APPENDIX E VISUAL IMPACT ASSESSMENT

Visual Impact Assessment

GRIFFITH SOLAR FARM

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CONTENTS

TABLES

FIGURES

1 INTRODUCTION

NGH Environmental completed a visual impact assessment of the proposed Griffith Solar Farm, located approximately seven kilometres south east of Griffith in southern New South Wales (refer Appendix A). This report has been prepared on behalf of the proponent, Neoen Australia (Neoen) to assess the potential visual impacts of the proposed Griffith Solar Farm. Visual amenity values and visual impacts are subjective, therefore the assessment included a transparent systematic evaluation has been undertaken to address subjectivity as much as possible.

1.1 PROJECT OVERVIEW

The Griffith Solar Farm would be commercial scale solar photovoltaic (PV) plant which would produce up to 53 megavolt-ampere (MVA) of electricity. The site covers approximately 125 hectares of land and the layout of the proposed solar farm is provided in Appendix A.

Key infrastructure components would include:

- Solar arrays: approximately 200,000 solar panels supported by approximately 25,000 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 2,650 tracker units)
    - north-oriented fixed-tilt panels
    - east-west facing fixed-tilt panels

  or a combination of these alternatives.
- Approximately 26 PV boxes or PV skids (either containerised or installed on a 'skid' platform) each of them containing an inverter and a 33kV transformer.
- Onsite cabling and electrical connections between solar arrays and panel inverters.
- Delivery station in a container or mounted on a 'skid' platform (no further voltage step-up being required, the delivery station will not contain any transformer).
- Cables and trenches.
- Internal access tracks to allow for site maintenance vehicles, and gravel access road and parking for staff and visitors.
- Permanent staff amenities and offices.
- Perimeter security fencing, approximately 2.3m high.
- Vegetation buffer around perimeter of site.
- A 33kV underground or overhead power line to connect into the existing Griffith/Yoogali Transgrid substation, approximately 300 metres west of the site, on Hamilton Road.

All electrical equipment and plant will be established at least 410 mm above the surrounding finished surface level to accommodate extreme flood events.

Environmental assessment in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is required for the proposal. The Secretary's Environmental Assessment Requirements (SEARs), provided by NSW Department of Planning and Environment (DPE) on 9 December 2014, specify the impacts to be considered in the environmental assessment, including visual impacts.

1.2 SITE CONTEXT

The site proposed for the solar farm is located to the east of the Irrigation Way, a high use transport corridor. It is bounded by Hamilton Road (sealed) to the north and Mirrool Branch Canal Road (unsealed) to the south; both are low use roads. An existing Transgrid substation is located at the corner of the Irrigation Way and Hamilton Road.

Five residences (one is project-involved) are located in close proximity (within 1km) of the site. The site is currently used as cropping land and is surrounded by similar land uses. Linear road, rail and canal infrastructure are dominating visual elements. Vegetation is limited largely to crops and plantings around rural residences.

1.3 OBJECTIVES OF THIS REPORT

This Visual Impact Assessment (VIA) includes a full assessment of the visual impacts associated with the proposed Griffith Solar Farm. It includes an assessment of:

- Landscape character and scenic vistas (including significant or sensitive vistas).
- Stakeholder values regarding visual amenity.
- Potential impacts on representative viewpoints, including residences and road corridors.

Specifically, this report addresses the SEARs for the proposed Griffith Solar Farm as shown in

Table 1-1.

Table 1-1 Director General's Requirements for visual impact assessment of the Griffith Solar Farm

Requirement	Addressed in this report
Provide an assessment of the landscape character and values and any scenic or significant vistas of the area potentially affected by the development. This should describe community and stakeholder values of the local and regional visual amenity and quality, and perceptions of the development, based on surveys and consultation.	Landscape character is described in Section 3.4. Significant vistas within 16km of the development are discussed in Section 3.2, with reference to community values and perceptions.
Include a full assessment of the visual impacts associated with the solar farm including identification and documentation of all key viewing points and corridors particularly from identified sensitive lands. This should include the transmission line. Alternative pole designs should be presented and assessed and potential for undergrounding in sensitive locations should be assessed.	Visual impacts are evaluated and discussed in Section 5.2. This includes reference to all key viewing points and sensitive areas identified in Section 3.2. This includes consideration of the transmission line.
Provide an assessment of the reflectivity from the panels and associated infrastructure and any safety impacts for motorists and aircraft (including consideration of the establishment and maintenance of a visual buffer to minimise potential distraction of motorists.	Visual impacts, including reflectivity and impacts to motorists and aircraft, are discussed in Section 4.1.2. The establishment and maintenance of a visual buffer is considered in mitigation measures, Section 5.2.2.

