



# Environmental Impact Statement

BERYL SOLAR FARM



APRIL 2017



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## Certification

For submission of an environmental impact statement (EIS) under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979*.

### EIS prepared by:

Jane Blomfield, NGH Environmental

### Applicant:

Tom Best, First Solar

### Proposed Development:

The Beryl Solar Farm proposal includes the construction, operation and decommissioning of a photovoltaic (PV) solar farm that would produce up to 95 Megawatts of electricity, and associated infrastructure.

### Land to be developed:

The Beryl Solar Farm proposal site would be located on Lot 20 DP 1173059, Lot 1 DP 1012926, Lot 1 DP 190927 and Lot 1 DP 1016556, Beryl.

### 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 development, activity or infrastructure, and that information in the EIS is neither false nor misleading.

Name: Jane Blomfield, Lead author

Signature:



Date: 22/3/2017

## TERMS AND DEFINITIONS

ABS	Australian Bureau of Statistics
AC	Alternating Current
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHCRP	<i>Aboriginal cultural heritage consultation requirements for proponents 2010</i>
AHIMS	Aboriginal Heritage Information Management System
ANZECC	Australian and New Zealand Environment Conservation Council
ARENA	Australian Renewable Energy Agency
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASL	Above Sea Level
BAR	Biodiversity Assessment Report
BBAM	Biobanking Assessment Methodology
BCC	BioBanking Credit Calculator
BOM	Bureau of Meteorology
BOS	Balance of Systems
BOS	Biodiversity Offset Strategy (in BAR)
CBFMP	Cudgegong Bush Fire Management Plan
CEEC	Critically Endangered Ecological Community
CCP	Community Consultation Plan
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Application
dB	Decibel
DC	Direct current
DECC	Refer to OEH
DECCW	Refer to OEH
DEMP	Decommissioning Environmental Management Plan

DoE	Department of the Environment (Commonwealth)
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
EECs	Endangered Ecological Communities
EIA	Environmental impact assessment
EIS	Environmental Impact Statement
ELF	Extremely Low Frequency
EMFs	Electromagnetic fields
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environmental Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EPL	Environment Protection Licence
ESD	Ecological Sustainable Development
FBA	Framework for Biodiversity Assessment
FM Act	<i>Fisheries Management Act 1994</i>
GDE	Groundwater Dependant Ecosystem
GHGs	Greenhouse Gases
GW	Gigawatts
ha	hectares
HAZMAT	Hazardous Material
Hz	Hertz
ICNG	NSW Interim Construction Noise Guideline
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEA	International energy Agency
INP	Industrial Noise Policy
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i>
kL	kilolitre

km	kilometres
kV	kilovolts
LALC	Local Aboriginal Land Council
LCA	Lifecycle Analysis
LCU	Landscape Character Unit
LEP	Local Environment Plan
LGA	Local Government Area
LMZ	Landscape Management Zone
m	Metres
m/s	Metres per second
mm	Millimetres
MNES	Matter of National Environmental Significance
MW	Megawatt
NEM	National Electricity Market
NHMRC	National Health and Medical Research Council's
NOW	NSW Office of Water
NPW Act	National Parks and Wildlife Act 1974
NSW	New South Wales
EPA	Environmental Protection Authority
O&M	Operation and Maintenance
OEH	Office of Environment and Heritage
OEMP	Operational Environmental Management Plan
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
PCTs	Plant Community Types
PV	Photovoltaic
RBL	Rating Background Level
RE Act	<i>Renewable Energy (Electricity) Act 2000 (Commonwealth)</i>
RET	Renewable Energy Target

RFP	Request for Proposal
RMS	(NSW) Roads and Maritime Services, formerly Roads and Traffic Authority (RTA)
RNP	Road Noise Policy
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy (NSW)
SEPP (Infrastructure)	<i>State Environmental Planning Policy (Infrastructure) 2007 (NSW)</i>
SF	Solar Farm
SHI	NSW State Heritage Inventory
sp/spp	Species/multiple species
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011 (NSW)</i>
SSD	State Significant Development, as defined by section 89C of the EP&A Act ( <i>c.f.</i> )
TMP	Traffic Management Plan
TSC Act	<i>Threatened Species Conservation Act 1995 (NSW)</i>
UFP	Unexpected Finds Protocol
VDV	Vibration Dose Values
VIA	Visual Impact Assessment
VLM	Visual Landscape Management
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i>
WM Act	<i>Water Management Act 2000</i>
WMP	Waste Management Plan
WSP	Water Sharing Plans
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 Beryl Solar Farm (the 'Proposal'). The proposed photovoltaic (PV) solar farm would have an upper capacity of 95 Megawatts (MW) of electricity generation. NGH Environmental has prepared this EIS on behalf of the proponent, First Solar Pty Ltd.

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 the NSW Department of Planning and Environment (DPE).

## PROPOSAL OBJECTIVES

The objectives of the Beryl Solar Farm (Beryl SF) are to:

- Select a site which is suitable for commercial scale solar electricity generation, in terms of solar yield, connection to the National electricity grid and environmental (including social) constraints.
- Develop a profitable commercial scale solar electricity generation project.
- In producing renewably sourced energy:
  - Assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets and other energy and carbon mitigation goals.
  - Provide a clean and renewable energy source to assist in reducing greenhouse gas (GHG) emissions.
- Obtain a social license to operate from the local community.
- Provide local and regional employment opportunities and other social benefits during construction and operation.
- Identify opportunities to avoid and minimise environmental impacts in the construction and operation of the project.

## PROPOSAL NEED AND BENEFITS

The proposed Beryl SF would support Australia in its efforts toward achieving 23.5 per cent of its energy from renewable resources by 2020. Additionally, it would further establish regional NSW as a leader in renewable energy. On an annual basis, the proposed Beryl SF would provide enough clean, renewable energy for about 28,000 average NSW homes. At the same time, it would displace approximately 183,000 metric tons of carbon dioxide; the equivalent of taking about 49,000 cars off the road.

The proposed Beryl SF would provide the following benefits, specific to Australia's environmental commitments:

- Reduction in greenhouse gas emissions required to meet our energy demands.
- Assisting the transition towards cleaner electricity generation.
- Direct contribution to help in meeting the Renewable Energy Target (RET).

At a State level, the proposed Beryl SF proposal is consistent with current goals and targets for renewable energy generation in NSW. These include:

- Goal 22 of the NSW 2021: A plan to Make NSW Number One (NSW Government 2011). *Contribute to the national renewable energy target [i.e. 20% renewable energy supply] by promoting energy security through a more diverse energy mix, reducing coal dependence, increasing energy efficiency and moving to lower emission energy sources*
- The three goals of the NSW Renewable Energy Action Plan (NSW Government 2013) which include:
  1. Attract renewable energy investment and projects.
  2. Build community support for renewable energy.
  3. Attract and grow expertise in renewable energy.

Additionally, the proposal would allow for the provision of significant economic benefits to the region, through the creation of direct and indirect jobs, supporting small business and by developing skills in a growing industry. First Solar (Australia) Pty Ltd has a proven track record of hiring local, qualified labour for plant construction and long-term positions for the maintenance and monitoring of daily operations. Working alongside the selected EPC contractor, this remains an important commitment by First Solar for the Beryl SF. The Beryl SF would also provide embedded electricity generation, to supply into the Australian grid closer to the consumption centres.

For the life of the project, the proposal would harness a natural resource (solar energy). While the activity would impact on land available for primary production during construction and operation, being fully reversible at the end of the project's life, the land would be available for continued agricultural production or alternative land uses, after decommissioning. While occupying a large area of land, being mounted above the ground, most of the solar array infrastructure requires limited ground disturbance.

## PROPOSAL DESCRIPTION

The proposed Beryl SF site is located approximately 6km west of Gulgong and 80km east of Dubbo, within the locality of Beryl and the Mid Western Local Government Area (LGA). The site would be accessed directly off Beryl Road, on the northern site boundary adjacent to the existing Beryl Substation.

The Beryl SF proposal site would be located on Lot 20 DP 1173059 and Lot 1 DP 1012926, Beryl. The site is approximately 332ha and is used for grazing and cropping purposes. The majority of the site is derived from a community of conservation significance: Box Gum Woodland Endangered Ecological Community (EEC). Although tree cover has been removed across most of the site, the vegetation community, which can include derived grasslands, remains present across some of the site, mostly in low condition. The low condition EEC has limited potential for regeneration after a long history of grazing; only one tree species is present in low abundance and this is not dominant species of the EEC. Understorey vegetation is highly modified.

Three existing electricity transmission lines pass through the proposal site, mostly in a north-south direction and in alignment with the existing Beryl substation. The existing Beryl Substation is directly adjacent to the proposal site within the north-western section. In the centre of the site, a raised embankment indicates the location of the former railway line which passes through the proposal site in an east-west direction. Most of the railway line infrastructure has been removed; some concrete beams are present in the centre of the site. One house is located within the north-eastern section of the proposal site. Stock yards and two sheds are located on site.

### Site suitability

The proposed Beryl SF site represents an ideal location for the deployment of photovoltaic generation.

- The site is predominately flat cleared land that has been highly modified by a long history of cropping and grazing activities.
- Despite proximity to water sources, more of the site (and surrounding area) is grazed than cropped, indicating lesser agricultural capability; these sandy soils present an ideal site for the installation of the driven piles used to support PV modules.
- The Irradiance levels at the site are consistently high and when combined with the humidity of the region provide an impressive capacity factor of 28%.
- The site directly connects the existing TransGrid Beryl Substation, a robust connection point for the injection of electricity to the National Electricity Market (NEM).

### **Solar farm**

The key infrastructure for proposal would include:

- PV modules (solar panels).
- Single Axis horizontal tracking (likely) or fixed mounting frames.
- 22-40 inverter stations with associated transformer.
- An onsite substation containing one main transformer and associated switchgear.
- A 66kV transmission line to the adjacent existing Beryl Substation (300m).
- Modifications of existing Beryl Substation, including civil and electrical works.
- Underground electrical conduits and cabling to connect the inverters to the onsite substation
- Underground and aboveground (mounted to module structure) DC cabling to connect the modules to the inverter stations.
- An access track off Beryl Road.
- Permanent Site office and maintenance building with associated vehicle parking.
- Internal access tracks to allow for site maintenance.
- Perimeter security fencing up to 2.3m high.
- Native vegetation screening, where required to break up views of infrastructure for specific residences.

During the construction period, some additional temporary facilities would be located within the site boundary and may include:

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

The construction and commissioning phase of the proposal would take approximately 12 months. Approximately 150 workers would be required during the peak construction period.

At the end of its operational life, the proposal site would be decommissioned, all above ground infrastructure to a depth of 500mm would be removed. All areas of soil disturbed during decommissioning would be rehabilitated with the aim of meeting the existing (pre-construction) land capability

### **Subdivision**

The subject land comprises two allotments with the legal description of Lot 1 DP 1012926 and Lot 20 DP 1173059, Beryl Road, Beryl. It is proposed to:

- Consolidate land contained within Lot 1 with Lot 20. This land will contain the proposed solar farm development, and
- Excise the existing dwelling and surplus land with an area of approximately 12ha from Lot 20. The dwelling will remain in the ownership of the current landowners and will not be associated with the solar farm development.

## 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. Specialist investigations were subsequently undertaken in these areas as part of this EIS:

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

These issues are discussed in Section 6 of this EIS and specialist assessments are appended to the EIS. Lower risk issues are discussed in Section 7, primarily by desktop assessment.

### Summary of higher risk issues

#### Biodiversity

Biodiversity (flora and fauna) investigations included searches of relevant data bases and a site assessment in line with the *Framework for Biodiversity Assessment (FBA) - NSW Biodiversity Offsets Policy for Major Projects* (Office of Environment and Heritage 2014). One Plant Community Type (PCT) was identified in the development site, *Rough-barked Apple – red gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions* (PCT281). This vegetation forms part of the White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland which is listed as an Endangered Ecological Community (EEC) under the *Threatened Species Conservation Act 1995* (TSC Act). No Critically Endangered Ecological Community (CEEC) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) would be impacted.

Three threatened species listed under the NSW TSC Act were identified during surveys including Dusky Woodswallow (*Artamus cyanopterus cyanopterus*), Silky Swainson-pea (*Swainsona sericea*) and Pine Donkey Orchid (*Diuris tricolor*). Silky Swainson-pea and Pine Donkey Orchid were identified outside the proposal development footprint.

The layout has been revised twice and now excludes impacts on higher value Box-Gum Woodland EEC on the project site's western corner and most of the higher value EEC associated with the site's central laneway north-south. Residual impacts are mostly in low condition EEC including approximately 94 trees (about 30% of these would be considered mature). The low condition EEC has limited potential for regeneration after a long history of grazing; only one tree species is present in low abundance and this is not dominant species of the EEC. Groundcover vegetation is highly modified with a low percentage of native species. Mitigation measures which have been outlined to further to reduce the impacts to biodiversity. A 'worst case' offset requirement calculation has generated 684 ecosystem credits, in accordance with the FBA. Regarding offsetting the impacts of this proposal it is noted that the solar array

panels will modify not remove vegetation through shading, however for the purpose of this assessment, 100% vegetation removal within the solar arrays has been assumed.

### Aboriginal heritage

Aboriginal heritage investigations included Aboriginal community consultation, background research, a field survey and significance assessment. 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*. The assessment was guided by the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) and the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH 2010a). The survey recorded six artefacts in five site occurrences.

It is possible that additional stone artefacts could occur within the proposed development footprint. However, based on the land use history of the proposal area, and an appraisal of the results from the field survey, there is negligible potential for the presence of intact subsurface deposits with high densities of objects or cultural material within the solar farm and powerline easement areas. The archaeological features have been recorded as an artefact scatter (Beryl Solar Farm AS1) and four isolated finds (Beryl Solar Farm IF 1, Beryl Solar Farm IF 2, Beryl Solar Farm IF 3 and Beryl Solar Farm IF 4).

No additional archaeological investigations are considered to be required. The four isolated finds and one artefact scatter would be salvaged prior to development of the project by an archaeologist with representatives of the registered Aboriginal parties.

### Noise

Noise investigations were undertaken in accordance with *NSW Industrial Noise Policy* (EPA 2000), *NSW Interim Construction Noise Guideline* (DECC 2009), *EPA's Assessing Vibration: A Technical Guideline* (DECC 2006) and *NSW Road Noise Policy* (DECCW 2011). Background noise monitoring was undertaken at the third closest receiver to the proposal site. The monitoring location was used to model construction and operational noise impacts for the proposal.

The assessment predicted noise emissions would exceed relevant criteria during construction of the proposed solar farm for Receivers R1, R2, R6, R9 and R10. It is noted that construction noise levels at all receivers are predicted to be less than the highly noise affected level of 75dB(A). Mitigation measures including noise control measures such as distance and screening would limit the potential noise generated to within acceptable levels.

No exceedances of noise limits are predicted during operation or from traffic.

### Visual

Visual impact investigations were undertaken using a transparent and systematic evaluation framework, based on the BLM Visual Resource Management System (Bureau of Land Management, US Department of the Interior n.d.). The assessment also includes reference to ARENA's *Establishing the social licence to operate large scale facilities in Australia* document (no date). These guidelines assisted in addressing the subjectivity of visual assessment and the importance of including community perceptions in the assessment, as much as possible. The assessment included topographical modelling, ground truthing, incorporates community consultation results and was informed by specific photomontages from representative viewpoints.

Generally, the low height infrastructure and onsite screening will minimise the view shed, and therefore visual impact will be low at most locations assessed. A medium impact was determined for six

representative viewpoints. While mitigation is required for high impact locations (none of which were identified), in this instance mitigation has been suggested for specific medium impact locations, to address community expectations. Onsite vegetation screening is proposed to break up views of the proposed infrastructure for residences located to the north. This would reduce the impact to a low and acceptable level at all locations.

### **Lower risk issues**

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

- Soil.
- Water use and water quality (surface and groundwater) and hydrology
- Traffic, transport and road safety.
- Land use impacts (including mineral resources)
- Historic heritage.
- Resource use and waste generation.
- Community and Socio-economic
- Climate and air quality.
- Magnetic fields
- Bush fire risk.

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 Department of Planning and Environment (DPE), prior to each stage of works.

## **CONCLUSION**

The proposed Beryl SF would provide the following benefits:

- Reduce greenhouse gas emissions required to meet Australia's energy demands.
- Assist in the transition towards cleaner electricity generation.
- Directly contribute to helping in meeting the RET.
- Create significant economic benefits to the region, through the creation of direct and indirect jobs, supporting small business and by developing skills in a growing industry. First Solar (Australia) Pty Ltd has a proven track record of hiring local, qualified labour for plant construction and long-term positions for the maintenance and monitoring of daily operations.

- Embed electricity generation, to supply into the Australian grid closer to the consumption centres.

The impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. The proposal is considered compatible with existing land uses and highly reversible upon decommissioning, returning the site to its previous land capability. The proposal would make a long-term contribution to meeting the energy demands of Australians, using renewable sources that would offset emissions generated through the burning of fossil fuels. Impacts are considered justifiable and acceptable.

# 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 Beryl Solar Farm (henceforth Beryl SF or the 'proposal'). The proposed photovoltaic (PV) solar farm would have an upper capacity of 95 Megawatts (MW AC) of electricity generation.

NGH Environmental has prepared the EIS on behalf of the proponent, First Solar (Australia) Pty Ltd.

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 the 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 DPE on 25 January 2017 (refer Appendix A).

## 1.2 PROPOSAL OVERVIEW

### 1.2.1 Site location

The proposed Beryl SF site is located approximately 6km west of Gulgong and 80km east of Dubbo, within the locality of Beryl and the Mid Western Local Government Area (LGA). The site would be accessed directly off Beryl Road, on the northern site boundary adjacent to the existing Beryl Substation.

The site is approximately 332ha in area. It is used for grazing and cropping purposes. The majority of the site is derived from a community of conservation significance: Box Gum Woodland Endangered Ecological Community. Although tree cover has been removed across most of the site, the vegetation community, which can include derived grasslands, remains present across some of the site.

In the centre of the proposal site, a raised embankment indicates the location of the former railway line. The raised embankment passes through the proposal site in an east-west direction. Most railway line infrastructure has been removed.

Three existing electricity transmission lines pass through the proposal site. These are mostly in a north-south direction. An existing substation, Beryl Substation, is located immediately adjacent to the north west section of the proposal site.

The location of the proposal site is illustrated in Figure 1-1. Further information on the proposal site and the locality is provided in Section 3.



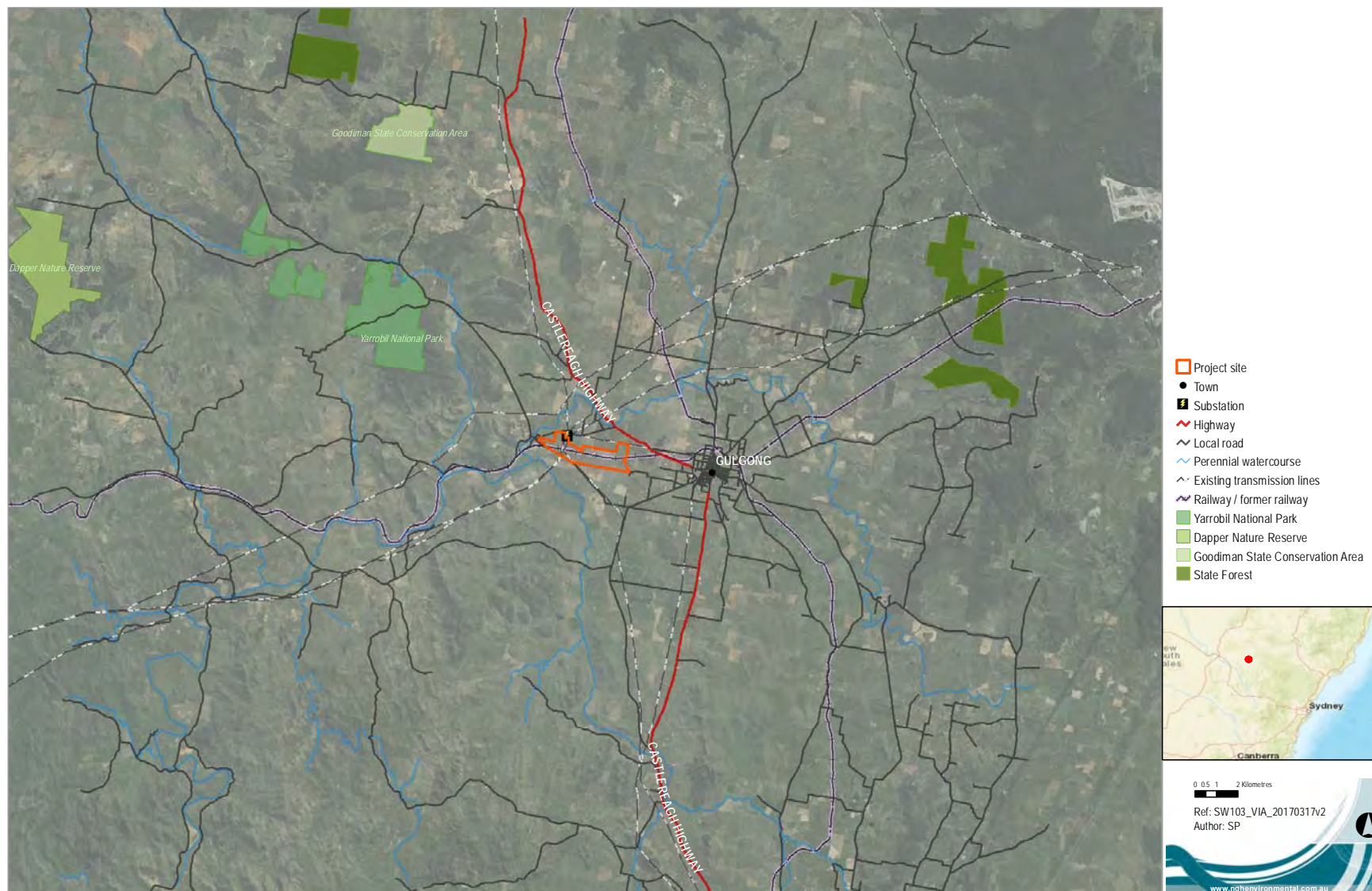


Figure 1-1 Location of the project

### **1.2.2 Key components of the proposal**

The Beryl SF proposal would include the installation of a solar plant with an upper capacity of 95 MWac that would supply electricity into the National Electricity Market (NEM). The power generated would be fed by a proposed transmission line to the existing Beryl Substation, adjacent to the proposal site. On an annual basis, the proposed Beryl SF would provide enough clean, renewable energy for about 28,000 average NSW homes while displacing approximately 183,000 metric tons of carbon dioxide.

First Solar (Australia) Pty Ltd proposes to develop approximately 206ha of the 332ha proposal site. The Beryl SF would include the following elements:

- PV modules mounted on either a horizontal tracking structure (likely) or fixed structure.
- Internal inverter stations to allow conversion of DC module output to AC electricity, with associated transformers.
- Onsite solar farm substation (smaller than the existing Beryl Substation).
- Overhead electricity transmission for grid connection to the adjacent existing substation (66kV).
- Modifications of existing Beryl Substation, including civil and electrical works.
- Underground electrical conduits and cabling to connect the inverters to the onsite substation.
- Underground and aboveground (mounted to module structure) DC cabling to connect the modules to the inverter stations.
- An access road off Beryl Road.
- Site office and maintenance building.
- Internal access tracks to allow for site maintenance.
- Perimeter security fencing.
- Native vegetation screening, where required to break up views of infrastructure to specific receivers.

Refer Section 3.2 for further detail on these elements.

The Beryl SF is expected to operate for around 30 years. The construction phase of the proposal is expected to take twelve months. After the initial operating period, the solar farm would either be decommissioned or repowered with new PV equipment for continued solar power generation. At the end of the project's life, existing land capability would be restored, including removing all above ground solar plant infrastructure.

The Beryl SF design and construction, operation and decommissioning requirements are described in more detail in Section 3. An indicative layout is shown in Figure 1-2. Detailed design may lead to some minor layout changes. The layout shown represents the maximum impact areas that would be required. The current layout has been determined following the outcomes of the assessments in this report, particularly the biodiversity assessment which resulted in removing arrays from the western portion of the site to minimise impacts on threatened communities and species (refer Appendix B for original and current layout).



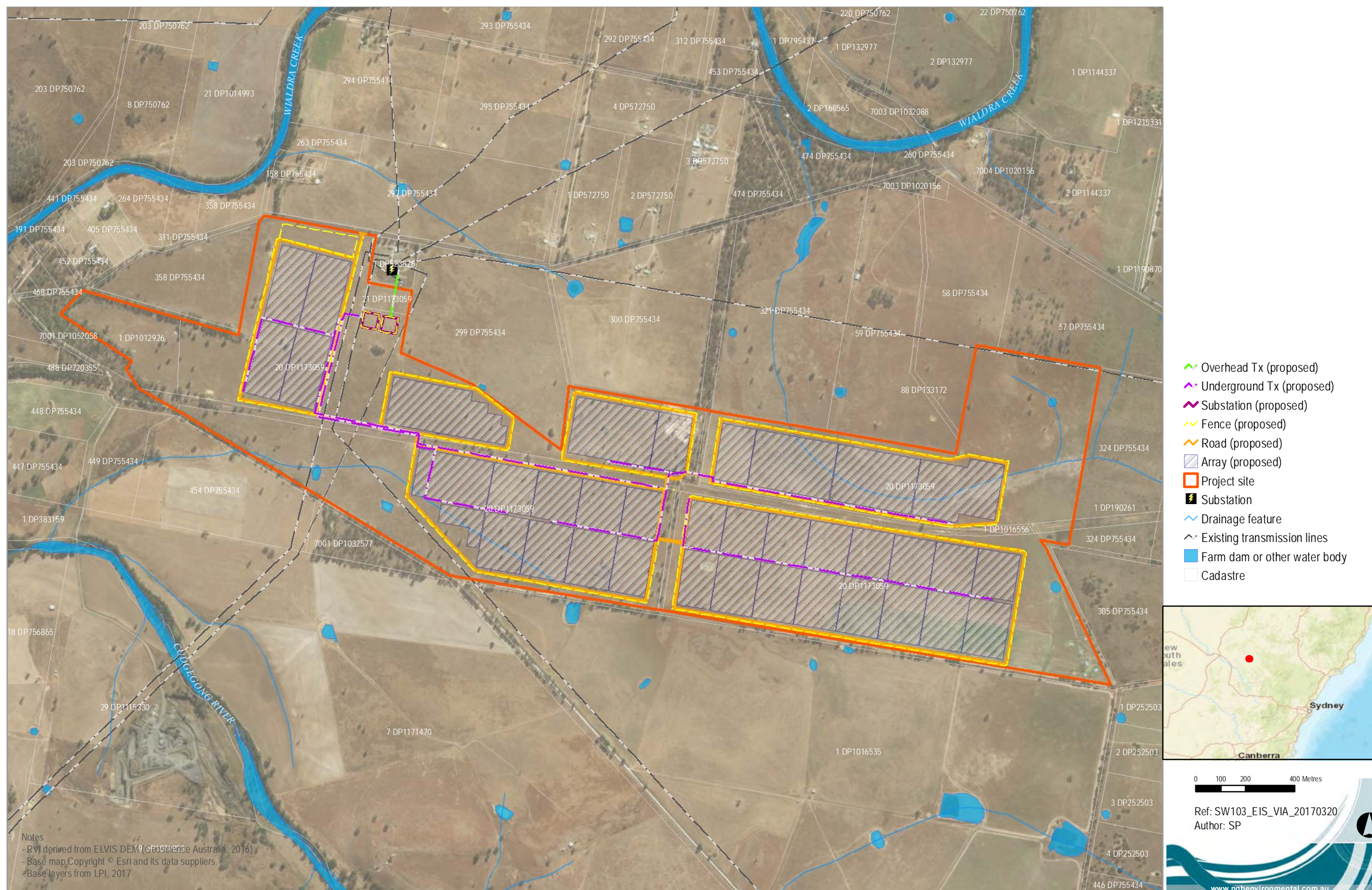


Figure 1-2 Indicative layout



To facilitate the solar farm development, subdivision of the land must occur. The subject land comprises two allotments with the legal description of Lot 1 DP 1012926 and Lot 20 DP 1173059, Beryl Road, Beryl. Details of the proposed subdivision are included in Section 3.

### **1.2.3    *The proponent***

First Solar (Australia) Pty Ltd is a branch of First Solar, which has developed, financed, engineered, constructed and currently operates a number of large grid-connected PV power plants all over the world. First Solar was founded in 1999 and has over 17Gigawatts (GW) of solar power installed worldwide. In Australia, First Solar has constructed five solar projects and is in the process of developing another six projects including Beryl SF (First Solar 2017).

## 2 JUSTIFICATION AND BENEFITS OF THE PROPOSAL

### 2.1 PROJECT OBJECTIVES

The objectives of the Beryl SF are to:

- Select a site which is suitable for commercial scale solar electricity generation, in terms of solar yield, connection to the National electricity grid and environmental (including social) constraints.
- Develop a profitable commercial scale solar electricity generation project.
- In producing renewably sourced energy:
  - Assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets and other energy and carbon mitigation goals.
  - Provide a clean and renewable energy source to assist in reducing greenhouse gas (GHG) emissions.
- Obtain a social license to operate from the local community.
- Provide local and regional employment opportunities and other social benefits during construction and operation.
- Identify opportunities to avoid and minimise environmental impacts in the construction and operation of the project.

### 2.2 PROJECT NEED AND BENEFITS

The proposed Beryl SF would support Australia in its efforts toward achieving 23.5 per cent of its energy from renewable resources by 2020. Additionally, it would further establish regional NSW as a leader in renewable energy. On an annual basis, the proposed Beryl SF would provide enough clean, renewable energy for about 28,000 average NSW homes. At the same time, it would displace approximately 183,000 metric tons of carbon dioxide – the equivalent of taking about 49,000 cars off the road.

The proposed Beryl SF would provide the following benefits, specific to Australia's environmental commitments:

- Reduction in greenhouse gas emissions required to meet our energy demands.
- Assisting the transition towards cleaner electricity generation.
- Direct contribution to help in meeting the Renewable Energy Target (RET).

At a State level, the proposed Beryl SF proposal is consistent with current goals and targets for renewable energy generation in NSW. These include:

- Goal 22 of the NSW 2021: A plan to Make NSW Number One (NSW Government 2011).  
*Contribute to the national renewable energy target [i.e. 20% renewable energy supply] by promoting energy security through a more diverse energy mix, reducing coal dependence, increasing energy efficiency and moving to lower emission energy sources*
- The three goals of the NSW Renewable Energy Action Plan (NSW Government 2013) which include:
  1. Attract renewable energy investment and projects.
  2. Build community support for renewable energy.
  3. Attract and grow expertise in renewable energy.

Additionally, the proposal would allow for the provision of:

- Significant economic benefits to the region, through the creation of direct and indirect jobs, supporting small business and by developing skills in a growing industry. First Solar (Australia) Pty Ltd has a proven track record of hiring local, qualified labour for plant construction and long-term positions for the maintenance and monitoring of daily operations. This remains an important commitment by First Solar for the Beryl SF.
- Embedded electricity generation, to supply into the Australian grid closer to the consumption centres.

For the life of the project, the proposal would harness a natural resource (solar energy). While the activity would impact on land available for primary production, the land would allow for diversity in land use and being fully reversible at the end of the project's life. Being mounted above the ground, most of the solar array infrastructure required limited ground disturbance. Therefore, it would not remove the potential to use the land for primary production (or some alternative land use) at the end of the solar farm's life. Upon decommissioning, all above ground infrastructure, and any infrastructure below the ground surface to a depth of 500mm, would be removed, returning the site to its current land capability.

## **2.3 OPTIONS CONSIDERED**

### **2.3.1 The 'do nothing' option**

The consequences of not proceeding with the proposed Beryl SF would be to forgo the identified benefits outlined above. 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 RET.
- 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. These include construction noise, traffic and dust, visual impacts and a reduction in agricultural production at the site for the lifetime of the solar farm. However, these impacts are considered to be manageable and would not result in a substantive impact to the environment in the long term.

Given the benefits of the proposal, set out above, and the level of environmental impact (as assessed within this EIS), the do nothing option is not the preferred option.

### **2.3.2 Alternative site locations**

First solar (Australia) Pty Ltd have reviewed numerous sites within NSW for the solar farm proposal and determined that the Beryl site represented the best opportunity for the development of a large scale PV solar plant.

Considerations during initial site investigations included:

- Access to electrical network
- Availability of suitably sized lots
- Existing land use and quality
- Soil structure

- Site vegetation
- Flood risk and location relevant to waterways
- Location of nearby sensitive receivers
- Locality population density

### **2.3.3 Technology alternatives**

Solar farm technology options considered for the Beryl SF proposal included:

- Fixed mounting structures
- Single axis mounting structures
- String Inverters
  - Numerous brands and size options were considered
- Central inverters
  - Numerous brands and size options were considered

Throughout the development phases of their projects, First Solar optimises the entire Balance of System (BOS), which consists of all of the non-module components of the solar power plant. By aligning all of the BOS inputs with the module roadmap and incorporating feedback from Engineering Procurement Construction and Operations & Maintenance experiences, First Solar has uncovered opportunities to optimise the entire power plant, resulting in increased energy yield.

#### **Photovoltaic Modules**

First Solar modules were assessed during the development of the project as they require a smaller footprint and have a higher energy yield. With over 17GW deployed world-wide, First Solar's advanced thin-film PV modules are the industry benchmark for utility-scale applications and are proven to outperform conventional silicon based solar modules. They offer a reliable and proven technology that have been validated by numerous independent engineers and backed by financial institutions worldwide. Having secured billions of dollars in project financing due to their robust performance and environmental attributes, First Solar modules have a proven energy yield advantage over typical crystalline silicon solar modules, generating up to 15% more annual energy than competing solar modules with the same power rating. The leading contributor to First Solar's performance advantage is due to the superior temperature coefficient of cadmium telluride ("CdTe") which delivers higher energy yields at elevated temperatures compared to conventional solar module technologies.

First Solar's thin-film modules have recently become the first and only thin-film modules, and one of five PV modules in the world, to pass the Thresher reliability and Long-term Sequential tests, indicating best in class long term performance, degradation, and durability in the harshest operating conditions. The combination of better energy yields and world leading reliability drives a lower LCOE by maximising value and minimising risk.

#### **Inverters**

A solar inverter, or PV inverter, converts the variable direct current (DC) output of a PV solar panel into a utility frequency alternating current (AC) that can be fed into a commercial electrical grid. Main types of Inverters are:

- String Inverters: Small size inverters (1-25 kW) which are directly connected to the PV modules. String inverters have the advantage of easy installation and maintenance tasks. However, they are not preferred for installation in large scale PV plants due to the large amount of equipment required, lower performance ratios and higher prices.

- **Central inverters:** Large inverters with a capacity up to 4MW. Skilled personnel are required to install and maintain these inverters, but the performance ratio is higher and they are cheaper than string inverters making them ideal for large scale PV plants.

First Solar was the first to utilise 1500V inverters in utility scale projects and has worked with the leading global inverter manufacturers such as SMA, Ingeteam and GE.

For this project, it is proposed to use 1500V central inverters.

### Mounting system

PV modules must be installed utilising a mounting structure that could be fixed or may incorporate a mechanism that enables the modules to track the path of the sun:

- **Fixed Structure:** No movement of the modules. Structure is installed, to align the modules at an optimal orientation and tilt/angle for the site to improve the production.
- **Single axis tracking system:** Structure includes a mechanism to enable the modules to track the sun from east to west, in order to follow sun path. The tilt/angle of the module is fixed.
- **Dual axis tracking system:** Structure includes a mechanism to enable the modules to track the sun from east to west and north to south. This tracking ensures the module surface is always presented perpendicular to solar radiation, and therefore gains the maximum radiation

The mounting systems are generally installed on steel piles that have been driven or screwed into the ground and there is generally very little ground disturbance associated with the pile installation.

Table 2-1 A comparison of the benefits of the different mounting technologies is included below.

Element	Fixed	Single axis tracking system	Dual axis tracking system
Land area required	Low	Medium	Very high
Production	Medium	High	High
High generation output window	Noon +/- 2 hours	From sunrise + 30 min to sunset -30 min	From sunrise + 30 min to sunset -30 min
Investment (CAPEX)	Low	Medium	Very high
Operational expenses (OPEX)	Low	Low	High
Wind resistance	Very high	Very high	Low
System reliability	Very high	Very high	Medium



First Solar produced energy yield predictions for both the fixed and single axis tracking structures that were used to undertake a cost benefit analysis of the alternate mounting structures. The output of the analysis concluded that the single axis tracking structure provided the lowest cost of energy for the Beryl site and is what is proposed, however the final supplier and technology is yet to be selected.

#### **2.3.4    *Size of proposal***

First Solar have undertaken extensive grid modelling to determine the optimal size of the Beryl SF to ensure constraint free operation and dispatch into the National Electricity Market. Through the finalisation of connection application planning process First solar will continue to liaise with TransGrid to ensure the final plant layout and size is matched to the existing grid infrastructure.

#### **2.3.5    *Preferred option***

The preferred option is detailed in Section 3.

It provides a balance between technological, energy and environmental aspects, while retaining the flexibility required in the final design stage of the project. The current plant design includes First Solar's thin film modules mounted on a single axis tracking structure connected to 1500V central inverters.

The environmental impact assessment (as assessed within this EIS) is precautionary, has considered long term impacts that may result for future generations, assesses and manages for the conservation of biological diversity and values natural services and assets. As such, with the suite of management measures developed in this EIS that now form part of the proposal, the proposal is considered to be ecologically sustainable and justifiable.

## 3 DESCRIPTION OF THE PROPOSAL

### 3.1 OVERVIEW

The proposal is for the construction of a solar farm. To facilitate the development of the solar farm, subdivision of land must also occur. These project components are addressed separately in this section.

### 3.2 PROPOSAL SITE

The Beryl SF proposal site would be located on Lot 20 DP 1173059 and Lot 1 DP 1012926, Beryl. The site is approximately 332ha and is used for grazing and cropping purposes. Access to the Beryl SF proposal site would be by an upgraded existing farm access track from Beryl Road at the northern site boundary and adjacent to the existing Beryl Substation. This is a sealed Mid Western Regional Council road. The southern boundary is bounded by unsealed local Council roads: Spring Ridge Road and Perseverance Lane.

Three existing electricity transmission lines pass through the proposal site, mostly in a north-south direction and in alignment with the existing Beryl substation. The existing Beryl Substation is directly adjacent to the proposal site within the north western section. In the centre of the site, a raised embankment indicates the location of the former railway line which passes through the proposal site in an east-west direction (Lot 1 DP 190927 and Lot 1 DP 1016556). Most of the railway line infrastructure has been removed; some concrete beams are present in the centre of the site. One house is located within the north eastern section of the proposal site. Stock yards and two old sheds are located on site.

Two mapped waterways and eight wetlands/farm dams occur within the proposal site. One waterway, located within the south western area of site, is an ephemeral tributary of the Cudgegong River. The waterway enters the Cudgegong River approximately 900m south west of the proposal site. The other waterway is located on the eastern area of the site and is an ephemeral tributary of the Wialdra Creek. Its confluence with Wialdra Creek is located approximately 1.2km north of the site boundary. The site inspection noted the waterways are not incised channels, rather minor depressions with no water present or likely to be present except in high rainfall conditions.

The site has a history of agriculture including cropping and grazing. Although most overstorey vegetation has been removed, the majority of the site is derived from a community of conservation significance: Box Gum Woodland Endangered Ecological Community. The community remains present across some of the site low and moderate to good condition.

Part of the proposal site appears to have been used by the landowner for quarrying. An area measuring approximately 1.7ha is located near the centre of the site. The ground cover and soil surface have been disturbed by some excavation activities.

