Visual Impact Assessment

COLEAMBALLY SOLAR FARM

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1 INTRODUCTION

NGH Environmental completed a Visual Impact Assessment (VIA) of the proposed Coleambally Solar Farm, proposed to be located approximately five kilometres (km) north-east of Coleambally, NSW (refer Appendix A.1 for site location). This report has been prepared on behalf of the proponent, Neoen, to assess the potential visual impacts of the proposed solar farm infrastructure.

As visual amenity values and visual impacts can be subjective, the assessment includes a transparent, systematic evaluation with reference to existing guidelines, to address subjectivity as much as possible.

1.1 PROJECT OVERVIEW

The Coleambally Solar Farm proposal ('the proposal') would comprise of the installation of a solar plant with a capacity up to 150MW. Neoen proposes to develop the 570 ha solar farm site, retaining existing viable native vegetation remnants on the site. A proposed infrastructure map is illustrated in Appendix A.2.

Key development and infrastructure components would include:

- Solar arrays, PV boxes or skids.
- Potential battery storage.
- Delivery station and solar substation.
- Associated above or underground cabling.
- Underground connection to TransGrid substation and extension to substation.
- Ancillary facilities.
- New proposal area access point from Ercildoune Road and associated road upgrades.
- Construction of bridges across Tubbo irrigation channel and central drainage channel.
- Construction of internal gravel access tracks.
- Possible irrigation drainage channel relocation, subject to final design.
- Subdivision of land.
- Perimeter security fencing.

In total, the construction phase of the proposal is expected to take between 9 to 12 months. The Coleambally Solar Farm is expected to have approximately 30 year operating life at which point the solar farm would either:

- Be decommissioned at the end of its operational life, removing all above ground infrastructure and returning the site to its existing land capability; or
- Continue operation (which could involve reconditioning), if the lease agreement is renewed. Reconditioning would involve replacing components that were originally installed with new components that reflect technology that is available at that time.

1.2 SITE CONTEXT

The proposed Coleambally Solar Farm comprises approximately 570ha of freehold land, identified as Lots 78, 81, 82, 83, part of 101 and 100 of DP 750896. An irrigation channel (Tubbo Channel) identified as Lot 1 DP 821577 borders the north of the proposal area. A smaller channel, also identified as lot 1 DP 821577, passes through the southern portion of the proposal area. The Kidman Way (B87) is located directly to the

south and north-east of the proposal area, where it intersects with Ercildoune Road. Immediately to the north of the proposal area is Kook Road.

The majority of the proposal area has been previously cleared of native vegetation and is currently cultivated for agriculture, which is the dominant land use in the area. There are patches of remnant native vegetation within the site; these are located along the north-east boundary, adjacent to the proposed access in the north of the site, and along the drainage channel in the centre of the site. Scattered roadside vegetation extends along the boundary of the proposal site along the Kidman Way, Ercildoune Road and Kook Road. There is one residence within one kilometre of the proposal site.

The proposed solar farm would connect to the existing 132 kilovolt (kV) Transgrid substation, located directly across Ercildoune Road, about 150m north of the site. The vegetation surrounding the substation has been cleared and is currently managed with hazard reduction burns, slashing or grazing. High voltage electricity easements are located to the west of the existing Transgrid substation, traversing pasture paddocks north of the proposal site.

The visual character of the village of Coleambally is defined by sealed tree-lined residential streets. The village is well screened from the Kidman Way by woodland. The village entrance includes a recreational area. An industrial area is located east of the village. The surrounding area is dominated by cropped paddocks, pastures, silos, irrigation channels and other agricultural infrastructure.

1.3 OBJECTIVES OF THIS REPORT

This VIA includes a full assessment of the visual impacts associated with the proposed Coleambally Solar Farm. Specifically, it includes an assessment of:

- Landscape character and scenic vistas in the locality.
- Stakeholder values regarding visual amenity.
- Potential impacts on representative viewpoints, including residences and road corridors.

Secretary's Environmental Assessment Requirements (SEARs) for the proposal were provided by NSW Department of Planning and Environment (DPE) on 13 February 2017. The SEARs are intended to guide the structure and content of the Environmental Impact Statement (EIS) and reflect the responsibilities and concerns of NSW government agencies in relation to the environmental assessment of the proposal. This report addresses the SEARs for the proposed Coleambally Solar Farm where relevant to potential visual impacts, as shown in Table 1-1.

Table 1-1 Secretary's Environmental Assessment Requirements for visual impact assessment of the Coleambally Solar Farm

Requirement	Addressed in this report
Visual – including an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners;	The following matters are addressed in this report: • Likely visual impacts on surrounding residences, road corridors, scenic or significant vistas • Glare, reflectivity and night lighting • A draft landscaping plan for on-site perimeter planting (Appendix D). • Consultation with most affected landowner It is noted that air traffic is considered separately in the EIS.

1.4 TERMINOLOGY

Terminology used in this report includes:

Study area	Defined as land within 16km of the proposed solar farm site.
Solar farm site / site	The lot boundaries within which the solar farm development is proposed, excluding offsite infrastructure such as transmission lines and connections.
Project	All infrastructure and activities required for the construction, operation and decommissioning of the solar farm.
Landscape Character Unit (LCU)	LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a way to categorise the existing scenic quality of the receiving environment and consider the ability of the environment to absorb visual change at the landscape scale.
Viewer sensitivity	Viewer sensitivity is subjective but can be discussed in terms of factors such as whether the view relates to recreational or work environments, or whether the view is experienced continuously or intermittently.
Landscape Management Zone (LMZ)	LMZs are derived by combining scenic quality with viewer sensitivity and proximity to the proposed infrastructure at the landscape scale. A three-tiered management hierarchy sets out appropriate management objectives for each zone.
Zone of Visual Influence (ZVI)	ZVI modelling uses GIS modelling and topography to determine areas which would be shielded from views of infrastructure at the proposed solar farm site. It does not take into account existing or proposed screening features such as vegetation or built structures.

2 METHODOLOGY

2.1 OVERVIEW

The VIA has been completed in the following stages:

1. Background investigations, mapping and modelling.
2. Field survey including reconnaissance, ground truthing and photography.
3. Community consultation.
4. Impact assessment.
5. Development of a visual impact mitigation strategy.

These methods are detailed below.

2.2 BACKGROUND INVESTIGATIONS, MAPPING AND MODELLING

Background investigations included identifying key landscape features within the landscape that may be affected by the visual impacts of the proposed solar farm. This was done using existing literature and aerial photos.

Mapping and modelling were undertaken to:

- Identify and classify LCUs within 16km of the proposed solar farm. This was done based on aerial imagery and later validated with field inspection. LCUs are a way to summarise differences in landscape amenity and the sensitivity of different areas within the landscape to visual impacts.
- Define areas in which the infrastructure may be visible, using ZVI modelling. A map identifying the ZVI (or viewshed) of the proposal was produced. This method uses topographic information to determine areas in which views of infrastructure may be visible. The infrastructure was modelled as a 3m high rectangular block, equivalent to the project boundaries. Topography was based on a 25m resolution Digital Elevation Model (DEM) derived from 25m contours. Modelling does not take into account screening that may be provided by existing vegetation or structures.
- Identify key viewpoints such as major travel routes, public recreation areas, potential receivers (dwellings and other structures), and built up areas. This step excluded areas deemed not to be visible from the ZVI modelling.
- Understand the feasibility of screening to mitigate visual impacts.

The results were used to inform the field survey.

2.3 FIELD SURVEY

With reference to the mapping and modelling, field reconnaissance and ground truthing was undertaken to:

- Verify and document the existing LCUs in the study area (16km).
- Identify representative viewpoints within the LCUs, including foreground, middle ground and background viewpoints.
- Understand the likely sensitivity of the LCUs to views of the proposed solar farm.

Fieldwork consisted of driving along major roads (and minor roads that were publicly accessible), investigating and documenting dominant visual character elements and potential views to the proposed infrastructure. Photographs were taken at representative locations. No residences were specifically targeted however, nearby roadside viewpoints have been tagged 'residential' where they occur near a residence.

Representative view point locations used in this assessment are provided in Appendix B.

2.4 COMMUNITY CONSULTATION

Community consultation specific to this assessment of visual impacts is required to:

- Understand how the community values existing visual amenity in the study area.
- Document the perceptions of the community to the proposed development.

Community consultation is being undertaken in accordance with the proposal's Community Consultation Plan. As part of the plan, respondents are being surveyed on their views regarding solar farm development and local visual amenity.

Specific questions relating to visual impacts were included in a feedback form distributed via:

- The project website.
- At a public information session to introduce the proposal, on 20 March 2017 in Coleambally.
- Direct meetings with near neighbours.

These questions related to:

- Local values, including views.
- Identification of views or landscape characteristics in the region and local area important to respondents.
- Perceptions and concerns about solar farm development.

The feedback form questions are included in Appendix C. The results are used in the impact assessment and are summarised in Section 3.3.2.

2.5 IMPACT ASSESSMENT

The impact assessment methodology used in this VIA is based on the Bureau of Land Management (BLM) Visual Resource Management System, developed by the BLM, US Department of the Interior (n.d). The BLM developed a systematic process to analyse the visual impact of proposed developments. The basic philosophy states that the degree to which a development affects the visual landscape depends on the visual contrast imposed by the project.

Key steps undertaken to assess the visual impact are as follows:

- Define LMZs for the representative viewpoints, based on:
    - The scenic quality of the study area's LCUs.
    - The expected sensitivity at representative viewpoints.
    - The proximity of each representative viewpoint.
- Evaluate the degree of contrast the solar farm would result in at representative viewpoints in consideration of the management objectives of the relevant LMZ.

- Determine the acceptability of the contrast with the management objectives of the relevant LMZ; this is the resultant visual impact, rated as high, medium or low.