Requirement	Addressed in this report
Include photomontages of the development taken from potentially affected residences (including approved by not yet developed dwellings or subdivisions with residential rights), settlements and significant public viewpoints, and provide a clear description of proposed visual amenity mitigation and management measures for the solar farm.	Potentially affected residential receivers were determined with reference to Zone of Visual Influence modelling (Appendix B), aerial photo interpretation and ground truthing. It is understood that there are no additional approved residential dwellings within close proximity of the site (pers. comm. Kelly McNicol, Griffith City Council, 6 January 2016). Representative viewpoints showing the extent of infrastructure from these locations are provided in Section 5.2. No montages have been prepared but panoramic photographs are used to understand the visual extent of the impacts from key viewpoints. Clear mitigation measures are set out in Section 6.
Provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after these measures have been implemented.	The feasibility, effectiveness and reliability of proposed mitigation measures are discussed in Section 6. The mitigation strategy (including a post construction Visual Verification Report) ensures that actual and not potential impacts will be addressed, increasing the reliability of the strategy.

1.4 TERMINOLOGY

Study area	Defined as within 16km of the proposed solar farm site (maximum view distance).
Solar farm site / site	The lot boundaries within which the solar farm development is proposed, excluding offsite infrastructure such as access upgrades or 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.
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 site. It does not take into account other existing or proposed screening features such as vegetation or built structures.

2 METHODOLOGY

2.1 OVERVIEW

The visual impact assessment has been completed in the following stages:

- Background investigations, mapping and modelling.
- Field survey including reconnaissance, ground truthing and photography.
- Community consultation.
- Impact assessment.
- 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, tourism information, topographic maps 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 lot zoning information. 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 would not 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. Note: the ZVI does not account for any overhead powerlines that may be constructed (an overhead powerline is an option being considered).
- Identify key viewpoints such as major travel routes, public recreation areas, potential receivers (dwellings and other structures, within 2km of the proposed solar farm), and built up areas. This step generally 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).
- Document representative viewpoints within the LCUs.
- Understand the likely sensitivity of the LCUs to views of the proposed solar farm.

Fieldwork consisted of driving along major and minor roads, investigating views from key local landscape features and general views from different distances from the site and from within different LCUs. Photographs were taken at representative locations, including road sides and near to residences.

Where possible, the horizontal extent of the solar array infrastructure was indicated on key viewpoint panoramas.

Where photographs and panoramas were produced, these were taken from public roads. For residences, photos were taken near to residences, from the road, to maximise the view of the proposed solar farm site. Photos were not taken from private properties.

The property involved in the project (represented by Viewpoint 5) was not excluded from the assessment but is identified as involved in the assessment tables, Section 5.

2.4 COMMUNITY CONSULTATION

Community consultation specific to this assessment of visual impacts was 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 as part of the Development Application process, in accordance with a 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 public information session to introduce the proposal, on 14 December 2015.
- Direct meetings and mail outs to 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 identification of viewpoints and the impact assessment and are summarised in Section 3.3.2.

2.5 IMPACT ASSESSMENT AND DEVELOPMENT OF A MITIGATION STRATEGY

The impact assessment methodology used in this Visual Impact Assessment 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 LMZ, for the representative viewpoints, based on:
    - The scenic quality of the study area's LCUs.
    - The expected sensitivity at representative viewpoints.
- Evaluate the degree of contrast the solar farm would result in at representative viewpoints and 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, contrast and visual impact are included in the assessment, Section 5.

Mitigation measures are considered for impacts greater than medium visual impact; for a medium impact, the contrast is considered acceptable.

3 EXISTING ENVIRONMENT

3.1 STUDY AREA

Griffith is a well-designed rural city. It was designed by Walter Burley Griffin and Marion Mahony Griffin. It was established in 1916 as part of the Murrumbidgee Irrigation Area project and its outskirts are defined by farming canals, distributing water from the Murrumbidgee River to farming properties.

Attractions in the city include theatres, museums, art galleries, restaurants and other retail facilities. Many Griffith wineries offer a cellar door experience. In the surrounding areas, intensively worked agriculture dominates the landscape. Views are a mosaic of crops, many annual or not long lived, changing colour and form with the seasons. Supporting infrastructure is also dominant in the landscape (silos, irrigation canals, powerlines, road and rail networks).

The study area is flat, apart for the hills around the city, approximately 6.5km north-west of the proposed solar farm site.

3.2 SIGNIFICANT VISTAS

Scenic vistas in the study area and their distance from the site include:

- Banna Avenue (7km), the main street of Griffith. It provides formalised landscaping and public open spaces off the main street. It is an important civic space. The proposed solar farm will not be visible from this location.
- Hermit Cave and Rotary lookouts (6.5km), off Scenic Drive. While of general low relief, Scenic Hill reserve to the immediate north of the city, provides elevated views to the south-east, in the direction of the proposed solar farm and hosts various walking trails.
- Irrigation Way is the main road located between the city and the proposed solar farm site. It is high use highway, dominated by utility infrastructure (powerlines, rail corridor, irrigation canals) but also provides views into working farms with orderly rows of oranges, grapes and other crops, defining the productive focus of this area. The proposed solar farm site is located immediately adjacent to Irrigation Way. Views of the solar array and powerlines (if overhead) would be visible from here.
- Griffith Wetlands Important Bird Area (32km), Cocoparra National Park (12km), the Murrumbidgee River and Lake Wyangan (13km) all offer nature based experiences and visual amenity. The proposed solar farm would not be visible from here.

Figure 3-1 provides examples of the vistas from Hermits Cave lookout, Scenic Hill Reserve and Griffith Road.

