



Environmental Impact Statement

GRIFFITH SOLAR FARM

MARCH 2016

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Certification

I certify that I have prepared the contents of this Environmental Impact Statement in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulations 2000*. To the best of my knowledge, this assessment contains all available information that is relevant to the environmental assessment of the project and that information is neither false nor misleading.

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TERMS AND DEFINITIONS

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACHCRP	Aboriginal Cultural Heritage Consultation Requirements for Proponents
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AGO	Australian Greenhouse Office
ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ARENA	Australian Renewable Energy Agency
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AWS	Automatic weather station
BOM	Australian Bureau of Meteorology
BLM	Bureau of Land Management
BREE	Bureau of Resources and Energy Economics
BFRMP	Bush Fire Risk Management Plan
CEMP	Construction environmental management plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Application
dB(A)	A measure of A-weighted (<i>c.f.</i>) sound levels.
DEC	Department of Environment and Conservation
DECC	Department of Climate change
DECCW	Refer to OEH
DOE	Department of the Environment
DPE	Department of Planning and Environment
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EEC	Endangered Ecological Community – as defined under relevant law applying to the proposal
EIS	Environmental impact statement
ELF	Extremely low frequency, in relation to Hz (<i>c.f.</i>)
EMFs	Electromagnetic fields
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i> (NSW)
EPA	(NSW) Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
EPL	Environment Protection Licence, issued under the POEO Act (<i>c.f.</i>)
ESD	Ecologically sustainable development

GA	Geoscience Australia
GHG	Greenhouse gas
GWh	Gigawatt hours
ha	hectares
Heritage Act	<i>Heritage Act 1977 (NSW)</i>
Hz	Hertz
ICNG	Interim Construction Noise Guideline
INP	<i>NSW Industrial Noise Policy</i>
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i>
km	kilometres
kV	kilovolts
L_{A90} (15 minutes)	The A-weighted sound pressure level that is exceeded for 90% of a 15-minute measurement period, when measured in the absence of the construction works under consideration and excluding extraneous noise. This is considered to represent the background noise.
L_{Aeq} (15 minutes)	The A-weighted equivalent continuous (energy average) sound pressure level of the construction works under consideration over a 15-minute period that excludes other noise sources such as from industry, road, rail and the community.
LALC	Local Aboriginal Land Council
LCA	Life Cycle Assessment
LCU	Landscape Character Unit
LEP	Local Environment Plan
LGA	Local Government Area
LRET	Large scale Renewable Energy Target
m	metres
mm	millimetres
MIA	Murrumbidgee Irrigation Area
MNES	Matters of National Environmental Significance, under the EPBC Act (<i>c.f.</i>)
MRET	Mandatory Renewable Energy Target
MVA	Megavolt-ampere
MW	Megawatt
MWh	Megawatt hours
NHMRC	National Health and Medical Research Council
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NSW	New South Wales
NW Act	<i>Noxious Weeds Act 1993 (NSW)</i>
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
PMF	Probable Maximum Flood

PV	Photovoltaic
RBL	Rating Background Level - the level of background noise
RDA	Regional Development Australia
RE Act	<i>Renewable Energy (Electricity) Act 2000</i> (Commonwealth)
REAP	Renewable Energy Action Plan (NSW)
RFS	NSW Rural Fire Service
RNP	<i>NSW Road Noise Policy</i>
Roads Act	<i>Roads Act 1993</i> (NSW)
RMS	(NSW) Roads and Maritime Services, formerly Roads and Traffic Authority (RTA)
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy (NSW)
SEPP (Infrastructure)	<i>State Environmental Planning Policy (Infrastructure) 2007</i> (NSW)
Sound pressure level	The noise at a given distance from plant or equipment
sp/spp	Species/multiple species
SPRAT	EPBC Act Species Profiles and Threats Database
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011</i> (NSW)
SSD	State Significant Development, as defined by section 89C of the EP&A Act (<i>c.f.</i>)
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW)
μT	Microtesla , multiples of a unit of magnetic field
VIA	Visual Impact Assessment
V	Volts
WHO	World Health Organisation
WM Act	<i>Water Management Act 2000</i>
WMP	Waste Management Plan
WSP	Water Sharing Plan
ZVI	Zone of Visual Influence

EXECUTIVE SUMMARY

This Environmental Impact Statement (EIS) identifies and assesses the environmental issues associated with the construction, operation and decommissioning of the proposed photovoltaic (PV) 53 megavolt-ampere (MVA) or 60 Megawatt (MW) Griffith Solar Farm ('the proposal'). NGH Environmental has prepared the EIS on behalf of the proponent, Neoen Australia (Neoen).

This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). The structure and content of the EIS address the Secretary's Environmental Assessment Requirements, provided by NSW Department of Planning and Environment (DPE) on 9 December 2014.

PROPOSAL DESCRIPTION

The proposal site is located approximately 7 kilometres (km) south east of Griffith, within the Griffith Local Government Area and Murrumbidgee Irrigation Area. The site is accessed via Irrigation Way, Hamilton Road and Poletta Road. The proposal would connect to the existing Griffith/Yoogali Transgrid substation, located on Hamilton Road to the west of the site.

The proposal site comprises approximately 125 hectares of freehold land which is very flat, completely cleared of trees and is currently used for irrigated cropping. The site has been previously laser levelled for irrigation purposes and includes three irrigation channels. The areas immediately adjacent to the proposal site are dominated by broad scale irrigated agriculture, as well as road, rail and canal infrastructure. Six residences are located in close proximity to the site, the nearest being approximately 150 m from the site boundary.

The proposal comprises the construction, operation and eventual decommissioning of a 53 MVA or 60 MW solar farm. 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.
- One delivery station in a container or 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.
- Staff amenities and offices.
- Perimeter security fencing, approximately 2.3m high.
- Vegetation buffer.
- 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.

The construction and commissioning phase of the proposal would take approximately nine months. Approximately 35 employees would be required during the first month of construction, rising to approximately 90 employees during the peak construction period. During construction, approximately 0.5 full time equivalent staff would be required on site.

At the end of its operational life, the proposal site would be either reconditioned or decommissioned. Decommissioning would remove all above ground infrastructure, rehabilitating the site to allow for a return to agricultural or other land use for the majority of the site.

PROJECT NEEDS AND BENEFITS

At present, Australia has one of the world's highest greenhouse gas emissions per unit of electricity produced in the world, with the vast majority of its power generated by aging coal-fired power plants. The NSW Renewable Energy Action Plan and the Commonwealth's Large-scale Renewable Energy Target are incentives to support a global reduction in GHG emissions.

The proposal would generate approximately 116,000 megawatt hours (MWh) of renewable electricity per year and would have the following benefits:

- Reduced GHG emissions and move towards cleaner electricity generation.
- Provision of a renewable energy supply that would assist the Commonwealth and NSW Governments to reach Australia's energy and carbon mitigation goals.
- Embed electricity generation supply into the Australian grid, closer to the main consumption centres.

KEY ENVIRONMENTAL ASSESSMENT ISSUES

Prior to detailed environmental investigations, a risk assessment was carried out to identify the key environmental risks of the proposal, to guide the depth of investigation in this EIS. The risk assessment identified four environmental aspects as key risks, and specialist investigations were subsequently undertaken in these areas as part of this EIS:

- Aboriginal heritage.
- Biodiversity.
- Visual amenity.
- Noise.

These issues are discussed in Section 6 of this EIS. Lower risk issues are discussed in Section 7, primarily by desktop assessment.

Summary of results

HIGHER RISK ISSUES

Aboriginal heritage

Aboriginal heritage investigations included Aboriginal community consultation, background research, a field survey and significance assessment. The survey recorded 11 artefacts in three separate site areas.

With regard to the proposal site it is likely that additional artefacts could occur within the proposed development footprint. However, based on the land use history of the proposal area, and an appraisal of the area from the field survey, there is negligible potential for the presence of intact subsurface deposits.

No additional archaeological investigations is considered to be required, while all efforts should be made in the design stage to avoid the artefacts recorded during the survey. If complete avoidance is not possible, the artefacts should be collected and moved to a safe area within the property, as close as possible to their original location, which will not be subject to ground disturbance.

Visual amenity

From the results of the community consultation, there appears to be little concern in the local community about the visual impacts of the proposal. Twenty four representative viewpoints were assessed separately, none were considered to have high impact significance. Medium to high impacts are seen for the three residences in closest proximity to the site. While 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 and screening as a mitigation strategy should be considered for these viewpoints.

Biodiversity

Biodiversity (flora and fauna) investigations included searches of relevant data bases and a site visit. The solar farm site is cleared of any trees, with Weeping Myall Woodland endangered ecological community (EEC) present in the road reserve adjacent to the two transmission line route options. The proposal would not require the removal of any trees and would therefore have no impact to the Weeping Myall Woodland EEC or threatened species.

Noise

Background noise monitoring was undertaken at the nearest residence to the proposal site, located on Hamilton Road and was used to model construction and operational noise impacts for the proposal.

The assessment predicted construction noise exceedances for two residences when works are conducted at the closest proximity to the residences. These exceedances are predicted based on all plant and equipment operating concurrently and at a location closest to the corresponding receiver location. Management measures are recommended to reduced noise levels and potential impact for these receivers.

Operational noise impacts would not exceed noise limits traffic noise levels as a result of the construction works for the solar farm would not adversely contribute to the existing traffic noise levels at the most affected residences along the surrounding roads.

LOWER RISK ISSUES

Eleven lower risk issues were investigated, primarily using desktop assessment, in Section 7 of this EIS and include.

- Hydrology and flooding.
- Soil
- Water use and water quality (surface and groundwater)
- Traffic, transport and road safety
- Climate and air quality
- Health and safety
- Land use
- Socioeconomic and community
- Resource use and waste generation
- Fire and bush fire issues
- Historic heritage

These impacts were assessed as highly manageable.

MANAGEMENT OF IMPACTS

Impact avoidance and minimisation measures have been incorporated into the design of the proposal. These measures are considered practical and achievable by the proponent. They are set out for each area of investigation in Sections 6 and 7 and summarised in Section 8.2 of this EIS.

All commitments and environmental safeguards would be managed through the implementation of a Project Environmental Management Plan, consisting of a Construction Environmental Management Plan, an Operation Environmental Management Plan and a Decommissioning Environmental Management Plan. These plans would be prepared sequentially and submitted to the DPE, prior to each stage of works.

CONCLUSION

This EIS identifies and assesses the environmental issues associated with the construction, operation and decommissioning of the proposed Griffith Solar Farm, in accordance with Part 4 of the NSW EP&A Act and the Schedule 2 of the EP&A Regulation.

The proposal would comply with relevant Commonwealth, State and local planning requirements. It would:

- Be sympathetic to landscape and potential environmental impacts.
- Contribute to greenhouse gas emission reduction and the move towards cleaner electricity generation.
- Assist to meet Commonwealth and NSW Governments carbon mitigation goals.
- Provide social and economic benefits during construction and operation of the solar plant.

In light of the benefits of the proposal, its low level of expected environmental impacts and their reversibility, the proposal is considered to be ecologically sustainable and justified.

1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This Environmental Impact Statement (EIS) identifies and assesses the environmental issues associated with the construction, operation and decommissioning of the proposed Griffith Solar Farm ('the proposal'). The proposed photovoltaic (PV) solar farm would produce up to 53 megavolt-ampere (MVA) or 60 Megawatts (MW) of electricity. NGH Environmental has prepared this EIS on behalf of the proponent, Neoen Australia (Neoen).

This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to support a Development Application (DA) to be lodged with NSW Department of Planning and Environment (DPE).

The objective of this EIS is to fulfil the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and Section 79C of the EP&A Act. The structure and content of the EIS address the Secretary's Environmental Assessment Requirements (SEARs), provided by NSW Department of Planning and Environment (DPE) on 9 December 2014 (refer Appendix A).

The EIS also addresses the assessment requirements of the *Threatened Species Conservation Act 1995* (TSC Act) and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 PROJECT OVERVIEW

1.2.1 The proponent

Neoen is an Independent Power Producer specialized in renewable energy projects. The company is headquartered in Paris (France) and operates across renewable energy technologies, including solar, wind, and biomass, with an experienced workforce of around 100 employees.

Neoen develops, finances, constructs, operates and maintains its projects as a fully integrated renewable energy player, with a genuine long-term approach.

Since its founding in 2008, Neoen expanded beyond its local market in France and currently has branches in Portugal (2010), Australia (2012), Mexico and Egypt (2013) and Salvador (2014). It is also actively developing projects in other African areas, in Central America, in the Pan-Caribbean region, in the Middle East and in the Asia-Pacific region.

Neoen has now reached an industrial maturity with more than 760 MW of assets either in operation or construction. The company is now scaling up its portfolio of projects, both inside and outside France, with the goal of reaching a capacity of 2,000 MW by 2020.

In 2015, Neoen Australia initiated the construction of the first stage (100 MW) of the South Australian Hornsdale Wind Farm, and the 10.6 MW solar PV + 6MW batteries hybrid DeGrussa project in Western Australia.

1.2.2 Site location

The proposal site is located approximately 7 kilometres (km) south east of Griffith (refer to Regional Location map in Appendix B), within the Griffith Local Government Area (LGA) and Murrumbidgee Irrigation Area (MIA). The site is accessed via Irrigation Way, Hamilton Road and Poletta Road (refer to Proposal Site map in Appendix B). The solar farm would connect to the existing Griffith/Yoogali Transgrid substation, located on Hamilton Road to the west of the site.

1.2.3 Key components of the proposal

The proposal site covers approximately 125 hectares (ha) of land. The Proposed Infrastructure map in Appendix B illustrates the proposal layout. 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 33 kilovolt (kV) transformer.
- Onsite cabling and electrical connections between solar arrays and panel inverters.
- One delivery station in a container or 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.
- Staff amenities and offices.
- Perimeter security fencing, approximately 2.3 metres (m) high.
- Vegetation buffer.
- A 33 kV underground or overhead power line to connect into the existing Griffith/Yoogali Transgrid substation, approximately 300 m west of the site, on Hamilton Road.

All non-submersible electrical equipment and plant will be established at least 410 millimetres (mm) above the surrounding finished surface level to accommodate extreme flood events (however Neoen may find an alternative solution to meet compatibility with flood protection for non-submersible electrical equipment, which would be agreed with Griffith City Council).

1.2.4 Capital investment

The proposed Griffith Solar Farm would have a capital investment of approximately \$90 million.

2 JUSTIFICATION AND BENEFITS OF THE PROJECT

2.1 PROPOSAL OBJECTIVES

The objectives of the Griffith Solar Farm proposal are to:

- Select and develop a site which is suitable for commercial scale solar electricity generation.
- Assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets and other energy and carbon mitigation goals.
- Develop a project which is acceptable to the local community.
- Provide local and regional employment opportunities and other social benefits during construction and operation.
- Provide a clean and renewable energy source to assist in reducing greenhouse gas (GHG) emissions.
- Construct a project with minimal adverse environmental impacts.
- Provide electricity generation close to a consumption centre.

2.2 PROJECT NEED

2.2.1 Global warming

Human activity is resulting in the release of large amounts of GHGs which trap the sun's heat in our atmosphere and upset the balance of the Earth's climate. This threat is acknowledged by scientists and politics around the world, as illustrated by the historic global agreement to tackle climate change in November 2015 at the COP21 conference in Paris.

2.2.2 Renewable energy targets

The Kyoto Protocol is an international agreement created under the United Nations Framework Convention on Climate Change in Kyoto, Japan in 1997. The Australian Prime Minister signed Australia's instrument of ratification of the Kyoto Protocol in 2007, thereby committing Australia to reduce its collective GHG emissions.

There have been a number of government policies in place in Australia influencing the development of renewable energy. In 2001, the Commonwealth Government introduced the Mandatory Renewable Energy Target (MRET) Scheme to increase the amount of renewable energy being used in Australia's electricity supply. The initial MRET was for Australia to provide 9,500 gigawatt hours (GWh) of new renewable energy generation by 2010.

This target was revised and from January 2011 an expanded target of 45,000 GWh of additional renewable energy between 2001 and 2020. The MRET was split into a Small-scale Renewable Energy Scheme and Large-scale Renewable Energy Target (LRET) components to ensure that adequate incentive exists for large scale grid connected renewable energy. The LRET aims to create a financial incentive for the establishment and growth of renewable energy power stations, such as wind and solar farms, or hydro-electric power stations through the creation of large-scale generation certificates.

In September 2013, the NSW Government released the NSW Renewable Energy Action Plan (REAP) to guide NSW's renewable energy development and to support the former national target of 45,000 GWh of

additional renewable energy by 2020. The NSW Government's vision is for a secure, reliable, affordable and clean energy future for the state. The Plan positions the state to increase energy from renewable sources at least cost to the energy customer and with maximum benefits to NSW. The strategy is to work closely with NSW communities and the renewable energy industry to increase renewable energy generation in NSW.

In June 2015, the Australian parliament passed the *Renewable Energy (Electricity) Amendment Bill 2015*. As part of the amendment bill that LRET was reduced from 41,000 GWh to 33,000 GWh in 2020 with interim and post 2020 targets adjusted accordingly. The current projection is that about 23.5% of Australia's electricity generation in 2020 will be from renewable sources.

To meet the LRET of generating 33,000 GWh of renewable electricity annually by 2020, the market situation in early 2016 indicates that this target is unlikely to be reached unless approximately 4,400 MW of projects are committed in 2016, as illustrated in Figure 2-1 (Green Energy Markets 2015).

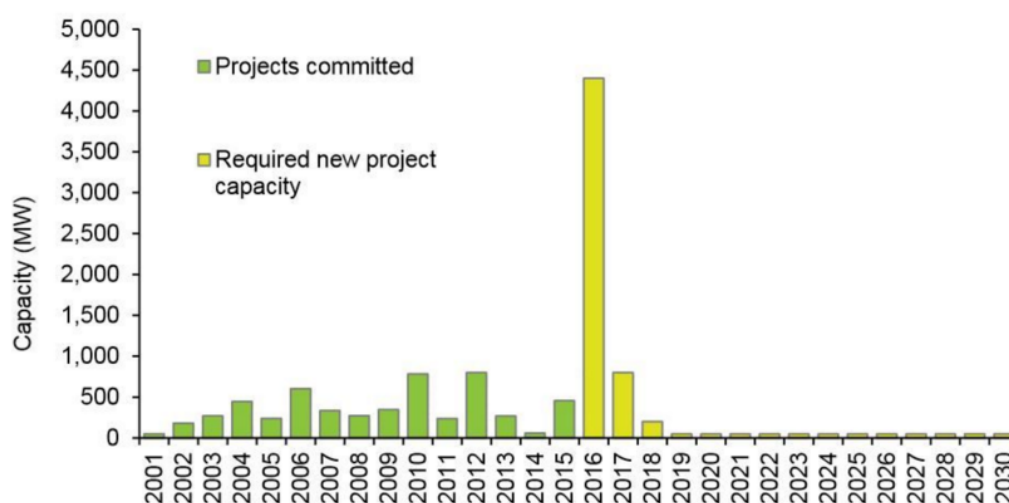


Figure 2-1 Installed capacity required to maintain market liquidity (Green Energy Markets Pty Ltd 2015)

At the Paris COP21 conference in November 2015, Australia committed to reducing its emissions to 26-28% below 2005 levels by 2030.

2.2.3 State and Federal support for renewable energy

At present, Australia has one of the world's highest GHG emissions per unit of electricity produced in the world, with the vast majority of its power generated by aging coal-fired power plants. The REAP and LRET incentives are supported at the federal level by grant programs from the Australian Renewable Energy Agency (ARENA), and financing programs from the Clean Energy Finance Corporation. It should be noted that the Griffith Solar Farm is one of 22 projects short-listed by ARENA in January 2016 in the context of its first Large-Scale Solar Competitive Round.

2.3 PROJECT BENEFITS

Key project benefits include:

- The Griffith Solar Farm would generate approximately 116,000 megawatt hours (MWh) of renewable electricity per year.
- Based on an emission factor of 0.87 kg CO₂-e/kWh (for NSW and ACT) (DIICCSRTE 2013) the proposed solar farm would displace approximately 100,000 tonnes of carbon dioxide (CO₂) or GHG emissions per year.
- The proposed solar farm would supply enough power each year to service over 17,500 average NSW households (ACIL Allen Consulting, 2015).
- A solar energy facility that displaces 100,000 tonnes of CO₂ per annum is the equivalent of taking approximately 30,000 cars off the road each year, based on an average car in NSW travelling 14,100 km per year (DIT 2011).

2.3.1 Broad project benefits

Broad project benefits that would be associated with the operation of the Griffith Solar Farm include:

- Reduced GHG emissions and move towards cleaner electricity generation.
- Provision of a renewable energy supply that would assist the Commonwealth and NSW Governments to reach Australia's LRET and other energy and carbon mitigation goals.
- Embed electricity generation supply into the Australian grid, closer to the main consumption centres.

2.3.2 Local project benefits

Local social and economic project benefits that would be associated with the construction and operation of the Griffith Solar Farm include:

- Direct and indirect employment opportunities during construction and operation of the solar farm; this includes approximately 90 employees during construction and 0.5 full time equivalent operational staff for the life of the project.
- Direct business volume benefits for local services, materials and contracting businesses.
- Delivery of sufficient solar energy into the national electricity system at Griffith to power the entire LGA.
- Assistance in meeting the future electricity demands for the Griffith LGA, with the increased population, chicken hatchery farms and processing plant developments anticipated in the LGA over the next 30 years.

Furthermore, the proposal would reflect the environmental constraints of the site appropriately. It would be designed to:

- Preserve biodiversity features, through avoiding tree removal.
- Minimise impacts to soil and water, through pile driven panel mounts rather than extensive soil disturbance and excavation.
- Minimise visual impacts to neighbours, incorporating vegetation screens located in consultation with neighbours.
- Preserve agricultural production values, being highly reversible at the end of the project's life.

2.4 PROJECT JUSTIFICATION

The Griffith Solar Farm would meet the proposal objectives and is justified in terms of reducing Australia's GHG emissions, meeting future energy demands, contributing to Australia's renewable energy targets, supporting a global reduction in GHG emissions, being consistent with the REAP and contributing to economic development in the Griffith region.

The proposal has been developed to make use of existing grid connections, on a previously cleared agricultural site that has generally low environmental values.

2.5 ALTERNATIVES CONSIDERED

During the development of the proposal, a number of alternatives were considered and are provided below. These include the 'do nothing option', or not developing the solar farm, different renewable technologies, the size and the location of the proposal.

2.5.1 The 'do nothing' option

The consequences of not proceeding with the proposal would be to forgo the identified benefits. This would result in:

- Loss of opportunity to reduce GHG emissions and move towards cleaner electricity generation.
- Loss of a renewable energy supply that would assist in reaching the LRET.
- Loss of additional electricity generation and supply into the Australian grid.
- Loss of social and economic benefits, created through the provision of direct and indirect employment opportunities during the construction and operation of the solar farm.

Doing nothing would avoid the environmental impacts associated with the development and operation of the proposal, which include construction noise, traffic and dust, visual impacts and a temporary reduction in agricultural production at the site. However, these impacts are considered to be manageable and would not result in a significant impact to the environment. Given the benefits of the proposal, the do nothing option is not considered to be a preferred option. In light of the benefits of the proposal and the low level of environmental impact (assessed within this EIS), the proposal is considered to be ecologically sustainable and justifiable.

2.5.2 Renewable energy project alternatives

The LRET and REAP outline the commitment by both Australia and NSW more specifically, to reducing GHG emissions and have set targets for increasing the supply of renewable energy. Other forms of largescale renewable energy accounted for in the LRET include wind, hydro, biomass, and tidal energy. The feasibility of wind, solar, biomass, hydro or tidal projects depends availability of energy resources and grid capacity. Neoen has interests in both wind and solar projects. Wind projects were considered to be more suitable to South Australia's world-class wind resources and superior solar resources were identified in New South Wales, providing excellent opportunities for solar projects. This led Neoen to initiate several solar developments in the state, bearing in mind that this technology can generally be deployed faster than any other type of renewable energy infrastructure.

Available grid capacity at a suitable voltage (33 kV) was instrumental in making Griffith an ideal choice for a renewable energy development, which was confirmed by Transgrid in a presentation at the NSW large-

scale solar workshop on the 19 November 2015, where Griffith was identified as one of the “regions of interest” with good connection capacity for renewable energy projects (refer Figure 2-2).

Regions of interest

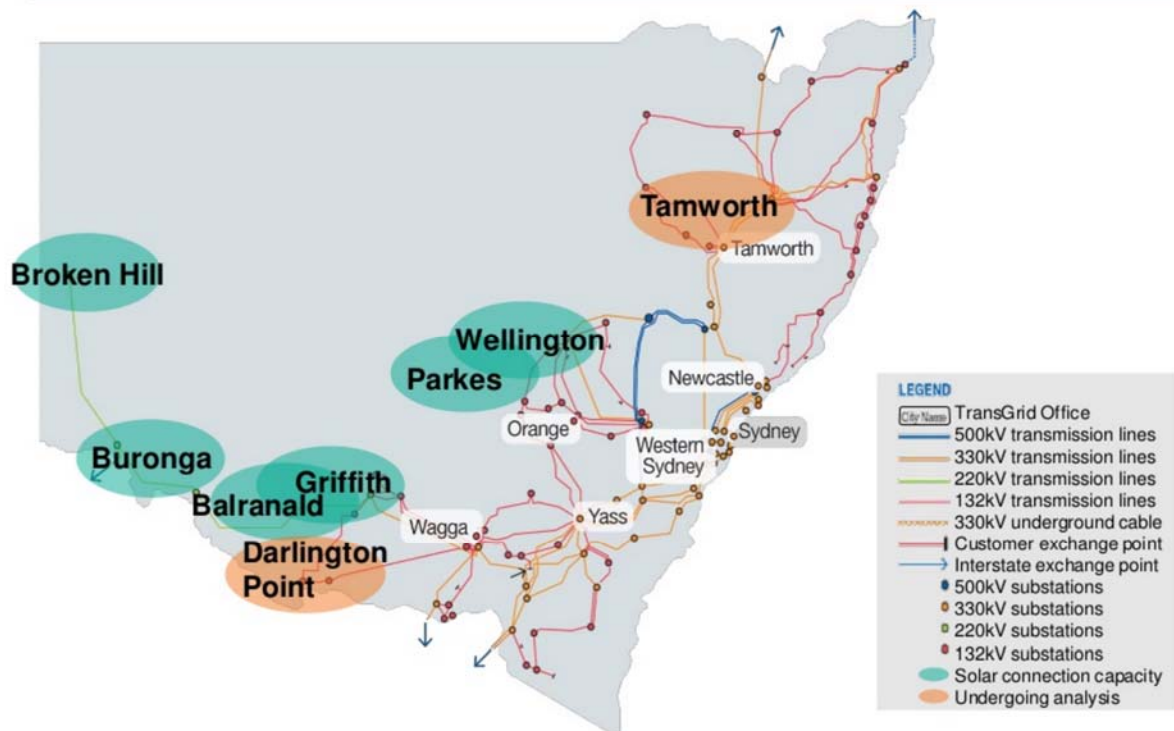


Figure 2-2 Regions of interest for large scale solar in NSW (source Transgrid 2015)

2.5.3 Alternative PV technologies

Neoen is considering several different solar PV mounting technology options for the proposal (see Figures 2-3, 2-4 and 2-5). These include:

- North facing fixed tilt panels.
- East-west facing fixed tilt panels (a lower cost of installation and better density of panels can be achieved).
- Single-axis tracking panels (a lower density but higher energy yield can be achieved).

The final decision may be one or a combination of these technologies.



Figure 2-3 Example of single-axis tracking systems with multicrystalline modules



Figure 2-4 Example of south-facing fixed-tilt mounting system with thin-film technology in Europe (installation in Australia would face the north)



Figure 2-5 Example of east-west facing fixed-tilt mounting system with multicrystalline modules

Each option would have relatively comparable constructed footprints, visual impacts and environmental impacts, as the varying structures would be of similar height with similar support mountings (installed by driving or screwing into the ground, rather than excavations for footings).

In terms of module technology, Neoen is considering both multicrystalline modules, which are the most common technology globally, and thin-film technologies which were used on the recently constructed Nyngan and Broken Hills solar farm projects in NSW.

2.5.4 Alternative site locations

During the site selection process for the Griffith Solar Farm, a number of alternative locations were considered. Minimising environmental and social impacts and maximising efficiency were major considerations in the evaluation of alternatives.

The current site was identified as the preferred location, based on the following features:

- Availability of abundant solar resource.
- Proximity to an electricity substation with good connection capacity.
- Availability of appropriate land with good topography.
- Suitability in terms of environmental constraints (the site has a long disturbance history under agricultural cultivation, minimising potential for biodiversity and heritage constraints).
- Absence of major flood risk.

The Griffith site was identified by Neoen as a high-potential location for a solar farm in 2013. An initial feasibility assessment was undertaken which determined the site to be a suitable area to accommodate a solar farm. Subsequent environmental investigations have confirmed its suitability.

2.5.5 *Size of proposal*

Neoen initially envisaged a 30 MVA capacity solar farm at the Griffith site, at a time when additional connection capacity was uncertain. Further discussions with Transgrid, the network service provider, confirmed that the nearest substation could accommodate up to 110 MVA. Such a large project could be built at the site with insignificant additional environmental impact with east-west oriented fixed-tilt structures, a mounting technology used by Neoen when building the largest European Solar Farm in Cestas, close to Bordeaux (France). In this context, Neoen submitted a letter to DPE, requesting the possibility to extend the project maximum capacity to 110 MVA.

Further design studies have since concluded that a 53 MVA solar farm would likely provide the best outcome for the project.

This EIS assesses the impacts of constructing the proposal in one phase, however Neoen may consider constructing the proposal in two stages; a first phase of 26.5 MVA followed by a second stage of similar capacity.

3 PROJECT DESCRIPTION

3.1 PROPOSAL SITE

The proposal site comprises approximately 125 ha of freehold land. Involved lots include Lots 59, 60, 61, 62, 81 and 82 in DP 751728.

Appendix B provides a map of the proposal site. It is located to the east of Irrigation Way (sealed), and is bounded by Hamilton Road (sealed) to the north and Mirrool Branch Canal Road (unsealed) to the south. Ross Road makes up part of the western boundary of the site, with the eastern boundaries made up of Poletta Road and Savage Road (all unsealed).

Figure 3-1 illustrates the site from its north western corner, at the point where Hamilton Road meets Ross Road. Figure 3-2 shows the northern boundary of the site, at the point where Hamilton Road meets Poletta Road, illustrating an irrigation channel and an existing power line. Figure 3-3 shows the southern boundary of the site, at the point where Mirrool Branch Canal Road meets Poletta Road.



Figure 3-1 View of proposal site from its north western corner, looking south east



Figure 3-2 View of proposal site from its northern corner, looking south



Figure 3-3 View of proposal site from its southern boundary, looking north along Poletta Road

The photographs depict the very flat nature of the proposal site, which is completely cleared of trees and is currently used for irrigated cropping. The site has been previously laser levelled for irrigation purposes.

There are three irrigation channels within the proposal site in the following locations:

- One running parallel to Poletta Road, on the eastern side of the road. This is the main Murrumbidgee Irrigation canal.
- Two running parallel to Hamilton Road, through the northern portion of the site between Ross Road and Poletta Road. These are secondary irrigation channels.

The proposal site has been used for irrigated agriculture for several decades and has therefore highly modified from intensive farming including ploughing.

An existing Transgrid substation is located at the corner of the Irrigation Way and Hamilton Road (see Appendix B), approximately 300 m west of the site boundary.

Irrigation Way is a high use transport corridor linking Narrandera, Leeton and Griffith, with an operational railway line running parallel on its northern site. There is a level crossing where Hamilton Road crossed the railway line, immediately east of Irrigation Way. Hamilton Road, Ross Road, Poletta Road, Savage Road and Mirrool Branch Canal Road are low use roads.

Figures 3-4 and 3-5 illustrate the view from Hamilton Road, near its junction with Irrigation Way, showing the Transgrid substation and the railway line level crossing.



Figure 3-4 View of Hamilton Road and Transgrid substation



Figure 3-5 View of Hamilton Road toward Irrigation Way with the railway line level crossing visible

The areas immediately adjacent to the proposal site are dominated by broad scale irrigated agriculture, including viticulture, citrus and cereal crop production and improved pasture, as well as road, rail and canal infrastructure.

Six residences are located in close proximity to of the site, as illustrated in Appendix B, noting that Residence 6 to the west is an unoccupied and likely derelict house. Sensitive receivers include residences located to the west, north and north east of the site (Residences 1 to 5 in Appendix B), the nearest being approximately 150 m from the site boundary (Residence 1).

Native vegetation in the surrounding region is generally restricted to nature reserves, however there are patches of native vegetation within road reserves and planted vegetation within house lots. The road reserve along Hamilton Road and Mirrool Branch Canal Road contains remnants of Weeping Myall (*Acacia pendula*) Woodland.

Excluding water supply channels within the proposal site boundary and the Mirrool Creek Branch Canal, adjacent to Mirrool Branch Canal Road, the nearest water course to the site is Mirrool Creek approximately 1 km to the south east. Mirrool Creek flows to the south west then north west into Barren Box Swamp, which connects to tributaries of the Lachlan River.

3.2 THE PROPOSAL

Appendix B provides a Proposed Infrastructure map showing the layout of the Griffith Solar Farm proposal, plus drawings of the indicative layout of the proposal including:

- Solar arrays: approximately 200,000 solar panels.
- Approximately 2,650 tracker units (for the single-axis tracking technology option).
- Approximately 26 PV boxes or PV skids, each of them containing an inverter and a 33kV transformer.
- Onsite cabling and electrical connections between solar arrays and panel inverters
- One containerised or skid-mounted delivery station.
- 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.
- A 33kV underground or overhead power line to connect into the existing Griffith/Yoogali Transgrid substation, approximately 300 m south-west of the site, through Hamilton Road.

Within the 125 ha proposal site 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 access tracks.
- Establishment of PV boxes and delivery station.
- Trenches for the installation of cables.
- Establishment of staff amenities and offices.
- Construction of perimeter security fencing.

As illustrated on the Proposed Infrastructure map in Appendix B, the solar array area covers the majority of the site, however the ground disturbance from pile installation would be disturb only about 0.2% 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 area of the site which would be affected by shading from the solar panels would be approximately 70% of the total site area.

Excluding underground cabling, all electrical plant and equipment will be established at least 410 mm above the surrounding finished surface level to accommodate extreme flood events (however Neoen may find an alternative solution to meet compatibility with flood protection for electrical equipment, which would be agreed with Griffith City Council).

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 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 (0.5 full time equivalent staff) to be onsite.

