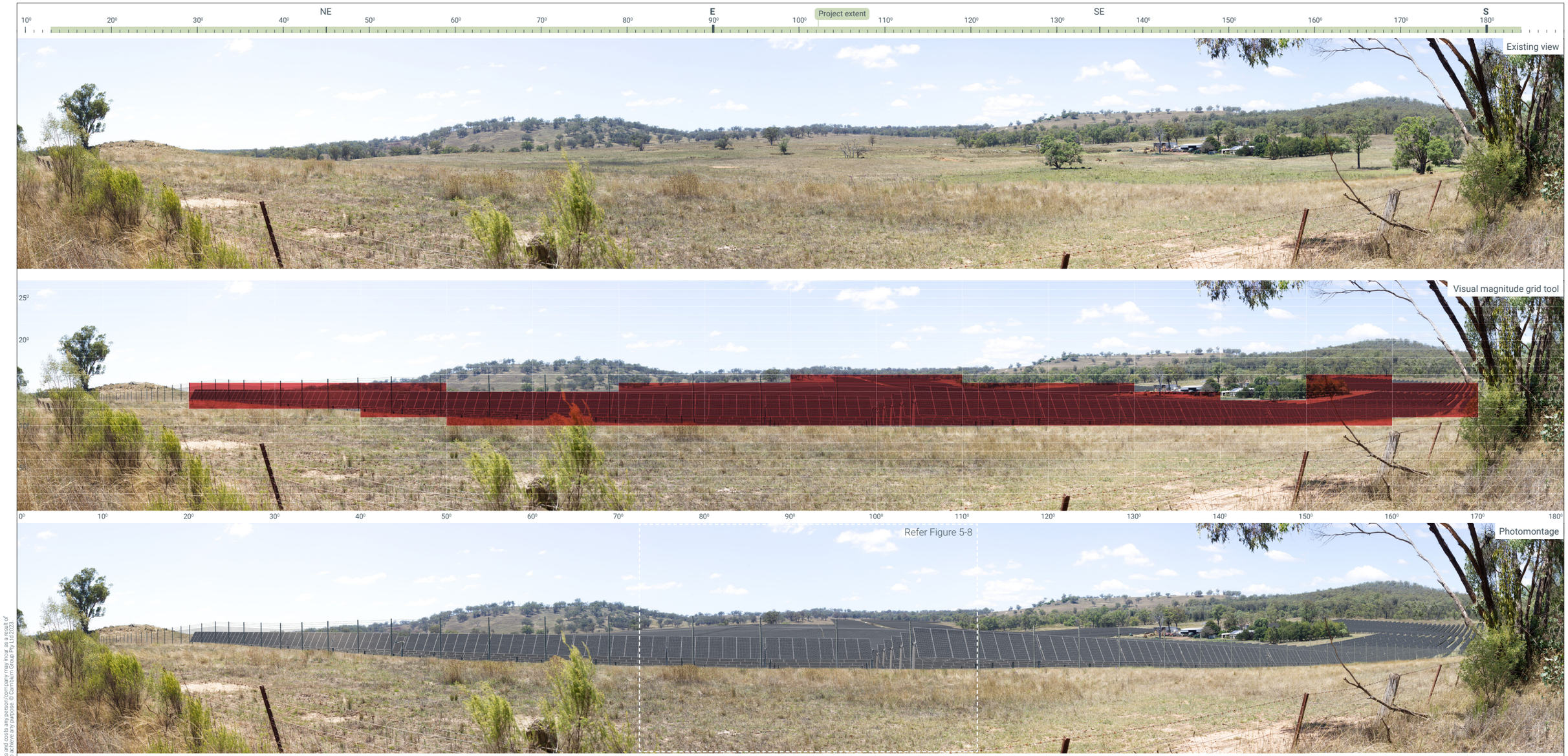
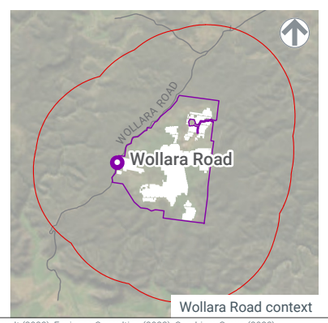
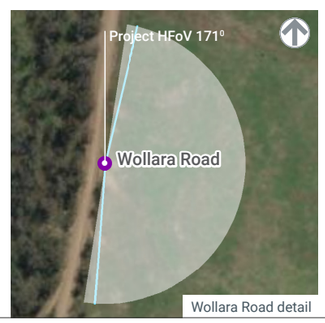
Figure 6-15
Wollara Road photomontage



