

# Environmental Impact Statement

SUNRAYSIA SOLAR FARM, BALRANALD

JANUARY 2017



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**Certification**

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

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## TERMS AND DEFINITIONS

<b>AC</b>	Alternating current
<b>ACHA</b>	Aboriginal Cultural Heritage Assessment
<b>AEMO</b>	Australian Energy Market Operator
<b>Applicant</b>	Entity applying for development consent under the EP&A Act (refer also proponent)
<b>AR5</b>	Assessment Report 5 (IPCC)
<b>ARPANSA</b>	Australian Radiation Protection and Nuclear Safety Agency
<b>Balranald LGA</b>	Balranald Local Government Area
<b>BAR</b>	Biodiversity Assessment Report
<b>BCC</b>	BioBanking Credit Calculator
<b>BOM</b>	Australian Bureau of Meteorology
<b>CEMP</b>	Construction Environmental Management Plan
<b>CHMP</b>	Cultural Heritage Management Plan
<b>Cwth</b>	Commonwealth
<b>DA</b>	Development Application
<b>dB</b>	Decibel
<b>dB(A)</b>	A measure of A-weighted ( <i>c.f.</i> ) sound levels.
<b>DC</b>	Direct Current
<b>DCCEE</b>	Department of Climate Change and Energy Efficiency (Commonwealth)
<b>DECCW</b>	Refers to OEH
<b>DP&amp;E</b>	Department of Planning and Environment (NSW)
<b>DPI</b>	Department of Primary Industries (NSW)
<b>DoE</b>	(Cwth) Department of Environment.
<b>EEC</b>	Endangered Ecological Community – as defined under relevant law applying to the proposal
<b>EIA</b>	Environmental Impact Assessment
<b>EIS</b>	Environmental Impact Statement
<b>ELF</b>	Extremely low frequency, in relation to Hz ( <i>c.f.</i> )
<b>EMFs</b>	Electric and Magnetic Fields
<b>EPBC Act</b>	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwth)
<b>EPA</b>	(NSW) Environment Protection Authority
<b>EPL</b>	Environment Protection Licence, issued under the POEO Act ( <i>c.f.</i> )
<b>EP&amp;A Act</b>	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
<b>EP&amp;A Regulation</b>	<i>Environmental Planning and Assessment Regulation 2000</i> (NSW)
<b>ESD</b>	Ecologically Sustainable Development
<b>GHG</b>	Greenhouse gas
<b>GWh</b>	Gigawatt hours
<b>ha</b>	hectare

<b>Heritage Act</b>	<i>Heritage Act 1977</i> (NSW)
<b>Hz</b>	Hertz
<b>IBRA</b>	Interim Biogeographic Regionalisation for Australia (IBRA) i
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>km</b>	Kilometre
<b>kL</b>	Kilolitres
<b>LALC</b>	Local Aboriginal Land Council
<b>LCA</b>	Life Cycle Analysis, an assessment and quantification of the energy and material flows associated with a given process or product to identify the resource impacts of that process.
<b>LEP</b>	Local Environment Plan
<b>LGCs</b>	Large-Scale Generation Certificates
<b>LLSWR</b>	Local Land Services – Western Region
<b>LRET</b>	Large-Scale Renewable Energy Target
<b>m</b>	metres
<b>ML</b>	Megalitres
<b>NEFR</b>	National Electricity Forecasting Report
<b>NEM</b>	National Electricity Market
<b>Maoneng</b>	Maoneng Australia Pty Ltd
<b>MNES</b>	Matters of National Environmental Significance, under the EPBC Act ( <i>c.f.</i> )
<b>MRET</b>	Mandatory Renewable Energy Target
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt hours
<b>NW Act</b>	<i>Noxious Weeds Act 1993</i> (NSW)
<b>NSW</b>	New South Wales
<b>OEH</b>	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water (DECCW)
<b>PCTs</b>	Plant Community Types
<b>POEO Act</b>	<i>Protection of the Environment Operations Act 1997</i> (NSW)
<b>Proponent</b>	The entity proposing this development, in this instance, Sunraysia Solar Farm Two Pty Ltd.
<b>PV</b>	Photovoltaic
<b>RAPs</b>	Registered Aboriginal Parties
<b>RBL</b>	Rating Background Level - the level of background noise
<b>RE Act</b>	<i>Renewable Energy (Electricity) Act 2000</i> (Commonwealth)
<b>REC</b>	Renewable Energy Certificate
<b>RET</b>	Renewable Energy Target
<b>RFS</b>	NSW Rural Fire Service

