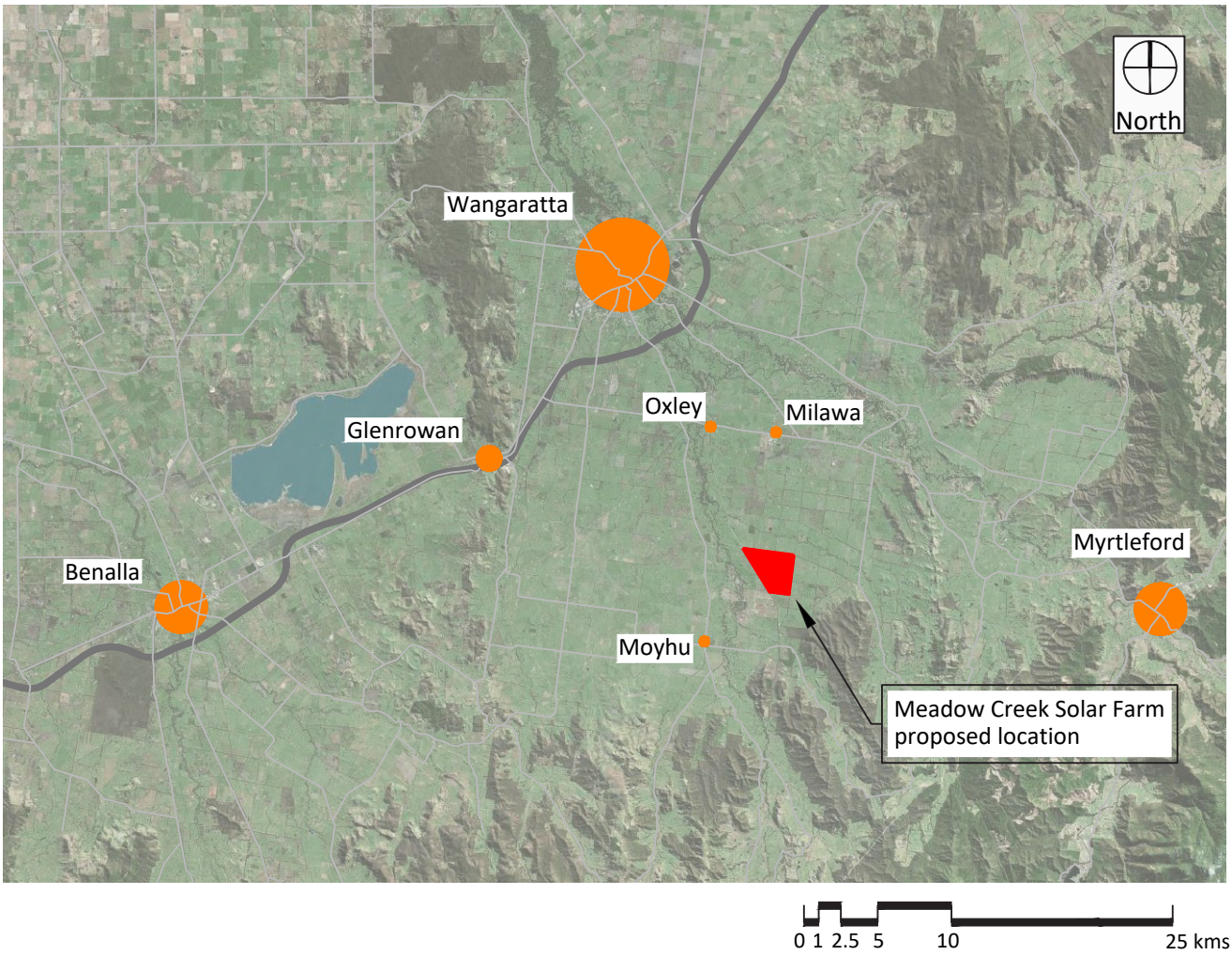


Figure 4. Regional context

The proposed site is bounded by the Docker - Carboor Road to the north, Allans Road to the east, Oxley - Meadow Creek Road to the west and private farming land to the south. Refer to Figure 5. Local context, on the following page.

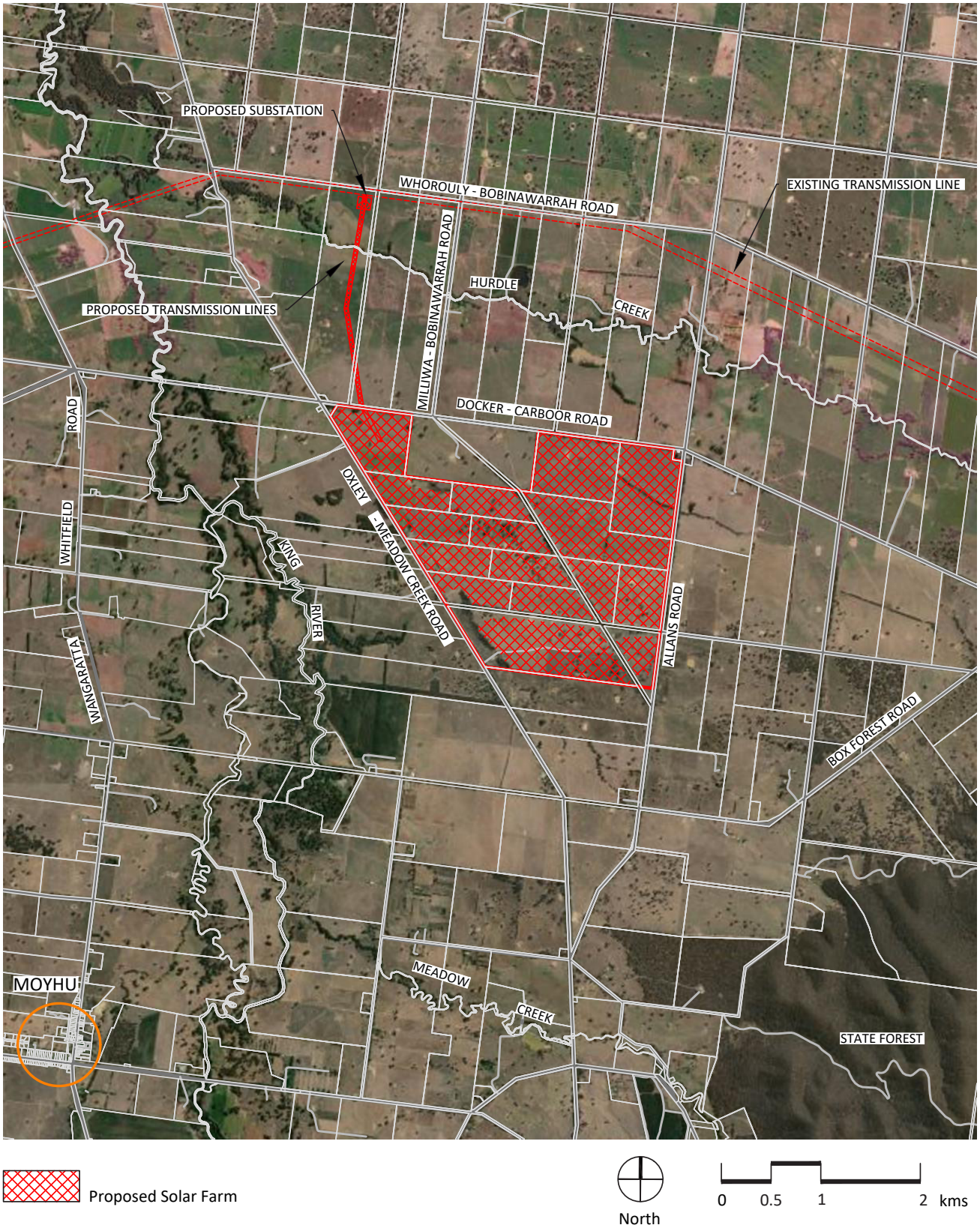


Figure 5. Local context

2.2 Planning context

The proposed development is in the Farming Zone, (FZ), as designated by the Wangaratta Planning Scheme. The purpose of the Farming Zone is to:

- To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To provide for the use of land for agriculture.
- To encourage the retention of productive agricultural land.
- To ensure that non-agricultural uses, including dwellings, do not adversely affect the use of land for agriculture.
- To encourage the retention of employment and population to support rural communities.
- To encourage use and development of land based on comprehensive and sustainable land management practices and infrastructure provision.
- To provide for the use and development of land for the specific purposes identified in a schedule to this zone.

3. Determining the study area

Determining the study area requires assessment of the potential distance or extent to which the solar farm infrastructure and the transmission lines may be visible and the scale and connectedness of the landscape that it is proposed to be located within. The Field of View, (FOV), and Zone of Theoretical Visibility, (ZTV), provide a means for determining the likely visibility of the proposed development and a basis for establishing the study area in which to conduct the site inspection and carry out the visual impact assessment.

3.1 Zone of Theoretical Visibility,

The Zone of Theoretical Visibility, (ZTV), is the area in which an object or objects can potentially be seen across terrain with no vertical objects such as vegetation, buildings or infrastructure present that may block or diminish the view of the subject object. The ZTV is used to understand the potential maximum extent to which the solar farm infrastructure including the transmission towers may be viewed from theoretically. Determining the ZTV provides the basis for defining the study area in which to conduct the site inspection and identify potential visual receptors.

ZTV mapping is achieved by using specialist computer software to create a digital terrain model, placing a model of the proposed development on that terrain and running a mapping process to determine the extent to which the development is visible. The height and location of the PV modules and associated infrastructure are essential inputs for ZTV mapping.

For this project a terrain model of the Bobinawarrah area was created in Autodesk Civil 3d using the 10m contour data information available through the Victorian Government Spatial Data portal. The data set was imported as an Autocad .dwg file with MGA 94, Zone 55 geographic projection. Key Terra Firma ZTV module was then used to calculate the Zone of Theoretical Visual Influence for the proposed solar farm, the transmission towers and substation.

The parameters used for the ZTV process include:

- Viewer height of 1.65 metres, (the average human eye level)
- PV module height of 3.24 metres, the maximum height when the modules are at maximum tilt of 60 degrees from horizontal.
- The heights of the transmission towers as provided in Figure 2, heights range between 23.8 to 52.49 metres.
- The layout of the PV arrays, location of the proposed transmission towers and associated infrastructure including the substation on the Whorouly - Bobinawarrah Road.

3.1.1 Meadow Creek Solar Farm ZTV

The ZTV for the Meadow Creek Solar Farm, Figure 6. Meadow Creek Solar Farm ZTV on the following page, indicates that theoretically, the infrastructure would be visible from up to twelve kilometres primarily to the north. This is due to the terrain being generally flat in this region and the height of the proposed transmission towers. However this is the 'theoretical visibility and does not take into account objects that may partially or completely obscure views such as vegetation or buildings. Regardless this ZTV provides the basis for conducting the landscape and Visual Impact Assessment.

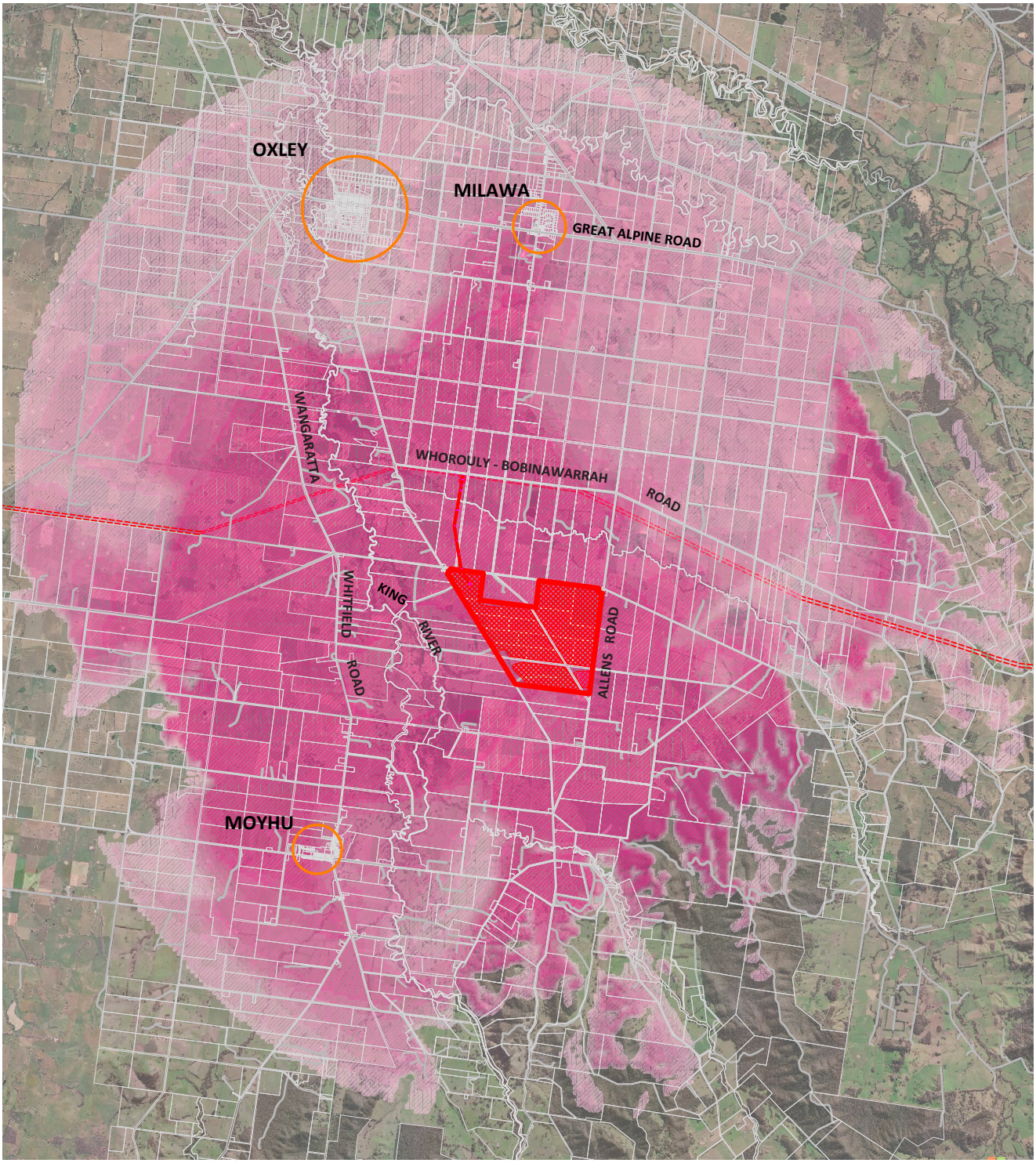


Figure 6. Meadow Creek Solar Farm ZTV

3.2 Field of View

The Field of View is the area in which an object or objects are discernible to the human eye. The Field of View provides a method to determine the degree of visibility of objects. Figure 7 below shows the typical Vertical Field of View of a person with normal eyesight, (Panero & Zelnik). The typical human view cone when standing is 10 degrees starting from zero degrees at eye level. Objects are typically visible if they occupy more than 5% or 0.5 degrees of the cone of vision. if objects occupy less than 5% of the cone of vision they are typically indiscernible and the visual impact is considered negligible.