Figure 3-1 illustrates the existing electricity infrastructure onsite, dam and current crop paddocks. Figure 3-2 illustrates the embankment which supported the former railway line within proposal site. Figure 3-3 and Figure 3-5 illustrates areas where quarrying operations appear to have occurred within the proposal site. Figure 3-5 illustrates the waterways that are present within the proposal site.



Figure 3-1 View across the proposal site showing the existing transmission lines, cropping land, one of the dams and remnant Box Gum Woodland in the background.



Figure 3-2 Embankment of former railway line located within the proposal site.





Figure 3-3 Possible existing quarry area within the project site (central southern portion of site)



Figure 3-4 Another existing possible quarry area within the project site (central northern part of the site)



Figure 3-5 Existing drainage depressions located within the project site with Box Gum Woodland in the background, more evident from soil moisture than the presence of a formed channel.

Access to the site would be from Beryl Road which bounds part of the site to the north. Beryl Road is a sealed road with two lanes (Figure 3-6). The Castlereagh Highway, which intersects with Beryl Road 2.5km from the proposed site entrance, would be the major transport route for haulage and site vehicles during construction and operation of the project.





Figure 3-6 Beryl Road.

### **3.2.1 Surrounding locality**

The proposed solar farm is within the locality of Beryl, a small rural locality approximately 6km west of Gulgong, NSW. Residences generally occur on large rural properties with grazing and cropping activities. Approximately 60 residences are located within 2km of the proposal site, one being an involved landholder.

Gulgong is the closest township to the locality of Beryl. The population of Gulgong was 2,383 in the 2011 Census (ABS 2011b). The main industries are coal mining at 16.6%; followed by school education at 6.6%, supermarket and grocery stores 4.2% and sheep, beef cattle and grain farming at 3.3% (ABS 2011b). The main local industry for employment in Gulgong is the coal mining industry (ABS 2011b).

This area of rural NSW is rich in European heritage and was settled in the 1860's during the Australian gold rush (Destination NSW 2016b). There are currently 130 buildings, within the town of Gulgong, listed under National Trust classification many still have the original verandahs and iron-lace balconies (Destinations NSW 2016b).

The Yarrobil National Park is approximately 6.2km north west of the site and is not visible from the site. No formalised amenity areas (such as picnic areas) are located in the park. An operational quarry is located approximately 1.2km south of the proposal site, along Spring Ridge Road.

## **3.3 SOLAR FARM**

### **3.3.1 Key infrastructure components**

The proposed Beryl SF would comprise of the installation of a solar plant with an upper capacity of 95MW that would supply electricity to the national electricity grid. First Solar (Australia) Pty Ltd proposes to

develop around 225ha of the 332ha proposal site. An indicative proposed infrastructure layout is included in Figure 1-2.

The key infrastructure for proposal would include:

- PV modules (solar panels).
- Single Axis horizontal tracking (likely) or fixed mounting frames.
- 22-40 inverter stations with associated transformer.
- An onsite substation containing one main transformer and associated switchgear.
- A 66kV transmission line to the adjacent existing Beryl Substation (300m).
- Underground electrical conduits and cabling to connect the inverters to the onsite substation
- Underground and aboveground (mounted to module structure) DC cabling to connect the modules to the inverter stations.
- An access track off Beryl Road.
- Permanent Site office and maintenance building with associated vehicle parking.
- Internal access tracks to allow for site maintenance.
- Perimeter security fencing up to 2.3m high.
- Native vegetation screening, where required to break up views of infrastructure to specific receivers.

During the construction period some additional temporary facilities would be located within the site boundary and may include:

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

Further details have been provided below for indicative key infrastructure components however the final supplier for all components would be confirmed during the construction contract Request for Proposal (RFP).

### **Solar arrays**

The solar arrays would be comprised of First Solar thin film solar modules installed on a single-axis tracker in rows aligned in north south arrangement. The tracker would have an estimated tracking range of 120 degrees, or +/- 60 degrees from the horizontal.

Piles would be driven or screwed into the ground in order to support the solar array's mounting system and solar modules. During the piling installation, work would be undertaken to avoid disturbing the existing ground cover to minimise ground disturbance and limit the potential for erosion.

The panel structures would have a height of approximately 3m high when tracked to the extent of their range. The final mounting system to be installed is yet to be determined but the below images provide an indication of the look of the infrastructure proposed.



Figure 3-7 Indicative First Solar ThinFilm modules



Figure 3-8 First Solar modules and a single axis tracker installed at the Gatton Research Facility in Queensland.





Figure 3-9 Piling installation for a single axis tracker

### **Inverters**

Depending on the final inverter selected for the project approximately 20 to 40 inverter stations would be installed across the site with each inverter station containing the following equipment:

- Inverter – up to forty inverters
- Transformer to step the AC voltage up to high voltage for transmission to the substation
- HV switchgear
- Communication and ancillary equipment

The current arrangement has been produced using 3 inverters per station, but this may change during detailed design. The inverter stations are usually delivered as either a fully containerised solution or a skid mounted solution. Both the containerised and skid solutions are sized to suit international shipping standards and have the same dimensions as either a 20' or 40' shipping container. The standard dimensions for the both options are detailed below. Figure 3-10 and Figure 3-11 provide examples of both options.

Table 3-1 Standard dimension of shipping containers to be used inverters

Dimensions	40 foot	20 foot
Length	12.2m	6.10m
Width	2.5m	2.5m
Height	2.6m – 2.9m	2.6- 2.9m



Figure 3-10 Example 20' skid solution.



Figure 3-11 Example 40' containerised solution.

The inverter stations are generally installed on piles or a concrete foundation and are slightly elevated above the ground to enable the installation of the AC and DC cabling.

### Underground cables

All underground cabling would be installed at a depth of at least 500mm with the electrical reticulation buried to either 600mm (low voltage) or 800mm (high voltage) depth, depending on the cables voltage and relevant Australian Standard. Cables would be installed across the solar farm site and would cross the railway easement in two locations.

Prior to excavating the cable trench, the topsoil would be stripped and stockpiled for use in the rehabilitation of the trench following the cable installation.

As the majority of the cabling would be direct buried, depending on the quality of the excavated material, a sand bed may be placed in the trench to create a cable bed. Once the cables are installed another layer of sand may be installed above the cable prior to the trench being backfilled with excavated material. Cables would be mechanically protected in accordance with AS 3000.

Figure 3-12 shows examples of the underground trenches with the installation of sand bed.



Figure 3-12 Examples of underground cable trenches with bedding sand installed.

### Transmission line

A new overhead transmission line would be required to transmit energy generated at the solar plant to the electricity grid. The transmission line would be constructed over a length of approximately 300m from the new on site substation north to the existing TransGrid Beryl Substation. The new line would be constructed in a similar manner to the existing on site transmission lines utilising either timber or concrete poles, cross member, insulators and strung conductor (Figure 3-13).

The transmission line would be owned by TransGrid. Consultation between First Solar and Transgrid is ongoing with regards to the detailed planning and construction of the transmission line. The impacts associated with construction of the transmission line have been assessed within this EIS.





Figure 3-13 Existing onsite transmission line.

### **Substation**

A new smaller substation would be located near the existing Transgrid Beryl Substation in the north west of the site. Power generated in the solar plant would be transformed in the substation to grid voltage, 66kV. A 66kV transmission line would then connect the substation to the existing Transgrid Beryl Substation (refer to Figure 1-2).

The final substation design is yet to be finalised but it is anticipated the substation would feature an elevated busbar, switchroom, a lightning protection system, circuit breakers, disconnectors, current transformers, voltage transformers, and a 66kV transformer.

The substation would be constructed on prepared bench of compacted material, approximately 30m x 30m, and would be surrounded by security fencing with gravel placed around the equipment and fence to restrict vegetation growth and provide a safe working environment in accordance with Australian Standards. The existing Beryl Substation is roughly 2 times bigger than the proposed substation onsite.

Connection to the existing substation would require civil and electrical works, including site excavation and construction of footings for the proposed infrastructure. This infrastructure would include a 66kV linebay, primary electrical equipment including control, and protection equipment, communications equipment, and any additional infrastructure required for the connection.

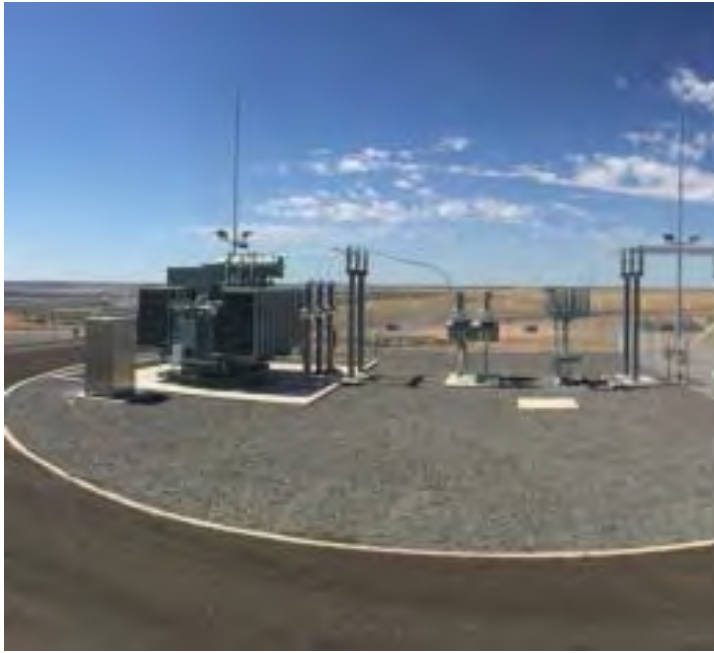


Figure 3-14 Example of a typical 66kV substation.

#### **Access track and internal tracks**

The entrance to the site would be off Beryl Road located next to the existing Transgrid Beryl Substation in the same location as the current farmer access way. The existing access way would be upgraded. The intersection with Beryl Road would also be upgraded to the appropriate standard to accommodate the increased traffic flows that would occur during construction and delivery vehicles. Although the final design has not yet been complete, the location and form of the main access road intersection with Beryl Road would provide adequate sightlines (approximately 350m) for vehicles entering and exiting the site. The final intersection design would be completed with input from Council, this being a Council administered road.

Internal solar farm access tracks would be required to access the modules and inverter stations onsite for maintenance. These would be around 6m wide and constructed of compacted but unsealed gravel (Figure 3-15). The access road and all internal tracks would be maintained throughout the construction and operation of the solar farm. The track would cross the railway line in two locations.

If required, water trucks would be used to suppress dust on unsealed access tracks during construction. Stabilising techniques and/or environmentally acceptable dust palliatives would be utilised if the wetting down of surfaces proves to be ineffective.





Figure 3-15 Example of an access track formed thorough cropping land

### **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 worker's transportation. Once the plant has been commissioned a small car park would remain for the minimal operational/maintenance 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 (1-3 full time equivalent staff) to be onsite.
- CCTV installed to the operation and maintenance building and substation for security purposes.

Temporary staff amenities would be designed to accommodate the number of workers at the peak of the construction period (estimated at 150 workers) and would include:

- Car parking.
- Sanitary modules with septic tank.
- Water tanks
- Changing rooms.
- Lunch rooms
- Dining hall.
- Administrative offices.
- Covered walkways
- Undercover storage area.
- Muster point in case of emergency.
- Generator, if required.
- Electrical, data and water reticulation.

### **Perimeter security fencing**

The perimeter of the site would be fenced with a 2.3m high security fence. It is expected to be cyclone fencing with a strands of barbed wire located within the top 450mm. The fence would be designed to ensure adequate access and egress points are provided during both the construction phase and ongoing operational life of the project. An example is provided in Figure 3-16.



Figure 3-16 Example of a typical 2.3m high security fence.

Some sections of the fenced perimeter would be targeted for landscaping treatment. This would entail 1-2 rows of native species planted to break up views of the infrastructure from specific receivers. Species selection would consider the impact of shading on the array.

### 3.3.2 Construction and commissioning

#### Indicative timeline

An indicative timeline for the proposal is outlined in Table 3-2.

Table 3-2 Indicative timeline.

Phase	Approximate commencement	Approximate duration
Construction	1 <sup>st</sup> Quarter 2018	12 months
Operation	4 <sup>th</sup> Quarter 2018	30 years
Decommissioning	2048	12 months

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

#### Construction activities

The construction and commissioning phase is expected to last approximately 12 months. The main construction activities would include:

- Site establishment and preparation for construction (fencing, ground preparation, preliminary civil works and drainage).
- Installation of steel post and rail foundation system for the solar panels.
- Installation of underground cabling (trenching) and installation of inverter stations.
- Modifications of existing Beryl Substation, including civil and electrical works
- Construction of the 66kV overhead transmission line, onsite substation and equipment, and interconnection to the existing Beryl substation.
- Removal of temporary construction facilities and rehabilitation of disturbed areas.

## Earthworks

Figure 1-2 indicates the development envelope which covers approximately 225ha of the 332ha project. A majority of the 225ha area is already disturbed due to farming and quarry activities. Ground disturbance, resulting from earthworks would be minimal and limited to:

- The installation of the piles supporting the solar panels, which would be driven or screwed into the ground to a depth of approximately 1.5m.
- Construction of internal access tracks and associated drainage.
- Substation bench preparation.
- Concrete or steel pile foundations for the inverter stations, onsite substation and maintenance building.
- Trenches up to 1000mm deep for the installation of cables.
- Construction of footings for the transmission line to the existing Beryl substation.
- Establishment of temporary staff amenities and offices for construction.
- Construction of perimeter security fencing.

The ground disturbance from pile foundations would be less than 1% (approximately 1ha) of the total site area. Panels within the solar array area would sit above the ground and existing ground cover would be maintained underneath the panels. Approximately 56% of the total site area ground cover would be affected by shading to varying degrees depending of time of year and time of day. Additional ground disturbance would result from construction of the internal access tracks and any associated drainage, trenches for cabling and footings for other infrastructure.

Apart from the permanent infrastructure footprint, any disturbed areas would be restored to grassed ground cover immediately after construction.

## Hours of operation during construction

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, if required, would only be undertaken with prior approval from relevant authorities.

## Resourcing requirements

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

### Labour, machinery and equipment

It is anticipated that approximately 150 construction personnel would be required on site during the peak construction period. 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 60 vehicles. The proposed timeline for the project indicates that approximately 40 employees would be required during the first month rising to 150 employees during the peak construction period. Table 3-3 provides an indication of the total overall one-way traffic movements anticipated throughout the construction period.

The final traffic haulage route and number would be further detailed in the traffic management plan that would be prepared by the appointed EPC contract as part of First Solar's pre mobilisation works.

Table 3-3 Traffic volumes and requirements for Beryl SF.

Phase	Purpose	Vehicle type / trailer type	No. of one way vehicle movements
<b>Site set-up and de-mobilisation</b>	Temp office delivery and removal	Low loader	10
	Skip delivery and removal	Low loader	4
	Generator delivery and removal	Semi-trailer	4
	General Deliveries	Semi-trailer	12
	Crane mob and demob	Crane	1
	Water tank delivery and removal	Truck	2
<b>Roads and hardstands</b>	Delivery of imported capping for roads, laydowns and crane hardstands	Truck and dog	390
	Plant delivery and removal: excavators, compactors, drill rig	Low loader	16
<b>Generating equipment</b>	Tool container delivery and removal	Low loader	2
	Module deliveries	Semi-trailer	1198
	Mounting structure and pile deliveries	Semi-trailer	2130
	Inverter Station deliveries	Low loader	44
	DC cabling, trays and combiner boxes	Semi-trailer	50
<b>AC Cable Installation</b>	AC Cable delivery	Semi-trailer	8
	Backfill material delivery	Dump Truck	72
	Plant delivery and removal: Telescopic handler and excavator	Low loader	8

Phase	Purpose	Vehicle type / trailer type	No. of one way vehicle movements
<b>Overhead Line</b>	Conductor delivery	Semi-trailer	1
	Pole deliveries	RAV	2
	Pole dressing delivery	Semi-trailer	2
	Plant delivery and removal: Telescopic handler and excavator	Low loader	8
<b>Sub Station</b>	Concrete deliveries	Concrete agitator	20
	Switchroom delivery	Low loader	4
	Operations and maintenance and workshop deliveries	Low loader	8
	Transformer delivery	RAV	2
	Electrical equipment deliveries	Semi-trailer	16
<b>Other</b>	Employee vehicle movements	Light vehicle	16000
	Monitoring equipment, fibre, SCADA servers etc.	Truck	12
	Waste collection	Truck	104
	Consumables (oil, petrol etc.)	Truck	24
	Miscellaneous deliveries	Light vehicle (Vans)	144
<b>Total <sup>1</sup></b>			<b>22294</b>

<sup>1</sup> Assumes rock would be imported to site and water for dust suppression would be sourced from existing dams onsite.

### Materials

In total, approximately 3,900m<sup>3</sup> of gravel would be required to cap the access and internal network of service tracks.

Approximately 1400m<sup>3</sup> of sand would be required for the bedding of cables that are to be direct buried throughout the project site.

Potable water would be trucked to the site on as needs basis and stored within temporary water tanks at the staff amenities area. While water required for dust suppression water be drawn from dams located on the proposal site. Should the level of the dams be diminished below an acceptable level, water for dust suppression would be sought from a local council standpipe.



### **3.3.3 Operation**

The operational phase of the proposal is anticipated to commence in the fourth quarter of 2018. Once operational, activities would include daily operations and maintenance. This would include:

- Routine visual inspections, general maintenance and cleaning operations of the solar arrays, if required.
- Routine visual inspections, general maintenance and cleaning operations of the substation.
- Vegetation management (which may include controlled grazing, utilising sheep). Ground cover vegetation would be maintained beneath panels to reduce erosion and weed infestation. A monitoring program would address any bare areas that develop. Management may include the use of seeding or armouring (i.e. jute mesh) to avoid erosion.
- Site security response (24hr) if a security event occurs.
- Replacement of equipment and infrastructure, as required.
- Pest and vermin control

#### **Hours of operation**

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

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

Outside of emergencies or major asset inspection or maintenance programs, night works or work on Sundays or public holidays would be minimised.

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 on tracker units, the solar farm would potentially operate outside standard working hours during summer months.

There would be no permanently lit night lighting installed within the array but lighting may be included in each inverter station for maintenance purposes. There would also be maintenance lighting installed at the substation that would only be used in case of emergency, and security lighting at the operation and maintenance building. All lighting would be designed to reduce disturbance to neighbouring properties and would be utilised only when there are staff on site or during emergency situations.

#### **Resourcing requirements**

During the operational phase of the project, it is anticipated there would be three full time staff located on site supported by First Solar's Asset management team of 6 people located in Sydney. Given the nature of the services conducted by the operation and maintenance team there is potential to employ and train apprentices on site.

Given the proposed size of the plant it is likely that three light vehicles (4x4) and an All-terrain vehicle would be required to transport the staff around the site.

The majority of the plant maintenance including inverter station, transformer and HV switchgear, PV arrays and the trackers would be conducted by the onsite team on a rolling basis with activities scheduled consistently throughout the year. There would some occasions, such as during a major substation shut down, that additional maintenance staff may be required on site. If required, the staff would be accommodated in the existing O&M building and additional traffic would be minimised through car pooling.

During operation non potable water would be required for cleaning panels, onsite toilet and showers, landscaping and animal care. Potable water would be required for the workers. Rain water would be collected onsite.

### **3.3.4 Decommissioning**

During decommissioning, all above ground infrastructure would be removed to a depth of 500mm. Key elements of proposal decommissioning would include:

- 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 installed within 500mm of the surface would be removed and recycled, equipment below this depth would be left in situ.
- Fencing would be removed including small concrete footings.

Above ground concrete slabs for the onsite buildings, inverter stations and substation would be left in place where there is no impact to the agricultural viability of the land.

All areas of soil disturbed during decommissioning would be rehabilitated with the aim of meeting the existing (pre-construction) land capability.

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

## **3.4 SUBDIVISION**

### **3.4.1 Existing environment**

The subject land comprises two allotments with the legal description of Lot 1 DP 1012926 and Lot 20 DP 1173059, Beryl Road, Beryl. A map of the subject land and its current environment is provided in Figure 3-17 below and described in Table 3-4.

Table 3-4 Summary of existing environment

Lot & DP	Area (approx)	Zone	Min lot size	Comment
Lot 1 DP 1012926	10 ha	RU1 Primary Production	100 ha	Vacant with dwelling entitlement (M271/00)
Lot 20 DP 1173059	290 ha	RU1 Primary Production R5 Large Lot Residential	100 ha 12 ha	Existing dwelling

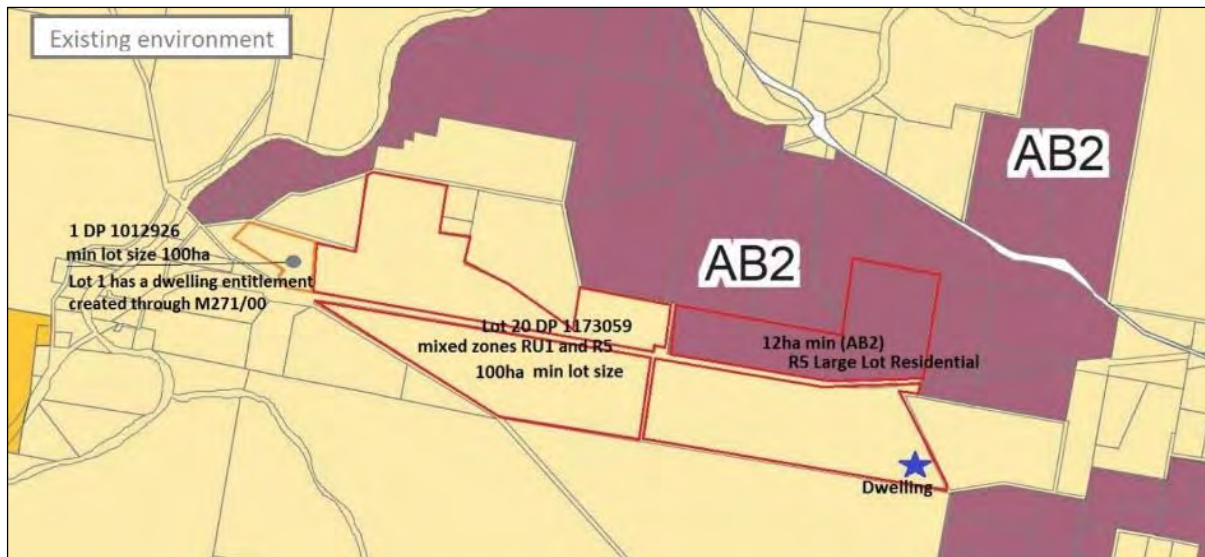


Figure 3-17 Existing environment

### 3.4.2 Proposed modified environment

It is proposed to:

- Consolidate land contained within Lot 1 with Lot 20. This land will contain the proposed solar farm development, and
- Excise the existing dwelling and surplus land with an area of approximately 12ha from Lot 20. The dwelling will remain in the ownership of the current landowners and will not be associated with the solar farm development.

The proposed arrangement is shown below in Figure 3-18 below.

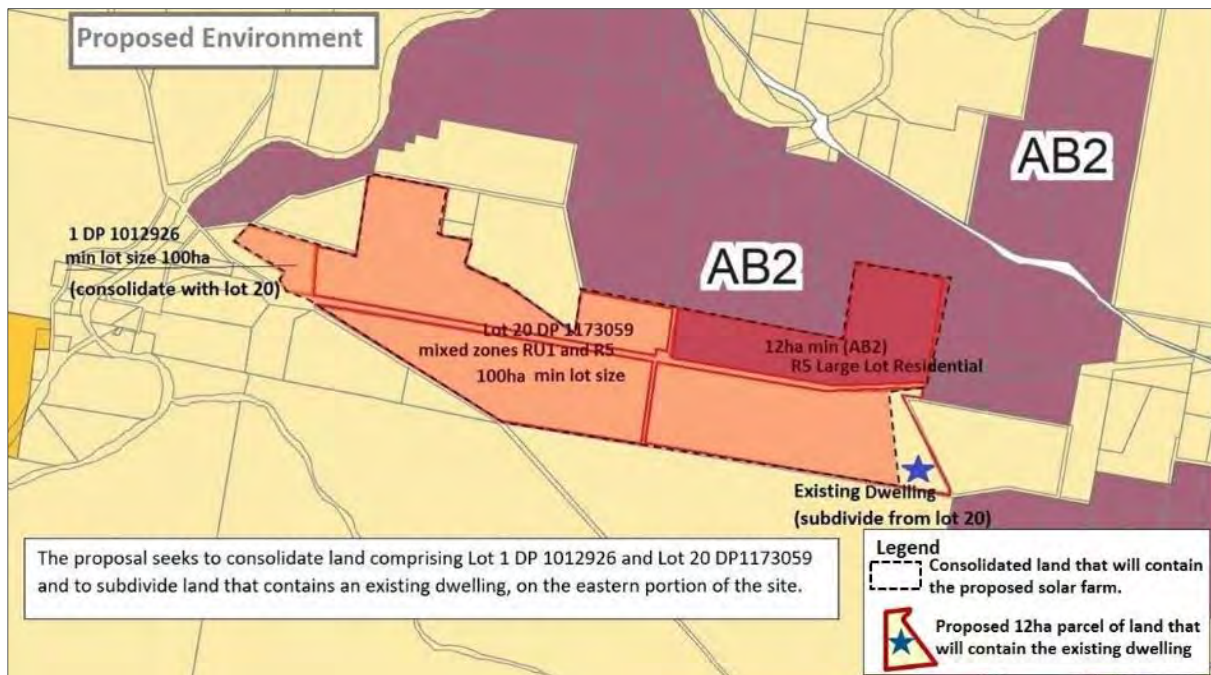


Figure 3-18 Proposed modified environment

The proposed solar farm development is reliant upon the ability to subdivide the surplus agricultural land and dwelling from the site as shown in Figure 3. In principle, the proposed subdivision would result in a land swap within the RU1 Primary Production zone. The dwelling entitlement attached to Lot 1 would be surrendered once the land is consolidated with the greater part of Lot 20, and the existing dwelling would continue to operate on a smaller parcel of land. Agricultural activities associated with the existing dwelling would also continue on a smaller scale. The proposed subdivision would not result in any change or impact to the existing environment or increase in the dwelling potential of the land.

## 4 PLANNING CONTEXT

### 4.1 ASSESSMENT CONTEXT

#### 4.1.1 Permissibility

*State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) declares the proposal to be state significant development (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 development application 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.

#### 4.1.2 State Significant Development (SSD)

Section 89C of the EP&A Act provides that development will be SSD if it is declared to be SSD by a State Environmental Planning Policy (SEPP).

The State Environmental Planning Policy (State and Regional Development) (SRD SEPP) declares the Beryl SF to be SSD as it is development for the purpose of electricity generating works with a capital investment value of greater than \$30 million (clause 20, Schedule 1).

Section 78A (8A) of the EP&A Act requires a development application for SSD to be accompanied by an EIS prepared in accordance with the EP&A Regulation.

The proponent made a written application to the Secretary requesting SEARS for the proposed Beryl SF as required by clause 3 of Schedule 2 of the EP&A Regulations. The proponent's application was accompanied by a Scoping Report, which provided detailed information about the proposed Beryl SF including key environmental issues. The request for SEARs was registered as SSD 8183.

On 25 January 2017, the Secretary issued the SEARs for the Beryl SF (Appendix A). In formulating the environmental assessment requirements, the Secretary consulted with relevant public authorities and agencies and considered key issues raised by those authorities. Table 5-1 outlines the SEARs and provides a cross reference to where each item is addressed within this EIS. This EIS complies with the SEARs and the environment assessment requirements contained in Schedule 2 of the EP&A Regulation.

### 4.2 EVALUATION OF THE DEVELOPMENT

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

Table 4-1 Matters of consideration

Provision	Relevance to the proposal
Any environmental planning instrument;	Relevant environmental planning instruments (EPIs) are discussed in Section 4. They include:



Provision	Relevance to the proposal
	<ul style="list-style-type: none"> <li>• <i>State Environmental Planning Policy (State and Regional Development) 2011</i></li> <li>• <i>State Environmental Planning Policy (Infrastructure) 2007</i></li> <li>• <i>State Environmental Planning Policy (Rural Lands) 2008</i></li> <li>• <i>State Environmental Planning Policy No. 55 - Remediation of Land</i></li> <li>• <i>State Environmental Planning Policy 44 - Koala Habitat Protection</i></li> <li>• <i>Mid-Western Regional Council Local Environmental Plan 2012</i></li> </ul>
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;	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);	<p>Clause 92 of the EP&amp;A Regulation requires consideration of:</p> <ul style="list-style-type: none"> <li>• the Government Coastal Policy, for development applications in certain local government areas; and</li> <li>• the provisions of AS 2601 for development applications involving the demolition of structures.</li> <li>• the provisions of a subdivision order and any development plan for development of land that is subject to a subdivision order.</li> <li>• the provision of development under the <i>Dark Sky Planning Guideline</i>.</li> </ul> <p>The Beryl SF does not involve any of these types of development and the LGA is not listed in the table under this clause. The additional provisions provided by the EP&amp;A Regulation are not relevant to the proposal.</p>
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	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 7 and 8 of this EIS. This EIS demonstrates that the environmental impacts of

Provision	Relevance to the proposal
social and economic impacts in the locality;	the proposal have to the extent, reasonably and feasibly possible, been avoided or minimised through careful proposal design and through the implementation of mitigation measures provided within this EIS.
The suitability of the site for the development;	<p>As discussed in Section 2, various options were considered when selecting an appropriate site for the proposal. The proposal site has a number of characteristics that make it suitable for the development of a solar farm. Most notably, its location is within close vicinity to an existing electricity substation with good connection capacity.</p> <p>Other characteristics include:</p> <ul style="list-style-type: none"> <li>• Availability of suitably sized lots</li> <li>• Suitability of the land in terms environmental factors such as soil, site vegetation, flood risk, waterway locations, location of sensitive receivers and population density.</li> </ul> <p>Further, the Beryl SF is largely reversible; at the end of the life of the solar farm, all above ground infrastructure would be removed and agricultural land use activities could resume.</p>
Any submissions made in accordance with this Act or the regulations; and	First Solar would consider and, as necessary, respond constructively to any submission made in relation to the Beryl SF. Consultation with stakeholders that has been undertaken during the planning stages including the preparation of this EIS is summarised in Section 5.4.
The public interest.	<p>The Beryl SF is in the public interest for a number of reasons. The plant would produce up to 95MW. On an annual basis, the proposed Beryl SF would provide enough clean, renewable energy for about 28,000 average NSW homes while displacing approximately 183,000 metric tons of carbon dioxide – the equivalent of taking about 49,000 cars off the road. The solar farm would also assist to:</p> <ul style="list-style-type: none"> <li>• Reduce greenhouse gas emissions required to meet Australia's energy demands</li> <li>• Assist in the transition towards cleaner electricity generation.</li> <li>• Directly contribute to helping Australia in meeting the RET.</li> <li>• Create economic benefits to the region, through the creation of direct and indirect jobs, supporting small business and by developing skills in a growing industry.</li> </ul> <p>A Community Engagement Plan has been prepared and implemented to inform the community and stakeholders about the proposal and their opportunities to provide input into the</p>

Provision	Relevance to the proposal
	assessment and development process. Further details on the consultation process is provided in Section 5.4.

## 4.3 NSW LEGISLATION

### 4.3.1 Environmental Planning and Assessment Act 1979

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

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.
- c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.

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

Given the Beryl SF would support a number of the objects of the EP&A Act, and is not inconsistent with the remaining objects of the Act, the proposal is considered appropriate in the context of the EP&A Act.

The Beryl SF would be assessed under Part 4 of the EP&A Act.

### Environmental Planning and Assessment Regulation 2000

Clauses 82 to 85B of the EP&A Regulation addresses public participation in SSD.

The Beryl SF Development Application and accompanying information (including this EIS) will be placed on public exhibition by DP&E for a period not less than 30 days.

### 4.3.2 State Environmental Planning Policy (State and Regional Development) 2011

The provisions of the SEPP are relevant given the proposed development is deemed a State significant development.

The proposed solar farm development involves:

- the construction of four arrays within the R5 Large Lot Residential zone, and
- consolidation and subdivision of land that within the RU1 Primary Production zone.

The Mid-Western Regional Council Local Environmental Plan 2012 prohibits photovoltaic solar farms in the R5 zone and the subdivision of land that is less than the minimum lot size map shown in relation to that land.

Given the limitations of the LEP2012, development consent is sought under the provisions of the SEPP and the *Environmental Planning and Assessment Act 1979*. These matters are discussed in detail below in the relevant sections this report.

#### **4.3.3 State Environmental Planning Policy (Rural Lands) 2008**

The provisions of the State Environmental Planning Policy (Rural Lands) 2008 are relevant to the proposed development given the proposal to subdivide land that involves a dwelling.

Consideration has been given to the Rural Planning Principles, which are as follows:

- (a) *The promotion and protection of opportunities for current and potential productive and sustainable economic activities in rural areas,*
- (b) *Recognition of the importance of rural lands and agriculture and the changing nature of agriculture and of trends, demands and issues in agriculture in the area, region or State,*
- (c) *Recognition of the significance of rural land uses to the State and rural communities, including the social and economic benefits of rural land use and development,*
- (d) *In planning for rural lands, to balance the social, economic and environmental interests of the community,*
- (e) *The identification and protection of natural resources, having regard to maintaining biodiversity, the protection of native vegetation, the importance of water resources and avoiding constrained land,*
- (f) *The provision of opportunities for rural lifestyle, settlement and housing that contribute to the social and economic welfare of rural communities,*
- (g) *The consideration of impacts on services and infrastructure and appropriate location when providing for rural housing,*
- (h) *Ensuring consistency with any applicable regional strategy of the Department of Planning or any applicable local strategy endorsed by the Director-General.*

It is considered that the proposed subdivision is in accordance with the above rural planning principles given the proposal will continue to provide the opportunity for a rural lifestyle that contributes to the social welfare of the rural community whilst accommodating a productive, sustainable economic activity in the rural area.

This proposed development will facilitate the establishment of a state significant development that is consistent with the principles of strategy endorsed by the Department of Planning and Environment.

#### **Rural Subdivision Principles**

The Rural Subdivision Principles are as follows:

- a) *The minimisation of rural land fragmentation,*
- b) *The minimisation of rural land use conflicts, particularly between residential land uses and other rural land uses,*
- c) *The consideration of the nature of existing agricultural holdings and the existing and planned future supply of rural residential land when considering lot sizes for rural lands,*
- d) *The consideration of the natural and physical constraints and opportunities of land,*
- e) *Ensuring that planning for dwelling opportunities takes account of those constraints.*

It is considered that the proposed subdivision would not generate any land use conflicts or have an impact on the nature of existing surrounding agricultural holdings given the proposal will not alter the existing environment. The proposed subdivision would facilitate the management of the solar farm while ensuring surplus land remains as productive agricultural land.

Furthermore, the proposed subdivision would prevent the potential fragmentation of resource lands that may arise from subdivision should the proposed solar farm not proceed. It is estimated that a total of 8 dwellings could potentially be created under clause 4.2 Rural subdivision of the LEP 2012 given the existing zoning and minimum lot sizes applicable to the subject land.

The proposed subdivision satisfies the subdivision principles of this clause.

#### **Clause 10 – Matters to be considered in determining development applications for rural subdivisions or rural dwellings**

Clause 10 of the Rural Lands SEPP lists the following matters to be taken into account when determining a rural subdivision:

- (a) *The existing uses and approved uses of land in the vicinity of the development,*
- (b) *Whether or not the development is likely to have a significant impact on land uses that, in the opinion of the consent authority, are likely to be preferred and the predominant land uses in the vicinity of the development,*
- (c) *Whether or not the development is likely to be incompatible with a use referred to in paragraph (a) or (b),*
- (d) *If the land is not situated within a rural residential zone, whether or not the development is likely to be incompatible with a use on land within an adjoining rural residential zone,*
- (e) *Any measures proposed by the applicant to avoid or minimise any incompatibility referred to in paragraph (c) or (d).*

In consideration of the above matters the proposed subdivision would not have an impact on surrounding land uses, would not be incompatible with a preferred land use and would facilitate the management of an approved land use on the subject land. The proposed subdivision satisfies the requirements of this clause.

#### **4.3.4 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. SEPP No.55 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 Register of notices (NSW Government 2017a) on 3 February 2017 identify one site within the Mid-Western LGA. The site is however located within Mudgee, over 27km for the proposed site. The proposed site does not appear on the List of NSW contaminated sites notified to the EPA, as at 3 February 2017 (NSW Government 2017b).

There is a risk that contamination associated with 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 and no evidence of contamination was observed during the site assessment, this risk is considered very low.

#### **4.3.5 State Environmental Planning Policy No. 44 – Koala Habitat Protection**

*State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44) encourages the conservation and management of natural vegetation that provides habitat for Koalas. Koalas are listed under the TSC Act as a vulnerable species. The SEPP applies to each local government area listed in Schedule 1. Mid-Western Regional LGA is not listed in Schedule 1 of SEPP 44. As such, this SEPP does not apply to the proposal site.

Beryl SF may not be located within listed LGAs of Schedule 1 of the SEPP however, it is identified that the sites previous LGA before augmentation in 2012 (Mudgee LGA) is listed in Schedule 1 of the SEPP. Additionally, Koalas are known to occur within the Central West CMA. Therefore, the biodiversity assessment undertaken for the proposal (summarised in Section 7.1 and provided in full in Appendix D) considers the proposals potential impact on Koalas and their habitat.

#### **4.3.6 Mid Western Regional Council Local Environmental Plan 2012**

The site is located within the Mid Western LGA and is therefore subject to the provisions of the *Mid Western Regional Council Local Environmental Plan 2012*. The solar farm site is located on land zoned RU1 - Primary Production and R5 – Large Lot Residential.

##### **RU1 Primary Production**

Electricity generating works are permitted with consent within the RU1 Zone. The LEP states that the consent authority must have regard to the objectives for development in a zone when determining a development application. 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 maintain the visual amenity and landscape quality of Mid-Western Regional by preserving the area's open rural landscapes and environmental and cultural heritage values.*
- *To promote the unique rural character of Mid-Western Regional and facilitate a variety of tourist land uses.*

For the life of the proposal, the proposal would harness a natural resource (solar energy). While the activity would impact on land available for primary production, the land would allow for diversity in land use and

being reversible and involving limited ground disturbance, it would not remove the potential to use the land for cropping (or some alternative permissible rural land use) at the end of the solar farm's life (expected to be 30 years). The solar farm would be decommissioned at the end of its operational life, removing all above ground infrastructure.

Mitigation measures contained within this EIS that would form a commitment of the proposal, address construction and operational soil and water impacts and would act to maintain the onsite land capability as well as protect the visual amenity and landscape quality of the region.

The proposed development would also involve the consolidation and subdivision of land within the RU1 zone.

As indicated in Section 3.4 of this report, it is proposed to:

- Consolidate land contained within Lot 1 with Lot 20. This land will contain the proposed solar farm development, and
- Excise the existing dwelling and surplus land with an area of approximately 12ha from Lot 20. The dwelling will remain in the ownership of the current landowners and will not be associated with the solar farm development.

Clause 4.3(3) of the Mid-Western Local Environmental Plan (LEP) 2012 states that the size of any lot resulting from a subdivision of land to which this clause applies is not to be less than the minimum size shown on the Lot Size Map in relation to that land.

With respect to the subject land, which contains land zoned RU1 Primary Production, the minimum lot size shown on the Lot Size Map is 100ha. Therefore, the proposed subdivision is under the prescribed minimum lot size and not permitted under the provisions of the Plan.

However, the proposed development being a State Significant Development is subject to the provisions of the State Environmental Planning Policy (State and Regional Development) 2011. In this regard, Clause 8(2) of the SEPP State & Regional Development 2011 states that if a single development application comprises development that is only partly State significant development, the remainder of the development is also declared to be State significant development. Furthermore, Section 89E (3) of the *Environmental Planning and Assessment Act 1979* states "development consent may be granted despite the development being partly prohibited by an environmental planning instrument".