<b>Roads and Maritime</b>	(NSW) Roads and Maritime Services, formerly Roads and Traffic Authority (RTA)
<b>SEARs</b>	Secretary's Environmental Assessment Requirements
<b>SEPP</b>	State Environmental Planning Policy (NSW)
<b>SEPP (Infrastructure)</b>	<i>State Environmental Planning Policy (Infrastructure) 2007 (NSW)</i>
<b>Sound pressure level</b>	The noise at a given distance from plant or equipment
<b>SRD SEPP</b>	<i>State Environmental Planning Policy (State and Regional Development) 2011 (NSW)</i>
<b>SPM</b>	Summary for Policy Makers
<b>SSD</b>	State Significant Development, as defined by Section 89C of the EP&A Act ( <i>c.f.</i> )
<b>Sunraysia SF</b>	Sunraysia Solar Farm
<b>Sunraysia SFTPL</b>	Sunraysia Solar Farm Two Pty Ltd
<b>TSC Act</b>	<i>Threatened Species Conservation Act 1995 (NSW)</i>
<b>TSR</b>	Travelling Stock Reserve
<b>μT</b>	Microtesla, multiples of a unit of magnetic field
<b>V</b>	Volts
<b>WSP</b>	Water Sharing Plan
<b>VIA</b>	Visual Impact Assessment
<b>WG1</b>	Working Group 1 (IPCC)
<b>WHO</b>	World Health Organisation

## **EXECUTIVE SUMMARY**

This Environmental Impact Statement (EIS) identifies and assesses the environmental issues associated with the construction, operation, upgrade and decommissioning of the proposed 200 MW Sunraysia Solar Farm (Sunraysia SF). NGH Environmental has prepared the EIS on behalf of the proponent, Sunraysia Solar Farm Two Pty Ltd (Sunraysia SFTPL), a subsidiary of Maoneng 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) and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). The structure and content of the EIS addresses the Secretary's Environmental Assessment Requirements (SEARs), provided by NSW Department of Planning and Environment (DP&E) on 16 June 2016.

### **ES 1 - PROJECT LOCATION**

The Sunraysia SF proposal site is located around 17km south of the Balranald town centre and around 140km south east of Mildura, within the Balranald Shire Council Local Government Area (LGA). The site is accessed from Balranald-Tooleybuc Road (also known as Yanga Way and Mallee Highway) located to the east. The proposed solar farm would connect to an existing substation, approximately two kilometres north of the site.

The proposal site covers an area of around 1,000 hectares of mostly cleared agricultural land (grazing and cropping). The surrounding land within a five kilometre radius of the proposal site is predominantly agricultural farmland (grazing and cropping). A Travelling Stock Reserve (TSR) is located on the eastern boundary of the proposal site.

### **ES 2 – SUNRAYSIA SF PROJECT DESCRIPTION**

Sunraysia Solar Farm (Sunraysia SF) would be one of the largest utility scale solar farms in Australia with a capacity of around 200 MWAC. Maoneng proposes to develop around 800 hectares of the 1,000 hectare proposal site. Sunraysia SF would include the following elements:

- PV modules using crystalline or thin-film technology with solar tracking system
- Energy storage
- A site office and maintenance building
- An access from Balranald-Tooleybuc Road to the site
- Internal access tracks to allow for site construction and maintenance
- Perimeter security fencing
- Grid connection to the substation to the north via an overhead powerline (220kV)
- Native vegetation screening, if required to break up views of infrastructure

The proposed development may be undertaken in stages. Stage 1 would be 100MWAC and Stage 2 100MWAC. The energy storage may also be undertaken as a separate stage. In total, the construction phase of the proposal is expected to take 7 to 12 months.

Sunraysia SF is expected to have a 30 year operating life and would employ operations and maintenance personnel. At the end of its operating life, Sunraysia SF could be either decommissioned returning the site to its existing land capability or, retrofitted with new equipment. If decommissioned, all above ground

infrastructure would be removed and the site would be rehabilitated to allow for a return to agricultural or other land use.

### **ES 3 - NEED FOR THE SUNRAYSIA SF PROJECT**

There is substantial scientific evidence that the Earth's climate is changing. The 5<sup>th</sup> Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), Working Group 1 (WG1), Summary for Policy Makers (SPM), concluded that:

*“Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions”...*

The Quarterly update of the National Greenhouse Gas Inventory (Department of Environment 2014) states that energy generation is the largest individual contributor of Greenhouse Gas (GHG) emissions in Australia, accounting for 32% of emissions in the year to March 2014. Australia has committed to reducing its GHG emissions to 26-28% below 2005 levels, by 2030. Thus, there is an important role for the development of renewable energy generation projects in lowering national emissions to combat climate change.

The central objective of the Sunraysia SF Project is to generate renewable electricity using solar PV technology. While the Australian Energy Market Operator (AEMO) does not predict that NSW will experience a shortfall of electricity over the next couple of years, the Sunraysia SF Project would assist in meeting the Australian Government's Renewable Energy Target (RET) and would be important in the implementation of the NSW Renewable Energy Plan.

### **ES 4 - ENVIRONMENTAL ASSESSMENT AND CONSULTATION**

The detailed investigation of risks and impacts was undertaken for the construction, operation and decommissioning phases of the Sunraysia SF. Additional to addressing the project-specific SEARs, a risk assessment was carried out to identify key environmental risks of the proposal, to guide the depth of investigation that would be undertaken in this EIS. The risk assessment identified five environmental aspects as key risks, and detailed investigations were subsequently undertaken in these areas:

- Biodiversity impacts and, if relevant offsetting requirements
- Aboriginal heritage impacts
- Visual impacts
- Noise impacts
- Land use impacts

Biodiversity, Aboriginal heritage, visual and noise impacts were assessed in specialists reports. Summaries of these reports are included in Section 7 and the full reports are attached as Appendices E-G & J. Land use has been assessed in Section 7.5 with guidance provided in Primefact 1063 (DPI 2013). Additional issues that did not constitute 'Key Issues' are considered in Section 8 of this EIS.