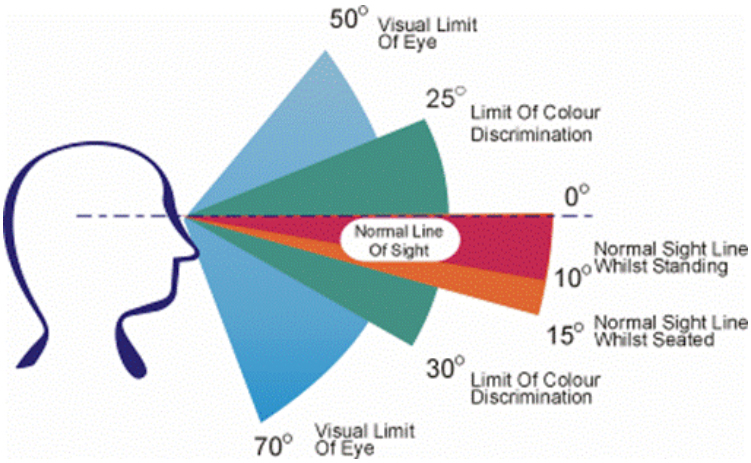


Figure 7. Vertical Field of View, Panero & Zelnik

The proposed PV modules for the Meadow creek Solar Farm will have a maximum height of 3.24 metres at maximum tilt of 60 degrees from horizontal. In theory, on a flat plain with no intervening vertical objects, the PV modules would commence occupying less than 5% of the Vertical Field of View at a distance of 280.71 metres.

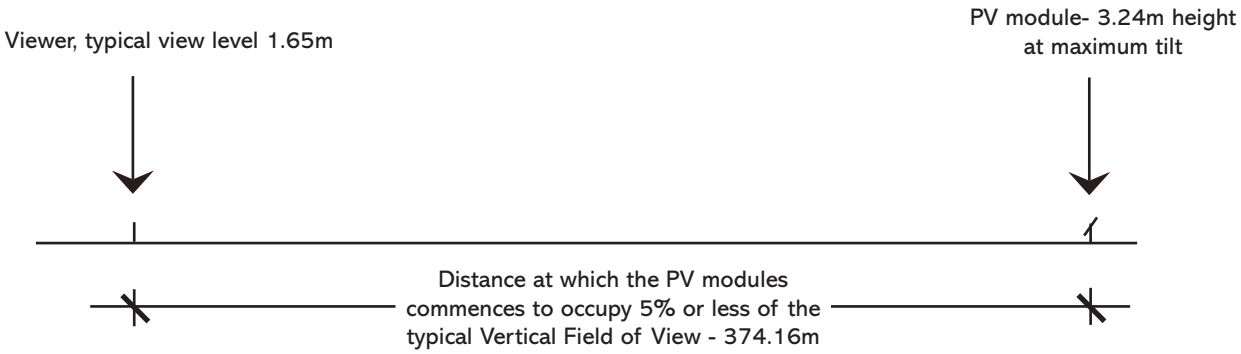


Figure 8. PV Field of View

The distance at which the transmission towers occupy up to 5% of the viewers Field of View depends on the overall tower height. The following diagram shows the distances at which the transmission towers commence occupying less than 5% of the Vertical Field of View and then considered negligible in terms of visibility.

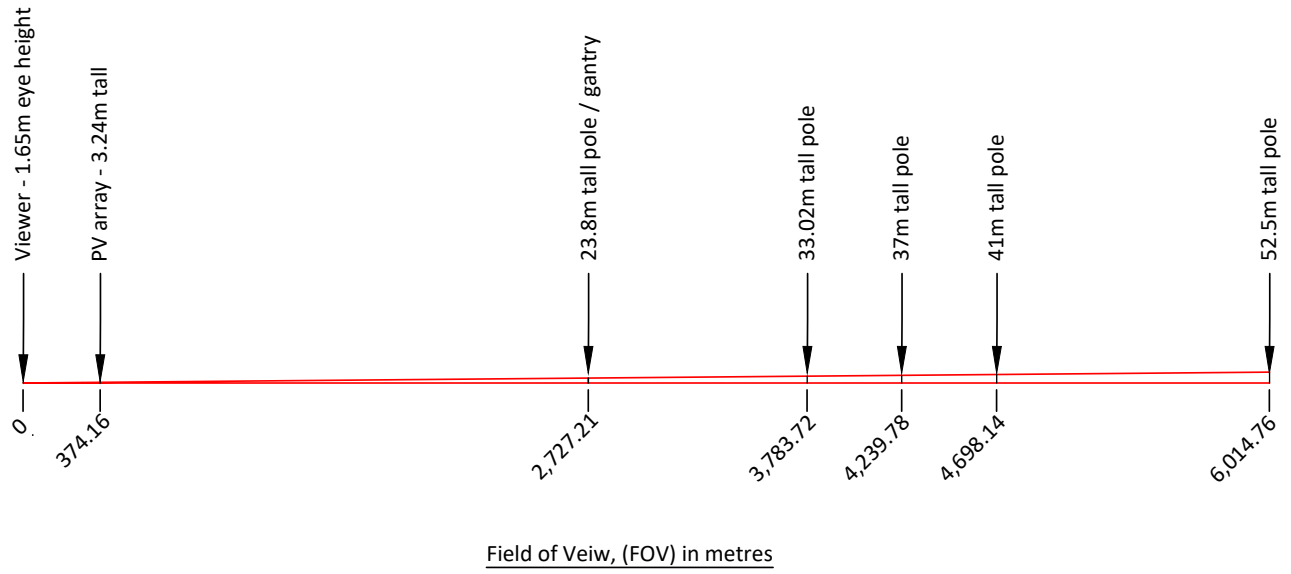


Figure 9. Transmission tower Field of View

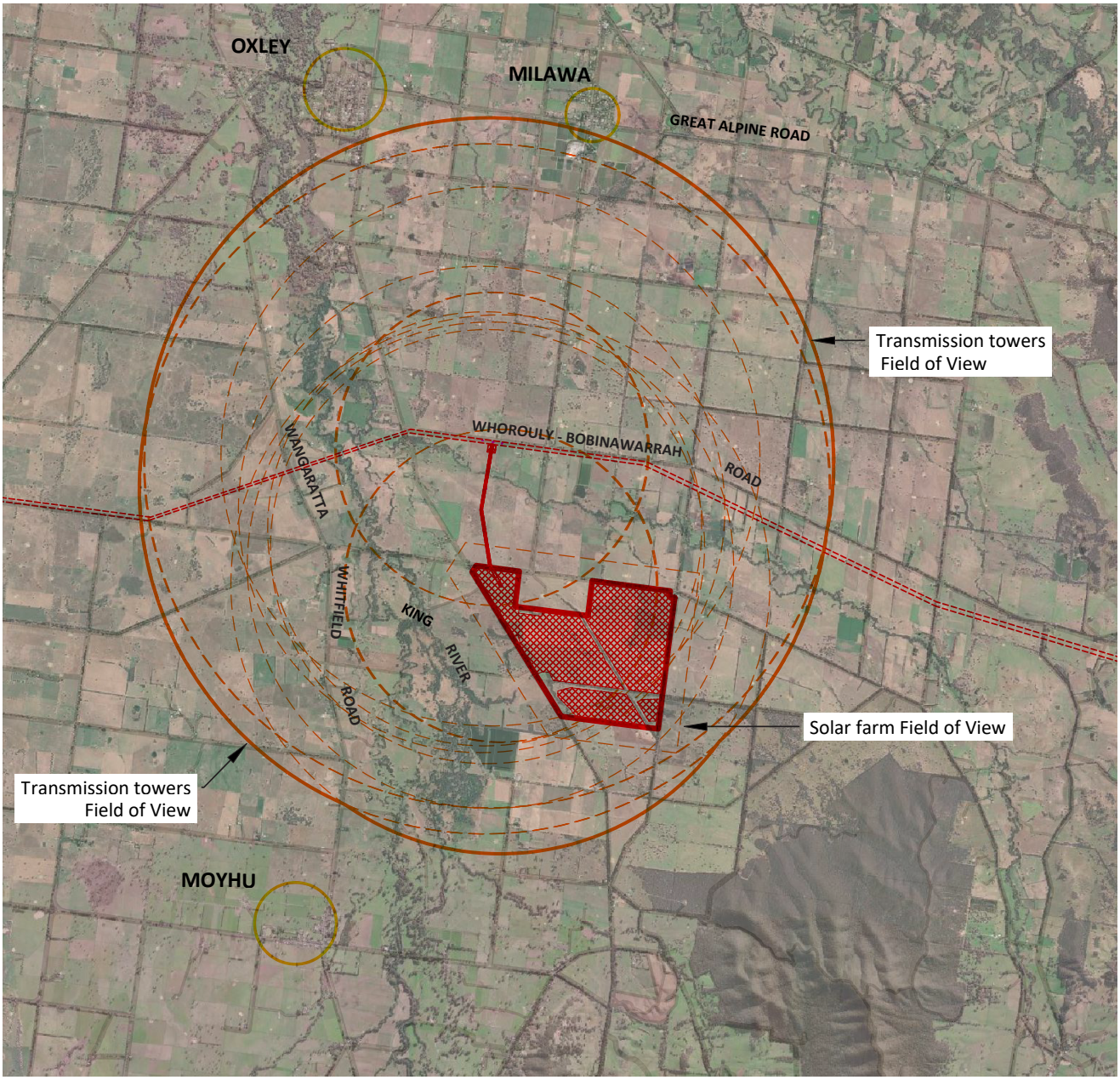
The plan on the following page shows the location of the extent of the Vertical Field of View of the solar farm and the transmission towers. Like the ZTV model the Field of View is theoretical and does not consider real world situations where objects such as vegetation or buildings may partially or completely block views.

3.3 Determination of the study area

The Zone of Theoretical Visibility, ZTV indicates the maximum possible extent to which the solar farm and associated infrastructure may be visible should there be no vertical objects in that area to block views. The Field of View, FOV, indicates the distance at which the PV arrays and transmission towers occupy more than 5% of the view, again subject to there being no other objects impacting the inter-visibility between the viewer and the solar farm infrastructure.

The extent of the ZTV and the FOV provide the basis for the study area including evaluation of the potential impacts on the existing landscape character and visual impact resulting from changes associated with the proposed solar farm development.

Given the theoretical distance at which the transmission towers may be visible the area of the field study extended approximately 6.5 kilometres to the north and approximately a 5 kilometre radius from the proposed site in all other directions. Due to the flat topography of the area and the prolific presence of trees across the landscape it was found that the site and immediate surrounds was not visible at these distances. Consequently the study area was narrowed to a 2.5 kilometre offset from the proposed site which was assessed in greater detail for identifying visual receptors and representative viewpoints.



Legend

- Site property boundary
- Solar farm infrastructure
- Vertical Field of view
- Property boundary
- Roadway sealed / unsealed

North

0 1 2.5 5 kms

Note:
The Vertical Field of View assumes all objects are on a flat surface and there are no other objects on the surface such as trees or buildings.

Figure 10. Solar farm and transmission tower Field of View

4. Establishing the Baseline - existing landscape character

4.1 Landscape character

Landscape is defined as the combination of physical features and cultural influences within a given area which combine to form a perceptible patterning. Physical features include terrain, vegetation, waterways or other natural features, and the scale and spread of man made elements such as roads or buildings. Cultural influences include past, present and emerging land use. Understanding the existing landscape character provides the baseline for assessing the potential impacts from the proposed development.

4.2 Regional landscape context

Meadow Creek, the proposed location for the solar farm, is located in north east Victoria, approximately 27 kilometres south east of Wangaratta, the closest regional centre. Meadow Creek and surrounds is generally considered to be in the King Valley which is a rural area. Grazing and pasture fields are the dominant landscape feature with native trees lining the majority of roads and the foothills that rise to the south and east in the King Valley.

4.3 Local landscape context

Meadow Creek is a farming district with cattle grazing being the primary activity. The landscape is comprised primarily of undulating open paddocks with scattered trees throughout being either shade for livestock, windbreak or associated with waterways. The majority of roads are gravel, generally linear, in an east - west or north - south orientation with some roads winding around natural features or negotiating hilly terrain. There are large native trees along most public road verges and extensively along the waterways that run through the area including the King River, Hurdle Creek and Meadow Creek. Moyhu is the closest settlement to the proposed solar farm, being 5 kilometres to the south west. Facilities in Moyhu include a small public park with amenity, bowls club, a brewery, cafe, a hotel and a number of dwellings.