Criteria for scenic quality, sensitivity, proximity, contrast and visual impact are included in the assessment, in Section 5.

Mitigation measures are considered to be required for 'high impact' receivers, for whom unmitigated impacts are considered greater than what is acceptable. For 'medium impact' receivers, the contrast is considered acceptable; mitigation may be recommended. For 'low impact' receivers, the contrast is considered unlikely to be perceived and therefore acceptable. No mitigation is considered.

3 EXISTING ENVIRONMENT

3.1 COLEAMBALLY

Coleambally is part of the Murrumbidgee LGA. The Murrumbidgee LGA has a population of 2,261 people (ABS, 2011). In the 2006 Census, the population was 2,503, which represents almost a 10 percent decline in population over a period of five years. The percentage of people of Indigenous origin in 2011 was 10.2 percent, which is high in comparison to the Australian average of 2.5 percent. The overseas immigrant population is small with 87 percent of the population born in Australia compared to the Australian average of 69.8 percent (ABS, 2011).

The local economy is based on irrigated and dryland agriculture, including broadacre cropping and sheep and cattle production. Sheep, beef cattle and grain farming involves 18.5 percent of the population. Other important sectors of the local economy include poultry farming, meat and meat product manufacturing, school education and residential care services (ABS, 2011). The unemployment rate for Murrumbidgee LGA is 4.4 percent, which is less than the national rate of 5.6 percent (ABS, 2011).

Coleambally is a service centre for the area and includes:

- A 'stop over' location along the Kidman Way, being a highway connecting Bourke with the Newell Highway north of Jerilderie.
- Tourist accommodation including one motel, one hotel motel and one caravan park (Murrumbidgee Council, 2017).
- Educational facilities within the Coleambally Shire include one Catholic primary school and one combined primary and high school.
- Tirkandi Inaburra Cultural and Development Centre.
- A medical centre.
- An aged care facility.
- A small shopping precinct with banks, post office, supermarket, newsagency, pharmacy and cafes.
- A community hall, Masonic hall, sports stadium and youth and sports centre.
- Recreational and sporting facilities including a public swimming pool, 9 hole golf course, recreation grounds for football and cricket, netball courts and tennis courts (Murrumbidgee Council, 2015).

The residences within the study area (16km) are either located on large land holdings or are located within the village of Coleambally, 5km south west of the proposal site. Approximately 6 residences are located in close proximity (within 2km) of the proposed solar farm site boundaries. None of these are project-involved. The location of these residences is shown in the Appendix B map set.

Local land uses in the study area include irrigated cropping, grazing (sheep and cattle), state forests, rural residential areas, commercial areas and electricity infrastructure.

3.2 SIGNIFICANT VISTAS

No look outs or promoted scenic areas are located within 16km of the site however, features that contribute to the scenic character of the area include:

- Coleambally village.

- Native vegetation remnants along roadside and irrigation channels.
- State forest reserves.
- Expansive pastoral views.

3.2.1 Coleambally village

The visual character of the village is defined by sealed, wide tree-lined streets, with buildings and other infrastructure such as street lights and power poles. Garden plantings that extend onto the nature strip, street trees and well maintained residences provide visual amenity.

3.2.2 Native vegetation remnants and State Forest reserves

The roads, irrigation channels and electricity transmission infrastructure create linear built elements in the landscape. Within these corridors however, native vegetation is quite mature and provides a relatively well connected series of remnants, breaking up or framing views of pastures for travellers in these corridors.

There are four State Forest Reserves within 16km of the proposal site. These reserves are relatively uniform areas of tall native vegetation. Three of the reserves are intersected by roads.

3.2.3 Expansive pastoral views

The pastures and cropping lands range from relatively low input (cattle grazing) to high input (high rotation irrigated cropping and canal infrastructure). The views would change with the seasons, from brown fallow areas, to yellow canola, green wheat, green rice and green and white cotton crops.

Figure 3-1 provides examples of local vistas.

a) Coleambally village

b) Native vegetation remanent along the Kidman Way and electricity easement.

c) Bretts State Forest, intersected by Martin Bell Road

d) Pastoral views

3.3 COMMUNITY VALUES

3.3.1 General attitudes to solar infrastructure

Research indicates there is widespread support for solar energy as a source of energy for electricity generation in Australia (ARENA n.d); 78% of respondents of the social research that the ARENA report is based on, are in favour of large scale solar energy facilities and 87% are in favour of domestic installations. The large scale solar energy sector is still at a relatively early stage of development in Australia. While most members of the community are aware of large scale solar energy, many do not know a great deal about their impacts (ARENA n.d.), including visual impacts.

Three approaches to improving community understanding of the visual impacts of large scale installations include:

- Provision of images (from many angles) of large scale solar facilities, particularly in the early stages of a proposal.
- Understanding the similarities between highly supported domestic scale installations and large scale facilities.
- Understanding the current function of the land proposed to hold the facility and the additional value the installation allows for.

(Source: extracted from ARENA n.d).

This report endeavours to address these issues.

3.3.2 Perceptions of the local community, regarding solar farm visual impacts

Community consultation specific to the assessment of visual impacts for the proposal was conducted for near neighbours and the broader community.

Nearest neighbours

Neoen representatives met with the nearest neighbours to the site on 27th and 28th February 2017. Information about the proposed solar farm was provided at the meetings and the neighbours were invited to raise concerns about the proposal.

Feedback from the neighbours was very positive as they saw the project as a good opportunity for the local community in terms of local employment, investment potential and 'dynamism' for the region. They also support the outcome of the town being a contributor to more sustainable energy generation.

Concerns were raised by one neighbour, relating to visual impact/impact on property value and potential increased fire risk. The location of an appropriate vegetation buffer and monitoring of views from the residence following commissioning of the solar farm was discussed during the one-on-one meeting with the concerned neighbour.

Broader community

A community drop-in session was held on March 20th at the Coleambally Club; about 15 people attended.

Feedback forms

As well as one on one and group presentations, a feedback form was prepared to better understand the community's values and concerns regarding the proposal (included in Appendix C). Forms were distributed

in one on one meetings. As of March 31, six forms have been received; one from a resident less than 2km from the site, one was 2-5 km from the site and four were located more than 5km from the site.

Local values of the respondents included:

- Values work opportunities
- Educational opportunities
- Community ties
- Recreational opportunities.

Positive aspects of solar energy were noted as:

- Potential for economic stimulus, jobs and tourism; the positive influence on rural confidence
- A diversification of land use
- The low impact of energy generation
- The use of natural resource / renewable electricity generation.

Concerns included:

- The potential for visual impacts
- The potential for community impacts
- The potential to effect land use or land values
- The potential for greater fire risk
- The potential to impact natural areas and habitats
- The issue of supplying accommodation to workers
- Concerns for movement of kangaroos that would be restricted by security fences

One respondent noted that they believed obstacles could be overcome regarding potential impacts generally.

Visual values included:

- Sun sets and sun rises,
- General landscape views
- The openness of the landscape
- Views from town
- Tree planting
- Local fauna.

3.4 LANDSCAPE CHARACTER UNITS (LCU)

LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a way to summarise differences in the receiving environment that may affect the visual impact of the proposed solar farm at different locations.

Four key LCUs were identified within 16km of the proposed solar farm site:

- Agricultural (both cropping and grazing lands).
- Reserves (State Forest Reserves, woodland).
- Rural village (retail, recreational and residential areas).
- Industrial (road, electricity and agricultural built infrastructure).

The scenic quality was rated in each LCU as follows:

- A high scenic quality rating describes areas with outstanding, unusual or diverse features.
- A moderate scenic quality rating applies to areas with the features and variety normally present in the character type.
- A low scenic quality rating is given for areas lacking features and variety.

The four LCUs identified within 16km of the proposed solar farm site are characterised in Table 3-1 in terms of their scenic quality and illustrated in the following plates.

Table 3-1 Landscape Characteristic Units (LCUs) within 16km of the Coleambally Solar Farm

Landscape Character Unit	Key features
Agricultural	The pastures and cropping lands are very flat, creating expansive views. The views would change with the seasons, brown fallow paddocks, yellow canola, green rice, green wheat and green and white cotton crops. Unsealed roads and bare paddocks are deep browns, light orange and reds. The Kidman Way is the main vantage point from which to view agricultural areas. From the road corridor, cropping lands and pastures are usually viewed through a screen of native vegetation of varying density. In some locations, this vegetation is dense with a well-developed midstorey that entirely screens views. In other areas, where the vegetation is lacking, wide pastoral views are afforded. In addition to the long sections of straight highway, overhead powerlines and irrigation channels are often visible and reinforce the rectilinear shapes. Residences within this landscape are sparsely distributed and commonly associated with some additional plantings, presumably to separate the residential spaces from the farmland. Other infrastructure includes sheds and low open fences. Also, located within this LCU: • A community farm, adjacent to the existing substation, just north of the proposal site. Currently a crop. • A Pony Club and olive business, over 2km west of the proposal site. **Scenic quality is moderate. Built elements are production related and include linear fences, powerlines, roads, irrigation channels and agricultural buildings and rural houses. Forms are generally uniform, of low elevation and linear. However, the colours would change with the seasons and where framed by road and channel side vegetation remnants, expansive pastures and crops can have a higher scenic quality. This LCU is common and the dominant LCU in the study area. The proposed solar farm site is located within this LCU.**
Reserve	There are two state reserves located within study area (16km). The Boona State Forest is located approximately 1km east of the proposal site. The Bretts State Forest is in three separate areas, these are approximately located 900m north, 3km west and 2.7km south of the proposal site. These reserves are consistent areas of woodland, often intersected by internal unsealed tracks and Bretts State Forest is intersected by local roads. The views would be mostly trees, browns and greens. There is limited midstorey and the under storey is dominated by brown and green grasses. **Scenic quality is considered moderate. These areas have variety in colour and form normal in this character type. Elements include woodland and recreational aspects. This LCU is common in the study area.**