Where relevant to the assessment of the various issues and potential impacts, consultation was undertaken with government agencies and community stakeholders as described in Section 5. Mitigation measures identified in Sections 7 and 8 are compiled in Section 9.

## Summary of results for key issues

**Biodiversity impacts** were assessed against the *Framework for Biodiversity Assessment (FBA)*, the NSW biodiversity offsets policy developed for Major Projects (OEH 2014) and the requirements of the SEARs within a Biodiversity Assessment Report (BAR – Appendix F). The development footprint would impact on approximately 815.6 hectares of land, of which approximately 803.49 ha (98.52%) is cleared land (non-native vegetation). The BAR identifies that approximately 12.11 hectares of native vegetation would be impacted. Of the native vegetation that would be impacted 1.29 is *Acacia melvillei* Shrubland (PCT 23), this is listed as an Endangered Ecological Community under the TSC Act, the majority of which occurs along the transmission line. A total of 391 ecosystem credits have been generated for the proposal area and require offsetting (retirement).

Mitigation measures are provided to further minimise impacts to vegetation and habitat. Based on the specialist assessment, a referral under the EPBC Act is not considered to be required. Preparation of a Species Impact Statement, under the TSC Act is not required.

**Aboriginal cultural heritage impacts** were assessed in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011); the Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (OEH 2010), and Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (OEH 2010). The Aboriginal Heritage survey and assessment identified eight stone artefacts found across the proposal area and three hearths as well as two clusters of burnt clay which were recorded as ovens. The heritage assessment identified that the impact to scientific values, if the sites within the proposal area were to be impacted by the current proposal, is considered low. The sites have little research value apart from what has already been gained from the information obtained during the assessment undertaken. A re-alignment of the northern section of the transmission line is proposed in order to avoid a site containing hearths and artefacts.

**Visual Impacts** were assessed using methodology adapted from the Bureau of Land Management (BLM) Visual Resource Management System, developed by the BLM, US Department of the Interior (n.d). This methodology was combine with mapping and modelling to determining the Zone of Influence (ZVI) from these viewpoints and their sensitivity was assessed.

The assessment identified areas of medium impact, where mitigation could be considered as including;

- The residence 1.4 kilometres to the south. Located away from the site. Some additional vegetation screening has been recommended, subject to confirmation following construction to further minimise visual impacts
- The TSR along the eastern boundary of the site (viewpoints 5a, 5b and 5c). The vegetation would partially obscure the proposal site from users of the TSR. There is limited opportunity to further reduce the impacts. The impacts, however, are considered acceptable.
- Users of Balranald-Tooleybuc Road approaching the proposal site from the south (viewpoint 3). Given the 100km/hr speed limit on the road and existing vegetation screening, impacts would already be minimised but additional onsite screening has the potential to further reduce impacts if required.

A suggested screening plan has been developed (refer Appendix E) that includes screening.

In regards to the overhead powerlines which would be visible from a greater distance than the proposed solar farm, the visual impacts are considered to be low from all viewpoints as:

- Powerlines are not uncommon in the study area.

- A high voltage powerline with large truss towers cuts through the landscape from east to west in proximity to the proposed powerline which dominates the landscape.
- The proposed powerline would run parallel to Balranald-Tooleybuc Road which would minimise visual impacts from road users coming from the north or south.
- The length of the proposed powerline has been minimised as far as practicable to two kilometres (i.e. it starts at the most north eastern corner of the proposal site and takes the shortest route possible to the substation).

**Noise Impacts** for construction and operation were assessed by an acoustic specialist. The specialist Environmental Noise Assessment (ENA) was undertaken with reference to the *NSW Industrial Noise Policy 2000* (INP) and the *Department of Environment & Climate Change Interim Construction Noise Guideline 2009* (ICN Guideline). The Noise Assessment modelled noise levels at 1,400 metres south of the Sunraysia SF Project; this is the distance of the closest dwelling to the proposed Sunraysia SF. The noise assessment identified that there is unlikely to be any impacts from noise and vibration as a result of the construction or operation of the proposal to this residence.

**Land Use impacts.** The proposal would be located on land identified by NSW land Classification (OEH 2012) as having very severe limitations. The site has largely been used for grazing interspersed with opportunistic cereal cropping. The removal of relatively low value land from agricultural production during construction, operation and decommissioning, has been considered. The restricted grazing potential during operation of a solar farm has also been considered. While the agricultural output from the farm would be reduced by the operation of the solar farm this would be a very small fraction of agricultural output of the Balranald area. Additionally, the Sunraysia SF would not impact on horticultural production which is steadily increasing in the Balranald area. The Sunraysia SF land would continue to produce meat and fibre from grazing over the proposal's life. Consequently, the land would continue to contribute to agricultural production in the district and contractor's dependant on grazing enterprises.