Consultation with the Department of Planning and Environment on Friday 3 February 2017, confirmed the intent of the provisions set out under Clause 8(2) of the SEPP and Section 89(3) of the EP&A Act 1979 that provide justification for the proposed subdivision.

Following this, a written submission was made to Mid-Western Regional Council on 2 March 2017, seeking support for the development under Clause 8(2) of the SEPP and Section 89(3) of the EP&A Act 1979. A copy of the submission is attached as Appendix C.2 to this report.

The submission justifies the proposed subdivision of land based on the merits of the proposal against the LEP2012 and Rural Lands SEPP 2008 given the proposed subdivision is not inconsistent with the objectives of the RU1 zone. The solar farm met the objective to encourage diversity in primary production. The proposed subdivision would not fragment resource lands, given there will be no alteration to the existing environment.

Without the subdivision, the residual agricultural land and dwelling would be taken away from agricultural production as it would be incorporated into the solar farm site. The subdivision would facilitate the management of the solar farm while ensuring surplus land remains as productive agricultural land.

Council responded to the submission with a letter dated 21 March 2017 (refer Appendix C.3). No objection was raised to the proposed subdivision even though it is not compliant with Council's LEP. Council acknowledged that the proposal would not result in any additional dwelling entitlements for the site and will essentially relocate the existing smaller Lot 1 to encompass the existing dwelling that sits upon the larger Lot 20. Council requested that direct access arrangements to Perseverance Lane for the dwelling be retained and the location of the new lot boundaries ensure that all ancillary structures and septic systems in association with the dwelling are retained within the same lot with adequate setbacks. Council's requirements would be met by the development.

### **R5 Large Lot Residential**

Electricity generating works are prohibited within the R5 Zone. The objectives for development in this zone are:

- *To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality.*
- *To ensure that large residential lots do not hinder the proper and orderly development of urban areas in the future.*
- *To ensure that development in the area does not unreasonable increase the demand for public services or public facilities.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*

The proposed site layout includes the construction of four arrays within the R5 Large Lot Residential zone. Under the provisions of the Mid-Western Regional Council the proposed development is prohibited in the R5 zone, however given the proposed development is deemed a State significant development approval is sought under the following provisions:

- Clause 8(2) of the SEPP State and Regional Development 2011, which states that if a single development application comprises development that is only partly State significant development, the remainder of the development is also declared to be State significant development. Consultation with the Department confirmed that the intent of this clause means if the subdivision is included in the development application with the solar farm, the subdivision is also declared to be state significant; and
- Section 89E(3) of the *Environmental Planning and Assessment Act 1979*, which states "development consent may be granted despite the development being partly prohibited by an environmental planning instrument".

#### **4.3.7 Roads Act 1993**

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

The proposal would use one existing access point from Beryl Road, adjacent to the existing Transgrid Beryl substation, for operation and construction. The entry point would be upgraded in consultation with Mid Western Regional Council to the appropriate standard to accommodate the increased traffic flows during construction and delivery vehicles. The upgrade would include the improving of sight lines for vehicles entering and exiting the site. These upgrades would involve work within the road reserves and require a Section 138 approval from Mid Western Regional Council.

#### 4.3.8 Crown Lands Act 1989

The objective of the *Crown Lands Act 1989* is to ensure that Crown land is managed for the benefit of the people of New South Wales. The Catchments and Lands Division, DPI is responsible for the sustainable and commercial management of Crown land. This involves the management of state-owned land, linking with other agencies, local government, the private sector and communities to provide social and economic outcomes for NSW.

Connection of the solar farm to the existing Beryl substation may require a transmission line to be established through Crown Land. This would require consent from the Department of Primary Industries Lands Division (DPI Lands). Consultation with DPI (Lands) is summarised in Section 5. The Minister will provide comment on the EIS, during the exhibition period.

#### 4.3.9 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.

It should be noted that under Section 89J of the EP&A Act, an approval under Part 4 or a permit under Section 139 of the *Heritage Act 1977* would not be required for SDD.

A search of the NSW Heritage Register on 15<sup>th</sup> November 2016 for the Mid Western LGA identified 14 listed items under the NSW Heritage Act and 485 items listed under the Mid- Western LEP and by state agencies. The closest listed heritage items are located within Gulgong, approximately 6km east of the proposal site. The onsite inspection identified a number of old structures that would potentially have historic significance. These include a dilapidated huts structure and the lane way that runs east west across the site. At least two dilapidated structures onsite would require removal. The proposed potential impact on historic heritage is addressed in Section 8.5.

#### 4.3.10 Mining Act 1992

The main objective of the *Mining Act 1992* is to encourage and facilitate the discovery and development of mineral resources in New South Wales, having regard to the need to encourage ecologically sustainable development.

A search of Department of Industry's MinView database (Department of Industry 2016) found the site to have one mineral title (EL8160), however this title expired 29 August 2016. First Solar Pty Ltd has consulted with the mineral title landowner and adjacent quarry operators, refer to Section 5.1.3

#### 4.3.11 Water Management Act 2000

The *Water Management Act 2000* (WM Act), currently administered by Department of Primary Industries (Office of Water) NOW and Water NSW, is progressively being implemented throughout NSW to manage water resources, superseding the *Water Act 1912*. The aim of the WM Act is to ensure that water resources are conserved and properly managed for sustainable use benefiting both present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental

qualities of waterways and their in-stream uses, as well as to provide for the protection of catchment conditions.

Freshwater 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. There are two WSPs that relevant to the proposal site.

Regarding the proposal, there would be no requirement to modify existing entitlements or seek new entitlements under these plans. The proposal has minimal water requirements that would be satisfied by the purchasing of portable water and use of existing dams onsite for dust suppression during construction. Water would be sourced from a council standpipe if the onsite dam water diminishes. During operation, rainwater would be collected onsite or water would be purchased.

Works would occur within 40m of both watercourses that occur with the proposal site, this is defined as waterfront land under the WM Act. However, a controlled activity approval is not required for SSD under Section 89J of the EP&A Act. Potential impacts on waterways are addressed in Section 8.2.

#### 4.3.12 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides an integrated system of licensing for certain polluting activities within the objective of protecting the environment.

- Section 148 of this Act requires notification of pollution incidents.
- Section 120 of this Act provides that it an offence to pollute waters.
- Schedule 1 of the POEO Act describes activities for which an Environment Protection Licence is required.

First Solar (Australia) Pty Ltd must ensure that all phases of the solar farm proposal are managed to prevent pollution, including pollution of waters.

First Solar Pty Ltd is obliged to notify the relevant authorities (e.g. Environment Protection Authority) when a 'pollution incident' occurs that causes or threatens 'material harm' to the environment.

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, however does not include solar power. Therefore, the Beryl SF would not be a scheduled activity under this Act. Accordingly, an EPL is not required under the POEO Act.

Legal requirements for the management of waste are also 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 143 of the POEO Act. Waste management should be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act). The objectives of this Act are:

- a) to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development,
- b) to ensure that resource management options are considered against a hierarchy of the following order:
  - i. avoidance of unnecessary resource consumption,
  - ii. resource recovery (including reuse, reprocessing, recycling and energy recovery),
  - iii. disposal,
- c) to provide for the continual reduction in waste generation,



- d) to minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste,*
- e) to ensure that industry shares with the community the responsibility for reducing and dealing with waste,*
- f) to ensure the efficient funding of waste and resource management planning, programs and service delivery,*
- g) to achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis,*
- h) to assist in the achievement of the objectives of the Protection of the Environment Operations Act 1997.*

Waste minimisation and management is assessed in Section 8.6 of the EIS.

#### **4.3.13 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 under section 89J of the EP&A Act. Native vegetation clearing is summarised in Section 7.1. The biodiversity assessment is appended in full in Appendix D.

#### **4.3.14 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 a specialist biodiversity assessment, summarised in Section 7.1 and appended in full in Appendix D of this EIS. The format of the assessment is consistent with the newly developed Framework for Biodiversity Assessment, developed for major proposals. Under Section 79B(2A) of the EP&A Act, concurrence under the TSC Act is not required for SSD.

#### **4.3.15 Fisheries Management Act 1994 (FM Act)**

The FM Act sets out to conserve fish stocks and key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation and biological diversity. Further, it aims to promote viable commercial fishing, aquaculture industries and recreational fishing opportunities. Threatened species, populations and ecological communities and key threatening process are listed in the FM Act's Schedules.

The Beryl SF is within the Lower Murrumbidgee catchment. There are no watercourses within or in close proximity of the development envelope deemed to be Key Fish Habitat under the Act. Key Fish Habitat are those aquatic habitats that are important to the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species (DPI 2016).

A permit under Section 201, 205 or 219 of the Act is not required by virtue of Section 89J of the EP&A Act.

#### 4.3.16 National Parks and Wildlife Act 1974

Under the *National Parks and Wildlife Act 1974*, the Director-General of the National Parks and Wildlife Service 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 is also responsible under this legislation for the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

It should be noted that under Section 89J of the EP&A Act, an Aboriginal Heritage Impact Permit under Section 90 of the *National Parks and Wildlife Act 1974* would not be required for a State Significant Development.

The potential impact to Aboriginal heritage and native fauna and flora are discussed in Section 7.1 and 7.2 of this report.

#### 4.3.17 Noxious Weeds Act 1993 (NW Act)

This Act aims to control noxious weeds in NSW. Part 3 of this Act outlines the obligations of a public authority to control noxious weeds.

One noxious weed was found onsite, St John's wort (*hypericum perforatum*). Refer to Section 7.1 and Appendix D for management.

### 4.4 COMMONWEALTH LEGISLATION

#### 4.4.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of 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 nine 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).
- A water resource, in relation to coal seam gas development and large coal mining development

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

A search for MNES and other matters protected by the EPBC Act was carried for the proposal site using the Commonwealth online Environmental Reporting Tool (report created 30 October 2016). A summary of the findings is provided in the tables below.

Table 4-2 Summary of Matters of National Environmental Significance.

Matters of National Environmental Significance	No.
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Significance	4
Great Barrier Reef Marine Park	0
Commonwealth Marine Areas	0
Threatened Ecological Communities	6
Threatened Species	29
Migratory Species	8

Table 4-3 Summary of other matters protected by the EPBC Act.

Other Matters Protected by the EPBC Act	No.
Commonwealth Lands	3
Commonwealth Heritage Places	0
Listed Marine Species	14
Whales and Other Cetaceans	0
Critical Habitats	0
Commonwealth Reserves	0

Table 4-4 Summary extra information.

Extra Information	No.
State and Territory Reserves	1
Regional Forest Agreements	0
Invasive Species	28
Nationally Important Wetlands	0
Key Ecological Features (Marine)	0

The EPBC protected matters report identified the following MNES to have potential to occur within the proposal site:

- Wetlands of international importance
- Threatened ecological communities
- Threatened species
- Migratory species

- Commonwealth land
- Listed marine species

The potential for these MNES to occur at the site are discussed below. Refer to the Biodiversity Assessment (Appendix D) for a more detailed assessment of the proposal in relation to the identified MNES.

### **Wetlands of International Importance**

Four wetlands of international importance were returned from the protected matters report. The nearest of these (between 200-300km from search area) is the Macquarie Marshes. All other wetlands returned from the search are over 700km away. The Macquarie Marshes occurs approximately 212km north west of the proposal site.

### **Threatened Ecological Communities**

Four threatened ecological communities were returned from the protected matters report.

The majority of the site is derived from a community of conservation significance: White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland which is listed under both the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Cwth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The community remains present across some of the site in varying levels of condition

### **Threatened species**

Twenty-nine threatened species were returned from the protected matters report. Of these, none are considered to have the potential to utilise the habitats at the proposal site:

### **Migratory species**

Eight listed migratory species were returned from the protected matters report. None of these species are considered likely to occur at the site on a regular basis or rely on the habitats present.

### **Commonwealth land**

The proposal would not impact on Commonwealth Land.

### **Listed Marine species**

Fourteen listed marine species were returned from the protected matters report. None of these species are considered likely to occur at the site due to distance from marine environments and any migratory species would not occupy the site on a regular basis or rely on the habitats present.

#### **4.4.2 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 proposal 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.

A search of the Native Title Register on 6 February 2017 for the Mid-Western Regional LGA found no registered native titles relevant to the proposal site.

#### **4.4.3 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 greenhouse gases 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 RET; 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 RET scheme.

The Beryl SF would need to be accredited as a Renewable Energy Generator to create Renewable Energy Certificates.

## **4.5 OTHER RELEVANT POLICIES AND MATTERS**

### **4.5.1 Ecological 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 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 Beryl SF 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 is present. 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.

Potential impacts of the Beryl SF are likely to be localised and would not diminish the options regarding land and resource uses and nature conservation available to future generations. Importantly, the Beryl SF provides additional renewable energy that contributes to minimising the risk of climate change to current and future generations by reducing carbon emissions intensity of electricity generation.

The solar farm would be decommissioned at the end of its operational life, removing all above ground infrastructure. Decommissioning would therefore result in returning the site to its existing land capability for future generations.

- 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 Beryl SF on biodiversity, including EPBC listed species, have been assessed in detail in the Biodiversity Assessment in Appendix D and are summarised in Section 7.1. This has included avoidance of areas of higher conservation value and management prescriptions to minimise and manage residual impacts.

- 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, land capability, 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 requirement for biodiversity offsets has been considered in accordance with the FBA for Major Proposals. A life Cycle Analysis has been completed for the proposal.

The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in chapter 9.2 provide an auditable environmental management commitment to these parameters. Based on the social and environmental benefits accruing from the Beryl SF 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.

## 4.6 SUMMARY OF LICENSES AND APPROVALS

Table 4-5 Summary of licenses and approvals required for Beryl SF.

Legal Instrument	License or Approval
<b>EP&amp;A Act 1979 - Part 4</b>	<ul style="list-style-type: none"><li>• Development consent required.</li></ul>
<b>Crown Lands Act</b>	<ul style="list-style-type: none"><li>• Licence for access across Crown Land, clearing vegetation, construction of an electricity transmission line and registration of an easement.</li></ul>
<b>Roads Act 1993</b>	<ul style="list-style-type: none"><li>• Section 138 approval for work within a public road reserve, Beryl Road.</li></ul>

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

## 5 STAKEHOLDER CONSULTATION

### 5.1 AGENCY CONSULTATION

#### 5.1.1 Secretary's environmental assessment requirements (SEARs)

SEARs were provided by NSW DPE on 25 January 2017. 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.

The following sections paraphrase the SEARs and cross reference 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 to seek further advice. This additional consultation with agencies is also summarised below.

Table 5-1 SEARs issue summary

Issue summary	Addressed in this EIS
The EIS for the development must comply with the requirements in Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i> . The EIS must include the following:	
<ul style="list-style-type: none"> <li>a full description of the development, including: <ul style="list-style-type: none"> <li>details of construction, operation and decommissioning;</li> <li>a site plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of separate approvals process);</li> <li>a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development;</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>The proposal is described in Section 3.</li> <li>A site plan is provided in Figure 1-2. No required infrastructure is part of a separate approvals process</li> <li>An updated constraints map developed during the assessment and used to inform the design is included in Section 6.</li> </ul>
<ul style="list-style-type: none"> <li>a strategic justification of the development focusing on site selection and the suitability of the proposed site;</li> </ul>	<ul style="list-style-type: none"> <li>the proposal justification is provided in Section 2.</li> </ul>
<ul style="list-style-type: none"> <li>an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including: <ul style="list-style-type: none"> <li>a description of the existing environment likely to be affected by the development;</li> <li>an assessment of the likely impacts of all stages of the development which is commensurate with the level of impact), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice;</li> <li>a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below); and</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Site context is provided in Section 3.2. Existing environment of the site is described in Section 7 and 8.</li> <li>Detailed information regarding environmental legislation relevant to the proposal is outlined in Section 4.</li> <li>A risk scoping table included in Section 6 identifies the key environmental issues for this proposal. Commensurate with</li> </ul>

Issue summary	Addressed in this EIS
<ul style="list-style-type: none"> <li>o a description of the measures that would be implemented to monitor and report on the environmental performance of the development;</li> </ul>	<p>the level of impact, detailed impact assessment, mitigation and monitoring are included in Section 7 and 8. Draft management plans or management outlines have been included for:</p> <ul style="list-style-type: none"> <li>o Proposed visual screening (Appendix F)</li> <li>o Noise management (Appendix G.2)</li> </ul>
<ul style="list-style-type: none"> <li>• a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; and</li> </ul>	<ul style="list-style-type: none"> <li>• A summary of all environmental management measures is included in Section 9.</li> </ul>
<ul style="list-style-type: none"> <li>• the reasons why the development should be approved having regard to the biophysical, economic and social costs and benefits of the development.</li> </ul>	<ul style="list-style-type: none"> <li>• The conclusion in Section 10 includes a summary of the key benefits and reasons why the proposal should be approved.</li> </ul>
The development application must be accompanied by:	
<ul style="list-style-type: none"> <li>• a signed report from a suitably qualified person that includes an accurate estimate of the capital investment value of the development (as defined in Clause 3 of the <i>Environmental Planning and Assessment Regulation 2000</i>); and</li> <li>• the consent in writing of the owner of the land (as required in clause 49(1)(b) of the <i>Environmental Planning and Assessment Regulation 2000</i>).</li> </ul>	<ul style="list-style-type: none"> <li>• The capital investment report has been provided separately.</li> <li>• Landowners consent has been provided separately.</li> </ul>
The EIS must address the following specific issues:	
<ul style="list-style-type: none"> <li>• Biodiversity – including an assessment of the likely biodiversity impacts of the development, including but not limited to the impacts on Box Gum Woodland endangered ecological community, <i>Euphrasia arguta</i>, <i>Prasophyllum sp. Wybong</i>, Bluegrass <i>Dichanthium setosum</i>, Pink Donkey Orchid <i>Diuris tricolor</i>, Regent Honeyeater <i>Anthochaera phrygia</i>, Swift Parrot <i>Lathamus discolor</i>, and Silky Swainson-pea <i>Swainsona sericea</i>, having regard to the <i>NSW Biodiversity Offsets Policy for Major Projects</i>, and in accordance with the <i>Framework for Biodiversity Assessment (FBA)</i>, unless otherwise agreed by the Department;</li> </ul>	<ul style="list-style-type: none"> <li>• An FBA assessment has been completed and is summarised in Section 7.1 and provided in full Appendix D.</li> </ul>
<ul style="list-style-type: none"> <li>• Heritage – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community;</li> </ul>	<ul style="list-style-type: none"> <li>• An Aboriginal Cultural Heritage Assessment Report (ACHAR) has been completed and is summarised in Section 7.2 and provided in full Appendix E.</li> <li>• This includes consultation, summarised in Section 5.2.</li> <li>• Historic heritage is addressed in Section 8.5.</li> </ul>

Issue summary	Addressed in this EIS
<ul style="list-style-type: none"> <li>Land – including an assessment of the impact of the development on agricultural land and flood prone land, a soil survey to consider the potential for erosion to occur, and paying particular attention to the compatibility of the development with the existing land uses on the site and adjacent land (e.g. operating mines, extractive industries, mineral or petroleum resources, exploration activities, aerial spraying, dust generation, and risk of weed and pest infestation) during operation and after decommissioning, with reference to the zoning provisions applying to the land;</li> </ul>	<ul style="list-style-type: none"> <li>An assessment of land use impacts is detailed in Section 8.4.</li> <li>A soil survey report is included as Appendix H.</li> </ul>
<ul style="list-style-type: none"> <li>Visual – including an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners;</li> </ul>	<ul style="list-style-type: none"> <li>A visual assessment has been completed and is summarised in Section 7.3.</li> <li>Proposed perimeter planting is detailed as a recommendation of the visual assessment. It includes a requirement to consult with the most affected land owners in finalising the treatment.</li> <li>First Solar have held meetings with the most affected landowners and have provided them information regarding the proposal. Screening is proposed to address views for these landowners.</li> </ul>
<ul style="list-style-type: none"> <li>Noise – including an assessment of the construction noise impacts of the development in accordance with the <i>Interim Construction Noise Guideline</i> (ICNG) and operational noise impacts in accordance with the <i>NSW Industrial Noise Policy</i> (INP), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria;</li> </ul>	<ul style="list-style-type: none"> <li>A noise assessment has been completed and is summarised in Section 7.4.</li> <li>A draft noise management plan is included in Appendix G.2.</li> </ul>
<ul style="list-style-type: none"> <li>Transport – including an assessment of the site access route (including Castlereagh Highway and Beryl Road), site access point, rail safety issues and likely transport impacts of the development on the capacity and condition of roads (including on any Crown land), a description of the measures that would be implemented to mitigate any impacts during construction, and a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required);</li> </ul>	<ul style="list-style-type: none"> <li>An assessment of transport impacts is detailed in Section 8.3.</li> </ul>
<ul style="list-style-type: none"> <li>Water – including:               <ul style="list-style-type: none"> <li>an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including watercourses (including Cudegong River and Wialdra Creek), wetlands, riparian land, groundwater dependent ecosystems, and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights,</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>An assessment of water impacts are detailed in Section 8.2.</li> <li>A description of erosion and sediment measures are detailed in Sections 8.1 and 8.2.</li> </ul>



Issue summary	Addressed in this EIS
<ul style="list-style-type: none"> <li>and measures proposed to monitor, reduce and mitigate these impacts;</li> <li>○ details of water supply arrangements; and</li> <li>○ a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils &amp; Construction (Landcom 2004);</li> </ul>	
<ul style="list-style-type: none"> <li>• Hazards and electromagnetic Interference – an assessment of potential hazards and risks associated with bushfires and the proposed transmission line and substation against the International Commission on Non-ionizing Radiation Protection (ICNIRP) <i>Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields</i>.</li> </ul>	<ul style="list-style-type: none"> <li>• An assessment of hazards and electromagnetic interference impacts is detailed in Section 8.9 and 8.10.</li> </ul>
<ul style="list-style-type: none"> <li>• Socio-Economic – including an assessment of the likely impacts on the local community and consideration of the construction workforce accommodation.</li> </ul>	<ul style="list-style-type: none"> <li>• An assessment of potential impacts on the local community are addressed in Section 8.7.</li> </ul>
<ul style="list-style-type: none"> <li>• In preparing the EIS for the development, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders.</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation is summarised in Section 5.4.</li> </ul>
<ul style="list-style-type: none"> <li>• In particular, you must undertake detailed consultation with affected landowners surrounding the development and Mid-Western Regional Council.</li> </ul>	
<ul style="list-style-type: none"> <li>• The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.</li> </ul>	<ul style="list-style-type: none"> <li>• A table of issues raised is provided in Section 5.4.</li> </ul>

### 5.1.2 Relevant guidelines

The following guidelines have been consulted in the preparation of this EIS:

Table 5-2 Guidelines relevant to this EIS

	Guideline	How guideline has been addressed?
<b>Biodiversity</b>	Framework for Biodiversity Assessment (OEH)	Biodiversity Assessment format, Section 7.1.
	NSW Biodiversity Offsets Policy for Major Projects (OEH)	
	Threatened Species Assessment Guidelines – Assessment of Significance (OEH)	Biodiversity survey methods, Section 7.1.
	Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings (2003)	NA

	Guideline	How guideline has been addressed?
	Policy and Guidelines for Fish Habitat Conservation and Management (DPI)	NA
<b>Heritage</b>	Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH)	Consultation approach Section 5.2.
	Code of Practice for Archaeological Investigations of Objects in NSW (OEH)	Heritage survey methods Section 7.2.
	Guide to investigating, assessing and reporting on aboriginal cultural heritage in NSW (OEH).	Heritage assessment format Section 7.2.
	NSW Heritage Manual (OEH)	NA
<b>Land</b>	Primefact 1063: Infrastructure proposals on rural land (DPI)	NA
	Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry (ARENA)	Community consultation, Section 5.4. Visual assessment method, Section 7.3.
	<i>Local Land Services Act 2013</i>	NA
	Australian Soil and Land Survey Handbook (CSIRO)	Section 8.1.
	Guidelines for Surveying Soil and Land Resources (CSIRO)	
	The land and soil capability assessment scheme: second approximation (OEH)	NA
<b>Noise</b>	NSW Industrial Noise Policy (EPA)	Section 7.4
	Interim Construction Noise Guideline (EPA)	
	NSW Road Noise Policy (EPA)	
<b>Transport</b>	Guide to Traffic Generating Development (RTA)	Section 8.3
	Road Design Guide (RMS) & relevant Austroads Standards	
	Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development	NA
<b>Water</b>	Managing Urban Stormwater: Soils & Construction (Landcom)	Section 8.2
	Floodplain Development Manual (OEH)	NA
	Guidelines for Controlled Activities on Waterfront Land (DPI Water)	NA
	Water Sharing Plans (DPI Water)	Section 8.2
	Floodplain Management Plan (DPI Water)	Section 8.2

	Guideline	How guideline has been addressed?
	Guidelines for Watercourse Crossings on Waterfront Land (DPI Water)	NA
<b>Waste</b>	Waste Classification Guidelines (EPA)	Section 8.6
<b>Electromagnetic Interference</b>	ICNIRP Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields	Section 8.9
<b>Environmental Planning Instruments</b>	State Environmental Planning Policy (State and Regional Development) 2011	Section 4
	State Environmental Planning Policy (Infrastructure) 2007	
	State Environmental Planning Policy (Rural Lands) 2008	
	State Environmental Planning Policy No.44 – Koala Habitat Protection	
	State Environmental Planning Policy No.55 – Remediation of Land	
	Mid-Western Regional Local Environmental Plan 2012	

### **5.1.3 Agencies additional comments**

The SEARs require that, in preparing the EIS for the development, relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups and affected landowners be consulted.

Relevant local, State or Commonwealth Government authorities, infrastructure and service providers and consultation and assessment to address matters raised by these entities are provided below.:

Table 5-3 Agency consultation summary

Agency	Issue raised	How issue has been addressed
Roads and Maritime Services	<p>Matters raised in RMS's addendum to the SEARs included the requirement for:</p> <ul style="list-style-type: none"> <li>• A Traffic Impact Study</li> <li>• Traffic volumes</li> <li>• Travel routes for traffic</li> <li>• Description of over size and over mass vehicles and materials to be transported</li> <li>• Details of access requirements</li> <li>• Need and proposed road improvements</li> <li>• Consideration of local climate conditions in regards to road safety.</li> <li>• Proposed road facilities, access and intersection treatments are to be identified and be in accordance with Austroads Guide to Road Design and, on classified roads, Roads and Maritime supplements, including safe intersection sight distance.</li> <li>• Layout of internal road network, parking facilities and infrastructure within project boundary</li> <li>• Development of a Traffic Management Plan (TMP)</li> </ul>	<p>The traffic assessment was completed from desktop assessment and site inspection and is included at Section 8.3. Required information, including hours of construction, traffic volumes and overmass vehicles etc., is included in this section. Consideration has been given to the effect of local climate in the development of mitigation measures.</p> <p>The appointed construction contractor would prepare a Traffic Management Plan (TMP), including this information, in consultation with the RMS and Mid-Western Regional Council.</p>
Office of Environment and Heritage (OEH)	<p>Matters raised in Department's addendum to the SEARs included impacts on biodiversity, Aboriginal Cultural Heritage, historic heritage, water, soils and flooding.</p>	
	<ul style="list-style-type: none"> <li>• Biodiversity and offsetting: <ul style="list-style-type: none"> <li>○ Biodiversity impacts to be assessed and documented in accordance with the Framework for Biodiversity Assessment.</li> <li>○ Impacts on Box Gum Woodland endangered ecological community, <i>Euphrasia arguta</i>, <i>Prasophyllum sp. Wybong</i>, Bluegrass (<i>Dichanthium setosum</i>), Regent Honeyeater (<i>Anthochaera phrygia</i>) and Swift Parrot (<i>Lathamus discolor</i>), will require further consideration and provision of the information specified in s9.2 of the Framework for Biodiversity Assessment.</li> </ul> </li> <li>• Aboriginal cultural heritage <ul style="list-style-type: none"> <li>○ Identify and describe the Aboriginal cultural heritage values that exist across</li> </ul> </li> </ul>	<p>The biodiversity assessment and offsetting has used the FBA for major projects, as required, summarised in Section 7.1.</p> <p>The Aboriginal heritage assessment has used the <i>Guide to Investigating, assessment and reporting on</i></p>

Agency	Issue raised	How issue has been addressed
	<p>the whole area that will be affected by the development.</p> <ul style="list-style-type: none"> <li>Where Aboriginal cultural heritage values are identified, consultation with Aboriginal people must be undertaken.</li> <li>Impacts on Aboriginal cultural heritage values are to be assessed. The EIS must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.</li> </ul>	<p><i>Aboriginal Cultural Heritage in NSW</i> and consultation guidelines <i>Aboriginal cultural heritage consultation requirements for proponents 2010</i> as required, summarised in Section 7.2.</p>
	<ul style="list-style-type: none"> <li>Historic heritage <ul style="list-style-type: none"> <li>A heritage assessment including but not limited to an assessment of impacts to <i>State and local heritage</i> including conservation areas, natural heritage areas, places of Aboriginal heritage value, buildings, works, relics, gardens, landscapes, views, trees should be assessed. Where impacts to State or locally significant heritage items are identified, the assessment shall: <ul style="list-style-type: none"> <li>outline the proposed mitigation and management measures</li> <li>be undertaken by a suitably qualified heritage consultant(s)</li> <li>include a statement of heritage impact for all heritage items (including significance assessment),</li> <li>consider impacts including, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment (as relevant), and</li> <li>where potential archaeological impacts have been identified develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations (terrestrial and maritime as relevant) and include the results of these test excavations.</li> </ul> </li> </ul> </li> </ul>	<p>The heritage assessment was desktop, informed by a site inspection. No listed heritage items would be affected by the proposal. Refer to Section 8.5.</p>
	<ul style="list-style-type: none"> <li>Water and soils: <ul style="list-style-type: none"> <li>Must map the following features relevant to water and soils including: <ul style="list-style-type: none"> <li>Acid sulfate soils</li> </ul> </li> </ul> </li> </ul>	<p>The soil and water assessments were desktop, informed by a site inspection. Surface and ground water resources are detailed in Section 8.2. Acid sulphate soils are</p>



Agency	Issue raised	How issue has been addressed
	<ul style="list-style-type: none"> <li>▪ Rivers, streams, wetlands, estuaries</li> <li>▪ Groundwater.</li> <li>▪ Groundwater dependent ecosystems.</li> <li>▪ Proposed intake and discharge locations.</li> <li>○ Must describe background conditions for any water resource likely to be affected by the development.</li> <li>○ Must assess the impacts of the development on water quality.</li> <li>○ Must assess the impact of the development on hydrology.</li> </ul>	<p>not relevant to the site. Water quantities are detailed. No direct impacts are proposed on waterways.</p> <p>Operational impacts, such as creation of additional impervious surfaces, would be adequately mitigated through a commitment to a prepare a Ground Cover Management Plan, to retain ground cover beneath the panels, arresting soil erosion impacts.</p> <p>No landform reshaping or other effects that would alter onsite hydrology are proposed.</p>
	<ul style="list-style-type: none"> <li>• Flooding               <ul style="list-style-type: none"> <li>○ Must map the following features relevant to flooding including:                   <ul style="list-style-type: none"> <li>▪ Flood prone land.</li> <li>▪ Flood planning area, the area below the flood planning level.</li> <li>▪ Hydraulic categorisation (floodways and flood storage areas).</li> </ul> </li> <li>○ Must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 1 in 10 year, 1 in 100 year flood levels and the probable maximum flood, or an equivalent extreme event.</li> <li>○ Must model the effect of the proposed development (including fill) on the flood behaviour.</li> <li>○ Must assess the impacts on the proposed development on flood behaviour.</li> </ul> </li> </ul>	<p>The flooding assessment was desktop, informed by a site inspection. Flooding risks are assessed in Section 8.2. Maps of relevant flooding features are provided.</p>
Department of Primary Industries (DPI)	<p>Matters raised in Department's addendum to the SEARs included impacts on land and water.</p> <ul style="list-style-type: none"> <li>• Land should include a requirement for the proponent to develop Rehabilitation and Decommissioning/Closure Plans that outline rehabilitation objectives and strategies.</li> </ul>	<p>Soil properties and key risks of construction are well understood and documented in Section 8.1. Excepting the perimeter track and small footings onsite for inverters and the substation, the majority of the soil surface would not be impacted by the development; no large areas of landform reshaping or excavation are proposed.</p> <p>A Groundcover Management Plan is a commitment of the proposal. The</p>

Agency	Issue raised	How issue has been addressed
		<p>objective is to ensure a stable ground cover during operation of the solar farm, minimising erosion and adverse water quality impacts. Agronomist input is a requirement of the plan, to ensure persistence of groundcover. Highly managed grazing may be used to maintain the height of groundcover.</p> <p>A Rehabilitation Plan is a commitment of the proposal, relevant to post construction and decommissioning. The objective is to ensure land uses post-construction and operation are not adversely affected. Below ground infrastructure that impedes cropping (less than 500mm depth) may be removed, in consultation with the land owner.</p> <p>The Ground Cover Management Plan and Rehabilitation Plan would both be informed by soil testing to ensure any limitations are addressed specific to the soils onsite.</p>
	<ul style="list-style-type: none"> <li>Water should include <ul style="list-style-type: none"> <li>A detailed description of the proposed management of watercourses on site.</li> <li>Estimated volume of water required for dust suppression and construction purposes and the source of this water.</li> </ul> </li> </ul>	<p>The water assessment and quantities required are detailed in Section 8.2.</p>
Division of Resources and Energy	<p>Matters raised in Department's addendum to the SEARs included impacts on mineral titles.</p> <ul style="list-style-type: none"> <li>Recommends the requirement for demonstrated, authentic consultation with mineral resource stakeholders including the Geological Survey of NSW, adjacent mineral title holders and quarry operators.</li> <li>Must consider the potential impact of the project, including associated ancillary infrastructure, on any mineral resources, both within and adjacent to the project area.</li> <li>Indicate, on a map or other visual means, the following: <ul style="list-style-type: none"> <li>the extent of the Project area,</li> <li>the location of affected minerals titles (adjacent and adjoining),</li> </ul> </li> </ul>	<p>Consultation undertaken is outlined in Section 5.4.</p> <p>Potential impact on mineral resources and map of features is provided in Section 8.4.</p> <p>Mitigation measures include ongoing consultation with the Stakeholders.</p>

Agency	Issue raised	How issue has been addressed
	<ul style="list-style-type: none"> <li>○ transmission and (project) related infrastructure,</li> <li>○ any transmission corridors, and</li> <li>○ any other relevant information.</li> <li>● An assessment regarding the potential impacts of the project, including electricity transmission infrastructure, on any significant mineral resources.</li> <li>● The proponent must liaise with the Division regarding the location of proposed electricity transmission infrastructure.</li> <li>● Provide evidence of any associated stakeholder consultation documents and, where required detail the ongoing engagement strategy in the form of management plans</li> </ul>	
Mid-Western Regional Council	Matters raised in Department's addendum to the SEARs included impacts on transport and community consultation.	
	<ul style="list-style-type: none"> <li>● Transport: <ul style="list-style-type: none"> <li>○ Details be provided on the proposed road upgrades that the applicant intends on undertaking.</li> <li>○ Address the impact on local roads during the construction and operational phases and shall include a Road Dilapidation Report and a complete audit of the road formation and/or pavement condition.</li> </ul> </li> </ul>	<p>Proposed upgrades are outlined in the project description (Section 3) and further in Section 8.3.</p> <p>A Road Dilapidation Report and audit have been included as mitigation measures.</p>
	<ul style="list-style-type: none"> <li>● Community Consultation</li> </ul>	<p>Consultation undertaken is addressed in Section 5.4.</p>

## 5.2 CONSULTATION REGARDING THE PROPOSED SUBDIVISION OF LAND

The proposed development involves the subdivision of land that initially was thought would be dealt with separately, and at the local level via a development application. However, after review of the local instrument and in consultation with Mid-Western Regional Council, it was determined that there were no provisions within the Mid-Western Regional Council Local Environmental Plan (LEP) 2012 or State Environmental Planning Policy Infrastructure (ISEPP) that would permit approval of the subdivision at the local level.

Given the proposed development would be deemed a State Significant Development, the direction of the Department of Planning and Environment was sought, requesting that the proposed subdivision of land be assessed as part of the overall development.

A telephone conference was held on Friday 3 February 2017. In attendance was the Project Manager (First Solar), consulting town planner (NGH Environmental) and representatives from the Department of Planning and Environment.

The Department advised that they could include the subdivision in their assessment however, requested evidence from the Mid-Western Regional Council that there would be no objection to the proposal during

the notification period and that evidence of Council's concurrence would be required prior to the assessment of the proposed development.

On 2 March 2017, a formal submission was made to the Mid-Western Regional Council requesting Council. The submission outlined the State Significant Development and justified the merits of the proposed subdivision against the Mid-Western Regional Local Environmental Plan and the State Environmental Planning Policy (Rural Lands) 2008. Council responded to the submission by letter raising no objection to the proposed subdivision (refer Section 4.3.6)

### 5.3 ABORIGINAL COMMUNITY CONSULTATION

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. 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.

The full list of consultation steps, including those groups and individuals that were contacted and a consultation log is provided in Appendix E. A summary of actions carried out in following these stages are as follows.

**Stage 1.** Letters outlining the development proposal and the need to carry out an ACHA were sent to the Mudgee LALC and various statutory authorities including OEH, as identified under the ACHCRP. An advertisement was placed in the local newspaper, the Mudgee Guardian on the 18<sup>th</sup> of November 2016 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, four groups contacted the consultant to register their interest in the proposal. The groups who registered interest were Buudang, Murong Gialinga Aboriginal & Torres Strait Islander Corporation, Warrabinga Native Title Claimants Aboriginal Corporation and the Wellington Valley Wiradjuri Aboriginal Corporation.

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

**Stage 2.** On the 19<sup>th</sup> of December 2016, an Assessment Methodology document for the Beryl Solar Farm was sent to the four registered parties as noted above and the Mudgee LALC as required by OEH. 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 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. Comments were received from Warrabinga Native Title Claimants Aboriginal Corporation and the Wellington Valley Wiradjuri Aboriginal Corporation.

The main points raised in the comments received from the Wellington Valley Wiradjuri Aboriginal Corporation on the methodology were in relation to:

- Survey spacing; and
- Recording techniques for sites, specifically photography and GPS co-ordinates.

The main points raised in the comments received from the Warrabinga Native Tittle Claimants Aboriginal Corporation on the methodology were requests for further information on:

- The proposal, specifically the proposed earthworks;
- Landforms;
- The closest site to the project area; and
- Previous surveys.

These comments were addressed by NGH in reply letters sent to the Wellington Valley Wiradjuri Aboriginal Corporation on the 30<sup>th</sup> of January 2017 and the Warrabinga Native Tittle Claimants Aboriginal Corporation on the 9<sup>th</sup> of February 2017. No further correspondence was received regarding the letters from NGH Environmental that addressed the comments on the methodology from either group. No response or registration of interest in the project was received from the Mudgee LALC.

The Wellington Valley Wiradjuri Aboriginal Corporation has requested that any information they provided in regards to the project area was not shared. Therefore, the letters received as noted above have not been included in this report or appendix. As a similar courtesy, we have not included the response received from the Warrabinga Native Tittle Claimants Aboriginal Corporation.

**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.

Cultural information about to the project area was received from the Wellington Valley Wiradjuri Aboriginal Corporation however they have requested that the information provided is not shared. Therefore, the cultural information received has not been included in this report.

No other response regarding cultural information was received.

At this stage, the fieldwork was organised and all four registered parties were asked to participate in one of the two days of fieldwork. The fieldwork was carried out in late February 2017 with a representative from all four of the registered parties participating for a day of the survey.