Landscape Character Unit	Key features
Rural village	Coleambally is a service centre for surrounding large land holdings and a stop over for motorists between the larger service centres of Griffith, Jerilderie and Finley. The village is located off the Kidman Way and is surrounded by woodland to the north, east and south. The village includes: • A tree lined divided main street (Kingfisher Avenue). Garden plantings that extend onto the nature strip, street trees and well maintained residences provide visual amenity. • Buildings are modest and located side by side. Residences are well maintained. Outlooks are generally limited, onto other residences or low relief rural views to west or onto woodland to the north and south of the town. • A main recreational area, at the entrance to the town on the junction with the Kidman Way. This includes picnic area, BBQs, playground and old large machinery. Other recreational areas in the village include sporting ovals and ovals associated with the school located with the south eastern area of the town. These areas are also occupied by tennis basketball and netball courts. Gardens and lawns are vivid green with large feature trees. All the roads are sealed. **Scenic quality is considered moderate. These areas have variety in colour and form normal in this character type. Elements include recreational aspects; parks and gardens. This LCU is common in the study area.**
Industrial	To the east of the village, industrial infrastructure dominates landscape. Silos and Sunrice Rice Mill creates a localised industrial precinct. Industrial features include: • Agricultural silos and processing infrastructure. • Transit vehicles and large trucks actively work this area. • Large industrial sheds, stockpiles and ponds. Another industrial area is located north of the proposal site. It is dominated by a substation and large silos. The connecting powerlines and fencing contribute to the industrial character. A waste depot is located 3.4km west of the proposal site. It features fencing, weighbridge, buildings and large vehicles would be common in the area. **Scenic quality is considered low. Elements are production related. The structures match the land use. Screening is present at both areas, breaking up views from the roads. This LCU is common in the study area.**

Agricultural LCU plates








Reserve LCU plates

Residential LCU plates

Industrial LCU plates

3.5 VIEWPOINT SENSITIVITY

3.5.1 Identifying viewpoints

The BLM methodology requires identification of representative viewpoints in the study area. These may be travel routes such as roads, waterways and recreational tracks, residential areas, tourist facilities, houses and farmland.

The ZVI modelling produced a set of maps that estimated the areas that would be shielded from views of infrastructure at the proposed solar farm site, based on topography. A height of 3m was used to model onsite infrastructure. This is a realistic approximation of the height of panels and inverter containers, which may actually be 2.3m and 3.5m, respectively. Viewpoints were not selected in areas predicted to be shielded from views of the solar farm. Twenty six representative viewpoints were identified within the ZVI and are mapped in Appendix B, which colour codes the LCU of each viewpoint.

3.5.2 Rating proximity and assessing sensitivity of viewpoints

The predicted sensitivity of each viewpoint can be determined, considering its proximity to the proposed solar farm site and factors such as use, scenic quality and regional significance.

Criteria for proximity are as follows:

- Foreground 0 – 1 kilometres
- Middle ground 1 – 5 kilometres
- Background 5 – 16 kilometres

Criteria for sensitivity are as follows:

- High sensitivity:
  - high use routes or areas
  - routes or areas of national or state significance
  - areas with high scenic quality
- Moderate sensitivity:
  - moderate use routes or areas
  - routes or areas of regional or local significance
  - areas with moderate scenic quality
- Low sensitivity:
  - low use routes or areas
  - routes or areas of low local significance
  - areas with low scenic quality

Considering the sensitivity of local viewpoints, the following assessments were made:

- **Residential / recreational viewpoints** were assessed as having high sensitivity generally. While the population is relatively low, in these locations, if there were a view to the solar farm infrastructure, the view duration could be expected to be high for a receiver. Maintenance of gardens and recreational areas in Coleambally and surrounds demonstrates the areas are valued for their visual amenity.
- **Road viewpoints** were assessed as having generally moderate sensitivity. While the Kidman Way is a high use corridor, in the 100km speed zone, motorists would have limited view durations, if there were a view to the solar farm infrastructure. There are

limited pull over areas. As motorists use local roads such as Ercildoune Road and Kook Road, as well approaching intersections with the Kidman Way, view durations increase as vehicle speed is reduced (50-80km/hr). However, the expected amount of vehicles on these local road are considered to be low.

- **Industrial viewpoints** were assessed as having low sensitivity. In these locations, receivers would be more likely to be focused on work activities and view durations, if there were a view to the solar farm infrastructure, would be limited due to this focus. While sites are tidy and well kept, there is limited effort expended on visual amenity, such as screening or garden plantings in Coleambally and surrounds. Built structure is more commonly functional than aesthetic in these commercial settings.

The sensitivity of each viewpoint is tabulated below; 26 representative viewpoints were identified and are mapped in Appendix B, which colour codes the LCU of each viewpoint.

Table 3-2 Representative viewpoints and assessed proximity, scenic quality and sensitivity

ID	LCU	View location	Distance to site	Scenic quality	Sensitivity
1	Industrial	Industrial	Foreground	Low	Low
2	Agricultural	Road	Foreground	Moderate	Moderate
3	Agricultural	Road	Foreground	Moderate	Moderate
4	Agricultural	Road	Foreground	Moderate	Low
5	Agricultural	Road	Foreground	Moderate	Low
6	Agricultural	Road	Foreground	Moderate	Low
7	Agricultural	Road	Foreground	Moderate	Low
8	Reserve/Industrial	Industrial	Middle ground	Low	Low
9	Agricultural	Road	Middle ground	Moderate	Low
10	Agricultural	Road	Background	Moderate	Low
11	village	Recreational	Middle ground	Moderate	High
12	village	Residential	Middle ground	Moderate	High
13	Reserve	Road	Middle ground	Moderate	Moderate
14	Industrial	Industrial	Middle ground	Low	Low
15	Agricultural	Residential	Middle ground	Moderate	High
16	Agricultural	Road	Foreground	Moderate	Moderate
17	Agricultural	Road	Foreground	Moderate	Moderate
18	Agricultural	Road	Foreground	Moderate	Moderate
19	Agricultural	Road	Foreground	Moderate	Moderate
20	Agricultural	Residential	Middle ground	Moderate	High
21	Agricultural	Residential	Middle ground	Moderate	High
22	Agricultural	Residential	Middle ground	Moderate	High
23	Agricultural	Residential	Middle ground	Moderate	High
24	Agricultural	Residential	Middle ground	Moderate	High
25	Agricultural	Residential	Middle ground	Moderate	High
26	Agricultural	Residential	Middle ground	Moderate	High

4 VISUAL CHARACTERISTICS OF KEY INFRASTRUCTURE COMPONENTS

The key infrastructure components of the proposed Coleambally Solar Farm, with reference to the stage of the project and the potential visual amenity impacts they may generate are discussed below and referenced in the visual impact assessment, Section 5.

4.1 INFRASTRUCTURE COMPONENTS

The proposal includes the following components:

- Solar arrays: approximately 560,000 solar panels supported by approximately 75,000 piles, driven or screwed into the ground in order to support the solar array's mounting system. The panels to be installed would be either:
    - single-axis tracking panels (which would have approximately 7,900 tracker units)
    - north-oriented fixed-tilt panels
    - east-west facing fixed-tilt panels
    - or a combination of these alternatives.
- Up to 80 PV boxes skids, each of them containing at least one inverter and one transformer.
- One containerised or skid-mounted medium voltage delivery station.
- One containerised or skid-mounted high voltage solar substation including at least one 132 kV transformer.
- Onsite cabling and electrical connections between solar arrays and panel inverters.
- Trenches for underground cabling.
- New site access point from Ercildoune Road.
- Gravel access road and parking for staff and visitors.
- Internal gravel access tracks to allow for site maintenance.
- Upgrade of Ercildoune Road and its intersection with Kidman Way in accordance with NSW Roads and Maritime Services and Murrumbidgee Council requirements.
- Construction of access bridge over Tubbo irrigation channel from Ercildoune Road.
- Construction of bridge over Tubbo irrigation channel from Kook Road for maintenance access to the solar substation.
- Construction of bridge across central irrigation drainage channel.
- Permanent staff amenities and office building (approximately 8.5 metres long and 5 metres wide).
- Perimeter security fencing, approximately 2.3 m high.
- A 132kV underground transmission line to connect the solar farm to the existing Coleambally TransGrid substation, approximately 150 metres north of the proposal area.
- Possible battery storage. The inclusion of batteries would be considered during the detailed design stage.
- Possible irrigation drainage channel relocation, subject to final design.
- Extension of the existing bench of the substation on Lot 3 DP 1055725 to accommodate the new connection infrastructure. The proposed bench would be built to the same level as the existing substation, and the height of HV equipment would be similar to the adjacent switch bays.

Within the 570 ha proposal area, ground disturbance would be limited to:

- The installation of the piles supporting the solar panels, which would be driven or screwed into the ground.
- Construction of internal gravel access tracks and access bridges.
- Establishment of PV skids or boxes, delivery station and solar substation.
- Trenching and possible boring for the installation of cables.
- Establishment of staff amenities and offices.
- Construction of parking area.
- Construction of perimeter security fencing.
- Trenching and boring of underground transmission line.
- Substation extension.
- Establishment of battery storage if carried out.
- Modification or relocation of irrigation drainage channel if carried out.

As illustrated on the Proposed Infrastructure map in Appendix A.2, the indicative solar array area covers the majority of the site, however the ground disturbance from pile installation would disturb only a fraction of the total site area. Panels within the solar array area would sit above the ground and ground cover would be maintained under the panels. Additional ground disturbance outside the solar arrays would result from construction of the internal access tracks, trenches for cabling and footings for other equipment.