It is noted that the location of the ancillary facilities is not specified on the Proposed Infrastructure map in Appendix B and will be determined at the detailed design phase.

The annual output of the proposal would be up to 116 Gigawatt hours (GWh), with a capacity factor of approximately 17 to 23 per cent depending on the technology. The construction phase of the project would be approximately 9 months with a capital cost of approximately \$90 million. The proposal is expected to have a 25 to 30 year operating life at which point, all above ground infrastructure would be removed from the site.

3.2.1 Solar arrays

The solar arrays would be comprised of approximately 200,000 solar panels, which would be either multicrystalline or thin-film technology.

The panels to be installed would be either single-axis trackers (which would have approximately 2,650 tracker units), north-oriented fixed-tilt, east-west facing fixed-tilt or a combination of these technologies.

Approximately 25,000 piles would be driven or screwed into the ground in order to support the solar array's mounting system and solar panels, with racking systems to allow the installation of solar panels. This minimises ground disturbance.

The panel structures would be 1.5 m to 2.3 m high. The mounting system to be installed on the poles would be dependent on the final project technology. Panel technology options are illustrated in Figures 2-1, 2-2 and 2-3. Figures 3-6, 3-7 and 3-8 illustrate the construction and assembly stages of a solar PV array (for a single-axis tracking system).



Figure 3-6 Example of poles driven into the ground on a Neoen solar project in Western Australia



Figure 3-7 Example of a single-axis mounting system before panel installation



Figure 3-8 Example of a single-axis mounting system after panel installation

The multicrystalline or thin-film solar photovoltaic panels installed on the mounting system would be interconnected so as to obtain a number of strings whose overall voltage would be adequate for the operating input voltage range of the inverters. These module interconnections would be as short as possible and would shorten the cabling loops thereby minimizing the lightning effects.

3.2.2 PV boxes or PV skids

Approximately 26 PV boxes or PV skids would be installed and spread across the site. Each of them would contain an inverter and a transformer. The PV boxes (containerised) or PV skids (on skid platforms) would measure up to 6.1 m long x 3.4 m high x 2.4 m wide.

The containerised PV boxes would contain inverter and transformer stations in containers, with an example illustrated in Figure 3-9.



Figure 3-9 Example of a containerised PV box

The PV skids would be an inverter and transformer installed on a platform and would be similar to that illustrated in Figure 3-10.



Figure 3-10 Example of a skid platform PV box

The PV boxes or PV skids would be designed to withstand extreme flood events, and may be installed on footings in order to mitigate any risks in relation to the occurrence of such flood events.

3.2.3 Delivery station

The main transformer and delivery station would have a similar appearance to the PV box or PV skid in described above. The delivery station measurements would be up to container which is 8.2 m long x 3.5 m wide x 3.4m high.

3.2.4 Underground cabling

Underground cabling on site would be designed in accordance with Australian and international standards, taking into account the temperature of the ambient environment in which the cables and ancillaries shall operate, the allowable currents compatible with an acceptable warming-up as stated in the standards and as per manufacturers' recommendations.

Trenches would accommodate and protect the power and would be comprised of the following:

- Power ducts to export the production from the solar arrays to the Array Boxes (AB's).
- Power ducts to export the production from the ABs to the PV boxes or PV skids.
- One 25mm² copper wire for equipotentiality.
- The medium voltage cable for the two antennae from the PV boxes or PV skids to the delivery station.
- A fibre optic connection.
- A low current duct for communication.

Figure 3-11 illustrates an example of a trench design which may be used.

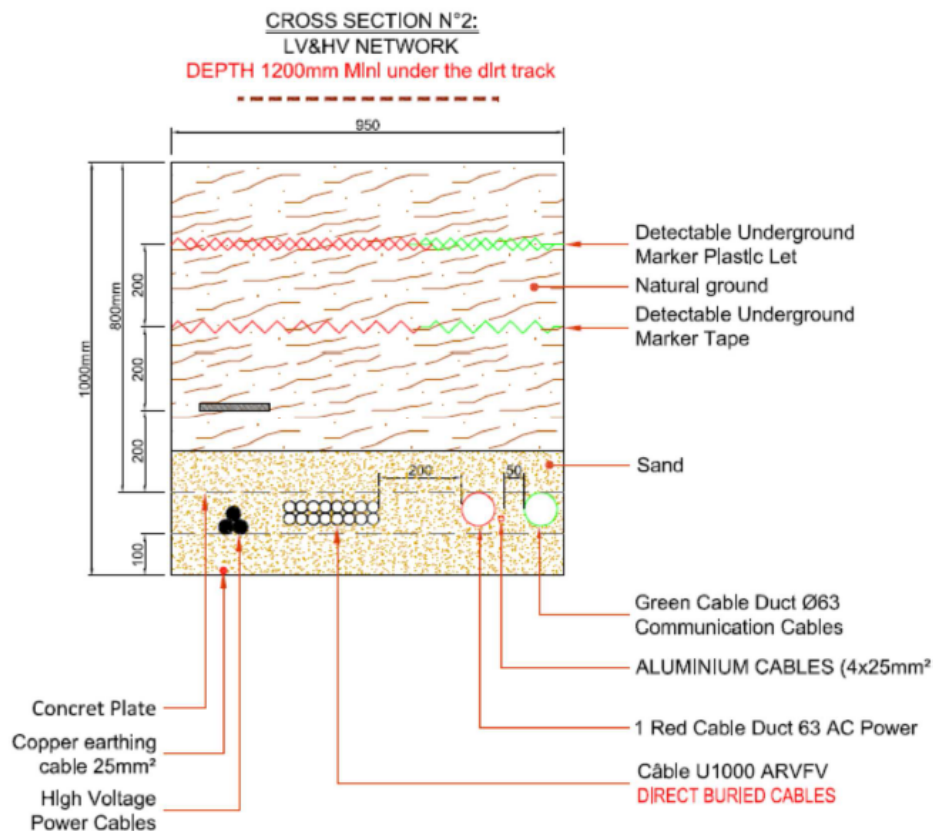


Figure 3-11 Typical trench design

3.2.5 Transmission line

The electrical connection from the site would be via a 33kV underground or overhead running to the existing Griffith/Yoogali Transgrid substation, approximately 300m west of the site. The Proposed Infrastructure map in Appendix B illustrates the route of the underground powerline and the indicative route of the overhead powerline.

The underground powerline option would be installed within the road reserve of Hamilton Road by a combination of trenching and under boring, to avoid tree removal. The work would be completed in agreement with Griffith City Council and the operator of the irrigation canal.

The overhead powerline would be up to 20 m high power poles. The actual route of the overhead powerline, across provide property, would be determined at the detailed design phase in consultation with affected land owners.

3.2.6 Internal access tracks

The on-site tracks would be made of a gravel compacted layer. If required, a geotextile would be laid between the soil and the gravel. Figure 3-12 illustrates a typical internal track design.

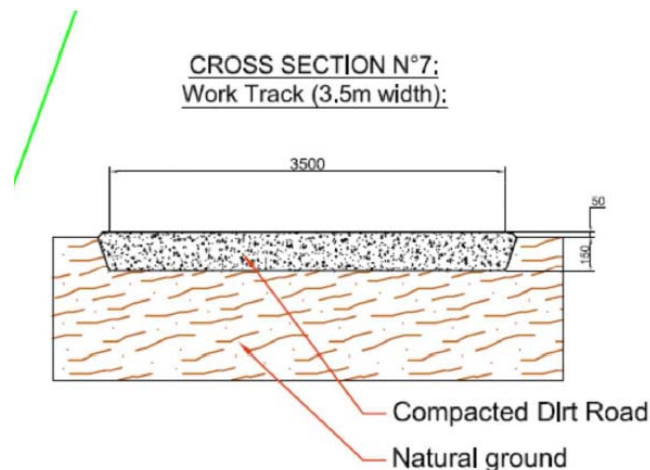


Figure 3-12 Typical internal track design

3.2.7 Ancillary facilities and construction compound

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 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 (two to five staff) 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.
- Dining hall.
- Administrative office.
- Undercover storage area.
- Pedestrian road allowing workers to go from the parking to the base camp in security without crossing a vehicular road.
- Muster point in case of emergency.
- Genset for electrical supply.

3.2.8 *Perimeter security fencing*

The perimeter of the site would be fenced with 2.3 m high security fencing along the site boundaries. It is expected to be cyclone fencing with a strand of barbed wire at the top.

3.2.9 *Site access*

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. Site access points off Hamilton Road and Poletta Road are illustrated on the Proposal Infrastructure map in Appendix B. Poletta Road would need to be upgraded to be used for construction traffic, in consultation with Griffith City Council and Murrumbidge Irrigation (the operator of the irrigation canal).

Access from the western site if the site to the eastern site would be provided by a bridge over the irrigation canal parallel to Poletta Road. The bridge would be located at the south-east extremity of Poletta Road, allowing trucks to move from one portion of the site to the other. It may also be possible for traffic movement from the western to the eastern portions of the site to occur via an existing bridge at the intersection of Poletta Road and Mirrool Branch Canal Road (with the approval of Griffith City Council).

Construction vehicles would turn on to Hamilton Road in a left turn only arrangement to access the site and would leave the site via Hamilton Road using a left turn only arrangement onto Irrigation Way. Dedicated temporary left turn only lanes off and on to Irrigation Way from Hamilton Road would be constructed and would be subject to detailed design, in consultation with Roads and Maritime Services (RMS) and John Holland Rail (consultation with these parties has been initiated).

3.3 CONSTRUCTION AND COMMISSIONING

3.3.1 Indicative timeline

An indicative timeline for the proposal is outlined in Table 3-1.

Table 3-1 Indicative timeline.

Phase	Approximate commencement	Approximate duration
Construction	January 2017	9 months
Commissioning	September 2017	1 month
Operation	October 2017	25 years
Decommissioning	2042	2 months

Activities specific to each phase of the project are discussed below.

3.3.2 Construction activities

The construction and commissioning phase is expected to last approximately 9 months. The main construction activities would include:

- Site establishment and preparation for construction (fencing, preliminary civil works and drainage (including removal of two of the three irrigation channels), access road construction, construction services and offices).
- Installation of steel post foundation system for the solar panels.
- Installation of underground cabling (trenching), installation of PV boxes containers and delivery station, connection of communications equipment.
- Construction of the 33kV transmission line (underground or above ground), switch gear and equipment, and interconnection of the generator to the existing Transgrid Griffith/Yoogali electricity substation.
- Removal of temporary construction facilities and rehabilitation of disturbed areas.

As discussed in Section 3.2, the level of ground disturbance across the site is low. This is primarily because the piles supporting the solar array's mounting system would be driven or screwed into the ground, minimising ground disturbance. Therefore ground disturbance would be minimal, would not involve levelling and would be limited to discrete tracks, piles and other elements described above. Post construction, ground cover would be rehabilitated and maintained beneath solar array areas.

The two irrigation channels to be removed would be the secondary channels. The main Murrumbidgee Irrigation channel (parallel to Poletta Road) would remain intact, so that the downstream water supply is not impacted by the proposal. The secondary irrigation channels to be removed were designed by the current land owner. The canals would be removed by the land owner.

3.3.3 Hours of operation during construction

Works would be undertaken during standard working hours:

- Monday – Friday 7am to 6pm
- Saturday 8am to 1pm

No night works or work on Sundays or public holidays are proposed. Any construction outside of standard construction hours would only be undertaken at the request of relevant roads authorities.

3.3.4 Resourcing requirements

Key resourcing requirements for the project would include labour, machinery and equipment, steel, electrical components, water, gravel and landscaping materials.

Labour, machinery and equipment

It is anticipated that approximately 90 construction personnel would be required on site during the peak construction period (approximately five months). Construction supervisors and the construction labour force, made up of construction labourers and technicians, are intended to be hired locally where possible.

It is anticipated that most workers would be accommodated at existing accommodation within the local area. It is proposed that bus transfers would be provided to minimise traffic volumes and transit risks during construction.

Equipment used during construction would include earth-moving equipment for civil works, diesel generators, trucks and cranes with similar noise outputs to farm machinery such as tractors.

Pile driving of the solar panel foundations would be undertaken using a machine which screws or hammers poles into the ground, similar to that used for driving farm fence poles into the ground.

Traffic volumes and requirements

Traffic management would be undertaken during the construction phase to manage haulage traffic. Preliminary plans for the site propose parking for approximately 50 vehicles. The proposed timeline for the project indicates that approximately 35 employees would be required during the first month rising to 90 employees during the peak construction period (approximately five months). Two or three piling or drilling machines would also be present on site during the first months of the works. During construction, up to 20 trucks a day will deliver equipment on site. A special convoy and a 50T mobile crane may be required for the offloading of the PV boxes or PV skids and the delivery station. Traffic volumes and requirements are discussed in detail in Section 7.4.

Construction activities would be undertaken during standard daytime construction hours (7.00am to 6.00pm Monday to Friday and 7.00am to 1.00pm on Saturdays). Any construction outside of these normal working hours would only be undertaken with prior approval from relevant authorities.

Materials

In total, approximately 5,000 m³ of gravel would be required for work and service tracks, while PV boxes or PV skids peripheral backfill and compaction would require around 500 m³ of gravel.

Approximately 500 m³ of sand would be required for the burying of cables into about 25 km of trenches. Approximately 400 m³ of sand will likely be required for the installation of the PV boxes or PV skids, subject to further geotechnical studies.

3.3.5 Operation

The operational phase of the proposal is anticipated to commence in October 2017. Once operational, activities would include daily operations and maintenance. This would include:

- Routine visual inspections, general maintenance and cleaning operations of the solar arrays, use of 'drone' technology to enhance maintenance operations.
- Vegetation management. Ground cover vegetation would be maintained beneath panels to resist erosion and weed infestation. A monitoring program would address any bare areas that develop, by seeding or armouring (i.e. jute mesh) to avoid erosion.
- Site security if a security event occurs.
- Replacement of equipment and infrastructure, as required.
- In total, approximately 3000 man-hours of work per year for preventive maintenance.

During normal operation, it is likely that no vehicles would be present at the site on a permanent basis, with only occasional visits by standard vehicles. Standard work hours would be maintained for standard operational activities. During major outages, 20-30 vehicles may be present at any one time.

Hours of operation during operation

Daily operations and maintenance by site staff would be undertaken during standard working hours:

- Monday – Friday 7am to 6pm
- Saturday 8am to 1pm

Outside of emergencies, night works or work on Sundays or public holidays are not proposed.

During summer months, the solar farm may continue to produce electricity after 6pm and prior to 7am while the days are longer. In the case that the panels installed are single-axis trackers, the tracker units would potentially operate outside standard working hours during summer months.

3.3.6 Decommissioning

During decommissioning, all above ground infrastructure would be removed. Key elements of project decommissioning would include:

- The solar farm's generator would be disconnected from the Transgrid metering point.
- The solar arrays would be removed, including the foundation posts. Materials would be sorted and packaged for removal from the site for recycling or reuse. Much of the solar array panels would be recyclable.
- All site amenities and equipment would be removed and materials recycled or reused, wherever possible.
- Posts and cabling would be removed and recycled (some infrastructure 300 mm below ground may be left in place).
- Fencing would be removed (some fencing may be retained, if it is requested by the landowner).

Traffic required for decommissioning would be similar in type but of shorter duration than that required for the construction phase.

4 STAKEHOLDER CONSULTATION

4.1 AGENCY CONSULTATION

4.1.1 Secretary's environmental assessment requirements (SEARs)

As the proposal is classified as State Significant Development (SSD), SEARs were requested (for a of 30 MVA PV solar farm) and were provided by DPE on 26 August 2014 (refer Appendix A). The SEARs are intended to guide the structure and content of the EIS and reflect the responsibilities and concerns of NSW government agencies in relation to the environmental assessment of the proposal.

In September 2015, Neoen made contact with DPE to advise of changes to the proposal, including an increase in the proposed capacity of the solar farm (from 30 MVA to 110 MVA) and an increase in site coverage (from approximately 55 ha to 120 ha). The revised proposal site remains within the site boundary from the original scoping study. Neoen is now applying for a 53MVA project.

DPE advised on 29 September 2015 that the SEARs issued on 26 August 2014 remain relevant (refer Appendix C.1).

The following sections provide a summary of the SEARS from the various agencies and a cross reference to where specific issues are addressed within this EIS. Additional consultation was undertaken with several of the agencies to clarify some of the issues raised in the SEARs or seek further advice. This additional consultation with agencies is also summarised below.

Department of Planning and Environment

Issue summary	Addressed in EIS
The (EIS) must be prepared in accordance with, and meet the minimum requirements of, Part 3 of Schedule 2 of the EP&A Regulation and include the following: • Description of the development for the solar farm, as required under clause 6, Part 3 of Schedule 2 of the EP&A Regulation; • Summary of the EIS; • Statement of objectives of the development, including strategic need, justification, objectives and outcomes and demonstration of greenhouse gas benefits; • Analysis of feasible alternatives; • Analysis of the development, including an assessment, with a particular focus on the requirements of the listed key issues, in accordance with clause 7(1)(d) of the EP&A Regulation (where relevant); • Identification of how relevant planning, land use and development matters (including strategic and statutory matters) have been considered in the impact assessment (direct, indirect and cumulative impacts), including section 79C of the EP&A Act; • Mitigation measures; • Justification of the development taking into consideration the objects of the EP&A Act; • Incorporation of the principles of ecologically sustainable development (ESD) into proposal design.	Proposal description – Section 3.2. Executive summary provided. Proposal objectives, needs and benefits – Section 2 Proposal alternatives – Section 2.5. Analysis of the development provided throughout EIS. Planning context – Section 5. Mitigation measures summary - Section 8.2 Justification - Section 2.4. ESD - Section 5.5.1

Issue summary	Addressed in EIS
The EIS must address the following specific matters: Flora and fauna • Include an assessment of the impacts of all development components on flora and fauna (both terrestrial and aquatic, as relevant) and their habitat. • The assessment must take into account: ◦ the <i>Threatened Species Assessment Guidelines</i> (DECC, 2007); ◦ the <i>Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities</i> (DEC, 2004); and ◦ Lachlan Catchment Management Plan including details on the existing site conditions and likelihood of disturbance (including quantifying the worst case extent of the impact on the basis of vegetation type and total native vegetation disturbed); • Specifically consider impacts on threatened species and ecological communities listed under both State and Commonwealth legislation that have the potential to occur on the site and surrounding land, impacts on riparian and/ or instream habitat in the case of disturbance of waterways, and on biodiversity corridors; • Provide an assessment of the likely impacts on bird species, bats and flying invertebrates considering the results of targeted survey techniques, actual or likely flight paths in the vicinity of the project, an assessment of the potential impact of birds and bats coming into contact with the heliostats, receiving towers, heat envelopes and path of solar energy between heliostats and receiving towers, and the potential for bird and/or strike; • Include details of how flora and fauna impacts would be managed during construction and operation including adaptive management and maintenance protocols (including the mitigation and/or management of weeds); and • Any steps taken to mitigate or offset any identified impacts to the environment should also be detailed in the EIS. Current OEH offsets policy should be used in assessing and determining the adequacy of offsets. Note that a draft Biodiversity Offsets Policy for Major Projects is in the process of being finalised.	Section 6.4 and Appendix D.
Visual impacts • 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; • 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 also include the associated transmission line. Alternative pole designs should be presented and assessed and the potential for undergrounding in sensitive locations should also be assessed; • Provide an assessment of the potential for reflectivity from the panels and associated infrastructure, and any safety impacts for motorists or aircraft (including a consideration of the establishment and maintenance of a visual buffer to minimise potential distraction of motorists); • Include photomontages of the development taken from potentially affected residences (including approved but not yet developed dwellings or subdivisions with residential rights), settlements and significant public view points, and provide a clear description of proposed visual amenity mitigation and management measures for the solar farm; and	Landscape character, visual impacts and a feasible and reliable mitigation strategy are provided in Appendix E and Section 6.3. Glare and reflectivity are also addressed as part of the visual assessment.

Issue summary	Addressed in EIS
Provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after these measures have been implemented.	
Noise Impacts - Include a noise assessment of all phases and components of the development including, but not limited to construction noise (focusing on high noise-generating activities and any works proposed outside of standard construction hours, traffic noise, and vibration generating activities). The assessment must identify noise/vibration sensitive locations (including approved but not yet developed dwellings), baseline conditions based on monitoring results, the levels and character of noise (eg. tonality, impulsiveness etc.) generated by noise sources, noise/vibration criteria, modelling assumptions and worst case and representative noise/vibration impacts; - Include monitoring to ensure that there is adequate background noise data that is representative for all sensitive receptors; - Provide justification for the nominated average background noise level used in the assessment process, considering any significant difference between daytime and night time background noise levels if there are noise generating activities at night; and - Clearly outline the noise mitigation, monitoring and management measures that would be applied to the development. This must include an assessment of the feasibility, effectiveness and reliability of proposed measures and any residual impacts after these measures have been incorporated. - The assessment must take into account the following guidelines (as relevant): - Site Establishment and Construction – <i>Interim Construction Noise Guidelines</i> (DECC, 2009); - Traffic Noise – <i>NSW Road Noise Policy</i> (DECCW, 2011); - Vibration – <i>Assessing Vibration: A Technical Guideline</i> (DECC, 2006; and - Operation – <i>NSW Industrial Noise Policy</i> (EPA, 2000).	Appendix F and Section 6.5.
Heritage The EIS must include an assessment of impacts on Aboriginal heritage. The EIS must demonstrate the likely impacts of the development to Aboriginal heritage (including cultural and archaeological significance). Where impacts are identified the assessment shall: - Outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the measures) generally consistent with the <i>Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation</i> (Department of Environment and Conservation, 2005); - Be undertaken by a suitably qualified heritage consultant(s); - Demonstrate effective consultation with Aboriginal communities in determining and assessing impacts and developing and selecting options and mitigation measures (including the final proposed measures); and - Demonstrate that an appropriate archaeological assessment methodology, including research design (where relevant) has been undertaken, to guide physical archaeological test excavations of areas of potential archaeological deposits. The full spatial extent and significance of any archaeological evidence shall be established and results of excavations included.	Appendix G and Section 6.2. Aboriginal consultation is discussed in Section 4.2.

Issue summary	Addressed in EIS
Traffic and transport The EIS must assess the construction, operational and decommissioning traffic impacts of the development. The EIS must be accompanied by a Traffic Impact Assessment to address the impacts of traffic generated by the proposal on the nearby road network including: • Details of the nature of traffic generated, vehicle numbers and types of vehicles, transport routes for vehicles accessing the site, and potential impacts on local and regional roads (including impacts on the structural integrity of the road network), bridges and intersections, including any proposed road upgrades and repairs; • Details of measures to mitigate and/or manage the potential impacts, including measures to control soil erosion and dust generated by traffic volumes; and • Details of site access roads including how these would connect to the existing road network and any operational maintenance or handover requirements.	Section 7.4.
Hazards/Risks • The EIS must include an assessment of potential hazards and risks associated with electric and magnetic fields (EMFs) (with reference to Australian Radiation Protection and Nuclear Safety Agency standards) and bushfires. The EIS should demonstrate the application of the Principles of Prudent Avoidance in relation to EMFs. The EIS must also detail measures to contain any hazardous substances to prevent the contamination of pasture and dams. • The EIS must identify the potential hazardous chemical emissions from all processes and the proposed type, quantity and location of chemicals to be stored on site.	Section 7.6 and 7.10. Section 7.2.
Water Quality, Waterways and Flooding The EIS must identify likely impacts to the waterways and measures to minimise impacts including: • An assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts should also be provided; • Details of the design of waterway crossings where such crossings are to be located in third order or higher streams; • Address soil erosion issues and the potential for clearing to create salinity risks; • An assessment of potential flooding impacts, undertaken generally in accordance the NSW Government Floodplain Development Manual 2005, considering a full range of potential flood events up to and including the Probable Maximum Flood (PMF) and any local floodplain risk management planning processes; and • Details of proposed storm water collection, storage and disposal systems including demonstration that surface and ground waters will be protected through adequate design, construction and management.	Sections 7.1 and 7.3.
General Environmental Risk Analysis Notwithstanding the key assessment requirements, the EIS must include an environmental risk analysis to identify potential environmental impacts associated with the development, proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of the additional key environmental impact(s) must be included in the EIS.	Section 6.1 and mitigation measures within Sections 6 and 7.

Issue summary	Addressed in EIS
Consultation The Proponent must undertake a consultation program as part of the environmental assessment process, including consultation with, but not necessarily limited to, the following parties:	
Griffith City Council.	See below.
Riverina Local Land Services.	See below.
Office of Environment and Heritage.	See below.
Environment Protection Authority.	See below.
Department of Primary Industries (NSW Office of Water).	See below
NSW Trade and Investment (Crown Lands Division and NSW Mineral Resources).	Crown Lands advised that the SEARs were adequate to thoroughly assess the proposal. Mineral resources advised no issues. See Appendix A.
NSW Roads and Maritime Service (RMS).	RMS would be consulted regarding design of intersection upgrades required by the proposal. This has been initiated.
NSW Rural Fire Service (RFS).	See below.
Transgrid.	Neoen has consulted regarding transmission line and connection to grid.
Local Aboriginal Land Council.	See Section 4.2.
Relevant mineral stakeholders and the local community and landowners.	No mineral stakeholders were identified (see Section 7.7). See Section 4.3 for details of consultation with the local community and neighbouring landowners.
Consultation process to include measures for disseminating information to increase awareness of the development as well as methods for actively engaging stakeholders on issues that would be of interest/concern to them. The EIS must: - Demonstrate effective consultation with stakeholders, and that the level of consultation with each stakeholder is commensurate with their degree of interest/concern or likely impact; - Clearly describe the consultation process undertaken for each stakeholder/group including details of the dates of consultation and copies of any information disseminated as part of the consultation process (subject to confidentiality); and - Describe the issues raised during consultation and how and where these have been addressed in the EIS.	Appendix C2 Community Consultation Plan and Section 4.3.

In addition to the SEARS, NGH Environmental contacted DPE to seek further advice regarding the respective scopes of the Visual Impact Assessment (VIA), Aboriginal heritage assessment and flooding assessment. DPE responded on 30 October 2015 (see Appendix C.1) as follows.

Visual Assessment (regarding the NGH Environmental request not to prepare photomontages):

Based on the information you provided in your letter, it is difficult for me to determine the necessity of photomontages. Before you dismiss the need to provide photomontages, you should provide some context. Much would depend on the distance of the nearest sensitive receivers, their orientation and impact. It would depend upon how well you present your supporting information demonstrating the impact. In other words once all analysis is proposed you must demonstrate that it would add no additional value.

The VIA summarised in Section 6.3 provides the context for the proposal and demonstrates the impact of the proposal by way of panoramic photos from representative viewpoints. Indicative photos of infrastructure are provided to demonstrate the likely impacts.

Heritage (regarding the NGH Environmental request that investigations should not necessarily include archaeological sub-surface testing):

It is my understanding that there is no automatic requirement for test excavations. Rather it is required that appropriate archaeological methodology must be employed for excavations where relevant for PADs.

Several artefacts were discovered along Poletta Road during the archaeological site survey. The site is very disturbed and the impact to scientific values if the artefacts were to be impacted is considered low to moderate. The integrity of the site is already low and any additional disturbance is therefore unlikely to make a meaningful difference to the status of the site. Therefore sub-surface testing was not undertaken.

Flooding (regarding NGH Environmental's proposal to assess flooding impacts based on the *Griffith Main Drain J and Mirrool Creek Flood Study 2014*, which would not involve project specific-modelling).

Regarding your approach at Griffith, I have no problem with your approach, provided again, that you report justifies the approach taken.

Section 7.1 provides a full assessment of hydrological impacts, specific to the project, without modelling project specific impacts.

Office of Environment and Heritage

Issue summary	Addressed in this EIS
Biodiversity - proposal should avoid clearing of native vegetation wherever possible.	The proposal would avoid tree removal, refer to Section 6.4.
The EIS must include an assessment of the impacts of all development components on flora and fauna (both terrestrial and aquatic, as relevant) and their habitat. The assessment must take into account the: - Threatened Species Assessment Guidelines (DECC, 2007); - Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC, 2004); - Department of Planning & Environment Guidelines for Threatened Species Assessment.	Section 6.4.
The EIS must specifically consider impacts on threatened species and ecological communities listed under both State and Commonwealth legislation that have the potential to occur on the site and surrounding land, impacts on riparian and/ or instream habitat in the case of disturbance of waterways, and on biodiversity corridors.	Section 6.4.
The EIS must include an assessment of impacts on Aboriginal cultural heritage.	Section 6.2.

OEH was further consulted regarding the biodiversity assessment requirements for the proposal in late 2015 and the draft assessment was provided to Miranda Kerr at OEH on 8 February 2016. Peter Ewin from the South West office of OEH advised (pers. comm. 9 February 2015) that:

- The EIS should include mapping of the threatened communities in the road corridors adjacent to the site and note the source of mapping (Government mapping, etc).*
- The EIS should cover impacts to threatened species and communities. If there is no proposed native vegetation removal for site access or the powerline, an Assessment of Significance may not be necessary (though it may be more comprehensive to include one for DPE's purposes).*
- Where screening planting is proposed along Irrigation Way, use a mixture of native local species.*

The issues are addressed in Section 6.4 (Biodiversity).

Griffith City Council

Issue summary	Addressed in this EIS
The following issues are to be addressed in the EIS:	
Development Control Plans, Policies and Plans.	Section 5.3
Flora and fauna impacts, including maps of existing vegetation. Impact to weeping Myall trees should be minimised.	Section 6.4.
Landscaping plan showing visual buffer.	Section 6.3.
Site remediation plan for measures at end of proposal lifespan.	Section 3.2.
Plans of site office, maintenance buildings and parking areas.	Section 3.2
Potable water requirements.	Section 7.3
Stormwater drainage with regard to irrigation impacts.	Sections 7.3.
Access and traffic details and impacts – concerns raised in relation to vehicles turning off and onto Hamilton Road from Irrigation Way and proximity of railway line to Irrigation Way.	Section 7.4 and see below.
Provide Construction Environmental Management Plan (CEMP).	CEMP to be provided post approval.

Griffith City Council was further consulted regarding construction heavy vehicle access from Irrigation Way onto Hamilton Road and vice versa (the Council is the road authority for all adjacent roads to the site, apart from Irrigation Way). As discussed in Section 3.2, dedicated temporary left turn only lanes off and on to Irrigation Way from Hamilton Road would be constructed and would be subject to detailed design, in consultation with RMS and John Holland Rail (consultation with these parties has been initiated).

Griffith City Council also advised (via email dated 22 December 2015, see Appendix C.1) that all non-submersible electrical outlets and perishable items should be kept a minimum 410 mm above surrounding finished surface level to minimise the likelihood of damage from flooding. As discussed in Section 3.2, all non-submersible plant and equipment would be raised at least 410 mm above surrounding finished surface level, (however Neoen may find an alternative solution to meet compatibility with flood protection for non-submersible electrical equipment, which would be agreed with Griffith City Council).

Environment Protection Agency

Issue summary	Addressed in this EIS
Identify potential air quality impacts (dust) and potential noise impacts from the proposal and detail management and mitigation measures for those impacts.	Section 7.5 assesses impacts to air quality. Appendix F and Section 6.5 assess noise impacts.
Details on proposed stormwater collection, storage and disposal systems.	A Soil and Water Management Plan will be developed prior to construction. The Plan will detail specific measures relative to the final design to ensure that surface water drainage infrastructure are designed to minimise impacts.
Assess potential environmental impacts including: - Air. - Water. - Land. - Waste and chemicals.	Section 7.5. Section 7.3.. Sections 7.2 and 7.7. Sections 7.2 and 7.9.

Department of Primary Industries

Issue summary	Addressed in this EIS
Water supply, use and management: - Identify adequate and secure water supply for the life of the proposal. - Details of water proposed to be taken (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan. - Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project). - A detailed and consolidated site water balance. - Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts. - Proposed surface and groundwater monitoring activities and methodologies. - Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts. - Consideration of relevant policies and guidelines.	Section 0 assesses impacts to water quality. Section 7.2 includes management of soil resources to control erosion and sedimentation. Detailed water balance has not been undertaken. A ground cover management plan would be developed with the aim of maintaining ground cover beneath panels, thereby resisting erosion and weed infestation and run off into aquatic habitat. There are no water licencing requirements relevant to the proposal. Section 5 considers policies and guidelines.

DPI (Office of Water) was further consulted regarding flooding assessment requirements for the proposal in late 2015. Tim Baker from DPI (Office of Water) emailed on 11 December 2015 and advised that:

- Flood work approvals assessed under the Water Management Act 2000 are generally not required for areas covered by a Council Floodplain Management/Risk Plan. In those areas Council is the relevant regulator. Therefore for this project as it is covered by Councils Flood study I would assume this would be the guiding document initially and Council would need to be consulted for further requirements. As this is an SSD project the requirements of OEH or DP&E would also need to be addressed.*
- Where Floodplain Management Plans are developed under the Water Management Act 2000, OEH is responsible for developing the content of the plans, hence they would be worthwhile contacting to clarify their position.*

The issues are addressed in Section 7.1 (Hydrology and flooding).

Roads and Maritime Services

Issue summary	Addressed in this EIS
Given the scale and operational characteristics of the proposed development, Roads and Maritime Services considers that the traffic related issues relevant to the development should be considered and addressed in two distinct stages as follows: - Establishment & decommission phase – the transport of materials and equipment/components for the establishment of the facility and ancillary infrastructure, the movement and parking of construction related vehicles, including personal vehicles, during the construction of the facility, - Operational phase – the ongoing traffic generation due to the operation, maintenance and servicing of the various elements of the project.	Traffic and transport impacts are assessed in Section 7.4.
A Traffic Management Plan outlining measures to manage vehicular access to the site, particularly during the construction and decommissioning phases should be prepared. This plan shall detail the potential impacts associated with the phases of the development, the measures to be implemented to maintain the standard and safety of the road network, and procedures to monitor and ensure compliance.	Traffic Management Plan developed in consultation with the Griffith City Council and RMS, prior to construction of the proposal, is a commitment of this proposal.
Given the type and scale of the proposed development it is considered appropriate that issues relating to potential for distraction of, and for glare impacts on, passing motorist be addressed in any submission. As a minimum, consideration should be given to the establishment and maintenance of a visual buffer, such as a vegetated buffer, within the subject site along its frontage to any public road, particularly Irrigation Way.	Glare, reflectivity and suggested planted screens are included in Section 6.3.
Roads and Maritime Services emphasises the need to minimise the impacts of any development on the existing road network and maintain the level of safety, efficiency and maintenance along the road network. Given the scale of the proposal a Traffic Impact Assessment (TIA) should be submitted with the Development Application. Any Traffic Impact Assessment needs to address the impacts of traffic generated by this development upon the nearby road network.	Traffic and transport impacts are assessed in Section 6.6.
For guidance in the preparation of the TIA the applicant is referred to section 2 of the “Guide to Traffic Generating Developments” prepared by the RTA and the Austroads publications, particularly the Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development. The TIA should contain information such as the expected traffic generation, vehicle numbers and types of vehicles, and travel routes for vehicles accessing the development site.	Traffic and transport impacts are assessed in Section 7.4.