**Stage 4** In March 2017 a draft version of this *Aboriginal Cultural Heritage Assessment Report* for the proposal (this document) was forwarded to Buudang, Murong Gialinga Aboriginal & Torres Strait Islander Corporation, Warrabinga Native Tittle Claimants Aboriginal Corporation and the Wellington Valley Wiradjuri Aboriginal Corporation inviting comment on the results, the significance assessment and the recommendations. A minimum of 28 days was allowed for responses to the document.

## 5.4 COMMUNITY CONSULTATION

First Solar Pty Ltd has undertaken consultation with the local community in developing the proposal, in line with 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 informed by *Beyond Public Meetings: Connecting community engagement with decision making* (Twyford Consulting 2007).

#### **5.4.1 Community Consultation Plan**

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

A Community Consultation Plan (CCP) was developed for the proposal. It is provided in Appendix C.1.

The aim of the CCP is to identify methods to inform the community about the Beryl SF 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 proposal development timeline to facilitate consultation.

#### **5.4.2 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 the existing visual amenity in the study area.
- Document the perceptions of the community to the proposed development.

As part of the community engagement for the proposal, 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.
- 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). The results (summarised below in Section 5.4.4) were used to inform the visual impact assessment (refer Appendix F and Section 7.3).

#### **5.4.3 Community consultation activities to date**

The following community consultation has been undertaken with regards to the proposal:

- Direct engagement with nearby neighbours through face to face meetings on 7 November 2016.
- The proposal was presented to Mid Western Regional Council planning staff on 7 November 2016. Emails were also sent to the Chamber of Commerce and Mayor on 30 January 2017. A follow up presentation was presented at a council meeting on the 15 February 2017.



- Mail out to all residents within 2km of the proposal site, notifying them of the proposal on 8 December 2016.
- Project update and feedback form mailed out to adjacent neighbours, near neighbours (residents of Beryl locality), local businesses, special interest groups and the Gulgong Chamber of Commerce 3<sup>rd</sup> February.
- Advertisement in Mudgee Guardian outlining proposal and receipt of SEARs on the 14<sup>th</sup> and 21<sup>st</sup> of February 2017
- Community Open Day held by First Solar at the CWA Hall on 23<sup>rd</sup> February 2017.
- Direct engagement with nearby neighbours through face to face meetings on 23<sup>rd</sup> February 2017
- Direct engagement with nearby neighbours through face to face meetings on 22<sup>nd</sup> March 2017
- Development of a project website to provide information and updates (<http://www.firstsolar.com/Resources/Projects/Beryl%20Solar%20Farm>)
- Establishment of dedicated email address for feedback ([berylsolarfarm@firstsolar.com](mailto:berylsolarfarm@firstsolar.com)).

#### **5.4.4 Results of community consultation**

The community consultation process was initiated on the 7 November 2016 by Tom Best, First Solar Australia Pty Ltd with face to face meetings undertaken with 10 neighbours near to the proposed solar farm site. Information regarding the potential project and First Solar was provided to residents and they were invited to provide feedback about the proposal. Feedback received by neighbours at this time included:

- That they were supportive of the project and would like to be kept informed on the planning approval progress.
- Two neighbours requested information on the exact location of the proposal.
- One neighbour was pro development as long as existing services, such as mobile phone reception, were not affected by the proposal.

A community mail out was sent to all residents within two kilometres of the proposed site, local business and community groups on the 8 December 2016. A dedicated website was also established for the Beryl SF to provide reliability and transparency of information. A feedback form and email address were provided to 44 households and 44 businesses enabling residents to comment directly on the proposal.

Feedback from residents included the following:

- Residents were generally supportive and showed interest in the consultation process.
- One resident raised concerns regarding the impacts of glare and heat of the proposal on his property.

Six local businesses provided feedback to First Solar:

- All expressed support and the positive economic benefits to the local community.
- A local mining operator had concerns regarding land conflict with the site.
- A local quarry raised concerns about traffic impacts on their operations.
- One electrical contractor expressed interest to work on the project.

Tom Best (First Solar Australia Pty Ltd) met with Mid Western Council representatives, Lindsey Dunstan and Drew Roberts on the 7 November 2016 and presented the Beryl SF proposal to the Council on the 15 February 2017. Feedback received included:

- Council members were supportive of the proposal as it will provide good use of low level farming land in the area and benefits the local community. Council appreciated the early consultation process (7 November 2016).
- Concerns were raised regarding:
  - planning development application on the parcel of land zoned R5;
  - the land around the existing house being rezoned as a new lot being below the minimum land size for land zoned RU1.
- Confirmation was given that the subdivision memo, to be circulated, would be supported by Mid Western Council (15 February 2017).

The Community Open Day, on the 23 February 2017, at the CWA Hall had 22 people attend. This included residents, local business owners, council members and associated landowners. Feedback included:

- Residents were very supportive of the project.
- Positive feedback regarding the creation of jobs, economic flow on effects to local businesses and benefits to the community were expressed.
- Visual screening was discussed and residents showed their support and wanted to be kept informed.
- Two residents raised concerns regarding impacts on access roads, namely Beryl Road and Perseverance Lane, and the effects of increased traffic on local infrastructure.
- Resident on the Southern side raised concerns regarding the potential impact to the value of adjacent land. This land is primarily used for grazing and cropping.

First Solar Australia Pty Ltd received four completed community feedback forms. The four residents lived five kilometres or less from the proposed site. Important local values to the respondents included to be living in a close community with a country lifestyle; enjoying the peace and quiet. Visual landscape values considered important included the farming landscape; views of trees, sky, hills, large paddocks and cattle.

Key concerns raised by members of the community were traffic impacts, potential decline in land value, visual impacts and the clarity of the planning approval process. All these matters have been discussed directly with the local community and included in this environmental assessment. The issues identified through the consultation process have also been addressed in the proposal design and mitigation measures included in this EIS.

#### **5.4.5 Continued engagement**

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

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

## 6 SCOPING

### 6.1 FATAL FLAWS ANALYSIS AND CONSTRAINTS MAPPING

Early in the investigation of the Beryl site, NGH Environmental prepared a fatal flaws analysis. The analysis was undertaken based on desktop review and site surveys, to identify high level constraints and major risks of the project. It assisted to guide more detailed investigations, as well as inform the development of a site layout that reflects the site's constraints.

Low, moderate and high environmental constraints were defined with reference to the 'developability' of the site. Where uncertainty exists, a higher constraint rating was applied. A preliminary constraints map was developed to guide further detailed investigations and ultimately the site infrastructure layout.

The constraints map was further refined during the preparation of the Scoping Report and following the detailed field investigations and further desktop assessments as part of the EIS. This allowed further refinements of the concept design to avoid potential environmental constraints. The final constraints map is provided in Figure 6-1 and provides the updated environmental constraints mapping for the proposal site (and key surrounding features). This includes:

- Conservation significant vegetation and threatened species
- Waterways
- Nearby residences
- Travelling Stock Reserve
- Aboriginal Heritage sites





Figure 6-1 Consolidated site constraints map



## 6.2 RISK ASSESSMENT

The Fatal Flaws Analysis and Scoping Report identified the key environmental issues likely to be associated with the Beryl SF. A risk assessment was undertaken to characterise the likely adverse environmental risks associated with the construction, operation, and decommissioning of the solar farm. The aim of the risk assessment was to ensure that all relevant risks were identified, investigated and mitigated as part of the EIS, relative to the degree of environmental risk they represented.

The environmental impact assessment below addresses all impacts likely to be attributed to the proposal (including the solar farm, access roads 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 and hazards
  - Pollution risks
- 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.

The risk rating is a factor of the **consequence** of an impact occurring and the **likelihood** of the impact occurring. Depending on the combination of consequence and likelihood, the overall risk rating could be low to extreme (refer Table 6-1). High to extreme risks (termed ‘key risks’) have warranted a higher level of investigation and discussion within the EIS. Risks identified as low to medium are discussed in less detail.

Table 6-1 Risk assessment rating matrix.

Likelihood	Consequence				
	Negligible	Minor	Moderate	Major	Catastrophic
Remote	Low	Low	Low	Medium	Medium
Unlikely	Low	Low	Medium	High	High
Possible	Low	Medium	High	Very High	Very High
Likely	Medium	High	Very High	Very High	Extreme
Almost certain/ inevitable	Medium	High	Very High	Extreme	Extreme

Table 6-2 summarises the results of the ‘unmitigated’ risk assessment. The following four key risks were investigated in detail by way of specialist assessments (refer Section 7):

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

Lower risk issues were investigated, primarily using desktop assessment. These are included in Section 8 of this EIS.

It is noted that on the basis of the investigations now documented in this EIS for key and lower risk issues, all risks are considered manageable and would have a revised ‘mitigated’ risk rating of ‘low’.

Table 6-2 Risk analysis of environmental issues

Relevant EIS section	Environmental risk	Consequence	Likelihood	Unmitigated risk rating
7.1	Biodiversity	Moderate	Likely	Very high
7.2	Aboriginal heritage	Moderate	Likely	Very high
7.3	Visual amenity	Moderate	Likely	Very high
7.4	Noise and vibration	Moderate	Likely	Very high
8.1	Soils	Minor	Likely	High
8.2	Hydrology, water use and water quality (surface and ground water)	Minor	Possible	Medium
8.3	Traffic, transport and road safety	Moderate	Possible	High
8.4	Land use including mineral resources	Minor	Possible	Medium
8.5	Historic heritage	Minor	Possible	Medium
8.6	Resource use and waste generation	Minor	Possible	Medium
8.7	Socioeconomic and community	Minor	Possible	Medium
8.8	Climate and air quality	Minor	Possible	Medium
8.9	Magnetic fields	Minor	Unlikely	Low
8.10	Bush fire risk	Minor	Unlikely	Low



## 7 ENVIRONMENTAL IMPACT ASSESSMENT: KEY ISSUES

### 7.1 BIODIVERSITY (FLORA AND FAUNA)

#### 7.1.1 Approach

A Biodiversity Assessment Report (BAR) has been prepared by NGH Environmental on behalf of First Solar (Australia) Pty Ltd. It is appended in full (Appendix D) and summarised in this section.

The aim of the BAR is to address the biodiversity matters raised in the Secretary's Environmental Assessment Requirements (SEARs) and to address the requirements of the Framework for Biodiversity Assessment (FBA), developed for Major Projects as part of the Biodiversity Offsets Policy for Major Projects. It contains the assessment methodology that is adopted by the policy to assess impacts and provide offset guidance for Major Projects. This report follows the BAR format required by the FBA.

Comprehensive mapping and field surveys were completed in accordance with the requirements in the FBA and BioBanking Credit Calculator (BCC). BCC plot data were collected in November 2016 for five homogenous vegetation zones that were mapped for the site.

Targeted flora and fauna field surveys were undertaken in early November 2016 to ensure that the majority of species likely to occur within the development site could be detected, and in accordance with the threatened species survey timing matrix produced by the BCC. The survey timing was appropriate to all flora and fauna returned by the BCC with the exception of two flora species; *Prasophyllum* sp. 'Wybong' and *Acacia ausfeldii*. The BCC identified October as the end of the survey period for these species. Targeted surveys for these species were undertaken at the beginning (first week) of November. OEH were consulted regarding the timing of the surveys for these species and advised that the November timing was considered suitable by the OEH (Steven Cox, OEH, pers. comm. 05/03/17).

Survey effort included:

#### Targeted searches for threatened flora

Targeted searches were conducted in parts of the study area considered potentially suitable for:

- Ausfeld's Wattle (*Acacia ausfeldii*)
- *Euphrasia arguta*
- Pine Donkey Orchid (*Diuris tricolor*)
- *Prasophyllum* sp. 'Wybong'
- Silky Swainson-pea (*Swainsona sericea*)

The survey areas included patches of remnant woodland with areas of suitable ground cover containing a representation of native flora. The majority of the study area, comprising improved pasture and intensively grazed pastures in low condition, was not targeted. The searches were conducted by systematically traversing the woodland areas with linear transects approximately 10 m apart.

## **Fauna habitat assessment**

An assessment of habitat types available and their quality and suitability as threatened species habitat was conducted across the project area. Factors such as arboreal resources, ground-layer resources, vegetation structure/types, as well as connectivity and disturbance were noted. All trees within the project area were inspected for hollows and general habitat values, including signs of use by fauna such as the presence of scratches/scats. An opportunistic record of fauna species observed during the fauna assessments was also taken.

### **Brush-tailed Phascogale**

Nocturnal spotlighting surveys were carried out on foot with two spotlights, (including one 50W and one 100W) and included a total of 2.5 hours of spotlighting within the treed areas of the site.

### **Koala**

During the fauna habitat assessment, described above and which included an inspection of all trees within the development envelope, including an inspection of trees for signs of fauna use, such as the presence of scratch marks or scats on or at the base of trees. Additionally, the 2.5 hours of nocturnal spotlighting surveys described above for the Brush-tailed Phascogale, also targeted the Koala.

### **Pink-tailed Legless Lizard**

During the site habitat assessment, a small area of approximately 2 ha of scattered surface rocks was noted in the eastern portion of the site. Active searches for the species was undertaken by turning over these rocks (where possible, based on overall size and degree of embeddedness), and inspecting beneath them for signs of the species. This included either direct observations of individuals, or skin sloughs left behind by individuals. Approximately 50 rocks were turned over for this inspection (which represents about the total number of potentially suitable rocks able to be effectively turned over within the area).

### **Regent Honeyeater**

Eight diurnal bird surveys (comprising primarily 30 minute surveys each) were undertaken across the site, for a combined total of 4 hours. In addition to this, 2 x 15 minute avifaunal surveys (on the morning and evening of 2/11/2016) were conducted within clumps of trees at survey site 3a, involving a general meander through this area. An additional 105 minute survey and 60 minute survey was conducted across/throughout the area identified as survey site 3b on the mornings of 3/11/2016 and 4/11/2016 respectively. These avifaunal surveys gave a total survey effort of 7.25 hours.

The surveys were conducted at both dawn and dusk when the Regent Honeyeater is most active. The survey locations were selected to cover available/potential Regent Honeyeater habitat within the project area, which was found to be restricted to woodland patches as well as isolated trees in paddocks. In addition to this, opportunistic records of all bird species observed during fauna assessments, vegetation surveys and hollow-bearing tree assessments, were also recorded.

### **Squirrel Glider**

The survey methods for this species included the nocturnal spotlighting surveys as described above for the Brush-tailed Phascogale, which included a total of 2.5 hours of nocturnal surveys over 2 nights. This level of

survey effort is generally in keeping with the NSW *Threatened Species Survey and Assessment Guidelines* (DEC, 2004) which requires 2 x 1 hour of spotlighting up to 200ha of stratification unit on two separate nights. The woodland (treed parts of the site) comprise about 32 ha, and were subject to more than 2 hours of spotlighting over two nights.

### 7.1.2 Results

#### Previous surveys conducted in the local area

It is unclear whether dedicated biodiversity surveys have been previously undertaken within the locality, however evidence from the Atlas of Living Australia indicates that occasional opportunistic surveys are undertaken and the results provided to the relevant government agencies. None of the species targeted above have been previously recorded within the development envelope.

#### Landscape attributes

The dominant IBRA subregion affected by the proposal is the Inland Slopes Subregion of the South-Western Slopes Bioregion.

Five Mitchell Landscapes occur within the development site; Talbragar – Upper Macquarie Terrace Sand, Dubbo Basalts, Gulgong Ranges, Cope Hills Granite and Macquarie – Turon Gorges. The dominant Mitchell Landscape affected by the proposal is the Talbragar – Upper Macquarie Terrace Sand Landscape.

A site based assessment was completed in the BCC, in accordance with Appendix 4 of the FBA (as the proposal is non-linear). The total area of native vegetation mapped within the outer assessment circle of 2000 ha is 508.39 ha. This reflects the high amount of land cultivation and development surrounding the site.

No rivers or permanent streams are present within the site. Two small ephemeral drainage lines are located within the north-eastern and south-western portions of the site. The former is a predominantly 2<sup>nd</sup> order stream draining north into Wialdra Creek (approx. 1.35 km north of the site boundary), and the latter is a 1<sup>st</sup> order stream draining west into Cudgegong River (approx. 900 m west of the site boundary). Both of these drainage lines were predominantly dry at the time of the survey.

There are numerous man-made dams occurring within the project area and on immediately surrounding lands. These artificial wetlands may provide potential habitat for waterbirds and amphibians, although in general, the habitat value of these dams is considered to be of low quality due to sparse aquatic vegetation and often turbid water quality.

The closest Wetlands of International Importance (Ramsar Wetlands) to the project area are the Macquarie Marshes, situated approximately 250 km northwest of the site.

No state or regionally significant biodiversity links occur within the development site and within the inner and outer assessment circles.

The BCC returned a landscape value score of 14.20.

#### Field survey results

##### PLANT COMMUNITY TYPE

One Plant Community Type (PCT) was identified in the development site; *Rough-barked Apple – red gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions* (PCT281).

Cleared areas that were dominated by non-indigenous vegetation are not considered to provide habitat for native species and thus were not included in the BCC calculations.

Within the project area, PCT 281 occurs as small patches of good condition woodland in the western and central parts of the site, and areas of low condition woodland across the majority of the central parts of the site. Low condition derived grasslands occur across the majority of the central and north-eastern parts of the site and mixed condition derived ephemeral wetland vegetation also occurs across the other parts of the north-eastern portion of the site. The low condition derived grasslands and mixed condition derived ephemeral wetland vegetation are also considered part of PCT 281 as they are derived from this woodland community, even though these areas are generally devoid of trees, and have a proportionately low percentage of native groundcover. These low condition areas represent highly degraded pasture, and it is considered likely that most of these areas have been cultivated and possibly cropped in the past. The distribution of PCT 281 at the site is mapped on Figure 7-1. Figure 1-1

White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland is listed as an EEC under the TSC Act and is listed as a CEEC under the EPBC Act. PCT 281 forms part of this community.

The community occurs across the majority of the western half of the site, and includes areas of moderate to good and low condition woodland (identified as Zones 1, 2 and 3). These areas of the TSC-listed EEC are characterised by areas where the overstorey (treed) vegetation is at the benchmark cover value and with some native groundcover (rated as moderate/good condition), as well as areas where there is overstorey (treed) vegetation at or above 25% of the lower benchmark cover value but has groundcover vegetation dominated by exotics. A total of 17.13 ha of this EEC occurs within the development footprint.

The low condition and highly modified derived grasslands (Zones 4 and 5) do not meet the criteria for the EEC or CEEC.

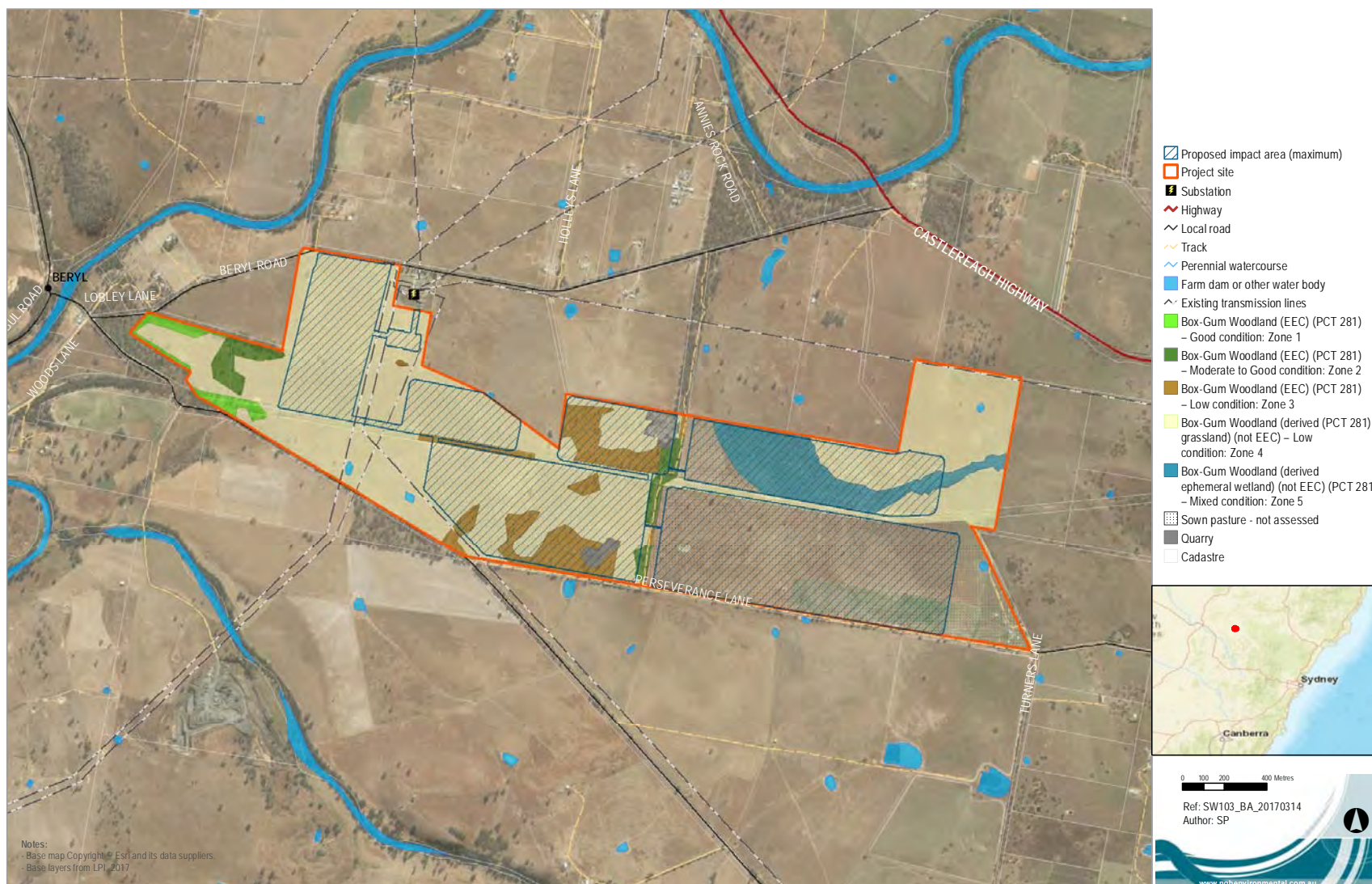


Figure 7-1 Distribution of PCT's





Figure 7-2 Distribution of EEC and EEC condition





Figure 7-3 Example of moderate/good condition Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions in the project area



Figure 7-4 An example of exotic-dominated vegetation within the project area

## THREATNED SPECIES

Three threatened species listed under the NSW TSC Act were detected during the survey, including:

- Dusky Woodswallow *Artamus cyanopterus cyanopterus* – Vulnerable (TSC Act)
- Silky Swainson-pea *Swainsona sericea* – Vulnerable (TSC Act)
- Pine Donkey Orchid *Diuris tricolor* – Vulnerable (TSC Act)

The Silky Swainson-pea and Pine Donkey Orchid are species credit species, whilst the Dusky Woodswallow is neither an ecosystem or species credit species.

### Biobanking Credit Calculator results

Applying the above information to the BCC assessment, the following data were entered into the BCC and returned the site value scores and areas of impact detailed in Table 7-1 below. It is noted that Zone 4 and 5 do not comprise an EEC or threatened species habitat and impacts to these zones do not generate credits under the FBA. No areas of habitat for species credit species would be impacted by the proposal.

Table 7-1 Vegetation zones for the development site

Zone ID	Vegetation zones	Condition class	EEC status (NSW TSC Act)	Area (ha) within development footprint	Survey effort (number of plots completed)	Site value score (current)
1	PCT #281 BVT #CW111 Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Moderate - good	Yes	0	2	66.67
2	PCT #281 BVT #CW111 Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Moderate - Good	Yes	0.99	3	67.33
3	PCT #281 BVT #CW111 Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Low	Yes	16.14	3	47.33
4	PCT #281 BVT #CW111 Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Low	No	95.04	3 (+2)	10

Zone ID	Vegetation zones	Condition class	EEC status (NSW TSC Act)	Area (ha) within development footprint	Survey effort (number of plots completed)	Site value score (current)
5	PCT #281 BVT #CW111 Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Moderate - good	No	17.89	3	20.67

The outcome of the FBA BCC assessment is that a total of 684 ecosystem credits have been generated for the development site (BCC Major Project 0035/2017/4165MP Version 1). The BCC full credit report is included within the BAR, Appendix D.

#### ECOSYSTEM CREDITS

- PCT 281 - Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions – 684 Credits

#### SPECIES CREDITS

No species credits are generated by the proposal

To offset the impacts of the development, these credits must be retired, either through the establishment of an offset onsite, retirement at another offset site, or purchase of credits on the Public Biobanking Register.

### 7.1.3 Commonwealth Matters of National Environmental Significance (MNES)

An EPBC protected matters report was undertaken on the 12 October 2016 (10km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site. The MNES relevant to the biodiversity assessment are summarised below.

#### WETLANDS OF INTERNATIONAL IMPORTANCE

Four wetlands of international importance were returned from the protected matters report. The nearest of these (approximately 250 km from the development site) is the Macquarie Marshes. All other wetlands returned from the search are over 500 km away. There is no apparent connectivity between the development site and the Macquarie Marshes.

#### THREATENED ECOLOGICAL COMMUNITIES

Four threatened ecological communities were returned from the protected matters report. One of these, the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC occurs within the development site. Based on the EPBC listing criteria, 4.43 ha of the CEEC occurs west of the development footprint (equivalent to Zone 1). It would not be impacted by the development.

The other three EEC's are not present within or near the proposal site.

#### THREATENED SPECIES

Twenty-nine threatened species were returned from the protected matters report. None of the listed species are considered to have the potential to utilise the habitats at the development site, based on either or both an assessment of the habitat conditions present at the site, or a lack of existing records in the database within close proximity (i.e. less than 15 km) to the site.

#### MIGRATORY SPECIES

Eight listed migratory species were returned from the protected matters report. None of these species are considered likely to occur at the site on a regular basis or rely on the habitats present.

### **7.1.4 Potential impacts**

#### **Avoidance measures**

A preliminary constraints analysis was conducted by NGH Environmental (2016) which informed the site layout design. This analysis included identification of low, moderate and high environmental constraints, as summarised below. From this assessment, a development footprint was established which was designed to minimise impacts on the Zone 1 EEC/CEEC vegetation in the far-west of the project site, including avoidance of the small woodland patches in the west of the site which have the potential to support listed threatened species such as the Silky Swainson-pea and Pine Donkey Orchid.

After the first calculation of offset requirements, the layout was further scrutinised in terms of 'credit drivers'. The layout was further adapted:

- To remove all impacts on Zone 1 EEC/CEEC vegetation
- To reduce impacts on Zone 2 and 3 EEC, where they occur near the north-south lane way in the centre of the site. A 30 m buffer either side of the fenced lane way was mapped and the development footprint excluded from this buffer.

The array has been designed to utilise the suitable flat clear land within the site. It is noted that the area within the north east of the site is not suitable for the deployment of PV as it is located on the southern face of a small hill and is further constrained by the rail corridor. The area of the site south of the existing Beryl substation contains numerous transmission lines and due to shading issues and the existing easements it is not considered suitable to construct a PV array within the remaining area.

The final design footprint allows for areas of better quality vegetation at the western corner of the project site (as well areas along the south-western boundary) to be avoided. These have been highlighted as potential offset / revegetation sites. They would contribute to local landscape connectivity.

#### **Construction and decommissioning**

In addition to the offset requirement, direct impacts that must be managed during construction and decommissioning include:

- Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks). The consequences of this impact may include:
  - Direct loss of native flora and fauna habitat
  - Potential clearing of habitat outside of the development footprint

- Injury and mortality to fauna during clearing of fauna habitat
- Introduction and spread of noxious weeds and pathogens
- Disturbance to fallen timber, dead wood and bush rock

A commitment to a Flora and Fauna Management Plan to address the risks during construction and decommissioning forms part of the proposal.

Indirect impacts identified in the BAR included risks for soil and water contamination, weed and feral animal encroachment into areas adjacent to the site or the generation of excessive dust, light or noise and associated disturbance to fauna. Where not already included as soil and water mitigation commitments of the proposal, these issues are addressed in the mitigation measures below.

## Operation

Direct impacts that must be managed during operation include:

- Collision risk to birds and microbats to exterior barbed-wire fencing
- Shading by solar array infrastructure. The consequences of this impact may include:
  - Ongoing prevention of flora regeneration
  - Unstable ground surfaces and sedimentation of downstream habitats

Indirect impacts identified in the BAR included risks for light spill, weed encroachment, increased vehicle traffic, solar array microclimate, fences, pest animals, and mobilisation of sediments. Where not already included as soil and water mitigation commitments of the proposal, these issues are addressed in the mitigation measures below.

### 7.1.5 Safeguards and mitigation measures

The safeguards provided in the BAR are restated below and would be implemented to minimise and manage risks to biodiversity values. Soil and water measures that would also act to management impacts on adjacent habitats are included in those sections and not duplicated below.

Table 7-2 Safeguards and mitigation measures for biodiversity impacts

C: Construction, O: Operation, D: Decommissioning

Safeguards and Mitigation Measures	C	O	D
<ul style="list-style-type: none"> <li>• Hollow-bearing trees within the development site would not be cleared between June and January, to avoid the breeding season of hollow-dependant fauna including the Superb Parrot as well as the Large-eared Pit Bat and Corben's Long-eared Bat, which whilst considered unlikely to occur within the site, nevertheless may have some small potential as occurring within the site from time to time. The nominated clearing period above will also help to avoid the core hibernation period for the two bat species.</li> <li>• If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure these species do not occur.</li> </ul>	C		
<ul style="list-style-type: none"> <li>• Preparation of a Flora and Fauna Management Plan (FFMP) that would incorporate protocols for:               <ul style="list-style-type: none"> <li>○ Protection of native vegetation to be retained (including EEC)</li> </ul> </li> </ul>	C		



Safeguards and Mitigation Measures	C	O	D
<ul style="list-style-type: none"> <li>Best practice removal and disposal of vegetation</li> <li>Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist. Where possible, fallen timber with hollows is to be collected and placed into adjacent suitable habitats outside the development footprint.</li> <li>The relocation of displaced fauna during clearing</li> <li>Weed management, particularly noxious weeds</li> <li>Pathogen management</li> <li>Unexpected threatened species finds</li> <li>Rehabilitation/stabilisation of disturbed areas.</li> </ul>			
<ul style="list-style-type: none"> <li>Stockpiling materials and equipment and parking vehicles will be avoided within the dripline (extent of foliage cover) of any native tree that originates from outside of the development site.</li> <li>Prior to the commencement of work, a physical vegetation clearing boundary at the approved clearing limit is to be clearly demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>Use non barbed-wire on exterior fencing where possible.</li> </ul>		O	
<ul style="list-style-type: none"> <li>A groundcover management plan would be developed and implemented to ensure the existing ground cover is maintained beneath the array during operation of the solar farm. The plan would be developed with reference to soil testing. Highly managed grazing may be used to maintain the height of ground cover during operation.</li> </ul>		O	
<ul style="list-style-type: none"> <li>Where possible, landscape plantings will be comprised of local indigenous species with the objective of increasing the diversity of the existing vegetation. Planting locations would be designed to improve the connectivity between patches in the landscape where consistent with landscaping outcomes.</li> </ul>		O	
<ul style="list-style-type: none"> <li>Avoid night works as much as possible, and avoid altogether where in close proximity to woodland habitats on adjacent properties.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>Ensure lights (during nightworks and operation) are directed away from vegetation and adjacent habitats.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>Weed and hygiene protocols will be prepared and implemented.</li> </ul>		O	
<ul style="list-style-type: none"> <li>Awareness training (fauna collision risks) during site inductions and enforcement of site speed limits.</li> </ul>		O	
<ul style="list-style-type: none"> <li>Feral species to be monitored and a management plan to be prepared and implemented to reduce feral species abundance.</li> </ul>	C	O	
<ul style="list-style-type: none"> <li>Implement plan which ensures that fauna movement still possible around perimeter of development site.</li> </ul>	C	O	
<ul style="list-style-type: none"> <li>A Biodiversity Offset Strategy (BOS) would be developed and implemented to retire the credits generated by the proposal, in</li> </ul>	C	O	



Safeguards and Mitigation Measures	C	O	D
accordance with the NSW Biodiversity Offsets Policy for Major Proposals.			

## 7.2 ABORIGINAL HERITAGE

### 7.2.1 Approach

A specialist Aboriginal Cultural Heritage Assessment Report (ACHAR) was undertaken to provide an assessment of the Aboriginal cultural values associated with the proposal site and to assess the cultural and scientific significance of any Aboriginal heritage sites recorded.

The full report is provided in Appendix E and is summarised below.

This ACHA Report was prepared in line with the following:

- *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)

*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.

As a result of this process, four groups contacted the consultant to register their interest in the proposal. The groups who registered interest were Buudang, Murong Gialinga Aboriginal & Torres Strait Islander Corporation, Warrabing Native Title Claimants Aboriginal Corporation and the Wellington Valley Wiradjuri Aboriginal Corporation. No other party registered their interest, including the entities and individuals recommended by OEH.

The fieldwork was organised and all registered parties were asked to participate in one of the two days of fieldwork. The fieldwork was carried out in late February 2017 with a representative from all four of the registered parties participating for a day of survey.

A copy of the draft report was provided to all the registered parties for comment.

### 7.2.2 Archaeological context

The assessment included a review of relevant information relating to the existing landscape of the proposal area. Included in this was a search of the OEH AHIMS database. No Aboriginal sites had previously been recorded within and adjacent to the proposal area. The closest AHIMS site to the project area was recorded as an open artefact site (AHIMS # 36-2-0016) located approximately 500m north of the assessment area.

Assessment of Aboriginal site models for the region suggest that there appears to be a pattern of site location that relates to the presence of potential resources for Aboriginal use. The most archaeologically

sensitive areas are noted to occur within 100-400 m of water. Nonetheless, given that Aboriginal people have lived in the region for tens of thousands of years, there is some potential for archaeological evidence to occur across the proposal area. This would most likely be in the form of stone artefacts and scarred trees.

### 7.2.3 Survey results

The intention for the heritage survey was to cover as much of the ground surface as possible, given that the project was going to disturb approximately 206ha, within the 332ha proposal site. Survey transects were undertaken on foot across the project area to achieve maximum coverage. All mature trees within or adjacent to the development footprint were also inspected for evidence of Aboriginal scarring. Visibility within the project area was variable with visibility ranging from 80% in exposures to less than 5%. The average effective visibility was 15% but overall was quite good.

Between the survey participants, over the course of the field survey, approximately, 100km of transects were walked across the proposed solar farm development area. Allowing for an effective view width of 5m each person, this equates to a surface area examined of 46ha. However, allowing for the visibility restrictions, the effective survey coverage was reduced to 6.9 ha, or 3.3% of the project area. The effective survey coverage for the area outside the development plan was lower at 1.9 ha or 1.5%.

Despite the variable visibility encountered during the survey, there were six stone artefacts found across the proposal area that were recorded as five site occurrences. The archaeological features have been recorded as an artefact scatter (Beryl Solar Farm AS1) and four isolated finds (Beryl Solar Farm IF 1, Beryl Solar Farm IF 2, Beryl Solar Farm IF 3 and Beryl Solar Farm IF 4).

In terms of the current proposal therefore, extrapolating from the results of this survey, it is possible that additional stone artefacts could occur within the proposed development footprint. Based on the land use history of the proposal area, and an appraisal of the results from the field survey, there is negligible potential for the presence of intact subsurface deposits with high densities of objects or cultural material within the solar farm and powerline easement areas.

The models of site location for the area have been shown to be accurate, with the current survey confirming the predicted distribution and nature of archaeological material with the sites located within 100-400m to a water source, even in areas highly disturbed by farming activities.

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

### 7.2.4 Potential impacts

The proposal involves the construction of a solar farm and includes connection to the nearby substation with an above ground powerline on Lot 21/DP 1173059 that will extend to the existing Beryl substation on Lot 1/ DP 523876. The development will result in disturbance of almost 206ha of the 332ha property within Lot 20/DP 1173059 and Lot 1/DP 1012926. 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 Aboriginal objects by the development in its present form.

Table 7-3 Identified risk to known sites

Site name	Site integrity	Type of harm	Degree of harm	Consequence of harm	Recommendation
Beryl Solar Farm IF 1	Poor – 100+ year history of agricultural and pastoral use	Direct	Complete	Minimal loss of value	Salvage object prior to development of project.
Beryl Solar Farm IF 2	Poor – 100+ year history of agricultural and pastoral use	Direct	Complete	Minimal loss of value	Salvage object prior to development of project.
Beryl Solar Farm IF 3	Poor – 100+ year history of agricultural and pastoral use	Direct	Complete	Minimal loss of value	Salvage object prior to development of project.
Beryl Solar Farm IF 4	Poor – 100+ year history of agricultural and pastoral use	Direct	Complete	Minimal loss of value	Salvage object prior to development of project.
Beryl Solar Farm AS1	Poor – 100+ year history of agricultural and pastoral use	Direct	Complete	Minimal loss of value	Salvage objects prior to development of project.

The impact to the scientific values if the sites Beryl Solar Farm IF 1, Beryl Solar Farm IF 2, Beryl Solar Farm IF 3, Beryl Solar Farm IF 4 and Beryl Solar Farm AS 1 were to be impacted by the current proposal is considered low. The stone artefacts have 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 artefacts and in the development of Aboriginal site modelling, which has largely now been realised by the recording.

The Beryl Solar Farm proposal is classified as State Significant Development under the EP&A Act which 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 as the Department of Planning and Environment provides development approval.

### 7.2.5 Safeguards and mitigation measures

The ACHAR identifies that the development proposal can proceed with no additional archaeological investigations. The report identifies a number of safeguards, these are identified below, tabulated by find in Table 7-4 and stipulated as project commitments in the Safeguards and mitigation measures in the table below.

Table 7-4 Safeguards and mitigation measures for Aboriginal heritage

C: Construction, O: Operation, D: Decommissioning

Safeguards and Mitigation Measures	C	O	D
<ul style="list-style-type: none"> <li>If complete avoidance of the five recorded sites within the proposal area (Beryl Solar Farm IF 1, Beryl Solar Farm IF 2, Beryl Solar Farm IF 3, Beryl Solar Farm IF 4 and Beryl Solar Farm AS 1) is not possible, the artefacts must be salvaged prior to the proposed work commencing and moved to a safe area within the property that will not be subject to any ground disturbance.</li> </ul>	C		
<ul style="list-style-type: none"> <li>The collection and relocation of the artefacts should be undertaken by an archaeologist with representatives of the</li> </ul>	C		

Safeguards and Mitigation Measures	C	O	D
registered Aboriginal parties. A new site card/s will need to be completed once the sites are moved to record their new location on the AHIMS database.			
<ul style="list-style-type: none"> <li>Once the sites Beryl Solar Farm IF 1, Beryl Solar Farm IF 2, Beryl Solar Farm IF 3, Beryl Solar Farm IF 4 and Beryl Solar Farm AS 1 are salvaged, the proposed work can proceed with caution within the development footprint.</li> </ul>	C		
<ul style="list-style-type: none"> <li>First Solar should prepare an Unexpected Finds Protocol (UFP) to address the potential for finding additional Aboriginal artefacts during the construction of the Solar Farm. The UFP will outline the procedure to deal with construction activity. Preparation of the UFP should be undertaken in consultation with the registered Aboriginal parties</li> </ul>	C		
<ul style="list-style-type: none"> <li>In the unlikely event that human remains are discovered during the construction, all work must cease in the immediate vicinity. OEH, the local police and the registered Aboriginal parties should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Further archaeological assessment would be required if the proposal activity extends beyond the area of the current investigation. This would include consultation with the registered Aboriginal party and may include further field survey.</li> </ul>	C	O	D

## 7.3 VISUAL IMPACT

NGH Environmental completed a Visual Impact Assessment (VIA) of the proposed Beryl Solar Farm (provided in full, Appendix F 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 ensures the reliability of the mitigation strategy and provides a trigger to undertake additional mitigation if required.