4.4 Terrain

The terrain within the study area ranges from generally flat in the north and west, slightly undulating in the centre and to the south; and foothills to the east and south east. The terrain in and to the to the north and west of the proposed solar farm site has elevations ranging between 160 - 170m above sea level, with the 10 metre change spread over approximately 5 kilometres. This equates to a general grade of 2% across the north half of the study area.. The terrain to the south and east of the site begins to rise gently to the base of the nearby foothills which then rise to 550m above seal level. The foothills continue to rise to the south and east eventually transforming into the larger tree covered mountains of the Victorian alpine Region.

Distant views of the higher peaks and ridges along the Great Dividing Range to the east of the study area are available from higher and unobstructed locations. Viewing distance in the study area varies depending on the terrain and the prevalence of native vegetation.

4.5 Natural features

Natural features that contribute to the landscape character within the study area include waterways ; the King River, Hurdle Creek and Meadow Creek; the foothills in the nearby state forest to the south east and the native trees within the road corridors and scattered stands through the landscape.

4.6 Man-made features

Being a farming district, buildings are spread sparsely across the landscape and include dwellings and sheds. The Bobinawarrah Memorial hall is located at the intersection of Allans Road and the Docker - Carboor Road and neighbors the proposed solar farm site on the south boundary.

A high voltage power line runs parallel to the Whorouly - Bobinawarrah Road, then traveling east across the farming land from the intersection at with the Whitfield - Wangaratta Road. The power lines and towers can be seen from elevated areas or locations with sparse vegetation. Otherwise they generally obscured occupying less that 5% of the field of view and are consequently not visually significant.

4.7 Landscape character types

Landscape character type, (LCT), is determined by the dominant visual quality and visual value for a given area taking into account the features and attributes outlined above including:

- Physical attributes - terrain, vegetation cover, the quality of vegetation, the presence and quality of waterways or water bodies.
- Aesthetic and perceptual qualities - scale, complexity, openness, naturalness.
- Land use - existing and emerging
- Notable features - man made or natural.

Four LCT's have been identified within the study area including:.

1. Agricultural Plains - the dominant landscape character type within the study area.
2. Foothills - typically forested on both private and public land.
3. River Valley- significant waterways.
4. Townships - Moyhu.

The location and extent of these four LCT's is shown in Figure 11 on the following page. The key characteristics and dominant features of these LCT's provide the baseline for evaluating the potential impacts associated with the proposed solar farm and transmission line development on landscape character and visual amenity.

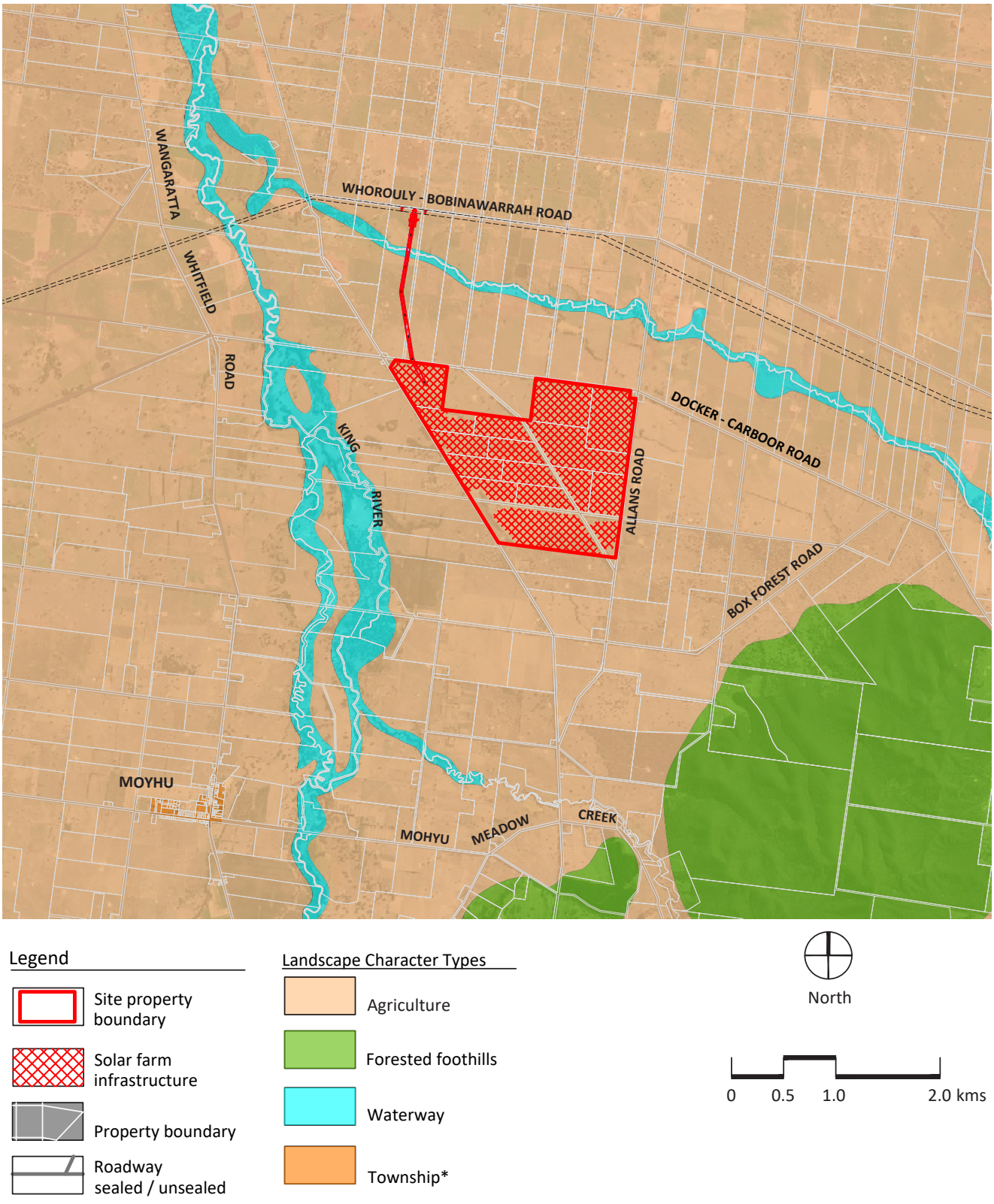


Figure 11. Landscape character types

4.7.1 LCT1 - Agricultural Plains

Key Characteristics

- Typically wide open views across a generally flat landscape with open sky - Figure 5
- Rural roads, typically gravel, with scattered native trees along both verges. - Figure 6
- Dispersed buildings including dwellings and farm sheds set back from roadways. - Figure 7
- Existing transmission lines. - Figure 8
- The landscape is dominated by the open sky with the scattered trees occasionally fragmenting the view across the open fields.
- Existing transmission lines run generally east - west across the landscape however these are only apparent on the roads with which they run parallel with and the properties on which the towers are located.
- This is a modified landscape used extensively for agriculture with pockets of native vegetation on farm land and along corridors of natural features.

Figure 12. Typical view - LCT1 - Agricultural Plains

Figure 13. Typical view - LCT1 - Agricultural Plains

Figure 14. Typical view - LCT1 - Agricultural Plains

Figure 15. Typical view - LCT1 - Agricultural Plains

Dominant features

- Open sky
- Scattered native trees
- Rural Roads

4.7.2 LCT2 - Foothills

Key Characteristics

- Typically forested areas on either private or public property.
- Located south and east of the proposed solar farm site.
- Views typically framed by nearby tree canopy
- Typically open ground plain with scattered under-story vegetation or features impeding views beyond the immediate location.

Figure 16. Typical view - LCT2 - Foothills

Figure 17. Typical view - LCT2 - Foothills

Figure 18. Typical view - LCT2 - Foothills

Figure 19. Typical view - LCT2 - Foothills

Dominant features

- Panoramic open views
- Scattered native trees

4.7.3 LCT3 - River valley

Key Characteristics

- Waterway lined with native vegetation along the banks
- Typically viewed as continuous stand of trees from other LCT's
- Closed views within due to density of vegetation.
- Public access to waterways including King River limited to vehicle bridges only.
- King river located due west of the proposed solar farm site, no direct public access.

Figure 20. Typical view - LCT3 - River valley

Figure 21. Typical view - LCT3 - River valley

Figure 22. Typical view - LCT3 - River valley

Figure 23. Typical view - LCT3 - River valley

Dominant features

- Continuous band of trees along waterways.
- Scattered trees in surrounding paddocks and along roads.
- Open paddocks
- Rural fencing
- Rural Roads

4.7.4 LCT4 - Township

Key Characteristics

- Dominated by buildings, roadways and built infrastructure.
- Restricted views to surrounding landscape.
- Limited views of distant foothills and alpine region.

Figure 24. Typical view - LCT4 - Township

Figure 25. Typical view - LCT4 - Township

Figure 26. Typical view - LCT4 - Township

Figure 27. Typical view - LCT4 - Township

Dominant features

- Sealed roads
- Overhead power lines.
- Buildings
- Mix tree plantings - native and exotic
- Open sky

5. Landscape Visual Impact Assessment Criteria

Assessment of the potential impacts on landscape character and visual amenity is carried out in two ways,

1) Landscape Character Impact Assessment - considers the potential change in the combination and balance of characteristics that define each of the identified Landscape Character Types, (LCT's). The Landscape impact Assessment considers the broader landscape context as well as the immediate location of the proposed development. The LCT's provide the baseline from which the potential impacts are assessed.

2) Visual Impact Assessment - compares existing views to proposed views at specific representative viewpoints selected for reasons of sensitivity and exposure to the proposed development.

Sensitivity and magnitude of change are the key parameters assessed for both the Landscape Impact Assessment and the Visual Impact Assessment. Impacts can be considered to be either adverse, beneficial or neutral.

5.1 Sensitivity and magnitude of change

5.1.1 Landscape character sensitivity

The sensitivity of a landscape character is dependent on it's inherent value and its capacity to absorb changes in the combination of features or cultural influences without adverse impact or change to its character. The value of a landscape is dependent on over all condition, cultural significance and land use designation. The following definitions and criteria have been used for establishing the sensitivity value for the Landscape Character Types, (LCT's).

Landscape Sensitivity	Description
High	Recognized Nationally or at the state level as having significant natural or cultural values. Typically a cohesive character with little variation in activity or land use. Potentially having noteworthy features such as a waterway, mountain range or shoreline.
Medium	Having a generally cohesive character with an acceptable level of variation in activity or land use that does not detract from the dominant positive character.
Low	Noticeable variation in activity or land use with potential for a degree of degradation yet having a generally positive mixed character
None	Significant variation in activity or land use or having obvious degradation. A highly modified landscape with no positive character.

Table 1. Landscape character sensitivity

5.1.2 Visual sensitivity

Visual sensitivity is concerned with viewers and viewpoints and is dependent on the importance of the view to the viewer or visual receptor, such as locals, visitors or passers by, the volume or frequency or duration of exposure to the changed elements. The following criteria have been used for categorising the visual sensitivity of the viewpoints selected for this assessment.

Viewpoint sensitivity	Description
High	High frequency or duration or number of viewers, local viewers, established viewpoint, e.g., lookout or signed viewpoint. Location with high visitor numbers, e.g., National Park, tourist township, park or tourist landscape.
Medium	Moderate frequency or duration or number of viewers, local or regional viewers. Location with a moderate level of visitation, e.g., regionally significant destination, township, park or tourist landscape.
Low	Low frequency or duration or number of viewers. Location with low or no tourist attraction. Viewers not concerned about landscape value.
Negligible	Infrequent to very few viewers who are not interested in the immediate landscape, e.g., passers by or local workers.

Table 2. Viewpoint sensitivity

5.1.3 Magnitude of change

The magnitude of change is dependent on the size and scale of the potential change, the geographical extent and the duration and the potential reversibility of the change. For this assessment the following definitions and criteria have been used for measuring the potential magnitude of change associated with the proposed development for both the Landscape Impact Assessment and the Visual Impact Assessment. The criteria is a guide only and is not definitive as the magnitude must be considered in context of the specific development proposal and the specific location only.

Magnitude	Description
Predominant	An obvious and constant change in the landscape character affecting the entire area
Significant	An obvious change in the landscape character affecting a significant portion of the area.
Noticeable	A noticeable change in the landscape character for a portion of the area only, not impacting on the wider area
Low	Only slight change in the landscape character, only noticeable from specific locations, no impact on the overall character or the character in specific locations.

Table 3. Magnitude of change

5.1.4 Impact rating

Impacts are rated as being major, moderate, minor and negligible and are applied according to the following matrices for the Landscape Impact Assessment and the Visual Impact Assessment.

		Magnitude of change			
Landscape sensitivity		Predominant	Significant	Noticeable	Insignificant
	High	Major	Moderate to major	Moderate	Minor to moderate
	Medium	Moderate to major	Moderate	Minor to Moderate	Minor
	Low	Moderate	Minor to Moderate	Minor	Negligible to Minor
	None	Minor to moderate	Minor	Negligible to Minor	Negligible

Table 4. Landscape character impact Assessment Rating

		Magnitude of change			
Visual receptor sensitivity		Predominant	Significant	Noticeable	Insignificant
	High	Major	Moderate to major	Moderate	Minor to moderate
	Medium	Moderate to major	Moderate	Minor to Moderate	Minor
	Low	Moderate	Minor to Moderate	Minor	Negligible to Minor
	Negligible	Minor to moderate	Minor	Negligible to Minor	Negligible

Table 5. Visual Impact Assessment Rating

5.1.5 Impact significance

The combination of the sensitivity and magnitude scale provide a means for rating the potential impacts as described in Tables 4 and 5. Impacts may be either adverse, creating a negative or diminished outcome, beneficial, creating an improved outcome, or neutral, no change from the current condition.