Viewpoint ID	Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Visual sensitivity	Occupied cells	Magnitude rating	Impact rating
Wollara Road	32m	Public	Low	Low	Low	67	Very high	Moderate



Wollara Road context



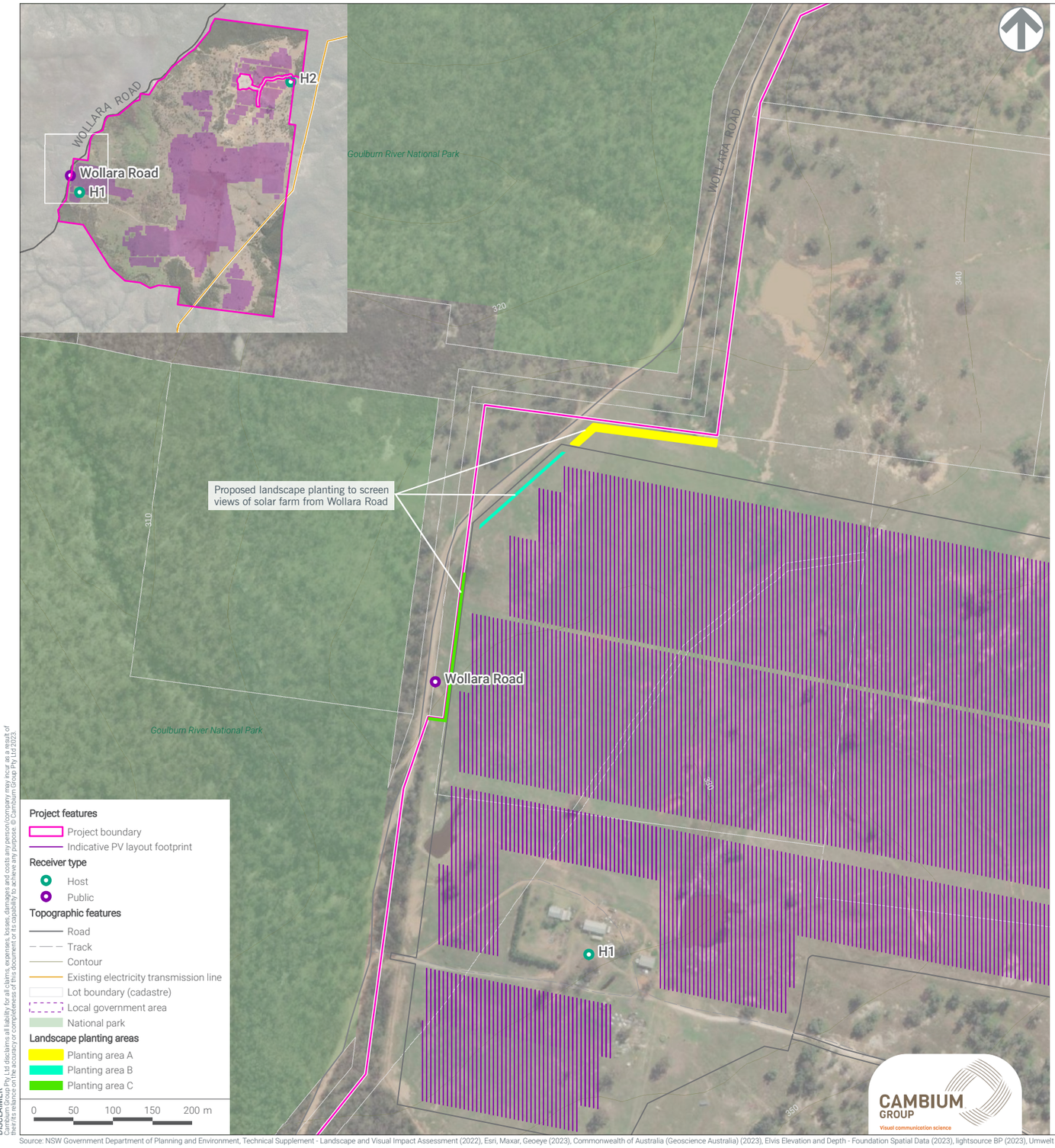
Wollara Road detail

Date	07/02/23
Time	12:09
Camera level	332mAHD
Camera coordinates	E224256.m, N6424587m
Camera	Canon EOS 6D Mark II (full frame DLSR)
Panorama type	50mm portrait
Bearing	99°
Vertical field of view	39.6° (cropped to 27°)
Horizontal field of view	180°
Geodetic datum	GDA2020
Projection	MGA
Zone	56
Photography	Envisage Consulting