Figure 3-1 Scenic vistas in the study area

a) View toward the south east from Hermits Cave lookout on the eastern side of Griffith
b) Scenic Hill Reserve (L)
c) Griffith Road – road and rail corridors (R)

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 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, however. 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 Values of the local community to the proposal

Twenty-five people attended the Griffith Solar Farm information session held in in Griffith on 14 December 2015. Only two feedback forms were returned; one by a respondent less than 2km from the proposed solar farm site and one was not a member of the local community.

- Both cited community and family ties as holding the most value for the local area. Work opportunities were also cited.
- Both cited renewable energy generation as what they liked most about solar farms generally. Diversification of land use was also cited.
- Both cited potential impacts on land use and land values as what concerned them most about solar farms generally. Visual impact was also cited.

Issues raised with specific reference to the proposed Griffith Solar farm included:

- The potential closure of Poletta Road; this was not seen as desirable.
- Views of rich farming land were considered an important visual landscape characteristic.

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.

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

- Agricultural.
- Residential (rural village, peri urban, suburban).

They are characterised below in terms of their scenic quality, below. Scenic quality is rated 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 outstanding, unusual or diverse features or variety.

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

Table 3-1 Landscape Characteristic Units within 16km of the Griffith Solar Farm

Landscape Character Unit	Key features
Agricultural	Cropped and irrigated rectangular paddocks form a collection of intensively worked agricultural areas. Rice, grapes and oranges are key crops. Many paddocks are tilled but bare. This results in a mosaic of well-defined rectangular patches, from bright green to dark green, yellow to red and brown. The proposed solar farm site is located within this LCU. Average paddock sizes range from 40-100ha. The paddocks and their crops are of low relief on flat terrain, producing a uniform landscape. This is dissected by roads, sealed and unsealed, rail lines, irrigation channels and powerlines that reinforce the linear patterns of the landscape and its key role as a primary production landscape. The powerlines provide a rare vertical element. Powerlines are relatively abundant in proximity of site, with at least 6 existing lines radiating from substation in different directions. The substation is located within 250m of the proposed solar farm site. Residences within this LCU are commonly well screened with vegetation, presumably to separate the residential spaces from the noise and dust of intensively worked farmland. Other infrastructure is clustered and includes sheds and silos and low fences. Vegetation over 4m in height is rare and usually a result of planting near residences. **Scenic quality is generally low. These areas are uniform in colour and form, lacking variety. Elements are production related. Existing infrastructure mostly includes powerlines, canals, roads, houses and farm buildings. This LCU is the most extensive in the study area.**

Landscape Character Unit	Key features

Rural village, peri urban and suburban, areas

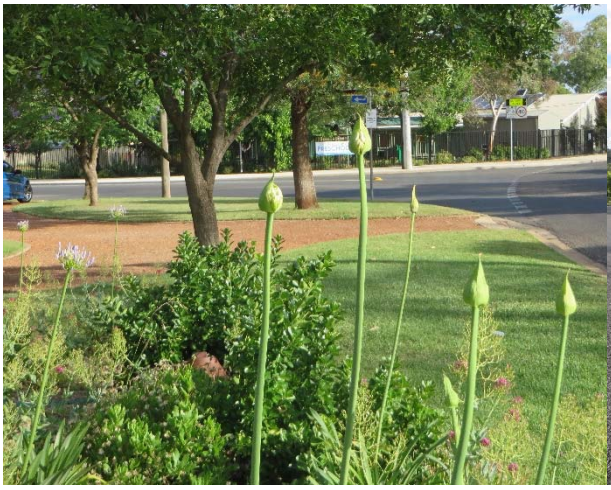
Several small rural villages occur in the study area. These are service hubs, with retail facilities and agricultural suppliers. Residences are well maintained with well-maintained yards and gardens. Outlooks are generally broad, onto low relief cropping paddocks. Views of silos, powerlines, road and rail corridors are common.

The closest peri urban area is north west of Burley Griffin Way, 2.8km north-west of the site. The closest suburban street is Burley Street, is 4.9km north west of the site. It is north west of an industrial area. These are primarily residential areas, with child care and other compatible services. Residences are well-maintained with well-maintained yards and gardens. Street trees and street furniture are common. Outlooks are generally closed. Only newly developed outer areas have broader views, onto low relief cropping paddocks and agricultural infrastructure.

At the time of the site visit, gardens and lawns were vivid green with large feature trees. Building bricks and render colour typically reflects the soil colours of oche, brown and reds.

Roads are primarily sealed and curbed. Powerlines reinforce the linear pattern of the landscape.

Scenic quality is considered moderate. There is variety in colour and form throughout this character type. Elements include recreational aspects; parks and gardens. This LCU is common in the study area.