The following construction ancillary facilities would be located within one or both ancillary facility option areas within the proposal area:

- Material laydown areas.
- Temporary construction site offices.
- Temporary car and bus parking areas for construction workers transportation. Once the solar farm has been commissioned a small car park would remain for the minimal staff required and occasional visitors.
- Staff amenities. Once constructed, the solar farm would be monitored and operated remotely and would therefore require a minimum number of maintenance personnel to be onsite.
- Parking for staff and visitors.

These facilities would be designed in line with the relevant Australian standards.

Staff amenities would be designed to accommodate the number of workers at the peak of the construction period and would include:

- Car park.
- Sanitary modules with septic tank.
- Changing rooms.
- Administrative office.
- Undercover storage area.
- Muster point in case of emergency.
- Genset for electrical supply.

Temporary construction ancillary facilities and solar farm ancillary facilities would be located within ancillary facilities Area A or Area B or a combination of both, indicated in the Proposed Infrastructure map in Appendix A.

The construction phase of the project is expected to take between 9 to 12 months. The proposal is expected to have approximately a 30 year operating life at which point the solar farm would either;

- Be decommissioned at the end of its operational life, removing all above ground infrastructure and returning the site to its existing land capability, or
- Continue operation (which could involve reconditioning) if the lease agreement is renewed. Reconditioning would involve replacing components that were originally installed with new components that reflect technology that is available at that time.

4.1.1 Construction components

Construction impacts would be temporary, confined to approximately 9-12 months. Visual impacts could be generated during this time by:

- Development of site compound areas, site offices and stock piles, located within the site boundaries. Steel sheds can generate reflectivity and glare although would be a similar look to existing farm sheds. Material stockpiles may detract from visual amenity, particularly if dispersed across broad areas.
- Construction traffic will increase visual impacts and add to dust generation on the entry to Kidman Way. Onsite parking areas, material laydown, site offices etc. would be visible from the Kidman Way, Ercildoune Road and Kook Road.
- Areas of bare soil created through grading or trenching cables could contribute to dust and detract from visual amenity until they are rehabilitated. These areas would be visible to the Kidman Way, Ercildoune Road and Kook Road.

4.1.2 Operational components

Operational impacts centre on the look of the solar farm, once construction is complete.

- The solar arrays would be between 1.5m to 2.3m high.
- Several different solar PV mounting technology options are still being considered:
    - North orientated fixed tilt.
    - East-west facing fixed tilt.
    - Single-axis trackers.
    - Combination of all the above alternatives.

  The mounting technology will affect the views of infrastructure; that is, whether panels or mountings are the dominant element from a specific viewing location.

  The potential for glare associated with non-concentrating photovoltaic systems which do not involve mirrors or lenses is relatively limited. PV solar panels are designed to reflect as little sunlight as possible (generally around 2% of the light received; Spaven Consulting 2011), resulting in negligible glare. The reason for this is that PV panels are designed to absorb as much solar energy as possible in order to generate the maximum amount of electricity or heat. The panels will not generally create noticeable glare compared with an existing roof or building surfaces (NSW Department of Planning 2010). Seen from above (such as from aircraft) they appear dark grey and do not cause a glare or reflectivity hazard. Solar photovoltaic farms have been installed on a number of airports around the world.

  Other onsite infrastructure that may cause glare or reflections depending on the sun angle, include:

    - Steel array mounting - array mounting would be steel or aluminium.

- Temporary site offices, sheds, PV boxes or PV skids.
- The onsite delivery station.
- Perimeter fencing.
- Permanent staff amenities.

This infrastructure would be relatively dispersed and unlikely to present a glare or reflectivity hazard to motorists or aircraft.

- PV boxes or PV skids and could measure up to 3.5m high.
- Electricity cables would be installed between the array modules, either underground or mounted to the underside of the array, producing negligible additional visual impact.
- The electrical connection from the site would be via a 132kV underground line running to the existing Coleambally Transgrid substation, approximately 150m north east of the site. Visual impact of this would be negligible.
- The delivery station and site offices would add visual impact, mostly to motorists along the Kidman Way, Ercildoune Road and Kook Road. The delivery station would most likely be visible for the closest residence to the proposal site, approximately 932m south east. The delivery station would be similar to the PV boxes or skids, up to 3.5m high. The site office would be up to 4m high.
- Fencing would be up to 2.3m high security fencing along the site boundaries. It is expected to be cyclone fencing with a strand of barbed wire at the top. While much higher than the array, the fence would not be solid. Views would be afforded beyond the fence.
- The main access to the site would be off Ercildoune Road. This would be a visual impact to motorist along Ercildoune Road.
- An area for parking would be included within the site boundaries.

Infrastructure would be of low height, up to 4m, and in this low relief landscape, relatively easily screened as part of the project. Examples of the look of some of the key infrastructure components are provided in figures below.

Figure 3-1 Example of poles driven into the ground on a Neoen solar project in Western Australia

Figure 3-2 Example of a single-axis mounting system before panel installation.

Figure 3-3 Example of a single-axis mounting system after panel installation.

Figure 3-4 Example of a containerised PV box

Figure 3-5 Example of a skid platform PV box

5 IMPACT ASSESSMENT

The VIA was undertaken considering:

- The infrastructure components, described in Section 4.
- Their potential to be viewed from representative viewpoints.
- The degree of contrast they would have within identified LMZ.

LMZs were assigned to each viewpoint and the contrast at that viewpoint was evaluated, as described below.

5.1 DEFINITION OF LANDSCAPE MANAGEMENT ZONES

Visual LMZs were assigned to each representative viewpoint. The zones were derived by combining scenic quality (from the LCU, Section 3.2), viewer sensitivity and the distance to the proposed solar farm site (from Section 3.3). Combined they produce a three-tiered management hierarchy: A – C, as shown in Table 5-1.

Table 5-1 Visual Landscape Management Zone decision matrix

		Proximity / sensitivity						
		Foreground High	**Middle ground High**	**Background High**	**Foreground Moderate**	**Middle ground Moderate**	**Background Moderate**	**Foreground Low**
Scenic quality	**High**	A	A	A	A	B	B	B
	Moderate	A	B	B	B	B	C	C
	Low	B	B	B	B	C	C	C

Each zone has associated objectives to guide management of visual change and to help evaluate proposed project impacts. These are shown in Table 5-2:

Table 5-2 Visual Landscape Management Zone management objectives

Management priority	Management objectives
A	Maximise retention of existing visual amenity. Landscapes are least able to absorb change. Developments may lead to a major change.
B	Maintain existing visual amenity, where possible. Protect dominant visual features. Developments may be allowed to be visually apparent.
C	Less importance for retaining existing visual amenity. Landscapes are able to absorb change. Developments may be allowed to dominate but should reflect existing forms and colours where possible.

5.2 VISUAL IMPACT ASSESSMENT AT REPRESENTATIVE VIEWPOINTS

5.2.1 Evaluation criteria

The ratings for the degree of contrast created by the proposed solar farm infrastructure in each viewpoint have the following definitions (BLM n.d.):

- High contrast: the proposal would be dominant within the landscape and generally not overlooked by the observer, the visual change would not be absorbed.
- Medium contrast: the proposal would be moderately dominant and noticed, the visual change would be partially absorbed.
- Low contrast: the proposal would be seen but would not attract attention, the visual change would be well absorbed.
- Indistinct: contrast would not be seen or would not attract attention, the visual change would be imperceptible.

To determine if the objectives for the VLM zone are met, the contrast rating for the viewpoint is compared with the relevant management objectives to give a visual impact level. The visual impact level is consequently defined as:

- High impact: contrast is greater than what is acceptable.
- Medium impact: contrast is acceptable.
- Low impact: visual contrast is little or not perceived and is acceptable.

For high impact viewpoints, mitigation must be considered.

Table 5-3 below evaluates the representative viewpoints. They are ordered in terms of highest visual impact rating. Note, no high impact viewpoints were identified. The results summary is presented in Section 5.2.

Table 5-3 Visual impact at representative viewpoints with reference to the Coleambally Solar Farm

ID	LCU	Viewpoint	LMZ objective	Contrast	Visual Impact	Comment	Image
2	Agricultural	Road (foreground)	B Protect dominant visual features	Medium	**Medium**	The viewpoint is located at the junction of the Kidman Way and Ercildoune Road, adjacent to the north eastern corner of the proposal site. Dominant features are road infrastructure, transmission lines, cropping paddocks, irrigation channels and fencing. View extent to the solar farm site is relatively unimpeded for south bound traffic. Along this section of the Kidman Way views of the solar farm infrastructure would be visible for traffic travelling in both directions with some minor breaks through existing vegetation screening. View durations would be relatively short in this 100km/hr zone. **Mitigation is suggested** The view of the array site could be softened along its north-eastern corner to break up views of the array infrastructure. The aim in this area will be to minimise the cumulative impact of built elements. The mitigated visual impact would be considered low.	
3	Agricultural	Road (foreground)	B Protect dominant visual features	Medium	**Medium**	This viewpoint is located along Ercildoune Road, just 340m west of the Kidman Way junction and 100m east of the entrance into the Community Farm (also substation). Dominant features are cropping paddocks and overhead powerlines. The silos and substation north of the view point are well screened. This section of road would be used by locals and visitors to the community farm. View extent to the solar farm site is relatively unimpeded. View durations would be relative short in this 60km/hr zone. **Mitigation is suggested** The view of the array site could be softened along its north-eastern corner to break up views of the array infrastructure. The aim in this area will be to minimise the cumulative impact of built elements. The mitigated visual impact would be considered low.	