CAMBIUM GROUP
Visual communication science

Source: NSW Government Department of Planning and Environment, Technical Supplement - Landscape and Visual Impact Assessment (2022), Esri, Maxar, Geoeye (2023), Commonwealth of Australia (Geoscience Australia) (2023), Elvis Elevation and Depth - Foundation Spatial Data (2023), lightsource BP (2023), Umwelt (2023), Envisage Consulting (2023), Cambium Group (2023).

Figure 6-16
Draft landscape plan



Landscape strategy

The aim of proposed landscaping is to establish a quick growing, dense screen to reduce public views of the solar panels (from Wollara Road), as well as providing additional ecological benefits. Plant species have been selected that:

- are locally native
- are suitable for the site conditions (are hardy)
- will provide effective visual screening
- will provide ecological benefits (such as a food source for birds, habitat etc)
- include quick growing as well as longer-living species.

Draft landscape plan and planting guide

The draft landscape plan (shown Figure 1) indicates proposed perimeter screen planting on-site, adjacent to Wollara Road. Three planting areas (A, B and C) are proposed based on expected mature plant heights to avoid casting shadows on solar panels:

- Planting area A is 8 m wide and includes plants to 18 m high
- Planting area B is 8 m wide and includes plants to 8 m high
- Planting area C is 4 m wide and includes plants to 5 m high

Sourcing plants

1. Proposed species are shown in the draft planting schedule (Table 1).
2. Propagate plants from local provenance sourced seed. Plan for sourcing as early as feasible.
3. Plant pot sizes for all plants to be 75 mm tubestock.

Site preparation

4. When marking out planting area, ensure the root zone of remnant vegetation is protected.
5. Eradicate existing weeds and pasture grass species within the planting area at least one month before planting (with spot removal/treatment prior to planting if required). Carefully manage weed control measures when in vicinity of existing trees. Any proposed use of herbicides to be approved by NPWS.
6. Cultivate to a depth of 60 cm in tyned rows 50 – 100 cm apart for full width of planting area. Do not cultivate within the root zone of remnant vegetation.
7. Incorporate soil improver and/or organic fertiliser (if appropriate and approved by NPWS) following soil testing in a number of locations to determine the appropriate soil conditioning.
8. Apply mulch to a minimum depth of 75mm across the planting area.

Planting

9. Avoid planting during harsh weather conditions (i.e. mid-summer and mid-winter)
10. Select species for each planting area (A, B or C) from the draft planting schedule. Ensure only species marked for each planting area, are planted within that planting area.
11. Planting random order within each planting area to ensure an even mix of species .
12. Plant within the central 6 m of the 8 m wide planting area for planting areas A and B, and the central 2 m of the 4 m wide planting area for planting area C (i.e. with a 1 m buffer along each side).
13. Plant at densities to achieve about 50 plants per 10 lineal metres of the planting area.
14. Install natural fibre weed mats and biodegradable plant guards around each plant suitable for rabbit protection (if applicable) and install stock fencing around the planting area to protect from grazing sheep/cattle if necessary.
15. Water at the time of planting, weekly for first 3 months, fortnightly for next 3 months and as required over first 18 months. Watering to take account of any rainfall and adjust as needed.
16. Keep records of maintenance practices, including listing species that have failed and any substituted plant species.

[1] This ratio is generally consistent with the *Revegetation Guide for Holbrook, Hume and Urana Districts* (Murray Catchment Management Committee & Department of Land & Water Conservation (1998)

Draft planting schedule

The draft plant schedule provides an indicative range of site-appropriate species[1] for future use in landscaping the site. The selection of species would be further refined during preparation of the detailed landscape plan.