Landscape Character Unit	Key features

3.5 VIEWPOINTS AND EXPECTED SENSITIVITY

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 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 and sensitivity are as follows:

- Proximity to the proposed solar farm site:
    - Foreground 0 – 1 kilometres
    - Middle ground 1 – 5 kilometres
    - Background 5 – 16 kilometres
- Potential sensitivity to visual impact:
    - 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, or where the duration of view is moderate
        - routes or areas of regional or local significance
        - areas with moderate scenic quality
    - Low sensitivity:
        - low use routes or areas, or where the duration of view is short or which will be seen by few people
        - routes or areas of low local significance
        - areas with low scenic quality

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 and the proposed height of infrastructure. A height of 3m was used to model onsite infrastructure. This is realistic approximation of the height of panels and PV containers, which may actually be 2.3m and 3.4m, respectively. It does not address power pole heights however, there are already several existing power lines onsite and in the immediate locality. Considering the short distances proposed, these are considered a lesser issue for this assessment.

Viewpoints were not selected in areas predicted to be shielded from views of the solar farm. Twenty-three representative viewpoints were identified within the ZVI. The 24 viewpoints are described in Table 3-2 in terms of visual impacts from the proposed solar farm, with the viewpoint locations illustrated in Appendix B.

Residences were assessed to have moderate sensitivity. Even where they are located in low use areas (off minor local roads) of low scenic quality (agricultural areas). It is noted that community members cited views of rich farming land as an important local value. In agricultural areas, gardens and plantings have often been incorporated into house lots, most likely to provide shade as well as screening (views, dust, noise) from the intensively worked agricultural lands. These areas provide an ‘oasis’ within the broader LCU. They are also likely to offer some visual screening to views of the solar farm.

Table 3-2 Representative viewpoints (ID) with reference to the Griffith Solar Farm

Viewpoint ID	LCU	Scenic quality	Viewpoint	Proximity	Sensitivity
1	Agricultural	Low	Residence	Middle ground	Moderate
2	Agricultural	Low	Shed	Foreground	Low
3	Agricultural	Low	Residence	Foreground	Moderate
4	Agricultural	Low	Residence	Foreground	Moderate
5 [1]	Agricultural	Low	Residence	Foreground	Moderate
6	Agricultural	Low	Residence	Foreground	Moderate
7	Residential	Moderate	Residence	Background	High
8	Agricultural	Low	Residence	Middle ground	High
9	Agricultural	Low	Residence	Foreground	Moderate
10	Agricultural	Low	Residence	Foreground	Moderate
11	Agricultural	Low	Shed	Middle ground	Low
12	Agricultural	Low	Road	Middle ground	Low
13	Agricultural	Low	Shed	Foreground	Moderate
14	Agricultural	Low	Shed	Foreground	Low
15	Residential	Moderate	Residence	Background	Moderate
16	Agricultural	Low	Residence	Middle ground	Moderate
17	Agricultural	Low	Road	Background	Low
18	Agricultural	Low	Road	Middle ground	Low
20	Residential	Moderate	Road	Middle ground	Moderate
21	Residential	Moderate	Residence	Background	Moderate
22	Residential	Moderate	Residence	Middle ground	Moderate
23	Residential	Moderate	Lookout	Background	High
24	Residential	Moderate	Lookout	Background	High

[1] Involved landowner

4 VISUAL CHARACTERISTICS OF KEY INFRASTRUCTURE COMPONENTS

The key infrastructure components of the proposed Griffith 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 proposed infrastructure components include:

- Solar arrays:
    - Piles driven or screwed to the ground.
- Racking systems to allow the installation of solar panels in either of the following configurations
    - North facing fixed tilt.
    - East-west facing fixed tilt (higher density of panels)
    - Single-axis trackers (less density of panels)
- Approximately 26 PV boxes or PV skids (either containerised or installed on a 'skid' platform) each of them containing an inverter and a 33kV transformer.
- Onsite cabling and electrical connections between solar arrays and panel inverters
- Delivery station in a container or mounted on a 'skid' platform (no further voltage step-up being required, the delivery station will not contain any transformer).
- Cables and trenches.
- Internal access tracks to allow for site maintenance vehicles, and gravel access road and parking for staff and visitors.
- Permanent staff amenities and offices.
- Perimeter security fencing, approximately 2.3m high.
- Vegetation buffer around perimeter of site.

All electrical equipment and plant will be established at least 410 mm above the surrounding finished surface level to accommodate extreme flood events.

The following elements would connect to the site:

- A 33kV underground or overhead power line will be installed to connect into the existing Griffith/Yoogali Transgrid substation, approximately 300m west of the site, on Hamilton Road.

Ancillary facilities would be located within the site boundary and would include:

- Material laydown areas.
- Temporary construction site offices.
- Temporary car and bus parking areas for construction workers transportation. Once the plant has been commissioned a small car park would remain for the minimal staff required and occasional visitors.

- Permanent staff amenities. Once constructed, the plant would be monitored and operated remotely and would therefore require a minimum number of maintenance personnel to be onsite and only intermittently.

These components are discussed in terms of their visual characteristics below.

4.1.1 Construction components

Construction impacts would be temporary, confined to approximately 9 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 on unsealed roads. Onsite parking areas would be visible to surrounding properties and Irrigation Way.
- 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 surrounding properties and Irrigation Way.

4.1.2 Operational components

Operational impacts relate to the look of the solar farm, once construction is complete.