ID	LCU	Viewpoint	LMZ objective	Contrast	Visual Impact	Comment	Image
17	Agricultural	Road (foreground)	B Protect dominant visual features	Medium	**Medium**	The viewpoint is located along the Kidman Way, approximately 480m west of the south western corner of the proposal site. Dominant features are the road, cropping paddocks, irrigation channels and fencing. View extent to the solar farm site is relatively unimpeded for east-bound traffic. View durations would be relatively short in this 100km/hr zone. **Mitigation is suggested** The view of the array site could be softened along its south-western corner to break up views of the array infrastructure. The mitigated visual impact would be considered low.	
19	Agricultural	Road (foreground)	B Protect dominant visual features	Medium	**Medium**	The viewpoint is located along the Kidman Way, approximately 75m east of the south eastern corner of the proposal site. Dominant features are the road, cropping paddocks, irrigation channels and fencing. View extent to the solar farm site is relatively unimpeded for west-bound traffic. View durations would be relatively short in this 100km/hr zone. **Mitigation is suggested** The view of the array site could be softened along its south-eastern corner to break up views of the array infrastructure. The mitigated visual impact would be considered low.	

ID	LCU	Viewpoint	LMZ objective	Contrast	Visual Impact	Comment	Image
20	Agricultural	Residential (Middle ground)	B Protect dominant visual features	Medium	**Medium**	The viewpoint is the closest residence to the proposal site, approximately 932m south east of the site. The viewpoint was taken from the rear of the property. The residence and its backyard area faces the proposal site. The residence would have long term views of the site to the south-west, west and north. There is vegetation screening present however, between the residence and the solar site in these directions. An example of the vegetation present is shown in the adjacent image. **Mitigation is suggested** While existing screening may soften the views sufficiently, potential for additional vegetation screening in this location should be discussed with the affected landowner.	
4	Agricultural	Road (foreground)	B Protect dominant visual features	Low	**Low**	Dominant visual features at this viewpoint include the road corridor, fencing, overhead electricity, pastures and irrigation channels. View extent and duration would be limited by the height of the existing irrigation channel banks. The use of the vehicles along Kook Road are expected to be low. There are no residences present along Kook Road. **No mitigation required**	

ID	LCU	Viewpoint	LMZ objective	Contrast	Visual Impact	Comment	Image
5	Agricultural	Road (foreground)	B Protect dominant visual features	Low	**Low**	Dominant visual features at this viewpoint include the road corridor, fencing, overhead electricity, pastures and irrigation channels. View extent and duration would be limited by the height of the existing irrigation channel banks. The use of the vehicles along Kook Road are expected to be low. There are no residences present along Kook Road. **No mitigation required**	
6	Agricultural	Road (foreground)	B Protect dominant visual features	Low	**Low**	Dominant visual features at this viewpoint include the road corridor, fencing, overhead electricity, pastures and irrigation channels. View extent and duration would be limited by the height of the existing irrigation channel banks. The use of the vehicles along Kook Road are expected to be low. There are no residences present along Kook Road. **No mitigation required**	

ID	LCU	Viewpoint	LMZ objective	Contrast	Visual Impact	Comment	Image
7	Agricultural	Road (foreground)	B Protect dominant visual features	Low	**Low**	Dominant visual features at this viewpoint include the road corridor, fencing, overhead electricity, pastures and irrigation channels. View extent and duration would be limited by the height of the existing irrigation channel banks. The use of the vehicles along Kook Road are expected to be low. There are no residences present along Kook Road. **No mitigation required**	
16	Agricultural	Road (foreground)	B Protect dominant visual features	Low	**Low**	Dominant visual features at this viewpoint include the road corridor, fencing, pastures and irrigation channels. View extent is impeded by some vegetation screening and views would also be limited by distance. **No mitigation required**	

ID	LCU	Viewpoint	LMZ objective	Contrast	Visual Impact	Comment	Image
18	Agricultural	Road (foreground)	B Protect dominant visual features	Low	**Low**	Dominant visual features at this viewpoint include the road corridor, fencing, pastures and irrigation channels. The viewpoint is adjacent to the southern boundary, however vegetation screening impedes the view for vehicles along this section of the Kidman Way. **No mitigation required**	
26	Agricultural	Residential (Middle ground)	B Protect dominant visual features	Low	**Low**	Dominant visual features at this viewpoint include the road corridor, fencing, overhead electricity, pastures and irrigation channels. Viewpoint is location along Eulo Road representing residences to the east. View extent and duration would be limited by distance and vegetation screening. Traffic along Eulo Road is expected to be low. **No mitigation required**	
1	Industrial	Commercial (foreground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
8	Reserve/Industrial	Commercial (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
9	Agricultural	Road (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA

ID	LCU	Viewpoint	LMZ objective	Contrast	Visual Impact	Comment	Image
10	Agricultural	Road (Background)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
11	Village	Recreational (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
12	Village	Residential (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
13	Reserve	Road (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
14	Industrial	Commercial (middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
15	Agricultural	Residential (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
21	Agricultural	Residential (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
22	Agricultural	Residential (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
23	Agricultural	Residential (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA
24	Agricultural	Residential (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA

ID	LCU	Viewpoint	LMZ objective	Contrast	Visual Impact	Comment	Image
25	Agricultural	Residential (Middle ground)	C Reflect existing forms and colours	Indistinct	**Low**	Proposed infrastructure unlikely to be discernible. **No mitigation required**	NA

5.2.2 Results summary

No view points were assessed to have a high impact and as such no screening is required. However, in a number of locations it is considered that screening may soften close up views (not block views) of the infrastructure and assist to mitigate cumulative impacts. In these locations, screening is suggested to be considered by the proponent, in consultation with the community.

Medium impact – mitigation could be considered

Medium impacts are seen for five viewpoints including four road viewpoints within the foreground and one residential viewpoint within the middle ground. Viewpoint 2 at the junction of the Kidman Way and Ercildoune Road and Viewpoint 3 along Ercildoune Road are in close proximity of the site. It is expected this area would be of moderate use with the access to the community farm and motorists would be travelling at a slower speed than that on the Kidman Way increasing view duration. There is minor vegetation screening present, however more is present to screen the silos and substation to the north. This existing screening to the north would make the solar infrastructure a dominant feature within the landscape. Screening as a mitigation strategy should be considered for these viewpoints.

Viewpoints 17 and 19 are adjacent the southern boundary of proposal site along the Kidman Way. The Kidman Way is considered a high use area, however view durations would be short of the proposal. At these two viewpoints existing vegetation screening is minimal and there would be dominant views of the infrastructure. The form of the infrastructure, low (<3m) and in rectangular arrays, is not incongruous with the existing low lying rectangular forms in this agricultural area however, screening as a mitigation strategy could soften views of infrastructure from these viewpoints.

A medium impact is also expected for the closest residence, represented by viewpoint 20. While it occurs in a low use area (one residence) and existing vegetation will to some extent screen views to the proposed solar farm site from the residence itself, there is potential for long duration views of infrastructure from some areas of the yard. The form of the infrastructure, low (<3m) and in rectangular arrays, is not incongruous with the existing low lying rectangular forms in this agricultural area however, screening as a mitigation strategy should be considered in consultation with the landowner for this viewpoint.

Suggested (not required) screening is provided in Appendix D and discussed further in Section 6.1. Additionally, general design measures have been recommended that would further lessen the contrast of the infrastructure from these locations.

Low impact – no mitigation

Low impacts are seen for roads and residences, commercial, recreational and forestry reserves in the middle and background where views of the solar farm infrastructure would be difficult to perceive or indistinct. No mitigation is required for these locations.

5.3 CUMULATIVE IMPACTS

Adverse cumulative impacts occur when the infrastructure or activities at the solar farm site exacerbate the negative impacts of other infrastructure or activities occurring nearby.

5.3.1 Construction

During construction, the additional traffic and dust generation impacts are probably the greatest potential for cumulative visual impacts. The Kidman Way is a high use road corridor carrying a large proportion of heavy and oversized vehicles. Ercildoune Road, while only a short section of this road would be utilised, is unsealed and also carries large vehicles. The visual impact of increased traffic movements to the site and potential dust generation along Ercildoune Road would be predominantly limited to construction (approximately 9-12 months). It is understood a Traffic Management Plan would be developed to minimise vehicle movements as much as practical for construction.

5.3.2 Operation

The operational view of the solar farm may generate a cumulative impact with the existing substation and powerlines. The array site requires security fencing and steel dominated infrastructure.

Further, at the northern boundary and at any of the proposed site access options, the solar array may add to existing transmission line, road, and fencing infrastructure, to detract from the visual amenity.

During operation, excepting unusual maintenance operations such as inverter or transformer replacement, a small maintenance team using standard vehicles are all that will be required. Cumulative visual traffic impacts are considered negligible.

It is possible another large scale development could be approved within view of the proposed solar farm, however none are known to be proposed at this time.

Generally, adverse cumulative visual impacts are anticipated to be manageable due to the ability to effectively screen infrastructure in this low relief landscape. Specifically, screening to soften cumulative impacts near view point 2 has been recommended.

6 MITIGATION STRATEGY

6.1 SCREENING

6.1.1 Screen location

No viewpoints were assessed as requiring screening (high impact locations) however, to minimise impacts and address community concerns, screening vegetation would be considered in accordance with the draft planting layout provided in Appendix D, to break up views from key locations.

The final screening plan should be developed in consultation with the nearest affected landowner (the residence 932m south-east of the site).

6.1.2 Screen requirements

- Plantings would be more than one row deep and where practical, planted on the outside of the permitter fence, to break up views of infrastructure including the fencing.
- The plant species to be used in the screen are recommended to be native, derived from the naturally occurring vegetation community in this area. They should be fast growing, with spreading habitat and having a mature height of 3-4 m. Species selection could be undertaken in consultation with affected near neighbours and a botanist or landscape architect.
- The timing is recommended to be within 2 months of completion of construction so that actual impacts of infrastructure are mitigated. The timing of planting should also be chosen to ensure the best chance of survival.
- The screen would be maintained for the operational life of the solar farm. Dead plants would be replaced. Pruning and weeding would be undertaken as required to maintain the screens visual amenity and effectiveness in breaking up views.

It is noted that the aim of plant screens is to break up the view and not eliminate it entirely. Partial views are considered likely, particularly while vegetation is developing to maturity.