Table 1: Planting schedule

Botanical name	Common name	Approximate mature height (m)	Planting area
Medium tree			
Acacia implexa	Hickory Wattle	5 - 12	A
Callitris endlicheri	Black Cypress Pine	15	A
Eucalyptus dealbata	Tumbledown Red Gum	15	A
Pittosporum undulatum	Native Daphne	15	A
Small tree / tall shrub			
Acacia decurrens	Black wattle	3 - 10	A and B
Acacia doratoxylon	Currawang	3 - 8	A and B
Acacia linearifolia	Narrow-leaved wattle	10	A and B
Persoonia linearis	Narrow-leaved Geebung	2 - 5	A, B and C
Shrub			
Allocasuarina distyla	Scrub She-oak	1 - 3	A, B and C
Baeckea densifolia (Harmogia densifolia)		1.5	A, B and C
Calytrix tetragona	Common Fringe-myrtle	2	A, B and C
Cassinia cunninghamii	Cunningham's Everlasting	1 - 1.5	A, B and C
Dodonaea triangularis		3	A, B and C
Grevillea sericea	Pink Spider Flower	2	A, B and C
Hibbertia monogyna		0.5	A, B and C
Indigofera australis	Australian Indigo	2.5	A, B and C
Leptospermum parvifolium		2	A, B and C
Leucopogon muticus	Blunt Beard-heath	1.5	A, B and C
Tall grass			
Lomandra glauca	Pale Mat-rush		A, B and C
Lomandra longifolia	Spiny-headed mat-rush		A, B and C
Climber			
Clematis aristata	Old Man's Beard		A, B and C

[1] *Vegetation of the Merriwa Area, New South Wales*, R.H.D McRae and M.G. Cooper, 1985
* Species has been identified at the Project site during the ecological survey

Detailed landscape plan

Subsequent to project approval, a detailed landscape plan would be prepared which would refine the concepts presented in this draft. It is recommended that the detailed landscape plan be prepared with input from the NSW National Parks and Wildlife Service. Final species selection, ratio/rate of planting, and the planting guide may vary depending on future advice, the Project construction program and plant availability at the time.

The detailed landscape plan is to include a landscape maintenance plan for the operational period of the Project, to ensure proposed landscaping achieves, and continues to achieve, intended outcomes. The maintenance plan is to include:

- a defined initial establishment period of a minimum of 18 months
- a schedule for monitoring planting areas and watering during the establishment period
- ongoing maintenance practices during and post establishment (such as a weeding/mulching regime)
- guidance for replacement planting (for plants that fail to thrive).

Plan prepared by registered landscape architect (Stacey Brodbeck) RLA #719 (Australian Institute of Landscape Architects). A detailed landscape plan is required once the project is approved, to fully document and confirm planting locations and plant species.

Source: NSW Government Department of Planning and Environment, Technical Supplement - Landscape and Visual Impact Assessment (2022), Esri, Maxar, Geoeye (2023), Commonwealth of Australia (Geoscience Australia) (2023), Elvis Elevation and Depth - Foundation Spatial Data (2023), lightsource BP (2023), Umwelt (2023), Envisage Consulting (2023), Cambium Group (2023).

6.7.5.2 Landscape Character Impact

The overall assessed impact of the Project on landscape character is ***low***. The solar farm would change the character of the landscape by introducing somewhat uncharacteristic dark, linear, built elements across cleared parts of the open, agricultural landscape. However, the Project is generally low in height, would not cause noticeable landform change, retains vegetation and additional native vegetation would be established alongside Wollara Road to reduce visibility and integrate the Project with the existing landscape.

The Project has been designed to facilitate sheep grazing within the Development Footprint, thus retaining some of the grazing function and some agricultural characteristics of the rural landscape. It is also important to note that the Project is reversible that is, the components could be removed and there would be little residual impact to the landscape.

6.7.5.3 Lighting

Lighting associated with the Project is minimal. The solar farm would not be lit at night, and workers would not attend the site except in emergency or security situations.

There is minimal lighting associated with the Project. The inverters will require targeted lighting during commissioning and operations. Sensor lights will be used around the substation for security purposes only. Lights may also be used by employees in an emergency.