The transmission line would travel through Crown reserves, including a Travelling Stock Reserve (TSR). Development of the transmission line would not impact on existing use of the TSR

## **ES 5 - OVERALL MANAGEMENT FRAMEWORK**

A preliminary constraints analysis was used to inform the location of infrastructure in the early planning phase of the Sunraysia SF Project. This included a 'Radial Risk Assessment' (RRA), this being a desktop constraints analysis, to identify potential solar farm sites within a 10 kilometre radius of the substation at Balranald which would be of sufficient size, and with low environmental constraints. The RRA, which is included as Appendix C, incorporated a risk rating for lands in relation to likely suitability for the development of a solar farm and associated infrastructure. Lands were given environmental risk ratings of 'low', 'moderate' and 'high' for various environmental constraints. The proposal site selected had a general risk rating of low.

Following initial site selection a constraints and opportunities map was prepared (Appendix D). This has assisted in developing a layout of the solar arrays and associated infrastructure with objective minimising impact on constraints including native vegetation and Aboriginal Heritage.

Impacts of the proposed Sunraysia SF relate primarily to the construction phase of the Sunraysia SF Project. Primary impacts include clearing of vegetation (mostly for the access tracks, 33 kV cable trench and construction laydown area), construction noise, construction traffic and dust. The main impacts associated with operation relate to visual impact and reduction in agricultural production at the site for the duration

of the Sunraysia SF Project. Decommissioning impacts are generally of a similar nature but to a lesser extent than construction impacts.

Mitigation measures and safeguards have been developed and are compiled in Section 9.

The environmental risks associated with the Sunraysia SF would be managed by implementing a project-specific suite of mitigation measures detailed in Sections 7 and 8 and summarised in Section 9 of this EIS.

All commitments and environmental safeguards would be managed through the implementation of a Project Environmental Management Plan (PEMP) adapted to the phase of development (construction/upgrading, operation, decommissioning).

## **ES 6 – CONCLUSIONS**

The Sunraysia SF Project involves the construction and operation of a 200 MW Solar Farm that will provide a beneficial contribution to Australia's transition to a low emission energy generation economy. The Sunraysia SF is considered compatible with existing land uses and highly reversible upon decommissioning, returning the site to its previous agricultural capacity.

The key environmental risks have been investigated through specialist investigations:

The Sunraysia SF Project is considered to be consistent with the principles of Ecologically Sustainable Development. Specifically, it would address the need to mitigate the risk of climate change to current and future generations by reducing the carbon emissions intensity of electricity generation.

# 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, upgrade and decommissioning of the proposed Sunraysia Solar Farm (Sunraysia SF). NGH Environmental has prepared the EIS on behalf of the proponent, Sunraysia Solar Farm Two Pty Ltd (Sunraysia SFTPL), a subsidiary of Maoneng 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) and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). The structure and content of the EIS addresses the Secretary’s Environmental Assessment Requirements (SEARs), provided by NSW Department of Planning and Environment (DP&E) on 16 June 2016 in respect of the Sunraysia SF Project SSD 7680 (Table 1-1; Appendix A).

By virtue of the EP&A Act and State *Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP), the Sunraysia SF is a State Significant Development (SSD). Accordingly, the application for development consent will be assessed and determined by the Minister for Planning (or delegate) under Part 4.1 of the EP&A Act.

Table 1-1 Secretary’s Environmental Assessment Requirements for the Sunraysia SF

Issue summary	Addressed in EIS
<b>General requirements</b>	
The (EIS) for the development must comply with the requirements in Schedule 2 of the EP&A Regulation 2000 and include the following, a full description of the development, including:	
<ul style="list-style-type: none"> <li>• Details of construction, operation, upgrading and decommissioning.</li> </ul>	Section 3
<ul style="list-style-type: none"> <li>• site plan showing all infrastructure and facilities (including site access location, site access routes, site compounds, laydown areas, substation, carpark and any other ancillary infrastructure that would be required for the development).</li> </ul>	Appendix B
<ul style="list-style-type: none"> <li>• a strategic justification of the development focusing on site selection and the suitability of the proposed site, including the permissibility of the proposal and the capacity of the existing electricity transmission network with consideration for other potential electricity generation projects.</li> </ul>	Section 2
<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>○ consideration of the cumulative impacts of other developments (where relevant).</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).</li> </ul> </li> </ul>	Sections 7 and 8