### 7.3.1 Approach

The VIA 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 VIA is based on the Bureau of Land Management (BLM) Visual Resource Management System, developed by the BLM, US Department of the Interior (n.d). The

BLM developed a systematic process to analyse the visual impact of proposed developments. The basic philosophy states that the degree to which a development affects the visual landscape depends on the visual contrast imposed by the proposal. Mitigation measures are considered to be required for areas with a high visual impact; for medium and low impacts, the contrast is considered acceptable and mitigation is not required.

For the purpose of the assessment, a height of 3m was used to model onsite infrastructure to the proposal boundary extents. This is a realistic approximation of the height of panels and inverter containers, which may actually be 2.3m and 3.4m, respectively. It is conservative as panels may not be distributed to the site boundaries and the model does not take into account screening such as vegetation or infrastructure. On this basis is considered a 'worst case' model. The full methodology is provided in Appendix F.

### **7.3.2 Results**

#### **Existing environment**

The proposed Beryl Solar Farm location is located on the edge of a rural residential area, in an area of moderate scenic quality and in close proximity (<1km) of a number of residences. Thirty-one residences have been counted from aerial imagery within 1 km of the site. Sixty-nine residences have been counted within 5km of the site<sup>1</sup>.

The visual outlook around Beryl is typical of many places of rural NSW. It is characterised by mainly cleared low land areas, dissected by creeks and rivers, where riparian corridors are largely retained. Surrounding forested hills and ranges rise up to contain the low lands, occurring as disconnected remnants to the north, west and south.

The Beryl locality's visual landscape is dominated by large parcels of cleared agricultural land with scattered trees; extensive grazing of horses and cattle is the predominant agricultural activity. Large lot rural residences as well as clusters of smaller lot residential subdivisions occur. Sheds, tanks and farm machinery contribute to the rural character. House and garden plantings around houses contribute to the residential character. The proposed solar farm site is currently worked agricultural land (grazing).

The Beryl locality contains no look outs, promoted scenic areas or formalised recreational infrastructure however, notable features that are likely to be valued for their visual character include:

- Views of the surrounding forested ranges and hill tops, hemming in the fertile alluvial landscape; occurring as disconnected remnants to the north, west and south of the proposed solar farm site, between 1 and 8km from the proposed solar farm site.
- Riparian corridors such as Wialdra Creek and Cudgegong River, including timber truss bridges and providing river access in a number of locations.
- Yarrobil National Park, accessed off Spring Ridge Road. The Yarrobil National Park is approximately 8km from the site.
- The historic property of Guntawang, including race track and stables, accessed off Goolma Road, approximately 3km from the proposed solar farm site.

Nearby, Gulgong's historic township offers:

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<sup>1</sup> This is considered an estimate as errors can occur; small houses may be overlooked and sheds may be incorrectly counted as residences.



- Formalised parks and lookout areas (including Flirtation Hill, which looks in the direction of the proposed solar farm site).
- Historic buildings.
- Scenic residential areas.

Refer to Figure 7-5.



Figure 7-5 Scenic vistas in the study area

Left to right from top: Views of the surrounding forested ranges and hill tops, Riparian corridors and creek access, Gulgong's historic township, Yarrobil National Park.

### Values of the local community to the proposal

Community consultation undertaken to inform the assessment and design of the proposal is summarised in Section 5.5 of this EIS. Comments relevant the community's perception about solar farms and visual values have been included below.

- Surrounding landowners are generally supportive of the project.
- Residents in the locality were generally supportive and showed interest in the consultation process.
- One resident raised concerns regarding the impacts of glare and heat of the proposal on his property.
- Visual screening as a means to minimise views of infrastructure was discussed at the open house event.
- One resident raised concerns regarding the potential impact to the value of adjacent land (currently used for grazing and cropping).

Important local values to the respondents of the feedback forms included:



- To be living in a close community
- Country lifestyle
- The peace and quiet.

The visual landscape values considered important to respondents included:

- The farming landscape
- Views of elements including trees, sky, hills, large paddocks and cattle.

One of the key concerns raised by members of the community was potential for visual impacts.

### **Landscape character units (LCU) and representative viewpoints**

LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a device that can be used to group areas that may be similarly affected by a development. Four key LCUs were identified within 16km of the proposed solar farm site:

- Agricultural (most commonly, grazing lands).
- Native vegetation remnants (includes roadside corridors, riparian areas and surrounding ranges).
- Rural residential (mostly large RU1 Primary Production lots but including some smaller R5 Village lots to the north and west of the site).
- Urban (Gulgong town centre and residential areas).

These four LCUs are characterised below in terms of their scenic quality.

#### **Landscape Character Unit - Agricultural**

Scenic quality is moderate. Natural landscape elements (ranges and alluvial flats) have visually pleasing elements and contrast. View locations are varied, given the short sightlines and framing influence of local topography and remnant vegetation. However, built elements are clearly production related and include low density supporting infrastructure; linear fences, powerlines, roads and agricultural buildings and rural houses.

This LCU is common in the study area, but has features and variety. The proposed solar farm site is located within this LCU, but is on the edge of the rural residential LCU.



### **Landscape Character Unit – Native vegetation remnants**

Scenic quality is low. Forms are generally uniform, lacking variety, but are organic rather than straight, and of low elevation and provide a pleasing visual contrast to the agricultural LCU. Colour variation is low. The extent of the remnants acts to reduce sight lines and view extent, framing shorter duration views.

This LCU is common in the study area.



### **Landscape Character Unit – Rural residential**

Scenic quality is considered moderate. These areas have variety in colour and form. Built elements and landscaping contribute to the character type.

This LCU is not common in the study area.



### Landscape Character Unit – Urban

Scenic quality is considered high. These areas have variety in colour and form. They contribute to a unique historic character type. Elements include recreational aspects; parks and gardens. The character is important in defining the town and contributes to its local economy.

This LCU is not common in the study area.



Representative viewpoints within each LCU were identified using Zone of Visual Influence (ZVI) modelling. This was to ensure all viewpoints are located in the 'view shed' of the solar farm. The ZVI modelling (provided as an appendix of the Visual Assessment) assumes the proposal could be modelled as a 3m high rectangular block. This is realistic approximation of the height of panels and inverter containers, which may actually be 2.3m and 3.4m, respectively. Topography was based on a 25m resolution Digital Elevation Model (DEM) derived from 25m contours. The ZVI does not take into account screening such as vegetation or infrastructure and on this basis is considered a 'worst case' model.

The predicted sensitivity of each viewpoint was then be determined, considering its proximity to the proposed solar farm site and factors such as use, scenic quality and regional significance. Figure 7-6 illustrates the locations of these representative viewpoints with reference to the proposal site and Table 7-6 provides details of representative viewpoints. Criteria for proximity and sensitivity are provided in the full visual assessment, Appendix F.

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

- Generally, within the Agricultural LCU, whether viewed from pastures, roadside or residences, these viewpoints were assessed to be of low sensitivity. These are low use roads in a production dominated landscape. View extents are often limited or broken up by existing native vegetation remnants and house plantings. Sensitivity to contrast is expected to be low. The exception to this may be elevated residences that are oriented to take in the pastoral view.
- Where viewpoints within the Native vegetation remnants LCU have a recreational component, such as creek access or lookouts, or where residences occur, a moderate sensitivity has been assigned. In other areas, these are considered low sensitivity, reflecting low use and a low level of 'uniqueness'. Further, view extents are often limited or broken up by existing native vegetation in these areas.
- Generally, rural residential viewpoints have been assigned a moderate sensitivity. In areas where a village character is developing, they are considered to have some local significance.

- Residential and recreational viewpoints in urban areas were assigned high sensitivity. These are located in high use areas and the unique historic character of the Gulgong township has local significance.

The sensitivity of each viewpoint is tabulated below.

Table 7-5 Representative viewpoints, proximity, scenic quality and resulting sensitivity

ID	LCU	View location	Proximity	Scenic quality	Sensitivity
1	Agricultural	Road	Foreground	Moderate	Low
2	Agricultural	Residential	Middle ground	Moderate	Low
3	Agricultural	Road	Foreground	Moderate	Low
4	Agricultural	Residential	Middle ground	Moderate	Low
5	Agricultural	Road	Middle ground	Moderate	Low
6	Agricultural	Road	Middle ground	Moderate	Low
7	Agricultural	Road	Middle ground	Moderate	Low
8	Remnant	Creek	Foreground	Low	Moderate
9	Remnant	Residential	Middle ground	Low	Moderate
10	Remnant	Road	Foreground	Low	Low
11	Remnant	Road	Foreground	Low	Low
12	Remnant	Road	Foreground	Low	Low
13	Remnant	Road	Middle ground	Low	Low
14	Remnant	Recreation	Middle ground	Low	Moderate
15	Rural residential	Road	Foreground	Moderate	Moderate
16	Rural residential	Residential	Middle ground	Moderate	Moderate
17	Rural residential	Residential	Foreground	Moderate	Moderate
18	Rural residential	Residential	Foreground	Moderate	Moderate
19	Rural residential	Residential	Foreground	Moderate	Moderate
20	Rural residential	Road	Foreground	Moderate	Moderate
21	Urban	Recreational	Middle ground	High	High
22	Urban	Residential	Middle ground	High	High



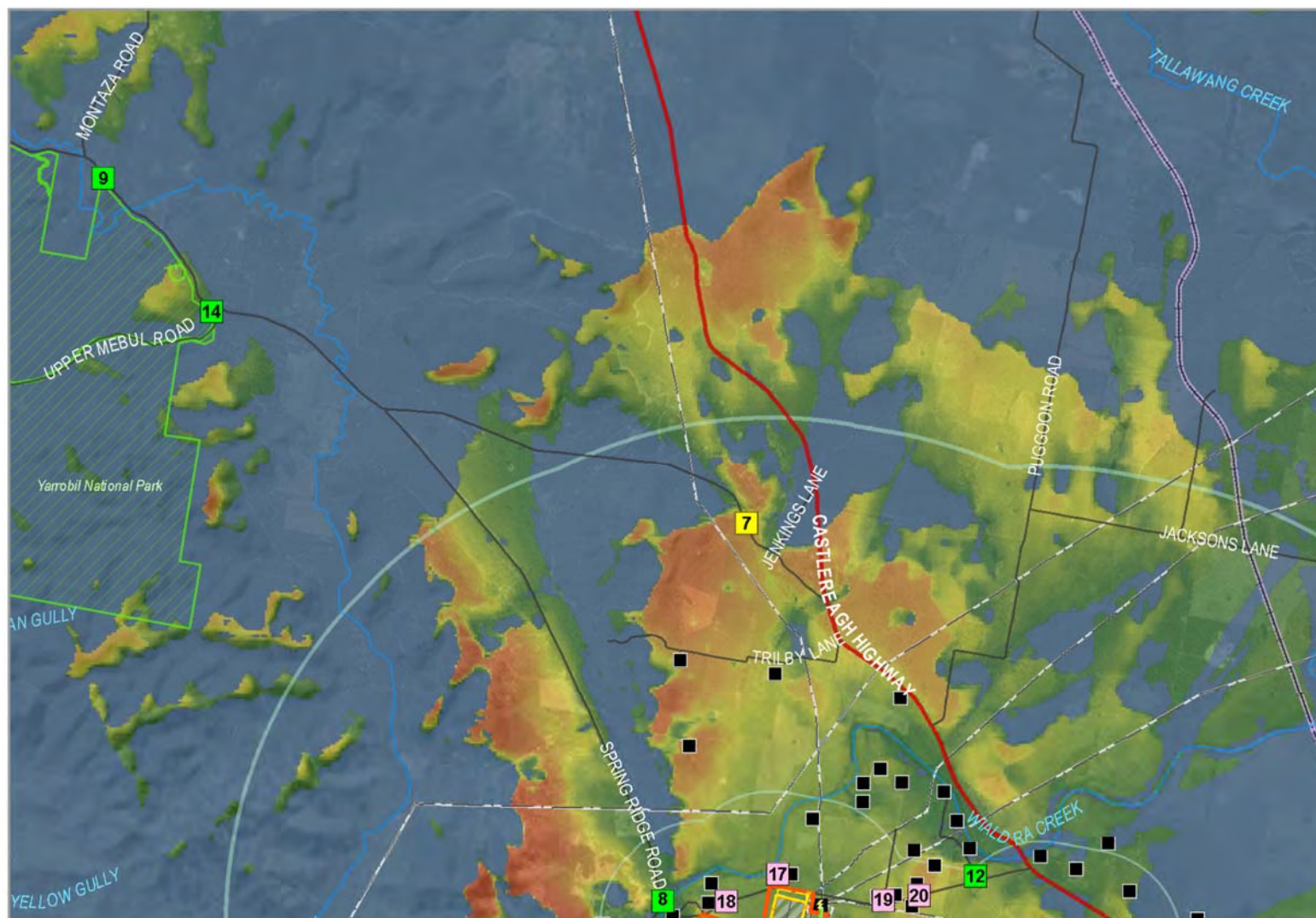


Figure 7-6 Location of representative viewpoints and array infrastructure ZVI (fore and midground view)



### 7.3.3 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.

#### Evaluation criteria

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

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

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

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

For high impact viewpoints, mitigation must be considered.

The table below evaluates the representative viewpoints. They are ordered in terms of highest visual impact rating (medium). Viewpoints assessed to have a low impact (negligible or not perceived and considered acceptable) are excluded below but provided in full, Appendix F.

Representative photos (including panoramas for selected locations) of the existing views are provided below. In the panoramas below, the visual extent of the 'worst case infrastructure layout'<sup>2</sup> is shown as follows:

- Green is the estimated visible extent of arrays, excluding shielding by trees/infrastructure: this is the extent of the array most likely to be observable.
- Yellow areas are likely to be shielded by trees/infrastructure: infrastructure in this area is unlikely to be visible.
- Red is the estimated extent of the solar farm site boundary within the view field.

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<sup>2</sup> This is the infrastructure footprint prior to reducing the western extent of the array. The panorama extents were based on the earlier layout and are in this case conservative; actual view extents would be less from some locations.

Table 7-6 Visual impact at representative viewpoints with reference to the Beryl Solar Farm, in order of highest impact

ID	LCU	Viewpoint	Proximity	LMZ objective	Contrast	Visual impact	Comment
17	Rural residential	Residential	Foreground	B Protect dominant visual features	Medium	Medium	<p>The infrastructure would be moderately dominant from this location. The horizontal view of infrastructure would be limited due to existing vegetation. Views would be broken up to a minor extent by existing roadside vegetation. This landscape can absorb some change but dominant visual features should be protected. The contrast of the low height solar array infrastructure is considered acceptable.</p> <p><b>Mitigation is recommended but not required.</b></p> <p>Additional vegetation planting on the site's northern boundary would minimise visual impacts further.</p>



ID	LCU	Viewpoint	Proximity	LMZ objective	Contrast	Visual impact	Comment
18	Rural residential	Residential	Foreground	B Protect dominant visual features	Medium	Medium	<p>The infrastructure would be moderately dominant from this location. The horizontal view of infrastructure would be limited due to the location of existing vegetation and placement of infrastructure. Views would be screened to a minor extent by existing roadside vegetation. This landscape can absorb some change but dominant visual features should be protected. The contrast of the low height solar array infrastructure is considered acceptable.</p> <p><b>Mitigation is recommended but not required.</b></p> <p>Additional vegetation planting on the site's north-east corner would minimise visual impacts further.</p>





ID	LCU	Viewpoint	Proximity	LMZ objective	Contrast	Visual impact	Comment
19	Rural residential	Residential	Foreground	B Protect dominant visual features	Medium	Medium	<p>The infrastructure would be moderately dominant from this location. The horizontal view of infrastructure would be limited by topography and existed vegetation. Views would be screened to a minor extent by existing roadside vegetation. This landscape can absorb some change but dominant visual features should be protected. The contrast of the low height solar array infrastructure is considered acceptable.</p> <p><b>Mitigation is recommended but not required.</b></p> <p>Additional vegetation planting on the site's northern boundary would minimise visual impacts further.</p>



ID	LCU	Viewpoint	Proximity	LMZ objective	Contrast	Visual impact	Comment
20	Rural residential	Road	Foreground	B Protect dominant visual features	Medium	Medium	<p>The infrastructure would be moderately dominant from this location. The horizontal view of infrastructure from the closest receiver at this location (which backs onto the solar site) may be expansive. Views would be broken up to a minor extent by existing buildings and vegetation. This landscape can absorb some change but dominant visual features should be protected. The contrast of the low height solar array infrastructure is considered acceptable.</p> <p><b>Mitigation is recommended but not required.</b></p> <p>Additional vegetation planting on the site's northern boundary would minimise views further.</p>





ID	LCU	Viewpoint	Proximity	LMZ objective	Contrast	Visual impact	Comment
1	Agricultural	Road	Foreground	C Landscapes are able to absorb change	Medium	Medium	<p>The infrastructure would be dominant and noticed from this location. The horizontal view of infrastructure would be expansive. Views would be of short duration (by motorists and agriculturalists working in paddocks) and screened to a minor extent by existing roadside vegetation. This landscape can absorb change. The contrast is acceptable.</p> <p><b>No mitigation required</b></p>



ID	LCU	Viewpoint	Proximity	LMZ objective	Contrast	Visual impact	Comment
11	Remnant	Road	Foreground	C Landscapes are able to absorb change	Medium	Medium	<p>The infrastructure would be dominant and noticed from this location. The horizontal view of infrastructure would be expansive. Views would be of short duration (by motorists and agriculturalists working on properties) and screened to a minor extent by existing roadside vegetation. This landscape can absorb change. The contrast is acceptable.</p> <p><b>No mitigation required</b></p>



### Visual impact assessment at representative viewpoints

The highest predicted impacts were identified for four rural residential viewpoints, one agricultural viewpoint and one remnant viewpoint. All are located in the foreground proximity; within 1km of the proposed solar farm site.

Table 7-7 Highest visual impact: summary

ID	LCU	Viewpoint	Visual impact
17	Rural residential	Residential	Medium
18	Rural residential	Residential	Medium
19	Rural residential	Residential	Medium
20	Rural residential	Road	Medium
1	Agricultural	Road	Medium
11	Remnant	Road	Medium

In all cases, these locations have expansive views of the proposed infrastructure and, while the landscapes can absorb some change and the contrast is considered acceptable, some further screening could be effective in further 'breaking up' views of the infrastructure. This would assist to protect the dominant visual features, which include native vegetation and planted landscaping. This is particularly warranted where residences and residential access ways are affected; viewpoints 17, 18, 19 and 20.

In all cases, the contrast of the proposed infrastructure is considered acceptable, but mitigation is recommended. Proposed onsite screening locations are provided in Appendix F specifically aiming to address impacts from these locations.

Generally, the visibility of low lying infrastructure (less than 3m) is low. This is on account the generally flat terrain, meaning that the view diminishes rapidly with distance from the site. It is noted however, that local rises in some cases assist to screen the site (receivers to the north-east and south) and in some cases may expand the view of the site (elevated receivers to the north, north of Wialda Creek, looking down on the site). Generally, the visibility is further by existing roadside vegetation and native vegetation remnants, including the riparian corridors that surround the site to the north, west and south. Impacts in all other locations have been assessed as low and acceptable. No mitigation has been recommended for these locations.

### CUMULATIVE IMPACTS

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

#### Construction

During construction, the additional haulage traffic impact creates the greatest potential for cumulative visual impacts. The Castlereagh Highway is a high use road corridor and likely to carry a substantial proportion of heavy and oversized vehicles. The visual impact of increased traffic movements to the site would be predominantly limited to construction (approximately 12 months).

## Operation

The operational view of the solar farm may generate a cumulative impact with the existing substation and powerlines. The array site and substation require security fencing and steel dominated infrastructure. The mitigation recommended in this report will act to reduce the cumulative impact. Screen planting would be undertaken onsite but outside the perimeter fencing to minimise views of the fence as well.

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

Generally, adverse cumulative visual impacts are anticipated to be manageable due to the ability to effectively screen infrastructure in this low relief landscape.

### 7.3.4 Safeguards and mitigation measures

A Visual Impact Management Plan and general measures to address the visual impacts of the proposed solar farm are commitments of the proposed Beryl Solar Farm. They are considered feasible, in that the proponent has agreed the measures can be implemented as part of the project. They are considered effective, as the measures include a 'post construction' verification process and would be undertaken in consultation with affected landholders (where relevant).

Table 7-8 Safeguards and mitigation measures for visual impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>If feasible, underground rather than overhead power lines would be considered.</li> <li>If feasible, co-location of powerlines would be undertaken to minimise the look of additional power poles. If additional poles are required, these would match existing pole design as much as possible.</li> <li>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: <ul style="list-style-type: none"> <li>Buildings will non-reflective and in eucalypt green, beige or muted brown.</li> <li>Pole mounts will be non-reflective.</li> <li>Security fencing posts and wire would be non-reflective; green or black rather than grey would reduce the industrial character of the fence.</li> </ul> </li> </ul>	Design stage		
<ul style="list-style-type: none"> <li>Dust would be controlled in response to visual cues.</li> <li>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.</li> </ul>	C		

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>• Areas of soil disturbed by the project would be rehabilitated progressively or immediately post-construction, reducing views of bare soil.</li> <li>• Ground cover would be maintained beneath the panels and within the site boundary, to break up views of the infrastructure from the side and back views.</li> <li>• Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations).</li> </ul>			
<p>A Visual Impact Management Plan would address the 'as built' visual impacts of the proposed solar farm. The plan would include:</p> <ul style="list-style-type: none"> <li>• Onsite vegetation screening, guided by the proposed screening, provided in Appendix D of the VIA report Appendix F.</li> <li>• Involvement of the most affected landowners (relevant to medium impact view locations). This may include increased onsite planting density in specific locations suggested by the landowners (for example, where the proposed solar farm would be visible from outdoor recreational areas).</li> <li>• Verification of predicted and actual impacts. This would improve the reliability of the measures and provide a trigger to undertake additional mitigation if required.</li> </ul> <p>(Guidance regarding these measures is provided in Appendix D of the VIA report Appendix F).</p>		O	

## 7.4 NOISE IMPACTS

### 7.4.1 Approach

A Construction and Operational Noise and Vibration Assessment for the proposed Beryl SF was undertaken by Renzo Tonin and Associates. The full report is provided in Appendix G.1 and is summarised below. It includes consideration of noise and vibration impacts from the construction and operation phases of the proposal in accordance with relevant Council and EPA requirements and guidelines.

### 7.4.2 Existing Environment

The proposal is located in a regional setting, approximately six kilometres west of Gulgong. The surrounding land use is agriculture based with residences existing on large rural properties that undertake grazing and



cropping activities. Noise sources include traffic and agricultural activities such as the operation of large harvesters, tractors, haulage trucks, irrigation pumps, quad bikes and 4WD vehicles.

Figure 7-7 illustrates the locations of the nearest receivers to the proposal site, with the nearest residential dwelling being approximately 135m north of the project area (R1).

### 7.4.3 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. For this project, background noise was determined by long-term noise monitoring.

Noise Monitoring was undertaken at the third closest receiver (R2, Monitored at L1 on Figure 7-7). Long term (unattended) noise monitoring was carried out at L1 between Thursday 17th and Monday 21st November 2016. The results are included in Table 7-9.

Table 7-9 Results of background noise monitoring and noise management levels

Monitoring location	L <sub>A90</sub> Background Noise Levels			L <sub>A90</sub> Ambient noise level		
	Day	Evening	Night	Day	Evening	Night
L1 – 5 Holleys Lane Gulgong	28	30	29	45	51	49

Based on the relevant section of the INP Guidelines, where background noise levels are less than 30dB(A), the minimum applicable background noise level is recommended to be set at 30dB(A). Therefore, this minimum background noise level has been adopted for all receiver locations nominated during the night time assessment period.

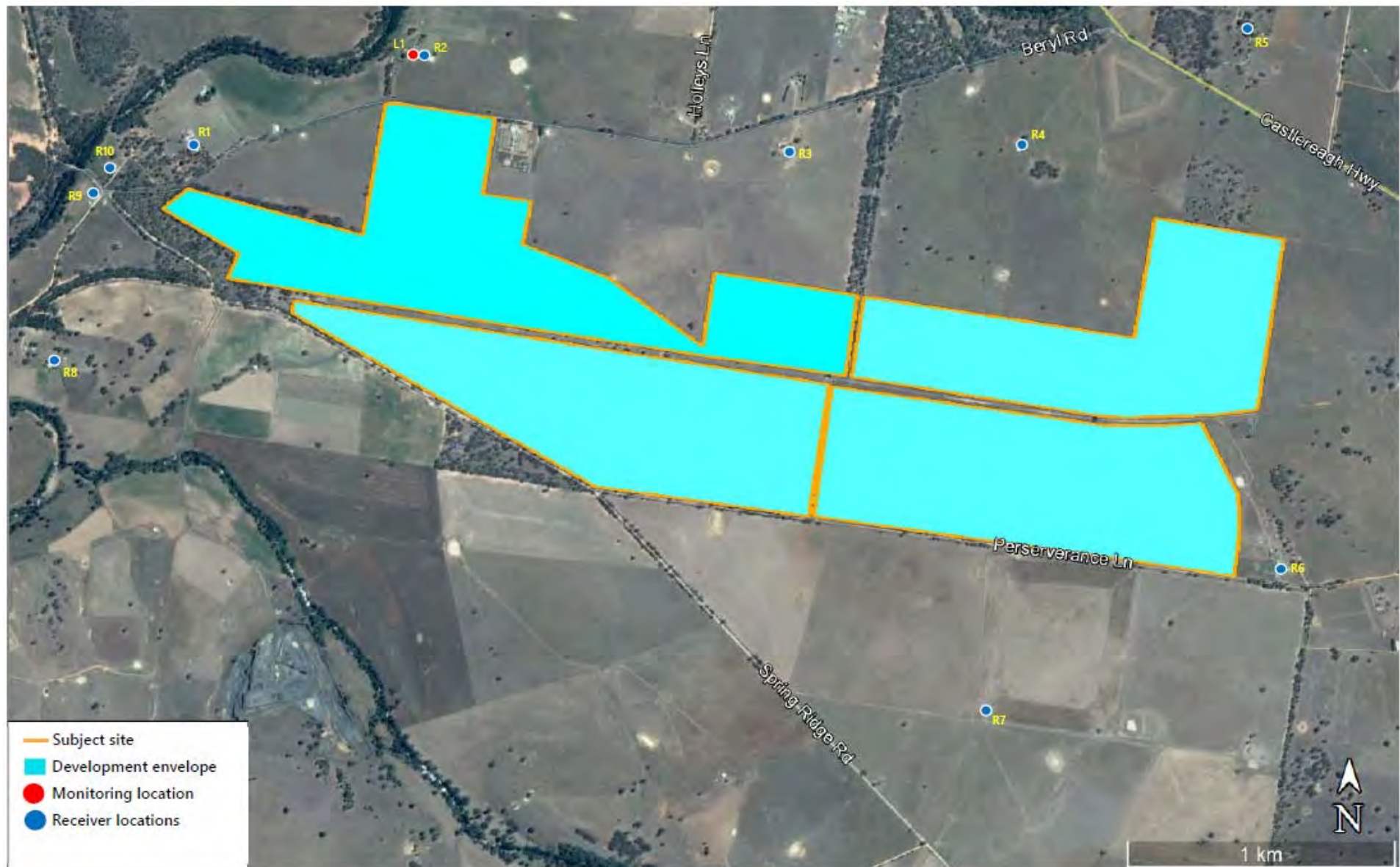


Figure 7-7 Residential receivers and noise monitoring locations adjacent to the proposal site

#### 7.4.4 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 7-10). The Rating Background level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measures 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 7-10 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 7-10 identifies the adopted construction noise management levels (NMLs) for the nearest noise sensitive receivers (refer to Figure 7-7). The NMLs for the receivers' locations are derived from the RBLs represented by the background noise levels measures at the monitoring location (Table 7-9) and NSW ICNG (DECC 2009) criteria (Table 7-10). Furthermore, during standard construction hours, a highly affected noise objective of 75 dB(A) applies to all receivers.

Table 7-11 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	30 <sup>1</sup>	40

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

### Construction noise sources

Noise impact predictions take 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 7-12.

Table 7-12 Construction equipment sound power levels

Equipment used	L <sub>Aeq</sub> Sound power levels (dBA)	No. Items required
Small pile driving rig	3	114
Crane	1	110
Drum Roller	1	109
Padfoot roller	1	109
Wheeled loader	1	109
Dump truck	2	108
30t Excavator	4	107
Grader	2	107
Chain trencher	1	104
Water truck	2	104
Telehandler	2	98
Forklift	2	90

### Construction noise assessment

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 the prediction of the total noise from a site.

The noise prediction models take 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 7-13 presents the noise levels likely to be experienced at the nearby affected receiver locations during the construction works. The present levels are considered a worst-case scenario with up to three noisiest plants operating concurrently.

Table 7-13 Predicted  $L_{Aeq\ 15\ min}$  construction noise levels at receiver locations

Receiver location (refer to Figure X)	Noise management level <sup>1</sup>	Predicted Construction Noise Level, $L_{Aeq\ (15\ min)}^2$	Comply? (Yes/No)
R1	40	<20-52	No
R2		<20-50	No
R3		<20-40	Yes
R4		<20-39	Yes
R5		<20-36	Yes
R6		<20-50	No
R7		<20-38	Yes
R8		<20-36	Yes
R9		<20-46	No
R10		<20-47	No

Notes: 1 Noise management for standard day time construction works (i.e Monday to Friday 7am to 6pm and Saturday 8am to 1pm)

2. Based on up to three noisiest construction plant and equipment operating concurrently.

Based on the construction noise level presented in the table above, the construction management levels at Receivers R1, R2, R6, R9 and R10 may be exceeded when construction works are conducted at closest proximity to the receivers. It is noted construction levels at all receivers are predicted to be less than the highly noise affected level of 75dB(A).

In light of the predicted noise levels above, it is recommended that a feasible and reasonable approach towards noise management measures be applied to reduce noise levels as much as possible to manage the impact from construction noise. Table 7-14 outlines possible noise reductions using some recommended control methods (refer to Appendix G.1 for more detailed list). Included in Appendix G.2 is a draft Construction Noise Management Plan, to assist in managing noise exceedances during construction.

Table 7-14 Relative effectiveness of various forms of noise control, dB(A)

Noise control method	Practical examples	Typical noise reduction possible in practice		Maximum noise reduction possible in practice	
		AS2436	Renzo Tonin and Associates	AS2436	Renzo Tonin and Associates
Distance	Doubling of distance between source and receiver	6	6	6	6
Screening	Acoustics barriers such as earth mounds, temporary or permanent noise barriers	5 to 10	5 to 10	15	15
Acoustic enclosures	Engine casing lagged with insulation and plywood	15 to 25	10 to 20	50	30



Noise control method	Practical examples	Typical noise reduction possible in practice		Maximum noise reduction possible in practice	
		AS2436	Renzo Tonin and Associates	AS2436	Renzo Tonin and Associates
Engine Silencing	Residential class mufflers	5 to 10	5 to 10	20	20
Substitution by alternative process	Use electric motors in preference to diesel or petrol	-	15 to 25	-	40

#### 7.4.5 Operational noise assessment

##### Background noise monitoring

The background noise data collected to assess construction noise was also used to assess operational noise.

##### 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 Beryl SF is outlined in Table 7-15.

Table 7-15 NSW Industrial Noise Policy Proposal Specific criteria

Assessment Criteria	Proposal Specific Criteria
<b>Intrusive</b>	Rating background level + 5dBA
<b>Amenity</b>	INP based on recommended LAeq noise levels for rural residential properties.

The operational proposal-specific noise criteria for the solar farm based on the INP criteria and guidelines shown in Table 7-15 is shown in Table 7-16.

Table 7-16 Applicable operational noise criteria

Receiver	Intrusiveness criteria		Recommended LAeq Amenity Noise level		
	Period	LAeq (15 minute) (dBA)	Time of day	Acceptable	Maximum
All receivers	Day	30 + 5 = 35	Day <sup>1</sup>	50	55
	Evening	30 + 5 = 35	Evening <sup>2</sup>	45	50
	Night	30 + 5 = 35	Night <sup>3</sup>	40	45

- Notes:
1. Day is defined as 7.00am to 6.00pm, Monday to Saturday, 8.00am to 6.00pm Sundays and Public holidays
  2. Evening is defined as 6.00pm to 10.00pm, Monday to Sunday and Public Holidays.
  3. Night is defined as 10.00pm to 7.00am, Monday to Saturday, 10.00pm to 8.00am, Sundays and Public Holidays.

When comparing the amenity and the intrusiveness criteria, it can be seen that the intrusiveness criteria is more stringent for day, evening and night periods. As such, intrusiveness criteria is the only criteria that was considered in the operational noise assessment.

As the proposal will potentially operate for part of the night time period (prior to 7.00am) during summer months, EPA sleep disturbance criteria apply. Criteria specific to the proposal are outlined in Table 7-17.

Table 7-17 Sleep Disturbance Criteria dB(A)

Receiver	Sleep Disturbance Criteria	Sleep Disturbance Criteria specific to proposal, $L_{\text{amax}}$
All residential receivers	Night Rating background level + 15dBA	30 +15 = 45dBA

### Operational noise sources

The potential sources of noise during operation of the solar farm considered for the assessment included:

- Mechanical noise from the tracking system of the solar panels, from up to 3,600 tracking motors to drive up to 950,000 solar panels.
- Operation of up to 66 inverters
- Three staff members onsite daily with the use of a light vehicle

The predicted power levels of these operation activities are outlined in Table 7-18.

Table 7-18 Typical operational plant and equipment and sound power levels for the proposal

Plant description	$L_{\text{Aeq}}$ Sound power levels (dBA)
Tracker Motor (up to 3,600 in total)	78 (each)
Ingeteam 1640TL B630 Inverters (up to 66 in total)	88 (each)
Light vehicle (3 in total)	88 (each)

### Operational noise assessment

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 was used. The modelling calculates the contribution of each noise source at each specified receptor point and allows the prediction of the total noise from a site.

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

- Calm and isothermal conditions (acoustically neutral) – no wind and no temperature inversion.
- Slight to gentle breeze – 3m/s wind velocity at 10 m 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 7-19 presents the predicted noise levels for the 'worst case scenario' based on concurrent operation all plant and equipment shown in Table 7-12.

Table 7-19 Predicted  $L_{Aeq\ 15min}$  Operational Noise Levels at Receiver Locations, dB(A)

Receiver location	Intrusiveness criteria	Predicted Operational Noise Levels, $L_{Aeq}$ (15 min)			Comply? (Yes/No)
		Calm and isothermal conditions	Slight to gentle breeze	Moderate temperature inversion <sup>1</sup>	
R1	35	26	30	30	Yes
R2		27	32	32	Yes
R3		27	32	32	Yes
R4		26	31	31	Yes
R5		<20	25	25	Yes
R6		26	31	31	Yes
R7		26	32	32	Yes
R8		<20	24	24	Yes
R9		21	26	26	Yes
R10		22	27	27	Yes

Based on the predicted operational noise levels presented in the table above, predicted noise levels at the nearest 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). No specific mitigation measures are required.

#### 7.4.6 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 receivers are in excess of 100m from the subject site. Also, there are no high vibration producing plant items to be used, therefore 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 EPAs Assessing Vibration: A technical Guideline (DECC 2006). Based on the proposed plant items to be used during construction (Table 7-12), vibration generated by construction plant was estimated and potential vibration impacts are summarised in Table 7-20.

Table 7-20 Potential vibration Impacts for Identified receivers.

Receiver location (refer to Figure 6-5)	Approx. distance to nearest buildings from works	Type of nearest sensitive buildings	Assessment on potential vibration impacts	Vibration monitoring
R1	135m	Residential	Very low risk of adverse comment	Not required
R2	330m	Residential	Very low risk of adverse comment	Not required
R3	465m	Residential	Very low risk of adverse comment	Not required
R4	1,120m	Residential	Very low risk of adverse comment	Not required
R5	1,470m	Residential	Very low risk of adverse comment	Not required
R6	290m	Residential	Very low risk of adverse comment	Not required
R7	1,220m	Residential	Very low risk of adverse comment	Not required
R8	710m	Residential	Very low risk of adverse comment	Not required
R9	495m	Residential	Very low risk of adverse comment	Not required
R10	470m	Residential	Very low risk of adverse comment	Not required

The potential for adverse comments to vibration impacts during the construction works was determined to be very low due to the large distances between the receiver locations and the type of construction activities. No vibration mitigation measures are required.

#### **7.4.7 Road traffic noise assessment**

As the proposed vehicle access to the subject site is much greater during the construction stage than the operational stage, the road traffic noise assessment is only considered for the construction stage, to provide 'worst case' assessment. Vehicle movements during operation of the solar farm would be minimal.

Noise impacts from the potential increase in traffic on the surrounding road network due to the construction is assessed against the NSW 'Road Noise Policy' (RNP). The RNP sets out criteria to be applied to types of road and land uses.

Vehicle access to the subject site will be via Beryl Road.

Table 7-21 Summary of estimated construction traffic volumes during peak.

Vehicle type	Trips per day
Cars / light vehicles (proposal management, construction staff etc.)	300
Trucks/ heavy vehicles	Up to 100

During the operational stage, vehicle access to the site will be maintenance vans and delivery trucks (3 x site staff light vehicle and 5 x miscellaneous courier deliveries per week) which would occur on an irregular basis.

Table 7-22 Predicted road traffic noise contribution levels along public roads, dB(A).

Receiver	Criteria	Speed (km/h)	Distance to Road	Predicted Noise Level	Comply? (Yes/No)
Residences on Beryl Road	$L_{Aeq}(15 \text{ hour})$ 60 dB(A)	80	20m	35 dB(A)	Yes

From Table 7-22 it can be seen that road traffic noise level contributions from the truck movements associated with the construction works are at least 7dB(A) below the applicable noise criteria. Therefore, traffic noise during 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 and require no specific mitigation.

#### 7.4.8 Safeguards and mitigation measures

Table 7-23 Safeguards and mitigation measures for noise impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>Implement noise control measures such as those suggested in Australian Standard 2436-2010 "Guide to Noise Control on Construction, Demolition and Maintenance Sites", to reduce predicted construction noise levels.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Preparation of a Construction Noise Management Plan. A draft plan is included in Appendix G.2.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Additionally, during construction:               <ul style="list-style-type: none"> <li>Use less noisy plant and equipment, where feasible and reasonable.</li> <li>Plant and equipment should be properly maintained.</li> <li>Provide special attention to the use and maintenance of 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended.</li> <li>Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel.</li> </ul> </li> </ul>	C		



Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>○ Avoid any unnecessary noise when carrying out manual operations and when operating plant.</li> <li>○ Any equipment not in use for extended periods during construction work should be switched off.</li> <li>○ Develop and implement a noise complaint process. Each complaint would be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits. Keep people informed of progress. The person selected to liaise with the community should be adequately trained and experienced in such matters.</li> </ul>			

## 8 ASSESSMENT OF ADDITIONAL ISSUES

### 8.1 SOILS

#### 8.1.1 Existing environment

##### Topography geology and soils

The topography of the proposal site is generally flat to gently undulating and sits at an elevation of between 410 and 435 metres above sea level (ASL). The site includes the following topographic features:

- The north-eastern part of the site rises to a small crest (approximately 455m ASL) which is located just north of the northern boundary.
- A rocky knoll is located in the central southern part of the site and appears to have once been subjected to quarrying operations.
- A raised embankment runs through the proposal site in an east-west direction.
- Some parts of the site are low lying and waterways exist close to the site on three boundaries.

The Cobbora 1:100,000 Geological Sheet (Meakin *et al.* 1999) indicates that the proposal site contains geology from the Cenozoic era, including:

- Undifferentiated unconsolidated quartz and quartz-lithic gravel, sand, silt and clay (Cza); and
- Tholeiite, alkali basalt, basanite, nephelinite, limburgite, trachyte, rare obsidian (Tb).