Riverina Local Land Services

On 7 January 2016, NGH Environmental contacted Riverina Local Land Services requesting environmental assessment requirements for the proposal environmental assessment requirements in addition to the SEARs and those from OEH.

Riverina Local Land Services responded via email on 14 January 2016 that Riverina Local Land Services has no objections to the proposal (Appendix C.1), though they anticipate that the following aspects of the proposal will receive due consideration. The table below provides a list of these aspects and a cross reference to where they are addressed within this EIS.

Issue summary	Addressed in EIS
Adjacent woodland remnants, Boree, are an EPBC Act listed endangered ecological community (EEC), therefore any immediate or potential impact requires appropriate action to be taken.	There would be no impacts on this community, Section 6.4.
The status of the site in relation to potential disturbance to cultural heritage is carefully considered.	Section 6.2.
The long term implications of ground disturbance and subsequent exotic or noxious weed growth and spread is carefully considered. This has implications with the introduction of machinery from other locations, with the potential to introduce weeds or other material having severe implications for surrounding areas.	Section 6.4.
The impacts of water flow across or from the site as a result of construction, infrastructure or other works is carefully considered. Sediment flow into drains, channels or creeks as a result of diversion of water could also result in a significantly perverse outcome.	Section 7.1, 7.2 and 0.

Telecommunications

Tim Pearse from NSW Telco Authority advised by email on 7 August 2014 (refer Appendix C.1) that the risk of interference from the proposal into the Telco Authority's radio communications is very low.

RFS advised NSW Telco Authority that there is no risk from the proposal to RFS radio communications activities.

Airservices Australia

Jessica Neidert from Air services Australia advised by email on 31 July 2014 (refer Appendix C.1) that the following information should be provided by DEP when available:

- Heights of all structures in AHD.
- Corner coordinates for the station.
- What exactly is being installed, including technical specifications.
- Any transmitting devices and their subsequent technical specifications.

Air services Australia had no concerns regarding the environmental impact assessment of the proposal.

Rural Fire Service

RFS advised the following by email (dated 18 February 2016):

- The site does not appear to be mapped as bush fire prone land.

If the proposal is considered to be at risk of bushfire, the proposal should address the aims and objectives of *Planning for Bushfire Protection 2006*. This should include a fire management plan to ensure appropriate mitigative measures are developed to reduce the risk of wildfire impacts on the facility, and to address the risk of activities occurring on the site becoming a potential ignition point for fire escaping from the site. Section 7.10 addresses potential bush fire risks.

4.2 ABORIGINAL COMMUNITY CONSULTATION

Local Aboriginal Land Council and Registered Aboriginal Parties

The consultation with Aboriginal stakeholders was undertaken by NGH Environmental (Heritage) in accordance with clause 80C of the *National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010* following the consultation steps outlined in the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCRP) guide provided by OEH. The guide outlines a four stage process of consultation as follows:

- Stage 1 – Notification of project proposal and registration of interest.
- Stage 2 – Presentation of information about the proposed project.
- Stage 3 – Gathering information about cultural significance.
- Stage 4 – Review of draft cultural heritage assessment report.

Stage 1. Letters outlining the development proposal and the need to carry out an Aboriginal Cultural Heritage Assessment (ACHA) were sent to the Griffith Local Aboriginal Land Council (Griffith LALC), and various statutory authorities including OEH, as identified under the ACHCRP. An advertisement was placed in the local newspapers, the *Griffith Area News* on 23 October 2015 seeking registrations of interest from Aboriginal people and organisations. A further series of letters was sent to other organisations identified by OEH in correspondence to NGH Environmental. In each instance, the closing date for submission was 14 days from receipt of the letter.

As a result of this process, one group contacted the consultant to register their interest in the proposal; Griffith LALC (registered by phone).

No other party registered their interest, including the entities and individuals recommended by OEH.

Stage 2. On the 13 November 2015, an Assessment Methodology document for the Griffith Solar Farm was sent to the Griffith LALC by NGH Environmental (Heritage). This document provided details of the background to the proposal, a summary of previous archaeological surveys and the proposed heritage assessment methodology for the proposal. The document invited comments regarding the proposed methodology and also sought any information regarding known Aboriginal cultural significance values associated with the subject area and/or any Aboriginal objects contained therein. A minimum of 28 days was allowed for a response to the document. No written response was received but Robert Carroll, CEO of the Griffith LALC, indicated by phone that he was satisfied with the methodology and was happy to proceed to conducting fieldwork.

Stage 3. The *Assessment Methodology* outlined in Stage 2 included a written request to provide any information that may be relevant to the cultural heritage assessment of the study area. It was noted that sensitive information would be treated as confidential. No response regarding cultural information was received.

At this stage, the fieldwork was organised and the Griffith LALC were asked to participate in the fieldwork. Max Harris, an experienced senior sites officer from Griffith LALC attended the survey with the archaeologist and assisted in conducting the survey.

Stage 4 In January 2016 a draft version of this *Aboriginal Cultural Heritage Assessment Report* for the proposal (this document) was forwarded to the Griffith LALC inviting comment on the results, the significance assessment and the recommendations. A minimum of 28 days was allowed for responses to the document.

4.3 COMMUNITY CONSULTATION

Neoen has undertaken consultation with the local community in developing the proposal, in line with DPE's *Guidelines for Major Project Community Consultation* (October 2007) and the Australian Renewable Energy Agency's (ARENA's) *Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry* (ARENA n.d.). The following section describes the consultation undertaken. Consultation activities were undertaken in line with *Beyond Public Meetings: Connecting community engagement with decision making*, Twyford Consulting (2007).

4.3.1 Community consultation plan

Effective engagement requires an understanding of community stakeholders and prioritisation of potential impacts. It also relies on the community understanding the project and specific issues of interest to them, in order to contribute effectively. The focus of the consultation process for the Griffith Solar Farm has been on providing this understanding and engagement.

A Community Consultation Plan (CCP) was developed early in the planning stages of the proposal and has been updated during the development of the proposal. It is provided in Appendix C.2.

The aim of the CCP is to identify methods to inform the community about the Griffith Solar Farm and facilitate engagement with the community.

The CCP identifies:

- Community stakeholders for the proposal.
- Issues / risks related to the engagement of each stakeholder group.
- A consultation strategy for each stakeholder group.
- A set of activities against the project development time line to facilitate consultation.

4.3.2 Visual impact assessment requirements

Community consultation specific to the assessment of visual impacts for the proposal was required in order to:

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

As part of the CCP, respondents were 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 the CCP (refer Appendix C.2). The results were used in the identification of viewpoints for the visual impact assessment (refer Appendix E and Section 6.3).

4.3.3 Community consultation activities to date

In line with the CCP, a range of community engagement tools have been used with regards to the proposal. These include:

- Development of a project website to provide information and updates (<http://griffithsolarfarm.com.au/> website went live in early December 2015 and is updated regularly).
- Establishment of dedicated email address for feedback.
- A media release was issued on 3 December 2015 to advise of the proposal and the date, time and venue of the information sessions for the Griffith Solar Farm on Monday 14 December 2015 (Griffith Ex-Servicemen's Club (refer Appendix C.3).
- Direct engagement with neighbours by a letter distributed in early December 2015. The letter advised of the solar farm location and size, identified the land owners, timing for DA lodgement, time and venue of the information sessions for the Griffith Solar Farm on Monday 14 December 2015) and that input from close neighbours to the site was encouraged. Appendix C.3 includes a copy of the letter, which included a Community Feedback Form.
- Direct engagement with neighbours through phone calls, letters, email and face to face meetings.
- Media release to the local Griffith newspaper, resulting in an article in mid December 2015.
- Public information session held by Neoen in Griffith on 14 December 2015 to provide proposal information and answer questions (with documentation presented at the community information session available on the website's "news room" section).
- Meetings with near neighbours to the proposal site and Neoen staff in March 2016.

4.3.4 Results of community consultation

Twenty-five people attended the Griffith Solar Farm information session held 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.

While uptake levels of community engagement activities for the proposal have been low, it is considered that this reflects a low level of concern about the proposal. The issues identified through the consultation process have been addressed in the EIA and proposal design.

On 3 March 2016, Chris Leonard from Neoen met with eight of the 10 nearest neighbours to the proposal site (excluding the involved landowner) to discuss any concerns with the proposal, particularly related to visual amenity. The neighbours were provided with a hard copy of the documentation presented at the December 2015 information session and a form (to be completed at the time of their convenience), where they could indicate any concern they had regarding the proposal.

Five of the eight neighbours completed the form and indicated they have no concern with the proposal. Of the remaining three neighbours visited, two indicated they had no concerns, and one stated that they would be in touch with Neoen to ask a question about the proposal.

Regarding the two near neighbours who were not available on 3 March 2016, Neoen will endeavour to visit these neighbours in the future to provide documentation and gain feedback regarding the proposal.

4.3.5 Continued engagement

Engagement activities will continue throughout the determination period, as set out in the CCP.

The CCP will be reviewed regularly, as well as at key transition phases between different stages of project development (e.g. prior to construction or operation). The Plan will continue to guide engagement activities at all stages of the project, ensuring that engagement is appropriate and in line with good practice.

5 PLANNING CONTEXT

This section sets out the strategic planning framework relevant to the proposal.

5.1 ASSESSMENT CONTEXT

The proposal to construct and operate Griffith Solar Farm requires development consent under Part 4 of the EP&A Act. *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) declares the proposal to be SSD as it is development for the purpose of electricity generating works with a capital cost of greater than \$30 million (clause 20, Schedule 1). Section 78A of the EP&A Act requires a DA for SSD to be accompanied by an EIS prepared in accordance with the EP&A Regulation.

This EIS has been prepared in accordance with Part 4 of EP&A Act and Schedule 2 of the EP&A Regulation.

5.2 EVALUATION OF THE DEVELOPMENT

Section 89H of the EP&A Act provides that section 79C applies to the determination of DAs for SSD. Under section 79C of the EP&A Act, the consent authority is required to consider a number of matters when determining a DA under Part 4. These matters are listed in Table 5-1 and assessed in terms of their relevance to the proposal.

Table 5-1 Matters of consideration

Provision	Relevance to the proposal
Any environmental planning instrument;	Relevant environmental planning instruments (EPIs) are discussed in Section 5.3.
Any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the consent authority;	There are no draft instruments relevant to the proposal.
Any development control plan;	Griffith City Council has prepared a number of specific Development Control Plans, however Clause 11 of the SRD SEPP provides that development control plans do not apply to SSD.
Any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F;	There are no planning agreements that have been entered into, nor are any planning agreements proposed, that relate to the proposal.
The regulations (to the extent that they prescribe matters for consideration);	Clause 92 of the EP&A Regulation requires consideration of: - the Government Coastal Policy, for development applications in certain local government areas; and - the provisions of AS 2601 for development applications involving the demolition of structures. Neither of these provisions is relevant to the proposal.
Any coastal zone management plan (within the meaning of the <i>Coastal Protection Act 1979</i>), that apply to the land to which the development application relates;	Coastal zone management is not applicable to the proposal.
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;	The likely impacts of the proposal, including environmental impacts on both the natural and built environments, and the social and economic impacts in the locality, are detailed in Sections 6 and 7 of this EIS. This EIS demonstrates that the environmental impacts of the proposal have been avoided or minimized through careful project design. Overall impacts are considered manageable and justifiable.
The suitability of the site for the development;	The suitability of the site for the development is assessed in Section 2.5.4. Characteristics that make it suitable for development of a solar farm are identified and justified.
Any submissions made in accordance with this Act or the regulations; and	Public submissions would be sought and responded to as part of the EIS determination process. Neoen would consider and respond to any submissions made in relation to the proposal.
The public interest.	A number of public benefits are relevant to the proposal as discussed in Section 0. Specifically, they relate to: Reducing fossil fuel emissions that contribute to climate change. Meeting State and Australian Government policies to increase renewable energy supply. Providing local employment and regional development opportunities.

5.3 NSW LEGISLATION

5.3.1 Environmental Planning and Assessment Act 1979

Development in NSW is subject to the requirements of the EP&A Act and the EP&A Regulation. Environmental planning instruments prepared under the Act set the framework for development approval in NSW.

The proposal would be assessed under Part 4 of the EP&A Act. The relevant objects of the EP&A Act are:

- a) *to encourage:*
 - i. *The proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.*
 - ii. *The promotion and coordination of the orderly and economic use and development of land.*
 - iii. *The protection, provision and coordination of communication and utility services.*
 - vi. *The protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.*
 - vii. *Ecologically sustainable development.*

The objects of the EP&A Act have been considered throughout this environmental assessment and natural resources and competing land uses have been taken into account. The proposal aims to promote the orderly and economic use of the land through the provision of utility services (power generation). The proposal has been located and designed such that it would avoid protected areas and generally minimise the use of natural and artificial resources while still considering the social and economic welfare of the local community.

The proposal is not in conflict with any of the remaining objects of the EP&A Act. Given the proposal would support a number of the objects of the EP&A Act, and is consistent with the remaining objects of the Act, the proposal is considered appropriate in the context of the EP&A Act.

5.3.2 Environmental Planning and Assessment Regulations 2000

Division 6 of the EP&A Regulation addresses public participation for SSD. Neoen would comply with Division 6 of the EP&A Regulations, including the specific provisions of clauses 84 and 85 regarding placing notices in local newspaper and on the website of the DPE and the form that notice must take. The Development application and accompanying information (including this EIS) would be placed on public exhibition for a period not less than 30 days.

5.3.3 Griffith Local Environmental Plan 2014

The proposal site is located within the Griffith LGA which is subject to the provisions of *Griffith Local Environmental Plan 2014* (Griffith LEP). The Griffith LEP aims:

- (a) to prevent unnecessary urban sprawl by promoting business, industrial, rural and residential uses within and adjacent to existing precincts related to those uses,*
- (b) to minimise land use conflict in general by creating areas of transition between different and potentially conflicting land uses,*
- (c) to provide a variety of development options to meet the needs of the community with regard to housing, employment and services,*
- (d) to manage and protect areas of environmental significance,*
- (e) to recognise the historical development of the area and to preserve heritage items associated with it.*

This EIS takes into account the proposal's compatibility with these aims. The proposal is considered compatible with these requirements.

Land zoning

The LEP states that the consent authority must have regard to the development objectives of planning zones identified in the Griffith LEP when determining DAs. The proposal site is located on land zoned RU1 Primary Production under the Griffith LEP.

The objectives of this zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- To minimise the fragmentation and alienation of resource lands.*
- To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- To permit a range of activities that support the agricultural industries being conducted on the land and limit development that may reduce the agricultural production potential of the land.*
- To permit tourist facilities that promote an appreciation of the rural environment and associated agricultural and horticultural activities, while ensuring the continued economic viability of the land.*

For the life of the proposal, the proposal site would harness a natural resource (solar energy). While the activity would impact on land availability for primary production, the land would meet the second and third objects as identified above; it would allow for diversity in land use, appropriate to the area and it would not fragment resource lands. Being fully reversible and involving limited ground disturbance, it would not remove the potential to use the land for primary production in the medium to long term.

Permissibility of the proposal is discussed in Section 5.3.15.

5.3.4 Development Control Plans and Council Policies

The following Development Control Plans and Council Policies are also applicable to the proposal:

- Griffith Land Use Strategy: Beyond 2030.
- Development Control Plan No. 1 -Non-Urban Development.
- Development Control Plan No. 20- Off-Street Parking (2011).
- Onsite Waste Management Plan.
- Griffith City Council Engineering Guidelines.
- Section 94A Contributions Plan.

The proposal is consistent with the provisions of these plans and policies.

5.3.5 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) was introduced to facilitate the effective delivery of infrastructure across the State by improving regulatory efficiency through a consistent planning regime for infrastructure and services across NSW.

Part 3 Division 4 of ISEPP relates to electricity generating works. Clause 34(1) states that development for the purpose of electricity generating works may be carried out by any person with consent on land in a prescribed rural, Industrial or special use zone. 'Electricity generating works' are defined in Clause 33 as:

'a building or place used for the purpose of making or generating electricity.'

And a 'prescribed rural zone' is defined in Clause 33 as:

any of the following land use zones or a land use zone that is equivalent to any of those zones:

- a) Zone RU1 Primary Production,*
- b) Zone RU2 Rural Landscape,*
- c) Zone RU3 Forestry,*
- d) Zone RU4 Rural Small Holdings.*

The proposal would generate electricity and is therefore classified as electricity generating works under Clause 34(1) of the ISEPP. Electricity generating works are permitted with consent in the RU1 Primary Production land use zone, under the Griffith Local Environmental Plan (LEP).

The proposal is located within the RU1 Primary Production zone and is therefore considered permissible with consent under the ISEPP. Permissibility of the proposal is further discussed in Section 5.3.156.

5.3.6 State Environmental Planning Policy (State and Regional Development) 2011

The aims of the SRD SEPP are to identify development that is SSD, and State Significant Infrastructure and to confer functions on joint regional planning panels to determine development applications.

State significant development

Clause 8 of the SRD SEPP provides that development is declared to be SSD for the purposes of the EP&A Act if:

- *the development is not permissible without consent under Part 4 of the EP&A Act; and*
- *the development is specified in Schedule 1 or 2 of the SRD SEPP.*

Clause 20 of Schedule 1 of the SRD SEPP includes:

"Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, bio-fuel, distillate and waste and hydro, wave, solar or wind power), being development that:

- (a) has a capital investment value of more than \$30 million.*

The proposed Griffith Solar Farm has a capital investment estimated to be \$90 million, therefore the proposal is classified as SSD under Part 4 of the EP&A Act.

SSDs are major projects which require approval from the Minister for Planning and Environment. This EIS has been prepared in accordance with the requirements of the Secretary of the DPE.

5.3.7 State Environmental Planning Policy No. 55 - Remediation of Land

SEPP No. 55 aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. The SEPP applies to the whole of the State.

Clause 7 of SEPP No. 55 requires that the remediation of land be considered by a consent authority in determining a development application.

A search of the NSW EPA contaminated land public record (NSW Government, 2015a) was undertaken for contaminated sites within the Griffith LGA on 30 November 2015. No records were returned. The online *List of NSW contaminated sites notified to EPA* (NSW Government, 2015b) was also searched on 30 November 2015. There are no sites listed in the Yoogali area, however there were eight sites found in the Griffith area, these are all located within the Griffith township.

There is a risk that contamination associated with past agricultural activities (e.g., pesticides) could be present on the site however, given no contaminated sites are recorded on or adjacent to the proposal site. The proposal site contains an area where waste has been placed including scrap metal. There was no evidence of contamination observed during the site visit or mentioned during conversations with the proponent. It is considered highly unlikely that significant contamination exists in areas that would be affected by the proposal. Furthermore, the construction activities would not significantly disturb soil or groundwater at the site.

5.3.8 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

In this Policy, potentially hazardous industry refers to a development which, if the development were to operate without employing any measures to reduce or minimise its impact, would pose a significant risk to human health, life or property or to the biophysical environment.

A potentially offensive industry is a development for the purposes of an industry which, if the development were to operate without employing any measures to reduce or minimise its impact, would emit a polluting discharge in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land.

This EIS investigates risks to human health and the biophysical environment, including risks that may affect existing and future land use. A series of mitigation measures have been developed to address identified risks. The proposal would be designed, constructed and operated to avoid significant risk to human health, life or property or to the biophysical environment. The potential risks to the environment would be reduced through engineering and control systems, and mitigation measures outlined in this EIS. Therefore it is considered that the proposal does not constitute a hazardous or offensive industry.

5.3.9 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the NSW EPA.

Under section 48 of the POEO Act, premises-based scheduled activities (as defined in Schedule 1 of the POEO Act) require an Environment Protection Licence (EPL). Clause 17 of Schedule 1 of the POEO Act concerns electricity generation works. General electricity works is a scheduled activity and requires an EPL where the activity has the capacity to generate more than 30 MW of electrical power. General electricity generation works is defined as:

...the generation of electricity by means of electricity plant that, wherever situated, is based on, or uses, any energy source other than wind power or solar power.

The works would generate more than net 30 MW of electrical power, however electricity generation would be from solar power which is not considered a scheduled activity. Accordingly, an EPL is not required under the POEO Act for the proposal.

It is noted that pollution events resulting from the proposal would still constitute a breach of the Act under section 120. Under section 148 of the Act, the proponent would be required to notify the EPA of any pollution incidents that occur as a consequence of the construction or operation of the proposed development. This is acknowledged in Section 7.2 and appropriate mitigation measures are a commitment of the proposal.

5.3.10 Roads Act 1993

The *Roads Act 1993* (Roads Act) provides for the classification of roads and for the declaration of roads authorities for both classified and unclassified roads. It also regulates the carrying out of various activities in, on and over public roads.

Irrigation Way, Hamilton Road and Poletta Road are public roads. Any works, such as upgrades that interfere with the structure of the road, require consent of the appropriate roads authority. The appropriate roads authority for Irrigation Way is RMS, with Griffith City Council being the roads authority for all other roads adjacent to the site.

5.3.11 Native Vegetation Act 2003

The *Native Vegetation Act 2003* regulates the clearing of native vegetation. Clearing is defined as cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning native vegetation including native grasses and herbage.

An authorisation to clear native vegetation is not required for SSD (section 89J EP&A Act). Further, the proposal does not involve the clearing of any native vegetation.

5.3.12 Water Management Act 2000

Water Sharing Plans

Fresh water sources throughout NSW are managed via Water Sharing Plans (WSPs) under the WM Act. Key rules within the WSPs specify when licence holders can access water and how water can be traded. Two WSPs made under Section 50 of the WM Act are relevant to the proposed development; the Proposal is located within the area covered by the WSPs for the:

- *Murrumbidgee Unregulated and Alluvial Water Sources*, and the
- *Lower Murrumbidgee Groundwater Sources*.

The WSP specifies rules for each water source that provide guidance on:

- Granting and managing access licences.
- Trading rules.
- Extraction limits/rules.

Murrumbidgee Unregulated and Alluvial Water Sources Water Sharing Plan

The Murrumbidgee Unregulated and Alluvial Water Sources WSP includes the unregulated rivers and alluvial groundwater within the Murrumbidgee catchment and commenced in 2012. The WSP covers 39 surface water sources and six alluvial groundwater sources.

The proposal site is within the Murrumbidgee Western water source. Table 5-2 presents the water extraction entitlement and active licences for the Murrumbidgee Unregulated and Alluvial Water Sources WSP, identified from a search of the *NSW Water Register* (NOW, 2016).

Table 5-2 Murrumbidgee Western Water Source licences and entitlements information

Water Source	Licence category	Entitlement (ML/year)	Number of licences
Murrumbidgee Western	Domestic and Stock	95	15
	Unregulated River	14870	15

Lower Murrumbidgee Groundwater Sources Water Sharing Plan

The Lower Murrumbidgee Groundwater Sources WSP is divided into two main water sources (aquifers) which are the Shepparton aquifer (Shallow Source) and Calivil/Renmark aquifer (Deep Source). The Shallow Source is defined as extending to the depth of 40m or to the bottom of the Shepparton Formation (whichever is greater). Table 5-3 presents the water extraction entitlement and active licences for the Lower Murrumbidgee Groundwater Sources WSP, identified from a search of the *NSW Water Register* (NOW, 2016).

Table 5-3 Lower Murrumbidgee Groundwater Sources Licences and entitlements information

Water Source	Licence category	Entitlement (ML/year)	Number of licences
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Shallow Source	Domestic and Stock	0	0
	Aquifer	5201	30
	Aquifer (Aboriginal Cultural)	0	0
	Local Water Utility	0	0
	Supplementary Water	0	0
Deep Source	Aquifer	268634	339
	Aquifer (Aboriginal Cultural)	0	0
	Aquifer (Community and education)	23	2
	Aquifer (Town water supply)	20	1
	Domestic and Stock	324	1
	Local Water Utility	2210	3
	Supplementary Water	0	0

Controlled activities for impacts on waterfront land

The project would include the removal of constructed irrigation channel and activities within 40 m of irrigation channels. These irrigation channels would not constitute as waterfront land or require a controlled activity approval under the *Water Management Act 2000*. However, the *Guidelines for Controlled Activities on Waterfront Land* provide relevant information for managing works in this area and have been cited in the mitigation measures for controlling physical impacts.

5.3.13 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides for the conservation of threatened species, populations and ecological communities of animals and plants. The TSC Act sets out a number of specific objects relating to the conservation of biological diversity and the promotion of ecologically sustainable development.

The potential to impact threatened species, populations and ecological communities listed under this act has been considered in Section 6.4 of this EIS.

5.3.14 National Parks and Wildlife Act 1974

Under the *National Parks and Wildlife Act 1974* (NPW Act), the Director General of OEH is responsible for the care, control and management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and state game reserves. The Director General of OEH is also responsible under this legislation for the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

The provisions of the NPW Act have been considered for the proposal. The proposal site is not in or in the vicinity of any protected areas as defined in the Act.

An assessment of impacts to Aboriginal Heritage is provided in Section 6.2 of the EIS (and in full, Appendix G). An Aboriginal Heritage Impact Permit (AHIP) under section 90 of the NPW Act is not required for SSD (section 89J EP&A Act).

5.3.15 Heritage Act 1977

This Act aims to conserve heritage values. The Act defines ‘environmental heritage’ as those places, buildings, works, relics, moveable objects and precincts listed in the Local or State heritage Significance. A property is a heritage item if it is listed in the heritage schedule of the local Council's Local Environmental Plan or listed on the State Heritage Register, a register of places and items of particular importance to the people of NSW.

The proposal would not impact directly or indirectly on any items of heritage significance (refer to Section 7.11).

5.3.16 NSW planning approval pathway

The proposal is permissible with development consent under the ISEPP and therefore assessed under Part 4 of the EP&A Act. The Minister for Planning and Environment is the consent authority.

5.4 COMMONWEALTH LEGISLATION

5.4.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is administered by the Commonwealth Department of the Environment (DoE). Under the EPBC Act, if the Minister determines that an action is a ‘controlled action’ which would have or is likely to have a significant impact on a Matter of National Environmental Significance (MNES) or Commonwealth land, then the action may not be undertaken without prior approval of the Minister.

The EPBC Act identifies eight MNES:

- World Heritage properties.
- National heritage places.
- Ramsar wetlands of international significance.
- Threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).

When a person proposes to take an action that they believe may be a ‘controlled action’ under the EPBC Act, they must refer the proposal to the DoE for a decision about whether the proposed action is a ‘controlled action’.

A search of the Commonwealth Protected Matters Search Tool on 1 December 2015 indicated that there are no World Heritage Properties or National Heritage Places within the proposal site. Search results listed Four Wetlands of International Importance that are either known to occur or have potential to occur in the area, however these are not relevant to the site or proposal. The proposal is not likely to impact on Commonwealth land. Section 6.4 discusses the results of searches in relation to threatened species, ecological communities and migratory species. Table 5-4, 5-5 and

Table 5-6 summarise the results of the searches.

Table 5-4 Summary of Matters of National Environmental Significance (10 km search radius)

Matters of National Environmental Significance	Addressed in this EIS
World Heritage Properties	NA
National Heritage Places	NA
Wetlands of International Significance	NA
Great Barrier Reef Marine Park	NA
Commonwealth Marine Areas	NA
Threatened Ecological Communities	Section 6.4 and discussion below
Threatened Species	Section 6.4 and discussion below
Migratory Species	Section Error! Reference source not found. and discussion below

Table 5-5 Summary of Other Matters Protected by the EPBC Act (10 km search radius)

Other Matters Protected by the EPBC Act	Addressed in this EIS
Commonwealth Lands	Not applicable to site.
Commonwealth Heritage Places	Not applicable to site.
Listed Marine Species	Not applicable to site.
Whales and Other Cetaceans	Not applicable to site.
Critical Habitats	Not applicable to site.
Commonwealth Reserves	Not applicable to site.

Table 5-6 Summary Extra Information (10 km search radius)

Extra Information	Addressed in this EIS
Place on the RNE	Not applicable to site.
State and Territory Reserves	Not applicable to site.
Regional Forest Agreements	Not applicable to site.
Invasive Species	Section 6.4.
Nationally Important Wetlands	Not applicable to site.

Commonwealth listed threatened ecological communities, threatened species, migratory species and invasive species are discussed in Section 6.4.

A significant impact is considered highly unlikely and the proposed activity is considered highly unlikely to be a controlled action.

No other matter of national environmental significance would be affected by the proposed activity.

5.4.2 Native Title Act 1993

The *Native Title Act 1993* provides a legislative framework for the recognition and protection of common law native title rights. Native title is the recognition by Australian law that Indigenous people had a system of law and ownership of their lands before European settlement. Where that traditional connection to land and waters has been maintained and where government acts have not removed it, the law recognises the persistence of native title.

People who hold native title have a right to continue to practise their law and customs over traditional lands and waters while respecting other Australian laws. This could include visiting to protect important places, making decisions about the future use of the land or waters, and hunting, gathering and collecting bush medicines. Further, when a native title claimant application is registered by the National Native Title Tribunal, the people seeking native title recognition gain a right to consult or negotiate with anyone who wants to undertake a project on the area claimed.

Native title may exist in areas such as:

- Vacant Crown land.
- Some national parks, forests and public reserves.
- Some types of pastoral lease.
- Some land held for Aboriginal communities.
- Beaches, oceans, seas, reefs, lakes, rivers, creeks, swamps and other waters that are not privately owned.

5.4.3 Renewable Energy (Electricity) Act 2000

The *Renewable Energy (Electricity) Act 2000* (RE Act) aims:

- To encourage the additional generation of electricity from renewable sources.
- To reduce emissions of GHGs in the electricity sector.
- To ensure that renewable energy sources are ecologically sustainable.

Section 17 of the RE Act defines renewable energy sources eligible under the Commonwealth government's renewable energy target scheme. This includes solar energy.

Certificates for the generation of electricity are issued using eligible renewable energy sources. This requires purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire. In January 2011, renewable energy certificates were reclassified as either large-scale generation certificates or a small-scale technology certificates following changes to the scheme.

The proposal is the subject of application to the Clean Energy Regulator under the RE Act.

5.5 OTHER RELEVANT POLICIES AND MATTERS

5.5.1 Ecologically Sustainable Development (ESD)

Ecologically Sustainable Development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In 1992, the Commonwealth and all state and territory governments endorsed the *National Strategy for Ecologically Sustainable Development*.

In NSW, the concept has been incorporated in legislation such as the EP&A Act and EP&A Regulation. For the purposes of the EP&A Act and other NSW legislation, the Intergovernmental Agreement on the Environment (1992) and the *Protection of the Environment Administration Act 1991* outline principles which can be used to achieve ESD. These principles are presented below along with a description of how the proposal and this EIS have considered each principle.

- a) *The precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*
- i. *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
 - ii. *an assessment of the risk-weighted consequences of various options.*

The precautionary principle has been adopted in the assessment of impact. All potential impacts have been considered and mitigated where a risk has been identified. Mitigation is commensurate with risk. Where uncertainty exists, measures have been included to address the uncertainty.

- b) *Inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*

The majority of the potential impacts of the proposal are likely to be localised and would not diminish the options regarding land and resource uses and nature conservation available to future generations. Particularly, pollution risks have been addressed and decommissioning would see all above ground infrastructure removed, such that the majority of the site could be returned to primary production or other compatible land use. It is also noted that the proposal would address the need to minimise the risk of climate change to current and future generations by reducing carbon emissions that result for electricity generation. Proposals such as Griffith Solar Farm are an important part of the transition to a low emission future.

- c) *Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*

The impacts of the proposal on biodiversity, including EPBC listed species, have been assessed in detail in Section 6.4. This has included avoidance of areas of higher conservation value areas and management prescriptions to minimise, manage and offset residual impacts. The impacts have been deemed acceptable and justifiable by this assessment.

- d) *Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:*
- i. *polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*
 - ii. *the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,*
 - iii. *environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

Attributes of the proposal site such as the existing native vegetation, soil and hydrology have been valued in terms of their broader contribution to the catchment and catchment processes. Pollution risks have been assessed and would place any cost of remediation solely upon the proponent.

The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in Section 8.2 set out an auditable environmental management commitment by the proponent. Based on the social and environmental benefits accruing from the proposal at a local and broader level, and the assessed impacts on the environment and their ability to be managed, it is considered that the development would be ecologically sustainable within the context of ESD and is justifiable.

5.6 SUMMARY OF LICENSES

Table 5-7 lists licenses that have been identified as relevant to the proposal.

Table 5-7 Summary of licenses required

Instrument	Licence or approval requirement
EP&A Act, Part 4	SSD consent - State Significant Developments require approval from the Minister for Planning and Environment. This EIS has been prepared in accordance with the requirements of the Secretary of the DPE.
Roads Act, section 138	Any works to public or classified roads require a permit under this act by the roads authority: • Irrigation Way: RMS. • Hamilton Road and Poletta Road: Griffith City Council.

Note, if it is determined that additional licenses or approvals are required, Neoen would obtain these prior to commencement of relevant activities.

6 ENVIRONMENTAL IMPACT ASSESSMENT

6.1 IMPACT ASSESSMENT APPROACH

The environmental impact assessment below addresses all impacts likely to be attributed to the proposal (including the solar farm and transmission line). This includes consideration of:

- Direct impacts - impacts directly attributable to the construction, operational and decommissioning phases such as:
 - Disturbances to native vegetation, soil, water and air quality
 - Potential to impact on cultural features and values
 - Noise generated by equipment and traffic movements
 - Public safety, pollution risks and hazards.
- Indirect impacts – follow-on or cascading impacts such as:
 - Impacts on the local economy
 - Potential to impact existing and future land uses.
- Cumulative impacts - the combined potential effects of different impact types as well as the potential interaction with other proposals. For example:
 - The combined impact of construction noise, traffic and visual impacts for nearby receivers
 - The combined effects of the construction phase coinciding with other large infrastructure works that may be planned in the area.

To guide the level of investigation within the EIS, a risk assessment was undertaken to characterise the likely environmental risks associated with the construction, operation and decommissioning of the proposal. This was based on the Constraints Analysis (NGH Environmental, Scoping Study (NGH Environmental, 2014; provided in the application for the SEARs) and a site inspection. This exercise has guided the preparation of this EIS.

The risk rating is a factor of the **consequence** and **likelihood** of an impact occurring. Depending on the combination of consequence and likelihood, the overall risk rating could be low to extreme. High to extreme risks (termed 'key risks') have warranted a higher level of investigation. Risks identified as low or highly manageable are discussed in less detail.