- The solar arrays would be no higher than 3m (more likely approximately 2.3m).
- Several different solar PV mounting technology options are still being considered:
    - North facing fixed tilt.
    - East-west facing fixed tilt (lower cost of installation and better density).
    - Single-axis trackers (lower density but higher yield).

  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).

  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, containerised PV boxes.
    - Permanent staff amenities.
- PV boxes or PV skids would contain the inverter and transformer stations and could measure up to 3.4m.

- Electricity cables would be installed between the array modules, either underground or mounted to the underside of the array, producing negligible additional visual impact.
- Electrical transmission to the substation, if underground, would produce no any additional visual impact. If overhead, it would add to existing powerlines, along Poletta Road, Irrigation Way, Hamilton Road. Pole heights are subject to Transgrid design but would be no higher than 20m and more likely, approximately 15m in height. For the residence at Viewpoint 9, which could have powerlines on all four sides of the residence, a substantial cumulative impact may result. Existing vegetation screens however, are established around the house, largely blocking views. The predominant remaining view is to the west. It is noted that landowner permission would be required for the overhead option and that an underground option exists. This impact is considered in the mitigation measures, Section 6.
- The substation is existing and would not have any additional visual impact.
- Fencing would be 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.
- Access to the site during construction would be from Irrigation way via Hamilton Road for the western portion of the site and via Hamilton Road and Poletta Road for the eastern portion of the site. Irrigation Way is the main road linking Narrandera, Leeton and Griffith. This is a high use road. Access upgrades may create additional bare areas prior to rehabilitation.
- An area for parking would be included within the site boundaries. This would accommodate a small number of vehicles and have negligible visual impact.

With the exception of the power poles, infrastructure would be of low height, generally less than 3m, 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 below.

a) Driven piles, during construction.

b) Operational array - Example of single-axis tracking systems with multicrystalline modules.

c) Example of north-facing fixed-tilt mounting system with thin-film technology.

d) Example of east-west facing fixed-tilt mounting system with multicrystalline modules.

e) Overhead power pole design will be subject to Transgrid assessment and may differ from existing powerlines on the proposed solar farm site.

f) Example of a PV box (contains an inverter and a transformer).

g) Example of a PV 'skid' PV (contains an inverter and a transformer).

Figure 4-1 Images representative of infrastructure components proposed

5 VISUAL IMPACT ASSESSMENT

The visual impact assessment was undertaken considering the:

a) Infrastructure components proposed (set out in Section 4).
b) Their potential impact on landscape character units and representative viewpoints.
c) The degree of contrast the development would have within the identified Visual Landscape Management Zones and if these are considered acceptable.

Points b) and c) are addressed in Section 5-2.

This section defines the LMZs for the study area and assesses the contrast with the LMZ management objectives to determine the level of visual impact. The potential for mitigation is then discussed for higher impacted viewpoints, to reduce them to an acceptable impact level.

5.1 DEFINITION OF LANDSCAPE MANAGEMENT ZONES

Visual Landscape Management Zones (LMZ) were developed for the study area. These zones were derived by combining information about scenic quality (from the LCU, Section 3.2), viewer sensitivity and the distance of the area from viewpoints (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 VIEWING POINTS

5.2.1 Evaluation

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.

Table 5-3 below evaluates the representative viewpoints. They are ordered in terms of highest visual impact rating. Panoramic images and where possible the horizontal visual extent of the solar array is indicated for medium to high impact ratings.

Figures 5-1 to 5-5 illustrate, where possible, the indicative horizontal extent of the view of solar array infrastructure from high and medium impact viewpoints.

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

View ID	Viewing opp.	Scenic quality	Proximity	Sensitivity	LMZ	Objective	Contrast	Visual Impact
5 [2]	Residence	Low	Fore-ground	Moderate – low use residence	B	Protect dominant visual features	High	**Medium to high impact** Some existing vegetation around the house will screen views from the residence itself to some extent. The intervening paddock was bare at the time of the assessment. It may offer some screening potential at other times, dependant on the crop. The contrast between the existing landscape and the low level infrastructure at this distance may be greater than acceptable, given the 270 degree view potential. Mitigation should be considered for this residence. **Solar site vegetation screening is proposed and could effectivity mitigate this impact.**
6	Residence	Low	Fore-ground	Moderate – low use residence	B	Protect dominant visual features	High	**Medium to high impact** Substantial existing vegetation around the house will screen views from the residence itself. Existing vegetation on the proposed solar farm site would provide some screening from the road and entrance. The contrast between existing landscape and the low level infrastructure at this distance may be greater than acceptable, given the close proximity and positioning of the access road; drivers leaving the property take in a 180 degree view of the site at close range. Mitigation should be considered for this residence. **Solar site vegetation screening is proposed and could effectivity mitigate this impact.**