Issue summary	Addressed in EIS
<ul style="list-style-type: none"> <li>a description of the measures that would be implemented to monitor and report on the environmental performance of the development.</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.</li> </ul>	Section 9
<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 development application must be accompanied by 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>).</li> </ul>	Separate report to be submitted to DP&E with Development Application (DA)
<ul style="list-style-type: none"> <li>the development application must be accompanied by 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>	Separate report to be submitted to DP&E with DA
<b>Specific issues</b>	
<p>The EIS must address the following specific issues:</p> <ul style="list-style-type: none"> <li><b>Constraints</b> - including a detailed map identifying the key environmental and other land use constraints that have informed the final design of the development, including but not limited to existing electricity transmission lines, the project site boundary, proposed infrastructure, site access, vegetation types, residences within 2 km of the project site, existing waterbodies, proposed perimeter planting and all identified Aboriginal heritage items.</li> </ul>	Appendix D
<ul style="list-style-type: none"> <li><b>Land</b> – including a baseline assessment of the soil and land capability prior to development; an assessment of the impact of the development on agricultural land, flood prone land, mineral resources and exploration activities in the project site and the travelling stock/timber reserves adjacent to the site; and consideration of the compatibility of the development with the existing agricultural land uses on and adjacent to the site both during operation and after decommissioning, particularly in relation to the zoning provisions applying to the land.</li> </ul>	Section 7.5
<ul style="list-style-type: none"> <li><b>Biodiversity</b> – including an assessment of the likely biodiversity impacts of the development, particularly in regard to all native vegetation present including Endangered Ecological Communities (EECs) and isolated trees, and any steps taken to avoid, mitigate or offset any identified impacts, having regard to the NSW Biodiversity Offsets Policy for Major Projects, and in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by DP&amp;E.</li> </ul>	Section 7.1
<ul style="list-style-type: none"> <li><b>Heritage</b> – 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>	Sections 7.2 (Aboriginal heritage) and 8.5 (historic)
<ul style="list-style-type: none"> <li><b>Transport</b> – including an assessment of the site access route, the site access point off Yanga Way, the likely traffic volumes and transport impacts of the development on the capacity, condition, safety and efficiency of any local and State road networks including Yanga Way and The Cut Line, and a description of: <ul style="list-style-type: none"> <li>the measures that would be implemented to mitigate any impacts during construction, upgrading or decommissioning; and</li> <li>any proposed road or intersection upgrades developed in consultation with the relevant road authorities (if required).</li> </ul> </li> </ul>	Section 8.2
<ul style="list-style-type: none"> <li><b>Visual</b> – 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 to demonstrate it has been developed in consultation with affected landowners.</li> </ul>	Section 7.3

Issue summary	Addressed in EIS
<ul style="list-style-type: none"> <li><b>Water</b> – including an assessment of the likely impacts of the construction, operation and decommissioning of the development on groundwater and surface water resources (including any nearby watercourses), annual volumes of surface water and groundwater required, details of water supply arrangements and a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with <i>Managing Urban Stormwater: Soils &amp; Construction</i> (Landcom 2004).</li> </ul>	Section 8.1
<ul style="list-style-type: none"> <li><b>Noise</b> - including an assessment of the construction, upgrading and decommissioning noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG) and sub-station noise impacts in accordance with the NSW Industrial Noise Policy (INP), and a description of the measures that would be implemented to mitigate any impacts if the assessment shows construction, upgrading or decommissioning noise is likely to exceed applicable criteria.</li> </ul>	Section 7.4
<ul style="list-style-type: none"> <li><b>Hazards</b> – consideration of any relevant hazards including electrical fire and impacts from electromagnetic interference.</li> </ul>	Section 8.3
<b>Consultation</b>	
<ul style="list-style-type: none"> <li>Consultation with relevant local, state or commonwealth government authorities, infrastructure and service providers, community groups and affected landowners.</li> </ul>	Section 5
<ul style="list-style-type: none"> <li>Detailed consultation with affected landowners surrounding the development, and Balranald Shire Council.</li> </ul>	Section 5
<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>	Section 5

## 1.2 TERMS USED IN THIS DOCUMENT

- Proposal site. Location of the proposed solar farm not including the perimeter fence and access from Balranald-Tooleybuc Road.
- Development envelope. The proposal site and any additional infrastructure required for the operation of the proposed solar farm (e.g. Perimeter fence access from Balranald-Tooleybuc Road including road upgrade).

## 1.3 PROPOSAL OVERVIEW

### 1.3.1 The proponent

Maoneng is an international renewable energy investment and development company headquartered in Australia. Since 2010, the founders of Maoneng have had the vision and ambition to be a respected global leader for delivering sustainable energy solutions for commercial, industrial and government clients.

Maoneng has a strong track record for financing, developing and delivering solar energy projects. The leadership team has delivered over 100 megawatts (MW) of solar energy solutions in Australia and China. Maoneng is currently building the Mugga Lane Solar Park (MLSP), a 13MW Alternative Current (AC) Solar Farm located on the south side of Canberra. MLSP was developed under the ACT Government’s innovative renewable energy policy – Reverse Solar Auction. MLSP has been commissioned and is now operational with a design life of at least 30 years. MAONENG’s development pipeline comprises of approximately 1000 MW of utility and industrial scale solar energy projects across the Asia Pacific (APAC) region.

### **1.3.2 The location**

The Sunraysia SF proposal site is located around 17km south of the Balranald town centre and around 140km south east of Mildura, within the Balranald Shire Council Local Government Area (LGA). The site is accessed from Balranald-Tooleybuc Road (also known as Yanga Way and Mallee Highway) located to the east. The proposed solar farm would connect to an existing substation, approximately two kilometres north of the site.

The proposal site is identified as Lots 9, 10, 11 and 14 of DP 751179. The site covers an area of around 1,000 hectares of mostly cleared agricultural land (grazing and cropping). The surrounding land within a five kilometre radius of the proposal site is predominantly agricultural farmland (grazing and cropping). A Travelling Stock Reserve (TSR) is located on the eastern boundary 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 proposal site

### **1.3.3 The Sunraysia Solar Farm**

Sunraysia Solar Farm (Sunraysia) would be one of the largest utility scale solar farms in Australia with a capacity of around 200 MWAC, enough to power approximately 120,000 households within the NSW/VIC region. The power generated by Sunraysia will be fed into the National Electricity Market (NEM) at the transmission level from Transgrid's Balranald Substation where the energy may be partly consumed by the township of Balranald and various nearby towns, and support interconnecting power flows between New South Wales and Victoria.