Table 6-1 summarises the results of the risk assessment. The following four key risks were investigated in detail by way of specialist assessments (refer Section 6):

- Aboriginal heritage.
- Visual amenity.
- Biodiversity.
- Noise.

Lower risk issues were investigated, primarily using desktop assessment, in Section 7 of this EIS.

The 'mitigated' risk ratings (the revised risk rating, taking into account the results of the investigations and the likely effectiveness of proposed mitigation strategies) are considered to be low for all environmental issues, as concluded in Section 9.

Table 6-1 Risk analysis of environmental issues

Relevant EIS section	Environmental risk	Consequence	Likelihood	Risk rating
6.2	Aboriginal heritage	Moderate	Possible	High
6.3	Visual amenity	Moderate	Possible	High
6.4	Biodiversity	Moderate	Possible	High
6.5	Noise and vibration	Minor	Possible	Medium
7.1	Hydrology including flooding	Minor	Possible	Medium
7.2	Soil	Minor	Possible	Medium
7.3	Water use and water quality	Minor	Possible	Medium
7.4	Traffic, transport and road safety	Minor	Possible	Medium
7.5	Climate and air quality	Minor	Possible	Medium
7.6	EMFs	Minor	Possible	Medium
7.7	Land use	Minor	Possible	Medium
7.8	Socioeconomic and community	Minor	Possible	Medium
7.9	Resource use and waste generation	Minor	Possible	Medium
7.10	Fire and bush fire issues	Minor	Possible	Medium
7.11	Historic heritage	Minor	Possible	Medium

6.2 ABORIGINAL HERITAGE

6.2.1 Approach

The purpose of the Aboriginal Cultural Heritage Assessment (ACHA) is to provide an assessment of the Aboriginal cultural values associated with the study area and to assess the cultural and scientific significance of any Aboriginal heritage sites. The ACHA is currently in draft format until comments are received from Griffith LALC. The full draft report, prepared by NGH Environmental Heritage, is provided in Appendix G and summarised below.

The ACHA Report was prepared in line with the:

- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011);
- *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH 2010a), and
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (ACHCRP) (OEH 2010b) produced by the NSW Office of Environment and Heritage (OEH).

The objectives of the assessment were to:

- Conduct Aboriginal consultation as specified in clause 80c of the *National Parks and Wildlife Regulation 2009*, using the consultation process outlined in the (ACHCRP);
- Undertake an assessment of the archaeological and cultural values of the study area and any Aboriginal sites therein;
- Assess the cultural and scientific significance of any archaeological material, and
- Provide management recommendations for any objects found

The consultation with Aboriginal stakeholders was undertaken in accordance with clause 80C of the *National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010* following the consultation steps outlined in the (ACHCRP) guide provided by OEH. Section 4.2 of this EIS describes the Aboriginal community consultation process that took place in relation to the proposal.

A survey looking for evidence of past Aboriginal occupation was conducted on 15 December 2015 by archaeologist Matthew Barber, NGH Heritage, and Max Harris, representing the Griffith LALC. The survey method was a series of parallel lines across each paddock or irrigation bay.

6.2.2 Existing environment

Landscape context

The study area is positioned within the Murrumbidgee River floodplain. The base geology comprises millennia of flood deposits of black and red clays and silts with sand and gravel. Nearby Griffith has some elevated terrain that consists of Late Devonian sandstone, conglomerate, siltstone and pebbly sandstone as part of the Cocoparra Group (Pogson 1974). The presence of conglomerate and pebbly sandstone is likely to have provided a source of stone material for Aboriginal people for flaking, as there is rarely stone material found on the flood deposits of the Murrumbidgee.

There is no topographic variation within the land proposed for the solar farm. Additionally, there are no differences observed in the soil types and no micro features such as sand ridges or palaeochannels within the proposal area. The landforms for the survey were therefore determined to be one single unit, described as level floodplain. The nature of this unit is that is an aggrading unit, although flooding regimes have likely been dramatically altered with the installation of channels and levees as part of the irrigation development.

Soils are heavily disturbed and there is unlikely to be any remnant intact profile within at least the upper 20-30 cm.

The proposal site is considered as a modified environment; all natural vegetation across the proposal site have been totally cleared. Some native trees are present along Hamilton Road, western boundary of the proposal site. The proposal site would also be categorised as highly disturbed through consistent farming and irrigation practices for many decades.

There are no natural water courses or drainage lines across the proposal area, the nearest permanent water is Mirrool Creek, located about 600 m to the east. It is likely to have been a major focus for Aboriginal people, resource, plants and animals away from the Murrumbidgee River (approximately 16.5km south). A probable remnant Black Box swamp, is also about 650 m north of the solar farm proposal area. This swamp is now modified as a farm dam and from aerial photography appears to have been cleared of trees. However, prior to European land modifications, this area may have provided resources, shelter, water and food for Aboriginal people.

Aboriginal Archaeological context

The proposal site is located within an area identified as part of the Wiradjuri language group. This is an assemblage of many small clans and bands speaking a number of similar dialects (Howitt 1996, Tindale 1974, MacDonald 1983, Horton 1994).

The Wiradjuri language group was the largest in NSW prior to European settlement. The borders were however, not static, they were most likely fluid, expanding and contracting over time to the movements of smaller family or clan groups. Boundaries ebbed and flowed through contact with neighbours, the seasons and periods of drought and abundance.

It was the small family group that was at the core of Aboriginal society, the basis for their hunting and gathering life. The immediate family camped, sourced food, made shelter and performed daily rituals together. The archaeological manifestations of these activities are likely to be small campsites, characterised by small artefact scatters and hearths across the landscape. Places that were visited more frequently would develop into larger site complexes with higher numbers of artefacts and possibly more diverse archaeological evidence.

The small family units were part of a larger band which comprised a number of families. They moved within an area defined by their particular religious sites (MacDonald 1983). Such groups might come together on special occasions such as pre-ordained times for ceremonies, rituals or simply if their paths happened to cross. They may also have joined together at particular times of the year and at certain places where resources were known to be abundant. The archaeological legacy of these gatherings would be larger sites than small family camps. They may include large hearth or oven complexes, contain a number of grinding implements and a larger range of stone tools and raw materials.

In an archaeological context, few of these resource items utilised would survive, particularly in an open site context. Anything made from bark and timber and animal skins would decay quickly in an open environment. However, other items, in particular those made of stone would survive where they were made, placed or dropped. Shell material may also survive in an archaeological context. Sources of raw materials, such as the extraction of wood or bark would leave scars on the trees that are archaeologically visible, although few trees of sufficient age survive in the modern context. Outcropping stone sources also provide clues to their utilisation through flaking, although pebble beds may also provide sources of stone which leave no archaeological trace.

An extensive search of the AHIMS database was undertaken on 10 November 2015. The search area focussed on a rectangular area approximately 25 km (east-west) x 20 km (north-south) centred on the study area. The coordinates for the search area were Lat. Long. from: -34.409, 145.9838 – Lat. Long to: -34.215, 146.285 with a buffer of 50 meters. The AHIMS Client Service Number was: 198654.

The AHIMS register search revealed that there were 57 Aboriginal heritage sites within the search area and a breakdown of the site types is shown in Table 6-2. None of the sites are within or adjacent to the solar farm proposal area. The nearest site is Mirrool 1, an artefact scatter situated 5.5 km to the east.

Table 6-2 Site types within AHIMS search

Site Type	Number
Isolated Find/artefact scatter	39
Modified tree	15
Quarry	2
Art	1

The results of previous archaeological surveys in the Griffith region serve to show that there are sites present in a range of landforms. There does appear however to be a pattern of site location that relates to the presence of potential resources for Aboriginal use. The quarry sites are present due to the occurrence of useable raw material in the form of stone, which was an essential material for Aboriginal people. Other sites, such as those at Lake Wyangan were associated with a wetland, and the proximity to food, raw materials such as reeds, and water. The sites identified within the Benerembah Irrigation area were also often associated with raw materials, such as Black Box trees.

The Aboriginal land use of the region is in reality little understood, as few in depth studies have been completed. It is possible however, to ascertain that proximity to raw materials was a key factor in the location of Aboriginal sites. It is also reasonable to expect that Aboriginal people ventured away from these resources to utilise the broader landscape but the current archaeological record of that activity is currently limited.

Archaeological investigation results

Survey transects were undertaken on foot and traversed the main part of the proposed solar farm site. The survey was severely impeded by very poor visibility. Recent cropping of the bay had left a mat of cut stubble and visibility of the ground surface as a result was limited.

Between the two survey participants, just under 15 km of transects were walked across the main proposal area. Allowing for an effective view width of 5m each person, this equates to a surface area of 148,400 m², representing 11.8% of the 125 hectares. However, allowing for the poor visibility, the effective coverage is reduced to 7,420m², which is only 0.6% of the area.

The effective survey coverage for the proposed powerline was higher at about 20% of the alignment.

Despite the poor visibility encountered during the survey, there were 11 artefacts found, recorded as three separate site areas. The details of the sites are outlined below, their location is shown in Figure 6-1 and artefact characteristics provided in Table 6-3.

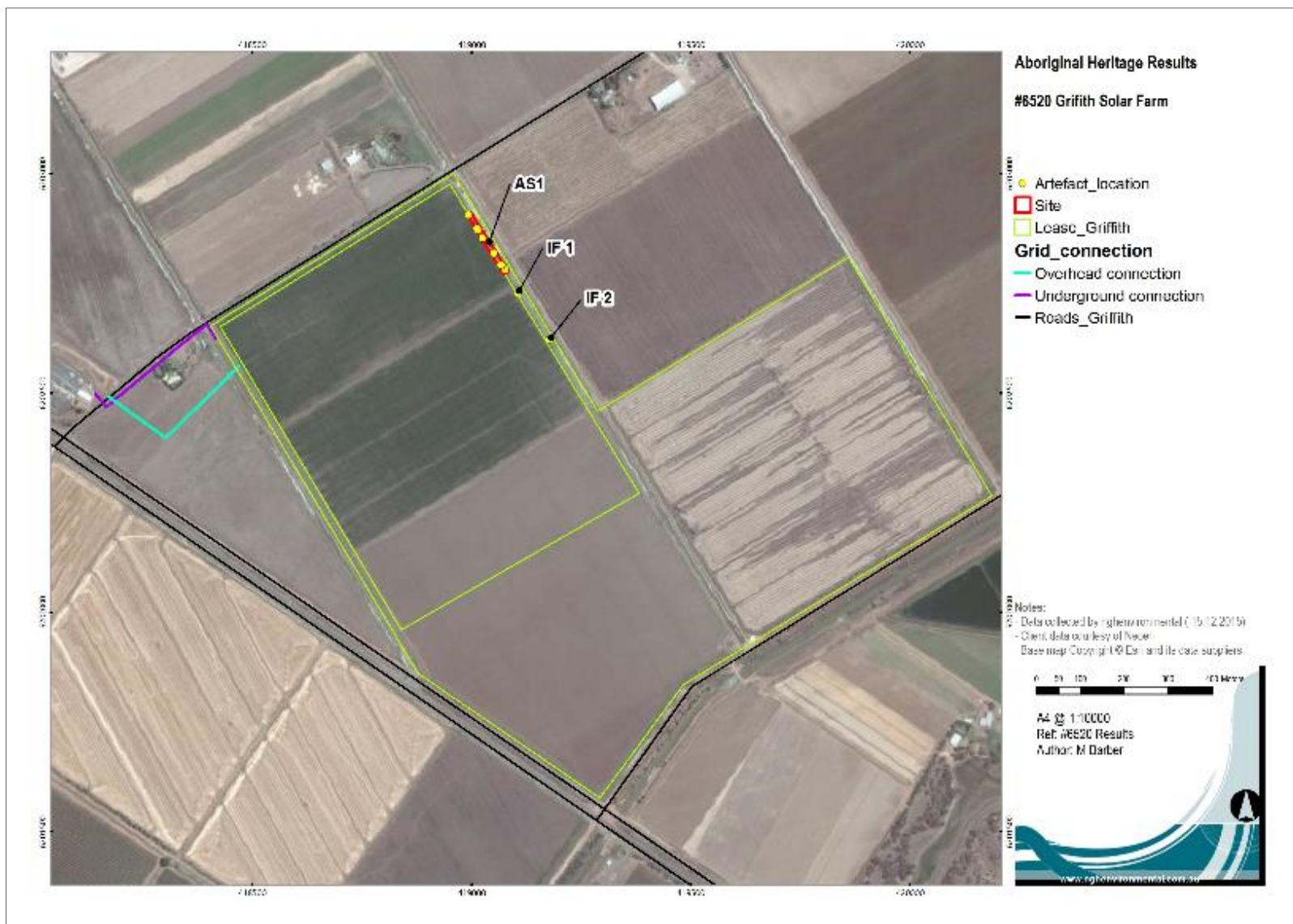


Figure 6-1 Location of recorded artefacts

Table 6-3 Artefact characteristics

Artefact Number	Type	Material	Dimensions mm	Platform Surface	Platform Type	Termination	Reduction Stage	Comment
1	Flake	Silcrete	21x18x4	Flake scar	Focal	Feather	Primary	
2	Flake	Volcanic	30x35x14	Cortex	Focal	Feather	Primary	Black, fine grained with pebble cortex
3	Flaked piece	Silcrete	20x9x5					
4	Hammerstone	Quartzite	55x30x28					broken pebble with hammer damage on end and side
5	Core	Silcrete	28x22x14	Flake scar			Tertiary	small core with 2 negative scar from 1 platform
6	Broken flake	Volcanic	13x18x5					
7	Flake	Silcrete	19x12x3	Flake scar	Focal	Step	Tertiary	White silcrete
8	Flake	Fine grained siliceous	20x15x5	Flake scar	Focal	Feather	Tertiary	
9	Distal fragment	Silcrete	16x17x7					
10	Grindstone	Sandstone	260x186x80					Large thick piece with grinding on one surface. Grinding is not total, has a very shallow concave with a narrow ground groove. Some plough damage. Opposite side appears not to be used.
11	Grindstone	Sandstone	90x65x30					Small broken grindstone with concave ground surface and anvil pit on opposite side. Margins are shaped by hammer dressing and flaking

The artefacts are described below and in Plates 1 to 4.

Griffith Solar Artefact Scatter (AS) 1

A scatter of nine stone artefacts (1-9 in Table 6-3) were recorded on the bare ground at the northern end of an irrigation bay. The artefacts were scattered along a 200 m x 6 m section of flat, bare ground between the channel bank and the crop. The soils were brown grey gritty loam with high clay content. The artefacts were clearly in a disturbed context, at the head of the irrigation bay and evidenced by the large tractor tyre turning marks. While it is possible that some of the artefacts came from the excavated channel, this is unlikely given the nature of the soil they were found on, being more associated with the surrounding deposits, as opposed to the grey clay on the channel bank.

The exposure continued to the north and south of the artefacts but the closest other objects were found 60m away, indicating that this is likely to represent a defined site. Artefacts are likely to extend into the bay to the west within the cropped area but visibility was too poor to discover any other artefacts.

Griffith Solar Isolated Find (IF) 1

This grindstone (artefact #10) was found 60m south from the nearest artefact within AS1 but in the same situation. It was located on the edge of the cropped area, on the farm track at the head of the irrigation bay a few metres from the base of the channel bank and a water gate. The soils were the same brown grey loamy clay as present at site 1 and this artefact may originate from the main concentration but was considered distant enough to warrant a separate recording.

Griffith Solar Isolated Find (IF)2

This grindstone (artefact #11) was situated 130 m further south along the same edge of the crop within the same topographic setting and soil context as the other finds. Being in the same environmental context as the other finds, it is possible that it is related to the man site area and has been displaced but was recorded as a separate items due to the distance between the finds.

In terms of the current proposal, extrapolating from the results of this survey, it is likely that additional artefacts could occur within the proposed development footprint. However, based on the land use history of the proposal area, and an appraisal of the area from the field survey, there is negligible potential for the presence of intact subsurface deposits.

The models of site location for the Griffith area must however be amended to identify that sites can occur at least 600 m from water sources and that Aboriginal artefact scatters, or campsites, exist within the broader floodplain environments, despite intensive agricultural practices.

The research potential of the sites located during this assessment are considered to be generally low, as their scientific value for further research is limited.

The cultural significance of the sites is only determined by the local Aboriginal community.

	
Plate 1. View east to IF1, note proximity of channel and water metre.	Plate 2. Grindstone surface of IF1, note plough damage.
	
Plate 3. View south east to IF2.	Plate 4. Close up of ground surface of IF2.

6.2.3 Potential impacts

The proposal involves the construction of a solar farm and connection to the nearby substation with an overhead or underground powerline. The development would extend across most of the approximately 125 hectare property, however soil disturbance would be relatively discrete, with no levelling of the array areas proposed. The impact is likely to be most extensive where earthworks occur and would involve the removal, breakage or displacement of artefacts. This is considered a direct impact on the site and the Aboriginal objects by the development in its present form.

The impact to the scientific values if the artefacts were to be impacted by the current proposal is considered low to moderate. The site is very disturbed, with little research value apart from what has already been gained from the information obtained during the present assessment. This information relates more to the presence of the site and in the development of Aboriginal site modelling, which has largely now been realised by the recording. The integrity of the site is already low and any additional disturbance is therefore unlikely to make a meaningful difference to the status of the site.

Proposals classified as SSD or State Significant Infrastructure under the EP&A Act have a different assessment regime. As part of this process, Section 90 harm provisions under the NPW Act are not required, that is, an AHIP is not required to impact Aboriginal objects.

6.2.4 Safeguards and mitigation measures

The ACHA Report proposes the following management and mitigation strategies (Table 6-4). Most are relevant to the pre-construction design phase of the project and focus on avoidance of impacts.

Table 6-4 Safeguards and mitigation measures for Aboriginal heritage

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
All efforts should be made in the design stage to avoid the artefacts recorded during the survey.	C		
If complete avoidance is not possible, the artefacts should be collected and moved to a safe area within the property, as close as possible to their original location, which will not be subject to ground disturbance. The collection and relocation should be undertaken by representatives of the Griffith LALC. A new AHIMS site card will need to be completed identifying the new location of the moved artefacts.	C		
Neoen prepares a Cultural Heritage Management Plan (CHMP) to address the potential for finding additional Aboriginal artefacts during the construction of the Solar Farm. The CHMP will outline an unexpected finds protocol to deal with construction activity. Preparation of the CHMP should be undertaken in consultation with the Griffith LALC.	C		
In the unlikely event that human remains are discovered during the construction, all work must cease. OEH, the local police and Griffith LALC should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal.	C		
Further archaeological assessment would be required if the proposal activity extends beyond the area of the current investigation. This would include consultation with the Griffith LALC and may include further field survey.	C		

6.3 VISUAL IMPACT

NGH Environmental completed a VIA of the proposed Griffith Solar Farm (provided in full, Appendix E and summarised below). It provides a full assessment of the visual impacts associated with the proposal, including:

- Landscape character and scenic vistas.
- Stakeholder values regarding visual amenity.
- Potential impacts on representative viewpoints (including glare and reflectivity).

It includes a strategy to address identified impacts, including onsite vegetation screening, general design measures and a process to verify the actual visual impacts of the proposal. This improves the reliability of the measures and provides a trigger to undertake additional mitigation if required.

6.3.1 Approach

The visual impact assessment includes the following components:

- Background investigations, mapping and modelling.
- Field survey including reconnaissance, ground truthing and photography.
- Community consultation.
- Impact assessment.
- Development of a visual impact 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. Mitigation measures are considered for impacts greater than medium visual impact; for a medium impact, the contrast is considered acceptable.

The full methodology is provided in Appendix E.

6.3.2 Results

Existing environment

Griffith is a well-designed rural city; 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. These farming properties are intensively worked. Views are a mosaic of crops, many annual or not long lived, changing colour and form with the seasons. Supporting infrastructure dominant in the landscape includes silos, irrigation canals, powerlines, road and rail networks. The study area is flat, apart from the hills around the city, approximately 6.5km north-west of the proposed solar farm site.

Scenic vistas in the study area include:

- Banna Avenue (7km), the main street of Griffith.
- Hermit Cave and Rotary lookouts (6.5km), off Scenic Drive.
- Irrigation Way is the main road located between the city and the proposed solar farm site.
- Reserves including Griffith Wetlands Important Bird Area (32km), Cocoparra National Park (12km), the Murrumbidgee River and Lake Wyangan (13km).

The proposal would be visible from the Irrigation Way and would be low to negligible in terms of its visibility to the lookouts off Scenic Drive. It would not be visible from other scenic vistas.

Values of the local community to the proposal

Only two feedback forms were returned to inform this component of the assessment.

- 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.

Landscape character units (LCU) and representative viewpoints

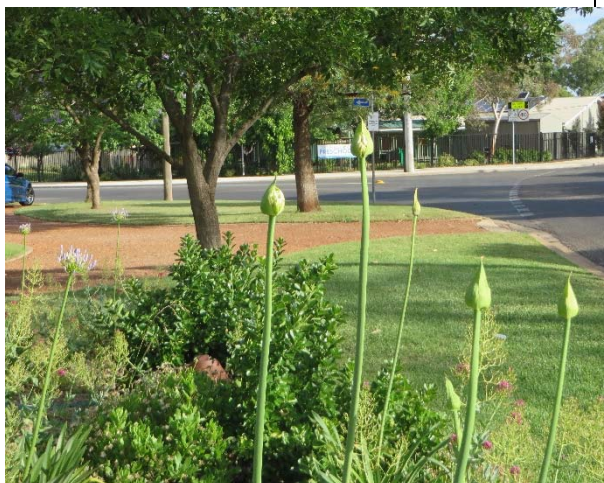
LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a way to summarise differences in the receiving environment that may affect the visual impact of the proposed solar farm at different locations. Two key LCUs were identified within 16 km of the proposal (illustrated in Table 6-5):

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

Representative viewpoints within each LCU were identified using ZVI modelling, assuming the proposal could be modelled as a 3 m high rectangular block. 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. The predicted sensitivity of each viewpoint was then determined, considering its proximity to the proposed solar farm site and factors such as use, scenic quality and regional significance. Figure 6-2 illustrates the locations of these representative viewpoints with reference to the proposal site and Table 6 provides details of representative viewpoints. Criteria for proximity and sensitivity are provided in Appendix E.

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 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 6-5 Landscape Characteristic Units within 16 km of the Griffith Solar Farm

Landscape Character Unit - Agricultural	
	
	
Landscape Character Unit - Rural village, peri urban and suburban, areas	
	

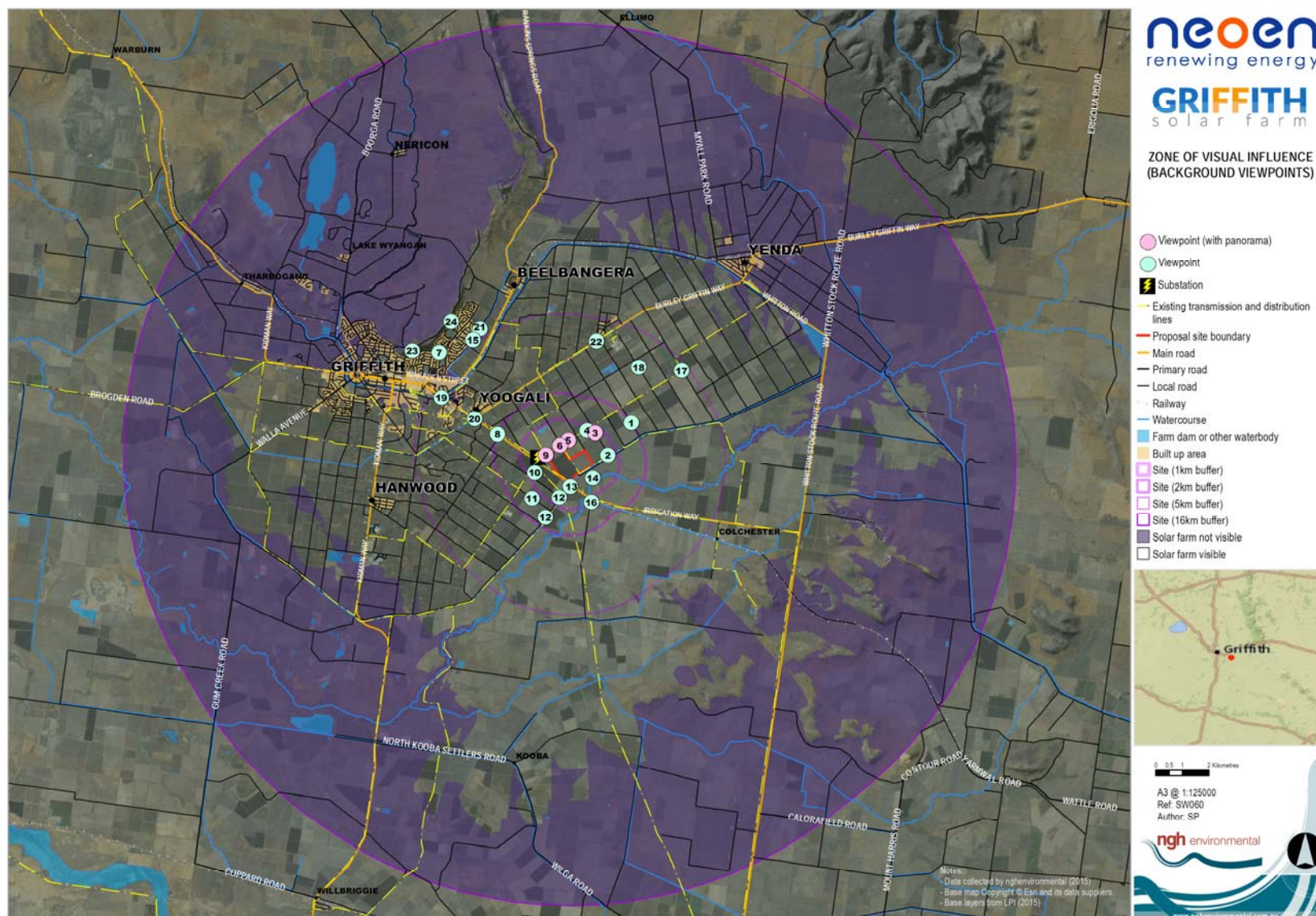


Figure 6-2 Representative viewpoints with reference to the Griffith Solar Farm

Table 6-6 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

6.3.3 Potential impacts

The visual impact assessment was undertaken considering the:

- a) Infrastructure components proposed.
- 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.

Visual impact assessment at representative viewpoints

Table 6-7 evaluates the representative viewpoints that rated medium or higher visual impacts (all impact ratings are shown in Appendix E). In summary:

- No viewpoints were considered to have a high visual impact.
- Three viewpoints were considered to have a medium to high visual impact.
- Five viewpoints were considered to have a medium visual impact.
- 15 viewpoints were considered to have a low visual impact.

Figures 6-3 to 6-5 illustrate, where possible, the indicative horizontal extent of the view of solar array infrastructure from the viewpoints.

In summary, highest impacts are seen for the three residences in closest proximity to the site. These are represented by Viewpoints 5, 6 and 9. 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.

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. Additionally, a medium impact is seen for Viewpoint 13. This viewpoint is on Irrigation Way where infrastructure would be located closest to the highway. 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.

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.

Table 6-7 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 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 Solar site vegetation screening is proposed and could effectivity mitigate this impact.
9	Residence	Low	Fore-ground	Moderate – low use residence	B	Protect dominant visual features	High	Medium to high impact 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 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 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 The contrast between existing landscape and the low level infrastructure at this distance is considered to be acceptable.
8	Residence	Low	Middle-ground	High – high use residence	B	Protect dominant visual features	Medium	Medium impact The contrast is considered to be acceptable.
13	Road	Low	Fore-ground	Moderate – moderate use road	B	Protect dominant visual features	Medium	Medium impact The contrast is considered to be acceptable.

² Involved landowner



Figure 6-3 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 6-4 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 6-5 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.

Glare and reflectivity of solar panels

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.

6.3.4 Safeguards and mitigation measures

The proposal 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.

A vegetation buffer on the site perimeter is part of the project description. A suggested location for the buffer is provided in Appendix D of the VIA, targeting specific sections of the project perimeter to mitigate potential visual impacts to medium to high impact receivers and additionally the closest section of Irrigation Way. Screening requirements would be confirmed post construction, however. Screening is proposed to break up views of the proposed infrastructure, in consultation with the affected landholders. With the involvement of the affected landowners in the mitigation strategy set out in Table 6-8, the visual impacts of the proposal are considered acceptable and manageable.

Table 6-8 Safeguards and mitigation measures for visual impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Design measures: • If feasible, underground rather than overhead power lines would be considered. 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. • 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. • Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations).	C		
Screening: • Onsite planting within the solar farm boundaries would be considered for three residences identified with potential for medium to high level impacts; Viewpoints 5, 6 and 9. • Onsite planting within the solar farm would be considered for where infrastructure would be located closest to Irrigation Way (View point 13). Conversely, the option of a pull over viewing area could be considered in this location in consultation with the roads authority, with consideration of potential road hazards. • Planting requirements are outlined in the VIA and would be detailed fully within an appropriate management plan. • Screens would be maintained for the operational life of the solar farm, including replacing dead plants and weeding, as		O	

Safeguards and mitigation measures	C	O	D
required to maintain the screen's effectiveness in breaking up views.			
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.		O	

6.4 BIODIVERSITY (FLORA AND FAUNA)

6.4.1 Approach

An evaluation of constraints, including biodiversity constraints, was completed by NGH Environmental for the proposed Griffith Solar Farm site in 2014. The very low habitat values of the site suggested that a specialist report was not required to assess and mitigate potential impacts to biodiversity. The aim of this chapter is to:

- Address the requirements of the relevant legislation including the EP&A Act, the TSC Act and the EPBC Act.
- Determine the biodiversity values of the study area focussing on identifying threatened flora and fauna species, populations, ecological communities and their habitats that occur within the study area.
- Identify the potential impact of the proposal on threatened flora and fauna species, populations, ecological communities and their habitats including critical habitat.
- Assess the significance of the potential impacts on threatened flora and fauna species, populations, and ecological communities listed under the TSC Act and EPBC Act.
- Propose environmental management measures to avoid and minimise impacts.

The assessment of biodiversity impacts included:

- Database searches to identify threatened species, populations and ecological communities with potential to occur in the study area.
- Site inspection to document the potential of the site to support threatened species, populations and ecological communities.
- A characterisation of impacts to that would accompany the construction and operational phase of the project.
- Development of mitigation measures to avoid, minimise and offset the impact of the proposal.

Database searches and background review

Database searches were undertaken for records of Commonwealth and State listed threatened species, populations and ecological communities. Searches were first conducted on 25 February 2014 and revised on 1 December 2015 and included the following:

- NSW Office of Environment and Heritage (OEH) Wildlife Atlas data records within a 10 km radius of the proposal site.
- EPBC Act Protected Matters search tool items with potential to occur within a 10 km radius of the proposal site.
- Department of Primary Industries threatened & protected species (under the *Fisheries Management Act 1994*).

The results of the database searches are provided in Appendix D.1.

Literature relevant to this assessment was also reviewed and included:

- Office of Environment and Heritage (OEH) Threatened Species Profiles.
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) EPBC Act Species Profiles and Threats Database (SPRAT).
- Aerial maps.
- NSW Spatial Data, including the NSW VIS 3884 map sheet.

Site inspection

A site inspection was undertaken on 3 March 2014 by an NGH Environmental ecologist. The entire proposal site was traversed on foot. The site inspection aimed to describe the landscape context, ecological characteristics of the proposal site and identify flora and fauna constraints at the site.

6.4.2 Existing environment

Database searches

The search of the EPBC Act Protected Matters Search Tool identified five threatened bird species, two threatened plant species, one threatened frog species and two threatened mammal species along with three EECs that are either known to occur or have potential to occur in the study area.

The search of the Atlas of NSW Wildlife identified seven EECs, and 10 threatened fauna species (all birds) that are either known to occur or have potential to occur in the study area. The search did not identify any threatened flora species from the study area.

A search of the DPIs threatened & protected species (under the *Fisheries Management Act 1994*) returned one record of Southern Pygmy Perch (*Nannoperca australis*) from Barren Box Swamp, over 30 km to the north west of the site.

Vegetation mapping for the study area has been completed by DECCW (2010) as part of the NSW Vegetation Information Systems (VIS). This mapping is derived from high resolution aerial imagery and is considered 87 per cent accurate. The VIS map sheet 3884, identifies seven different ecological communities that occur within 1km of the proposal site. No native vegetation is mapped as occurring within the proposal site.

The full database search results and an evaluation of the potential for each entity to occur onsite is provided in Appendix D.1.

Flora and vegetation communities

The proposal site was being cropped (irrigated rice/corn) at the time of the inspection in 2014 (Figure 6-6). No native vegetation community is present onsite and therefore no EECs are present onsite. Some native flora species are likely to occur but these would be subject to periodic removal by cropping activities. The site is highly modified and of low value as habitat to threatened flora.

The area immediately adjacent to the proposal site is dominated by broad scale irrigated agriculture, including viticulture, citrus and cereal crop production and improved pasture.



Figure 6-6 Proposal site looking west along the proposed site access

Adjacent to the proposal site, vegetation within the Hamilton Road and Mirrool Branch Canal Road reserves include a mix of native shrubs and trees, pasture grasses and weeds. Both areas are mapped as Weeping Myall (*Acacia pendula*) Woodland (NSW Spatial Data, including the NSW VIS 3884 map sheet). A larger area of Myall woodland also occurs along the irrigation channel to the east of the proposal site. Approximately 72.19 ha of similar vegetation occurs within 2km of the proposal site.

While these Hamilton Road and Mirrool Branch Canal Road reserves are degraded and have established exotic species present (including Date Palm *Phoenix dactylifera* and Flaxleaf Fleabane *Conyza bonariensis*), Weeping Myall Woodland (see Table 6-9) is classified as an EEC under both the TSC Act and the EPBC Act and it is assessed as such. The community is unlikely to provide habitat to any threatened flora however, being weedy and subject to high levels of edge effects.

Areas of native vegetation occur in the surrounding locality but are generally restricted to linear remnants and the Mirrool Creek riparian corridor, illustrated in Appendix D.2 with photographs in Figure 6-7. Linear remnants are usually highly modified and being narrow, subject to high levels of edge effects.

Table 6-9 Description of vegetation within the road reserve

Weeping Myall open woodland of the Riverina and NSW South-western Slopes Bioregions	
Occurrence	This vegetation community occurs within the road reserve and the irrigation channel to the east of the proposal site is dominated by patches of Weeping Myall along with planted exotic trees north of the proposal area.
Structure	Trees: 2 - 5m 40% cover Shrubs: to 3m 0% cover Ground: < 50cm 80-90% cover Bare earth: (<5% cover) Fallen timber and leaf litter 10% cover
Conservation Status	Conservation status in NSW : Endangered <i>Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions</i> Commonwealth conservation status: Endangered <i>Weeping Myall Woodlands</i>
Condition	The woodland remnant is highly modified, being no more than one tree width and containing several exotic tree species. The understorey also contains a high percentage of weed species.