Four soil landscapes occur within the proposal site (Murphy and Lawrie 1998), all of which have moderate to very high erosion hazard when disturbed. The location and limitations of these soil landscapes are described in Table 8-1.

Table 8-1 Soil landscapes at the proposal site

Soil Landscape	Location	Limitations
<b>Nanima 'na'</b>	North East area of the site	Moderate fertility, friable surface soils, steep slopes, rock outcrop, moderate to high available water holding capacity, very high erosion hazard under cultivation, moderate to high shrink-swell potential, aggregated clays may leak in earthworks.
<b>Craigmore 'cm'</b>	South east area of the site	Moderate to high fertility, weakly structure surface soils, moderate to high available water holding capacity, moderate to high erosion hazard under cultivation.
<b>Home Rule 'hr'</b>	Western area of the site	Very low fertility, low available waterholding capacity, acidic surface soils, seasonal waterlogging, sodic subsoils in lower slopes, high permeability on mid to upper slopes, moderate to high erosion hazard under cultivation.
<b>Mebul 'me'</b>	Small area along south boundary in the western portion of the site	High erosion hazard under cultivation and low surface cover, high shrink-swell potential.

Most of the site is generally stable and well grassed. There are several areas of disturbed ground however, in the central part of the site that have been disturbed and contain areas of bare soil that would be at present risk of erosion.



Figure 8-1 Ground disturbance in the central northern part of the site



Figure 8-2 Mounds of soil and ground disturbance in the central northern part of the site.



Figure 8-3 Possible quarry area in the central southern part of the site

### Potential contamination

A search of the NSW EPA Contaminated Land Register of notices (NSW Government 2017a) on 3 February 2017 identify one site within the Mid-Western LGA. The site is however located near Mudgee, over 27km from the proposal site. The proposal site does not appear on the List of NSW contaminated sites notified to the EPA, as of 3 February 2017.

There is a risk that contamination associated with agricultural and quarrying activities onsite and former railway line (e.g., use and storage of pesticides, buried rubbish) could be present on the site however, no evidence of contamination was observed during the site assessment, such as odours or colouring and this risk is considered very low.

There is no potential for acid sulphate soils due to the distance of the proposal site from the coast.

### 8.1.2 Potential impacts

#### Construction and decommissioning

Construction activities at the proposal site, such as excavation and earthworks, have the potential to disturb soils, cause erosion and subsequent sedimentation. It is identified that the soils onsite have a moderate to high erosion risk. Construction activities specific to the proposal that would result in ground disturbance include:

- The installation of the piles supporting the solar panels, which would be driven or screwed into the ground to a depth of approximately 1.5m (minimal soil disturbance).
- Construction of internal access tracks and associated drainage.
- Substation bench preparation.
- Concrete or steel pile foundations for the inverter stations, onsite substation and maintenance building.

- Trenches up to 1000mm deep for the installation of cables.
- Establishment of temporary staff amenities and offices for construction.
- Construction of perimeter security fencing.

Given the generally low relief landforms within the proposal site, large scale bulk earthworks would not be required. There may be some earthworks within the raised embankment of the former railway line but this would be limited and would mostly constitute trenching works to install cables or a track construction works in which the general lay of the land would be followed.

The excavations and earthworks for the access tracks and associated drainage, foundations for infrastructure and buildings and the trenches for underground cabling would remove vegetation cover and disturb soils, potentially decreasing their stability and increasing susceptibility to erosion. The installation of the piles and security fence poles is unlikely to result in substantive ground disturbance (less than 1 hectare total) due their small and discrete footprint at the pole location. Ground cover would be retained as far as possible prior to and during construction, and would be rehabilitated post-construction. A ground cover management plan would be prepared to ensure stability post construction and is ongoing into operation of the solar farm.

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

- Managing Urban Stormwater: Soils and Construction, Volume 1, 4<sup>th</sup> 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 runoff and the potential for concentrated flows across the site. During excavations, mixing of different soil horizons can retard plant growth due to inadequate top soil layer. Top soil management would be required as part of the construction process.

Dust may be generated as a result of the construction and traffic activities such as vehicles travelling on unsealed roads as well as excavations. Impacts of dust generation are discussed in Section 8.8.

Machinery and vehicles have potential to track sediments onto public roads. This has potential to create a risk to other road users through reduced road stability. Cleaning vehicles and machinery as part of the soil and water management plan would reduce this risk.

The use of fuels and other chemicals onsite 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, these substances may spread via watercourse onsite, affecting much larger areas of aquatic habitat such as Cudgegong River and Wialdra Creek. This risk is manageable.

It is possible that contamination associated with past agricultural and possible quarrying activities (e.g. pesticides, fuels) could be present on the site however, no evidence of contamination was detected during the site inspections and no extensive excavations are required for the project. A contaminated soil protocol has been included to manage this risk should it occur.



## Operation

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 emergency protocols during operation of the solar farm.

The potential for wind erosion (dust generation) during regular plant operation would be low given the ability to stabilise exposed soils soon after construction. Additionally, the amount of vehicles on the unsealed tracks during operation would be minimal. Areas that were temporarily used during construction (e.g. laydown and construction parking areas) would be rehabilitated. This would be covered in a Rehabilitation Plan developed for construction.

Concentrated runoff from the impervious surfaces created by the solar panels could lead to increased soil erosion below the leading edge of the solar array modules during significant rain events and could be influenced by seasonal droughts. Further, if panels are located very close together, shading could reduce plant growth beneath the panels. Generally, however, the microclimate created under panels and the direction of water to the leading edge of panels is expected to lead to more not less grass growth at the leading edge. Moisture is expected to distribute evenly in this soil type. The cleaning of solar panels with water could also have similar impacts if water concentration was sufficient to cause erosion. The maintenance of ground cover (including monitoring through a formal groundcover management plan) would ensure a stable groundcover during the operation of the solar farm, minimising erosion and adverse water quality impacts. Soil testing would be undertaken to inform the groundcover management plan.

### 8.1.3 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 below.

Table 8-2 Safeguards and mitigation measures for soil impacts

C: Construction, O: Operation, D: Decommissioning

Safeguards and Mitigation Measures	C	O	D
<ul style="list-style-type: none"> <li>The array would be designed to allow sufficient space between panels to establish and maintain ground cover beneath the panels.</li> </ul>	Design stage		
<ul style="list-style-type: none"> <li>A soil and water management plan (with erosion and sediment control plans) would be prepared, implemented and monitored during the proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to: <ul style="list-style-type: none"> <li>Carry out soil testing prior to any impacts, to inform any soil treatments and provide baseline information for the decommissioning rehabilitation.</li> <li>Install, monitor and maintain erosion controls.</li> <li>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.</li> <li>Manage topsoil: In all excavation activities, separate subsoils and topsoils and ensure that they are replaced in</li> </ul> </li> </ul>	C		D

Safeguards and Mitigation Measures	C	O	D
<p>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.</p> <ul style="list-style-type: none"> <li>○ Minimise the area of disturbance from excavation and compaction; rationalise vehicle movements and restrict the location of activities that compact and erode the soils as much as practical. Any compaction caused during construction would be treated such that revegetation would not be impaired.</li> <li>○ Ensure any discharge of water from the site is managed to ensure ANZECC (2000) water quality criteria are met.</li> <li>○ 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.</li> </ul>			
<ul style="list-style-type: none"> <li>• A spill response plan would be developed as part of the overall risk management plan to prevent contaminants affecting adjacent surrounding environments. The plan would: <ul style="list-style-type: none"> <li>○ Manage the storage of any potential contaminants onsite.</li> <li>○ Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and EPA notification procedures and remediation.</li> <li>○ Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks.</li> </ul> </li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>• A protocol would be developed in relation to discovering buried contaminants within the proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements.</li> </ul>	C		D

## 8.2 WATER USE AND WATER QUALITY (SURFACE AND GROUNDWATER) AND HYDROLOGY

### 8.2.1 Existing environment

#### Surface water

The Beryl SF proposal site is located within the Central Tablelands Local Land Services Area (formerly Central West CMA). The site is located within the Macquarie catchment. Two waterways are located in close vicinity of the proposal site including Cudgegong River and Wialdra Creek (Figure 8-4).

- Cudgegong River is located between 164m and 823m from the western boundary of the proposal site. Cudgegong River flows in a south westerly direction.
- Wialdra Creek is a tributary of Cudgegong River, it is located approximately 1.2 km north of the proposal site boundary.

The closest Nationally Important Wetland and Ramsar Wetland to the proposal site is the Macquarie Marshes and Nature Reserve, which is over 200km north west of the site.



Figure 8-4 Waterways surrounding the proposal site (NSW Government, 2017).

Two waterways and eight wetlands/farm dams occur within the proposal site. One waterway located within the south western area of site, is an ephemeral tributary of the Cudgegong River. The waterway enters the Cudgegong River approximately 900m south west of the proposal site. The other waterway is located in the eastern area of the site. It is an ephemeral tributary of the Wialdra Creek, entering the creek 1.4km north of the proposal site. At the time of the site inspection these waterways were dry. There was no evidence of incised channels and no obvious creek bed; they were evident only as greener depressions in the pasture. These waterways are likely to have water present only after substantial rainfall. The water quality would be influenced by the surrounding land uses including cropping and grazing. It would therefore vary seasonally.

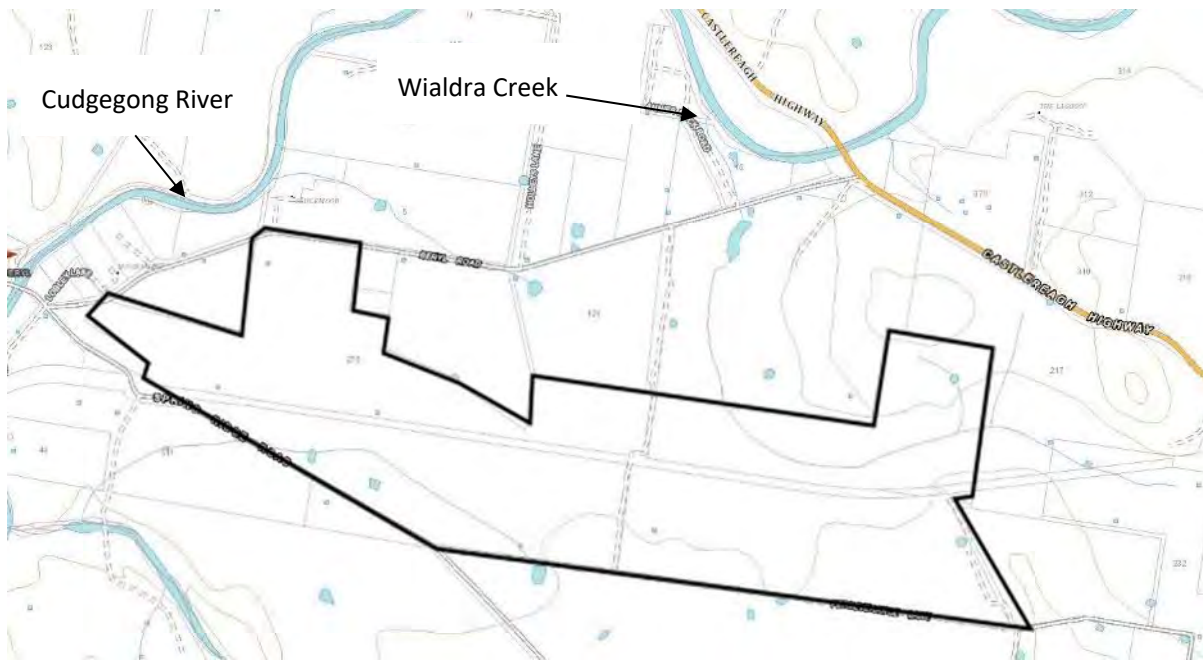


Figure 8-5 Waterways (blue) within proposal site (black outline) (NSW Government, 2017).



Figure 8-6 Man-made dam onsite.



Figure 8-7 Waterway onsite.

### Surface hydrology and flooding

The site is generally low lying, with some localised rises. It occurs in close proximity to two perennial waterways, located along three of its boundaries. The site was identified as not part of the Flood Risk Precincts identified in the Mudgee Floodplain Management Study (Mudgee Shire Council 2002). There is no flood prone land mapping for the site as part of the Mid Western Regional Council LEP 2012.

The Australian flood risk portal (Geoscience Australia 2017) identifies one man made dam within the site at the northern boundary as water detected during 1% and 5% of observations (Figure 8-8).

The proposal site has the potential to be temporarily flooded during flood events of Wialdra Creek and Cudgegong River due to their close proximity. There are several culverts installed underneath the railway line embankment indicating water flow needed to be managed during the operation of the railway line. However, there is no available history of the site being flooded.



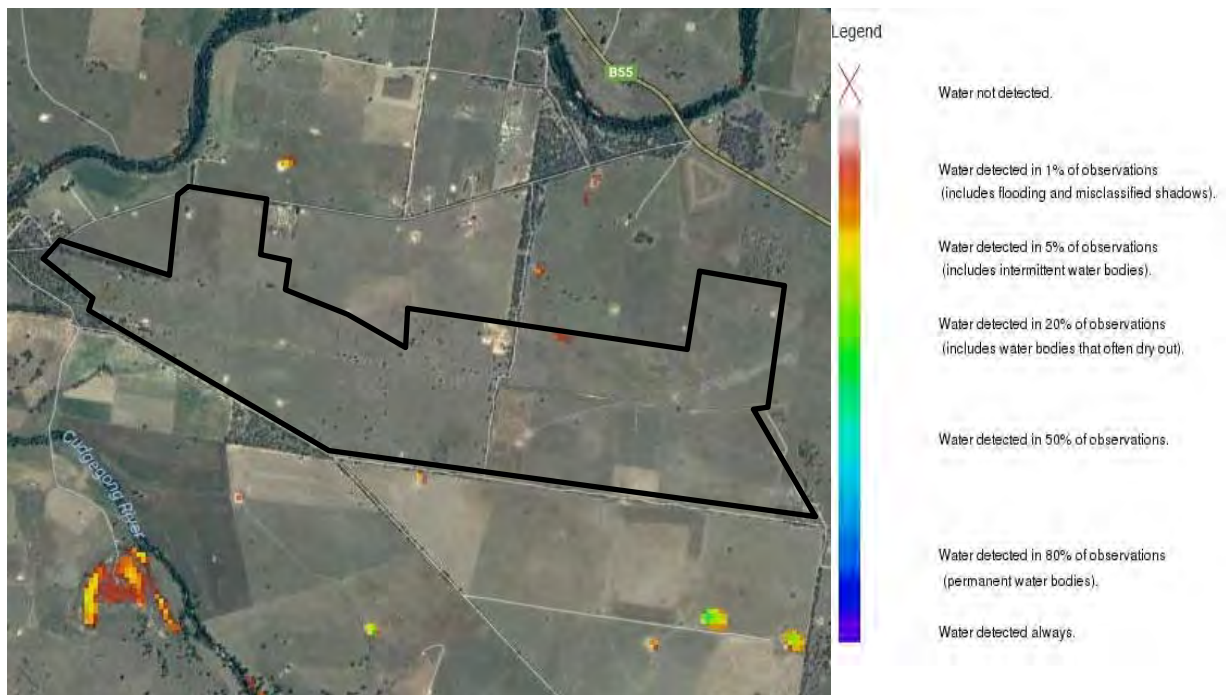


Figure 8-8 Flood Risk Information Map (Geoscience Australia 2017).

### Groundwater

There are three bores located within 1km of the proposal site with recorded groundwater (Figure 8-9). All bores are private and installed for stock, irrigation and domestic purposes. The two bores east of the proposal site, GW057947 and GW803647, intercepted groundwater at 22m and 35m respectively. The bore west of the site, GW803200, adjacent to Cudegong River, has a standing water level at 4m below the ground surface (DPI, 2017). During the site inspection there was no evidence of high water tables and the watercourses onsite were also dry.

The Mid-Western Regional LEP 2012 identifies the Beryl SF site as groundwater vulnerable.



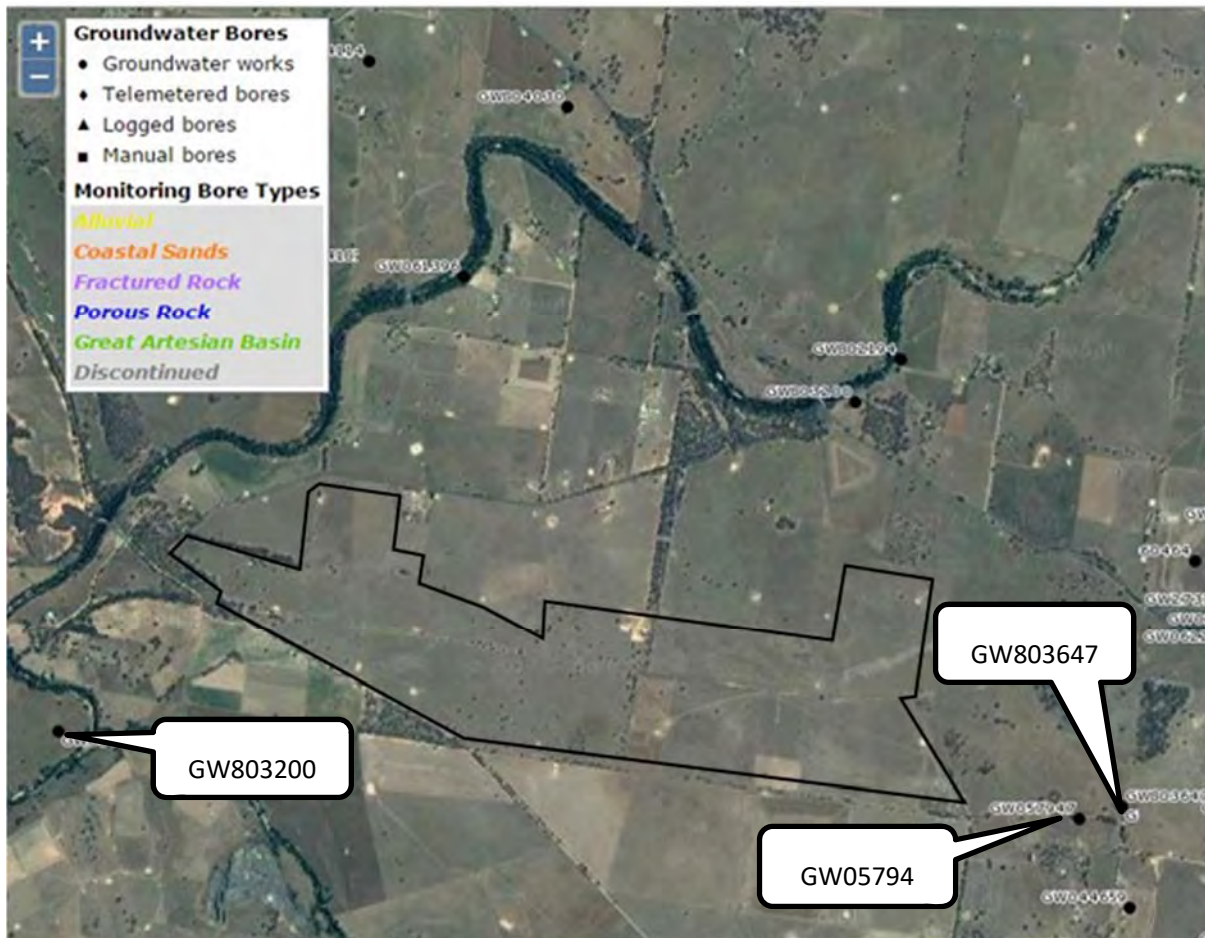


Figure 8-9 Groundwater bores within the vicinity of the proposal site (DPI, 2017).

### Groundwater dependent ecosystems

Potential Groundwater Dependent Ecosystems (GDEs) within the vicinity of the proposal site are mapped in the *Groundwater Dependent Ecosystems Atlas* (BOM, 2016) (refer Figure 8-10). The Atlas identified one vegetation GDE that is potentially reliant on subsurface groundwater outside the western portion of the proposal site. The vegetation is described as Blakely's Red Gum – Rough Barked Apple woodland on flats and alluvial terraces. This GDE has low to moderate potential for groundwater interaction. No GDEs are mapped for the proposal site.

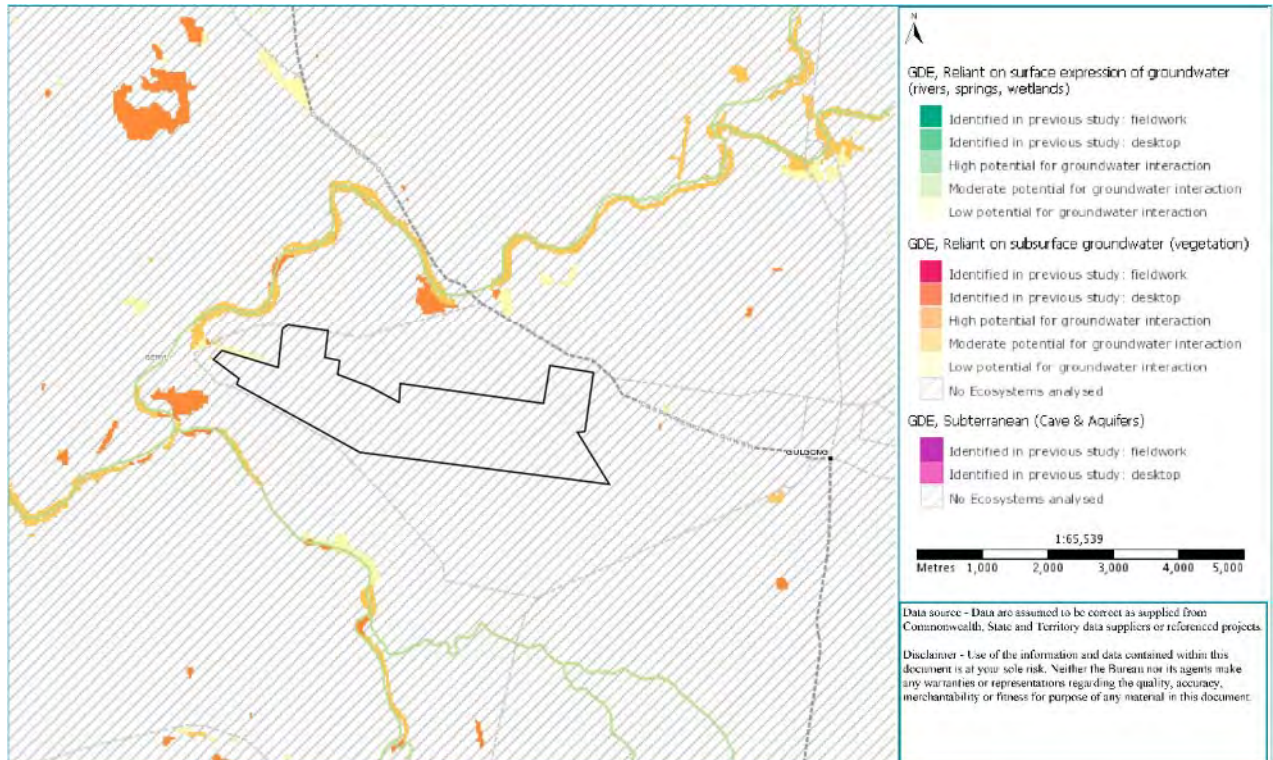


Figure 8-10 GDEs in regards to the proposal site, black (BOM 2016).

## Water entitlement

The proposal site is located within the area of two water sharing plans within the Central Tablelands water management area. However, the proposal would not involve the extraction of water and therefore would not require any extraction licences.

### 8.2.2 Potential impacts

#### Construction and decommissioning

##### SURFACE WATER

The proposal involves a range of activities that would disturb soils and potentially lead to sediment laden runoff, affecting local water ways. These activities include:

- Excavations for the construction of internal roads and associated drainage, parking areas, footings for onsite substation, inverters and maintenance building and footings for temporary staff amenities and offices during construction.
- Trenching for underground cable installation and transmission line
- Pile driving/ screwing of module frames, transmission line poles and fencing poles.

Soil compaction would occur when hardstand areas and access tracks are created, which would reduce soil permeability thereby increasing run off and the potential for concentrated flows. The use of fuels and other chemicals (lubricants and herbicides), as well as concrete used for footings onsite during construction and decommissioning, pose a risk of surface water contamination in the event of a spill.

Surface water contamination risks for Cudgegong River and Wialdra Creek are considered low, due to the distance from the proposal site. However, there is an increased risk for surface water contamination and

mobilisation of a spill during rainfall events due to the onsite watercourses being tributaries of these waterways.

Activities with the potential for adverse water quality impacts would be managed through the development of site specific sediment control plans and spill control plans, as detailed in Section 8.1– 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.

#### FLOODING AND HYDROLOGY

The proposal site has potential to be temporarily flooded during flood events of Cudgegong River and Wialdra Creek, due to their tributaries being located within the proposal site and the low relief of parts of the site. Temporary flooding has the potential to interfere with construction and poses a safety risk for workers onsite. Additionally, flooding has potential to impact the water quality of the site and downstream waterways if materials, equipment or fuels and other stored chemicals became mobile in floodwaters. A flood contingency plan would be developed to reduce the safety and potential water quality impacts. Additionally, mitigation measures would be implemented for the storing of fuels and chemicals onsite within the bunded areas.

The proposal would not involve any extensive earthworks or landform reshaping likely to affect hydrology with two exceptions:

- Limited benching to create the new substation pad.
- Existing disturbance areas near the quarry areas may be restored to a more natural surface landform in these two specific areas.

The two watercourses onsite would not be altered. Panels would be located over these watercourses but this is unlikely to change the hydrology of the watercourse or present any risk to bank stability (no incised channels exist in these well grassed drainage lines).

#### GROUNDWATER AND GROUNDWATER DEPENDENT ECOSYSTEMS

No Groundwater Dependent Ecosystems are known to occur within the proposal site. As the Proposal would not alter existing groundwater supplies within the solar farm site, it is considered that impacts to Groundwater Dependent Ecosystems (GDE) are not likely to result from the Proposal. Furthermore, the Proposal is not predicted to have any impact on any High Priority GDEs listed in the relevant WSPs given their distance from the proposal site.

Impacts to groundwater during construction, and decommissioning are unlikely to occur due to depth of groundwater. This is due to the standing water levels identified in the adjacent bores as greater than 4m deep in the western portion and greater than 20m in the eastern portion. The deepest infrastructure to be installed would be the mounting frames to a depth of 1.5m. Additionally the clearing of trees on site would unlikely have an impact on the groundwater levels.

#### WATER USE

Water use during the construction phase would be minimal and mainly for dust suppression on unsealed tracks. This water requirement is likely to vary depending on weather conditions such as rainfall and wind and is estimated to be up to 2000kL per annum. The water would be sourced from onsite dams. If the dams diminished below an acceptable level, water for dust suppression would be sought from a local council standpipe, in consultation with Council.



Potable water requirements for staff during construction would be approximately 90kL per annum. The non-potable water would be trucked to the site on an as-needs basis and stored within temporary water tanks at the staff amenities area.

Impacts on water use during the decommissioning would be similar to those during construction. The amount would be low and managed using standard measures.

## **OPERATION**

### **SURFACE WATER**

During operation, there is minimal potential for any impacts to surface water quality to occur. Appropriate drainage features would be constructed along internal 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 onsite substation, the site would be revegetated with grass cover. Water quality impacts at the site would therefore be low and are not considered substantially different to the current potential water quality impacts occurring from existing activities onsite including cropping and use of machinery.

There would be a low risk of contamination in the event of a chemical spill (fuels, lubricants, herbicides etc.) as storage and emergency handling protocols would be implemented (refer to Section 8.1- Soil).

### **FLOODING and HYDROLOGY**

While the proposal would not increase flooding risks at the site or change the local hydrology, extensive flooding may pose:

- A safety risk for workers and assets, where electrical infrastructure becomes inundated
- A pollution risk, where stored pollutants may be leaked to the environment
- A local flooding risk, should any components become mobile in flood waters

Design of footings for electrical componentry will consider flood risk. All infrastructure would be located above the 1/100 year flood level and would be designed to withstand periods of local flooding. The proposed new substation would be located adjacent to an existing substation, so risks are considered low. No components are considered susceptible to becoming mobile and entering waterways.

All the potential pollutants stored onsite would be stored in accordance with HAZMAT requirements and bunded.

A flood contingency plan would be developed to manage the safety of workers and equipment in the event of extended flooding in the region.

### **GROUNDWATER**

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

There would be no impacts to GDEs during the operation phase.

### **WATER USE**

Water use volumes during operation would be minimal. Water would be required for staff amenities and may be required for panel cleaning. Panel cleaning may be required in dry conditions when cropping operations in the locality are generating dust. Rain water will be gathered from the O&M building roof and stored within on-site tanks, in cases of prolonged drought water would be trucked to site as required.

### 8.2.3 Safeguards and mitigation measures

Table 8-3 Safeguards and mitigation measures for water quality impacts

C: Construction, O: Operation, D: Decommissioning

Safeguards and Mitigation Measures	C	O	D
<ul style="list-style-type: none"> <li>Design of footings for electrical componentry and panel mounts will consider flood risk.</li> </ul>	Design stage		
<ul style="list-style-type: none"> <li>All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>All fuels, chemicals, and liquids would be stored at least 50m from any waterways or drainage lines and would be stored in an impervious bunded area.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>Adequate incident management procedures will be incorporated into the Construction Environmental Management plan, including requirement to notify EPA for incidents that cause material harm to the environment (refer s147-153 Protection of the Environment Operations Act).</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>The refuelling of plant and maintenance would be undertaken in impervious bunded areas on hardstand areas only.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>Machinery would be checked regularly to ensure there is no oil, fuel or other liquids leaking from the machinery.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>A flood risk contingency plan would be prepared prior to construction and is to be implemented during construction, operation and decommission. The plan would:               <ul style="list-style-type: none"> <li>Detail who would be responsible for monitoring the flood threat and how this is to be done.</li> <li>A process for removing any necessary equipment and materials offsite and out of flood risk areas.</li> <li>Consideration of site access in the event that some tracks become flooded</li> <li>Establishment of an evacuation point</li> </ul> </li> </ul>	C	O	D

## 8.3 TRAFFIC, TRANSPORT AND ROAD SAFETY

### 8.3.1 Existing environment

The Beryl SF is bounded by three roads, including Beryl Road to the north, Spring Ridge Road along the south western boundary and Perseverance Lane along the southern boundary. Access to Beryl SF would be from the sealed Beryl Road, adjacent to the existing Beryl Substation. Spring Ridge Road and Perseverance Lane are unsealed and would not be used to access the Beryl SF. Perseverance Lane is currently in poor condition.



Beryl Road is a two lane, single carriageway sealed public road with a speed limit of 80 kilometres per hour. It is approximately 7m wide and maintained by Mid Western Regional Council. Beryl Road is accessed from Castlereagh Highway, approximately 6.2km north of Gulgong. It is approximately 4km long, ending at the junction with Spring Ridge Road. Along Beryl Road there are two unsealed roads that travel north of the road including Holleys Lane and Annies Rock Road, as well as five accesses into private properties.

The access into the Beryl SF proposal site off Beryl Road is an existing unsealed track. There are no turning lanes into the site. The access track is located 2.5km from the Castle Highway junction and 1.4km from the Spring Ridge Road junction. The access into the existing Beryl substation is 213m east of the proposed access track to Beryl SF. The closest resident driveway is located approximately 325m west of the site access.

Traffic along Beryl Road would currently include local residential traffic, local farm traffic and haulage trucks transporting materials from the nearby Beryl Quarry (located off Spring Ridge Road). There are no traffic counts available for Beryl Road, however it is expected to be low due to the low population density. Existing heavy vehicles numbers are expected to be higher than average for Beryl Road than other rural roads in the area due to the existing quarry located on Spring Ridge Road. It is likely that school buses operate along Beryl Road.

The Castlereagh Highway would be the major transport route for haulage and site vehicles during construction and operation of the project. The Castlereagh Highway is a two lane, single carriageway sealed public road with a speed limit of 100 kilometres per hour. The Castlereagh Highway has a total length of approximately 790 kilometres. Its northern terminus is located south of St George in southern Queensland. Its southern terminus is located near Lithgow in NSW. The highway is part of the 'Great Inland Way' linking Sydney and Cairns. In NSW, the Castlereagh Highway is maintained by Roads and Maritime Services. The closest counting average daily traffic along the Castlereagh Highway is located approximately 6km south east of the proposal site. In 2009 the average daily traffic was 613 vehicles travelling west which included 89% cars and 11% heavy vehicles (RMS 2009).

A railway line was historically located within the proposal site, however it is no longer operational and the majority of the infrastructure has been removed.

### **8.3.2 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 (school buses).
- Reduction of the level of service on the road caused by platooning of construction traffic.

#### **INCREASED VEHICLE NUMBERS**

The proposed timeline for the project indicates that approximately 40 employees would be required during the first month rising to 150 employees during the peak construction period (approximately 6 months).

Preliminary plans for the site propose parking for approximately 60 vehicles. If the proposed carpark was utilised to full capacity, this would result in approximately 120 vehicle movements per day to and from the site.

Buses may be used to transport workers to and from the site. Approximately 150 construction personnel would be required onsite during the peak construction period. Assuming an uptake rate of 80% and a 20-person capacity, up to 6 bus trips would be required per day during peak construction. During non-peak periods, approximately half as many buses are expected to be required.

Table 8-4 provides an indication of the total overall one-way traffic movements including heavy vehicles for the delivery of equipment and infrastructure, anticipated throughout the construction period of 12 months. During the construction period, a total of 4,150 heavy vehicles would be required. This averages to approximately 16 heavy vehicles per day for the construction period. The amount of deliveries per day would depend on the phase of works being undertaken. An increase amount of heavy vehicles is required for the delivery of modules and mounting frames, which would be delivered over a period of five months.

Table 8-4 Traffic volumes and requirements for Beryl SF.

Phase	Purpose	Vehicle type / trailer type	No. of one way vehicle movements
<b>Site set-up and de-mobilisation</b>	Temporary office delivery and removal	Low loader	10
	Skip delivery and removal	Low loader	4
	Generator delivery and removal	Semi-trailer	4
	General deliveries	Semi-trailer	12
	Crane mobilisation and demobilisation	Crane	1
	Water tank delivery and removal	Truck	2
<b>Roads and hardstands</b>	Delivery of imported capping for roads, laydowns and crane hardstands	Truck and dog	390
	Plant delivery and removal: excavators, compactors, drill rig	Low loader	16
<b>Generating equipment</b>	Tool container delivery and removal	Low loader	2
	Module deliveries	Semi-trailer	1198
	Mounting structure and pile deliveries	Semi-trailer	2130
	Inverter station deliveries	Low loader	44
	DC cabling, trays and combiner boxes	Semi-trailer	50
<b>AC cable installation</b>	AC cable delivery	Semi-trailer	8
	Backfill material delivery	Dump Truck	72
	Plant delivery and removal: telescopic handler and excavator	Low loader	8
<b>Overhead line</b>	Conductor delivery	Semi-trailer	1
	Pole deliveries	RAV	2

Phase	Purpose	Vehicle type / trailer type	No. of one way vehicle movements
	Pole dressing delivery	Semi-trailer	2
	Plant delivery and removal: Telescopic handler and excavator	Low loader	8
<b>Sub Station</b>	Concrete deliveries	Concrete agitator	20
	Switchroom delivery	Low loader	4
	Operations and maintenance and workshop deliveries	Low loader	8
	Transformer delivery	RAV	2
	Electrical equipment deliveries	Semi-trailer	16
<b>Other</b>	Employee vehicle movements	Light vehicle	16000
	Monitoring equipment, fibre, SCADA Supervisory Control and Data Acquisition (SCADA) servers etc.	Truck	12
	Waste collection	Truck	104
	Consumables (oil, petrol etc.)	Truck	24
	Miscellaneous deliveries	Light vehicle (vans)	144
<b>Total <sup>1</sup></b>			<b>22294</b>

<sup>1</sup> Assumes rock would be imported to site and water for dust suppression would be sourced onsite.

Traffic impacts would largely be confined to standard hours of construction. Exceptions would occur as staff arrive and leave the site, before and after shifts; some of this traffic may occur outside the standard construction hours. Additionally, the delivery of large components may take place outside normal working hours.

Decommissioning impacts are likely to follow a similar pattern as components are dismantled and removed, however this would occur over a reduced time period.

#### INCREASED COLLISION RISK

The increased collision risk relates primarily to traffic entering and exiting Beryl Road into the Beryl SF proposal site and Castlereagh Highway. This is related to both oncoming traffic and traffic following behind turning vehicles. Slow moving vehicles may also present a risk to through traffic, requiring signage to warn motorists of the construction timeframes. The intersection of the Beryl SF with Beryl Road would be upgraded to the appropriate standard to accommodate the increased traffic flows that would occur during construction and delivery vehicles. Although the final design has not yet been complete, the location and form of the main access road intersection with Beryl Road would provide adequate sightlines (approximately 350m) for vehicles entering and exiting the site. No upgrades are considered to be required to the Beryl Road and Castlereagh Highway intersection. Use of Spring Ridge Road and Perseverance Lane is not proposed.

As set out above, the majority of the traffic would be standard vehicles used by onsite workers, limited overmass or oversize haulage vehicles. As such there are opportunities to rationalise traffic movements, such as through the provision of shuttle buses for workers. This objective would be a requirement of the Traffic Management Plan to be developed for the proposal.

#### DAMAGE TO ROAD INFRASTRUCTURE

The increase in traffic and heavy vehicle movement could impact the condition of roads on the haulage network. Along the Castlereagh Highway the impact is expected to be negligible due to the existing capacity of the road network. Along Beryl Road, heavy vehicles are common due to the existing quarry located on Spring Ridge Road, south of the proposal site. However, the proposed solar farm is likely to have a larger amount of heavy vehicles within short period time compared to the ongoing operation of a quarry due to the delivery of infrastructure. Additionally, with the increase amount of heavy vehicles on Beryl Road, there is an increased potential for damage to the road. A Road Dilapidation report would be undertaken prior to construction. An audit would be undertaken at the completion of construction to identify any road formation and/or pavement condition resulting from the construction of the solar farm. The proponent would consult with Mid-Western Regional Council regarding any damage and restoration requirements. All damage attributable to the project would be paid for by the proponent.

Internal access roads would be constructed or upgraded as required to accommodate the proposal volumes and loads of traffic. The tracks would be compacted but unsealed with the expectation of the 'throat' entrance to the site which will be sealed to a length of 40m.

#### ASSOCIATED NOISE AND DUST

The proposal may result in increased noise and dust, particularly on unsealed access roads and internal tracks. Impacts from dust generated from the proposed activity, including that associated with increased traffic, is considered in Section 8.8. During construction, water would be used to minimise dust generation along access 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 G.1 and Section 7.4 of this EIS.

#### DISRUPTION TO EXISTING SERVICES

Local traffic in Gulgong 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. The potential impacts to Gulgong and Castlereagh Highway would be insignificant in the context of existing traffic movements along these roads and due to the size of Gulgong being a regional centre for the locality.

Increased traffic along Castlereagh Highway and Beryl Road during construction may cause disruptions to general traffic flows and to public transport services including school bus routes that operate along the road. The use of buses to transport workers to and from site will reduce the amount of disruption to traffic along both roads.

#### Haulage

While a detailed haulage program has not yet been developed, it is expected that the proposal's components are most likely to be delivered by road from either Sydney, Brisbane or Adelaide. The

proposed roads of these routes would have sufficient capacity to accommodate the haulage of components required for the construction of the solar farm and transmission line.

### Operation

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, three full time equivalent staff would access the proposal site to operate and maintain the solar infrastructure. It is likely three light vehicles (4x4) and an All-terrain vehicle will be required to transport the staff around the site. The anticipated volume of staff would result in very minimal increase in traffic flow on the local road network. Operational staff may also be required to access the substation, adjacent to the proposal site. Access to the substation is off Beryl 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.