There is no definitive established guidance for conducting landscape and visual impact assessments or determining if an impact is adverse, beneficial or neutral. The tables above and this methodology have been developed in accordance with the Guidelines for Landscape and Visual Impact Assessment, Landscape Institute and Institute of Environmental Management and Assessment, Third Edition, which is widely regarded as the best guidance for these assessments.

Professional judgment and expertise are used to determine the landscape value and significance of views and viewpoints for the specific location and specific project that will create unique impacts.

6. Landscape Character Impact Assessment

An assessment of the potential impacts associated with the proposed solar farm and transmission lines has been carried out for each of the Landscape Character Types identified within the study area. The assessment considers the potential impacts associated with the proposed solar farm and transmission infrastructure on the base line characteristics for each of the LCT's.

6.1 Landscape impacts. LCT1 - Agricultural Plains

Landscape sensitivity **- Medium**
This is a modified landscape with grazing and pasture fields being the dominant characteristic. Native trees are also a noticeable feature as they are typically located along all road verges with some breaks as well as corridors, wind breaks and scattered trees breaking up the open characteristic of the fields. Existing transmission lines run east - west however the contribution from these to landscape character is limited primarily to the immediate locality.
Magnitude of Change - **Noticeable**
The relatively low height of the PV arrays and associated infrastructure means that they will only be visible from close proximity at locations where there is little or no screening vegetation. The proposal includes transmission towers in eight locations spread over approximately 2.4 kilometres. Similar to the PV arrays the transmission lines will impact the immediate surrounds only due to the spread of the towers. However the proposed substation and replacement towers on the Whorouly - Bobinawarrah road will present a significant magnitude of change to the immediate surrounding landscape.
Landscape impact - **Minor**

6.2 Landscape impacts. LCT2 - Foothills

Landscape sensitivity **- Low**
The forested foothills to the south and east of the proposed solar farm site are locally significant in that they stand out as a background feature in the landscape. The foothills are not always visually apparent as views to them are often blocked by the scattered vegetation that is a dominant characteristic of the landscape across the study area.
Magnitude of Change - **Insignificant**
The foothills are a minimum of two kilometres from the proposed solar farm site extending further to the northwest and south east. long distance views are limited by the scattered trees across the valley below and the dense native forest of the foothills. The proposed solar farm and transmission infrastructure will not be visible from the foothills. There is potential that some infrastructure such as the transmission towers may intervene views of the foothills from the agricultural plains.
Landscape impact - **Negligible to Minor**

6.3 Landscape impacts. LCT3 - River Valley

Landscape sensitivity **- High**
The King River waterway has a high local landscape value and medium to high landscape value at the state level. The river corridor is primarily surrounded by private property within the study area with limited public access points.
Magnitude of Change - **Insignificant**
The King River waterway is set back from the proposed solar farm site approximately one kilometre or more. The waterway is lined with continuous vegetation which limits views to within the river corridor. The river valley is not distinct as a feature in the wider landscape being indiscernible from the scattered vegetation across the wider landscape of the study area.
Landscape impact - **Minor to Moderate**

6.4 Landscape impacts. LCT4 - Township

Landscape sensitivity **- Low**
The township of Moyhu is located on the Milawa - Whitfield Road and is identifiable by the shops and dwellings that front the road.
Magnitude of Change **- Insignificant**
While this landscape character type has been identified in the study area there will be no direct impact from the proposed solar farm development given the distance of the township from the proposed site.
Landscape impact - **Negligible to Minor**

7. Visual Impact Assessment

Visual Impact Assessment, (VIA), is conducted by comparing existing views with the changed views resulting from the proposed development. The viewpoints used to carry out the assessment are determined with consideration of visual receptor sensitivity. The changed views associated with the proposed development are created using a 3D model of the proposed development, placing that model in the virtual landscape and then developing a photo-montage for each of the selected viewpoints. The level of impact is then assessed by comparing the existing and proposed views and rating the impact in accordance with the criteria in Table 5. Visual Impact Assessment Rating.

7.1 Visual receptors

Visual receptor refers to people, either individual or groups, who have views of the proposed development site when going about their activity. The level of sensitivity varies according to the context and purpose of the visual receptor, for example a local resident with direct views of the proposed development site will have high sensitivity where as a worker or passer by will have a moderate to low sensitivity for the same view.

A number of factors need to be considered when determining the sensitivity of a receptor including 1) the type of the receptor, 2) the number of receptors, (at a specific location), 3) the frequency of exposure to the view and 4) the duration or length of time of exposure to the view.

1) Type of receptor

Receptor type depends on the activity that an individual or group of people are carrying out and include resident, worker, visitor and commuter. It is generally accepted that changes in view and visual amenity will have a higher magnitude of impact for residents with a lower magnitude for other receptor types.

2) Number of receptors

The magnitude of sensitivity is considered to be greater for locations where people gather such as a residence or place of work.

3) Frequency

The frequency at which the receptor is exposed to the view influences the magnitude of sensitivity. Nearby residents some workers will likely have a high frequency of exposure to the view, while visitors and commuters will only have a moderate to low frequency of exposure.

4) Duration

Residents are likely to be exposed to the view for longer periods relative to workers, visitors and commuters.

7.2 Sensitive Visual Receptors:

Following a desktop review of aerial imagery and site inspections a number of neighbouring and nearby residents have been identified as potential sensitive visual receptors as they have potential views of the solar farm and / or the transmission lines. The level of impact for these receptors varies depending on their elevation relative to the solar farm infrastructure and the presence of vegetation or buildings that may completely or partially block views. These sensitive receptors are listed in the following table and shown on "Figure 28. Sensitive receptors and viewpoints" on page 34

No.	Location / description
1	883 Oxley - Meadow Creek Rd Residence / Old Primary School
2	875 Oxley - Meadow Creek Rd Residence
3	616 Docker - Carboor Rd. Bobinawarrah Recreation Reserve / Memorial Hall
4	626 Docker - Carboor Rd. - Residence
5	686 Docker - Carboor Rd - Residence
6	1092 Oxley - Meadow Creek Road - Residence
7	926 Oxley - Meadow Creek Rd. - Residence
8	192 Docker - Carboor Road Residence
9	194 Docker - Carboor Rd - Residence
10	193 Docker - Carboor Rd. - Residence
11	740 Oxley - Meadow Creek Rd - Residence
12	717 Oxley - Meadow Creek Rd Residence
13	702 Oxley - Meadow Creek Rd - Residence
14	702 Oxley - Meadow Creek Rd - Residence, (on the same property as above)
15	638 Oxley - Meadow Creek Road - Residence
16	216 Whorouly - Bobinawarrah Rd. - Residence / Gin distillery
17	794 Whorouly - Bobinawarrah Rd. - Residence
18	787 Whorouly - Bobinawarrah Rd - Residence

Table 6. Sensitive receptors

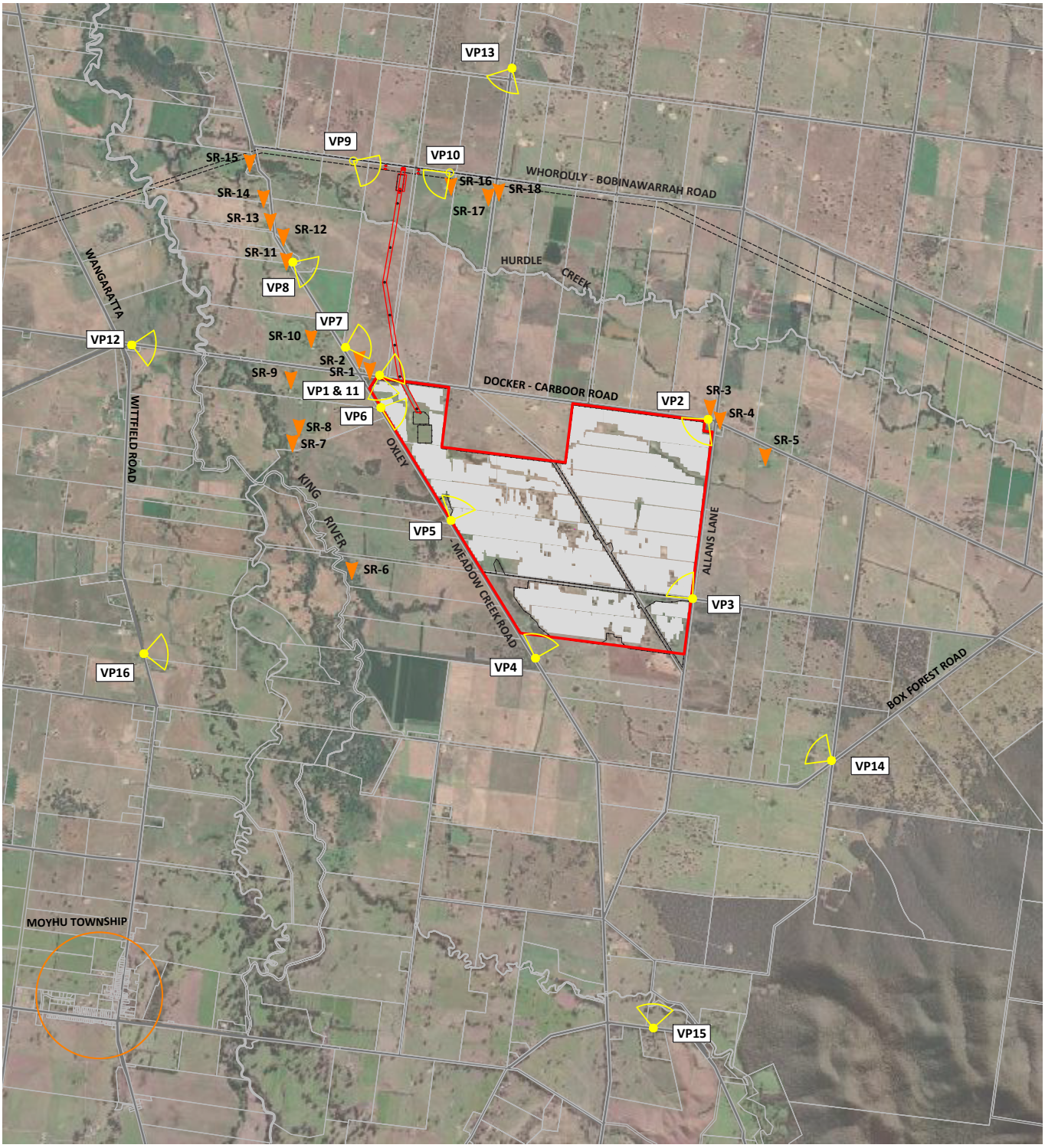
7.3 Viewpoints

The viewpoints used for conducting the visual impact assessment have been determined with consideration of the sensitivity of visual receptors including the sensitive visual receptors as listed above as well as other visual receptors including workers and visitors that may use the roads adjacent or near to the proposed solar farm infrastructure.

Where there are a number of sensitive receptors in close proximity such as the northern extent of the Oxley - Meadow Creek Road a viewpoint has been selected to represent for that group.

In addition to the viewpoints selected to represent the visual receptors a number of additional viewpoints that are at a greater distance from the proposed solar farm site have also been included to show the visual character of the surroundings and to demonstrate the screening provided by the scattered vegetation throughout the region and the limitation of long distance views.

The location of the viewpoints is provided on Figure 28. Sensitive receptors and viewpoints. The photo montage comparisons for each viewpoint are attached as appendix 1.



Legend

- Solar farm infrastructure extents
- SR-6 — Sensitive Receptors
- VP4 — Viewpoints
- Parcel boundaries
- Accessible roads - sealed / unsealed

North

0 .5 1 2 km

scale - 1:40,000 @ A3

Figure 28. Sensitive receptors and viewpoints

7.4 Visual Impact Assessment summary

The visual impact from the proposed solar farm is primarily limited to the immediate surrounds including the roadways adjacent to the site and neighbouring properties. The visual impact from the transmission towers is generally limited to the local Oxley - Meadow Creek Road and the Whorouly - Bobinawarrah Road areas.

The following table provides a summary of the assessment for each viewpoint including the Magnitude of change rating, impact rating for visual receptors and recommended mitigation measures.

Table 7. Visual Impact Assessment Summary

Viewpoint	Magnitude of change	Visual Receptors	Sensitivity	Impact	Mitigation
1	Noticeable	SR-1, Sr-2 & SR10	High	Moderate	Screen planting with low to medium height shrubs and trees to 6 - 8 metres tall.
		Workers / commuters	Medium	Minor to Moderate	
		Visitors	Medium	Minor	
2	Noticeable	SR-3, Sr-4 & SR-5	High	Moderate	Screen planting with low to medium height shrubs to block views of the solar farm while maintaining views of the open sky.
		Workers / commuters	Medium	Minor to Moderate	
		Visitors	Medium	Minor	
3	Noticeable	Workers / commuters	Medium	Minor to Moderate	Screen planting with low to medium height shrubs and trees to 6 - 8 metres tall.
		Visitors	Medium	Minor	
4	Noticeable	Workers / commuters	Medium	Minor to Moderate	Screen planting with medium to tall shrubs and trees along the southern extent of the proposed solar farm.
		Visitors	Medium	Minor	
5	Noticeable	SR-6, SR-7 & SR-8	High	Moderate	Screen planting with medium shrubs interspersed with stands of tall trees to compliment the character of the existing scattered vegetation along the road verge and throughout the local landscape.
		Workers / commuters	Medium	Minor to Moderate	
		Visitors	Medium	Minor	
6	Noticeable	SR-1, SR-7, SR-8 & SR-9	High	Moderate	Screen planting with medium shrubs interspersed with stands of tall trees to compliment the character of the existing scattered vegetation along the road verge and throughout the local landscape.
		Workers / commuters	Medium	Minor to Moderate	
		Visitors	Medium	Minor	
7	Noticeable	SR-1, SR-2 & SR-10	High	Moderate	Ensure the transmission towers and infrastructure are constructed using non reflective materials.
		Workers / commuters	Medium	Minor to Moderate	
		Visitors	Medium	Minor	
8	Noticeable	SR-11, SR-12, SR13, SR14 & SR-15	High	Moderate	Ensure the transmission towers and infrastructure are constructed using non reflective materials.
		Workers / commuters	Medium	Minor to Moderate	
		Visitors	Medium	Minor	
9	Noticeable	Workers / commuters	Medium	Minor to Moderate	Screen planting with medium to tall shrubs and trees around the substation. Ensure the transmission towers and infrastructure are constructed using non reflective materials.
		Visitors	Medium	Minor	
10	Noticeable	SR-16, SR-17 & SR-18	High	Moderate	Screen planting with medium to tall shrubs and trees around the substation. Ensure the transmission towers and infrastructure are constructed using non reflective materials..
		Workers / commuters	Medium	Minor to Moderate	
		Visitors	Medium	Minor	
11	Noticeable	SR-1 & SR-2	High	Moderate	Ensure the transmission towers and infrastructure are constructed using non reflective materials..
		Workers / commuters	Medium	Minor to Moderate	
		Visitors	Medium	Minor	

8. Glint and Glare assessment

8.1 Glint and Glare

Glare broadly refers to reflected bright light and also includes reference to glint. Glint is defined as a short temporary flash of bright light such as when sunlight is momentarily reflected off a moving vehicle and is cast into a receptors vision, (e.g., passer by). Glare is bright light that is sustained in its duration. In summary both glint and glare refer to instances of bright light with the difference being the duration of the luminance.