Figure 6-7 Examples of the Hamilton Road reserve remnant vegetation

Noxious weeds

The proposal site includes highly disturbed paddock areas under cultivation and weed infested tracks and canal verges. No noxious weeds were observed however several are common in the LGA and can become established in disturbed areas. A number of weed species occur onsite including Flaxleaf Fleabane (*Conyza bonariensis*) and Silver-leaf Nightshade (*Solanum elaeagnifolium*).

Fauna habitat

Fauna habitat of relevance to the proposal includes:

- Modified understorey, subject to periodic cultivation, within the site boundaries
- Temporary low quality aquatic habitat within irrigation channels and on irrigated land, within the site boundaries
- Limited discontinuous woodland habitat occurs within the road reserve vegetation adjacent to the proposal site.

Figure 6-8 illustrates examples of limited fauna habitat within and adjacent to the proposal site.

The proposal area supports a mixture of grasses, herbs and exotic annual and perennial species. These habitats are in poor condition with high weed infestation and areas of bare soil. However, they could provide foraging resources for birds, reptiles and some mammals. The value of this habitat is considered low, and is common in the local area and broader region.

Aquatic habitats are present within irrigation channels and within the irrigated paddocks. These habitats are highly effected by nutrient-laden runoff from sediment and fertilisers, and as such are of low quality. They are temporary and present only during irrigation activities, which generally occur from late winter to summer. Habitats include some instream vegetation, water ways and ponded water. These habitats and resources could be utilised by water birds, frogs and reptiles including turtles and snakes. Given the seasonal nature of their availability, and the likely poor water quality and generally low quality of the habitat, only disturbance-tolerant species are likely to utilise these habitats on a regular basis and it would not be considered important habitat for any species.

Woodland habitats in the local area are discontinuous and are limited to scattered trees along the road reserve in the immediate vicinity of the proposal site. No hollow bearing trees were observed during the site inspection. The understorey provides foraging resources, mostly grasses, with some limited fallen timber and leaf litter present. Limited foraging and possibly some nesting habitats for native bird species is present within these areas. Modified condition and limited width notwithstanding, even small remnants can provide important stepping stones for fauna moving through disturbed or modified environments.



Figure 6-8 Examples of limited fauna habitat within and adjacent to the proposal site

Threatened species

The evaluation of the potential for threatened species to occur onsite is provided in Appendix D.3. Due to the disturbed and limited habitat, most were rated: *habitat absent, unlikely to occur onsite*. Possible occurrence however, was noted for:

Spotted harrier

The Spotted Harrier occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.

Barking Owl

The Barking Owl inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or the dense clumps of canopy leaves in large Eucalypts.

Diamond Firetail

The Diamond Firetail is widely distributed in NSW, in grassy eucalypt woodlands. It also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. It is often found in riparian areas and lightly wooded farmland.

6.4.3 Potential impacts

The proposal would result in the following direct and indirect impacts on flora and fauna during construction and operation:

- Removal and modification of terrestrial habitat.
- Removal of aquatic habitat (two irrigation channels) within the proposal site.
- Potential for offsite impacts:
 - Potential for erosion to degrade offsite aquatic habitat.
 - Potential for weeds to be imported and/or distributed throughout the site. and adjacent areas.
 - Potential to affect movement or riparian corridors.
 - Potential to impact threatened species or communities.

Removal of terrestrial habitat

The proposal would require the development of the majority of the 125 ha site for the construction of the solar plant; the majority of this is highly disturbed agricultural land. Construction and operation of the solar array will not require extensive levelling or excavation. The mounting systems are pile driven or screwed into the ground, cable trenches would be approximately 1 m in width, potential footings for containers would be discrete and access tracks would be of minimal width required for standard 4WD access during operation. The underground and aboveground transmission line options would not require the removal any trees. Therefore, the majority of the impact would be to 'modify' existing habitat by panel shading, rather than directly remove it.

Once installed, the operational panels would shade ground cover beneath them and cause additional micro climate effects (reduced air flow and higher humidity may enhance pasture growth in hotter conditions). In high rain fall events, the additional impervious panel area would increase the velocity and restrict the

distribution of rain fall. As well as being very flat, the soil properties suggest that the soil is highly fertile and stable for cultivation. Therefore it is expected that the pasture growth and freely draining soils would distribute the water without causing bare areas susceptible to erosion or uneven waterlogging. Maintaining ground cover on the site to control weeds and erosion will be dependent on seasonal conditions however, and should be monitored so that action (such as changing pasture species beneath the panels or armouring the lower edge of the panels) can be undertaken if required.

Removal of aquatic habitat

The canals that would be removed are not considered important habitat for any species. There is a network of similar canals in the adjacent areas and local area. Subject to removal methods being planned to minimise adverse impacts to downstream habitats, no adverse biodiversity impacts are anticipated. The canals are periodically empty as part of agricultural operations and therefore this is not a new impact type.

Potential for offsite impacts

Soil disturbance, affecting waterways if not captured, noise during construction, vibration and the introduction of weeds on machinery can all accompany construction activities and degrade habitat onsite and on adjacent properties. The nearest quality habitats are considered to be the Mirrool Creek riparian corridor approximately 300m south of the site. Impacts are not anticipated to affect habitat or use of this habitat, given the distance between the sites and the manageability of these impacts.

Threatened species and ecological communities

The proposal would not require the removal of any trees with the Weeping Myall Woodland EEC. The installation of the transmission line would avoid impacts to Weeping Myall Woodland trees through design (underbore or micro siting to avoid tree removal). The understorey is not considered an important part of this community. Assessments of Significance (Appendix D.4) conducted under the TSC and EPBC Acts concluded that the proposal is unlikely to significantly affect Weeping Myall Woodland given that no Weeping Myall are to be removed. A Species Impact Statement or Referral to the Commonwealth Environment Minister is not required.

Regarding the three species of threatened fauna with potential to occur:

Spotted Harrier

Although the Spotted Harrier may fly over the proposal site from time to time, it is unlikely to rely upon the habitat within the proposal area for breeding or foraging habitat. The proposed work would be unlikely to have any substantial impacts on this species.

Barking owl

The habitat is to be affected is degraded and common in the local area. No trees would be removed. While it may occur nearby and from time to time, the proposed work would be unlikely to have any substantial impacts on this species.

Diamond Firetail

Given the small area of direct impact as a result of the proposal and that the Diamond Firetail is unlikely to rely upon the potential habitat within the proposal area for breeding or foraging habitat, the proposed work would be unlikely to have any substantial impacts on this species.

The proposal would not directly impact upon any other threatened species, population or ecological community.

6.4.4 Safeguards and mitigation measures

Management of indirect impacts is important for protecting higher quality habitat offsite. These are included in the mitigation strategy in Table 6-10.

Table 6-10 Safeguards and mitigation measures for biodiversity

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Vegetation clearing is to be restricted to areas identified within the project site. No machinery, equipment or personnel access would occur beyond these boundaries.	C		
No clearing of Weeping Myall Woodland is to occur without further assessment.	C		
- Rehabilitation and visual screening plantings should maximise the use of native species that form part of the local Weeping Myall Woodland, where appropriate. Species include; - o Weeping Myall (<i>Acacia pendula</i>), - o Western rosewood (<i>Alectryon oleifolius subsp. elongatus</i>); - o Poplar box (<i>Eucalyptus populnea</i>); - o Black box (<i>Eucalyptus largiflorens</i>). - Neoen will consider improving vegetation connectivity by planting vegetation screening along Ross Road and Irrigation Way (in line with the RMS requirement to maintain a 10 m buffer between roads and vegetation.	C		
- A Weed management plan would be prepared prior to the commencement of construction outlining measures to prevent the ingress and egress of weeds from the surrounding area. Measures should include: - o Vehicle hygiene protocols, including inspections and cleaning of vehicles when arriving at the site. - o Identify areas of noxious and environmental weeds within the proposal area. - o Identify the most suitable methods for the eradication and suggest ongoing control requirements to suppress noxious and environmental weeds prior to construction. - o Monitoring and controlling noxious weeds throughout the proposal area.	C		
A site restoration plan would be developed to rehabilitate disturbed areas, progressively.	C		D

A ground cover management plan would be developed with the aim of maintaining ground cover beneath panels, thereby resisting erosion, weed infestation and run off into aquatic habitat. It would include monitoring and triggers for action if bare areas develop.		O	
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6.5 NOISE AND VIBRATION IMPACTS

6.5.1 Approach

An environmental noise and vibration assessment for the proposed Griffith Solar Farm was undertaken by Renzo Tonin and Associates. The full report is provided in Appendix F and is summarised below. It includes consideration of noise and vibration impacts from the construction and operation phases of the project in accordance with relevant Council and EPA requirements and guidelines.

6.5.2 Existing environment

The proposal is located in a regional setting, on the outskirts of the Yoogali village and adjacent to a main road, Irrigation Way. The surrounding land uses are generally irrigated horticulture and sheep grazing land on improved irrigated pastures. The main sources of noise in the area are traffic along the Irrigation Way and agricultural activities such as the operation of large harvesters, large haulage trucks, irrigation pumps, quad bikes and 4WD vehicles.

Residential properties are sparsely distributed in the locality (Figure 6-9). The nearest residential dwelling is approximately 115 m from the proposed solar farm.

6.5.3 Noise monitoring

Criteria for the assessment of construction and operation noise are usually derived from the existing noise environment of an area. The NSW EPA Industrial Noise Policy (INP) outlines methods for determining the background noise level of an area. This assessment of these proposed works has used long-term noise monitoring.

Noise monitoring is to be undertaken at the nearest or potentially most affected residential locations. In this case the nearest and potentially most affected location where noise monitoring was undertaken was at 750 Hamilton Road, Yoogali (M1 on Figure 6-9). Long term (unattended) noise monitoring was carried out at M1 between Friday 6th and Thursday 19th November 2015. The existing background and ambient noise levels are presented in (Table 6-11).



Figure 6-9 Residential receivers and noise monitoring locations adjacent to the proposal site

Table 6-11 Results of background noise monitoring and noise management levels

Monitoring location	L _{A90} Background Noise Levels			L _{A90} Ambient noise level		
	Day	Evening	Nigh	Day	Evening	Nigh
M1 – 750 Hamilton Road	34	38	30	49	51	48

6.5.4 Construction noise impact assessment

Criteria

The NSW *Interim Construction Noise Guideline* (ICNG; DECC, 2009) deals with managing construction noise impacts. According to the guideline, a quantitative assessment of noise impacts is warranted when works are likely to impact an individual or sensitive land use for more than three weeks in total.

The guideline specifies noise targets, or ‘noise management levels’, for residences and other noise sensitive receivers (Table 6-12). The Rating Background Level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period. Residential receivers are considered ‘noise affected’ where construction noise levels are greater than the noise management levels identified below.

Table 6-12 Noise Management Levels at residential receivers

Time of day	Management Level
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A)
	Highly noise affected 75dB(A)
Outside recommended standard hours	Noise affected RBL + 5dB(A)

Noise management levels

Table 6-13 identifies the adopted construction noise management levels (NMLs) for the nearest noise sensitive receivers (refer to Figure 6-9). The NMLs for the receiver locations are derived from the RBLs represented by the background noise levels measured at the monitoring location (Table 6-11) and NSW ICNG (DECC 2009) criteria (Table 6-12). Furthermore, during standard construction hours a highly affected noise objective of 75 dB(A) applies at all receivers.

Table 6-13 Construction Noise Management Levels at residential receivers

Location description	Day L_{A90} Background Noise Level (RBL)	Day Noise Management L_{A90} (15min)
All residential receivers	34 ¹	44

¹ Construction works occur during the daytime period only, hence only the day period assessed.

Construction noise sources

Noise impact predictions, takes into account the typical noise levels of construction equipment likely to be used for the construction phase. The equipment and their sound power levels are in Table 6-14.

Table 6-14 Construction equipment sound power levels

Equipment used	L_{Aeq} Sound power levels (dBA)
Piling drilling rig	111
Powered hand tools	110
Mobile crane	110
Truck and dog	108
Delivery van	88

Construction noise assessment

Potential noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area and possible noise control treatments surrounding the study area. The modelling calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction models takes into account:

- Location of noise sources and receiver locations.
- Height of sources and receivers.
- Separation distances between sources and receivers.
- Ground type between sources and receivers.
- Attenuation from barriers (natural and purpose built).

Table 6-15 present the noise levels likely to be experienced at the nearby affected receiver locations during the construction works. The present levels are a worst case maximum with all plant and equipment operating concurrently.

Table 6-15 Predicted L_{Aeq} 15 min construction noise levels at receiver locations

Receiver location (refer to Figure 6-9)	Noise management level ¹	Predicted Construction Noise Level, L_{Aeq} (15 min) ²	Comply (Yes/No)
R1 – 751 Hamilton Road, Yoogali	44	21-50	No, exceeded by 6dB(A)
R2 – Lot 1 Poletta Road, Yoogali		23-50	No, exceeded by 6dB(A)
R3 – 262 Hamilton Road, Yoogali		23-37	Yes
R4 – 228 Hamilton Road, Bilbul		19-31	Yes
R5 – 2562 Evans Road, Bilbul		19-31	Yes
R6 – Savage Road, Bilbul		20-38	Yes

Notes: ¹ Noise Management for day

². Based on all construction plant and equipment operating concurrently. Higher level in range occurs when plant and equipment are at closest proximity to receiver and lower level in range occurs when plan and equipment are furthest.

Based on the predicted construction noise levels presented in Table 6-15 the construction management level will be exceeded when works are conducted at the closest proximity to Receivers R and R2 by up to 6db(A). These exceedances are predicted based on all plant and equipment operating concurrently and at a location closest to the corresponding receiver location. This scenario would not typically occur on site. Noise management measures are recommended to reduced noise levels and potential impact for these receivers.

Predicted construction noise levels at all other receivers will comply with the construction management level. No receiver is predicted to be highly noise affected (75db(A)).

6.5.5 Operation noise assessment

Background noise monitoring

Background noise data collected to assess construction noise were also used to assess operational noise. Refer to Section 6.5.3 for background noise monitoring results.

Criteria

The *NSW Industrial Noise Policy* (INP) (EPA, 2000) specifies noise criteria relating to intrusive noise impacts and noise level amenity. The assessment criteria under the INP for the Griffith Solar Farm is outlined in Table 6-16.

Table 6-16 NSW Industrial Noise Policy project-specific criteria

Assessment Criteria	Project Specific Criteria
Intrusive	Rating background level + 5dBA
Amenity	INP based on recommended LAeq noise levels for rural residential properties.

The operational project specific noise criteria for the solar farm based on the INP criteria and guidelines (Table 6-16) is shown in (Table 6-17).

Table 6-17 Applicable operational noise criteria

Receiver	Intrusiveness criteria		Recommended L _{Aeq} Amenity Noise level		
	Period	L _{Aeq} (15 minute) (dBA)	Time of day	Acceptable	Maximum
All receivers	Day	34 + 5 = 39	Day ²	50	55
	Evening	34 ¹ + 5 = 39	Evening ³	45	50
	Night	30 + 5 = 35	Night ⁴	40	45

- Notes:
1. Evening RBL is greater than the Day RBL as per EPA requirements the evening noise goal should not be higher than the Daytime noise goal.
 2. Day is defined as 7.00am to 6.00pm, Monday to Saturday, 8.00am to 6.00pm Sundays and Public holidays
 3. Evening is defined as 6.00pm to 10.00pm, Monday to Sunday and Public Holidays.
 4. Night is defined as 10.00pm to 7.00am, Monday to Saturday, 10.00pm to 8.00am, Sundays and Public Holidays.

Comparing the amenity and the intrusiveness criteria shows that the intrusiveness criteria are more stringent for day, evening and night periods. Intrusiveness criteria would be assessed from this point forward for the proposal.

As the proposal will potentially operate for part of the night time period (prior to 7.00am) during summer months, EPA sleep disturbance criteria applies. Criteria specific to the proposal is outlined in Table 6-18.

Table 6-18 Sleep disturbance criteria dB(A)

Receiver	Sleep Disturbance Criteria	Sleep Disturbance Criteria specific to proposal, L _{amax}
All residential receivers	Night rating background level + 15dBA	30 + 15 = 45

Operational noise sources

The potential sources of noise during operation of the solar farm would include:

- Mechanical noise from the tracking system of the solar panels. Up to 2,650 tracking motors will be employed to drive the 200,000 solar panels.
- Operation of 24 inverters with integrated transformers.
- One staff member onsite daily with the use of a light vehicle.

The predicted power levels of these operation activities are outlined in Table 6-19.

Table 6-19 Typical operational plant and equipment and sound power levels for the proposal

Plant description	L _{Aeq} Sound power levels (dBA)
NexTracker Motor (2,650 in total)	78 (each)
Sunny Central 2200 inverter with integrated transformer (24 in total)	94 (each)
Light vehicle	88

Operational noise assessment

In order to determine the noise impacts of the operating solar farm, a computer model incorporating all significant noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments surrounding the study area. The modelling calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction models takes into account:

- Location of noise sources and receiver locations.
- Height of sources and receivers.
- Separation distances between sources and receivers.
- Ground type between sources and receivers.
- Attenuation from barriers (natural and purpose built).

Additionally, in accordance with INP noise predictions, three meteorological conditions are considered, including:

- Calm & isothermal conditions (acoustically neutral) –no wind and no temperature inversion.
- Slight to gentle breeze –3m/s wind velocity at 10m from ground level between each noise source and each noise receiver (as per INP default wind conditions). Wind direction was based on wind travelling from the source to the receiver.
- Moderate temperature inversion –applicable for noise predictions during night time periods only.

Table 6-20 presents the predicted noise levels for the worst case scenario based on concurrent operation all plant and equipment shown in Table 6-19.

Table 6-20 Predicted L_{Aeq 15min} Operational Noise Levels at receiver locations, dB(A)

Receiver location (refer to Figure 6-9)	Intrusiveness criteria	Predicted Operational Noise Levels, L_{Aeq} (15 min)			Comply? (Yes/No)
		Calm and isothermal conditions	Slight to gentle breeze	Moderate temperature inversion ¹	
R1 – 751 Hamilton Road, Yoogali	Day 39 Evening 39 Night 35	31	35	35	Yes
R2 – Lot 1 Poletta Road, Yoogali		31	35	35	Yes
R3 – 262 Hamilton Road, Yoogali		29	34	34	Yes
R4 – 228 Hamilton Road, Bilbul		23	29	29	Yes
R5 – 2562 Evans Road, Bilbul		22	28	28	Yes
R6 – Savage Road, Bilbul		28	33	33	Yes

Notes: 1. Applicable for the night time period only.

Based on the predicted operational noise levels presented in Table 6-20, predicted noise levels at all nearby receivers comply with the nominated criteria under all scenarios and meteorological conditions. The predicted operational noise levels will additionally be below the sleep disturbance criteria of 45 dB(A). Therefore, no further reasonable and feasible noise mitigation measures are required to reduce operational noise impacts.

6.5.6 *Vibration assessment*

Vibration generating activities would occur only during the construction phase. There are no vibration generating activities expected during the operational phase. The nearest identified receiver is in excess of 100m from the proposal site and there are no high vibration producing plant items to be used, structural damage due to vibration is not expected. Assessment for vibration impact on human comfort is assessed during the construction phase.

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with EPA's Assessing Vibration: A Technical Guideline (DECC, 2006). Based on the proposed plant items to be used during construction (Table 6-14), vibration generated by construction plant was estimated and potential vibration impacts are summarised in Table 6-21.

Table 6-21 Potential vibration impacts for identified receivers.

Receiver location (refer to Figure 6-9)	Approx. distance to nearest buildings from works	Type of nearest sensitive buildings	Assessment on potential vibration impacts	Vibration monitoring
R1 – 751 Hamilton Road, Yoogali	115m	Residential	Very low risk of adverse comment	Not required
R2 – Lot 1 Poletta Road, Yoogali	120m	Residential	Very low risk of adverse comment	Not required
R3 – 262 Hamilton Road, Yoogali	390m	Residential	Very low risk of adverse comment	Not required
R4 – 228 Hamilton Road, Bilbul	780m	Residential	Very low risk of adverse comment	Not required
R5 – 2562 Evans Road, Bilbul	840m	Residential	Very low risk of adverse comment	Not required
R6 – Savage Road, Bilbul	430m	Residential	Very low risk of adverse comment	Not required

The potential for adverse comment to vibration impacts was determined to be very low. Additional vibration mitigation measures and vibration monitoring are not required at the identified receiver locations.

6.5.7 Road traffic noise assessment

As the proposed vehicle access to the subject site is much greater during the construction stage than the operational stage, road traffic noise assessment is only considered for the construction stage.

Noise impact from the potential increase in traffic on the surrounding road network due to construction is assessed against the NSW Road Noise Policy (RNP). The RNP sets out criteria to be applied to particular types of road and land uses. Griffith Road is categorised as an arterial road; while Hamilton Road and Mirrool Branch Canal Road are categorised as local roads. Criteria for these roads are outlined in Table 6-22.

It is assumed 40 truck movements per day will occur along the surrounding road network during the construction stage. It is assumed that 20% of the daily truck movement will occur during the worst one hour period; that is, eight truck movements in the worst one hour period. Truck movements will only occur during the day time period when construction works occur. Results of the road traffic noise predictions against criteria are presented in Table 6-22.

Table 6-22 Predicted Road Traffic Noise Contribution Levels Along Public Roads, dB(A).

Receiver	Road	Criteria	Truck traffic movements	Speed (km/h)	Distance to Road	Predicted Noise Level	Exceed?
Residences on Griffith Road	Arterial	L _{Aeq} (15 hour) 60	40 per day	100	30m	47	No
Residences on Hamilton Road	Local	L _{Aeq} (1 hour) 55	Eight (8) in worst one (1) hour period	50	47m	46	No
Residences on Mirrool Branch Canal Road	Local			50	400m	22	No

From Table 6-22 it can be seen that road traffic noise level contributions from the truck movements associated with the construction works are at least 9dB(A) below the applicable noise criteria. Therefore, traffic noise levels as a result of the construction works for the solar farm would not adversely contribute to the existing traffic noise levels at the most affected residences along the surrounding roads.

6.5.8 Safeguards and mitigation measures

Noise impacts are proposed to be addressed via the mitigation measures listed in Table 6-23.

Table 6-23 Safeguards and mitigation measures for noise impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
For construction works within approximately 400 m of Receivers R1 and R2, manage potential noise impacts via discussions/ agreements with residents. Consider time restrictions and providing periods of repose for residents, where feasible.	C		
Plant and equipment to be properly maintained.	C		
Avoid unnecessary noise when carrying out manual operations and when operating plant.	C		
Switch of any equipment not in use for extended periods.	C		
Establish good relations with people living in the vicinity of the site at the beginning of project and maintain. Keep people informed, take complaints seriously, deal with complaints expeditiously. The community liaison member of staff should be adequately experienced.	C		

7 ASSESSMENT OF ADDITIONAL ISSUES

7.1 HYDROLOGY (INCLUDING FLOODING)

7.1.1 Policy setting

The prime responsibility for planning and management of flood prone land in New South Wales rests with local government. The Flood Prone Land Policy and the Floodplain Development Manual (NSW Government, 2005) forms the basis of floodplain management in New South Wales. The Flood Prone Land Policy is directed towards providing solutions to existing flooding problems in developed areas and ensuring that new development is compatible with the flood hazard and does not create additional flooding problems in other areas.

In 2013, Griffith City Council commissioned the preparation of a Flood Study for the Main Drain J and Mirrool Creek Catchments. The Flood Study (BMT WBM, 2015a) was subsequently used as the basis for preparation of an updated Griffith Floodplain Risk Management Study and Plan (BMT WBM, 2015b).

The proposal site is covered by the Griffith Main Drain J and Mirrool Creek Flood Study and the Griffith Main Drain J and Mirrool Creek Floodplain Risk Management Study and Plan.

7.1.2 Approach

This section investigates the following issues in relation to the development, as required by the SEAR's:

- an assessment of potential flooding impacts, undertaken generally in accordance the NSW Government *Floodplain Development Manual 2005*, considering a full range of potential flood events up to and including the PMF and any local floodplain risk management planning processes.

To assess the potential flooding impacts relating to the proposed Griffith Solar Farm, a review of existing studies regarding flooding in the area of the proposal has been undertaken, generally in accordance with the Floodplain Development Manual (NSW Government, 2005). Studies reviewed include:

- Griffith Main Drain J and Mirrool Creek Flood Study, Final Report (BMT WBM, 2015a).
- Griffith Main Drain J and Mirrool Creek Floodplain Risk Management Study and Plan, Final Report (BMT WBM, 2015b).

No modelling or assessment of events outside those provided in the Flood Study (BMT WBM, 2015a) and Floodplain Risk Management Study and Plan (BMT WBM 2015b), has been undertaken. It was considered that an assessment based on existing studies and information, was sufficient to develop an understanding of the flood risk and potential impacts associated with development at the site.

7.1.3 Existing environment

Surface hydrology and flooding

The proposal site is located within the Main Drain J Catchment, which forms part of the broader Mirrool Creek Catchment. Construction of irrigation supply and drainage infrastructure in the region has substantially modified the natural drainage of the broader catchment. The proposal area is located north of the Mirrool Branch Canal, which forms the southern limit of the Main Drain J catchment.

The floodplains of the Main Drain J and Mirrool Creek systems are largely separated by the Mirrool Branch Canal. However, as evidenced by a flood event in March 2012, a transfer of flow from Mirrool Creek into the Main Drain J catchment can occur during major flood events (BMT WBM 2015a).

Flooding in the Main Drain J Catchment is driven principally by runoff from the farm drainage in the area bounded by the Main Canal and Mirrool Branch Canal (refer Figure 7-1). In large flood events, such as in March 2012, the drainage network conveys around 90% of the flood flows in the catchment.

A number of floods have been experienced in the study catchment since European settlement and the construction of the irrigation system in 1912. Major floods are known to have occurred in 1931, 1939, 1956, 1974, 1989 and most recently in 2012. Floods that occurred in March 2012 were the largest in recorded history for the catchment (BMT WBM, 2015a).

Three Murrumbidgee Irrigation channels currently traverse the proposal site. There are no other waterbodies or dams at the site. At present, surface waters would drain from the site via existing drainage swales and eventually through the irrigation channels.

7.1.4 Flood risks

The primary objective of the Griffith Main Drain J and Mirrool Creek Flood Study (BMT WBM, 2015a) was to define the flood behaviour within the Main Drain J catchment, including flood flow contributions from Mirrool Creek, through the establishment of appropriate numerical models. The Flood Study determines design flood conditions for a range of design events including the 20% Annual Exceedance Probability (AEP), 10% AEP, 5% AEP, 2% AEP, 1% AEP, 0.5% AEP and the PMF. It also provides hydraulic categorisation mapping across the floodplain, including at the proposal site.

The Griffith Main Drain J and Mirrool Creek Flood Study Draft Report by BMT WBM indicates that part of the proposal site is located in a low hazard flood fringe in a 1% AEP event. The study defines the Flood Fringe as low velocity backwaters within the floodplain. Development in flood fringe areas doesn't have any significant effect on flood patterns or flood levels (NSW Government, 2005).

Flood design modelling within the Flood Study (BMT WBM, 2015a) indicates that the proposal site could experience flooding in events equal to or greater than 2% AEP (i.e. the site is flood prone land in events of 2% AEP or greater). During flooding events lower than 2% AEP, the proposal site would not experience any flooding. During a **2% AEP** event, floodwaters could overtop the Mirrool Branch Canal adjacent to the proposal site, causing shallow flooding (< 10cm depth) of part of the eastern corner of the proposal site (within Lots 81 and 82). The irrigation channel traversing the site in a north west-southeast direction captures some flood waters, preventing waters from extending further west across the rest of the proposal site.

During a **1% AEP** event, the modelling indicates that shallow (<10cm) flood waters would extend across the majority of land within Lots 81 and 82, however not extending any further west than the irrigation channel immediately west of those lots. During a **0.5% AEP** event, the modelling predicted that flood waters from Mirrool Branch Canal would extend across the majority of the site, except for the central and western portions of the site which are at slightly higher elevation. According to modelling undertaken for the **PMF**, water depths also do not exceed approximately 10cm anywhere within the proposal site. The estimated PMF level is 127.24m AHD to 127.54 m AHD and Low Hazard (BMT WBM 2015a).

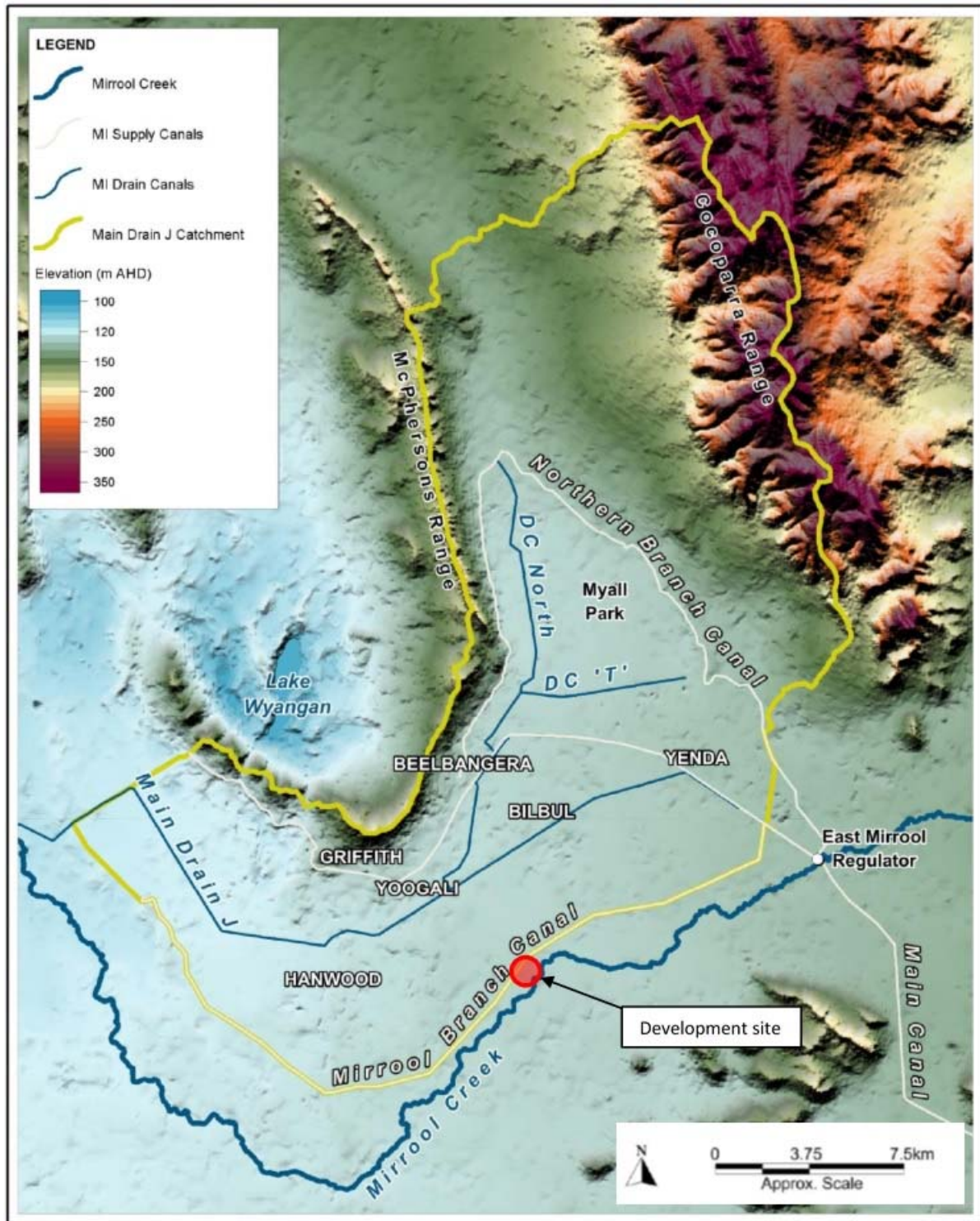


Figure 7-1 Topography of the Main Drain J Catchment (Source: adapted from BMT WBM, 2015a)

Despite the Flood Study modelling results, flooding records in the area of the proposal site suggest that even in the March 2012 floods (the largest in recorded history), the proposal site did not experience any flooding (pers. comm. Fiona de Wit, Griffith City Council). The flooding observed in the Main Drain J catchment during the March 2012 event are generally representative of the 0.5% AEP event (BMT WBM 2015a). During the March 2012 flood event, Mirrool Creek floodwaters had overtopped irrigation infrastructure approximately 11 kilometres east of the proposal site, spilling into the Main Drain J catchment. However, this only affected areas further east of the proposal site around the town of Yenda.

Anecdotal evidence from landowners south of the proposal site indicate that moderate - severe flooding has previously occurred on properties adjacent to Mirrool Creek, due to flooding of the Creek. However, these properties are separated from the Main Drain J catchment by the Mirrool Branch Canal, which appears to convey the vast majority of flood waters from the immediate area, thereby providing some flood protection to the proposal site.

It is considered that overall, there is a low risk of flooding occurring at the proposal site, based on known flood patterns and historical records of flooding in the catchment.

7.1.5 Potential impacts

Construction

Activities during construction would be confined to the proposal boundary. According to provisional mapping within the Main Drain J and Mirrool Creek Flood Study (BMT WBM 2015a), provided in the Local Flood Risk map in Appendix B, the proposal site is located within the flood fringe. Note that the map in Appendix B depicts the PMF level provided by GCC, which approximates the flood area from the modelled PMF levels in the Main Drain J and Mirrool Creek Flood Study. Design event modelling has predicted that flood events of **2% AEP** or greater have potential to cause some minor and shallow flooding within the proposal area. Even during a PMF event, flood water depth would not be expected to exceed approximately 10cm anywhere within the site. The velocity of flood water flows through the property would be slow due to the flat nature of the terrain. Modelling indicates that within the proposal site, only Lots 81 and 82 would potentially be affected by flood waters (see Flooding Map in Appendix B).

Despite the fact that past 0.5% AEP flood events have not affected the proposal site (Griffith City Council, 2015), the potential risk of flooding during extreme events is acknowledged. Flooding at the site during construction would have the potential to cause sedimentation of waters entering and eventually draining from the site. Such risks should be managed by the implementation of appropriate erosion and sediment control measures. If a heavy rainfall event was predicted, the site should be stabilised and work ceased until the wet period has passed. Loose materials such as construction waste and equipment, should be appropriately secured or removed from the site.