Maoneng proposes to develop around 800 hectares of the 1,000 hectare proposal site. The Sunraysia SF would include the following elements:

- PV modules using crystalline or thin-film technology with solar tracking system
- Energy storage
- A site office and maintenance building
- An access from Balranald-Tooleybuc Road to the site
- Internal access tracks to allow for site construction and maintenance
- Perimeter security fencing
- Grid connection to the substation to the north via an overhead powerline (220kV)
- Native vegetation screening, if required to break up views of infrastructure

The proposed development may be undertaken in stages. Stage 1 would be 100MWAC and Stage 2 100MWAC. The energy storage may also be undertaken as a separate stage. In total, the construction phase of the proposal is expected to take 7 to 12 months.

The Balranald Solar Farm proposal would have a capital investment cost estimated to be \$275 million.

The Sunraysia SF is expected to have a 30 year operating life and would employ operations and maintenance personnel. At the end of its operating life, the Sunraysia SF could be either decommissioned returning the site to its existing land capability or, subject to planning approvals, be retrofitted with new equipment. If decommissioned, all above ground infrastructure would be removed and the site would be rehabilitated to allow for a return to agricultural or other land use.

The Sunraysia SF design and construction, operation and decommissioning requirements are described in more detail in Section 3. The final design would be informed by the mitigation measures determined in this EIS, any additional development consent conditions and technical aspects from the detailed design phase.

## **1.4 PROPOSAL OBJECTIVES**

The objectives of the Sunraysia SF are to:

- Select and develop a site which is suitable for commercial scale solar electricity generation to 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.
- Develop a project which is acceptable to the local community.
- Provide local and regional employment opportunities and other social benefits during construction and operation.
- Construct a project with minimal adverse environmental impacts.

## 2 NEED, OPTIONS CONSIDERED AND JUSTIFICATION OF THE PROPOSAL

### 2.1 STRATEGIC NEED OF THE PROPOSAL

#### 2.1.1 Climate change and Renewable Energy

There is substantial scientific evidence that the Earth's climate is changing. Some impacts of this are already being observed (increases in air and ocean temperatures, widespread melting of snow and ice and rising sea levels) with other indicators including altered rainfall patterns and more frequent or intense weather patterns such as heatwaves, drought, and storms (DCCEE 2010). Climate change impacts in Australia are anticipated to affect water supply and quality, ecosystems and conservation, agriculture and forestry, fisheries, settlements and industry and human health, while trade and commodity prices may also be impacted by the global impacts of climate change (DCCEE 2010).

The 5<sup>th</sup> Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), Working Group 1 (WG1), Summary for Policy Makers (SPM), concluded that:

*"The largest contribution to total radiative forcing is caused by the increase in atmospheric concentration of carbon dioxide since 1750" (IPCC 2013).*

The significance of 1750 is that it represents the commencement of the Industrial Age and utilisation of hydrocarbon fuels to support development and modern lifestyles.

The AR5 WG1 SPM 2013 further concluded that:

*"Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions"; and*

*"Cumulative emissions of CO<sub>2</sub> largely determine global mean surface warming by the late 21st century and beyond. Most aspects of climate change will persist for many centuries even if emissions of CO<sub>2</sub> are stopped. This represents a substantial multi-century climate change commitment created by past, present and future emissions of CO<sub>2</sub>."*

The material presented in AR5, WG1 SPM supports that there is a need for a response to anthropogenic climate changes. There is a range of responses to Climate Change that are complementary and are likely to be needed together to achieve effective mitigation of climate change trends and effects. One important measure is the transition to less carbon intensive generation technologies that will reduce emissions intensity and growth in CO<sub>2</sub> emissions. Renewable energy technologies such as wind, solar, hydro that have very low CO<sub>2</sub> emissions are crucial to efforts to redress the current adverse changes. The significant global increase in take-up of renewable energy technologies is testimony to the importance of these forms of energy generation.

#### Greenhouse gas emissions – electricity generation and benefits of solar technology

While emissions from the electricity sector have declined significantly from peaks recorded in 2008-09, the quarterly update of the National Greenhouse Gas Inventory (Department of Environment 2016), states that electricity generation is the largest individual contributor of GHG emissions in Australia, accounting for 35% of emissions in the year to December 2015. Thus, there is an important role for the development of

renewable energy generation projects in lowering electricity generation's contribution to national emissions intensity, and as a result, combating climate change.

Reducing GHG emissions globally is likely to be able to reduce the rate and magnitude of climate change. The Sunraysia SF would produce an estimated 527,000 MWh/year of renewable electricity that would assist in meeting the LRET and providing a GHG emission-free source of electricity to the Australian electricity grid (refer to Section 2.1 for details). Where renewable energy supplies displace carbon based electricity generation then it results in greenhouse gas emissions savings, providing added benefit of renewable energy technology.