[2] Involved landowner

View ID	Viewing opp.	Scenic quality	Proximity	Sensitivity	LMZ	Objective	Contrast	Visual Impact
9	Residence	Low	Fore-ground	Moderate – low use residence	B	Protect dominant visual features	High	**Medium to high impact** Substantial existing vegetation around the house will screen views from the residence itself. The contrast between existing landscape and the low level infrastructure at this distance may be greater than acceptable, given the close proximity. Mitigation should be considered for this residence. **Solar site vegetation screening is proposed and could effectivity mitigate this impact.**
1	Residence	Low	Middle-ground	Moderate – low use residence	B	Protect dominant visual features	Medium	Medium impact Crops in intervening paddocks will largely obscure views of the site from the road. Substantial existing vegetation around the house will screen views from the residence itself. The contrast between existing landscape and the low level infrastructure at this distance is considered to be acceptable.
3	Residence	Low	Fore-ground	Moderate – low use residence	B	Protect dominant visual features	Medium	Medium impact Crops in intervening paddocks will obscure views of the site from the road to some extent. Substantial existing vegetation around the house will screen views from the residence itself. The contrast between existing landscape and the low level infrastructure at this distance is considered to be acceptable.
4	Residence	Low	Fore-ground	Moderate – low use residence	B	Protect dominant visual features	Medium	Medium to high impact Crops in intervening paddocks will obscure views of the site from the road to some extent. Existing vegetation and building around the house will screen views from the residence itself. The contrast between existing landscape and the low level infrastructure at this distance is considered to be acceptable.

View ID	Viewing opp.	Scenic quality	Proximity	Sensitivity	LMZ	Objective	Contrast	Visual Impact
8	Residence	Low	Middle-ground	High – high use residence	B	Protect dominant visual features	Medium	Medium impact Context of existing infrastructure, which makes the landscape better able to absorb the additional visual impact of the solar farm. The contrast is considered to be acceptable.
13	Road	Low	Fore-ground	Moderate – moderate use road	B	Protect dominant visual features	Medium	Medium impact Context of existing infrastructure, which makes the landscape better able to absorb the additional visual impact of the solar farm. Given the 100km/hr speed limit on Irrigation Way, onsite screening or conversely the option of a pull over viewing area could be considered. The contrast is considered to be acceptable.
10	Residence	Low	Fore-ground	Moderate – low use residence	B	Protect dominant visual features	Medium	Low to medium impact Context of existing infrastructure, which makes the landscape better able to absorb the additional visual impact of the solar farm. The contrast is considered to be acceptable.
2	Road	Low	Fore-ground	Low – low use shed	C	Reflect existing forms and colours	Medium	Low to medium impact Context of existing infrastructure, which makes the landscape better able to absorb the additional visual impact of the solar farm. The contrast is considered to be acceptable.
12	Road	Low	Middle-ground	Low – low use road	C	Reflect existing forms and colours	Medium	Low to medium impact Context of existing infrastructure, which makes the landscape better able to absorb the additional visual impact of the solar farm. The contrast is considered to be acceptable.
14	Shed	Low	Fore-ground	Low – low use shed	C	Reflect existing forms and colours	Medium	Low to medium impact Context of existing infrastructure, which makes the landscape better able to absorb the additional visual impact of the solar farm. The contrast is considered to be acceptable.
7	Residence	Moderate	Back-ground	High – high use residence	B	Protect dominant visual features	Indistinct	Low impact The contrast is considered to be acceptable.

View ID	Viewing opp.	Scenic quality	Proximity	Sensitivity	LMZ	Objective	Contrast	Visual Impact
15	Residence	Moderate	Back-ground	Moderate - moderate use residential	C	Reflect existing forms and colours	Indistinct	Low impact The contrast is considered to be acceptable.
16	Residence	Low	Middle-ground	Moderate - moderate use residential	C	Reflect existing forms and colours	Indistinct	Low impact The contrast is considered to be acceptable.
20	Residence	Moderate	Middle-ground	Moderate – high use road	B	Protect dominant visual features	Indistinct	Low impact The contrast is considered to be acceptable.
21	Residence	Moderate	Back-ground	Moderate - moderate use residential	C	Reflect existing forms and colours	Indistinct	Low impact The contrast is considered to be acceptable.
22	Residence	Moderate	Middle-ground	Moderate - moderate use residential	B	Protect dominant visual features	Indistinct	Low impact The contrast is considered to be acceptable.
11	Shed	Low	Middle-ground	Low – low use road	C	Reflect existing forms and colours	Indistinct	Low impact The contrast is considered to be acceptable.
17	Road	Low	Back-ground	Low – low use road	C	Reflect existing forms and colours	Indistinct	Low impact The contrast is considered to be acceptable.
18	Road	Low	Middle-ground	Low – low use road	B	Protect dominant visual features	Indistinct	Low impact The contrast is considered to be acceptable.

View ID	Viewing opp.	Scenic quality	Proximity	Sensitivity	LMZ	Objective	Contrast	Visual Impact
23	Lookout	Moderate	Back-ground	High – rare feature	B	Protect dominant visual features	Indistinct	Low impact The contrast is considered to be acceptable.
24	Lookout	Moderate	Back-ground	High – rare feature	B	Protect dominant visual features	Indistinct	Low impact The contrast is considered to be acceptable.

Figure 5-1 Extent of views of infrastructure for higher affected viewpoints: View point 5 MEDIUM TO HIGH IMPACT

The intervening paddock may offer some screening potential at times, dependant on the crop. Given the 270 degree view potential, mitigation should be considered for this residence. The existing power poles along Poletta Road are visible in the back ground.