Operation

Based on the modelled depth of flood waters for the PMF at the site, equipment that is situated below approximately 0.15 metres above ground level may be affected during an extreme flooding event. The PV plant construction would involve PV modules mounted above the ground on posts that are pile driven to the ground. Given the location of the site within a low hazard flood fringe, it is expected that the site would experience flooding by low velocity backwaters only with negligible potential to impact the stability or integrity of infrastructure at the site.

Flooding in and adjacent to the site has the potential to impact Poletta Road and Mirrool Branch Canal Road, as these are within the PMF zone (see Appendix B). The site is categorized as occurring within a low

hazard flood fringe, and in these zones, able-bodied adults would have little difficulty wading and trucks could be used to evacuate people and their possessions should it be necessary.

Flooding at the site has potential to cause erosion and sedimentation of exposed areas, including internal roads, parking areas and those areas around site the office buildings. The majority of the site however, would be revegetated with grass cover, minimising the risk of soil erosion by floodwaters. Appropriate drainage structures need to be considered during the detailed design of the proposal, to ensure that surface waters and runoff are directed from the site through stabilised discharge points.

Floor levels of habitable room areas are subject to Griffith City Council's Floor Heights Policy. The floor level for habitable rooms areas is to be 410mm above the existing natural ground level. Amenities and site office buildings at the proposed solar farm would be subject to this requirement, and would therefore not be at risk of impact by flood waters.

Blockage or filling of, or development within flood fringe areas, would not be expected to have any significant effect on flood patterns or levels in flood events up to the 1% AEP event (100 year ARI). Operation of the solar farm would not be expected to impact flood patterns or levels in the surrounding areas of the Main Drain J catchment. Two irrigation channels within the proposal site would be filled in as part of the proposal. However, the irrigation channel adjacent and parallel to Poletta Rd would remain intact, as it provides water to downstream users. Flood modelling suggests that during the PMF event, the irrigation channel next to Poletta Road would act to capture and drain backwaters and prevent water from extending further west of the channel. Closure of the other two irrigations channels is not expected to impact the extent of flooding within the site.

7.1.6 Safeguards and mitigation measures

Hydrological and flooding impacts are primarily addressed as part of the design of the project. The following management and mitigation strategy (Table 7-1) is recommended to manage flooding impacts associated with the development.

Table 7-1 Safeguards and mitigation measures for hydrology (including flooding)

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
The substation and office building would be designed to accommodate a 1:100 year flood and be located outside the PMF zone.	C		
Ensure that the floor level of habitable rooms is designed to be at least 410 mm above the existing natural ground level, in accordance with Griffith City Council's Floor Heights Policy.	C		

7.2 SOIL

7.2.1 Existing environment

Soils, landforms and geology

The proposal site is located on the floodplain of the Main Drain J catchment, which is situated within the broader Mirrool Creek catchment. The topography of the proposal site is flat. The proposal site is currently used for irrigated cropping.

The *Narrandera 1:250 000 Geological Sheet* (Pogson, 1974) indicates that the site is underlain by Quaternary flood plains of black and red clayey silt, sand and gravel. The stratigraphic unit underlying the proposal site is the Shepparton Formation of the Murray sedimentary basin. The Shepparton Formation is of Late Pliocene to Pleistocene age, and is characterised by unconsolidated to poorly consolidated mottled variegated clay, silty clay with lenses of polymictic, coarse to fine sand and gravel and intercalated red-brown palaeosols. The unit forms extensive flat alluvial floodplains. Below the Shepparton Formation are the Calivil Formation and the Renmark Group, which overlie Paleozoic and Mesozoic bedrock (Geoscience Australia, 2015).

The bore log for a bore within the site (Bore ID GW408499.1.1) indicates that approximately the top 0.3 metres of soil comprises clay loam. Below this, clay is present to a depth of approximately 4.8 metres, followed by clay loam (approximately 4.8 to 8.5 metres), loam (approximately 8.5 to 11.6 metres) and sand (approximately 11.6 to 12.2 metres) (BOM, 2016).

It is expected that soils in the proposal area are susceptible to erosion due to previous vegetation clearing and agricultural activities. Land capability mapping indicates that the site is subject to moderate land and soil limitations, capable of sustaining high impact land uses which can be managed by readily available, and easily implemented management practices (OEH, 2016).

There are no known occurrences of acid sulfate soils or dryland salinity in the proposal area.

Potential contamination

A search of the OEH contaminated land public record (NSW Government, 2016a) was undertaken for contaminated sites within the Griffith LGA on 16 January 2016. The search returned no results for contaminated land within the Griffith LGA. The online *List of NSW contaminated sites notified to the EPA* (NSW Government, 2016b) was also searched on 16 January 2016. The search returned eight listings, seven of which were in the Griffith township and one at the Griffith airport. None of the sites are near the proposal area.

There is a risk of contamination associated with past and present agricultural activities at the proposal site (e.g., use and disposal of pesticides). No above ground signs of contamination were observed during the site inspection.

7.2.2 Potential impacts

Construction and decommissioning

SOIL IMPACTS

Construction activities at the proposal site, such as excavation and earthworks, have the potential to disturb soils, cause soil erosion and subsequent sedimentation. Excavations would be required for the construction of internal roads, compound, lay down and parking areas. Given the relatively flat landforms, large scale bulk earth works would not be required. Trenches excavated for underground cabling would remove vegetation cover and disturb soils, potentially decreasing their stability and increasing susceptibility to erosion. Only 2% of the site is estimated to be disturbed for excavation activities.

Erosion and sedimentation impacts associated with soil disturbance from the construction and decommissioning activities can be minimised by undertaking such works in accordance with provisions of the Managing Urban Stormwater: Soils and Construction series, in particular:

- Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition (Landcom 2004), known as 'the Blue Book'.
- Volume 2A Installation of Services (DECC 2008a).
- Volume 2C Unsealed Roads (DECC 2008b).

Soil compaction would occur as hardstands and internal access roads are created, which would reduce soil permeability thereby increasing run off and the potential for concentrated flows. During excavations mixing of different soil horizons can retard plant growth due to inadequate top soil layer.

Pile driving/screwing of steel posts supporting the arrays as well as installation of power poles and fencing uses light equipment and is unlikely to result in material compaction or disturbance of soils. However, the areas of disturbance would be small and sparsely distributed, and the majority of groundcover would be retained. Dust may be generated as a result of the project site construction and traffic activities. Impacts of dust are discussed in further detail in Section 7.1.

The use of fuels and other chemicals on site pose a risk of soil contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and (minimally) herbicides. Spills of these contaminants can alter soil health, affecting its ability to support plant growth. When mobilised, such as in a rain event or flooding, the substances may spread via local drainage lines, affecting much larger areas including aquatic habitat.

It is possible that contamination associated with past agricultural activities (e.g. pesticides) could be present on the site. If contamination is identified during site construction, it would be managed in accordance with a Construction Environmental Management Plan (CEMP).

Operation

SOIL IMPACTS

Minimal operational impacts to soils would occur. Maintenance activities and vehicles would be largely confined to the formalised access tracks. There would remain a risk of soil contamination in the event of a chemical spill (fuels, lubricants, herbicides), requiring the development of strict emergency protocols.

The potential for wind erosion (dust generation) during regular solar farm operation would be low given the ability to stabilise soils exposed during after construction. Areas that were temporarily used during construction (e.g. laydown and construction parking areas) would be rehabilitated.

Concentrated runoff from the solar panels could lead to increased soil erosion below the solar array modules during significant rain events. Retaining vegetation cover would assist in reducing potential for erosion from rainfall run-off. Monitoring would be required to address any bare areas and erosion that develop.

7.2.3 Safeguards and mitigation measures

Activities with potential for adverse soil impacts would be managed through the development and implementation of site specific sediment control plans and spill controls, as detailed in Table 7-2.

Table 7-2 Safeguards and mitigation measures for soil impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Ground cover would be established and maintained beneath the array area as much as possible prior to and during construction, to minimise areas exposed to erosion.	C		
A soil and water management plan would be prepared, implemented and monitored during the project, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to: - At the commencement of the works, and progressively during construction, install the required erosion control and sediment capture measures. - Regularly inspect erosion and sediment controls, particularly following rainfall. - Maintain a register of inspection and maintenance of erosion control and sediment capture measures. - Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks. - Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads which may cause risks to other road users through reduced road stability. - In all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. - Stockpile topsoil appropriately, so as to minimise weed infestation, maintain soil organic matter, maintain soil structure and microbial activity. - Minimise the area of disturbance from excavation and compaction. - Ensure any discharge of water from the site is managed to ensure ANZECC (2000) water quality criteria are met. - Manage traffic generated soil erosion. - Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site should be stabilised and work ceased until the wet period had passed.	C		D

Safeguards and mitigation measures	C	O	D
A Spill Response Plan would be developed as part of the overall Risk Management Plan to prevent contaminants affecting adjacent pasture and dams. It would: • Manage the storage of any potential contaminants onsite. • Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and EPA notification procedures and remediation).	C	O	D
Dust suppression activities would be undertaken, including: <u>During construction and decommissioning</u> • A water cart (truck) would be utilised routinely, wetting all access roads and exposed dusty surfaces as appropriate to the conditions of the project site. • Stockpiled topsoil and other materials that exhibit significant dust lift off would be wet down routinely and as appropriate. • Stabilising techniques and/or environmentally acceptable dust palliatives will be utilised if the wetting down of surfaces prove to be ineffective. <u>During operation</u> • Any area that was temporarily used during construction (laydown and trailer complex areas) would be restored back to original condition or re-vegetated with native plants. • Areas that may not have been hard packed but have been disturbed in some form would be treated with environmentally acceptable dust palliatives and / or vegetated (e.g. by means of hydro seeding) with a suitable seed mix.	C	O	D
Stockpiled topsoil and other materials that exhibit significant dust lift off would be wetted down or covered to manage dust.	C		D
Any area that was temporarily used during construction (laydown and trailer complex areas) would be restored back to original condition or re-vegetated with appropriate species (exotic in exotic dominated areas (e.g. pasture grasses).	C		
A contamination protocol would be developed to address: • Procedure for discovering buried contamination within the proposal site (e.g. pesticide containers). Disposal would be at a facility able to accept the waste.	C		

7.3 WATER USE AND WATER QUALITY (SURFACE AND GROUNDWATER)

7.3.1 Existing environment

This section addresses water use and water quality impacts, including surface and groundwater. Flooding and hydrology impacts are addressed separately in Section 7.1.

Surface water

The proposal is located in the Riverina Local Land Services area. The site is within the floodplain of Main Drain J, which is located approximately 2.6 kilometres north west of the proposal site. The Mirrool Branch Canal runs parallel to the Mirrool Branch Canal Road, which adjoins the proposal site. The canal separates the Main Drain J floodplain from the Mirrool Creek floodplain.

A large number of irrigation channels supply water to properties in the region. A Murrumbidgee Irrigation supply channel runs through the middle of the proposal site, adjacent to Poletta Road. Two other Murrumbidgee Irrigation channels occur adjacent to but outside of the proposal site, one parallel to Ross Road and the other parallel to Savage Road.

There are several water supply points along the Murrumbidgee Irrigation canals which supply water to internal irrigation channels that traverse the fields. As well, there are drainage points at the downstream ends of some internal channels, which allow water to be drained from the channels back into the adjacent Murrumbidgee Irrigation channels. It is proposed that some of the internal irrigation channels and drains be closed prior to construction of the solar arrays and for the duration of the life of the proposal.

The Murrumbidgee Irrigation channel adjacent to Poletta Road (Figure 7-2) would remain intact as this channel supplies downstream users. A bridge would be constructed over the channel to allow vehicle access from Poletta Road over the channel.



Figure 7-2 Irrigation channel adjacent to Poletta Road (left of channel), from Hamilton Road

Groundwater

There are a number of bores within the local area (refer to Figure 7-3). There is one groundwater bore within the proposal site (GW408499) which is owned by Murrumbidgee Irrigation Ltd. This bore has a depth of 32.6 metres. Borewater extraction is unlikely to be undertaken for the solar farm.

There are two alluvial monitoring bores within 10 kilometres of the proposal site, both owned by NSW Office of Water. The latest available water level measurements for these bores is from 3 August 2015. Bore **GW036577** is located approximately 3.5 kilometres north of the proposal site. The water level measured at this bore in August 2015 was 12.33 metres below ground level (114.47 metres AHD). Historically, groundwater depth at this location has varied between approximately 9.5 metres to 14 metres below ground level.

Bore **GW036576** is located approximately 6 kilometres west of the proposal site. The water level measured at this bore in August 2015 was 16.38 metres below ground level (105.62 metres AHD). Historically, groundwater depth at this location has varied between approximately 9 metres to 21.5 metres below ground level. Given the flat terrain, the groundwater level at the proposal site is expected to be comparable to those measured at GW036577 and GW036576 (i.e. below a depth of approximately 9 metres).



Figure 7-3 Groundwater bores in the area (NSW DPI, 2016)

The proposal site boundary is indicated by the red line.

Groundwater Dependent Ecosystems

Potential GDEs within the vicinity of the proposal site are mapped in the *Groundwater Dependent Ecosystems Atlas* (BOM, 2016). There is one vegetation GDE reliant on subsurface groundwater within 2 kilometres of the proposal site: River Red Gum (*Eucalyptus camaldulensis*). This vegetation ecosystem occurs along Mirrool Creek, south of the proposal site (see Figure 7-44).

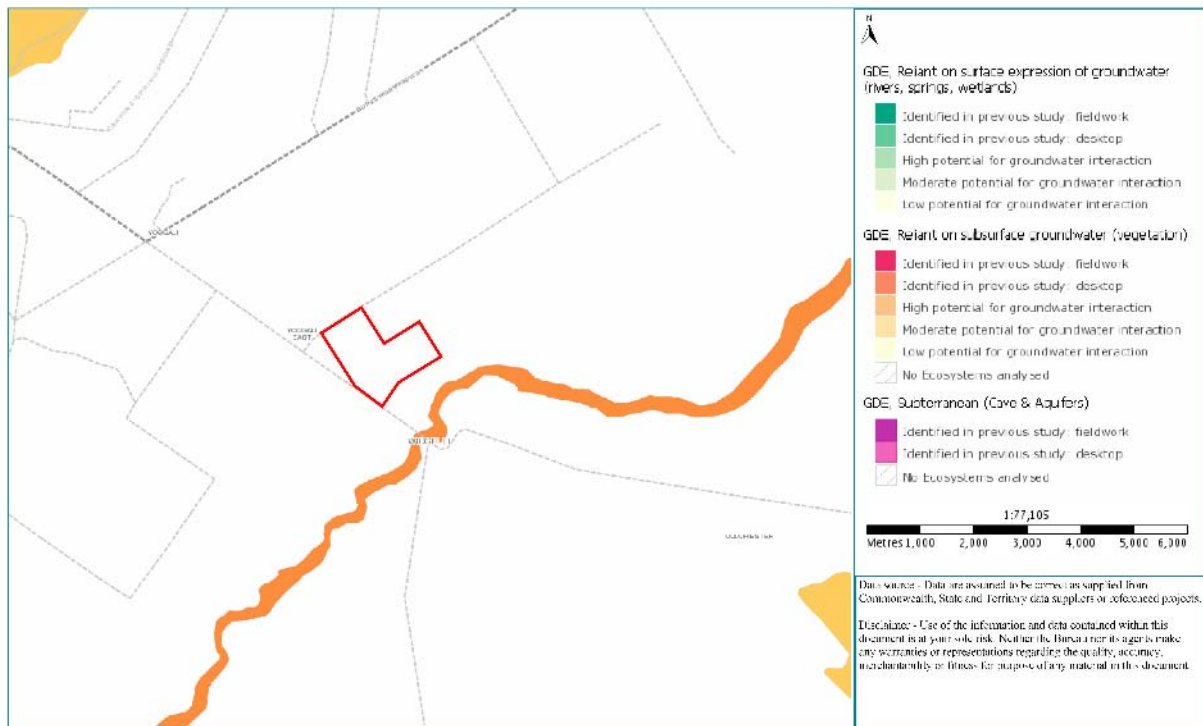


Figure 7-4 GDEs in proximity to the proposal site (BOM, 2016b)

Water entitlements

Water entitlements within the locality are held by Murrumbidgee Irrigation Ltd. This private corporation holds a Water Supply Work Approval and Water Use Approval licence under the *Water Management Act 2000*.

7.3.2 Potential impacts

Construction and decommissioning

WATER USE

Water use during the construction phase would be minimal and mainly for dust suppression on unsealed roads. This water requirement is likely to vary depending on weather conditions such as rainfall and wind and is estimated to be up to 180,000 kL per annum. Potable water requirements for staff would be approximately 40 kL per annum (refer Table 7-3).

Table 7-3 Water requirements during construction

Water quality	Annual construction water requirement (kL)	Potential sources	Availability
Potable (drinking)	30 (for 9 months)	Bottled water	Available as required – commercial supply
Non-potable	135,000 (for 9 months)	Truck delivery	Available as required at most convenient delivery point (to be defined by EPC contractor or subcontractors).

Water is likely to be delivered on site by truck during construction. Water is unlikely to be sourced from new groundwater supplies. In the event onsite supply is insufficient during construction, water access can be secured through commercial arrangements with local water supply authorities.

The proposal site land owner's current water entitlement allows the pumping of up to 3,000 mega litres per year from the main irrigation channel. Neoen may be able to extract water under this entitlement, using the existing pumping infrastructure, subject to agreement with Murrumbidgee Irrigation and the land owner.

Impacts on water use during the decommissioning would be similar to those during construction.

SURFACE WATER QUALITY

Construction activities at the site have the potential to degrade the water quality of nearby irrigation channels, canals and creeks. The works will involve a range of activities that would disturb soils and potentially lead to erosion and generation of sediment laden runoff during rainfall events. These activities include:

- Excavations for the construction of internal roads, compound, laydown and parking areas.
- Removal/closure of several internal irrigation channels/drains inside the proposal site.
- Construction of a crossing over the Murrumbidgee Irrigation channel adjacent to Poletta Road.
- Driving or screwing of piles into the ground to support solar array's mounting system and solar panels.
- Ground preparations associated with the installation of PV boxes or PV skids.
- Trenching for underground cable installation.

Soil compaction would occur as hardstands and access tracks are created, which would reduce soil permeability thereby increasing run off and the potential for concentrated flows. Similarly, the additional impervious area of the solar panels would increase the velocity and change the distribution of water run off on the site. The use of fuels and other chemicals on site pose a risk of surface water contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and herbicides.

Erosion and sedimentation impacts associated with soil disturbance from construction activities can be minimised by undertaking works in accordance with provisions of the Managing Urban Stormwater: Soils and Construction series, in particular:

- Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition (Landcom 2004), known as 'the Blue Book'.
- Volume 2A Installation of Services (DECC 2008a).
- Volume 2C Unsealed Roads (DECC 2008b).

Activities with the potential for adverse water quality impacts would be managed through the development of site specific sediment control plans and spill controls, as detailed in Section 7.9- Soil. Additionally, impacts to local water quality can be minimised by ensuring erosion and sediment control plans include measures to ensure ANZECC water quality criteria are met prior to discharge of water offsite.

Detention ponds, if required to manage surface water during construction and operation, will be detailed in the design phase, specific to the array layout.

GROUNDWATER

Groundwater depth at the site is expected to be in the order of 10-15 m below the ground, based on the levels identified at nearby monitoring locations and historic groundwater levels. Excavations required during construction would be relatively shallow, and not likely to exceed 5 m. It is considered highly unlikely that groundwater would be intercepted at the site during construction. The risk of groundwater contamination resulting from an accidental spill is considered low.

Clearing of trees can impact on groundwater; saline groundwater can move up through the soil profile if there is a reduction in water uptake and transpiration by trees in the landscape, exacerbating salinity impacts. The clearing of vegetation proposed during construction is very minor in this context. No trees would be removed. No operational impacts would affect groundwater at the site.

There would be no risk to groundwater or groundwater dependant ecosystems during decommissioning of the site.

GROUNDWATER DEPENDENT ECOSYSTEMS

No Groundwater Dependent Ecosystems are known to occur within the proposal site. As the Proposal would not be altering the existing groundwater supplies within the solar farm site, it is considered that no impacts to Groundwater Dependent Ecosystems (GDE) would result from the Proposal.

Operation

WATER USE

Water use volumes during operation would be minimal. Water would be required for staff amenities at the control and maintenance building and panel cleaning. Requirements would be extremely minor except for cleaning which is fully dependant on weather. Some solar plants are never cleaned, others require more than two cleanings per year.

Water is likely to be delivered on site by truck during operation. Water is unlikely to be sourced from new groundwater supplies. In the event onsite supply is insufficient during operation, water access can be secured through commercial arrangements with local water supply authorities.

WATER QUALITY

During operation, there is minimal potential for any impacts to surface water quality to occur. Appropriate drainage features would be constructed along internal access roads to minimise the risks of dirty water leaving the site or entering waterways. With the exception of internal roads, parking areas and areas around site offices, the site would be revegetated with grass cover. Risks of erosion and sedimentation at the site would therefore be low.

There would be a low risk of contamination in the event of a chemical spill (fuels, lubricants, herbicides etc.) as strict storage and emergency handling protocols would be implemented.

GROUNDWATER

No operational activities would affect groundwater at the proposal site. Groundwater is unlikely to be sourced during operation of the solar farm.

7.3.3 Safeguards and mitigation measures

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
The works should generally be carried out in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> (DPI, 2012).	C		D
Design of track drainage and other stormwater devices would be included in the detailed design phase.	C		
Procedures for testing, treatment and discharge of construction waste water must be as described in a Soil and Water Management Plan.	C		D
All fuels, chemicals, and liquids would be stored at least 50 m away from any waterways or drainage lines and would be stored in an impervious bunded area.	C	O	D
The refuelling of plant and maintenance of machinery would be undertaken in impervious bunded areas.	C	O	D
Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills	C		D
All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills.	C	O	D
Additional water requirements would be met commercial arrangements with local water supply authorities.	C	O	D

7.4 TRAFFIC, TRANSPORT AND ROAD SAFETY

7.4.1 Existing environment

Regional road network

The Burley Griffin Way (B94) is the main road transport route connecting Griffith to the east through Temora, and eventually connecting with the Hume Highway (M31) near Yass. Burley Griffin Way is an important link between the agricultural produce of the western Riverina and Murrumbidgee regions to eastern NSW and Sydney. Trucks make up a significant proportion of the traffic along Burley Griffin Way.

Kidman Way (B87) is a rural road servicing the Murrumbidgee Irrigation area. It provides a link between Griffith and other regional centres further north and south.

The Sturt Highway (A20), via Kidman Way (B87) is a primary link from Griffith to the west, connecting to the Mallee Highway (B12) which continues west to Adelaide. The Sturt Highway is an important road link for the transport of passengers and freight between Sydney and Adelaide and regional cities situated adjacent the route such as Wagga Wagga.

Local road network

The proposal site is located adjacent to Irrigation Way, and approximately 4.3 km south east of the point where Irrigation Way intersects Burley Griffin Way. Irrigation Way (MR 80) is a high use transport corridor linking Narrandera, Leeton and Griffith, with an operational railway line running parallel on its northern side. Irrigation Way is a two lane road with a sealed width of approximately 8 m and a speed limit of 100 km/hr at the Hamilton Road intersection. Hamilton Road is a bitumen sealed road with a sealed width of approximately 6 metres.

Access to the site during construction would be from Irrigation Way to Hamilton Road for the western portion of the site and via Hamilton Road and Poletta Road for the eastern portion of the site. Site access points off Hamilton Road and Poletta Road are illustrated on the Proposal Infrastructure map in Appendix B. Hamilton Road and Poletta Road are both low use roads. Poletta Road would need to be upgraded to be used for construction traffic, in consultation with Griffith City Council and the operator of the irrigation canal.

A State Rail Corp railway line is located parallel to Irrigation Way and crosses Hamilton Road. The vehicle stacking distance from the edge of Irrigation Way to the stop sign of the railway is approximately 17-20 metres in length. Austroads and RMS Guidelines require a minimum stacking distance of the length of the largest size vehicle to access the road plus 3.5 metres. The largest vehicle that would be required to access the site as part of the proposal would be a 19 metre long semi-trailer. Therefore, a stacking distance of 22.5 metres would be required.

An option being considered to address this issue is the construction and use of a dedicated left turn lane from Irrigation Way onto Hamilton Road. A dedicated left turn lane back onto Irrigation Way from Hamilton Road is also being considered. Any changes to the existing access onto Hamilton Road would be subject to detailed design, in consultation with RMS and John Holland Rail (the rail authority). Consultation with these parties has been initiated.

Haulage

While a detailed haulage program has not yet been developed, it is expected that the project's components would be delivered by road from Sydney or Adelaide. From Sydney, the route would likely include the Hume Highway (M31) and Burley Griffin Way (B94). From Adelaide, the route would likely include the Mallee Highway (B12), the Sturt Highway (A20) and Kidman Way (B87).

These roads of both routes are of sufficient capacity to accommodate the haulage of components required for the construction of the solar farm and transmission line. The additional traffic associated with the solar farm would be a small component of the existing loads. No substantive increased collision risks, damage to road infrastructure, noise or dust impacts, disruption to existing services or reduced level of service is expected to accompany construction. This would be ensured by the preparation of a detailed haulage plan, to manage the haulage process.

Proposal requirements

Access requirements can be separated into the following categories:

- Cars - would be required by project management staff and site workers to access the site. Cars would make up the largest proportion of vehicles accessing the site.
- Buses – would be used to transport workers to and from the site to minimise traffic volumes and transit risks during construction.
- Utility vehicles – would be required to transport equipment and materials around the site and for local pick up of materials.
- Trucks – would also be used to transport equipment and materials around the site and for local pick up of materials. Larger sized deliveries would be undertaken by trucks as opposed to utility vehicles.
- Standard articulate trucks – would be used to transport 12 metre containers from point of origin.
- Oversize and/or overmass vehicles – would deliver components such as the overhead transmission line poles.

Vehicle access to the site would generally be confined to the standard hours of construction. Exceptions would occur as staff arrive and leave the site, before and after shifts. Additionally, the delivery of large components may take place outside normal working hours.

Vehicles would travel around the site via constructed access tracks, which will be required to access the following locations:

- Around the perimeter of the solar farm.
- Site office/compound.
- Construction equipment laydown area.
- Substation.

Internal access tracks would remain unsealed but would be re-sheeted with gravel or crushed and compacted soil, to maintain their condition during the construction phase.

As discussed in Section 3.2, access between the western site if the site to the eastern site would be provided by a bridge over the irrigation canal parallel to Poletta Road. The bridge would be located at the south-east extremity of Poletta Road. It may also be possible for traffic movement from the western to the eastern portions of the site to occur via an existing bridge at the intersection of Poletta Road and Mirrool Branch Canal Road (with the approval of Griffith City Council).

7.4.2 Potential impacts

Construction

- The potential traffic, transport and road safety impacts associated with construction of the proposal relate primarily to the increased numbers of large vehicles on the road network which may lead to:
- Increased collision risks (other vehicles, pedestrians, stock and wildlife).
- Damage to road infrastructure.
- Associated noise and dust (particularly where traffic is on unsealed roads) which may adversely affect nearby receivers.
- Disruption to existing services (public transport and school buses).
- Reduction of the level of service on the road network caused by 'platooning' of construction traffic.

Onsite and local traffic

INCREASED VEHICLE NUMBERS

Approximately 35 employees would be required during the first month of construction, rising to 90 employees during the peak construction period (approximately 5 months duration). Up to 30 cars on average are anticipated during peak construction, resulting in approximately 60 trips per day. Two to five cars would be expected during normal operation of the solar farm. Approximately 5 - 10 utility vehicles would be used on a daily basis at the site during peak construction, less would be required during non-peak construction periods.

Buses would be used to transport workers to and from the site. Approximately 90 construction personnel would be required on site during the peak construction period. Assuming an up-take rate of 80% and 20 person capacity, up to 8 bus trips would be required per day during peak construction. During non-peak periods, approximately half as many buses are expected to be required. It is anticipated that up to 20 trucks a day will deliver equipment on site. The number of oversize/overmass vehicles required is expected to be low. Traffic volumes associated with the construction of the proposal are summarised in Table 7-5.

Table 7-4 Summary of the estimated construction traffic volumes during peak and non-peak times

Vehicle type	Trips per day (peak: 5 months)	Trips per day (non-peak: 4 months)
Cars (project management, construction staff etc.)	60	30
Utility vehicles	10-20	5-10
Buses	8	4
Delivery trucks (including overmass vehicles)	40	20 - 30
Total trips per day:	118 - 128	60 - 74

INCREASED COLLISION RISK

The increased collision risk relates primarily to traffic entering and exiting Hamilton Road from Irrigation Way. This primarily relates to both oncoming traffic and traffic following vehicles that are turning into Hamilton Way. At the Irrigation Way/Hamilton Road intersection, sufficient sight distance is available for vehicles entering and exiting Hamilton Road. On Hamilton Road, the vehicle stacking distance between Irrigation Way and the rail crossing is approximately 17-20 metres, which is not a sufficient stacking distance for large 19 metre trucks that would be required to access the proposal site.

The proponent, in consultation with RMS and John Holland Rail, will investigate the potential construction of a dedicated left turn lane from Irrigation Way onto Hamilton Way. The lane would allow large vehicles to stop at the railway line without impacting on the travel lanes of Irrigation Way. This would be subject to detailed design and ongoing consultation with RMS and John Holland Rail.

DAMAGE TO ROAD INFRASTRUCTURE

The increase in traffic and heavy vehicle movement could impact the condition of roads on the haulage network. From Yoogali, the impact is expected to be negligible due to the existing capacity of the road network. However, the impact of turning traffic at the Irrigation Way/Hamilton Road intersection would likely require monitoring to ensure that the road is maintained in an adequate condition. This includes the trucking of materials from the site onto sealed roads by vehicles and trucks exiting the proposal site.

Poletta Lane would remain unsealed, but will require upgrading to accommodate construction traffic. It would need to be constructed to a width and standard as specified in Griffith City Council's *Engineering Guidelines Subdivision and Development Standards December 2008*. The proponent would manage construction impacts on Hamilton Road and Poletta Road by way of a Traffic Management Plan. This may require periodic road improvements and lane closures to preserve traffic flow.

Internal access roads would be constructed or upgraded as required to accommodate the projected volumes and loads of construction traffic. The tracks would be compacted but unsealed.

ASSOCIATED NOISE AND DUST

The proposed works may result in increased noise and dust, particularly on unsealed roads including Poletta Road and internal tracks. Impacts from dust generated from the proposed activity, including that associated with increased traffic is considered in Section 7.4. During construction, water would be used to minimise dust generation along the tracks.

The DECCW (2011) *NSW Road Noise Policy* (NSW RNP) been used to evaluate impacts from road traffic noise. This policy outlines a range of measures required to minimise road traffic noise and its impacts, including noise generated by developments that generate additional traffic on existing roads. A road traffic noise assessment is included in Appendix F and Section 6.5 of this EIS.

DISRUPTION TO EXISTING SERVICES

A State Rail Corp railway line is located parallel to Irrigation Way and crosses Hamilton Road. The proponent has initiated consultation with both RMS and John Holland Rail (the rail authority) regarding the proposed access arrangements to the proposal site. The proposed dedicated left turn lane from Irrigation Way to Hamilton Road would allow sufficient stacking space for vehicles and trucks turning off Irrigation Way and onto Hamilton Road. Train services operating along the railway are not expected to be disrupted by vehicles and trucks accessing the proposal site.

Local traffic in Griffith would be minimally affected by increased vehicles from construction staff seeking accommodation and services, and conducting commercial activities relating to the solar farm. This would

extend outside construction hours but would be insignificant in the context of traffic movements in the major regional centre of Griffith.

Operation

Vehicles would use the designated road network to access the site and travel within the site during the operational phase (25 to 30 year period). Activities undertaken during the operation phase would include travelling to the site office or maintenance building and carrying out maintenance activities on the solar farm infrastructure. Operational staff would be confined to designated parking areas and access roads/tracks within the proposal site.

During operation, 0.5 full time equivalent staff would access the proposal site to operate and maintain the solar infrastructure. The anticipated volume of staff (<5) would result in very minimal increase in traffic flow on Irrigation Way. Operational staff may also be required to access the substation, east of the proposal site. Access to the substation is off Hamilton Road.

It is considered unlikely that the low levels of operational traffic would obstruct public or private local access. Additional risks to road safety from operational traffic would be minimal.

Flood modelling of the proposal site indicates that that majority of Poletta Road (within the proposal area) and Mirrool Branch Canal Road are Flood Prone for the Probable Maximum Flood event. The site is categorized as occurring within a low hazard flood fringe. Any flooding at the site would constitute low velocity backwaters due to the flat nature of the terrain and the depth would not be expected to exceed approximately 10 cm. It is considered that in an emergency situation, the site would be accessible by vehicles. Generally, for flooding within low-hazard flood fringe areas, able-bodied adults would have little difficulty wading and trucks could be used to evacuate people and their possessions should it be necessary.

Decommissioning

Decommissioning impacts are likely to follow a similar pattern as construction as components are dismantled and removed, over a lesser time period.

7.4.3 Safeguards and mitigation measures

Traffic and haulage impacts would be managed in consultation with the roads authorities covering issues such as, but not limited to, reinstatement of pre-existing road conditions, shuttle bus transport, intersection upgrade, scheduling of deliveries and traffic controls (speed limits, signage etc.), as detailed in Table 7-6.

Table 7-5 Safeguards and mitigation measures for traffic, transport and safety impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
A Haulage Plan would be developed with input from the roads authority, including but not limited to: - Assessment of road routes to minimise impacts on transport infrastructure - Scheduling of deliveries of major components to minimise safety risks (on other local traffic) - Traffic controls (signage and speed restrictions etc.).	C		D
A Traffic Management Plan would be developed as part of the CEMP, with input from the road authorities and Griffith City Council. The plan would include, but not be limited to: - Assessment of road condition prior to construction on all local roads that would be utilised. - A program for monitoring road condition, to repair damage exacerbated by the construction and decommissioning traffic. - The designated routes of construction traffic to the site. - Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction. - Scheduling of deliveries. - Community consultation regarding traffic impacts for nearby residents. - Consideration of cumulative impacts. - Traffic controls (speed limits, signage, etc.). - Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts. - Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.	C		D
The proponent would consult with the Griffith City Council regarding the proposed upgrading of Poletta Road. The upgrade would be subject to detailed design, and must be designed and constructed to the standards as specified in Griffith City Council's <i>Engineering Guidelines Subdivision and Development Standards December 2008</i>.	C		
The proponent would continue consultation with RMS and John Holland Rail in regard to the use of the Irrigation Way/Hamilton Road intersection and railway crossing. Any upgrades to the intersection (construction of left hand turn off Irrigation Way) would be subject to detailed design in consultation with RMS.	C		D
The proponent would repair any damage resulting from project traffic (except that resulting from normal wear and tear) as required at the proponent's cost.	C	O	D

7.5 CLIMATE AND AIR QUALITY

Air quality can be affected by dust caused by soil disturbance and emissions from vehicles and machinery. These impacts can be a nuisance to nearby receivers (residences, farm workers, traffic). At worst they can interfere with plant growth, degrade ecosystems, represent human health risks and contribute to GHG emissions and anthropogenic climate change.