### Decommissioning

Decommissioning impacts are likely to follow a similar pattern as construction, as components are dismantled and removed. It is expected there would be fewer heavy vehicles and workers required for decommissioning as well as over a shorter time period than construction.

#### 8.3.3 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 8-5.

Table 8-5 Safeguards and mitigation measures for traffic, transport and road safety impacts

C: Construction, O: Operation, D: Decommissioning

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>The proponent would consult with the Mid Western Regional Council regarding the proposed upgrading of the site access. The upgrade would be subject to detailed design, and must be designed and constructed to the standards specified by RTA Guidelines.</li> </ul>	Design stage		
<ul style="list-style-type: none"> <li>A Haulage Plan would be developed with input from the roads authority, including but not limited to: <ul style="list-style-type: none"> <li>Assessment of road routes to minimise impacts on transport infrastructure.</li> <li>Scheduling of deliveries of major components to minimise safety risks (on other local traffic).</li> <li>Traffic controls (signage and speed restrictions etc.).</li> </ul> </li> </ul>	C		D
<ul style="list-style-type: none"> <li>A Traffic Management Plan would be developed as part of the CEMP and DEMP, in consultation with the Mid Western Regional Council and Roads and Maritime. The plan would include, but not be limited to: <ul style="list-style-type: none"> <li>Assessment of road condition prior to construction on all local roads that would be utilised.</li> </ul> </li> </ul>	C		D



Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>○ A program for monitoring road condition, to repair damage exacerbated by the construction and decommissioning traffic.</li> <li>○ The designated routes of construction traffic to the site.</li> <li>○ Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction.</li> <li>○ Scheduling of deliveries.</li> <li>○ Community consultation regarding traffic impacts for nearby residents.</li> <li>○ Consideration of cumulative impacts.</li> <li>○ Consideration of impacts to the railway.</li> <li>○ Traffic controls (speed limits, signage, etc.).</li> <li>○ Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts.</li> <li>○ Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.</li> </ul>			
<ul style="list-style-type: none"> <li>● A Road Dilapidation Report would be prepared and include audits of the road formation and/or pavement condition to be undertaken prior to construction and at the completion of construction, operation and decommissioning phases. The proponent would repair any damage resulting from proposal traffic (except that resulting from normal wear and tear) as required at the proponent's cost and in consultation with Mid Western Regional Council.</li> </ul>	C	O	D

## 8.4 LAND USE IMPACTS (INCLUDING MINERAL RESOURCES)

### 8.4.1 Existing environment

The proposal site includes land that is zoned RU1 Primary Production and land zoned R5 Large Lot Residential under the Mid-Western Regional LEP. Electricity generating works are permitted with consent within the RU1 zone however Electricity generating works are prohibited in R5 zone.

#### Agriculture

The proposed solar farm site is currently worked agricultural land (grazed by cattle and sheep). The surrounding areas are dominated by large parcels of cleared agricultural land with scattered trees; extensive grazing of horses and cattle is the predominant agricultural activity. Few areas are cropped. Several horse studs are also located in the locality. The agricultural industry specifically sheep, beef cattle and grain farming is identified as 3.3 % of the main industries within the Gulgong locality (ABS 2011).

#### Residential areas

Large lot rural residences as well as clusters of smaller lot residential subdivisions occur. Sheds, tanks and farm machinery contribute to the rural character. House and garden plantings around houses contribute to the residential character in developing 'villages' of higher density on the Gulgong side (east) of the site.

One house is located within the north-eastern section of the proposal site and two dilapidated sheds are located onsite and would be removed.

## Mineral resources

Within the Gulgong locality, coal mining is the main industry (16.6%) and main source of employment for the area (ABS 2011). A search of the Department of Industry (Resources and Energy) MinView found the site to have mineral titles, refer to Figure 8-11. However, the mineral title for the proposal site, EL8160, expired 29 August 2016.

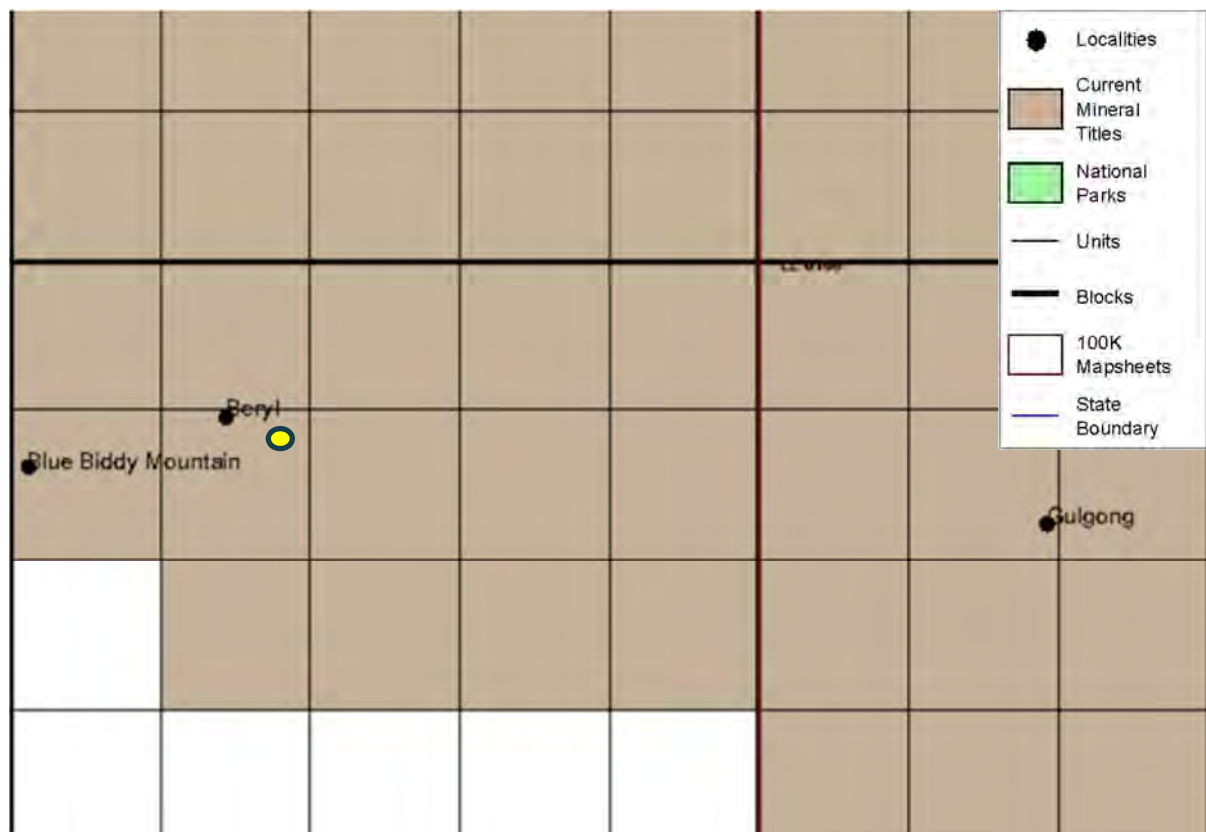


Figure 8-11 MinView (yellow circle indicates proposal site)

Beryl Quarry operates 1.2 kilometres south of the proposal site. The quarry is accessed from Spring Ridge Road and uses Beryl Road to access Castlereagh Highway. The haulage routes of this operation and the cumulative impacts of haulage traffic during construction of the solar farm is considered in Section 8.11. Small scale quarry operations have previously occurred within south central portion of the proposal site.

Consultation with Beryl quarry and the proposal site mineral titleholder for the proposal site is outlined in Section 5.

## Electricity

Three existing electricity transmission lines pass through the proposal site mostly in a north-south direction and in alignment with the existing Beryl substation. The existing Beryl Substation is directly adjacent to the proposal site within the north-western section.

## **Aviation**

There are three airstrips located within 10km of the proposal site. The closest is 1.5km north east of the proposal site. These airstrips are small primarily used by light aircraft, private charter flights and medical services. Due to the nature of the mining and agricultural industry in the area, there are potentially other smaller (private) airstrips at the locality used for transport or aerial spraying of crops. Cropping is not common in the local area, although grazing properties would also have sections of pasture dedicated to more intensive feed production.

## **Other land uses nearby**

The proposal site is located approximately 6km from Gulgong. Gulgong has a population of approximately 1,900 people. The main employment source in Gulgong is coal mining at 16.6% (ABS 2011). Services in Gulgong include banks, supermarkets, post office, real estate, trades people, machinery and farming services, accommodation, cafes and restaurants, fire station (Gulgong Chamber of Commerce 2016). It is a local service centre. Gulgong's main streets have a consistent historic character. Retail and residential building colours, materials and design reflect this. Gardens and public spaces are well maintained and attractive and it is likely a popular tourist destination and stop over point.

The Yarrobil National Park is approximately 6.2km north west of the site. No formalised picnic areas are in the park.

### **8.4.2 Potential impacts**

#### **Construction**

From the commencement of construction, agricultural activities would cease in areas required for access and construction of the solar farm. Except for the internal tracks and drainage and small footings onsite, for inverters, buildings and substation, the majority of the soil surfaces would not be impacted by the development; no large areas of reshaping or excavation are proposed. Therefore, post decommissioning, the land could return to existing agricultural use or an alternative use.

Consultation is being undertaken with Transgrid to ensure the construction of the solar farm and transmission line will have minimal impact on their adjacent substation and transmission lines onsite.

There is unlikely to be any impacts on aviation during construction of the low lying infrastructure proposed. Installation of electricity poles would be the tallest infrastructure to be constructed and would not impact on any flight paths of, or present a hazard to, aircraft.

There would be no extraction of minerals onsite during the construction period. Due to the proposal being highly reversible, mineral exploration would not be sterilised in the long term, post decommissioning. Ongoing consultation would be undertaken with the proposal site mineral titleholder.

Residence located near to the site may experience noise, dust and traffic during construction. These are temporary and manageable impacts, addressed in Section 7.4, 8.3 and 8.8. No impacts on the use of any recreational areas would occur.

No land use conflicts are likely during construction.

#### **Operation**

During operation, the proposal site would change from agricultural land use to power generation. Grazing may occur as maintenance but would not be conducted for agricultural profit. A groundcover management

plan which includes the option of a grazing regime would be developed primarily to manage grass cover beneath the panels and prevent erosion.

Once the panels are installed, the proposal would result in the development of a large proportion of the 332ha property, approximately 56% of the site. The transmission easement is mostly sited adjacent to existing transmission lines and easement associated with the Beryl Substation, so this would not result in a significant land use change. The duration of the proposal would be 30 years. The loss of the array site (225ha) for agricultural production during this period is not considered a significant economic loss in the locality. The loss is temporary. Agricultural use or an alternative land use, could be undertake at the end of the project's life, with minimal impact on land capability or productivity.

Operation of the solar farm would unlikely to impact on adjacent mineral extractive operations such as Beryl Quarry. All operation activities would be confined to the proposal site and there would small amount of workers (3 personnel) and associated vehicles. During operation, extractive activities onsite would not be able to occur, however quarrying no longer occurs onsite and the mineral title for the proposal site has expired.

The identified risk to aviation from the operation of the Beryl SF is reflective glint and glare. Glint is a quick reflection that occurs when the sun is reflected on a smooth surface. Glare is a longer reflection.

Onsite infrastructure that may cause glint or glare depending on the sun angle, include:

- Solar panels.
- Steel array mounting - array mounting would be steel or aluminium.
- Transmission line poles, if steel is used.
- Temporary construction site buildings.

The potential for glint or glare associated with non-concentrating solar panel systems which do not involve mirrors or lenses is relatively limited. Solar panels are designed to absorb as much solar energy as possible in order to generate the maximum amount of electricity or heat. As such, they reflect only around 2% of the light received (Spaven Consulting 2011).

Spaven Consulting 2011 provides a comparative reflection analysis against other surfaces and solar panels. In relation to water and snow, a solar panel (with a reflectivity coating) reflects a much lower percentage of light. In addition, the Department of Planning (2010) in their discussion paper on planning for renewable energy generation, stated that solar panels would not generally create noticeable glare compared with an existing roof or building surfaces.

For other infrastructure on site such as the buildings and steel mounting frames and transmission line poles, impacts from glint and glare is considered minor due to their small size and low surface area. Careful design and colour schemes can further reduce any potential reflection problems.

Impacts of glint and glare on aviation as a result of the proposed solar farm's infrastructure are considered to be minor and can be effectively managed with the implementation of the mitigation measures outlined below.

### **Decommissioning**

Due to the proposal site requiring relatively low levels of impacts on the soil surface, the proposal is viewed as highly reversible. Some compaction on access roads, from cabling and building footings would occur. Following decommissioning, the rehabilitated site would have similar opportunities for land use as the site currently possesses. At the end of the proposal, all above ground infrastructure would be removed.

Underground cabling would be placed at least 500mm deep and would likely remain insitu at decommissioning. Allowing current agricultural activities or alternative activities to be undertaken.

A Rehabilitation Plan is a commitment of the proposal, relevant to decommissioning. The objective is to ensure the array site is returned to its pre-solar farm land capability. Cropping, other forms of agriculture, or alternative land uses could occur. The plan would be developed with reference to soil testing (conducted pre-construction as a requirement of the staged Groundcover Management Plan) and with input from an Agronomist. The site would be left stabilised, under a cover crop or other suitable ground cover. The plan would reference:

- The Australian Soil and Land Survey Handbook (CSIRO 2009)
- The Guidelines for Surveying Soil and Land Resources (CSIRO 2008)
- The land and soil capability assessment scheme: second approximation (OEH 2012)

Due to the proposal being highly reversible, mineral exploration would not be sterilised onsite in the long term, post decommissioning. Ongoing consultation would be undertaken with proposal site mineral titleholder. There would unlikely to any impacts to the surrounding mineral extractive activities during decommissioning.

There is unlikely to be any impacts on aviation during decommissioning of the proposal.

#### **8.4.3 Safeguards and mitigation measures**

Potential for land use impacts is proposed to be addressed via the mitigation measures in Table 8-6.

Table 8-6 Safeguards and mitigation measures for land use impacts

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>• Consultation with proposal site mineral titleholder and Beryl Quarry regarding the proposal and potential impacts</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>• Consultation with local community, to minimise impact of construction of adjacent agricultural activities and access.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>• Consultation would be undertaken with Transgrid regarding connection to the substation and design of electricity transmission infrastructure</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>• A Rehabilitation Plan would be prepared to ensure the array site is returned to it pre solar farm land capability. The plan would be developed with reference to base line soil testing and with input from an Agronomist to ensure the site is left stabilised, under a cover crop or other suitable ground cover. The plan would reference:               <ul style="list-style-type: none"> <li>○ Australian Soil and Land Survey Handbook (CSIRO 2009)</li> <li>○ Guidelines for Surveying Soil and Land Resources (CSIRO 2008)</li> <li>○ The land and soil capability assessment scheme: second approximation (OEH 2012)</li> </ul> </li> </ul>			D



Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>The materials and colour of onsite infrastructure will, where practical, be non-reflective and in keeping with the materials and colouring of the landscape.</li> </ul>	C		

## 8.5 HISTORIC HERITAGE

### 8.5.1 Approach

A desktop study was undertaken to identify any historic heritage (Non-indigenous) items or places in proximity to the study area, with a focus on the proposal site and surrounding landscape. Heritage databases searched as part of this assessment are:

- The NSW State Heritage Inventory (SHI), this 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 Australian Heritage Database, this includes items on the National and Commonwealth Heritage Lists, to identify any items that are currently listed within or adjacent to the proposal site.
- Heritage schedule of Mid Western Regional LEP 2012, for locally listed heritage items, that are within or adjacent to the proposal site.

### 8.5.2 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 are illustrated in Table 8-7. Details of listed items are provided below.

Table 8-7 Summary of heritage listed items in the Mid Western LGA.

Name of register	Number of listings
World Heritage List	0
National Heritage List	0
NSW State Heritage Register	14
NSW State Agency Heritage Register (section 170)	29
Mid Western Regional Local Environmental Plan (LEP) 2012	449

### Australian Heritage Database

The Australian Heritage Database search was undertaken on the 8 February 2017. No known items listed under the National Heritage List were identified for the Mid Western Regional Council.

### NSW State Heritage Inventory

The SHI database search was undertaken on the 8 February 2017. No known items listed under the World Heritage List were identified for the Mid Western Regional LGA.

There were 14 items listed under the NSW State Heritage Register and 29 items listed under the NSW State Agency Heritage Register (Section 170) for the Mid Western regional LGA. None of these items were identified onsite, with the closest item being over 3.5km north east of the proposal site (Gulgong Railway bridge over Wialdra Creek). A majority of the listed items buildings located with Gulgong, approximately 6km south east of the proposal site.

### Mid Western Regional Local Environmental Plan 2012

The Mid Western LEP database search was conducted on the 8 February 2017. No local heritage items have been recorded onsite. The closest listed items are located in Gulgong, approximately 6km south east of the proposal site.

### 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. A site inspection identified a number of structures across the site.

The items identified include the following.

- Small concrete and corrugated iron shed with associated post and rail yards and concrete race.
- Small concrete and fibro sheeting structure.
- Machinery including crusher, conveyor and drilling equipment as well as other materials associated with the former basalt quarry operation.
- Disused farm equipment including tractors, balers, headers, ploughs, vehicles and other miscellaneous items
- The former railway corridor.



Shed and yards



Small concrete and fibro structure



Crusher and conveyor at the basalt quarry



Farm equipment

The farm structures and the farm machinery are currently outside the development footprint and therefore are unlikely to be impacted at all by the proposal.

A raised embankment running east west through the centre of the site indicates the location of the Sandy Hollow-Mary Vale railway line. The railway line was intended to link Newcastle with Dubbo and western NSW and was in planning since the mid 1800s, although the agreement to commence construction didn't eventuate until 1925. Actual construction didn't commence until 1936 but with the onset of World War 2, progress was slow and then ceased. It was restarted again in 1946 but priorities changed and in 1950 it was officially halted, with approximately 85% of work completed (Wangmann 2013).

Within the site, it is not clear if the railway line infrastructure was removed and taken elsewhere, as many sections were, or was never constructed.



Railway culvert in place



Railway embankment with culvert

### **8.5.3 Heritage Assessment**

The historic items located during the field inspection did not appear to be particularly old or rare. The material used in the construction of the structures were concrete, fibro, milled timber and corrugated iron, all common materials. The fence railings in the yards may have been older than the shed but there was nothing in their presence or construction that appeared to be significant. These farm related structures, including the farm machinery are considered common within a working farm environment.

The Gulgong district was first settled by Europeans in the 1820s with the gold rush of the 1870s the catalyst for rapid growth. After the goldrush died in the early 1880s and the miners left, the district turned to wheat and wool as the basis for its economy. The items identified during the field inspection are considered to be from the mid to late 1900s and are unlikely to relate to earlier periods of European settlement. Most of the items are in poor condition and dilapidated and have not been in use for some time.

#### 8.5.4 Potential impacts

Several heritage listed items were identified during the desktop study as outlined above but none of these items are in proximity to the proposal site. The items identified within the site are noted as typical of a rural landscape that has probably been farmed since the 1880s, although the items identified are all from the more recent period and are typical of a working farm.

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.

The development proposal includes the use of the earthen railway alignment as a thoroughfare to link vehicle access between the arrays north and south of the railway line. This would require the construction of vehicle crossings in two locations across the railway line. Underground cables linking the arrays would also be installed in these locations. The alignment is currently used as a farm track and is relatively intact. There are some sections that may need stabilization due to slight erosion. Any impacts to the railway line caused by the vehicle crossing works and cabling works would be managed by through mitigation measures in the CEMP.

#### 8.5.5 Safeguards and mitigation measures

The Gulgong Historical Society and Gulgong Pioneer Museum aim to collect, preserve and provide access to an array of historical objects including machinery. It is recommended that if the items are to be removed an opportunity be provided to the Historical Society and Museum to inspect the objects at the property for possible inclusion in the collection.

A protocol for unexpected finds would be developed for the proposal, as detailed below.

Table 8-8 Safeguards and mitigation measures for Non-Aboriginal Heritage

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>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.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>If any old farm machinery is to be removed, contact the Gulgong Historical Society to enquire about their interest in acquiring any items.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Maintain the railway embankment formation as much as possible.</li> </ul>	C	O	D

## 8.6 RESOURCE USE AND WASTE GENERATION

### 8.6.1 Existing environment

#### Resource use

Key resources and estimated quantities (pending the completion of the detailed proposal design) required to construct the proposed solar farm are listed in Table 8-9.

Table 8-9 Resource requirements for the proposed Beryl SF.

Resource	Quantity
Gravel (access tracks)	3,900 m <sup>3</sup>
Sand (bedding for cables)	1400 m <sup>3</sup>
Concrete	30m2
Metal (components for mounting system, inverters and delivery system containers,)	3900t
Glass for panels	130t
Water during construction	4500mL

The majority of the required resources will be used during the construction of the proposed solar farm. During operation and decommissioning, resource requirements would relate to maintenance activities, including the use of machinery, vehicles and water resources. Water resources would be required throughout construction, operation and decommissioning. Water use is considered in Section 8.2 of this REF.

#### 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 polycrystalline PV panels has been undertaken by the International Energy Agency Photovoltaic Power System Programme. In their report, *Life Cycle Inventories and Life Cycle Assessments of Photovoltaic Systems (IEA-PVPS-T12-04:2015)* the 'energy payback time' for thin film modules has been estimated at less than 1 year for a solar installation in Southern Europe. This is consistent with the estimation that the Beryl SF would have an energy payback period of approximately 2 years. Over the panels 30 year lifetime, they are expected to produce less than 18g of greenhouse gas per kWh generated, almost 50% lower than for Csi (Fthenakis *et al*, 2015).

First Solar is committed to lifecycle management and recycling. They have developed their own module recycling process that results in 90% of the semiconductor material to be reused in new modules and 90% of the glass can be reused in new glass products (First Solar 2017).



The production of the frames and other system components including cabling would also produce emissions and waste but less than the production of modules.

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

- CO<sub>2</sub> emissions generated per kilowatt hour of energy produced.
- Short energy payback time in comparison to the life span of the Beryl SF Project.
- Potential to reuse and recycle component parts.

## Waste generation

### POLICY POSITION

Guidelines for the legal requirements for waste management are stipulated 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 proposal resource management options would be developed using the *Waste Avoidance and Resource Recovery Act 2001* objectives. Specifically, these would be designed to:

- encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development;
- ensure that resource management options are considered against a hierarchy of the following order:
  - I. avoidance of unnecessary resource consumption,
  - II. resource recovery (including reuse, reprocessing, recycling and energy recovery),
  - III. 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 associated with the proposal would produce solid wastes, including:

- Packaging materials.
- Excess building materials.
- Scrap metal and cabling materials.
- Plastic and masonry products, including concrete wash.
- Excavation of topsoils and vegetation clearing (expected to be minimal).
- Bio wastes, from onsite septic systems.

In accordance with the 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, and metals may require replacement over the operational life of the Beryl SF.

## 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.

### **8.6.2 Potential impacts**

#### **Construction and decommissioning**

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 considering 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 the 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 8.2.

During decommissioning, all above ground infrastructure and materials would be removed. Underground cables buried at 500mm deep and greater would likely remain in situ. Materials removed from the site would be recycled or otherwise disposed of at approved facilities. The proposal is considered highly reversible in its ability to return to the site to the pre-existing land use capability or alternative land uses. The majority of the proposal components are recyclable and mitigation measures are in place to maximise reuse and recycling in accordance with resource management hierarchy principles.

#### **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.

### 8.6.3 Safeguards and mitigation measures

A Waste Management Plan would be developed to minimise waste and maximise the opportunity for reuse and recycling. Potential impacts are to be addressed with regards to the mitigation measures in Table 8-10.

Table 8-10 Safeguards and mitigation measures for resource use and waste generation

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to: <ul style="list-style-type: none"> <li>Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy.</li> <li>Quantification and classification of all waste streams.</li> <li>Provision for recycling management onsite.</li> <li>Provision of toilet facilities for onsite workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant).</li> <li>Tracking of all waste leaving the site.</li> <li>Disposal of waste at facilities permitted to accept the waste.</li> <li>Requirements for hauling waste (such as covered loads).</li> </ul> </li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>Septic system is installed and operated according to the Mid Western Regional Council regulations.</li> </ul>	C	O	

## 8.7 COMMUNITY AND SOCIOECONOMIC

### 8.7.1 Background

#### Socio-economic profile

##### MID-WESTERN REGIONAL LOCAL GOVERNMENT AREA

The Mid-Western LGA had a population of 24,017 in 2014 (ABS 2016). It covers an area of approximately 9000km<sup>2</sup> (Mid-Western Regional Council 2015). The area's population has steadily been increasing from 23,020 recorded on the 2011 Census, an increase of almost 5% (ABS 2011a). The median age of the locality is 41 years of age; this is comparable to the Australian average of 37.3 years of age (ABS 2016). The 2011 census records indicate that 3.9% of the population is from Aboriginal and Torres Strait Islander origin and 14.5% of the population was born overseas (ABS 2011a).

The main local industries for employment within the Mid-Western LGA is mining (13.8% in 2011a), followed by the retail trade at 11.3%; agriculture, forestry and fishing industry with 9.5% employed and health care and social assistance at 9.2% (ABS 2011a). The region is also renowned for its vineyards, wineries, wilderness areas and historic villages (Mid-Western Regional Council 2015, Destination NSW 2016a). The regional council is anticipating significant population growth in the area over the next five years due to the recent and ongoing expansions in the coal mining industry (Mid-Western Regional Council 2015).

The Mid-Western Regional Council (2015) states that advantages to living in this region include:

- A diverse and growing economic base;
- centrally located to regional centres;
- strong transport links (air and bus services daily);
- a skilled workforce,
- strong business service sector
- thriving tourism and arts/cultural industries.

Some of the community facilities and economic features of the Mid-Western LGA include:

- Health facilities include: Mudgee Hospital, Rylstone Hospital, The Carmel Croan Community centre (this includes community transport, meals on wheels, respite care and cultural services), doctors, aged care facilities, (Mid-Western Regional Council 2015).
- Recreation and sporting facilities include: Glen Willow Regional Sports Complex, various showgrounds, three swimming pools, pony clubs, horse clubs, poultry club, woodworkers group, pottery groups and various art and craft groups (Mid-Western Regional Council 2015).
- Community facilities include: Mudgee Town Hall, three libraries, various halls and community buildings, airport (five km from Mudgee), rotary club and aero club (Mid-Western Regional Council 2015).
- The MWRC maintains 55 parks, gardens and sporting fields, 11 cemeteries, numerous playgrounds, parks and reserves (Mid-Western Regional Council 2015).
- Active business organisations in the LGA include: Cudgegong business group, Gulgong Chamber of Commerce, Mudgee Chamber of Commerce, Mudgee Fine Foods Inc. and Mudgee grape growers' association Inc. (Mid-Western Regional Council 2015).
- Events in the region include the Rylstone Street Feast, Mudgee fine foods farmers market (monthly), Black tie at Burnbrae and the Huntington Estate Music festival (Destinations NSW 2016a).
- Environmental attractions include: Putta Bucca Wetlands, Capertee National Park, Wollemi National Park, Coorongoora National Park, Munghorn Cap Nature Reserve, Goulburn River National Park and Coolah Tops National Park, Ferntree Gully and Windamere Dam (Destinations NSW 2016a).

Mid-Westerns Region Community Plan (Mid Western Regional Council 2013) sets out the community's vision for the future. Consultation undertaken for the plan found the community values the areas 'country feel' with its historic linkages. Results of the community consultation also identified the following values:

- Maintaining and improving the road networks.
- Strong focus on health services and facilities.
- Emphasis on youth services.
- Development of additional pre-school and education facilities.
- Working towards achieving a balance between our natural environmental and our economic drivers.

A number of the measures proposed in the Plan (Mid Western Regional Council 2013) to meet the community's vision for the future would be assisted by the proposed Beryl SF. These include:

- An increase in the use of alternative energy sources.
- An increase in the number of jobs in the region.

- An increase in the number of residents.
- Increased economic activity in the region.

## GULGONG

Gulgong is the closest large township, to the locality of Beryl, and is 6km from the proposed site and approximately 350km from Sydney (Destinations NSW 2016b). The population of Gulgong was 2,383 in the 2011 Census (ABS 2011b). This comprises of a high 4.9% Aboriginal and Torres Strait Islander people, compared to the Australian average of 2.5% (ABS 2011b). The median age is 39, comparable to the Australian median of 37 (ABS 2011b). In Gulgong 12.8% of the population was born overseas, with the most common countries of birth being England (2.2%) or New Zealand (0.8%) (ABS 2011b).

The main local industry for employment in Gulgong is the coal mining industry (ABS 2011b). Full time employment, recorded at the 2011 census, was 56.6%, this is comparative to the Australian rate of the time of 59.7%; with the unemployment rate high at 6.5%, compared to the Australian average of 5.6% (ABS 2011b). The median age for full time employment in Gulgong is 42 (ABS 2011b). The main industries are coal mining at 16.6%; followed by school education at 6.6%, supermarket and grocery stores 4.2% and sheep, beef cattle and grain farming at 3.3% (ABS 2011b). The median weekly income for residents of Gulgong was \$412 in 2011 (ABS 2011b).

This area of rural NSW is rich in European heritage and was settled in the 1860's during the Australian gold rush (Destination NSW 2016b). Gulgong was the first town to be featured on the original ten-dollar note (Destinations NSW 2016b). There are currently 130 buildings, within the town of Gulgong, listed under National Trust classification many still have the original verandahs and iron-lace balconies (Destinations NSW 2016b). Today the town is renowned for its arts and crafts and is world famous for its clay/pottery (Mid-Western regional council 2015, Destinations NSW 2016b).

- Tourism attractions include the Pioneer Museum, Henry Lawson centre, The Prince of Wales opera house (oldest operating opera house in the southern hemisphere) and the Gulgong Symbol trail; a secret code of symbols used in the gold rush to communicate the 'lie of the land' (Destinations NSW 2016b).
- Events include: the annual Henry Lawson Festival, Gulgong Folk Festival; celebrating 30 years in 2016, Gulgong Gold Chinese festival, Community fun day and camel races, Gulgong annual eisteddfod and the triannual clay festival - Clay Gulgong (Destinations NSW 2016).
- Recreational and sporting facilities include: Billy Dunn Oval, Victoria Oval, swimming pool, turf club, golf club and dance academy (Destinations NSW 2016b).
- Community facilities and clubs include: a memorial hall, branch library, cemetery, Gulgong musical and dramatic society (MADS), craft club, RSL club and youth council (Destinations NSW 2016b, Gulgong Chamber of Commerce 2016).
- Health services include: Wenonah lodge aged care facility and Gulgong health services (Service NSW 2016).
- Services include: banks, supermarkets, post office, real estate, trades people, machinery and farming services, accommodation, cafes and restaurants, fire station (Gulgong Chamber of Commerce 2016).
- Education facilities include: Gulgong pre-school, Gulgong public school, Gulgong high School, All Hallows Catholic Primary School and the Red Hill environmental Centre (Service NSW 2016).
- Churches – St Luke's Anglican, St John's Catholic, Uniting and Presbyterian (Destinations NSW 2016a).



## BERYL

Beryl is a small rural locality approximately 9km North-West from Gulgong. The proposed solar farm is approximately 4km South of Beryl. The locality of Beryl is accessed from the Castlereagh Highway; it's residents are dispersed, and live on large rural properties. There was no data available from the Australian Bureau of Statistics (ABS) on population, businesses or number of dwellings in the Beryl locality.

### Attitudes to renewable energy proposals

A high percentage (77%) of Australians believe that large scale solar farms could supply a significant source of Australia's energy requirements (IPSOS 2015). Attitudes in Australia are greatly divided about the visual impacts of large scale solar farms; 30% agree and 26% disagree that large-scale wind farms have a negative visual impact (IPSOS 2015). Approaches to improving community understanding of the visual impacts of large scale installations include:

- Provision of images (from many angles) of large scale solar facilities, particularly in the early phases of a proposal (IPSOS 2015).
- Understanding the similarities between highly supported domestic scale installations and large scale facilities (IPSOS 2015).
- Understanding the current function of the land proposed to hold the facility and the additional value the installation allows for (IPSOS 2015).
- Understanding of what steps are needed to prepare the proposed land for the installation and how the condition of the land after decommissioning (IPSOS 2015).

This EIS and the CCP addresses these issues.

Attitudes towards renewable energy proposals can vary significantly from community to community. Often this is due to lack of information on the ability and efficacy on the renewable energy sector (IPSOS 2015). Key lessons learned from other solar farm proposals in regards to community and stakeholder engagement was that transparency is essential. Listening to the issues that are important to the community is essential over what issues outsiders (developer) may think are important and fit-for-purpose consultation needs to be a priority (FRV n.d.). Fit-for-purpose consultation can become a problem in the community consultation phase due to inconsistencies and confusion within the community (FRV n.d.). Various proposal phases would cause much activity, whilst other phases no consultation activity; this leads to confusion and misconceptions about the proposal, and interest and attitudes were adversely affected (FRV n.d.).

The International Energy Agency (IEA) reported that the renewable energy sector is now the largest source of installed power capacity in the world, surpassing coal (OECD/IEA 2016). Large scale solar energy proposals within Australia have been steadily increasing over the last decade (IPSOS 2015). In 2012-13 it was estimated that only 13% of all electricity generated within Australia came from renewable energy sources (IPSOS 2015); in 2015 this had increased to 14.6% (Clean Energy Council 2015). In 2015, eight solar farms were completed in Australia (Clean Energy Council 2015). This included Nyngan (102 MW) and Broken Hill (53MW) solar farms; two of the three largest in Australia, with the Moree 56 MW solar farm completed in 2016 (Clean Energy Council 2015). In September 2016, another 12 large-scale solar farms were announced in Australia with a proposed cost of \$1,056.4 million (ARENA 2016). This is set to increase in the future as Australia averages the highest average solar radiation potential per square metre in the world (IPSOS 2015). It is expected that strong policy support; climate change mitigation, and quality of information may help change attitudes towards renewables in the future (OECD/IEA 2016).

Employment in the sector is considered a positive driver; the Australian Bureau of statistics estimated that 14,020 people were employed in the renewable sector in the 2014-15 financial year (Clean Energy Council

2015). Additionally, there local economic benefits. Data from the recent Nyngan and Broken Hill solar projects, indicate that local goods and services accounted for approximately 56.3% of the project's procurement spend, including \$66 million spent on cables, mounting structures and power conversion equipment from local companies.

### **Community feedback on this proposal**

Section 5.4.3 of this EIS details the specific consultation and feedback received so far for the proposed Beryl SF. In summary, positive feedback received by neighbours to date has included shows of support, specifically with regard to positive economic benefits to the local community. This has included the local Mid Western Regional Council.

Concerns have also been voiced, regarding potential impacts on existing services, such as mobile phone reception, the traffic network, potential for glare and heat at adjacent properties, potential land use conflict with the site.

- A local quarry raised concerns about traffic impacts on their operations.
- One electrical contractor expressed interest to work on the project.

Tom Best (First Solar Australia Pty Ltd) met with Mid Western Council representatives, Lindsey Dunstan and Drew Roberts on the 7 November 2016 and presented the Beryl SF proposal to the Council on the 15 February 2017. Feedback received included:

- Council members were supportive of the proposal as it will provide good use of low level farming land in the area and benefits the local community. Council appreciated the early consultation process (7 November 2016).
- Concerns were raised regarding:
  - planning development application on the parcel of land zoned R5;
  - the land around the existing house being rezoned as a new lot being below the minimum land size for land zoned RU1.
- Confirmation was given that the subdivision memo, to be circulated, would be supported by Mid Western Council (15 February 2017).

The Community Open Day, on the 23 February 2017, at the CWA Hall had 22 people attend. This included residents, local business owners, council members and associated landowners. Feedback included:

- Residents were very supportive of the project.
- Positive feedback regarding the creation of jobs, economic flow on effects to local businesses and benefits to the community were expressed.
- Visual screening was discussed and residents showed their support and wanted to be kept informed.
- Two residents raised concerns regarding impacts on access roads, namely Beryl Road and Perseverance Lane, and the effects of increased traffic on local infrastructure.
- Resident on the Southern side raised concerns regarding the potential impact to the value of adjacent land. This land is primarily used for grazing and cropping.

First Solar Australia Pty Ltd received four completed community feedback forms. The four residents lived five kilometres or less from the proposed site. Important local values to the respondents included to be living in a close community with a country lifestyle; enjoying the peace and quiet. Visual landscape values considered important included the farming landscape; views of trees, sky, hills, large paddocks and cattle.

Key concerns raised by members of the community were traffic impacts, potential decline in land value, visual impacts and the clarity of the planning approval process. All these matters have been discussed

directly with the local community and included in this environmental assessment. The issues identified through the consultation process have also been addressed in the proposal design and mitigation measures included in this EIS.

### **8.7.2 Potential impacts**

#### **Construction**

The Beryl SF would be a new type of infrastructure in the area and would change the character of the site from extensive agriculture to electricity generation. This change in land use can be viewed as either positive or negative within a community depending on the values of each individual. Some people are adverse to changing the rural landscape and would consider the development to be in conflict with the existing environment and scenic values. Other community members may view the development as an opportunity for jobs and economic stimulus within the region and sign of protecting the environment through the generation of renewable energy.

The site would be visible to the public during construction, for traffic travelling along the Beryl Road, Spring Ridge Road and Perseverance Lane. Several houses are within 1km of the site but only three would have a direct view of the site. Visual, noise and traffic impacts and mitigation have been discussed in previous sections. As discussed above, the Beryl SF would assist in addressing some of the measures outlined in the Mid-Westerns Region Community Plan to meet the community's future vision of the region. Specifically, during construction would represent a direct economic benefit to the region. The construction of the proposal would utilise up to 150 staff at peak construction. Many of these would be drawn from the local area. First Solar (Australia) Pty Ltd has a proven track record of hiring local, qualified labour for plant construction and long-term positions for the maintenance and monitoring of daily operations and considers this to be an important commitment to the community for the development of the Beryl SF.

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, health services and accommodation. Additional traffic may be noticeable and could present an adverse effect on local tourism, if coinciding with local festivals for example. Additional hazards accompany construction traffic (refer to Section 8.3). 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 the following means:

- diversification of employment opportunities and income streams.
- they provide a substitute for carbon emission producing electricity production that is stable and renewable, and consistent with State and National greenhouse emission reduction objectives.

The operation of the Beryl SF would also assist with meeting the proposed Mid Western Regional community's vision for the future of using alternative energy sources within the area (Mid Western Regional Council 2013).

Considering the local economy includes agriculture, it is relevant to note that the soil capabilities at the site limit intensive agriculture (refer to Section 8.4). The installation of solar array modules, that involve little

soil disturbance and provide an alternative income stream for large agricultural properties, can be seen as an important local economic benefit. Further, it is noted that global warming will increase potential evaporation and water demand, potentially reducing the capacity of arable land. Pittock (AGO 2003) observed that a significant proportion of Australian exports are agricultural products that are 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 the consequences of climate change.

Minimal adverse social-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 benefit to construction in terms of opportunities for local staff and industries. It may also include local recycling of infrastructure components.

### 8.7.3 Safeguards and mitigation measures

Table 8-11 Safeguards and mitigation measures for Community and Socioeconomic impacts.

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>The Community Consultation Plan will continue to be implemented, including but not limited to implementing protocols to: <ul style="list-style-type: none"> <li>Keep the community updated about the progress of the proposal and proposal benefits.</li> <li>Inform relevant stakeholders of potential impacts (haulage, noise etc.).</li> <li>Respond to any complaints received.</li> </ul> </li> </ul>	C		
<ul style="list-style-type: none"> <li>Liaise with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Liaise with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>Liaise with local tourism industry representatives to manage potential timing conflicts with local events.</li> </ul>	C		D

## 8.8 CLIMATE AND AIR QUALITY

### 8.8.1 Existing environment

#### Air quality

The proposal site is located in the Mid Western LGA, Central Tablelands NSW. The closest climate data for the region is from the Gulgong Post Office weather station (BOM 2017). The area experiences hot summers and mild winters. The hottest months of the year are December through to February. The coldest months

of the year are June, July and August (BOM 2017). The average rainfall is 653.0mm; with the majority of rainfall occurring in the summer months. Annual wind speed averages for the area is 6.9km/h at 9am and 9.9km/h at 3pm. In the morning the average highest winds are experienced October, November and January. While at 3pm the average highest winds are experienced August to December (BOM 2017).