Figure 5-2 Extent of views of infrastructure for higher affected viewpoints: View point 6 MEDIUM TO HIGH IMPACT

Existing vegetation on the proposed solar farm site would provide some screening from the road and entrance. Given the close proximity and positioning of the access road, mitigation should be considered for this residence.

Figure 5-3 Extent of views of infrastructure for higher affected viewpoints: View point 9 MEDIUM – HIGH IMPACT

The contrast between existing landscape and the low level infrastructure at this distance may be greater than acceptable, given the close proximity. Mitigation should be considered for this residence.

Figure 5-4 Extent of views of infrastructure for higher affected viewpoints: View point 3 MEDIUM IMPACT

The horizontal extent of the solar array is indicated. Crops in the paddock between the residence and the site will obscure views to some extent.

Figure 5-5 Extent of views of infrastructure for higher affected viewpoints: View point 13 MEDIUM IMPACT

The solar farm would be adjacent to the road in this location. In this location screening or the option of a viewing location could be considered.

5.2.2 Results summary

Medium to high impact - mitigation required

Highest impacts are seen for the three residences in closest proximity to the site. These are represented by Viewpoints 5, 6 and 9 (panoramas presented in Figure 5-1, Figure 5-2, and Figure 5-3). While they occur in low use areas (off minor roads) and existing vegetation will to some extent screen views to the proposed solar farm site, there are likely to be dominant views of infrastructure from some areas of the residence or yard. The form of the infrastructure, low (<3m) and in rectangular arrays, is not incongruous with the existing forms in these agricultural areas however, screening as a mitigation strategy should be considered for these viewpoints.

A suggested screening plan has been developed (refer Appendix D) to specifically address views to these three residences. This is discussed further in Section 6.1.

Particularly for Viewpoint 9, if overhead powerline connection to the substation is proposed, the cumulative impacts of power lines in proximity to this residence may be substantial. Existing vegetation screens however, are established around the house, largely blocking views. The predominant remaining view is to the west. It is noted that landowner permission would be required for the overhead option. Recommendations to underground the line if feasible are provided in Section 6.2.

Medium impact – mitigation could be considered

Medium impacts are seen for residences located further from the site, where intervening crops and / or infrastructure obscures the view such that the low height infrastructure proposed is not likely to be dominant. These are represented by Viewpoints 1, 3, 4 and 8 (panorama presented in Figure 5-4 for View point 3).

Additionally, a medium impact is seen for Viewpoint 13. This viewpoint is on Irrigation Way where infrastructure would be located closest to the highway (refer Figure 5-5). While this viewpoint, which includes road, rail, powerline and canal infrastructure, has low scenic quality, which makes the landscape better able to absorb the additional visual impact of the solar farm, there is an opportunity to less impacts further. Given the 100km/hr speed limit on Irrigation Way, onsite screening or conversely the option of a pull over viewing area could be considered in this location. A suggested screening plan has been developed (refer Appendix D) that includes screening at this location. This is discussed further in Section 6.1.

Low to medium, low impact – no mitigation

Low to medium impacts are seen for roads and sheds in close proximity to the solar farm site. The short duration of views (experienced from moving vehicles or while working on nearby farms), as well as existing screening, represented by buildings, vegetation or local topographic relief (weedy vegetated mounds along canals are often enough to obscure views into adjacent paddocks), existing built structures (such as powerlines) ensure the views of the site will be acceptable in these areas. General measures to reduce visual impacts are recommended for these locations. This is discussed further in Section 6.3.

Low impacts are seen for residences and lookouts where the solar farm would be in the middle or background. In these areas, despite the higher sensitivity, the contrast will be indistinct due to the distance from the site. No mitigation is required for these locations.

5.3 CUMULATIVE IMPACTS

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

During construction, the additional traffic impact is probably the greatest potential for cumulative visual impacts. Irrigation Way is a high use road corridor carrying a large proportion of heavy vehicles, particularly in harvest periods. The visual impact of increased traffic movements to the site would be predominantly limited to construction (approximately 9 months). 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.

The operational view of the solar farm may generate a cumulative impact with the existing substation and powerlines. Both facilities would have security fencing and steel dominated infrastructure and be visible from Irrigation Way and Hamilton Road. The additional powerlines would exacerbate an already dominant view of powerlines in some locations and particularly affect the resident near View point 9. Existing vegetation screens however, are established around the house, largely blocking views. The predominant remaining view is to the west. It is noted that landowner permission would be required for the overhead option. Recommendations to underground the line if feasible are provided in Section 6.2.

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

6 MITIGATION MEASURES

A Visual Impact Management Plan is recommended to address the 'as built' visual impacts of the proposed solar farm. The plan would include:

- Screening (either onsite or offsite) for viewers for which a medium to high level of impact is confirmed. This would be aimed at 'breaking up' not blocking views of onsite infrastructure.
- General methods to reduce visual impact. This would centre on the colour and form of infrastructure, to reduce the overall visual contrast of the project.
- A process for verification of predicted and actual impacts. This would improve the reliability of the measures and provide a trigger to undertake additional mitigation if required.