6.2 GENERAL MEASURES

The following measures are recommended to reduce the general visual impact of the development for all other receivers:

6.2.1 Design

- The materials and colour of onsite infrastructure will, where practical, be non-reflective and in keeping with the materials and colouring of existing infrastructure or of a colour that will blend with the landscape. Where practical:
    - Buildings will non-reflective and in eucalypt green, beige or muted brown.
    - Pole mounts will be non-reflective.
    - Security fencing posts and wire would be non-reflective.

6.2.2 Construction

- During construction, dust would be controlled in response to visual cues.
- Areas of soil disturbed by the project would be rehabilitated progressively or immediately post-construction, reducing views of bare soil.
- Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations). It would be directed away from the Kidman Way, so as not to cause light spill that may be hazardous to drivers.

7 CONCLUSION

This report has been prepared to assess the potential visual impacts of the proposed Coleambally Solar Farm. A systematic evaluation has been undertaken to address subjectivity as much as possible. The report was informed by background investigations, mapping and modelling, field survey including reconnaissance, ground truthing and photography and the results of project-specific community consultation.

The proposed Coleambally Solar Farm is located in an agricultural area of generally moderate scenic quality. The visual characteristics of the expansive landscape, including sun sets and sun rises, general landscape views, tree planting and sightings of local fauna are important to members of the local community. It is located next to a high use transport corridor and about 900m from one residence. No view points were considered to be highly impacted by the views infrastructure and require mitigation. A medium impact was determined for five representative viewpoints. Onsite vegetation screening is suggested as a feasible way to break up views of the proposed infrastructure from key locations, also addressing cumulative impacts. A draft landscape plan is provided based on this assessment.

General measures to reduce impacts for all receivers have also been recommended. These centre on use of design elements to reduce visual contrast, mitigation of construction impacts such as dust and traffic that may reduce visual amenity and mitigation of operation impacts, such as maintaining ground cover beneath the panels, to break up side on and back views of infrastructure and soften the appearance of the facility.

Large scale solar farms are still relatively new in Australia. While they enjoy support from many in the community, provision of information on expected visual impacts and involvement in mitigating impacts (for affected receivers) is considered very important to obtaining social license to operate. With the involvement of the affected landowners in the mitigation strategy set out in Section 6, the visual impacts of the proposal are considered acceptable and manageable.

8 REFERENCES

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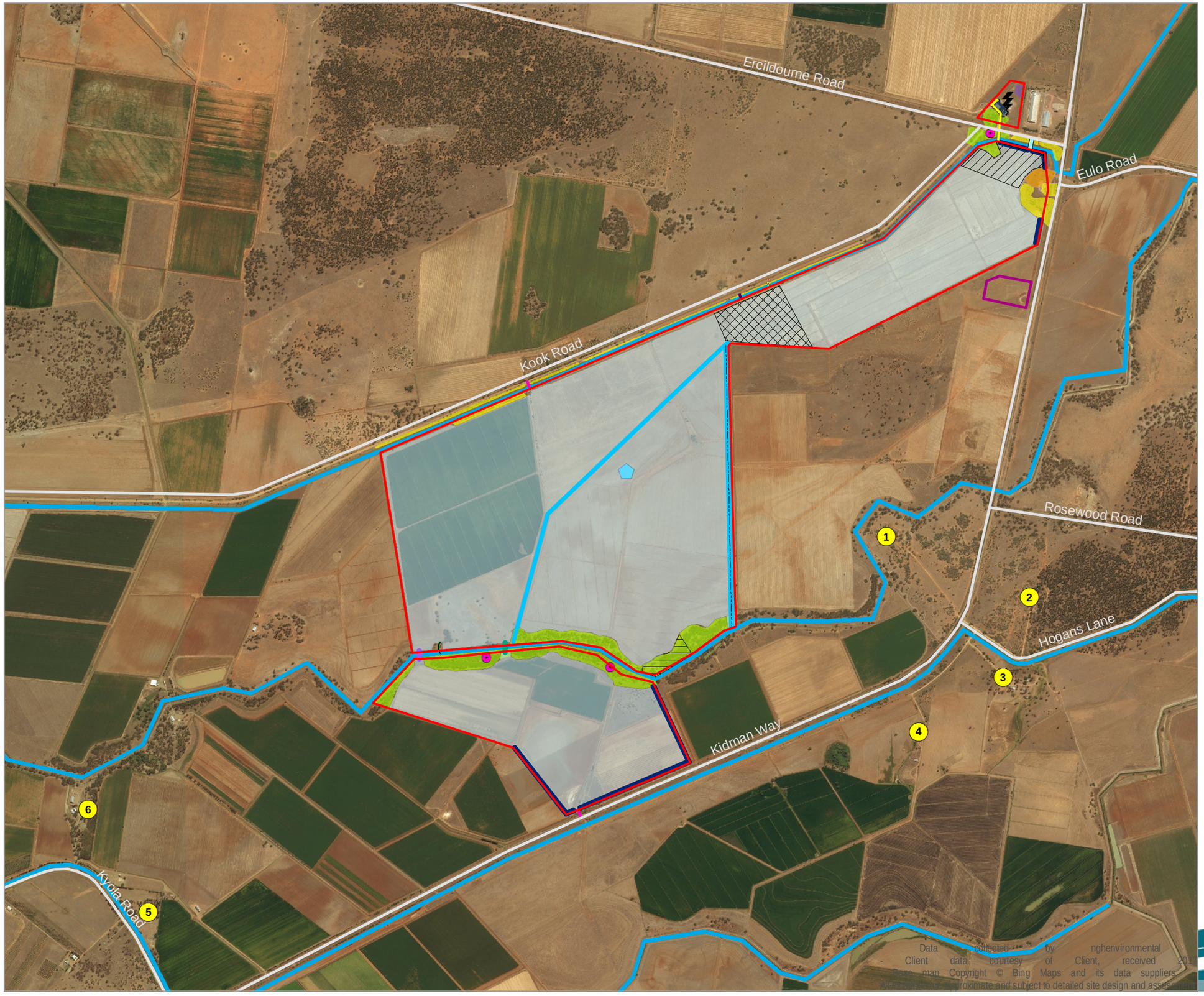
APPENDIX A LOCATION AND PROPOSED INFRASTRUCTURE LAYOUT



Proposal Area

Substation

Ethanol Plant Infrastructure

Development Envelope

Site access footprint

Solar farm footprint

Substation borrow pit

Transmission line and substation footprint

Irrigation Drain Crossing Options

Option A

Option B

Ancillary Areas

Area A

Area B

New Transmission Line

Proposed Vegetation Screening

Internal Irrigation Channel

Potential New Modified Drainage Channel

Substation Extension

Substation Extension

Temporary substation footprint

Landholders Set Aside Area

Hollow Bearing Tree

European Marker Trees

Plant Community Type

Black Box Open Woodland Moderate/Good Condition

Weeping Myall Woodland Moderate/Good Condition

Weeping Myall Woodland Low Condition

Farm dam

Roads

Access Roads

Existing Emergency Access

Maintenance Access Option A

Maintennace Access Option B

Site Access Road

Sensitive Receivers

0 0.3 0.6 1.2 Kilometers

Ref: Coleambally Solar Farm
Author: L Hamilton
Date:18/04/2017

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APPENDIX B ZONE OF VISUAL INFLUENCE AND REPRESENTATIVE VIEW POINTS

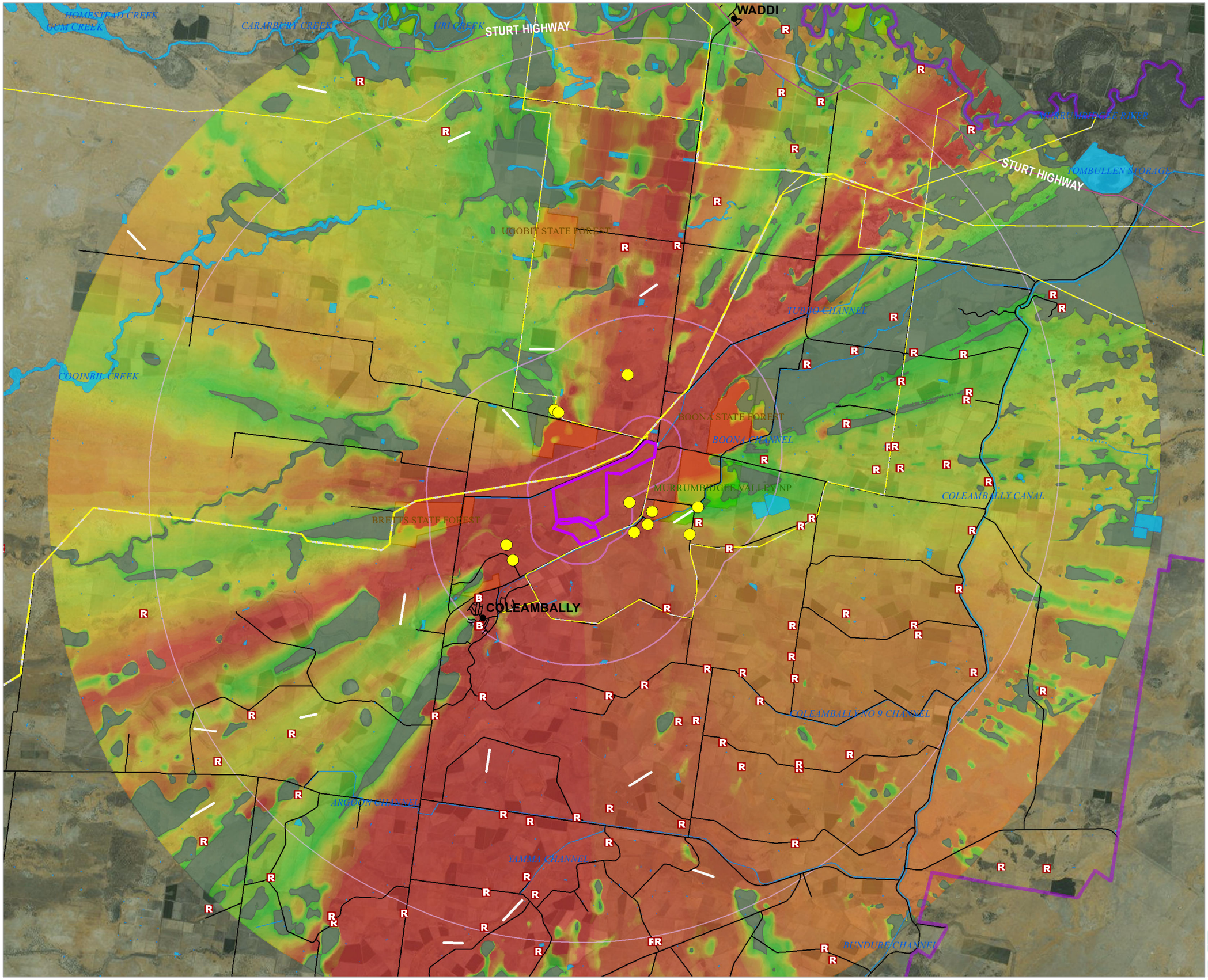
The ZVI (or view shed) of the proposal was produced using topographic information. Topography was based on a 25m resolution Digital Elevation Model (DEM) derived from 25m contours. The ZVIs do not take into account screening such as vegetation or infrastructure and on this basis is considered a 'worst case' model. They are used to assist in selecting representative viewpoints for the impact assessment.