7.5.1 Existing environment

Local air quality

The proposal site is located within the Cobar Peneplain Bioregion. The Cobar Peneplain Bioregion lies in Australia's persistently dry semi-arid climatic zone, which is dominated by hot summers and no dry season (NSW National Parks and Wildlife Service, 2003). The closest Bureau of Meteorology Automatic Weather Station (AWS) to the site is Griffith Airport, approximately 8km north west. The average annual minimum temperature is 9.9°C and the maximum annual average temperature is 23.7 °C. The average annual rainfall is 397.7mm, with most rain falling in March and October (Weatherzone, 2016; Figure 7-55). Winds speeds are greatest during spring and summer. During these warmer months the strong winds (>40 km per hour) come from the north in the mornings and south and south west in the afternoons. In the cooler months the strong winds (>40 km per hour) originate from the east (BOM, 2016b). The highest periods of air quality are during spring and summer where drier periods of high temperatures are associated with strong winds.

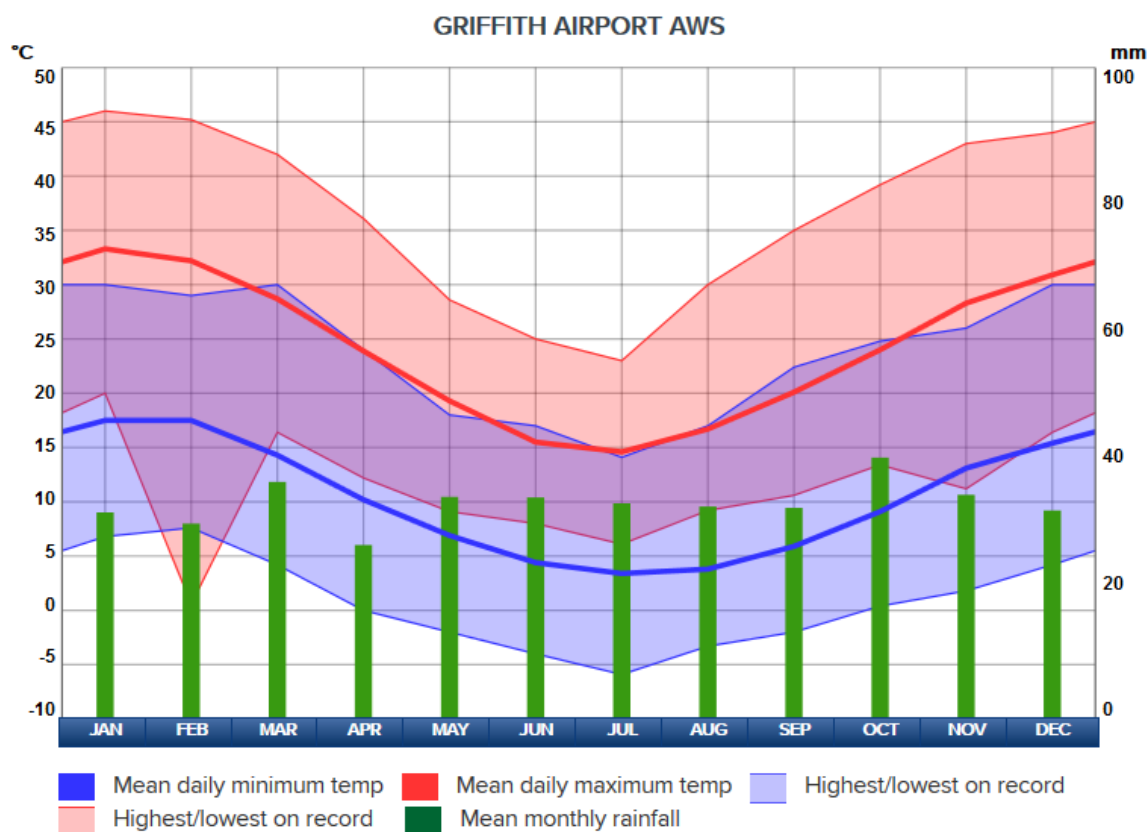


Figure 7-5 Griffith Airport AWS monthly climate statistics (Weatherzone, 2016).

The air quality in Griffith is generally expected to be good and typical of that found in a rural setting in NSW due to low population numbers. Existing sources of air pollution in the study area includes vehicle emissions, dust during dry periods and agricultural industries, particularly stubble burning. During colder

months, there may be a minimal increase in air contaminants due to smoke emissions from the operation of solid fuel heating.

In 2013/2014, there were 29 facilities recorded in the Griffith LGA releasing emissions. The closest facility to the proposal site is De Bortoli Winery Bilbul, approximately 5km north east. Emissions from the winery are Ethanol and Volatile Organic Compounds. Other facilities in the local area that are sources of air emissions include landfills, fuel depots, food processing plants, mills and water treatment plants (DoE, 2016).

The closest receiver is approximately 115m north west of the proposal site. Several other residences are located to the north and north east within 2km of the proposal site. Topography of the proposal area is flat. Surrounding the proposal site is minimal native vegetation or screenings.

CRITERIA

The POEO Act requires that no vehicle shall have continuous smoky emissions for more than ten seconds. Limits on dust emission of less than 4mg/m/m² are also specified.

Climate change

Climate change refers to the warming temperatures and altered climatic conditions associated with the increased concentration of GHGs in the atmosphere. Climate change projections for Australia includes more frequent and hotter hot days and fewer frost days, rainfall declines in southern Australia and more extreme weather events including intense rainfall, severe drought and harsher fires (CSIRO, 2015).

It is now generally accepted that the release of certain gases including, most notably carbon dioxide, contribute to global climate change. These gases are collectively referred to as 'greenhouse gases'. Construction and maintenance activities where plant and equipment uses diesel, gasoline and other hydrocarbons, result in GHG emissions and are likely to contribute to climate change. The construction, operation and decommission of the proposed solar farm assessed in this EIS would produce minimal CO₂ emissions when compared to conventional coal and gas fired powered stations; refer to Table 7-67.

Table 7-6 Comparison of CO₂ equivalent emissions produced per kilowatt hour

Generation method	Emissions produced (grams CO ₂ equivalent per kWh)	Source
PV solar farm	19-59	Wright and Hearps (2010)
Coal-fired power station	800-1000	Wright and Hearps (2010)
Combined cycle gas turbine	400	Alsema <i>et al.</i> (2006)

As discussed in Section 2.3, the operation of the proposal would help reduce GHG emissions and move towards cleaner electricity generation. Based on 116,000MWh, the proposal would offset the equivalent of 100,000 kilotonnes per annum of CO₂ emissions and power the equivalent of 17,500 NSW homes.

7.5.2 Potential impacts

Construction and decommissioning

Dust generation would accompany excavation and other earthworks as well as the movement of trucks and work vehicles along unsealed access roads during construction and decommissioning of the proposed solar farm. Air emissions would also be produced from equipment and vehicle exhaust fumes. Dust and emissions can be a nuisance, interfere with visibility when driving or lead to adverse health impacts where severe or prolonged.

Earthworks associated with construction would be relatively minor and mostly involve trenching for cables and potential underground power line, as well as the forming of access tracks. Poles for solar array and overhead power line would be pile driven. The impact area for the piles would be less than 1% of the site area.

The construction phase is expected to last approximately nine months with a peak period lasting approximately five months. During this time, emissions would be generated from earth-moving equipment, diesel generators, trucks, cranes and pile driving equipment. Vehicles accessing the site would include the construction labour force, largely using shared (bus) transport, (approximately 90 construction personnel during the peak period) and haulage traffic delivering construction components (as detailed in Section 7.4).

The closest residential dwelling is approximately 115 m from the proposed solar farm. While nearby houses have onsite vegetation screening in the direction of the solar farm, due to limited groundcover in the area, in dry and windy conditions, it is likely this dwelling would be affected by dust. However, the proposed works involves minimal earth-moving and mostly piling equipment would be used reducing the amount of dust produced. With the minor earthworks and implementation of mitigation measures, air quality issues for this dwelling would be considered manageable. Due to the distance of other residential dwellings, dust and emissions would be expected to attenuate with very limited distance from the site. Substantive air quality impacts are not anticipated for these dwellings.

Mitigation strategies include a formal community consultation and engagement system, and complaints mechanisms, whereby the sources of complaints are promptly identified and addressed, and appropriate application of a suite of dust and emission reduction measures.

The construction of the proposal is not anticipated to have a significant impact on air quality. Identified impacts are highly manageable.

No air quality impacts in addition to those mentioned for construction are anticipated during the decommissioning phase. Traffic requirements would be similar in type but of shorter duration than that required for the construction phase.

Due to the existing activities surrounding the proposal site and the minimal impacts on air quality during construction and decommissions, the cumulative impact is expected to be not significant. Cumulative impacts are discussed further in Section 0.

No climatic impacts are anticipated as a consequence of the construction and decommissioning activities for the solar farm. Haulage traffic and plant and equipment would generate emissions however, the short duration of the work and the scale of the Project suggests this contribution would be negligible in a local or regional context.

Operation

The generation of solar energy during the operation of the proposal would generate negligible air quality impacts and emissions.

Maintenance activities during operation would result in some minor, localised vehicle emissions and potentially some generation of dust from vehicles travelling on the unsealed access roads and tracks. The impacts on local and regional air quality are expected to be negligible during normal operation; during normal operation, it is likely that no vehicles would be present at the site on a permanent basis, with only occasional visits by standard vehicles. During major maintenance operations, this number could increase to 20-30 vehicles at any one time for a limited period.

Limited amounts of fuels would be required for maintenance vehicles during operation of the solar farm and for temporary power generation in the event of an unplanned outage. During operation, the proposal would have a significantly positive impact on global climate by assisting to reduce Australia's reliance on fossil fuels for electricity generation (discussed in Section 0).

Due to the existing activities surrounding the site and the minimal impacts on air quality during operation, the cumulative impact is expected to be not significant. Cumulative impacts are discussed further in Section 0.

7.5.3 Safeguards and mitigation measures

Air quality impacts would be addressed via the mitigation strategies in Table 7-8.

Table 7-7 Safeguards and mitigation measures for climate and air quality impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Development of a complaints procedure to promptly identify and respond to issues generating complaints.	C	O	D
Protocols to guide vehicle and construction equipment use, to minimise emissions would be included in construction and operational environmental management plans. This would include but not limited to Australian standards and (POEO Act).	C	O	D
Protocols would be included in construction and decommissioning to minimise and treat dust (water carts or similar in response to visual cues). This may involve installation of barriers such as shade cloth, to protect receivers.	C		D

7.6 ELECTRIC AND MAGNETIC FIELDS

This section addresses potential hazards and risks associated with electric and magnetic fields (EMFs).

EMFs consist of electric and magnetic fields and are produced whenever electricity is used. EMFs also occur naturally in the environment, e.g., from a build-up of electric charge in thunderstorms and Earth's magnetic field (WHO 2012).

Electric fields are produced by voltage. Magnetic fields are produced by current. When electricity flows, EMFs exist close to the lines and wires that carry electricity and close to electrical devices and appliances while operational (WHO 2007). Electric and magnetic field strengths reduce rapidly with distance from the source, and while electric fields are shielded to some extent by building materials, magnetic fields are not.

Fields of different frequencies interact with the body in different ways. In Australia, transmission lines and other electrical devices and infrastructure, including substations, operate at a frequency of 50 Hz. This frequency falls within the Extremely Low Frequency (ELF) range of 0-300 Hz.

Over decades of EMF research, no major public health risks have emerged, but uncertainties remain (WHO undated). While it is accepted that short-term exposure to very high levels of electromagnetic fields can be harmful to health, the International EMF Project has thus far concluded that there are no substantive health consequences from exposure to ELF *electric* fields at the low levels generally encountered by the public (WHO 2007), such as those that would be produced by electricity generation at the proposed solar farm and along the transmission line.

Whether exposure to ELF *magnetic* fields is also harmless is unclear. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA 2015) advises that 'the scientific evidence does not firmly establish that exposure to 50 Hz electric and magnetic fields found near transmission lines is a hazard to human health', and that 'current science would suggest that if any risk exists, it is small'.

Australia does not currently have a standard regulating exposure to extremely low frequency electric or magnetic fields. ARPANSA refers to the limits in the National Health and Medical Research Council's (NHMRC) *Interim guidelines on limits of exposure to 50/60 Hertz electric and magnetic fields* (1989). A summary of these Interim guidelines is provided in Table 7-9.

Table 7-8 Summary of the Interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields

Exposure characteristics	Electric field strength (volts per metre - V/m)	Magnetic flux density (microteslas - μ T)
Occupational		
Whole working day	10,000	500
Short term	30,000	5,000
General public		
Up to 24 hours/day	5,000	100
Few hours/day	10,000	1,000

The proposal includes four main types of infrastructure that could create EMFs:

1. Solar panels and invertors
2. Underground cables.
3. Overhead or underground 33kV transmission line.

Typical and maximum EMF levels for these types infrastructure are discussed below. Strength attenuates with distance from the infrastructure, as seen below.

Research into photovoltaic solar arrays in California³ by Chang and Jennings (1994), indicated that magnetic fields (the EMF type of greatest public concern) was significantly less for solar arrays than for household applications. Chang and Jennings (1994) found magnetic fields from solar arrays were not distinguishable from background levels at the site boundary, suggesting the health risk of EMFs from solar arrays is minimal.

Underground cabling does not produce external electric fields due to the shielding effects of the soil, however magnetic fields still occur. They are expected to be minimal.

It is proposed the 33kV transmission line would be either an overhead or underground power line. Figure 7-6 displays the maximum and typical magnetic field for a 33kV overhead powerlines and Figure 7-7 displays the typical magnetic field for a 33kV underground power line. Additionally ARPANSA (2016) provides the typical levels of magnetic fields near overhead transmission lines and substations in Figure 7-8.

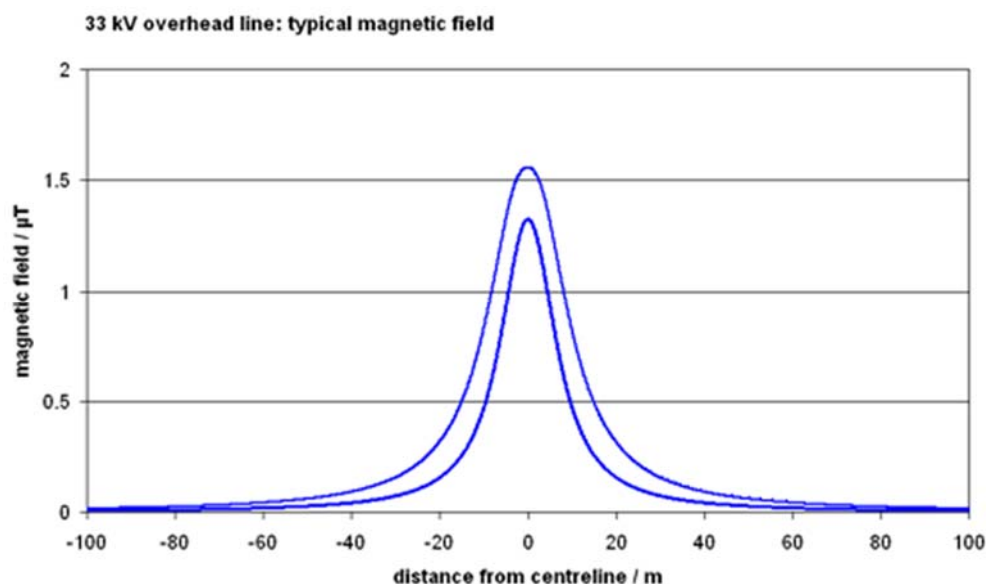


Figure 7-6 Maximum and typical magnetic field from 33kV overhead (EMFS info, 2016)

³ Converted from mG where 1 mG = 0.1 μT.

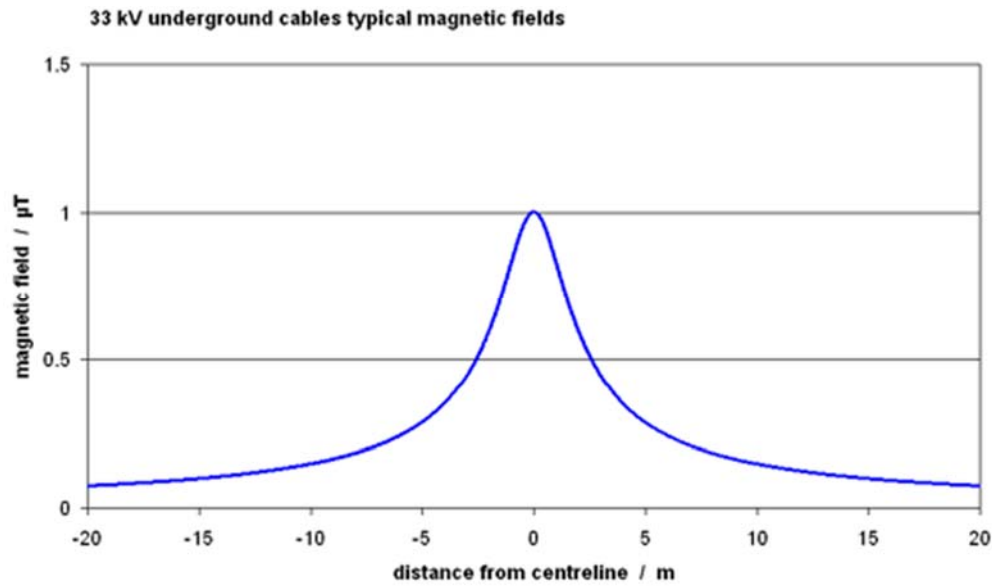


Figure 7-7 Typical magnetic field from 33kV underground powerlines (EMFS info, 2016)

Table 7-9 Typical magnetic field from overhead powerlines

Source	Location of measurement	Range of measurement	
		(mG)	(μT) ⁴
Transmission line	Directly underneath	10 - 200	1 - 20
Transmission line	At edge of easement	2 - 50	0.2 - 5
Substation	At substation fence	1 - 8	0.1 – 0.8

Table 7-10 displays the maximum and typical electric field for a 33kV overhead powerline.

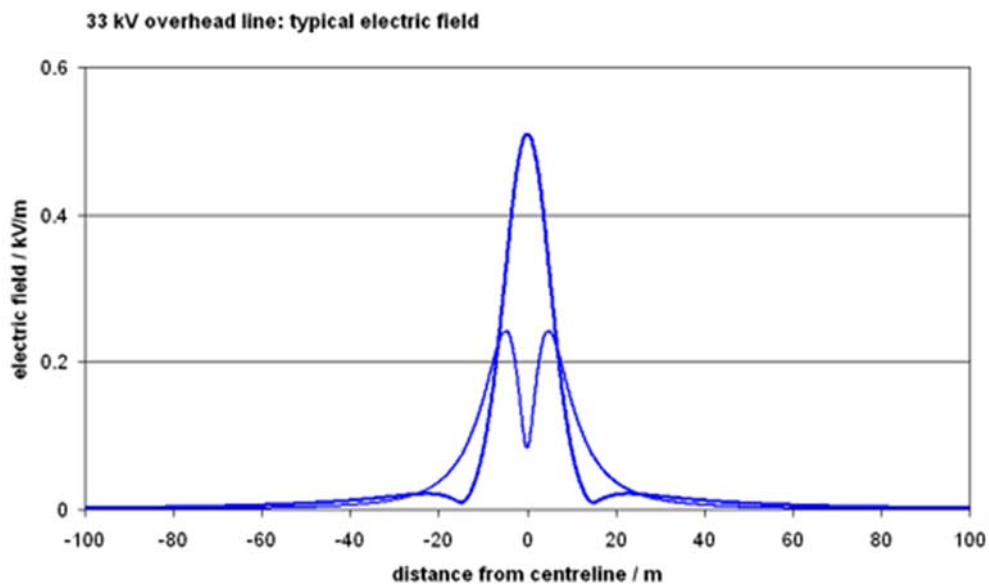


Figure 7-8 Typical electric field from overhead powerlines (EMFS info, 2016)

7.6.1 Potential impacts

Construction and decommissioning

There is low potential for EMF impacts during the construction and decommissioning phases of the project. Site staff would be exposed over intermittent periods during works at and around the existing and proposed 33kV transmission lines. The maximum magnetic field of the existing transmission lines are well under the 100 μ T and 500 μ T limits respectively recommended for public and occupational exposure. Given the voltage workers would be exposed to and the intermittent nature of exposure, the effects are likely to be negligible.

With the exception of the transmission line, the construction site would be fenced to protect the public from construction health and safety risks.

Operation

During operation, EMF sources would include a 33kV transmission line, underground cabling, and the solar array incorporating inverters.

Electric fields can be reduced with distance from operating electrical equipment and by shielding, while magnetic fields are reduced more effectively with distance. Using the Principle of Prudent Avoidance to design and site this infrastructure, the exposure to EMFs can be minimised and potential for adverse health impacts minimised also.

The site is surrounded by agricultural land. Public access would be restricted by site fencing around the site and existing substation during the operational phase. Given the levels associated with the infrastructure components, and the distance to the site perimeter fence, EMFs from the solar farm are likely to be indistinguishable from background levels at the boundary fence. The underground cabling would not produce external electric fields due to shielding from soil, and its magnetic fields are expected to be well within the public and occupational exposure levels recommended by ARPANSA.

The largest potential for public exposure would be associated with the potential overhead 33kV transmission line alignment, which crosses agricultural land, Ross Road and Hamilton Road. Public exposure would be intermittent when accessing those areas.

Staff exposure to EMFs from the proposed transmission line would be intermittent during site access and maintenance activities.

Using the Principle of Prudent Avoidance to design and site this infrastructure, exposure to EMFs and potential for adverse health impacts can be further reduced. Adverse health impacts from EMFs are therefore unlikely as a result of the proposal.

7.6.2 Safeguards and mitigation measures

Health and safety impacts are proposed to be addressed via the mitigation measures in Table 7-11.

Table 7-10 Safeguards and mitigation measures for health and safety

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
All design and engineering would be undertaken by qualified a competent persons with the support of specialists as required.	X		
Transmission lines would be located as far as practical from residences, farm sheds, and yards in order to reduce the potential for both chronic and acute exposure to EMFs.	X		
Design of electrical infrastructure would minimise EMFs.	X		

7.7 LAND USE IMPACTS (INCLUDING MINERAL RESOURCES)

The nature of a development determines whether a permanent land use change occurs or whether the development is reversible and existing or alternative land uses can occur alongside the proposal and in future. As well as direct uses of the land, such as agriculture, electricity generation or mining, associated impacts, such as the degree of visual impact and traffic regimes, can affect the compatibility of alternative land uses. These issues as they relate to the proposal are discussed below.

7.7.1 Existing environment

Agriculture

The excellent soil and water characteristics of the proposal site are key to the existing land use. The proposal site and surrounding area is currently used for agriculture, primarily irrigated agriculture, horticulture and cropping.

This land use has involved considerable investment. The proposal site is located on a paddock that has been laser levelled and is used for cropping. Three irrigation channels are located within the site, all deliver water from the Mirrool Creek Branch Canal to onsite paddocks and other properties in the area. The proposed 33kV transmission line connecting the solar farm to the existing substation would traverse an adjacent private landholding the proposal solar farm site and Hamilton Road which is a public Road. The transmission would be located with an agricultural paddock used for cropping.

Agriculture is a significant land use in the local area, with over 184, 800 ha of land dedicated to agriculture within the MIA (Singh, Mullen and Jayasuriya 2005). A total value of agricultural output for the Griffith LGA was \$281 million in 2011 (ABS, 2011; RDA Central West, 2012).

Mining

The nearest known metallic deposits are gold approximately 45.5km east of the proposal site in the Narrandera LGA (Department of Trade and Investment, 2016). In the Griffith LGA, there are a number of unidentified non-metallic deposits such as stone, sand and gravel. A non-metallic deposit is located 1 km south of the proposal site. There are no current exploration licence applications held for the proposal site. The current mineral titles and exploration licence applications held in the Griffith region are illustrated in Figure 7-9.

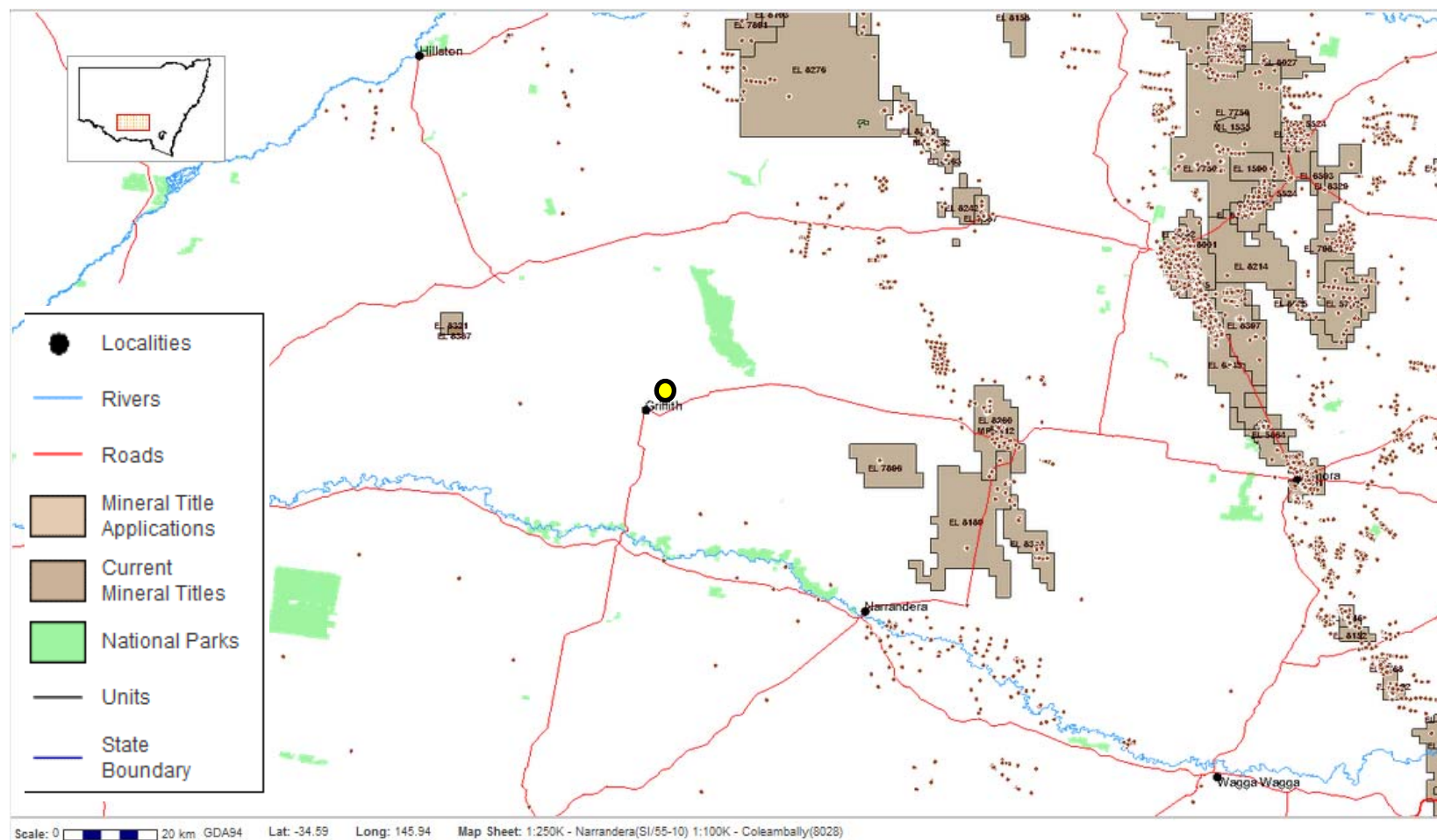


Figure 7-9 Mineral titles and applications within the locality of the proposal site (Department of Trade and Investment, 2016). *The proposal site is indicated by yellow circle*

Other land uses

The proposal site and all land immediately surrounding it is zoned RU1 Primary Production. The proposal site is not located on land proposed for rural residential development in local planning instruments, nor is it on land managed for forestry or conservation purposes. The nearest land zoned for conservation is approximately 10km to the north.

7.7.2 Potential impacts

Construction

During construction, agricultural activities would cease in areas required for access and construction of the proposal on the proposal site. Construction of the transmission line would result in temporary loss of access to land along the transmission line easement across private land and public road during the construction period. Construction traffic may impact local access, affecting other agricultural operations on Hamilton and Mirrool Branch Canal Road, for limited periods.

No extraction of minerals or extraction licences would be impacted by the construction of the proposal. No additional land use conflicts are foreseen during construction. The impacts would be temporary and mitigation strategies can reduce the level of impact on nearby agricultural activities.

Operation

CURRENT USES: AGRICULTURE

During operation, the proposal site would change from agricultural land use to power generation.. Cropping would still be able to occur under the overhead transmission line if this connection option was chosen, and there would no operational impact to vehicles travelling along Hamilton Road regarding the traversing electric cable.

The area affected by the operational footprint would be the 125 ha solar farm site, plus a 300m transmission line. The duration of the project would be 25 years. The loss of this amount of agricultural land in the region for this period is not considered a significant loss in the locality. Further, the proposal is highly reversible; at the end of the project all above ground infrastructure would be removed and current agricultural land use activities could resume or other land uses could be considered. The productive capacity of the land would not be affected.

FUTURE LAND USES

Given the context of the site, surrounded by agriculture, no land use conflicts are likely during operation in terms of rural residential development, land managed for forestry or conservation purposes.

During the operation of the proposal, future mineral exploration would be limited within the site boundary. Exploration in areas with above ground infrastructure would be precluded. Traffic and additional underground infrastructure such as cabling would make exploration in other areas very difficult and this would not be preferred.

Decommissioning

As the development of the site requires relatively low levels of impact on the soil surface, the proposal is viewed as highly reversible. Some compaction on access roads would have occurred. The rehabilitated site (discussed in Section 6.2) would have similar opportunities for land use as the site currently possesses. At

the end of the project all above ground infrastructure would be removed and current agricultural land use activities or alternative activities including rural residential development, forestry, mining or a return to agricultural use could be undertaken.

7.7.3 Safeguards and mitigation measures

Potential for land use impacts is proposed to be addressed via the mitigation measures in Table 7-12.

Table 7-11 Safeguards and mitigation measures for land use impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Consultation with local community, to minimise impact of construction of adjacent agricultural activities and access.	C		
Removal of all above ground infrastructure and rehabilitation of areas disturbed during the operation of the solar farm, to allow a return to agricultural or alternate use.			D

7.8 SOCIOECONOMIC AND COMMUNITY

Large or novel developments can produce social and economic impacts on local communities. These can be positive, such as the provision of employment and increased retail trade. They can also produce unintended or adverse impacts, such as creating strains on existing infrastructure (such as public transport or accommodation facilities during construction), including social infrastructure (volunteer services, social ties and networks). This section investigates the socio-economic profile of the region to understand the impact of the proposal on the local community.

7.8.1 Existing environment

Socio-economic profile

The Griffith LGA has a population of 24,364 people (ABS, 2011). This represents a population increase of around 2 per cent since the 2006 Census (23,801 people). The percentage of people of Indigenous origin (4.1 per cent in 2011) is high compared to the Australian average (2.5 per cent in 2011). The overseas immigrant population is slightly smaller than the Australian average of 69.8 per cent, 76 per cent of Griffith's population were born in Australia (ABS, 2011).

The local economy is based on beverage manufacturing, involving 7.3 per cent of the population, and fruit and tree nut growing, involving 5.2 per cent of the population. Other important sectors include retail, health care, education and public administration (ABS, 2011; GCC, 2014). The unemployment rate for Griffith LGA is 4.9 per cent, which is less than the national rate of 5.6 per cent (ABS, 2011).

Griffith is a service centre for the area:

- Regional Airport with two airlines that provide flights to Sydney and Melbourne (Griffith City Council, 2015).
- Accommodation options in the township of Griffith include 10 motels, 12 self-contained cottages/suites, three caravan parks, four hotels, five hostels and one bed and breakfast (Griffith Shire Council, 2015).
- Educational facilities within the Griffith LGA includes three high school, 12 primary schools, nine pre-schools. Additionally a TAFE campus, Community College and Skills Training Centre (Griffith City Council, 2015).
- Griffith Base Hospital provides facilities for accident/emergency and specialist services including intensive care, surgical and renal dialysis. A new private hospital is currently under construction, which has been assisted by the local community's fundraising. A new aged care facility has recently received development approval (Griffith City Council, 2015).
- Recreational and sporting facilities in Griffith include a indoor swimming pool, 18 hole golf course, racecourse , as well as facilities for touch football, rugby league, rugby union, little athletics, AFL, hockey, cricket, tennis, squash, badminton, basketball, netball, bowls, soccer, archery, sailing, cycling, pony club, and shooting ranges (Griffith City Council, 2015).
- Tourist attractions within the Griffith LGA include: La Festa, Festival of Gardens, UnWined, Pioneer Park Museum, Hermits Cave, and Lookout, Cocoparra National Park, Lake Wyangan, Winery Cellar Doors and Altina Wildlife Park (Griffith City Council, 2015).

Community make up and priorities

Community wellbeing is related to the quality of the natural and urban surroundings, socio-economic position, the availability of services and perceptions of safety (Australian State of the Environment, 2006). One measure of 'community' is the willingness of individuals to be involved in volunteer organisations such as the Bush Fire Brigade, Meals on Wheels, the Country Women's Association and farmers' associations. Local sports and recreation clubs are also well represented in the region. These organisations are based on shared goals and maintained by volunteer efforts. The additional element of people who have long associations with the area can strengthen the fabric of the local community. These features are present in the local community.

Griffith Community Action Plan was developed in 2007 and reviewed and updated in consultation with the community in 2010. The plan incorporates issues that have an impact on community wellbeing, provides an overview of the community and identifies key issues and strategies to address these issues. Key strengths of the community included:

- A diverse cultural mix.
- Community spirit such as volunteering and helping other community members.
- The lifestyle provided including entertainment options, employment opportunities and activities for children.