These measures are outlined below. They are considered feasible, in that the proponent has agreed the measures can be implemented as part of the project. They are considered effective, as the measures would be implemented post construction and in consultation with affected landholders (where relevant). It is noted that vegetation screens can take time to grow, grow differently than expected or expire before effective height is achieved. Furthermore, the as built infrastructure may differ from that assessed in this report, predicted impacts may be found to be different to actual impacts. For this reason, a verification process is included in the plan.

6.1 SCREENING

6.1.1 Screen location

Three residences have been identified with potential for medium to high level impacts; Viewpoints 5, 6 and 9. Onsite planting within the solar farm boundaries is expected to screen views effectively for these receivers. This vegetation buffer is part of the project description. A suggested location for the buffer is provided in Appendix D, targeting specific sections of the project perimeter. As well as mitigating impacts to the three identified residences, it would also provide additional screening for residences further from the site with medium and low to medium impact ratings; Viewpoints 1, 3 and 10.

Additionally, a short section of screening is shown onsite, where infrastructure would be located closest to Irrigation Way (View point 13; refer Figure 5-5). Given the 100km/hr speed limit on Irrigation Way, there is a short duration for motorists to view the solar site and slowing vehicles may cause a hazard. Onsite screening or conversely the option of a pull over viewing area could be considered in this location. The final decision should be made in consultation with the roads authority, with consideration of potential road hazards.

6.1.2 Screen requirements

- Planting would be more than one row deep and be located on the outside of the security fence, so that it breaks up views of the fencing as well as onsite infrastructure.
- The plant species to be used in the screen would be native species appropriate to the Weeping Myall open woodland of the Riverina and NSW South-western Slopes Bioregions, in line with the recommendations of the biodiversity assessment. Where possible, they would be fast growing, with spreading habitat and having a mature height of 3-4 m to minimise panel shading.

- The timing is recommended to be within 2 months of completion of construction so that actual and not predicted impacts of infrastructure are mitigated.
- 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

- If feasible, underground rather than overhead power lines would be considered. This would reduce the cumulative impact of powerlines in the area and particularly for Viewpoint 9. If undergrounding is not feasible, options to co-locate lines or match existing pole design would be investigated.
- 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; green or black rather than grey would reduce the industrial character of the fence.

6.2.2 Construction

- During construction, dust would be controlled in response to visual cues.
- Parking areas, material stock piles and other construction activities would be located as far as practical from nearby residences or screened (by existing vegetation or constructed screens) for the period of construction.
- Areas of soil disturbed by the project would be rehabilitated progressively or immediately post-construction, reducing views of bare soil.
- Ground cover would be maintained beneath the panels and within the site boundary, to break up views of the infrastructure from the side view.
- Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations).

6.3 VERIFICATION OF ACTUAL IMPACTS

A verification process would be implemented within 2 months of the completion of the construction phase. A Visual Verification Report and Landscape Plan would:

- Confirm the assumptions of this assessment by ground based assessment and ensure all medium to high impacts are mitigated.
- Finalise the location and species for proposed screening, in consultation with nearest affected landholders and roads authority.
- Detail planting methods and maintenance requirements of the screen planting.

7 CONCLUSION

This report has been prepared to assess the potential visual impacts of the proposed Griffith 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 Griffith Solar Farm would be located in an agricultural area of generally low scenic quality. However, the visual characteristics of this rich farming land are important to members of the local community. The solar farm site is located next to a high use transport corridor (road and rail) and in close proximity (<1km) from several residences, meaning views of the project would not be overlooked. A medium to high impact was determined for close proximity residences. Screening is proposed to break up views of the proposed infrastructure from these residences, in consultation with the affected landholders.

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 maintain ground cover beneath the panels, to break up side on views of infrastructure and soften the appearance of the facility.

Large scale solar panels 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

Regional location of proposal site

Proposed infrastructure

neoen renewing energy

GRIFFITH solar farm

REGIONAL LOCATION OF PROPOSAL SITE

- Substation
- Town
- Village
- Locality
- Existing transmission and distribution lines
- Proposal site boundary
- Main road
- Primary road
- Local road
- Railway
- Watercourse
- Waterbody
- Built up area

Notes:
- Data collected by nghenvironmental (2015)
- Base map Copyright © Esri and its data suppliers.
- Base layers from LPI (2015)

0 0.5 1 2 Kilometres

A3 @ 1:100000
Ref: SW060
Author: SP

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GRIFFITH solar farm

PROPOSED INFRASTRUCTURE

- Substation
- Proposed overhead transmission line (indicative)
- Underground section of proposed overhead transmission line (indicative)
- Proposed underground transmission line (indicative)
- Site access
- Proposed photovoltaic arrays and inverter/transformer stations
- Existing transmission and distribution lines
- Proposal site boundary
- Main road
- Local road
- Railway
- Watercourse
- Farm dam or other waterbody
- Cadastre

0 50 100 200 Metres

A3 @ 1:7000
Ref: SW060_
Author: SP

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Notes:
- Data collected by nghenvironmental (2015)
- Base map Copyright © Esri and its data suppliers.
- Base layers from LPI (2015)

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