8.2 Reflectivity of solar panels

Solar panels are designed to absorb sunlight and typically only reflect a portion of the light that falls on them. The amount of reflected light is dependent on the angle of incidence of the light rays relative to the solar panel, or the receiving surface. (Refer to Figure 29 below). The amount of light reflected by a surface increases as the angle of incidence, R, becomes greater. The position of a solar panel relative to the sun is a key factor for reflectivity, the panel will reflect less light the more it is facing the source, (sun) and conversely it has potential to reflect more light the greater its angle away from the source.

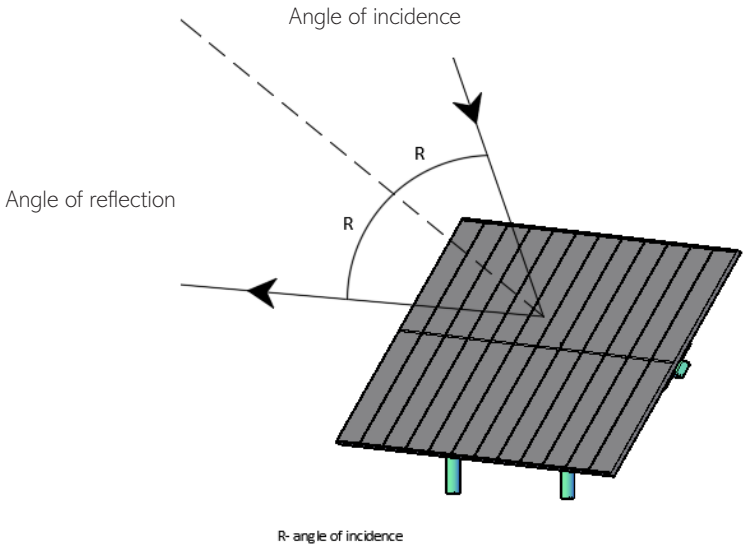


Figure 29. Angle of incidence

8.3 Glare hazard rating

The ocular, (or visual), impact from glare results from the intensity of the light source on the retina, (retinal irradiance), and the area of the viewers field of vision that the glare occupies, (subtended source angle). The severity of ocular impact is rated into three categories.

Hazard rating	Description
Green	Low potential to cause after-image (flash blindness
Yellow	Potential to cause temporary after-image
Red	Potential to cause retinal burn (permanent eye damage)

Table 8. Glare Hazard Rating

Red hazard rating, Retinal burn is typically not possible from PV glare as PV modules do not focus reflected light. The hazard rating categories assume a typical blink response of the observer.

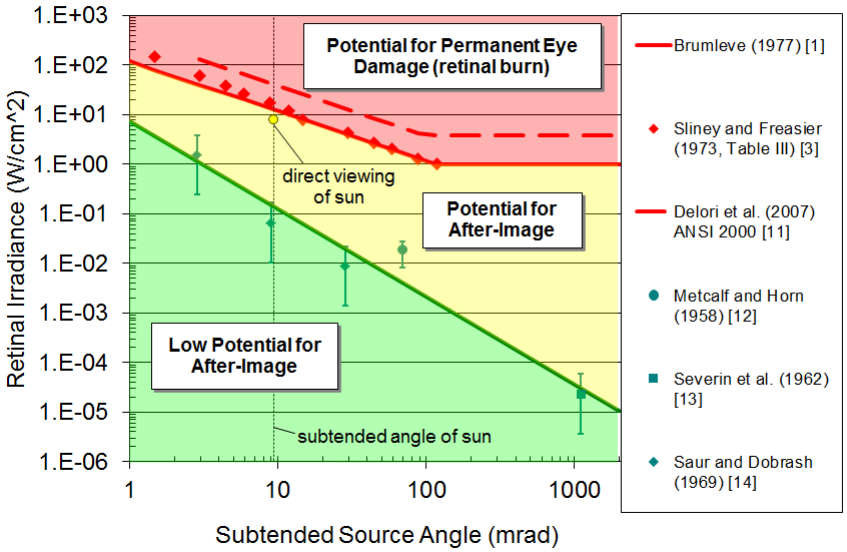


Figure 30. Glare hazard plot - ocular impact as a function of retinal irradiance and subtended angle. (Ho, 2011).

8.4 Glare assessment methodology

This glare assessment has been conducted using specialised software - GlareGauge, licensed by ForgeSolar. Glaregauge uses the Solar Glare Hazard Analysis Tool, (SGHAT) developed by Sandia National Laboratories to analyze nominated potential glare receptors. The analysis is dependent on the project specific parameters including:

- The geo-referenced layout of the PV modules.
- The PV module height measured as the pivot point or middle of the solar panel.
- The PV module material and finish and
- The tracking capability of the PV modules.
- Nomination of specific observer points or roadways or flight paths

The specific PV module parameters used for this assessment are:

- Height of 2.18 metres above ground level, (pivot point)
- Material and finish - smooth glass with an anti-reflective coating
- Tracking capability - 60 degrees in both east and west direction from zero degrees being horizontal.
- Orientation of tracking axis - 0 degrees from north, PV modules are oriented to track east to west

The layout of the PV modules are input into GlareGauge manually using an interactive Google Maps interface. Given the significant fragmentation of the proposed solar farm as a consequence of the retained vegetation, avoidance of waterways and avoidance of existing buildings and farm infrastructure, the PV layout was input as seven separate PV arrays. This configuration is considered adequate for the purposes of assessing the glare potential from the proposed solar farm. The input PV layout is shown in "Figure 31. Glare assessment layout" on page 39.

8.5 Visual receptors and sensitivity to glare.

A number of receptors were determined for assessing the potential for glare from the proposed PV arrays, these included drivers using the roads immediately adjacent to the site and those sensitive visual receptors in close proximity or in an easterly or westerly orientation from the proposed solar farm, specifically SR-1 to SR-12. For the roads vector points were created at approximately every 500 metres along each of the roads. The following provides the sensitivity rating for the identified receptors to be used for the glare analysis.

Receptor	Glare sensitivity rating	Reason
Drivers - Oxley - Meadow Creek Road	High	Operating a moving vehicle or machinery on a road due west of the proposed solar farm
Drivers - Docker - Carboor Road	High	Operating a moving vehicle or machinery on a road due north of the proposed solar farm.
Drivers - Allans Road	High	Operating a moving vehicle or machinery on a road due east of the proposed solar farm.
Sensitive visual receptors (Noted as 'OP' for Observation Point in the analysis)	Moderate	Potential high frequency with medium duration as receptor not always in the same location.

Table 9. Glare receptor sensitivity rating

Driver receptor height was set at 1.5 metres for the glare analysis as being representative of the typical height of a driver in a vehicle. Residence receptor height was set at 1.65 metres being considered as average eye level. The location of the receptors used for the glare assessment are shown on "Figure 31. Glare assessment layout" on page 39

8.6 Assumptions

- Glare hazard is difficult to define and is not the same for every person. Factors that influence glare hazard include optical parameters, (light intensity, angle of reflectance), ocular parameters, (pupil diameter, focal length), the size of the glare source and it's distance from the receptor. GlareGauge uses the following default values as baseline for the glare analysis.
- The modeled solar panels have a flat reflective surface and the angle of incidence equals the angle of reflection, (as shown in Figure 29. Angle of incidence).
- A pupil diameter of 0.002m which is typical for daylight adjusted eye sight.
- An eye focal length of 0.017m.

8.7 Limitations

- The glare analysis does not take into account vertical objects such as vegetation or buildings that may be between the reflected light source and the receptor. This provides a more conservative analysis result.
- The layout of the PV modules used in the analysis model is indicative due to the input method.. The layout input for this analysis was over represented of the designed layout to ensure a more conservative result was obtained.
- The direction of the reflected light source to the observation points and linear receptors is not defined, rather all the reflected light from the complete PV module layout is calculated for each of the receptors. This method can result in an over estimation of the glare hazard for any given receptor.
- The glare analysis assumes a typical clear day and does not account for potential cloud cover, smoke haze or other environmental factors that may influence solar irradiance. This assumption contributes to a conservative analysis result.
- The glare analysis assumes a simplified back tracking model which also contributes to a more conservative result. The proposed PV modules for Meadow Creek will have single axis tracking which allows the modules to rotate east to west through the day maximizing their orientation to the sun which subsequently reduces the potential for glare impact. However it is assumed the panels return to a neutral resting position when the sun is out of range, typically zero degrees where the panels are flat. The potential for glare impact is greatest at sunrise and sunset when the angle of the sun relative to the panel surface is at maximum.

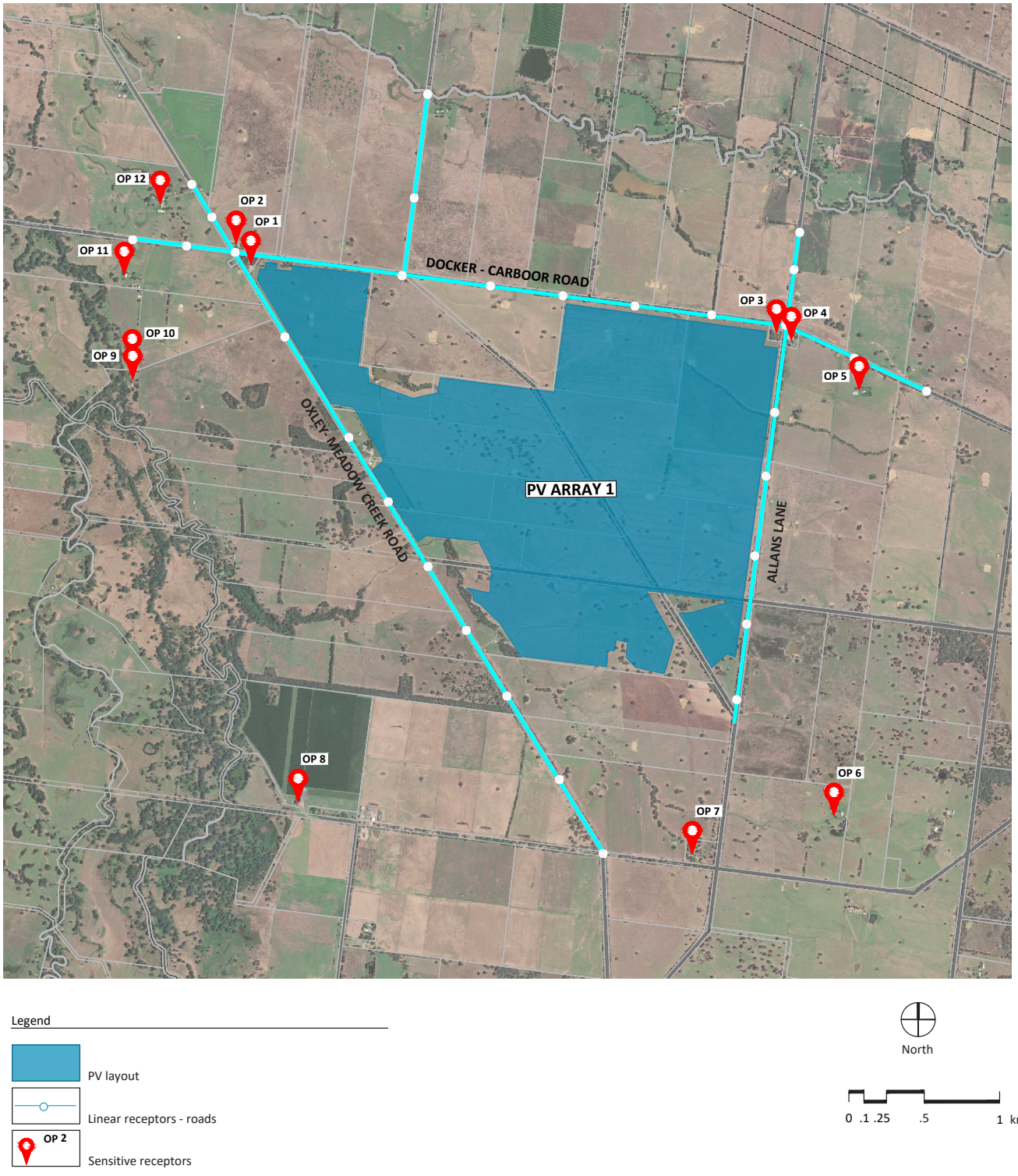


Figure 31. Glare assessment layout

8.8 Summary of glare analysis results

GlareGauge analyses the potential glare hazard of each receptor at one minute intervals for a one year period. The results of the analysis are presented as the total minutes of glare per year for each receptor point and route.. The following table provides a summary of the analysis results which are included as Appendix 2.