B.1 and B.2 Array infrastructure

A height of 3m was used to model onsite array infrastructure. This is a realistic approximation of the height of panels and inverter containers, which may actually be 2.3m and 3.5m, respectively. B.1 shows the middleground view shed (5km) and B.2 extends to the background view shed (16km).

Representative viewpoints

All representative viewpoints assessed in this report are shown on the ZVI map set. Representative viewpoints are used instead of assessing impacts from all actual receivers in the view shed. Only four receivers are shown. These are residential dwellings referred to specifically in the visual assessment.



VISIBILITY MAP (BACKGROUND)

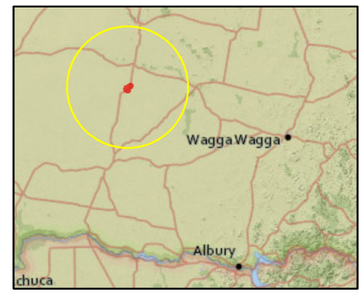
Coleambally Solar Farm

- Town
- Sensitive receiver (residence)
- B Other accommodation
- R Other possible residence
- Murrumbidgee LGA
- Site boundary
- Existing transmission line
- Road
- Highway
- Railway
- Private runway
- Waterbody (man-made or natural)
- Foreground (1km)
- Midground (5km)
- Background (16km)
- Shielded (proposal not visible)

Relative visibility
- High : 55
- Low : 1

- National Park
- State Forest

Notes:
- Designs courtesy of Neoen, received March 2017
- Base layers from LPI, accessed March 2017
- Base map Copyright © Esri and its data suppliers.



0 0.5 1 2 Km

A3 @ 1:140000
Ref: SW111
Author: SP

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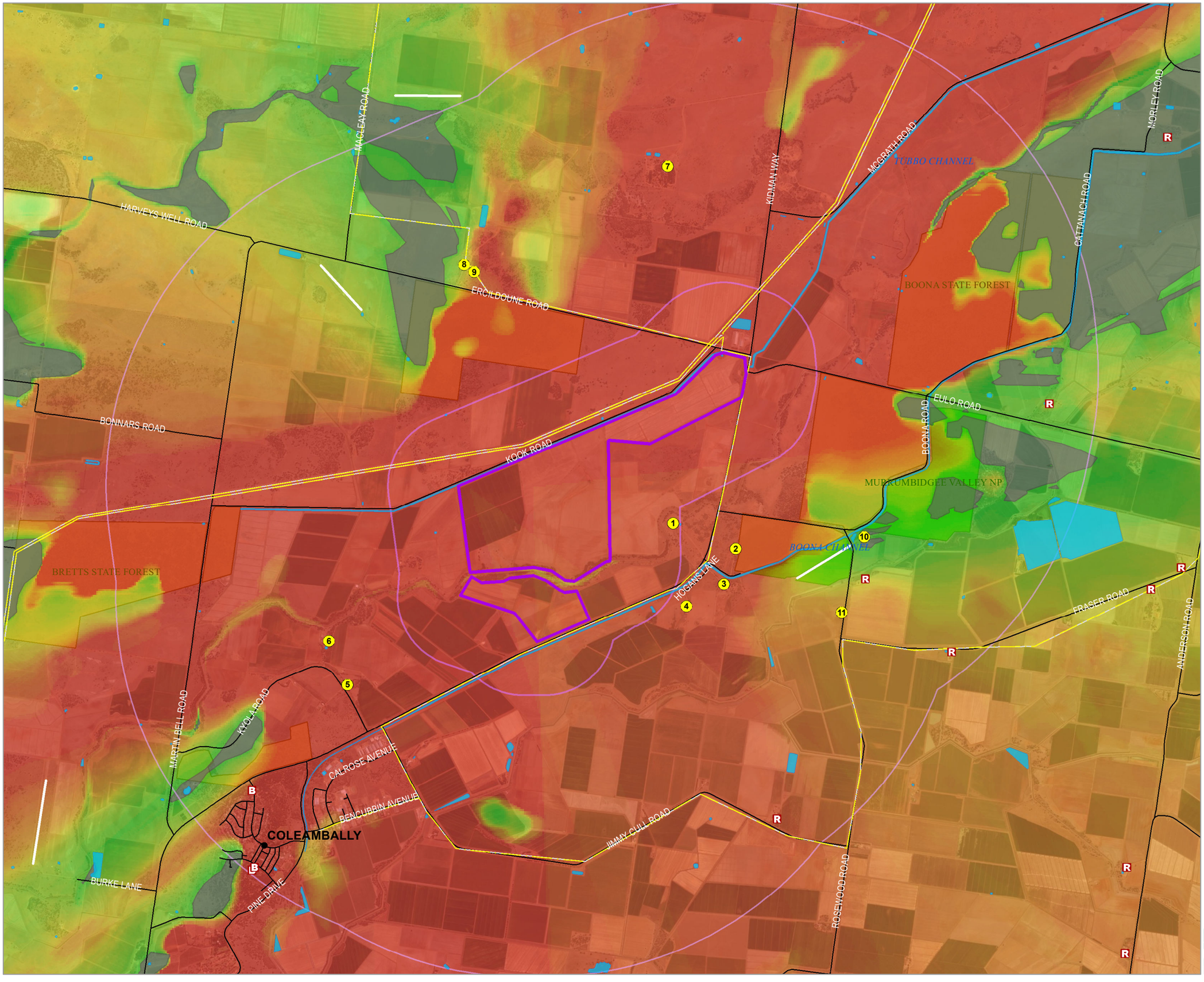
VISIBILITY MAP

Coleambally Solar Farm

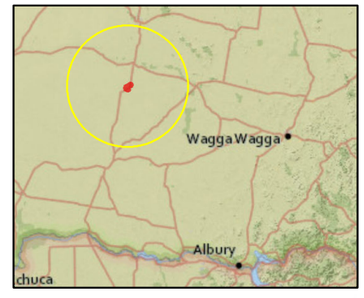


- Town
- Sensitive receiver (residence)
- Other accommodation
- Other possible residence
- Site boundary
- Existing transmission line
- Road
- Highway
- Railway
- Private runway
- Waterbody (man-made or natural)
- Foreground (1km)
- Midground (5km)
- Shielded (proposal not visible)

Relative visibility
- High : 55
- Low : 1

- National Park
- State Forest

Notes:
- Designs courtesy of Neoen, received March 2017
- Base layers from LPI, accessed March 2017
- Base map Copyright © Esri and its data suppliers.