### **Greenhouse gas emissions - life cycle analysis and benefits of solar technology**

Life cycle emissions take into account emissions produced during the manufacture, construction, operation and decommissioning of, in this case, electricity generation technologies. When compared with existing conventional fossil-fuel based electricity generation, solar PV technology generates far less life-cycle GHG emissions per GWh than conventional fossil-fuel-based electricity generation technologies (Fthenakis *et al* 2008, NREL 2012).

Unlike fossil fuel systems, most of the GHG emissions for solar technology occur upstream of the lifecycle, with the majority of the emissions (50-80%) arising during the production of the module (Weisser n.d). Other lifecycle emissions relate to construction and decommissioning activities. During plant operation, the production of electricity with photovoltaic modules emits no pollution, produces no GHGs, and uses no finite fossil-fuel resources. Support activities, such as maintenance works, may however generate emissions but the amount would be regarded as being very low. End of life and associated transport activities do not result in meaningful cumulative GHG emissions (Weisser n.d).

Emissions from conventional fossil fuel based energy generation can therefore be avoided by replacing conventional methods of fossil fuel energy generation with solar PV energy generation. The Sunraysia SF is expected to supply on average approximately 527,000 MWh of electricity per year over a 30 year operating period with an energy payback period of 1.5 years. Approximately 430 mega tonnes of CO<sub>2</sub> equivalent per annum would be avoided while the Sunraysia SF is operational, when compared to fossil-fuel based energy generation.

## **2.1.2 Energy Context in Australia and NSW**

### **Electricity generation in NSW**

Electricity in NSW is generated from a range of fuel sources, including black coal, natural gas, coal seam methane gas and to a lesser extent from renewable energy sources such as hydro, wind, biomass and solar (NSW T&I 2015).

NSW has over 18,000 MW of installed electricity generation capacity. Table 2-1 shows the installed capacity of power stations with greater than 30MW capacity, relative to the fuel used by the power station. Interconnectors with Queensland and Victoria provide additional capacity of about 1,100 MW and 1,500 MW respectively.

Table 2-1 Existing major power station capacity by technology in NSW.

Technology and energy source	Capacity (MW)	
<b>Fossil fuel technologies</b>		
Steam/Coal	10,760	12,860
Open Cycle Gas Turbine	1,388	
Combined Cycle Gas Turbine	460	
Diesel	156	
Coal Seam Methane	96	
<b>Renewable energy sources</b>		
Hydro	4510	5,390
Wind	657	
Solar	155	
Bagasse	68	
<b>Total</b>	<b>18,250</b>	

*Note: Table only includes major power stations with capacities over 30 MW.*

*Source: Modified from NSW T&I 2015*

In addition to the installed capacity described above, there are over 17,500 MW of power plant proposals in NSW (including over 8,500 MW from renewable sources) at various phases of development, from concept to construction.

### National Electricity Market

The National Electricity Market (NEM), Australia’s wholesale electricity market for the supply of electricity to retailers and end-users, has operations in five interconnected regions – Queensland, New South Wales and the Australian Capital Territory, Victoria, South Australia and Tasmania. The independent Australian Energy Market Operator (AEMO) manages operation of the NEM. AEMO published the National Electricity Forecasting Report (NEFR). This report provides independent electricity consumption forecasts for each National Electricity Market (NEM) region over a 20-year forecast period (2016–17 to 2035–36). AEMO’s forecasts explore a range of sensitivities that represent the probable pathway for Australia across weak, neutral (considered the most likely), and strong economic and consumer outlooks.

For the first time, the 2016 NEFR reviews trends in and forecasts of overall electricity usage by electricity consumers, as well as operational consumption and maximum and minimum demand from the grid.

AEMO (2015) forecasts the following:

- Consumption of grid-supplied electricity is forecast to remain flat for the next 20 years, despite projected 30% growth in population and average growth in the Australian economy, increasing from an estimated 183,258 gigawatt hours (GWh) 2015–16 to 184,467 GWh in 2035–36.
- Minimum demand for electricity is forecast to remain flat for five years, with the potential for a rapid reduction in the remaining forecast period driven by projected increases in rooftop PV. While the minimum for most regions currently occurs during the overnight period, by the mid-2020s this is forecast to start a shift to midday when the sun is strongest

and overhead, with continued growth in rooftop PV forecast to drive reductions in demand from the grid in the middle of the day.

Growth in generation from renewable energy sources is, however, essential to meet State and Australian Government renewable energy targets (discussed below in Section 2.1.3).

### **2.1.3 Strategic direction of the region and State**

Australia is a signatory to various international agreements, conventions and protocols. Most recently, at the Paris climate change conference, Australia committed to reducing its emissions to 26-28% below 2005 levels by 2030.

The Australian and NSW Governments have each developed strategies and set targets in relation to renewable energy generation that will assist in meeting energy demand while at the same time reducing GHG emissions. Key plans, strategies and targets, and how the proposal relates to them, are discussed below.