Receptor	Low potential for after image (min / year)	Potential for temporary after image (min / year)	Potential for permanent eye damage (min / year)
OP-1	0	0	0
OP-2	0	0	0
OP-3	0	0	0
OP-4	0	0	0
OP-5	0	0	0
OP-6	0	0	0
OP-7	0	0	0
OP-8	0	0	0
OP-9	0	0	0
OP-10	0	0	0
OP-11	0	0	0
OP-12	0	0	0
Allans Lane	0	0	0
Docker - Carboor Road	174	567	0
Milawa - Bobinawarrah Road	0	0	0
Oxley - Meadow Creek Road	0	0	0

Table 10. Summary Glare Hazard analysis on identified receptors.

In summary the analysis indicates that only drivers using the Docker - Carboor road south of the intersection with the Oxley - Meadow Creek Road will potentially be impacted by glare from the proposed solar farm for short periods in the early evenings from spring through summer. None of the other static receptors, (residences) or road receptors were impacted by glint or glare in the analysis.

9. Cumulative impacts

There are a number of renewable energy projects currently in construction or at the planning stage proposed for the north east Victoria region. Where developments are in close or visually apparent proximity the impacts can compound and have a cumulative impact on the landscape and views. Cumulative impacts can result in 'sequential viewing', where developments such as solar farms, although not contiguous, become repetitive features in the landscape or 'simultaneous viewing', where the developments can be seen from one viewpoint at the same time.

The nearest operating solar farm is the Winton Solar farm located approximately 21 kilometres west of the proposed Meadow Creek Solar Farm site. The Glenrowan Solar farm which is immediately next to the Winton Solar farm is in construction at the time of writing this report and is anticipated to be operational mid to late 2024. There are also a number of solar farm projects currently in planning stage and these are mostly located to the west of Benalla excepting the Laceby Solar Farm project which is located approximately 15 kilometres north west of the proposed Meadow Creek Solar farm.

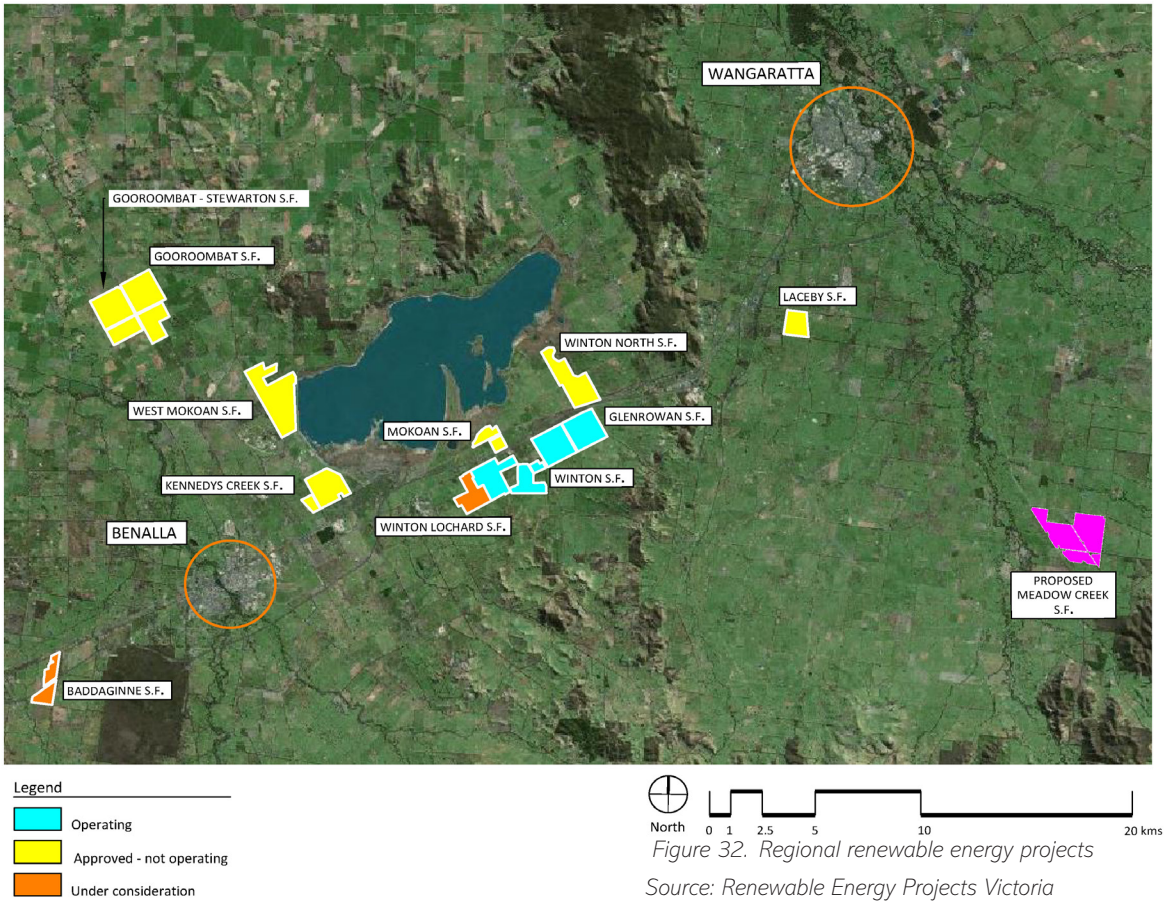


Figure 32. Regional renewable energy projects

Source: Renewable Energy Projects Victoria

Being located immediately adjacent to the Hume highway the Winton Solar farm has had a significant impact on the perception and opinions of many regarding the landscape character of the northeast. The cumulative impacts arising from the addition of the Glenrowan solar farm will be significant for the landscape character of the Benalla - Glenrowan region and be a significant change for the many viewers traveling on the Hume Highway.

The landscape of this region is primarily agricultural plains which is characterized by open paddocks, scattered trees and straight roads. Considering the operational, in construction and in planning solar projects in the region it is apparent that renewable energy facilities will soon be a typical characteristic of the landscape. Decision makers and planners need to consider the proximity of renewable energy developments to each other, to ensure they are properly dispersed so they do not significantly impact the existing agricultural plains landscape character Screen planting is also necessary to bring the scale of these facilities in line with the landscape within which they are located.

The distance of the proposed Meadow Creek Solar Farm from the operational and planned solar facilities in the region does not present any noteworthy cumulative impacts. Moreover the dispersed location and the proposed siting in a landscape with abundant scattered trees provides a model example for future renewable projects to follow.

10. Conclusion

10.1 Landscape impacts

The impacts on landscape character are limited to the Agricultural Plans, (LCT1) due to the relatively flat terrain and the scattered trees across this landscape that generally restrict long distance views. The scale of the proposed Meadow Creek solar farm is reduced by fragmentation of the PV arrays as a consequence of the retention of significant stands of trees across the site, avoidance of waterways and the stands of trees that are along much of the surrounding roadway. Excepting the transmission towers the solar farm infrastructure including PV arrays, battery energy storage systems, fire management and access infrastructure site below the majority of tree canopy height and will not impact on the open sky character of the landscape.

The new transmission towers and substation proposed to be located at the connection with the existing transmission lines on the Whorouly - Bobinawarrah road will impact the local character within the immediate vicinity out to approximately 250 metres. However as with the solar farm, the generally flat terrain and presence of scattered trees throughout this landscape limit visibility of this infrastructure from other landscape character types.

Table 11. Summary landscape impact ratings

LCT	Description	Sensitivity	Magnitude of change	Landscape Impact rating
LCT1	Agricultural Plains	Medium	Noticeable	Minor
LCT2	Foothills	Low	Insignificant	Negligible to Minor
LCT3	River valley	High	Insignificant	Minor to Moderate
LCT4	Township	Low	Insignificant	Negligible to Minor

10.2 Visual Impacts

The visual impact from the proposed solar farm will be primarily limited to the immediate neighbouring properties and adjacent roads due to the relatively flat terrain and scattered trees on and surrounding the proposed site. These aspects combine to restrict views to the immediate location of the viewer. The retention of existing stands of scattered trees and wind breaks along some fence lines contribute to fragmenting continuous views of the PV arrays. Additionally the scattered trees lining the verges of the adjacent roads also assist to fragment or block views of the proposed solar farm infrastructure.

Neighbouring and adjacent residences will have the greatest visual impact of moderate, being in close proximity to the proposed infrastructure. Visual receptors on sections of either of the Docker - Carboor road or the Oxley - Meadow Creek Road will also have a moderate impact as a consequence of the sections of verges where there is little to no existing vegetation.

The transmission infrastructure will create a moderate impact for visual receptors along the relevant section of the Oxley Meadow Creek Road. The transmission towers are well spread out over the view for these receptors however due to their high sensitivity and absence of utility infrastructure in current views, moderate is the lowest possible rating.

In context of the broader agricultural landscape the proposed substation and new transmission towers to be located at the connection with the existing transmission line on the Whorouly - Bobinawarrah road is considered to be a noticeable magnitude of change. The visual impact on the identified sensitive receptors, being nearby residences will be moderate due to their relatively close proximity and the frequency and duration of exposure to the view of this infrastructure.

In summary the visual impact from the proposed solar farm is primarily minor to moderate in context of the broader landscape and the relatively limited number of visual receptors. However the visual impact for neighbouring residences will be moderate. The proposed solar farm and transmission infrastructure is not visible beyond the immediate roads and neighbouring properties to that on which they will be located.

10.3 Cumulative Impacts

The location of the proposed Meadow Creek Solar Farm is relatively isolated being more than twenty kilometres from the nearest operating solar facility and fifteen kilometres from the nearest facility currently in planning. Additionally the location will have far fewer potential visual receptors compared to those solar facilities that can bee seen from the Hume Highway or the Great Alpine Road, Consequently it is the authors opinion that the cumulative impacts associated with the proposed Meadow Creek Solar Farm will be negligible for the reasons stated above.

10.4 Glint and glare assessment

A glint and glare analysis was conducted using GlareGauge software licensed by ForgeSolar. The analysis indicates that only drivers using the Docker - Carboor Road may potentially be impacted by glare at times in the early evening during spring through summer. However the analysis does not take into account potential obstructions between the glare source and the receptor such as vegetation or buildings. As there is substantial existing vegetation in and around the proposed PV array site the results of the analysis are considered to be conservative and the actual glare impacts would likely be less than indicated in the results.

The analysis also indicates that none of the residential receptors or receptors on the other roads adjacent to the proposed site will potentially be impacted by glare from the PV modules.

11. Potential mitigation

11.1 Mitigating visual impact from the PV arrays

Reducing or mitigating the visual impact from the proposed PV arrays and associated infrastructure can be achieved by implementing screening using selected native vegetation to effectively obscure views into the site. The current design includes a 5 metre corridor around the outer perimeter in which screening vegetation can be planted. The screening vegetation should include a mixture of medium to large native shrubs and small to large native trees.

Screening vegetation should be selected to compliment the existing native vegetation on and surrounding the site, and should be arranged to compliment the scattered nature of the existing stands of trees. The arrangement of screening vegetation must be accordance with any direction or recommendation for fire management for the proposed development.

The following table provides recommendation for the mix of screen planting to be used along the relevant PV array frontage.

PV array frontage	Recommended screening vegetation - percentage of cover		
	Medium to large native shrubs with height ranging between 3 to 6 meters.	Small to medium native trees with height ranging between 6 to 15 metres	Medium to large native trees with height ranging between 15 to 25 metres.
Oxley - Meadow Creek Road	70%	20%	10%
Docker - Carboor Road	80%	20%	
Allans Road	70%	30%	
South property boundary	70%	20%	10%

11.2 Mitigating visual impact from the transmission infrastructure

Mitigation options for the transmission towers are limited given their height and dispersal over approximately 2.2 kilometres. Off site screening for specific static receptors may be possible, for example placing selected trees or shrubs to obscure a specific view. However it would be difficult to accurately position screening measures in this manner until the towers are put in place. Screening along the road verges on the upper section of the Oxley - Meadow Creek Road and the Whorouly - Bobinawarrah road is also not recommended as this would obscure views of the open sky which are an intrinsic characteristic of this landscape.

Using non reflective or muted toned materials for the transmission towers is a potential mitigation option.

The visual impact associated with the substation to be located on the Whorouly - Bobinawarrah road can be mitigated by using selected native vegetation around the perimeter to obscure views of this infrastructure. As with the mitigation measure recommended for the PV arrays this should be arranged to reflect the scattered character of the existing surrounding native vegetation. Additionally selection and placement must be in accordance with fire management requirements for the proposed facility.

The recommended mix of screen planting is:

- 70 % Medium to large native shrubs with height ranging between 3 to 6 meters.
- 20% Small to medium native trees with height ranging between 6 to 15 metres.
- 10% Medium to large native trees with height ranging between 15 to 25 metres.

11.3 Mitigation for glare impact

The screening vegetation recommended for mitigating the visual impact from the PV arrays also applies as mitigation for potential glare hazard. Given that the screening vegetation will take between 3 to 5 years to reach an effective height it is also recommended to implement a temporary screening structure along the impacted section of the Docker - Carboor road frontage until the vegetation reaches an effective height.