Challenges for the Griffith Community included:

- Securing the sustainability of the local community with drought, climate change, infrastructure and transport.
- Retaining and engaging local young people, predominately due to the lack of tertiary education and activities for young people in the local community.
- Racism and bullying within the community, particular due to different cultures.

These characteristics are important in considering the impact on a community of a new development.

Attitudes to renewable energy projects

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.). This EIS addresses the associated impacts and mitigation measures to reduce the impact on the local community.

Community feedback on the proposal

Twenty-five people attended the Griffith Solar Farm information session held 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.

7.8.2 Potential impacts

Construction

Large scale solar farms can create polarised reactions in communities; some may see it as a large change to existing land use, lifestyles and land character. This feature alone can generate uncertainty, stress or opposition to the development. Others may see it as a positive contribution and sign of progress and may derive some direct benefit.

The local area has few large scale industries and would be a large change to the character of the site, from cropping to electricity generation. The site would be visible to the public during construction, particularly for traffic along Irrigation Way and nearby residents.

The proposal would represent a local economic and direct economic benefit to some. The construction of the proposal would utilise up to 90 staff at peak construction. Many of these could be drawn from the local area. Additional workers moving to the area temporarily may stimulate local economic activity. Accommodation and retail services would be stimulated. Conversely, the temporary influx may place pressures on local services such as schools and health services. Additional demands for accommodation and additional traffic may present an adverse effect on local tourism, if coinciding with local festivals for example. Additional traffic may be noticeable. Additional hazards accompany construction traffic (refer to Section 7.4). Mitigation strategies to address these impacts centre on consultation with the community, so that benefits can be maximised and conflicts resolved where possible.

Operation and decommissioning

The development of rural land uses compatible with agricultural activities, such as solar power generation, have potential to provide increased economic security to rural economies through diversification of employment opportunities and income streams. As well, they provide a substitute for carbon emission producing electricity production that is stable and renewable. Consistent with State and National greenhouse emission reduction objectives.

Considering the local economy is dominated by agriculture, it is relevant to note that projected global warming will increase potential evaporation and water demand, potentially reducing the capacity of the arable land. Pittock (AGO, 2003) observed that a significant proportion of Australian exports are agricultural products sensitive to global warming impacts. Federal Government publications note that failure to adequately mitigate increases in emissions will lead to greater costs for adaptation to consequences of climate change.

Minimal impacts are anticipated during operation and decommissioning. During operation, maintenance staffing and activities would be at low levels. The additional accommodation and traffic impacts of a number of operational staff are not likely to be noticeable.

Decommissioning is likely to require less staff onsite than for construction. It would offer a similar economic benefits to construction in terms of opportunities for local staff and industries. It may also include local recycling of infrastructure components.

7.8.3 Safeguards and mitigation measures

Potential for adverse socio-economic impacts is proposed to be addressed via the mitigation measures in Table 7-13.

Table 7-12 Safeguards and mitigation measures for socioeconomic and community impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
The CCP would be implemented to manage impacts to community stakeholders, including but not limited to: • Protocols to keep the community updated about the progress of the project and project benefits. • Protocols to inform relevant stakeholders of potential impacts (haulage, noise etc.). • Protocols to respond to any complaints received.	C		
Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.	C		
Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services.	C		D
Liaison with local tourism industry representatives to manage potential timing conflicts with local events.	C		D

7.9 RESOURCE USE AND WASTE GENERATION

7.9.1 Existing environment

Resource use

Key resources and estimated quantities (pending the completion of the detailed project design) required to construct the proposed solar farm include:

- Structural metal components for mounting system, PV boxes or PV skids and delivery system containers, fencing, site buildings, transmission line poles - 10,000 tonnes.
- Masonry products - negligible (concrete would only be used for the parking hardstand and concrete slabs for PV skids or boxes and delivery station).
- Glass for panels - 3,000 tonnes.
- Silicon for crystalline wafers - 500 tonnes.
- Copper for connection and communication cables - 300 tonnes.
- Fuels and lubricants associated with operation of machinery and motor vehicles - minimal.
- Gravel for work and service tracks and backfill, compaction of PV boxes or PV skids - 5,500 m³.
- Sand for burying cables and installation of PV Boxes or PV skids or boxes - 900 m³
- Water, for dust control during construction - 135,000 kl; and for panel washing during operation - 3,000 kl per year.

During operation and decommissioning, resources used would be associated with maintenance activities and use of machinery and vehicles.

Lifecycle analysis

Life cycle analysis (LCA) assesses and quantifies the energy and material flows associated with a given process to identify the resource impacts of that process and potential for resource recovery. LCA estimates of energy and emissions based on the total life cycle of materials used for a project, i.e., the total amount of energy consumed in procuring, processing, working up, transporting and disposing of the respective materials (Schleisner, 2000).

A life cycle inventory of multicrystalline PV panels has been undertaken by European and US photovoltaic module manufacturing companies over the 2005/2006 period. Over the panels 30 year lifetime it is expected to produce 28 g of GHG per kWh generated (Fthenakis *et al*, 2011). The 'energy payback time' for multicrystalline PV modules is dependent on the geographical location, it has been estimated at 1.5 years and less for a solar installation in Southern Europe (Fraunhofer ISE, 2015); this is considered roughly comparable to the proposal site.

The purification of the silicon, which is extracted from quartz, accounts for 30% of the primary energy to produce the module. This stage also produces the largest amount of pollutants with the use of electricity and natural gas for heating (Fthenakis *et al*, 2011). The waste produced during production of the modules which can be recycled include graphite crucibles, steel wire and waste slurry (silicon and polyethylene glycol). However, silicon crystals cannot be recycled during this stage (Fthenakis *et al*, 2011). The production of the frames and other system components including cabling would also produce emissions and waste but less than the production of modules.

The ratio of energy produced by, in this case, a solar PV system over its lifetime, to the energy required to make it is referred to as the system's 'energy yield ratio'. PV system energy yield ratio in Northern Europe

was estimated to be more than ten, indicating the system would produce more than ten times the amount of energy required to make it (Fraunhofer ISE, 2015). This positive energy yield ratio also means that GHG emissions generated from the production of solar energy systems are more than offset over the systems' life cycle (GA and ABARE 2010).

Solar farms are favourable in a number of aspects when compared to the major electricity generating methods employed in Australia:

- CO₂ emissions generated per kilowatt hour of energy produced.
- Short energy payback time in comparison to the life span of the Project.
- Potential to reuse and recycle component parts.

Waste generation

Legal requirements for the management of waste are established under the POEO Act and the *Protection of the Environment Operations (Waste) Regulation 2005*. Unlawful transportation and deposition of waste is an offence under Section 134 of the POEO Act. Littering is an offence under Section 145 of the POEO Act.

The *Waste Avoidance and Resource Recovery Act 2001* includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The proposal's resource management options would be considered against a hierarchy of the following order:

- Avoidance of unnecessary resource consumption.
- Resource recovery (including reuse, reprocessing, recycling and energy recovery).
- Disposal.

Adopting the above principles would encourage the most efficient use of resources, and reduce costs and environmental harm in accordance with the principles of ecologically sustainable development.

CONSTRUCTION

Solid waste is one of the major pollutants caused by construction. A number of different construction activities would produce solid wastes, such as:

- Packaging materials.
- Excess building materials.
- Scrap metal and cabling materials.
- Plastic and masonry products, including concrete wash.
- Vegetation clearing.
- Bio wastes, from onsite septic systems.

In accordance with definitions in the POEO Act and associated waste classification guidelines, most waste generated during the construction and decommissioning phases would be classified as building and demolition waste within the class general solid waste (non putrescibles). Ancillary facilities in the site compound would also produce sanitary wastes classified as general solid waste (putrescibles) in accordance with the POEO Act.

OPERATION

During operation the solid waste streams would be associated with maintenance activities and presence of employees. Some materials such as, fuels and lubricants, metals may require replacement over the operational life of the project.

DECOMMISSIONING

Decommissioning of the site would involve the recycling or reuse of materials including:

- Solar panels and mounting system.
- Metals from posts, cabling, fencing.
- Buildings and equipment such as the inverters, transformers and similar components would be removed for resale or reuse, or for recycling as scrap.

Items that cannot be recycled or reused, such as excess of above, would be disposed of in accordance with applicable regulations and to appropriate facilities. All above ground infrastructure would be removed from the site during decommissioning.

7.9.2 Potential impacts

Construction and decommissioning

RESOURCE USE

While increasing scarcity of resources and environmental impacts are emerging from the use of non-renewable resources, the supply of the materials required for the proposal are not currently limited or restricted. In the volumes required, the proposal is unlikely to place significant pressure on the availability of local or regional resources. The use of the required resources is considered reasonable in light of benefits of offsetting fossil fuel electricity generation.

Water would be required during construction for activities including watering of roads and in the site office and amenities. Water use is considered in Section 7.3

WASTE

In accordance with definitions in the POEO Act and associated waste classification guidelines, most waste generated during the construction and decommissioning phases would be classified as building and demolition waste within the class *general solid waste (non putrescibles)*. Ancillary facilities in the site compound would also produce sanitary wastes classified as *general solid waste (putrescibles)* in accordance with the POEO Act.

During decommissioning, all infrastructure and materials would be removed from the site and recycled or otherwise disposed of at approved facilities. The proposal is considered highly reversible in its ability to return to the pre-existing land use or alternative land use.

Operation

Electricity production using photovoltaics emits no pollution, produces no GHGs, and uses no finite fossil-fuel resources (US Department of Energy, 2004). Only limited amounts of fuels would be required for maintenance vehicles during operation of the solar farm. Operational waste streams would be very low as a result of low maintenance requirements of the solar farm.

Some balance of system electrical components (e.g., inverters, transformers, electrical cabling) would likely need replacement over the proposed life of the solar farm, requiring further use of metal and plastic based products. Repair or replacement of infrastructure components would result in some waste during plant operations; however, such activities would occur very infrequently and there would be a high potential for recycling or reuse of such waste.

7.9.3 Safeguards and mitigation measures

A Waste Management Plan would be developed to minimise waste and maximise the opportunity for reuse and recycling. Impacts are proposed to be addressed via the mitigation measures in Table 7-14.

Table 7-13 Safeguards and mitigation measures for resource use and waste generation

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to: • Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy. • Quantification and classification of all waste streams. • Provision for recycling management onsite. • Provision of toilet facilities for onsite workers and how sullage would be disposed of (i.e., pump out to local sewage treatment plant). • Tracking of all waste leaving the site. • Disposal of waste at facilities permitted to accept the waste. • Requirements for hauling waste (such as covered loads).	C	O	D
Septic system to be installed and operated in accordance with Griffith City Council requirements.	C	O	

7.10 FIRE AND BUSH FIRE ISSUES AND IMPACTS

Bush fire presents a threat to human life and assets and can deliver adverse ecological impacts. Bush fire risk can be considered in terms of environmental factors that increase the risk of fire:

- Fuel quantity and type.
- Topography.
- Weather patterns.

As well as specific activities (such as hot works) or infrastructure that exacerbate combustion or ignition risks (such as transmission lines and other electrical components).

7.10.1 Existing environment

The proposal site is flat and largely cleared of overstorey and midstorey vegetation. The proposal site is mostly surrounded by other cropping paddocks. Tree plantings are present along the Hamilton Road boundary, to the north of the site. The southern boundary includes an irrigation channel heavily dominated by weeds with no shrub or over storey present.

The proposed transmission line route runs approximately 300 m north west traversing Ross Road, a paddock and Hamilton Road to meet the existing Griffith/Yoogali Transgrid substation. Adjacent to Ross Road and within the paddock is no to little shrub or over storey. Along Hamilton Road, trees line the

roadside and fence. A dwelling is approximately 100m from the proposed transmission line route. The dwelling is screened and includes plantings of shrubs and trees.

The local bush fire season generally occurs between November and March. The local area experiences hot dry summers, with low rainfall levels. Hot dry north-westerly winds are common with high daytime temperatures, which increases bush fire risk. Fire danger is highest during December after high rainfall in spring increasing the quantity of grass fire fuel available (MIA BFRMP, 2008). Historically, the Murrumbidgee Irrigation Area Bush Fire Management Committee area has experienced 495 bush fires on average per year, including approximately 10 major fires per year. For Griffith, the area has an average of 250 fires per year. The MIA Bush Fire Risk Management Plan (MIA BFRMP, 2008) identifies the main ignition sources as natural causes such as lightning and escapes from agricultural burns.

The MIA BFRMP, prepared in accordance with the *Rural Fires Act 1997*, sets out a five year strategic management plan to reduce bush fire risk on private and public land within the MIA. The proposal area does not lie within any of the bush fire management zones identified in this plan.

The proposal includes two infrastructure components, inverters and transmission lines, with a risk of exacerbating or causing fire.

The nearest Rural Fire Service station is located in Griffith, at 200 Wakaden Street.

7.10.2 Potential impacts

Construction and decommissioning

Activities associated with construction that may cause or increase the risk of bush fire include:

- Smoking and careless disposal of cigarettes on site.
- Site maintenance activities such as mowing, slashing and using other petrol powered tools.
- Hot works; including welding and soldering activities.
- Operating a petrol, LPG or diesel powered motor vehicle over land containing combustible material.
- Operating plant fitted with power hydraulics on land containing combustible material.

Considering the sparse vegetation cover over the proposed site and other factors discussed above, it is considered unlikely that project would pose a significant bush fire risk. Site access would be formalised at the beginning of the construction stage during civil works, which would increase the ability to access and suppress any fire onsite or on adjoining sites.

The bush fire hazard associated with the activities listed above is considered highly manageable. Risks would be minimised through the implementation of fire and bush fire mitigation measures outlined in Section 7.10.3.

Potential impacts from decommissioning activities would be similar to those for construction. As for construction and operation activities (below), any bush fire risk associated with decommissioning of the project would be highly manageable.

Operation

Repairs and maintenance activities during project operation could increase bush fire risk. All electrical components would be designed to minimise potential for ignition. Asset protection zones would also be maintained around buildings at the site. Ground cover beneath panels would be maintained and not allowed to build up to high fuel levels (access and solar input requirements are in line with this activity). It

is anticipated that Transgrid would maintain the transmission line infrastructure to minimise bush fire ignition risks, once constructed.

Bush fire risks during operation of the solar farm and connection infrastructure is considered highly manageable.

7.10.3 Safeguards and mitigation measures

Fire risks would be addressed via the mitigation measures in Table 7-15.

Table 7-14 Safeguards and mitigation measures for fire and bush fire

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Develop a Bush Fire Management Plan with input from the RFS to include but not be limited to: • Management of activities with a risk of fire ignition. • Management of fuel loads onsite. • Storage and maintenance of firefighting equipment, including siting and provision of adequate water supplies for bush fire suppression. • The below requirements of <i>Planning for Bush Fire Protection 2006</i> - - o Identifying asset protection zones - o Providing adequate egress/access to the site (s4.1.3) - o Emergency evacuation measures (s4.2.7). • Operational procedures relating to mitigation and suppression of bush fire relevant to the solar farm.	C	O	D

7.11 HISTORIC HERITAGE

A search of listed items (under the NSW *Heritage Act 1977*, the Australian Heritage Database and those listed by local Councils and Stage Government agencies) was completed for the Griffith City LGA on 2nd February 2016. None of the items listed are located in the vicinity of the site.

7.11.1 Approach

A desktop study was undertaken to identify any historic heritage (non-indigenous) items or places in proximity to the study area, with a particular focus on the proposal site (solar farm site and surrounding landscape). Heritage databases searched as part of this assessment included:

- The NSW State Heritage Inventory (SHI) (includes items on the State Heritage Register and items listed by state agencies and local government) to identify any items currently listed within or adjacent to the proposal site. The area searched was the Griffith LGA.
- The Australian Heritage Database (includes items on the National and Commonwealth Heritage Lists) to identify any items that are currently listed within or adjacent to the proposal site.
- The heritage schedule of the Griffith LEP for locally listed heritage items that are within or adjacent to the proposal site.

7.11.2 Results

The results of the heritage searches listed above indicate that no known historic items or places occur on the site. A summary of the results of the heritage searches is provided in Table 7-15. Details of listed items are provided below.

Table 7-15 Summary of heritage listings in the Griffith LGA

Name of register	Number of listings
World Heritage List	0
National Heritage List	0
Commonwealth Heritage List	1
NSW State Heritage Register	2
NSW State Agency Heritage Register (section 170)	7
Griffith Local Environment Plan (LEP) 2014	27

State Heritage Register

A search of the NSW State Heritage Register within the Griffith LGA indicated two listings. These included:

- Hermits Cave Complex, Griffith.
- Our Lady of Pompeii Roman Catholic Church, Yoogali.

These items are listed under the *NSW Heritage Act 1977*. Neither item is located within the study area.

NSW State Agency Heritage Register (Section 170)

A search of the NSW State Agency Heritage Register within the Griffith LGA indicated seven listings. These included:

- Unnamed Item (scientific objects).
- Griffith Police Station (former), Griffith.
- Griffith Base Hospital, Griffith.
- Griffith Railway Precinct, Griffith.
- Griffith Courthouse, Griffith.
- Doradillo Vine, Hanwood.
- Griffith Centre for Irrigated Agriculture, Hanwood.

The above items are listed by State Agencies under s.170 of the *Heritage Act 1977*. None of the above items are located within the study area.

Local Heritage Schedule

A search of the Griffith LEP (2014) resulted in a total of 27 local heritage items being recorded within the LGA. The majority of these items (including one conservation area) are concentrated in the main town of Griffith with the remainder located in the smaller towns, villages and rural areas of the LGA.

No local heritage items are identified as being within or near the study area.

Unlisted Heritage Items

Although no listed items were identified within the site, it is acknowledged that there may be unlisted items of historic significance on the subject site. No additional potential heritage items were identified within the proposal site during the site inspection for historic heritage.

7.11.3 Potential impacts

A number of heritage items were identified from the desktop study, outlined above. A high percentage of these items are found in Griffith and other towns and villages. None of those items are found within the study area for the solar station proposed site, or adjacent.

The proposal is not considered likely to have a significant impact in accordance with the NSW *Heritage Act 1977*, the EP&A Act, or the EPBC Act, in terms of heritage.

No impacts are considered likely to any heritage items during the construction, operation or decommissioning phases. No heritage approvals are required.

7.11.4 Safeguards and mitigation measures

A protocol for unexpected finds would be developed for the construction phase, as detailed in Table 7-16.

Table 7-16 Safeguards and mitigation measures for historic heritage

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
Should an item of historic heritage be identified, the Heritage Division (OEH) would be contacted prior to further work being carried out in the vicinity.	C	O	D

7.12 CUMULATIVE IMPACTS

7.12.1 Existing environment

Cumulative impacts, for the purpose of this assessment, relate to the combined potential effects of different impact types of the proposal (i.e., construction noise combined with dust or visual impact) as well as the potential interaction with other proposals in the local area (e.g., the combined effects of the proposal coinciding with other utility works). Cumulative impacts can occur concurrently or sequentially.

7.12.2 Potential impacts

Construction and decommissioning

The key cumulative impacts of construction are considered to relate to traffic impacts and adverse amenity impacts (dust, noise, visual).

Construction traffic impacts include:

- Minimal increases in collision risks (other vehicles, stock and wildlife).
- Some incremental damage to road infrastructure.
- Associated noise and dust (where traffic is on unsealed roads) may adversely affect nearby receivers.
- Potential minor disruption to existing school bus services and farm vehicle movements.

A Traffic Management Plan would be prepared to take into account other road users including buses and tourist or trade events that may generate additional traffic impacts. It is noted that DPE's major projects register (searched on 3 March 2016) identifies that approval has been granted for a number of developments in the Griffith region which would generate traffic. This would create some cumulative traffic impacts for Irrigation Way, however due to the level of traffic already using this road, impacts are not considered significant.

The proposed Riverina Solar Farm site is located to the west and north west of the proposal site and has so far not been approved. Should this proposal be approved and constructed at a similar time to the proposal, there would be cumulative construction impacts, which are considered to be manageable.

Amenity impacts (primarily noise, also dust) would be managed through a consultation processes, including complaints mechanisms, whereby the sources of complaints are promptly identified and addressed. Although the construction process would be relatively long (9 months) these amenity impacts would be temporary and unlikely to be present equally at any one location. The construction activities and their location onsite would be changing throughout the construction process. Considering the distance to sensitive receivers and their low numbers, the cumulative effect of these impacts is considered highly manageable. Cumulative construction impacts are considered to be best managed by managing well each component individually.

Considering visual construction impacts, the additional traffic impact is probably the greatest potential for cumulative 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).

Cumulative decommissioning impacts would be minor. Cumulative impacts would be managed at the time of decommissioning. Infrastructure developed during construction (e.g., access tracks) would be utilised during decommissioning.

Operation

During operation, potential cumulative impacts would relate to agricultural production.

Agricultural production from the proposal site would be affected during the operation of the solar farm. Following decommissioning, the existing forms of agricultural production (irrigated cropping) could resume.

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. If the Riverina Solar Farm is constructed in addition to the proposal there may be cumulative visual amenity impacts.

Generally, adverse cumulative visual impacts are anticipated to be manageable due to the ability to effectively screen infrastructure in this low relief landscape.

7.12.3 Safeguards and mitigation measures

Cumulative impacts are best addressed through careful management of individual components, as set out in the sections above. No additional measures are considered to be required.

8 ENVIRONMENTAL MANAGEMENT

8.1 ENVIRONMENTAL FRAMEWORK

The environmental risks associated with the proposed Griffith Solar Farm would be managed by implementing a project-specific suite of mitigation measures detailed in Sections 6 and 7 and summarised below.

All commitments and environmental safeguards would be managed through the implementation of a Project Environmental Management Plan, consisting of a CEMP, an Operation Environmental Management Plan and a Decommissioning Environmental Management Plan. These plans would be prepared sequentially, prior to each stage of works.

These plans would detail the environmental management responsibilities of specific staff roles, reporting requirements, monitoring requirements, environmental targets and objectives, auditing and review timetables, emergency responses, induction and training, complaint response procedures and adaptive management mechanisms to encourage continuous improvement.

8.2 MITIGATION MEASURES

Where measures are relevant to more than one environmental aspect, they are cited only once under the most relevant aspect, to avoid duplication.

Construction (C), Operation, (O), Decommissioning (D)

Safeguards and mitigation measures	C	O	D
All efforts should be made in the design stage to avoid the artefacts recorded during the survey.	C		
If complete avoidance is not possible, the artefacts should be collected and moved to a safe area within the property, as close as possible to their original location, which will not be subject to ground disturbance. The collection and relocation should be undertaken by representatives of the Griffith LALC. A new AHIMS site card will need to be completed identifying the new location of the moved artefacts.	C		
Neoen prepares a Cultural Heritage Management Plan (CHMP) to address the potential for finding additional Aboriginal artefacts during the construction of the Solar Farm. The CHMP will outline an unexpected finds protocol to deal with construction activity. Preparation of the CHMP should be undertaken in consultation with the Griffith LALC.	C		
In the unlikely event that human remains are discovered during the construction, all work must cease. OEH, the local police and Griffith LALC should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal.	C		
Further archaeological assessment would be required if the proposal activity extends beyond the area of the current investigation. This would include consultation with the Griffith LALC and may include further field survey.	C		
Design measures: - If feasible, underground rather than overhead power lines would be considered. 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. - 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. - Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations).	C		

Safeguards and mitigation measures	C	O	D
Screening: - Onsite planting within the solar farm boundaries would be considered for three residences identified with potential for medium to high level impacts; Viewpoints 5, 6 and 9. - Onsite planting within the solar farm would be considered for where infrastructure would be located closest to Irrigation Way (View point 13). Conversely, the option of a pull over viewing area could be considered in this location in consultation with the roads authority, with consideration of potential road hazards. - Planting requirements are outlined in the VIA and would be detailed fully within an appropriate management plan. - Screens would be maintained for the operational life of the solar farm, including replacing dead plants and weeding, as required to maintain the screen's effectiveness in breaking up views.		O	
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.		O	
Vegetation clearing is to be restricted to areas identified within the project site. No machinery, equipment or personnel access would occur beyond these boundaries.	C		
No clearing of Weeping Myall Woodland is to occur without further assessment.	C		
- Rehabilitation and visual screening plantings should maximise the use of native species that form part of the local Weeping Myall Woodland, where appropriate. Species include; - Weeping Myall (<i>Acacia pendula</i>), - Western rosewood (<i>Alectryon oleifolius subsp. elongatus</i>); - Poplar box (<i>Eucalyptus populnea</i>); - Black box (<i>Eucalyptus largiflorens</i>). - Neoen will consider improving vegetation connectivity by planting vegetation screening along Ross Road and Irrigation Way (in line with the RMS requirement to maintain a 10 m buffer between roads and vegetation).	C		
A Weed management plan would be prepared prior to the commencement of construction outlining measures to prevent the ingress and egress of weeds from the surrounding area. Measures should include:	C		

Safeguards and mitigation measures	C	O	D
- o Vehicle hygiene protocols, including inspections and cleaning of vehicles when arriving at the site. - o Identify areas of noxious and environmental weeds within the proposal area. - o Identify the most suitable methods for the eradication and suggest ongoing control requirements to suppress noxious and environmental weeds prior to construction. - o Monitoring and controlling noxious weeds throughout the proposal area.			
• A site restoration plan would be developed to rehabilitate disturbed areas, progressively.	C		D
• A ground cover management plan would be developed with the aim of maintaining ground cover beneath panels, thereby resisting erosion, weed infestation and run off into aquatic habitat. It would include monitoring and triggers for action if bare areas develop.		O	
• For construction works within approximately 400 m of Receivers R1 and R2, manage potential noise impacts via discussions/ agreements with residents. Consider time restrictions and providing periods of repose for residents, where feasible.	C		
• Plant and equipment to be properly maintained.	C		
• Avoid unnecessary noise when carrying out manual operations and when operating plant.	C		
• Switch of any equipment not in use for extended periods.	C		
• Establish good relations with people living in the vicinity of the site at the beginning of project and maintain. Keep people informed, take complaints seriously, deal with complaints expeditiously. The community liaison member of staff should be adequately experienced.	C		
• The substation and office buildings would be designed to accommodate a 1:100 year flood and be located outside the PMF zone.	C		
• Ensure that the floor level of habitable rooms is designed to be at least 410 mm above the existing natural ground level, in accordance with Griffith City Council's Floor Heights Policy.	C		
Ground cover would be established and maintained beneath the array area as much as possible prior to and during construction, to minimise areas exposed to erosion.	C		
A soil and water management plan would be prepared, implemented and monitored during the project, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to: • At the commencement of the works, and progressively during construction, install the required erosion control and sediment capture measures. • Regularly inspect erosion and sediment controls, particularly following rainfall.	C		D

Safeguards and mitigation measures	C	O	D
- Maintain a register of inspection and maintenance of erosion control and sediment capture measures. - Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks. - Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads which may cause risks to other road users through reduced road stability. - In all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. - Stockpile topsoil appropriately, so as to minimise weed infestation, maintain soil organic matter, maintain soil structure and microbial activity. - Minimise the area of disturbance from excavation and compaction. - Ensure any discharge of water from the site is managed to ensure ANZECC (2000) water quality criteria are met. - Manage traffic generated soil erosion. - Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site should be stabilised and work ceased until the wet period had passed.			
A Spill Response Plan would be developed as part of the overall Risk Management Plan to prevent contaminants affecting adjacent pasture and dams. It would: - Manage the storage of any potential contaminants onsite. - Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and EPA notification procedures and remediation).	C	O	D
Dust suppression activities would be undertaken, including: <u>During construction and decommissioning</u> - A water cart (truck) would be utilised routinely, wetting all access roads and exposed dusty surfaces as appropriate to the conditions of the project site. - Stockpiled topsoil and other materials that exhibit significant dust lift off would be wet down routinely and as appropriate. - Stabilising techniques and/or environmentally acceptable dust palliatives will be utilised if the wetting down of surfaces prove to be ineffective. <u>During operation</u> - Any area that was temporarily used during construction (laydown and trailer complex areas) would be restored back to original condition or re-vegetated with native plants. - Areas that may not have been hard packed but have been disturbed in some form would be treated with environmentally acceptable dust palliatives and / or vegetated (e.g. by means of hydro seeding) with a suitable seed mix.	C	O	D
Stockpiled topsoil and other materials that exhibit significant dust lift off would be wetted down or covered to manage dust.	C		D
Any area that was temporarily used during construction (laydown and trailer complex areas) would be restored back to original condition or re-vegetated with appropriate species (exotic in exotic dominated areas (e.g. pasture grasses).	C		

Safeguards and mitigation measures	C	O	D
A contamination protocol would be developed to address: Procedure for discovering buried contamination within the proposal site (e.g. pesticide containers). Disposal would be at a facility able to accept the waste.	C		
The works should generally be carried out in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> (DPI, 2012).	C		D
Design of track drainage and other stormwater devices would be included in the detailed design phase.	C		
Procedures for testing, treatment and discharge of construction waste water must be as described in a Soil and Water Management Plan.	C		D
All fuels, chemicals, and liquids would be stored at least 50 m away from any waterways or drainage lines and would be stored in an impervious bunded area.	C	O	D
The refuelling of plant and maintenance of machinery would be undertaken in impervious bunded areas.	C	O	D
Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills	C		D
All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills.	C	O	D
Additional water requirements would be met commercial arrangements with local water supply authorities.	C	O	D
A Haulage Plan would be developed with input from the roads authority, including but not limited to: - Assessment of road routes to minimise impacts on transport infrastructure - Scheduling of deliveries of major components to minimise safety risks (on other local traffic) - Traffic controls (signage and speed restrictions etc.).	C		D
A Traffic Management Plan would be developed as part of the CEMP, with input from the road authorities and Griffith City Council. The plan would include, but not be limited to: - Assessment of road condition prior to construction on all local roads that would be utilised. - A program for monitoring road condition, to repair damage exacerbated by the construction and decommissioning traffic. - The designated routes of construction traffic to the site. - Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction. - Scheduling of deliveries. - Community consultation regarding traffic impacts for nearby residents. - Consideration of cumulative impacts. - Traffic controls (speed limits, signage, etc.). - Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts.	C		D

Safeguards and mitigation measures	C	O	D
Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.			
The proponent would consult with the Griffith City Council regarding the proposed upgrading of Poletta Road. The upgrade would be subject to detailed design, and must be designed and constructed to the standards as specified in Griffith City Council's <i>Engineering Guidelines Subdivision and Development Standards December 2008</i> .	C		
The proponent would continue consultation with RMS and John Holland Rail in regard to the use of the Irrigation Way/Hamilton Road intersection and railway crossing. Any upgrades to the intersection (construction of left hand turn off Irrigation Way) would be subject to detailed design in consultation with RMS.	C		D
The proponent would repair any damage resulting from project traffic (except that resulting from normal wear and tear) as required at the proponent's cost.	C	O	D
Development of a complaints procedure to promptly identify and respond to issues generating complaints.	C	O	D
Protocols to guide vehicle and construction equipment use, to minimise emissions would be included in construction and operational environmental management plans. This would include but not limited to Australian standards and (POEO Act).	C	O	D
Protocols would be included in construction and decommissioning to minimise and treat dust (water carts or similar in response to visual cues). This may involve installation of barriers such as shade cloth, to protect receivers.	C		D
All design and engineering would be undertaken by qualified a competent persons with the support of specialists as required.	X		
Transmission lines would be located as far as practical from residences, farm sheds, and yards in order to reduce the potential for both chronic and acute exposure to EMFs.	X		
Design of electrical infrastructure would minimise EMFs.	X		
Consultation with local community, to minimise impact of construction of adjacent agricultural activities and access.	C		
Removal of all above ground infrastructure and rehabilitation of areas disturbed during the operation of the solar farm, to allow a return to agricultural or alternate use.			D
The CCP would be implemented to manage impacts to community stakeholders, including but not limited to: - Protocols to keep the community updated about the progress of the project and project benefits. - Protocols to inform relevant stakeholders of potential impacts (haulage, noise etc.). - Protocols to respond to any complaints received.	C		
Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.	C		
Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services.	C		D

Safeguards and mitigation measures	C	O	D
Liaison with local tourism industry representatives to manage potential timing conflicts with local events.	C		D
A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to: • Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy. • Quantification and classification of all waste streams. • Provision for recycling management onsite. • Provision of toilet facilities for onsite workers and how sullage would be disposed of (i.e., pump out to local sewage treatment plant). • Tracking of all waste leaving the site. • Disposal of waste at facilities permitted to accept the waste. • Requirements for hauling waste (such as covered loads).	C	O	D
Septic system to be installed and operated in accordance with Griffith City Council requirements.	C	O	
Develop a Bush Fire Management Plan with input from the RFS to include but not be limited to: • Management of activities with a risk of fire ignition. • Management of fuel loads onsite. • Storage and maintenance of firefighting equipment, including siting and provision of adequate water supplies for bush fire suppression. • The below requirements of <i>Planning for Bush Fire Protection 2006</i> - ○ Identifying asset protection zones ○ Providing adequate egress/access to the site (s4.1.3) ○ Emergency evacuation measures (s4.2.7). • Operational procedures relating to mitigation and suppression of bush fire relevant to the solar farm.	C	O	D
Should an item of historic heritage be identified, the Heritage Division (OEH) would be contacted prior to further work being carried out in the vicinity.	C	O	D

9 CONCLUSION

The proposed Griffith Solar Farm would be located approximately 7 km south east of Griffith. The site is accessed via Irrigation Way, Hamilton Road and Poletta Road. The proposal would connect to the existing Griffith/Yoogali Transgrid substation, located on Hamilton Road to the east of the site.

The proposed PV solar farm would produce up to 53 MVA or 60 MW of electricity. NGH Environmental has prepared this EIS on behalf of the proponent, Neoen.

Development of the solar farm would make use of existing electricity infrastructure and contribute to Australia's transition to a low emission energy generation economy. The proposal is considered compatible with existing land uses and highly reversible upon decommissioning, returning the site to its previous agricultural capacity.

The key environmental risks have been investigated through specialist investigations:

- Aboriginal heritage impacts – impacts would be managed under a Cultural Heritage Management Plan.
- Biodiversity impacts – the site is highly disturbed. Minimal impacts are predicted and can be managed.
- Visual impact – low height infrastructure and onsite screening will minimise the view shed.
- Noise impacts – minor predicted construction noise exceedances are manageable.

Issues raised via community engagement included the potential closure of Poletta Road and impacts to views of rich farming land. The issues identified through the consultation process have been addressed in the EIA and proposal design. While uptake levels of community engagement activities for the proposal have been low, this is an indication of a low level of concern about and community support for the proposal.

A suite of management measures have been developed to address environmental impacts and risks to these and other physical, social and environmental impact areas. Key management strategies centre on management plans and protocols to minimise impacts and manage identified risks.

The impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Impacts are considered justifiable and acceptable.

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