6.7.5.4 Lighting Impact

The Project is located within 200 km of the Siding Spring Observatory and falls within the Dark Sky Region of NSW. The *NSW Dark Sky Planning Guidelines* (DPE, 2016) provide guidance to manage light in the Dark Sky Region and are a matter for consideration for all development under the EP&A Act. The Guidelines provide technical information on good lighting design, use of shielded, downward facing and site appropriate lighting. Lighting design principles that are applicable to the Project are included in mitigation measures in **Section 6.7.7**. There is minimal lighting associated with the Project. The inverters will require targeted lighting during commissioning and operations. Sensor lights will be used around the substation for security purposes only. Lights may also be used by employees in an emergency.

Based on the proposed lighted, outlined in (**Section 3.3.4**), it is considered unlikely that the Project would create a noticeable impact on the existing night-time landscape.

6.7.6 Cumulative Visual Impacts

As a part of the LCVIA a cumulative impact assessment was conducted for visual impacts associated with the Project. This cumulative impact assessment used a methodology based on the NSW Cumulative Impact Assessment Guidelines for State Significant Projects (NSW Government, 2022), and the UK Landscape Institutes Guidelines for Landscape and Visual Impact Assessment (3rd edition).

A distance of 35 km was used in this assessment, to account for the visual experience of short journeys and travel through the landscape, beyond a stationary viewpoint. On rural road a 35 km distance would take around half an hour to drive,a relatively short, local journey, with changing visual experiences along the route.

Renewable energy projects within the 35 km study area include Wollar Solar Farm, Merriwa Energy Hub and the EnergyCo Central West Orana Transmission Line (which will support future renewable projects in the Central West Orana REZ). The only other existing infrastructure in this study area is the existing 500 kV transmission line that runs through the Project Area. There is also a local mine/quarry (0.5 ha) on Wollara road, 4 km north of the Project Area. More broadly within 100 km of the Project Area there are significantly more renewable energy and other large-scale projects in planning, development and construction.

6.7.6.1 Cumulative Impact to Landscape Character

Cumulative changes to landscape character have the potential to affect the experience of the rural landscape and visual amenity.

The Wollar Solar Farm and the proposed Merriwa Energy Hub are relatively distant from the Project Area (Wollar Solar Farm 30 km southwest, Merriwa Energy Hub 28 km east). Both of these projects are visually separated from the Project Area by distance, and all three projects are relatively visually isolated being located on small, local roads (Wollar Solar Farm on Barigan Road, Merriwa Energy Hub on Flaggs Road, and the Project on Wollara Road). These local roads would most likely be only accessed by local residents and have little broader exposure.

It is expected that most tourist, recreational, and other road users would travel via the Golden Highway, or Castlereagh Highway and not encounter all three projects, although travelling through the Goulburn River National Park is very lightly trafficked and not used as primary access to the National Park.

It is unlikely that a resident road user would see multiple solar farms on a single journey during a regular route. It would be even less likely that a tourist would encounter multiple solar farms in a single day.

If all three proposals were to proceed, the cumulative impact would not alter the existing, dominant rural/agricultural and native forest characteristics of the landscape.

6.7.6.2 Cumulative Impacts to Viewpoints

Wollar Solar Farm would be around 30 km to the southwest of, and Merriwa Energy Hub would be over 28 km to the east of, the three representative viewpoints identified for the Project. Solar modules and other elements associated with the Wollar Solar Farm or Merriwa Energy Hub would not be visible from these viewpoints.

None of the viewpoints identified for Wollar Solar Farm or Merriwa Energy Hub would view the proposed Goulburn River Solar Farm due to distance, intervening existing vegetation and landform.

If all solar farm proposals were to proceed, the cumulative visual impact to viewpoints would not be compounded beyond the impact from each single proposal.

6.7.7 Management and Mitigation Measures

6.7.7.1 Draft Landscape Plan

Perimeter planning along Wollara Road is proposed in the vicinity of the proposed Project infrastructure. The draft landscape plan outlines the intended planting strategy and the location for planting, including a draft planting schedule (list of appropriate plant species) planting guide and ongoing management.

The aim of proposed landscaping is to establish a quick growing, dense screen to reduce public views of Project infrastructure from Wollara Road, as well as providing additional ecological benefits. Planting would be within the Project Area, located between Wollara Road and the Development Footprint's perimeter security fence, in three planting areas based on expected mature plant heights (to avoid casting shadows on the solar panels).

A draft of the landscape plan was sent to NPWS (February 2023) for feedback. NPWS advised the plan looked appropriate and will continue to be consulted prior to construction and implementation of the landscape plan.