12. References

- Ho, C. K., April (2013), *Relieving a Glaring Problem.* Solar Today Magazine
- Panero and Zelnik. (1979) *Human Dimension & Interior Space – A Source Book of Design Reference Standards*, The Architectural Press Ltd. London.
- The Australian Institute of Landscape Architects*, (AILA).* (2018), *Guidance Note for Landscape and Visual Assessment.*
- The Landscape Institute (LI) and the Institute of Environmental Management and Assessment (IEMA), UK, (2002) *Guidelines for Landscape and Visual Impact Assessment,* Third Edition.
- Victorian Department of Environment, Land, Water and Planning*,* (October, 2022)., *Solar Energy Facilities Design and Development Guidelines,*

13. Appendix

Appendix 1 Visual Impact Assessment Visualisations

HORIZON STUDIO

VP-1 Existing view

State Forest

883 Oxley - Meadow Creek Road - 20 metres

Location	Docker - Carboor Road	**View direction -** South south west
Landscape setting	Agricultural plains with views to the distant foothills and mountains to the south and east. This view location is on the Docker - Carboor Road close to the intersection with the Oxley- Meadow Creek Road where there are two dwellings. This viewpoint is representative of the views from both of these residences.	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
SR-1, SR-2 & SR-10	High	High	High	Moderate
Workers / commuters	Moderate	Moderate	Medium	Minor to Moderate
Visitors	Low	Moderate	Medium	Minor

Mitigation
Screen planting with low to medium height shrubs and trees to 6 - 8 metres tall.

Photo date:	03.03.23. 10.39am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 447082.201 N: 5958354.9087 Elevation: 162m

HORIZON STUDIO

VP-1 Proposed view no screening

VP-1 Proposed view with screening

Screen vegetation indicative at 6- 8 years growth

HORIZON STUDIO

VP-2 Existing view

← Allans Lane intersection - 70 metres Bobinawarrah Memorial Hall & tennis courts

Location	Docker - Carboor Road	**View direction -** South south west
Landscape setting	Agricultural plains. This view location is on the Docker - Carbour Road next to the Bobinawarrah Memorial Hall and CFA shed and seventy metres dues west from the intersection with Allans Lane. There is a residence opposite the Memorial Hall on Allans Lane. There are stands of existing trees along Allans Lane that will provide some screening and there are also intermittent stands of existing trees along the Docker - Carboor Road that fragment views into the subject site of the proposed solar farm.	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
SR-3, SR-4 & SR-5	High	High	High	Moderate
Workers / commuters	Moderate	Moderate	Medium	Minor to Moderate
Visitors	Low	Moderate	Medium	Minor

Mitigation
Screen planting with low to medium height shrubs to block views of the solar farm while maintaining views of the open sky.

Photo date:	03.03.23. 10.15am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 450486.6048 N: 5957914.6373 Elevation: 171m

HORIZON STUDIO

VP-2 Proposed view no screening

VP-2 Proposed view with screening

Screen vegetation indicative at 6- 8 years growth

HORIZON STUDIO

VP-3 Existing view

Location	Allans Lane	**View direction -** Westerly
Landscape setting	Agricultural plains. Allans Lane has extensive stands of medium to tall eucalyptus trees along both verges and there are stands of eucalyptus scattered across the subject site with enhance the rural character of this landscape from this location. The closest dwelling is 1.48 kilometres south west with stands of eucalyptus screening views of the subject site.	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
Workers / commuters	Moderate	Moderate	Medium	Minor to moderate
Visitors	Low	Moderate	Medium	Minor

Mitigation
Screen planting with low to medium height shrubs and trees to 6 - 8 metres tall.

Photo date:	03.03.23. 10.03 am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 450319.8821 N: 5956072.0012 Elevation: 174m

HORIZON STUDIO

VP-3 Proposed view no screening

VP-3 Proposed view with screening

Screen vegetation indicative at 6- 8 years growth

HORIZON STUDIO

VP-4 Existing view

Location	Oxley - Meadow Creek Road	**View direction -** North north east
Landscape setting	Agricultural plains. There are stands of eucalyptus trees along both verges of the Oxley - Meadow Creek Road at this location which fragment views across the subject site and there is a substantial corridor of eucalyptus on the site running south east to north east and the PV arrays will be seen in front of this from this viewpoint. There are no dwellings in the vicinity of this viewpoint however the views are likely to be taken in by workers, commuters and visitors traveling on the Oxley - Meadow Creek Road.	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
Workers / commuters	Moderate	Moderate	Medium	Minor to moderate
Visitors	Low	Moderate	Medium	Minor

Mitigation
Screen planting with medium to tall shrubs and trees along the southern extent of the proposed solar farm.

Photo date:	03.03.23. 9.35am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 448705.5313 N: 5955443.6314 Elevation: 169m

HORIZON STUDIO

VP-4 Proposed view no screening

VP-4 Proposed view with screening

Screen vegetation indicative at 6- 8 years growth

HORIZON STUDIO

VP-5 Existing view

Location	Oxley - Meadow Creek Road	**View direction - North north east**
Landscape setting	Agricultural plains. There are long stretches of verge along this section of Oxley - Meadow Creek Road that have open views across the subject site. There are scattered stands of eucalyptus across the site that visually fragment the agricultural plain. Some of these stands of existing trees are proposed to be removed and the impact of this is shown in the proposed photo montages for this location. There are no residences in proximity to this viewpoint.	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
SR-6, SR-7 & SR-8	High	High	High	Moderate
Workers / commuters	Moderate	Moderate	Medium	Minor to moderate
Visitors	Low	Moderate	Medium	Minor

Mitigation
Screen planting with medium shrubs interspersed with stands of tall trees to compliment the character of the existing scattered vegetation along the road verge and throughout the local landscape.

Photo date:	03.03.23. 9.18am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 447819.845 N: 5956869.2874 Elevation: 163.8m

HORIZON STUDIO

VP-5 Proposed view no screening

VP-5 Proposed view with screening

Screen vegetation indicative at 6- 8 years growth

HORIZON STUDIO

VP-6 Existing view

Location	Oxley - Meadow Creek Road	**View direction -** South east
Landscape setting	Agricultural plains. There are long stretches of verge along this section of the Oxley - Meadow Creek Road that have open views across the subject site. There are scattered stands of eucalyptus across the site that visually fragment the agricultural plain. There are southerly views to the distant foothills and mountains that will not be diminished by the proposed solar farm. There are a number of residence in proximity to this viewpoint location that will have the solar farm in the foreground of their southerly views.	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
SR-1, SR-7, SR-8 & SR-9	High	High	High	Moderate
Workers / commuters	Moderate	Moderate	Medium	Minor to Moderate
Visitors	Low	Moderate	Medium	Minor

Mitigation
Screen planting with medium shrubs interspersed with stands of tall trees to compliment the character of the existing scattered vegetation along the road verge and throughout the local landscape.

Photo date:	03.03.23. 10.47am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 447047.823 N: 5958132.094 Elevation: 162m

HORIZON STUDIO

VP-6 Proposed view no screening

VP-6 Proposed view with screening

Screen vegetation indicative at 6- 8 years growth

HORIZON STUDIO

VP-7 Existing view

Location	Oxley - Meadow Creek Road	**View direction -** East
Landscape setting	This section of the Oxley - Meadow Creek Road has open views across the paddocks across which the transmission lines are proposed to pass. There is an existing overhead power line running along Oxley - Meadow Creek Road with poles up to nominal 8 metres height. There are a number of residents in proximity to this viewpoint that will have views impacted by the proposed transmission lines and towers. Given the distance of the viewpoint from the proposed transmission corridor the transmission lines are likely to be barely perceptible. The transmission towers are spaced such that while they will be noticeable they will not present a significant change to the landscape character or views from this location.	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
SR-1, SR-2 & SR-10	High	High	High	Moderate
Workers / commuters	Moderate	Moderate	Medium	Minor to Moderate
Visitors	Low	Low	Medium	Minor

Mitigation
Ensure the transmission towers and infrastructure are constructed using non reflective materials.

Photo date:	03.03.23. 10.47am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 446732.7316 N: 5958651.6951 Elevation: 162.4m

HORIZON STUDIO

VP-7 Proposed view

HORIZON STUDIO

VP-8 Existing view

Location	Oxley - Meadow Creek Road	**View direction - South east**
Landscape setting	This section of the Oxley - Meadow Creek Road has open views across the paddocks across which the transmission lines are proposed to pass. There is an existing overhead power line running along Oxley - Meadow Creek Road with poles up to approximately 8 metres height. There are a number of residents in proximity to this viewpoint that will have views impacted by the proposed transmission lines and towers. Given the distance of this viewpoint from the proposed transmission corridor the transmission lines are likely to be barely perceptible. The transmission towers are spaced such that while they will be noticeable they will not present a significant change to the landscape character or views from this location.	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
SR-11, SR-12, SR-13, SR-14 & SR-15	High	High	High	Moderate
Workers / commuters	Moderate	Moderate	Medium	Minor to Moderate
Visitors	Low	Low	Medium	Minor

Mitigation
Ensure the transmission towers and infrastructure are constructed using non reflective materials.

Photo date:	03.03.23. 10.47am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 446194.0666 N: 5959530.4535 Elevation: 160m

HORIZON STUDIO

VP-8 Proposed view

HORIZON STUDIO

VP-9 Existing view

Location	Whorouly - Bobinawarrah Road	**View direction - East south east**
Landscape setting	While there are no residents in proximity to this viewpoint it has been selected due to the scale of the proposed substation and transmission towers. Being unsealed the Whorouly - Bobinawarrah road is primarily used by locals, and workers. There is a Gin distillery on the eastern side of the substation that would likely generate some visitor traffic along this road, (there are other potential access routes).	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
Workers / commuters	Moderate	Moderate	Medium	Minor to Moderate
Visitors	Low	Low	Medium	Minor

Mitigation
Screen planting with medium to tall shrubs and trees around the substation. Ensure the transmission towers and infrastructure are constructed using non reflective materials.

Photo date:	03.03.23. 10.47am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 446801.2364 N: 5960599.0524 Elevation: 160m

HORIZON STUDIO

VP-9 Proposed view no screening

VP-9 Proposed view with screening

Screen vegetation indicative at 6- 8 years growth

HORIZON STUDIO

VP-10 Existing view

Hurdle Creek Distillery

Location	Whorouly - Bobinawarrah Road	**View direction - West south west**
Landscape setting	There are a number of residence in proximity to this viewpoint including the Hurdle Creek (Gin) Still, a farm gate distillery typical of the produce attractions throughout the King Valley. While the majority of traffic on this section of the Whorouly - Bobinawarrah Road is likely locals and workers the Hurdle Creek Still would attract a number of visitors who would also use the road, thus generating more visitor traffic for this location relative to the other roads surrounding the proposed solar farm.	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
SR-16, SR-17 & SR-18	High	High	High	Moderate
Workers / commuters	Moderate	Moderate	Medium	Minor to Moderate
Visitors	Moderate	Low	Medium	Minor

Mitigation
Screen planting with medium to tall shrubs and trees around the substation. Ensure the transmission towers and infrastructure are constructed using non reflective materials..

Photo date:	03.03.23. 10.47am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 447893.5757 N: 5960455.586 Elevation: 161.4

HORIZON STUDIO

VP-10 Proposed no screening

VP-10 Proposed with screening

Screen vegetation indicative at 6- 8 years growth

HORIZON STUDIO

VP-11 Existing conditions

Location	Docker - Carboor Road	**View direction -** East north east
Landscape setting	Agricultural plains This view location is on the Docker - Carbour Road near the intersection with the Oxley- Meadow Creek Road where there are two dwellings in close proximity, one with views in this direction. The open paddocks and open sky dominate the landscape and views from this location. There is an existing overhead power line crossing the paddocks in this view however it is barely noticeable due to distance and the spacing of the poles. The proposed transmission lines and towers will present a significant change in the landscape character and views from this location	
Magnitude of change	Noticeable	

Visual Receptors	Frequency	Duration	Sensitivity	Impact
Residence - SR-1, SR-2	High	High	High	Moderate
Workers / commuters	Moderate	Moderate	Medium	Minor to Moderate
Visitors	Low	Moderate	Medium	Minor

Mitigation
Ensure the transmission towers and infrastructure are constructed using non reflective materials..