0 0.5 1 2 Km

A3 @ 1:50000
Ref: SW111
Author: SP

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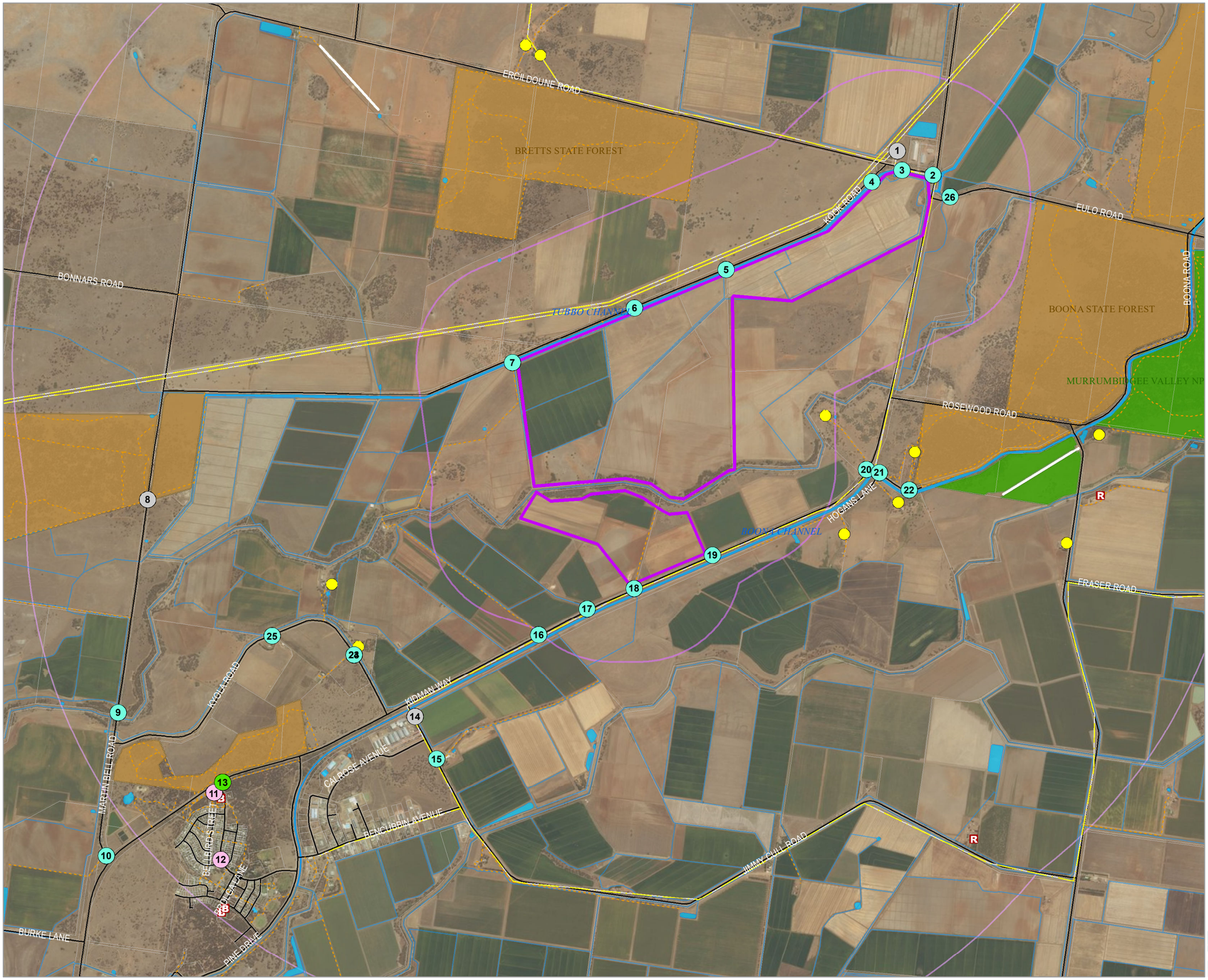
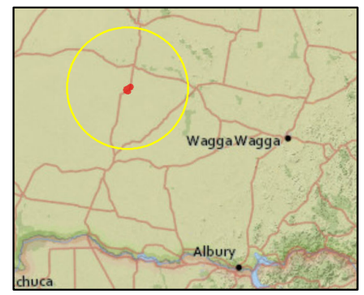


LANDSCAPE CHARACTER UNITS

Coleambally Solar Farm

Landscape Character Unit (LCU)
- Agricultural
- Industrial
- Reserve
- Village
- Sensitive receiver (residence)
- Town
- Other accommodation
- Other possible residence
- Site boundary
- Existing transmission line
- Track
- Road
- Highway
- Railway
- Private runway
- Drainage line or canal
- Waterbody (man-made or natural)
- Cadastre
- Foreground (1km)
- Midground (5km)
- National Park
- State Forest

Notes:
- Designs courtesy of Neoen, received March 2017
- Base layers from LPI, accessed March 2017
- Base map Copyright © Esri and its data suppliers.



0 250 500 1,000 Metres

A3 @ 1:35000
Ref: SW111
Author: SP

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APPENDIX C COMMUNITY FEEDBACK FORM QUESTIONS

150 MW AC Coleambally Solar Farm

Community Feedback Form

In developing the detailed project and undertaking the environmental assessment of the proposed solar farm, your feedback is important. It will ensure:

- local concerns are understood by the developers and the assessment team;
- all relevant impacts are identified, investigated and mitigation measures developed where required.

The results of the feedback will be compiled and used in the assessment of the project. All contact details will be kept anonymous. Only the geographic information and nominated organisations information will be used in collating the information.

Please hand over your form completed to one of the project team members.

For further information about the project, please visit the project website www.coleamballysolarfarm.com.au.

Your name: .....

Organisation
(if relevant): .....

Contact details
Telephone n°: .....

Email address: .....

Address: .....

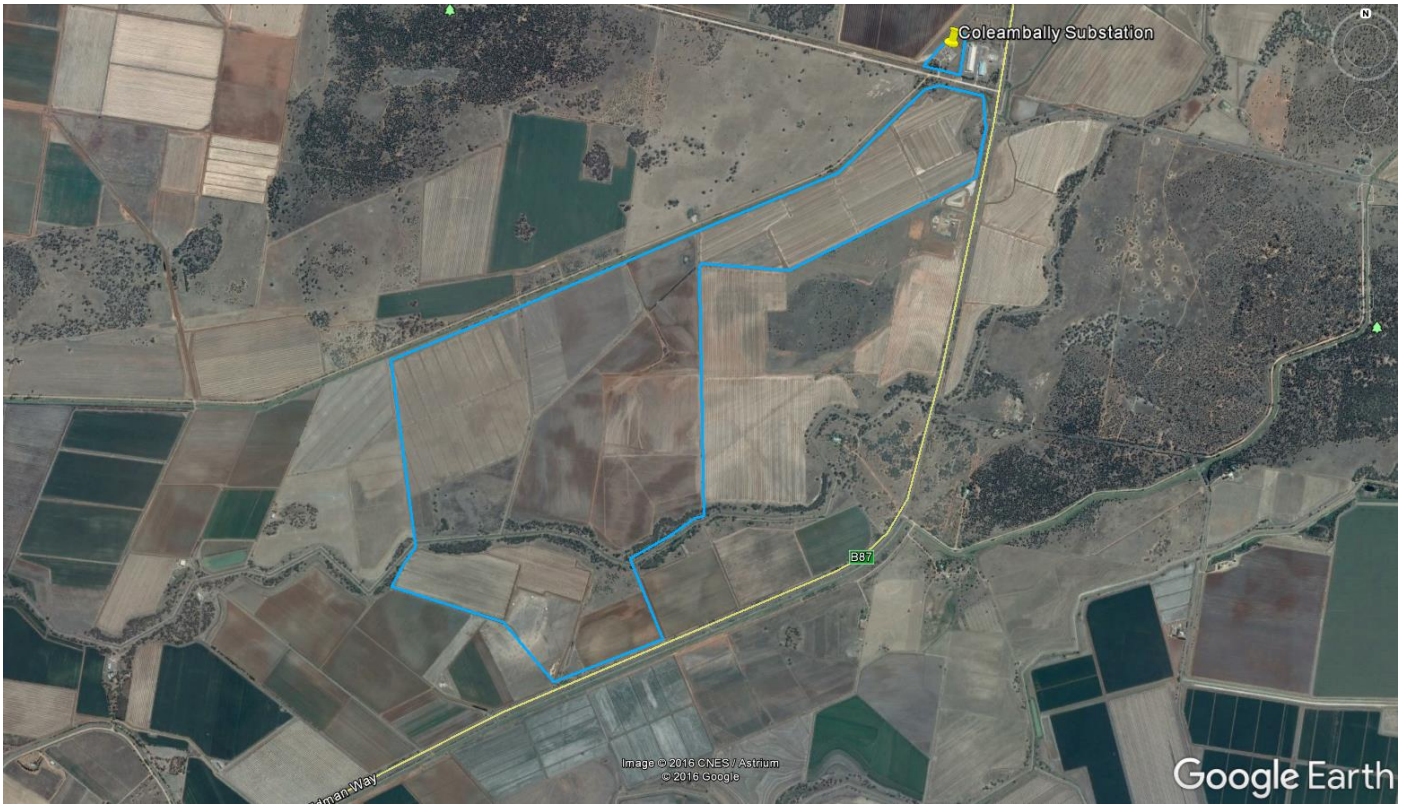
.....

.....

Tick which box best describes where you live:

- ☐ Less than 2 kilometres from the proposed solar plant*
- ☐ 2-5 kilometres from the proposed solar plant
- ☐ More than 5 kilometres from the proposed solar plant
- ☐ Not a member of the local community

* If you live less than 2 kilometres from the proposed solar plant. Please put a cross on the map below to approximately indicate where your property is located.



Tell us below what you think about the local area and the proposed solar farm.

What do you value most about the local area? Circle one or more.

a) Views
b) Community / family ties
c) Historic values
d) Work opportunities
e) Recreation opportunities, including sporting, nature based etc.
f) Other

Discuss:

……

……

……

……

……

What do you like most about solar farms, generally?

a) Renewable energy generation
b) Local economic opportunities – jobs, tourism, economic stimulus
c) Diversification of land use
d) Other

Discuss:

……

……

……

……

……

What concerns do you have about solar farms, generally? Circle one or more.

a) Community impacts
b) Visual impact
c) Noise, during construction or operation
d) Traffic, during construction or operation
e) Effects on land use or land values
f) Effects on recreation opportunities
g) Effects on natural areas and habitats
h) Other

What specific concerns do you have about the solar farm proposed at Coleambally ?

……

……

……

……

……

What additional information would you like us to know in assessing the impacts of the solar farm proposed at Coleambally?

……

……

……

……

What views or landscape characteristics in the region and local area are important to you?

Area or feature: ……

What do you enjoy / value about this area?

……

……

Area or feature: ……

What do you enjoy / value about this area?

……

……

Area or feature: ……

What do you enjoy / value about this area?

……

……

APPENDIX D PROPOSED ONSITE SCREENING

A vegetation buffer is part of the project description. A suggested location for the buffer is provided below, targeting specific sections of the project perimeter to mitigate medium visual impacts. Screening effectiveness would also be audited post construction and augmented if required.

Plantings would be more than one row deep. The plant species to be used in the screen are recommended to be native, derived from the naturally occurring vegetation community in this area. They should be fast growing, with spreading habitat and having a mature height of 3-4 m. Species selection could be undertaken in consultation with affected near neighbours and a botanist or landscape architect.