6.7.7.2 Other Mitigation Measures

Mitigation measures proposed to reduce the visibility of the Project include:

- Lighting would be installed in accordance with *AS4228-1997 – Control of Obtrusive Effects of Outdoor Lighting* and designed and installed to best practice principles identified within the *Dark Sky Planning Guidelines.*
- If possible, colour treat ancillary components of the Project, such as inverters and office/storage containers that would be visible from Wollara Road, so they are darker in colour and less prominent.
- Setback of the construction compound, vehicle parking and equipment storage areas in the vicinity of the Post War homestead so they are set back from Wollara Road and partially screened from view (from Wollara Road) via existing and new vegetation screening.
- Where soil disturbance is required, wind erosion controls would be implemented including the use of water carts, covering of stockpiles and avoiding ground disturbance during windy conditions.
- Signage (if required) would be of sufficient size to contain only information sufficient for the basic facility and company identification, for safety, navigation, and delivery purposes.
- Retention of as much existing vegetation within the Project Area as possible. Protect existing trees (that are to be retained) during construction activities.

6.7.8 Glint and Glare

6.7.8.1 Methodology

A glint and glare assessment was conducted utilising the Solar Glare Hazard Analysis Tool developed by Scandia National Laboratories. This tool is used to evaluate glare resulting from solar farms at different receptors based on proximity, orientation and specification of the PV modules.

This tool is used to indicate the nature of glare that can be expected at each potential receptor. Glare can be broadly classified into three categories, represented by three colours:

- **Green glare** – low potential for temporary after-image.
- **Yellow glare** – potential for temporary after-image.
- **Red glare** – retinal burn, not expected for PV.

The tool used to assess the glint and glare hazard was run in a simulation interval of one minute, based on the reflectivity of solar arrays of PV modules which typically last one minute.

The following factors were considered in the modelling tool:

- Position of the sun over time with respect to the location of the proposed solar farm.
- A worst-case scenario assuming clear weather all year round, (i.e. no consideration of cloud coverage).
- Tracking axis tilt, tracking axis orientation and properties of the PV modules.
- Potential to screen the impact by surrounding topography (does not take into account intervening elements such as vegetation and built structures).

Three types of receivers are addressed within the glint and glare assessment:

- Residential Receptors.
- Road and Rail Receptors.
- Aviation Receptors (no landing strips are within 5 km of the Development Footprint so no further assessment is required).

All residential viewpoints within 3 km of the Project that have a line of sight of the PV module array were analysed for the daily and yearly glare impacts in minutes. Representative viewpoints could be used for residential receivers that are clustered. All residential receivers must be assessed at a height of 1.5 m.

Table 6.14 Residential Receptors Impact Rating and Performance Objectives

High Glare Impact	Moderate Glare Impact	Low Glare Impact
>30 minutes per day **>30 minutes per day**	<30 minutes per day <30 minutes per day	<10 minutes per day <10 minutes per day
Significant amount of glare should be avoided	Implement mitigation measures to reduce impacts as far as practicable	No mitigation required

Further details on the modelling assumptions are provided in **Appendix 13**.

6.7.8.2 Assessment of Impacts

The Glint and Glare assessment identified residential receivers as viewpoints which within 3 km have a line of sight of the solar arrays. Or residential receptors are identified as a representative cluster of viewpoints that would have a line of sight of the solar arrays. One private residential receptor was identified within 2.5 km of the nearest solar panel. No yellow glare was identified for the residential receiver. Three public residential receptors were identified within 3–5 km of the solar array, including Spring Gully Campground, Big River Campground and Goulburn River National Park. The assessment indicated low to moderate potential for green glare for Big River Campground and Spring Gully Campground.

No rail receptors were identified for the Project; however, one road receptor was identified, Wollara Road. Wollara Road is adjacent to the western boundary of the Project Area. The glare assessment identified that Wollara Road will experience 11 hours of yellow glare per year from the Project, which has moderate potential for an after image. Existing vegetation and topography, however, is likely to obscure glare from the Project.

No aviation receptors within 5 km of the Project Area were identified.

6.7.8.3 Mitigation and Management Measures

To mitigate potential glare impacts the implementation of landscaping (screening) along the Project boundary adjacent Wollara Road is recommended. The screening will likely fragment potential glare impacts from the Project, as addressed in the proposed landscaping as a part of the LCVIA. More details on the landscape plan are provided in **Section 6.7.7.1**.