Photo date:	03.03.23. 10.39am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 447082.201 N: 5958354.9087 Elevation: 162m

HORIZON STUDIO

VP-11 Proposed -view

HORIZON STUDIO

VP-12 Existing view

Location	Docker - Carboor Road	**View direction -** East
Landscape setting	Agricultural plains This view location is on the Docker - Carbour Road near the intersection with the Wangaratta - Whitfield Road. The landscape is agricultural plains with the vegetation in the distance lining the King River. the vegetation along the river corridor and the scattered vegetation along the road verges and paddocks blocks long views and including visibility of the proposed solar farm and infrastructure.	
Magnitude of change	None	

Photo date:	03.03.23. 12.05am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 444543.0824 N: 5958688.7247 Elevation: 160m

HORIZON STUDIO

VP-13 Existing view

Location	Milawa - Bobinawarrah Road	**View direction -** South west
Landscape setting	Agricultural plains This view location is approximately 1.1 kilometres north of the Whorouly - Bobinawarrah Road on which the existing transmission lines run and where the new substation is proposed. Visibility of the existing transmission lines is blocked by the vegetation along the road verge and the vegetation scattered through the paddocks. The new transmission lines and solar farm infrastructure including the substation will not be visible at this location and locations of similar distance.	
Magnitude of change	None	

Photo date:	04.03.24. 12.13pm
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 448449.3756 N: 5954388.8075 Elevation: 161m

HORIZON STUDIO

VP-14 Existing view

Location	Box Forest Road	**View direction -** North west
Landscape setting	This view location is approximately 1.9 kilometres due south east of the most south eastern corner of the proposed solar farm, and is slightly elevated being at the base of the foothills. The scattered vegetation along the road verges and through the surrounding paddocks blocks visibility of the proposed solar farm site.	
Magnitude of change	None	

Photo date:	03.03.23. 1.02 pm
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 451767.0369 N: 5954388.8075 Elevation: 212m

HORIZON STUDIO

VP-15 Existing view

Location	Moyhu - Meadow Creek Road	**View direction -** North
Landscape setting	This view location is approximately 3.9 kilometres due south of the proposed solar farm, and is slightly elevated being at the base of the foothills. The scattered vegetation along the road verges and through the surrounding paddocks blocks visibility of the proposed solar farm site.	
Magnitude of change	None	

Photo date:	03.03.23. 11.37am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 449931.8101 N: 5951637.1395 Elevation: 189.8m

HORIZON STUDIO

VP-16 Existing view

Location	Milawa - Whitfield Road	**View direction -** East north east
Landscape setting	This view location is approximately 3.7 kilometres due east of the proposed solar farm. The line of vegetation in the background are trees and shrubs lining the King River. This vegetation completely blocks the visibility of the solar farm from this view location and any other location on the eastern side of the King River.	
Magnitude of change	None	

Photo date:	03.03.23. 11.59am
Photo montage method:	Autodesk Civil 3D, Photoshop & InDesign
Camera used:	Panasonic DMZ-FZ40

Photographer eye height	1.65m
Viewpoint location:	E; 444668.3028 N: 5955484.4352 Elevation: 161m

Appendix 2 ForgeSolar - Glare assessment results

ForgeSolar

Meadow Creek Solar Farm

Revision B

Site description: Complete area, no fragmentation of the PV module layout

Created May 01, 2024
Updated May 21, 2024
Time-step 1 minute
Timezone offset UTC10
Minimum sun altitude 0.0 deg
Site ID 118138.20281

Project type Advanced
Project status: active
Category 100 MW to 1 GW

Misc. Analysis Settings

DNI: **varies (1,000.0 W/m^2 peak)**
Ocular transmission coefficient: **0.5**
Pupil diameter: **0.002 m**
Eye focal length: **0.017 m**
Sun subtended angle: **9.3 mrad**

PV Analysis Methodology: **Version 2**
Enhanced subtended angle calculation: **On**

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

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	SA tracking	SA tracking	174	567	-

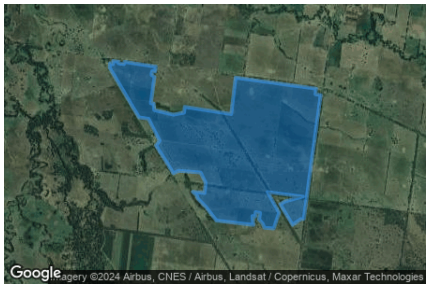
Component Data

PV Array(s)

Total PV footprint area: 4,879,560 m^2

Name: PV array 1
Footprint area: 4,879,560 m^2
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 0.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 0.0 deg
Ground Coverage Ratio: 0.5

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	-36.520110	146.408498	163.22	2.18	165.40
2	-36.519429	146.408541	165.18	2.18	167.36
3	-36.519584	146.409046	164.52	2.18	166.70
4	-36.519101	146.409121	165.64	2.18	167.82
5	-36.519187	146.410119	167.14	2.18	169.32
6	-36.519454	146.410097	166.16	2.18	168.34
7	-36.519558	146.411116	167.21	2.18	169.39
8	-36.519230	146.411202	167.43	2.18	169.61
9	-36.519851	146.416255	165.96	2.18	168.14
10	-36.519929	146.416910	165.09	2.18	167.27
11	-36.520653	146.416792	168.75	2.18	170.93
12	-36.520610	146.416245	167.20	2.18	169.38
13	-36.521162	146.416127	165.34	2.18	167.52
14	-36.521438	146.416685	166.73	2.18	168.91
15	-36.525343	146.416009	165.03	2.18	167.21
16	-36.525404	146.416534	165.00	2.18	167.18
17	-36.526357	146.416642	165.43	2.18	167.61
18	-36.527034	146.420172	166.26	2.18	168.44
19	-36.526732	146.422092	166.43	2.18	168.61
20	-36.525879	146.422210	167.27	2.18	169.45
21	-36.526944	146.430727	168.96	2.18	171.14
22	-36.521564	146.431521	168.64	2.18	170.82
23	-36.523186	146.446264	173.46	2.18	175.64
24	-36.524014	146.446135	172.95	2.18	175.13
25	-36.524135	146.447101	175.88	2.18	178.06
26	-36.542427	146.444004	175.20	2.18	177.38
27	-36.542462	146.443446	174.09	2.18	176.27
28	-36.543306	146.441966	177.49	2.18	179.67
29	-36.540272	146.439691	176.33	2.18	178.51
30	-36.539841	146.440614	173.22	2.18	175.40
31	-36.539134	146.443833	176.11	2.18	178.29
32	-36.538462	146.437395	178.61	2.18	180.79
33	-36.541514	146.439498	174.52	2.18	176.70
34	-36.543841	146.438511	169.63	2.18	171.81
35	-36.543737	146.436794	170.97	2.18	173.15
36	-36.543134	146.436494	171.68	2.18	173.86
37	-36.542496	146.435829	173.24	2.18	175.42
38	-36.541548	146.436022	171.07	2.18	173.25
39	-36.541427	146.435207	171.28	2.18	173.46
40	-36.542100	146.435099	172.56	2.18	174.74
41	-36.542013	146.434606	170.89	2.18	173.07
42	-36.543324	146.434777	173.00	2.18	175.18
43	-36.542669	146.427997	167.57	2.18	169.75
44	-36.540652	146.426087	164.63	2.18	166.81
45	-36.539445	146.424628	165.06	2.18	167.24
46	-36.538945	146.424392	164.00	2.18	166.18
47	-36.538428	146.423705	164.22	2.18	166.40
48	-36.538617	146.425851	167.33	2.18	169.51
49	-36.537100	146.426044	167.39	2.18	169.57
50	-36.535583	146.425121	165.57	2.18	167.75
51	-36.535324	146.421045	165.07	2.18	167.25
52	-36.535704	146.420143	164.52	2.18	166.70
53	-36.531582	146.416959	166.82	2.18	169.00
54	-36.530892	146.417624	165.15	2.18	167.33
55	-36.527633	146.415586	165.34	2.18	167.52
56	-36.527426	146.413848	167.62	2.18	169.80

Route Receptor(s)

Name: Allans Lane
Route type Two-way
View angle: 50.0 deg

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-36.546299	146.443907	177.55	1.50	179.05
2	-36.540368	146.444808	175.17	1.50	176.67
3	-36.536369	146.445473	174.93	1.50	176.43
4	-36.531595	146.446218	174.30	1.50	175.80
5	-36.527912	146.446885	176.10	1.50	177.60
6	-36.523066	146.447743	175.54	1.50	177.04
7	-36.519867	146.448327	175.03	1.50	176.53
8	-36.517194	146.448756	172.99	1.50	174.49

Name: Docker - Carboor Road
Route type Two-way
View angle: 50.0 deg

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-36.527040	146.458005	178.54	1.50	180.04
2	-36.525075	146.452984	176.40	1.50	177.90
3	-36.523005	146.447791	175.59	1.50	177.09
4	-36.522385	146.442212	172.13	1.50	173.63
5	-36.521764	146.436375	171.81	1.50	173.31
6	-36.521143	146.430925	169.27	1.50	170.77
7	-36.520626	146.425689	166.96	1.50	168.46
8	-36.519858	146.419392	165.49	1.50	166.99
9	-36.519324	146.414714	165.79	1.50	167.29
10	-36.518858	146.410079	165.53	1.50	167.03
11	-36.518496	146.406817	164.79	1.50	166.29
12	-36.518065	146.402955	166.44	1.50	167.94
13	-36.517685	146.399565	161.62	1.50	163.12

Name: Milawa - Bobinawarrah Road
Route type Two-way
View angle: 50.0 deg

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-36.519847	146.419378	165.45	1.50	166.95
2	-36.515086	146.420154	163.05	1.50	164.55
3	-36.509085	146.421269	164.86	1.50	166.36

Name: Oxley - Meadow Creek Road
Route type Two-way
View angle: 50.0 deg

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	-36.554563	146.433875	177.80	1.50	179.30
2	-36.550298	146.430782	175.83	1.50	177.33
3	-36.544971	146.426834	174.39	1.50	175.89
4	-36.537144	146.420933	166.00	1.50	167.50
5	-36.533401	146.418087	168.62	1.50	170.12
6	-36.529034	146.414781	166.01	1.50	167.51
7	-36.523409	146.410568	164.01	1.50	165.51
8	-36.518496	146.406816	164.79	1.50	166.29
9	-36.516297	146.405213	161.10	1.50	162.60
10	-36.514400	146.403786	165.00	1.50	166.50

Discrete Observation Receptors

Number	Latitude	Longitude	Ground elevation	Height above ground	Total Elevation
	deg	deg	m	m	m
OP 1	-36.519398	146.407949	165.31	1.65	166.96
OP 2	-36.518087	146.407144	165.23	1.65	166.88
OP 3	-36.523077	146.446977	173.70	1.65	175.35
OP 4	-36.523508	146.447932	176.35	1.65	178.00
OP 5	-36.527026	146.453371	173.23	1.65	174.88
OP 6	-36.551710	146.451112	183.06	1.65	184.71
OP 7	-36.554722	146.440874	179.70	1.65	181.35
OP 8	-36.551391	146.411452	166.47	1.65	168.12
OP 9	-36.525966	146.399121	167.63	1.65	169.28
OP 10	-36.525382	146.399410	166.32	1.65	167.97
OP 11	-36.519887	146.398997	165.78	1.65	167.43
OP 12	-36.516146	146.401420	164.04	1.65	165.69

Summary of PV Glare Analysis

PV configuration and total predicted glare

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced	Data File
	deg	deg	min	min	kWh	
PV array 1	SA tracking	SA tracking	174	567	-	-

Distinct glare per month

Excludes overlapping glare from PV array for multiple receptors at matching time(s)

PV	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
pv-array-1 (green)	26	31	12	0	0	0	0	0	0	46	22	37
pv-array-1 (yellow)	146	81	0	0	0	0	0	0	0	48	137	155

PV & Receptor Analysis Results

Results for each PV array and receptor

PV array 1 potential temporary after-image

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
Route: Allans Lane	0	0
Route: Docker - Carboor Road	174	567
Route: Milawa - Bobinawarrah Road	0	0
Route: Oxley - Meadow Creek Road	0	0

PV array 1: OP 1

No glare found

PV array 1: OP 2

No glare found

PV array 1: OP 3

No glare found

PV array 1: OP 4
No glare found

PV array 1: OP 5
No glare found

PV array 1: OP 6
No glare found

PV array 1: OP 7
No glare found

PV array 1: OP 8
No glare found

PV array 1: OP 9
No glare found

PV array 1: OP 10
No glare found

PV array 1: OP 11
No glare found

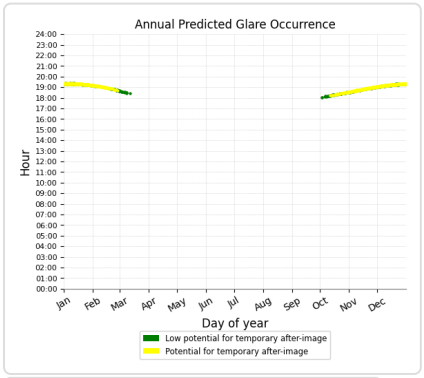
PV array 1: OP 12
No glare found

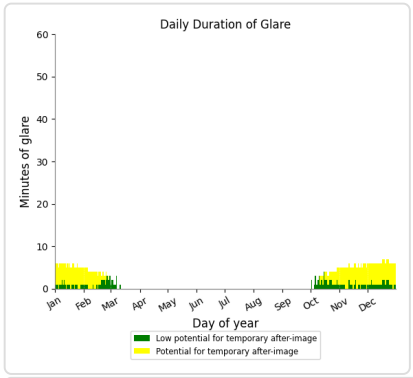
PV array 1: Allans Lane
No glare found

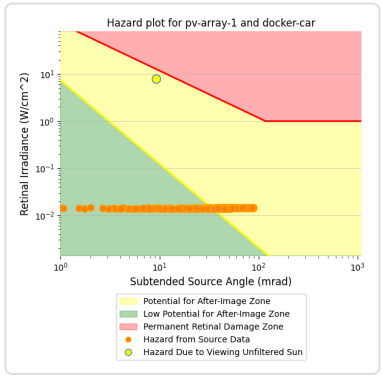
PV array 1: Docker - Carboor Road

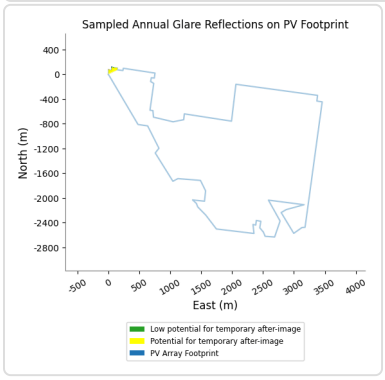
PV array is expected to produce the following glare for this receptor:

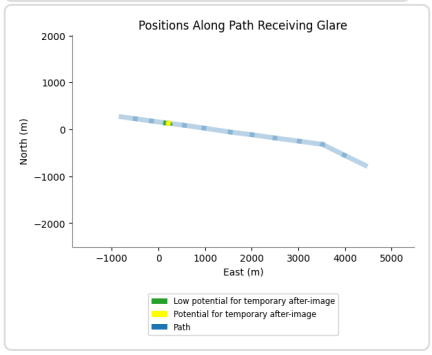
- 174 minutes of "green" glare with low potential to cause temporary after-image.
- 567 minutes of "yellow" glare with potential to cause temporary after-image.











PV array 1: Milawa - Bobinawarrah Road

No glare found

PV array 1: Oxley - Meadow Creek Road

No glare found

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not automatically account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
- Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results fo large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
- The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
- 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.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.