Air quality for the Mid Western LGA is generally expected to be good and typical of that found in a rural setting of NSW. Existing sources of air pollution include vehicle emissions, dust during dry periods, mining activities and agricultural activities, particularly stubble burning and harvest. During colder months, there may be a minimal increase in air contaminants due to smoke emissions from the operation of solid fuel heating. A search of the National Pollutant Inventory (Australian Government 2015) identified six facilities within the Mid Western LGA that are required to record emissions. The facilities include three coals mines, two lime manufactures and one quarry. The closest facility is the Beryl Quarry, approximately 1.2km south of the proposal site.

Approximately 60 residences are located within 2km of the proposal site, one being an involved landholder. The closest non-involved receiver is approximately 135m west of the proposal site. A second residence is located 330m north west of the proposal site access. Topography of the proposal site is flat. Vegetation or screening is present along the western and southern boundaries. There is limited screening along the northern and eastern boundaries.

### Climate change

Climate change refers to the warming temperatures and altered climatic conditions associated with the increased concentration of greenhouse gases in the atmosphere. Climate change proposals for Australia include 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' (GHGs). 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 CO<sub>2</sub> emissions when compared to conventional coal and gas fired powered stations; refer to Table 8-12.

Table 8-12 Comparison of CO<sub>2</sub> equivalent emissions produced per kilowatt hour

Generation method	Emissions produced (grams CO <sub>2</sub> 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)

On an annual basis, the proposed Beryl SF would provide enough clean, renewable energy to meet the demand of approximately 28,000 NSW homes based on average energy consumption, while displacing approximately 183,000 metric tons of carbon dioxide – the equivalent of taking about 49,000 cars off the road.



### **8.8.2 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/m<sup>2</sup> are also specified.

### **8.8.3 Potential impacts**

#### **Construction and decommissioning**

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 i.e. residences, farm workers and road users. At worst they can interfere with plant growth, degrade ecosystems, represent human health risks and contribute to GHG emissions and anthropogenic climate change. In Australia's rural agricultural landscape dust and dirt are a major influence on air quality. Within the Mid Western Regional LGA the operation of mines and quarries would also be a potential influence on air quality within the LGA.

Dust generation would accompany excavation and other earthworks as well as the movement of trucks and work vehicles travelling along unsealed access roads during construction and decommissioning of the project. 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, construction of access tracks and construction of footings for inverters, substation and buildings. Poles for the module frames would either be pile driven or screwed. The impact area for the piles would be less than 1% of the site area.

The majority of 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, and haulage traffic delivering construction components.

The closest non-involved receiver is approximately 142m west of the proposal site. Earthworks would also occur adjacent to Beryl Road near to the existing Beryl substation, and along Perservence Lane in the south of the proposal site. Vegetation is present along the western and southern boundaries of the proposal site. This vegetation screening would reduce the potential impact of dust on the closest receiver to west and traffic along Perservence Lane. In dry and windy conditions, it is likely that a portion of Beryl Road at the site access and adjacent to the existing Beryl Substation would be impacted by dust. There is currently no screening at that location. However, the proposed works involve minimal earth-moving, and mostly piling equipment would be used, thus reducing the amount of dust produced.

With the minor earthworks proposed and implementation of mitigation measures, air quality issues for sensitive receivers would be considered manageable. Due to the distance of other residential dwellings, dust and emissions would be expected to attenuate in a very limited distance from the site. Substantive air quality impacts are not anticipated for these dwellings.

There is potential for a cumulative impact on air quality with the existing quarry operations, 1.2km south east of the site. Also, the quarry haulage route includes Beryl Road. Due to the distance from the proposal site, the cumulative impact is expected to be not significant, particularly with the implementation of mitigation measures. Cumulative impacts are discussed further in Section 8.11.

Mitigation strategies include a formal community consultation and engagement process, and complaints management system, 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.

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 solar farm proposed suggests this contribution would be negligible in a local or regional context.

## Operation

The production 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 dust generation from vehicles travelling on the unsealed access roads. A groundcover management plan would be implemented to reduce dust production from disturbed areas (Section 8.1) and planting of the site would provide screening to Beryl Road (Section 7.3). 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.

Fuel 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 positive impact on global climate change by assisting to reduce Australia's reliance on fossil fuels for electricity generation.

Due to the existing the minimal impacts on air quality during operation, the cumulative impact is expected to be not significant. Cumulative impacts are discussed further in Section 8.11.

### 8.8.4 Safeguards and mitigation measure

Air quality impacts would be addressed via the mitigation strategies in Table 8-13.

Table 8-13 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 complaints.	C	O	D
• Develop protocols to minimise vehicle and construction equipment emissions for inclusion in the construction and operational environmental management plans. This would include but not limited to Australian standards and the POEO Act.	C	O	D
• Protocols would be developed minimise dust levels generated during construction (eg. water carts or similar in response to visual cues).	C		D

## 8.9 MAGNETIC FIELDS

### 8.9.1 Existing environment

Electromagnetic fields (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 thunder storms and Earth's magnetic field (WHO 2012).

Electric fields are produced by voltage and magnetic fields by current. When electricity flows, EMFs exist close to the lines and wires that carry electricity and close to electrical devices and appliances (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. EMF field sources to which people may be exposed are predominately in three frequency ranges. The Extremely Low Frequency (ELF) range of 0-300 Hz incorporates the 50 and 60 Hz frequencies of the electric power supply and of electric and magnetic fields generated by transmission lines and other electrical devices and infrastructure (Repacholi 2003).

As electricity use has become an everyday part of life, concerns have been raised about the potential for exposure to EMFs to adversely affect human health. 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 Proposal 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 Beryl SF 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'.

The International Commission on Non-Ionizing Radiation Protection (ICNPR) published *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHz)* in 1998. The guidelines were updated in 2010. The objective of the paper was to establish guidelines for limiting EMF exposure that will provide protection against known adverse health effects. To prevent health-relevant interactions with Low Frequency fields, ICNIRP recommends limiting exposure to these fields so that the threshold at which the interactions between the body and the external electric and magnetic field causes adverse effects inside the body is never reached. The exposure limits, called basic restrictions, are related to the threshold showing adverse effects, with an additional reduction factor to consider scientific uncertainties pertaining to the determination of the threshold. They are expressed in terms of the induced internal electric field strength in V/m. The exposure limits outside the body, called reference levels, are derived from the basic restrictions using worst-case exposure assumptions, in such a way that remaining below the reference levels (in the air) implies that the basic restrictions will also be met (in the body) (ICNIRP 2016). Reference levels for occupational and general public exposure are shown in Table 8-14.

Table 8-14 ICNIRP reference levels (ICNIRP 2010)

Exposure characteristics	Electric field strength (kVolts per metre - kV/m)	Magnetic flux density (microteslas - $\mu$ T)
Occupational	10	1000
General public	5	200

The proposal includes four main components that could generate EMFs:

- an overhead or underground 66kV transmission line;
- underground 22-33kV cables;
- Up to 40 Inverters up to 2.5MW
- a 66kV substation and;
- the solar array (up to 1.5kV DC).

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

### Transmission line and substation

Figure 8-12 displays the typical electric fields emitted from different voltage overhead powerlines. The proposal site has existing 132kV and 66kV powerlines. The proposal would include the construction of a new 66kV transmission line either overhead or underground. The existing and proposed overhead powerlines are less than the recommended 5kV/m and 10kV/m limits. Underground transmission lines do not produce external electric fields due to shielding from effects of the soil.

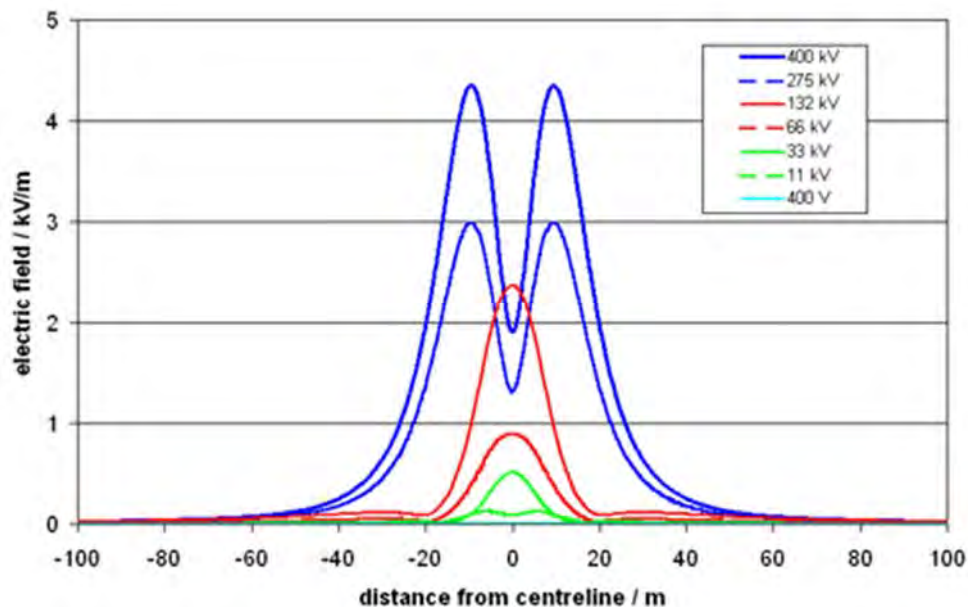


Figure 8-12 Typical electric fields from overhead powerlines (EMFs.info 2017).

Figure 8-13 and Table 8-15 shows a range of magnetic field levels measured by the ARPANSA around powerlines and substations. The existing and proposed overhead powerlines are less than the recommended 200 $\mu$ T and 1000 $\mu$ T limits, even if directly underneath the powerline.

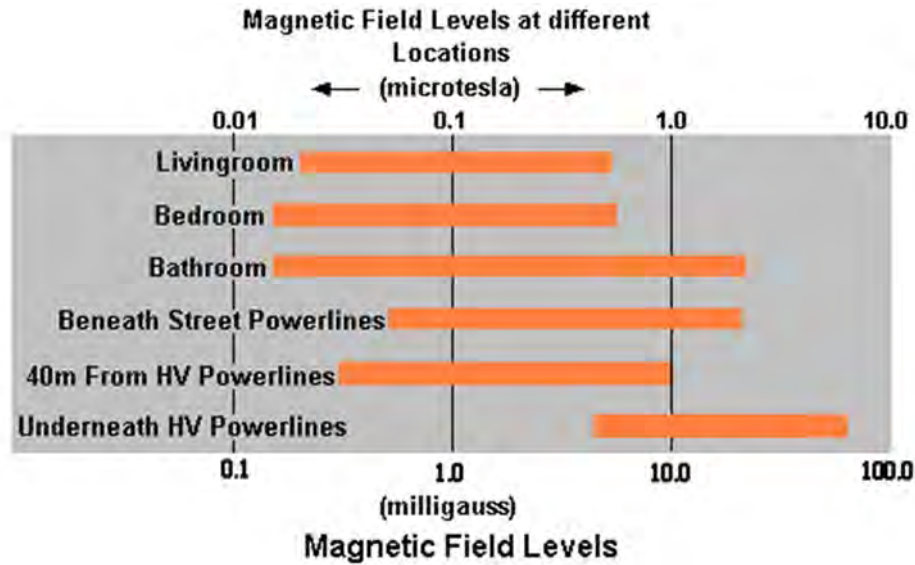


Figure 8-13 Magnetic field levels at different locations (ARPANSA 2015).

Table 8-15 Typical magnetic fields from overhead powerlines.

Source	Location of measurement	Range of measurement	
		(mG)	(μT) <sup>3</sup>
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

### Cabling

Underground 33kV cabling does not produce external electric fields due to shielding from effects of the soil, however magnetic fields still occur. EMFs.info (2016) provides some typical magnetic field data for a single 33kV underground cable at 0.5m depth. It can be seen that magnetic field would be under the recommended limits of 200 μT and 1000 μT.

Table 8-16 Magnetic field levels from underground 33kV cabling.

Magnetic Field (μT) at distance from centreline			
0 m	5 m	10 m	20 m
1.00	0.29	0.15	0.07

### Inverters

Up to 40 inverter stations containing inverter, transformer, HV switchgear and communication and ancillary equipment would be installed across the site. The inverter stations would have a total output of 2.5MW. The inverters would have an AC power frequency of 50 Hz and fall into the Extremely Low

<sup>3</sup> Converted from mG where 1 mG = 0.1 μT.



Frequency (ELF) range of 0-300 Hz. Within this range, the EMFs are not considered to be a hazard to human health.

### Arrays

Research into electric and magnetic fields undertaken at utility scale photovoltaic installations in California<sup>4</sup> 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.

## 8.9.2 Potential impacts

### Construction and decommissioning

There is low potential for EMF impacts during the construction and decommissioning phases of the proposal. Site staff would be exposed over intermittent periods during works at and around the existing 132kV and 66kV transmission lines that occur onsite and 132kV substation adjacent to the proposal site. The maximum magnetic and electric fields of the existing transmission lines and substation are well under the recommended limits for public and occupational exposure. Given the voltage that workers would be exposed to, and the intermittent nature of exposure, the effects are likely to be negligible.

### Operation

During operation, EMF sources would include the 22-33kV underground cables, 66kV transmission line, inverter stations, array and substation.

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 avoided.

The site is surrounded by agricultural land and public access would be further restricted by site fencing around the solar array and substation. EMFs from the solar farm are likely to be indistinguishable from background levels at the boundary fence. The underground 22-33kV cabling would not produce external electric fields due to shielding from soil, and its magnetic fields would be under the recommended limits for public and occupational exposure.

Staff exposure to EMFs from the proposed and existing transmission lines would be intermittent during site access and maintenance activities, and again EMF levels produced would be well within the recommended occupational exposure limits.

The EMFs produced by the proposed inverters and array are not considered to be a hazard to human health due the low voltage and magnetic fields significantly than household applications.

The onsite substation would also be located within fenced proposal site. While there are number of EMF sources within a substation, design procedures relating to equipment selection, layout, electrical connection techniques and compound size, would ensure the EMFs produced by the equipment within the station would also be typically indistinguishable from background levels beyond the substation fence. The

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<sup>4</sup> Note the U.S.A electricity supply operates at 60 Hz frequency

substation design would be similar to other designs used throughout Australia that have had EMF measurements taken to ensure levels within the compound are within recommended occupational exposure limits for staff.

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.

### 8.9.3 Safeguards and mitigation measures

Table 8-17 Safeguards and mitigation measures for magnetic fields.

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Transmission lines would be located as far as practical from residences, farm sheds, and yards to reduce the potential for exposure to EMFs.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Design of electrical infrastructure would minimise EMFs.</li> </ul>	C		

## 8.10 BUSH FIRE RISK

### 8.10.1 Existing environment

The study area is generally low relief and the majority of the proposal site has been cleared of overstorey vegetation. Localised native vegetation remnants occur in the locality, specifically linear roadside vegetation and along waterways. Patches of open woodland also occur within paddocks. The study area is dominated by cropping land.

The proposal site is currently used for grazing and therefore understorey bush fire fuel loads vary from season to season. In terms of existing bush fire hazards onsite, there are vegetation corridors along the western and southern boundaries of the property. As well as a corridor within the centre of the proposal site traversing north to south. These remanent patches onsite are part of larger patches that link to vegetation along Cudgegong River and Wialdra Creek. There are three existing powerlines (66 and 132kV) intersecting the site, mostly in a north-south direction and in alignment with the existing Beryl Substation. The existing Beryl Substation is directly adjacent to the proposal site within the north western section. There is no bushfire prone land mapping available for the proposal site.

The local bush fire danger period occurs between October and March. The Cudgegong Bush Fire Management Plan states typical climatic conditions for the area is varied with warm to temperate conditions in the western and northern areas and temperate to cool at higher elevations predominantly in the central and eastern portions with predominantly summer rainfall (CBFMC 2010). The catalyst for weather conditions favourable for bush fires in the area are south westerly and north-westerly winds accompanied by moderate to high temperatures and moderate levels relative humidity (CBFMC 2010).

Periods of higher temperatures and lower humidity lasting several days occur during the fire season along with frequent dry lightning storms. The harvest period of November to mid-December is considered a prime risk period due to machinery in crops and generally high activity in the rural sector.

Water resources available on-site include two waterways and eight wetlands/farm dams. One waterway is located within the south western area of site and the other waterway transverses the eastern area of the site. A number of tracks are located on the proposal site, including underneath powerlines, accessing dams and running down the centre of the site in a west and east direction. The site has good access from Beryl Road.

In terms of receivers and assets at risk from bush fire, 60 residences are located within 2km of the site. Additionally, a quarry 1.2km south of the proposal site, farm sheds, watering points, council infrastructure and equipment are common in the local area.

### **8.10.2 Potential impacts**

#### **Construction and decommissioning**

Activities associated with proposal 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 and fragmented nature of the woodland and forest remnants flanking the proposal site, it is considered unlikely that in combination with appropriate mitigation strategies, the proposal would pose a significant bush fire risk. Bush fire hazards associated with the activities listed above are considered highly manageable and would be minimised through the implementation of fire and bush fire mitigation measures outlined below. In addition, site access would be formalised at the beginning of the construction phase which would increase the ability to access and suppress any fire onsite or on adjoining sites if required.

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 proposal would be highly manageable.

#### **Operation**

Repairs and maintenance activities during the operation of the facility could increase bush fire risk. All electrical components would be designed to minimise potential for ignition. 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).

The overhead transmission line portions would be managed by maintaining appropriate vegetation clearance limits and reducing the potential ignition risks.

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

### 8.10.3 Safeguards and mitigation measures

Fire risks would be addressed as part of the proposal through the development and implementation of a Bush Fire Management Plan, covering construction and operational phases, as detailed in Table 8-18.

C: Construction; O: Operation; D: Decommissioning

Table 8-18 Safeguards and mitigation measures for bush fire risk.

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>Develop a Bush Fire Management Plan to include but not be limited to: <ul style="list-style-type: none"> <li>Management of activities with a risk of fire ignition.</li> <li>Management of fuel loads onsite.</li> <li>Storage and maintenance of firefighting equipment, including siting and provision of adequate water supplies for bush fire suppression. This includes access to the onsite dam if required for fire emergency situations.</li> <li>The below requirements of <i>Planning for Bush Fire Protection 2006</i> - <ul style="list-style-type: none"> <li>Identifying asset protection zones</li> <li>Providing adequate egress/access to the site</li> <li>Emergency evacuation measures</li> </ul> </li> <li>Operational procedures relating to mitigation and suppression of bush fire relevant to the solar farm.</li> </ul> </li> </ul>	C	O	D

## 8.11 CUMULATIVE IMPACTS

### 8.11.1 Existing environment

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

In terms of cumulative impacts, the most relevant interaction for the Beryl SF is the existing Beryl Quarry, located 1.2km south the of proposal site. The quarry's haulage route includes Beryl Road. Additionally, the Beryl SF would be adjacent to an existing substation, and the site has three existing transmission lines.

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

### **8.11.2 Potential impacts**

#### **Construction**

During construction, the additional traffic impact is likely the greatest potential for cumulative impact in regards to potential dust, noise and visual impacts for receivers along Beryl Road. There would be an increase in the amount of heavy vehicles along Beryl Road with the construction of Beryl SF and operation of the Beryl Quarry. Visually the receiver along Beryl Road would also see an increase in vehicles parked on the proposal site, approximately 60 vehicles. The potential impact from increased traffic and traffic movements to the site would be predominantly limited to construction (approximately 12 months).

It is unlikely there would be cumulative impact of onsite noise and air quality from concurrently operation of the quarry and construction of the Beryl SF, due to the distance between the sites and low density of receivers in the area.

#### **Operation**

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

There is unlikely to be any potential cumulative impacts with the concurrently operation of Beryl Quarry and Beryl SF.

The visibility of the facility, that translates into the operational view of the solar farm, may generate a cumulative impact with the existing substation and powerlines. The array site and substation require security fencing and steel dominated infrastructure. The mitigation recommended in this report will act to reduce the cumulative impact. Screen planting would be undertaken onsite but outside the perimeter fencing to minimise views of the fence as well.

Generally, adverse cumulative visual impacts are anticipated to be manageable due to the ability to effectively screen infrastructure in this low relief landscape

### **8.11.3 Environmental safeguards**

The cumulative impacts identified for this proposal are considered to be best managed by dealing with each component individually. No additional safeguards are proposed.



## 9 ENVIRONMENTAL MANAGEMENT

### 9.1 ENVIRONMENTAL FRAMEWORK

The environmental risks associated with the proposed Beryl SF would be managed by implementing a proposal-specific suite of mitigation measures detailed in Sections 7 and 8 and summarised below.

All commitments and mitigation measures 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.

### 9.2 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.

Table 9-1 Summary of mitigation measures

Construction (C), Operation, (O), Decommissioning (D)

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>Hollow-bearing trees within the development site would not be cleared between June and January, to avoid the breeding season of hollow-dependant fauna including the Superb Parrot as well as the Large-eared Pit Bat and Corben's Long-eared Bat, which whilst considered unlikely to occur within the site, nevertheless may have some small potential as occurring within the site from time to time. The nominated clearing period above will also help to avoid the core hibernation period for the two bat species.</li> <li>If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure these species do not occur.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Preparation of a Flora and Fauna Management Plan (FFMP) that would incorporate protocols for:               <ul style="list-style-type: none"> <li>Protection of native vegetation to be retained (including EEC)</li> <li>Best practice removal and disposal of vegetation</li> <li>Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist. Where possible, fallen timber with hollows is to be collected and placed into adjacent suitable habitats outside the development footprint.</li> <li>The relocation of displaced fauna during clearing</li> </ul> </li> </ul>	C		

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>○ Weed management, particularly noxious weeds</li> <li>○ Pathogen management</li> <li>○ Unexpected threatened species finds</li> <li>○ Rehabilitation/stabilisation of disturbed areas</li> </ul>			
<ul style="list-style-type: none"> <li>● Stockpiling materials and equipment and parking vehicles will be avoided within the dripline (extent of foliage cover) of any native tree that originates from outside of the development site.</li> <li>● Prior to the commencement of work, a physical vegetation clearing boundary at the approved clearing limit is to be clearly demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>● Use non barbed-wire on exterior fencing where possible.</li> </ul>		O	
<ul style="list-style-type: none"> <li>● A groundcover management plan would be developed and implemented to ensure the existing ground cover is maintained beneath the array during operation of the solar farm. The plan would be developed with reference to soil testing. Highly managed grazing may be used to maintain the height of ground cover during operation.</li> </ul>		O	
<ul style="list-style-type: none"> <li>● Where possible, landscape plantings will be comprised of local indigenous species with the objective of increasing the diversity of the existing vegetation. Planting locations would be designed to improve the connectivity between patches in the landscape where consistent with landscaping outcomes.</li> </ul>		O	
<ul style="list-style-type: none"> <li>● Avoid night works as much as possible, and avoid altogether where in close proximity to woodland habitats on adjacent properties.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>● Ensure lights (during nightworks and operation) are directed away from vegetation and adjacent habitats.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>● Weed and hygiene protocols will be prepared and implemented.</li> </ul>		O	
<ul style="list-style-type: none"> <li>● Awareness training (fauna collision risks) during site inductions and enforcement of site speed limits.</li> </ul>		O	
<ul style="list-style-type: none"> <li>● Feral species to be monitored and a management plan to be prepared and implemented to reduce feral species abundance.</li> </ul>	C	O	
<ul style="list-style-type: none"> <li>● Implement plan which ensures that fauna movement still possible around perimeter of development site.</li> </ul>	C	O	
<ul style="list-style-type: none"> <li>● A Biodiversity Offset Strategy (BOS) would be developed and implemented to retire the credits generated by the proposal, in accordance with the NSW Biodiversity Offsets Policy for Major Proposals.</li> </ul>	C	O	
<ul style="list-style-type: none"> <li>● If complete avoidance of the five recorded sites within the proposal area (Beryl Solar Farm IF 1, Beryl Solar Farm IF 2, Beryl Solar Farm IF 3, Beryl Solar Farm IF 4 and Beryl Solar</li> </ul>	C		

Safeguards and mitigation measures	C	O	D
Farm AS 1) is not possible, the artefacts must be salvaged prior to the proposed work commencing and moved to a safe area within the property that will not be subject to any ground disturbance.			
<ul style="list-style-type: none"> <li>The collection and relocation of the artefacts should be undertaken by an archaeologist with representatives of the registered Aboriginal parties. A new site card/s will need to be completed once the sites are moved to record their new location on the AHIMS database.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Once the sites Beryl Solar Farm IF 1, Beryl Solar Farm IF 2, Beryl Solar Farm IF 3, Beryl Solar Farm IF 4 and Beryl Solar Farm AS 1 are salvaged, the proposed work can proceed with caution within the development footprint.</li> </ul>	C		
<ul style="list-style-type: none"> <li>First Solar should prepare an Unexpected Finds Protocol (UFP) to address the potential for finding additional Aboriginal artefacts during the construction of the Solar Farm. The UFP will outline the procedure to deal with construction activity. Preparation of the UFP should be undertaken in consultation with the registered Aboriginal parties</li> </ul>	C		
<ul style="list-style-type: none"> <li>In the unlikely event that human remains are discovered during the construction, all work must cease in the immediate vicinity. OEH, the local police and the registered Aboriginal parties should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Further archaeological assessment would be required if the proposal activity extends beyond the area of the current investigation. This would include consultation with the registered Aboriginal party and may include further field survey.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>If feasible, underground rather than overhead power lines would be considered.</li> <li>If feasible, co-location of powerlines would be undertaken to minimise the look of additional power poles. If additional poles are required, these would match existing pole design as much as possible.</li> <li>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:               <ul style="list-style-type: none"> <li>Buildings will non-reflective and in eucalypt green, beige or muted brown.</li> <li>Pole mounts will be non-reflective.</li> </ul> </li> <li>Security fencing posts and wire would be non-reflective; green or black rather than grey would reduce the industrial character of the fence.</li> </ul>	Design stage		

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>Dust would be controlled in response to visual cues.</li> <li>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.</li> <li>Areas of soil disturbed by the project would be rehabilitated progressively or immediately post-construction, reducing views of bare soil.</li> <li>Ground cover would be maintained beneath the panels and within the site boundary, to break up views of the infrastructure from the side and back views.</li> <li>Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations).</li> </ul>	C		
<p>A Visual Impact Management Plan would address the 'as built' visual impacts of the proposed solar farm. The plan would include:</p> <ul style="list-style-type: none"> <li>Onsite vegetation screening, guided by the proposed screening, provided in Appendix D of the VIA report Appendix F.</li> <li>Involvement of the most affected landowners (relevant to medium impact view locations). This may include increased onsite planting density in specific locations suggested by the landowners (for example, where the proposed solar farm would be visible from outdoor recreational areas).</li> <li>Verification of predicted and actual impacts. This would improve the reliability of the measures and provide a trigger to undertake additional mitigation if required.</li> </ul> <p>(Guidance regarding these measures is provided in Appendix D of the VIA report Appendix F).</p>		O	
<ul style="list-style-type: none"> <li>Implement noise control measures such as those suggested in Australian Standard 2436-2010 "Guide to Noise Control on Construction, Demolition and Maintenance Sites", to reduce predicted construction noise levels.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Preparation of a Construction Noise Management Plan. A draft plan is included in Appendix G.2.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Additionally, during construction:               <ul style="list-style-type: none"> <li>Use less noisy plant and equipment, where feasible and reasonable.</li> <li>Plant and equipment should be properly maintained.</li> </ul> </li> </ul>	C		

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>○ Provide special attention to the use and maintenance of 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended.</li> <li>○ Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel.</li> <li>○ Avoid any unnecessary noise when carrying out manual operations and when operating plant.</li> <li>○ Any equipment not in use for extended periods during construction work should be switched off.</li> <li>• Develop and implement a noise complaint process. Each complaint would be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits. Keep people informed of progress. The person selected to liaise with the community should be adequately trained and experienced in such matters.</li> </ul>			
<ul style="list-style-type: none"> <li>• The array would be designed to allow sufficient space between panels to establish and maintain ground cover beneath the panels.</li> </ul>	Design stage		
<ul style="list-style-type: none"> <li>• A soil and water management plan (with erosion and sediment control plans) would be prepared, implemented and monitored during the proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to:               <ul style="list-style-type: none"> <li>○ Carry out soil testing prior to any impacts, to inform any soil treatments and provide baseline information for the decommissioning rehabilitation.</li> <li>○ Install, monitor and maintain erosion controls.</li> <li>○ 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.</li> <li>○ Manage topsoil: 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.</li> <li>○ Minimise the area of disturbance from excavation and compaction; rationalise vehicle movements and restrict the location of activities that compact and erode the soils as much as practical. Any compaction caused during construction would be treated such that revegetation would not be impaired.</li> <li>○ Ensure any discharge of water from the site is managed to ensure ANZECC (2000) water quality criteria are met.</li> </ul> </li> </ul>	C		D



Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>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.</li> </ul>			
<ul style="list-style-type: none"> <li>A spill response plan would be developed as part of the overall risk management plan to prevent contaminants affecting adjacent surrounding environments. The plan would:               <ul style="list-style-type: none"> <li>Manage the storage of any potential contaminants onsite.</li> <li>Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and EPA notification procedures and remediation.</li> </ul> </li> <li>Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>A protocol would be developed in relation to discovering buried contaminants within the proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>Design of footings for electrical componentry and panel mounts will consider flood risk.</li> </ul>	Design stage		
<ul style="list-style-type: none"> <li>All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>All fuels, chemicals, and liquids would be stored at least 50m from any waterways or drainage lines and would be stored in an impervious bunded area.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>Adequate incident management procedures will be incorporated into the Construction Environmental Management plan, including requirement to notify EPA for incidents that cause material harm to the environment (refer s147-153 Protection of the Environment Operations Act).</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>The refuelling of plant and maintenance would be undertaken in impervious bunded areas on hardstand areas only.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>Machinery would be checked regularly to ensure there is no oil, fuel or other liquids leaking from the machinery.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>A flood risk contingency plan would be prepared prior to construction and is to be implemented during construction, operation and decommission. The plan would:               <ul style="list-style-type: none"> <li>Detail who would be responsible for monitoring the flood threat and how this is to be done.</li> <li>A process for removing any necessary equipment and materials offsite and out of flood risk areas.</li> <li>Consideration of site access in the event that some tracks become flooded</li> </ul> </li> </ul>	C	O	D

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>Establishment of an evacuation point</li> </ul>			
<ul style="list-style-type: none"> <li>The proponent would consult with the Mid Western Regional Council regarding the proposed upgrading of the site access. The upgrade would be subject to detailed design, and must be designed and constructed to the standards specified by RTA Guidelines.</li> </ul>	Design stage		
<ul style="list-style-type: none"> <li>A Haulage Plan would be developed with input from the roads authority, including but not limited to:               <ul style="list-style-type: none"> <li>Assessment of road routes to minimise impacts on transport infrastructure.</li> <li>Scheduling of deliveries of major components to minimise safety risks (on other local traffic).</li> <li>Traffic controls (signage and speed restrictions etc.).</li> </ul> </li> </ul>	C		D
<ul style="list-style-type: none"> <li>A Traffic Management Plan would be developed as part of the CEMP and DEMP, in consultation with the Mid Western Regional Council and Roads and Maritime. The plan would include, but not be limited to:               <ul style="list-style-type: none"> <li>Assessment of road condition prior to construction on all local roads that would be utilised.</li> <li>A program for monitoring road condition, to repair damage exacerbated by the construction and decommissioning traffic.</li> <li>The designated routes of construction traffic to the site.</li> <li>Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction.</li> <li>Scheduling of deliveries.</li> <li>Community consultation regarding traffic impacts for nearby residents.</li> <li>Consideration of cumulative impacts.</li> <li>Consideration of impacts to the railway.</li> <li>Traffic controls (speed limits, signage, etc.).</li> <li>Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts.</li> </ul> </li> <li>Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>A Road Dilapidation Report would be prepared and include audits of the road formation and/or pavement condition to be undertaken prior to construction and at the completion of construction, operation and decommissioning phases. The proponent would repair any damage resulting from proposal traffic (except that resulting from normal wear and tear) as required at the proponent's cost and in consultation with Mid Western Regional Council.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>Consultation with proposal site mineral titleholder and Beryl Quarry regarding the proposal and potential impacts</li> </ul>	C	O	D

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>• Consultation with local community, to minimise impact of construction of adjacent agricultural activities and access.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>• Consultation would be undertaken with Transgrid regarding connection to the substation and design of electricity transmission infrastructure</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>• A Rehabilitation Plan would be prepared to ensure the array site is returned to its pre solar farm land capability. The plan would be developed with reference to base line soil testing and with input from an Agronomist to ensure the site is left stabilised, under a cover crop or other suitable ground cover. The plan would reference:               <ul style="list-style-type: none"> <li>○ Australian Soil and Land Survey Handbook (CSIRO 2009)</li> <li>○ Guidelines for Surveying Soil and Land Resources (CSIRO 2008)</li> <li>○ The land and soil capability assessment scheme: second approximation (OEH 2012)</li> </ul> </li> </ul>			D
<ul style="list-style-type: none"> <li>• The materials and colour of onsite infrastructure will, where practical, be non-reflective and in keeping with the materials and colouring of the landscape.</li> </ul>	C		
<ul style="list-style-type: none"> <li>• 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.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>• If any old farm machinery is to be removed, contact the Gulgong Historical Society to enquire about their interest in acquiring any items.</li> </ul>	C		
<ul style="list-style-type: none"> <li>• Maintain the railway embankment formation as much as possible.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>• A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to:               <ul style="list-style-type: none"> <li>○ Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy.</li> <li>○ Quantification and classification of all waste streams.</li> <li>○ Provision for recycling management onsite.</li> <li>○ Provision of toilet facilities for onsite workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant).</li> <li>○ Tracking of all waste leaving the site.</li> <li>○ Disposal of waste at facilities permitted to accept the waste.</li> <li>○ Requirements for hauling waste (such as covered loads).</li> </ul> </li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>• Septic system is installed and operated according to the Mid Western Regional Council regulations.</li> </ul>	C	O	

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>The Community Consultation Plan will continue to be implemented, including but not limited to implementing protocols to: <ul style="list-style-type: none"> <li>Keep the community updated about the progress of the proposal and proposal benefits.</li> <li>Inform relevant stakeholders of potential impacts (haulage, noise etc.).</li> <li>Respond to any complaints received.</li> </ul> </li> </ul>	C		
<ul style="list-style-type: none"> <li>Liaise with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Liaise with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>Liaise with local tourism industry representatives to manage potential timing conflicts with local events.</li> </ul>	C		D
<ul style="list-style-type: none"> <li>Development of a complaints procedure to promptly identify and respond to complaints.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>Develop protocols to minimise vehicle and construction equipment emissions for inclusion in the construction and operational environmental management plans. This would include but not limited to Australian standards and the POEO Act.</li> </ul>	C	O	D
<ul style="list-style-type: none"> <li>Protocols would be developed minimise dust levels generated during construction (eg. water carts or similar in response to visual cues).</li> </ul>	C		D
<ul style="list-style-type: none"> <li>All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Transmission lines would be located as far as practical from residences, farm sheds, and yards to reduce the potential for exposure to EMFs.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Design of electrical infrastructure would minimise EMFs.</li> </ul>	C		
<ul style="list-style-type: none"> <li>Develop a Bush Fire Management Plan to include but not be limited to: <ul style="list-style-type: none"> <li>Management of activities with a risk of fire ignition.</li> <li>Management of fuel loads onsite.</li> <li>Storage and maintenance of firefighting equipment, including siting and provision of adequate water supplies for bush fire suppression. This includes access to the onsite dam if required for fire emergency situations.</li> <li>The below requirements of <i>Planning for Bush Fire Protection 2006</i> -</li> </ul> </li> </ul>	C	O	D

Safeguards and mitigation measures	C	O	D
<ul style="list-style-type: none"> <li>▪ Identifying asset protection zones</li> <li>▪ Providing adequate egress/access to the site</li> <li>▪ Emergency evacuation measures</li> <li>○ Operational procedures relating to mitigation and suppression of bush fire relevant to the solar farm.</li> </ul>			



## 10 CONCLUSION

The proposed Beryl SF would be located approximately 6km west of Gulgong. The site is accessed directly off Beryl Road. The proposal would connect to the existing Beryl substation, which is immediately adjacent to the north west section of the proposal site.

The proposed solar farm would produce up to 95MW of electricity that will be fed into the National Electricity Market. 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 proposed Beryl SF would provide the following benefits:

- Reduce greenhouse gas emissions required to meet Australia's energy demands.
- Assist in the transition towards cleaner electricity generation.
- Directly contribute to helping in meeting the RET.
- Create significant economic benefits to the region, through the creation of direct and indirect jobs, supporting small business and by developing skills in a growing industry. First Solar (Australia) Pty Ltd has a proven track record of hiring local, qualified labour for plant construction and long-term positions for the maintenance and monitoring of daily operations.
- Embed electricity generation, to supply into the Australian grid closer to the consumption centres.

Key environmental risks have been investigated through specialist investigations and specific management strategies now form commitments of the proposal. Key commitments include:

- Biodiversity impacts:
  - A Flora and Fauna Management Plan (FFMP) would be developed and implemented to manage direct and indirect impacts on native vegetation and habitat values. This would include hollow bearing tree felling protocols, weed and pathogen management.
  - A Groundcover Management Plan would be developed and monitored to ensure the existing ground cover is maintained beneath the array during the operation of the solar farm.
  - A Biodiversity Offset Strategy (BOS) would be developed and implemented to retire the credits generated by the proposal, in accordance with the NSW Biodiversity Offsets Policy for Major Proposals.
- Aboriginal heritage impacts:
  - An Unexpected Finds Protocol (UFP) would be prepared to address the potential for finding additional Aboriginal artefacts during the construction of the Solar Farm. The UFP will outline the procedure to deal with construction activity.
- Visual impact:
  - Design measures (materials selection and colour) would be undertaken to reduce glint and minimise the contrast of the infrastructure where possible.
  - Screening vegetation would be planted to break up views of infrastructure in specific locations.
- Noise impacts:
  - A Construction Noise Management Plan would be finalised and implemented to manage exceedances during the construction phase.

A suite of additional management measures has been developed to address other environmental impacts and risks. These include:

- Traffic:
  - A Traffic Management Plan would be developed in consultation with the Mid Western Regional Council and Roads and Maritime, to manage construction and decommissioning impacts.
  - A Road Dilapidation Report would be prepared to ensure the proponent would repair any damage resulting from proposal traffic.
- Land capability:
  - A Rehabilitation Plan would be prepared to ensure the array site is returned to its pre solar farm land capability. The plan would be developed with reference to baseline soil testing and with input from an Agronomist to ensure the site is left stabilised, under a cover crop or other suitable ground cover.
- Community:
  - The Community Consultation Plan will continue to be implemented to keep the community updated about the progress of the proposal and proposal benefits, inform relevant stakeholders of potential impacts (haulage, noise etc.) and respond to any complaints received during construction and operation.
  - The proponent would liaise with local industry and commercial representatives to maximise the use of local contractors, manufacturing facilities, materials and to manage accommodation options for construction staff.
- Bushfire
  - A Bush Fire Management Plan would be developed to manage fire risks and responses during construction, operation and decommissioning.

The impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. The proposal is considered compatible with existing land uses and highly reversible upon decommissioning, returning the site to its previous land capability. The proposal would make a long-term contribution to meeting energy demands of Australians, using renewable sources that would offset emissions generated through the burning of fossil fuels. Impacts are considered justifiable and acceptable.

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