6.8 Noise and Vibration

A Noise and Vibration Impact Assessment (NVIA) was prepared by Umwelt (2023) (refer to **Appendix 14**) to address the SEARs in relation to noise including:

- An assessment of the construction noise impacts of the Project in accordance with the Interim Construction Noise Guideline (ICNG).
- Operational noise impacts in accordance with the NSW Noise Policy for Industry (NPfI) (2017).
- Cumulative noise impacts (considering other developments in the area).
- A draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria.

6.8.1 Existing Environment

The Project Area is located within a rural environment with typically low background noise levels, surrounded by Goulburn River National Park (zoned C1) and rural residential land (zoned RU1 Primary Production). Given the rural environment, monitoring of background noise levels was not undertaken, and minimum background noise levels i.e. 35 dB(A) for the day and 30 dB(A) for the evening and night periods were adopted in accordance with the NPfI.

Table 6.15 presents the ICNG Construction Noise Management Levels for representative receivers surrounding the Project. The assessment levels are intended to guide the need for and the selection of feasible work practices to minimise construction noise impacts.

Table 6.15 ICNG Construction Noise Management Levels, dB(A)

Land use	Construction time	Noise Management Level LAeq (15 min)
Residential	Recommended Standard Hours Monday to Friday – 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or Public Holidays	Noise affected: RBL + 10 dB(A)

Land use	Construction time	Noise Management Level LAeq (15 min)
Residential	Recommended Standard Hours Monday to Friday – 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or Public Holidays	Highly noise affected: 75 dB(A)
Residential	Outside recommended standard hours	Noise affected: RBL + 5 dB(A)
Passive Recreation	All construction hours	60 dB(A)1

The nearest receivers in the area surrounding the Project are shown on **Figure 6.17**.

A number of residential receivers are located on the northern, southern and western sides of the Goulburn River National Park (refer to **Table 6.16** below). The nearest non-involved dwelling sensitive receiver is located approximately 3 km north of the Project Area with dense bushland as a buffer in between. There are no other sensitive land uses (such as schools or places of worship) within or surrounding the Project Area.

One residential receiver is located within the Project Area. This is considered an 'involved dwelling' (i.e. owned by a landholder involved in the Project) and is not considered as a sensitive receiver for the purposes of the assessment (R01 in **Table 6.16**). An abandoned house (1900 house) located in the north-east corner of the Project Area is not considered further in the assessment as it is a structure, not a dwelling and will be demolished prior to construction.

For the Goulburn River National Park, given the vastness of the park and the unlikely chance of park use (i.e. bush walking) occurring at the same time as construction operating near the development boundary, a receiver point 200 m from the Project Area was adopted for noise prediction purposes. This is represented as R10 on **Figure 6.17**.

Details for all modelled receivers are presented in **Table 6.16** below.

Table 6.16 Nearest Receivers

Receiver ID	Receiver Type	Address / Description	Approx. distance (km) and direction
R01 (involved)[3]	Residential	2771 Wollara Road, Merriwa (Lot 58 DP750956)	Within Project Area
R02	Residential	1893 Wollara Road, Merriwa (Lot 13 DP731205)	3.2 km north
R03	Residential	54 Hulks Road, Merriwa (Lot 12 DP746396)	3.0 km north
R04	Residential	54 Hulks Road, Merriwa (Lot 14 DP746396)	3.1 km north
R05	Residential	153 Hulks Road, Merriwa (Lot 16 DP746396)	3.2 km north
R06	Residential	1324 Mogo Rd, Mogo (Lot 12 DP610756)	5.1 km west
R07	Residential	3483–3492 Wollara Road, Merriwa (Lot 14 DP750966)	5.4 km southwest

[3] Receiver R01 is involved in the Project and therefore is not considered sensitive.

Receiver ID	Receiver Type	Address / Description	Approx. distance (km) and direction
R08	Residential	5657 Wollar Road, Coggan (Lot 45 DP755421)	4.5 km south
R09	Residential	2076 Wollar Road, Merriwa (Lot 15 746396)	1.7 km north
R10	Passive Recreation	Goulburn River National Park	Adjacent to Project Area in all directions
R11	Residential	549 Ringwood Road, Merriwa	15 km northwest