#### **Australia's Renewable Energy Target**

In 2001, the Commonwealth Government introduced the Mandatory Renewable Energy Target (RET) Scheme to increase the amount of renewable energy being used in Australia's electricity supply. Since January 2011, the RET scheme was divided into two components, the Small-scale Renewable Energy Scheme (SRES) and the Large-scale Renewable Energy Target (LRET). The LRET creates a financial incentive for the establishment or expansion of renewable energy power stations, such as wind and solar farms or hydro-electric power stations. It does this by legislating demand for Large-scale Generation Certificates (LGCs). One LGC can be created for each megawatt-hour of eligible renewable electricity produced by an accredited renewable power station. LGCs can be sold to entities (mainly electricity retailers) who surrender them annually to the Clean Energy Regulator to demonstrate their compliance with the RET scheme's annual targets. The revenue earned by the power station for the sale of LGCs is additional to that received for the sale of the electricity generated.

The LRET includes legislated annual targets which will require significant investment in new renewable energy generation capacity in coming years. The large-scale targets ramp up until 2020 when the target will be 33,000 gigawatt-hours of renewable electricity generation. The current projection is that about 23.5% of Australia's electricity generation in 2020 will be from renewable sources.

At the commencement of operation, the Sunraysia would produce an estimated 527,000 MWh/year of renewable electricity and supply over 15 million MWh over its life. This would assist Australia to meet the LRET and the Sunraysia SF would constitute approximately 10 per cent of the annual LRET target for 2018 (Clean Energy Regulator 2015), the year it is proposed to become operational, and approximately 5 per cent of the overall LRET target.

#### **NSW 2021: A Plan to Make NSW Number One**

This plan was released in 2011, replacing the State Plan as the NSW Government's strategic business plan, setting priorities for action and guiding resource allocation. Goal 22 of this plan seeks to protect our natural environment, and includes a specific target to increase renewable energy. A commitment is made to:

*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 (NSW Government 2011).*

Specific initiatives under this target that directly support building solar power plants included the Solar Flagships Program, in partnership with the Commonwealth Government, established in 2009 (now closed). Additionally, a strategic move towards renewable energy generation is supported through the establishment of a Joint Industry Government Taskforce to develop a Renewable Energy Action Plan for NSW, which would identify opportunities for investment in renewable energy sources.

### **NSW Renewable Energy Action Plan**

In 2013, the NSW Government released the NSW Renewable Energy Action Plan to guide NSW's renewable energy development (NSW Government 2013). The Government's vision is for a secure, affordable and clean energy future for NSW.

The Plan positions the state to increase energy from renewable sources, at least cost to the energy customer and with maximum benefits to NSW. The strategy is to work closely with NSW communities and the renewable energy industry to increase renewable energy generation in NSW.

The Plan details three goals and 24 actions to efficiently grow renewable energy generation in NSW:

1. Attract renewable energy investment and projects.
2. Build community support for renewable energy.
3. Attract and grow expertise in renewable energy.

Furthermore, the Plan recognises that energy storage can increase the value of renewable energy to individuals, network operators and investors. Storage allows renewable energy investors to increase revenue by selling power at times of peak market prices as opposed to when the electricity is generated. This in turn places downward pressure on electricity prices by encouraging more supply at times of peak demand and reducing the need for additional distribution and transmission infrastructure.

Storage technology (including rechargeable batteries and thermal energy storage) is a global market, with many other countries currently grappling with ways to integrate increasing amounts of renewable energy into their networks. NSW can leverage the work being done overseas as well as develop storage expertise within NSW to create a long term export industry.

### **Climate Change Fund Draft Strategic Plan 2017 to 2022**

This strategic plan sets out priority investment areas and potential actions using \$500 million of new funding from the \$1.4 billion Climate Change Fund over the next five years. Investment in these areas will help New South Wales make the transition to a net zero emissions by 2050, and adapt to a changing climate.

This strategic plan is an important first step to implementing the policy framework. The strategic plan organises potential actions into three priority investment areas that will form the basis of future action plans:

- Accelerating advanced energy (up to \$200m)
- National leadership in energy efficiency (up to \$200m)
- Preparing for a changing climate (up to \$100m).

The advanced energy priority area focuses on supporting the transition to a net-zero emissions economy by providing greater investment certainty for the private sector, accelerating new technology to reduce future costs, and helping the community and industry make informed decisions about a net-zero emissions future.

## **2.2 OPTIONS CONSIDERED**

During the development of the proposal, a number of alternatives were considered and are provided below. The following we considered:

- the ‘do nothing option’, or not developing the solar farm
- Alternative locations for the proposal
- Different capacities (size) of the proposal
- The use of different solar technologies

### **2.2.1 *The ‘do nothing’ option***

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

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

Doing nothing would avoid the environmental impacts associated with the development and operation of the proposal, which include construction noise, traffic and dust, visual impacts and a 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 significant impact to the environment. Given the benefits of the proposal, the do nothing option is not considered to be a preferred option. In light of the benefits of the proposal and the level of environmental impact (assessed within this EIS), the proposal is considered to be ecologically sustainable and justifiable.

### **2.2.2 *Alternative site locations***

#### **Proposal site**

Available grid capacity at a suitable voltage was instrumental in making Balranald an ideal choice for a renewable energy development. This was confirmed by Transgrid in a presentation at the NSW large-scale solar workshop on the 19 November 2015, where Balranald was identified as one of the “regions of interest” with good connection capacity for renewable energy projects (Figure 2-1).

## Regions of interest

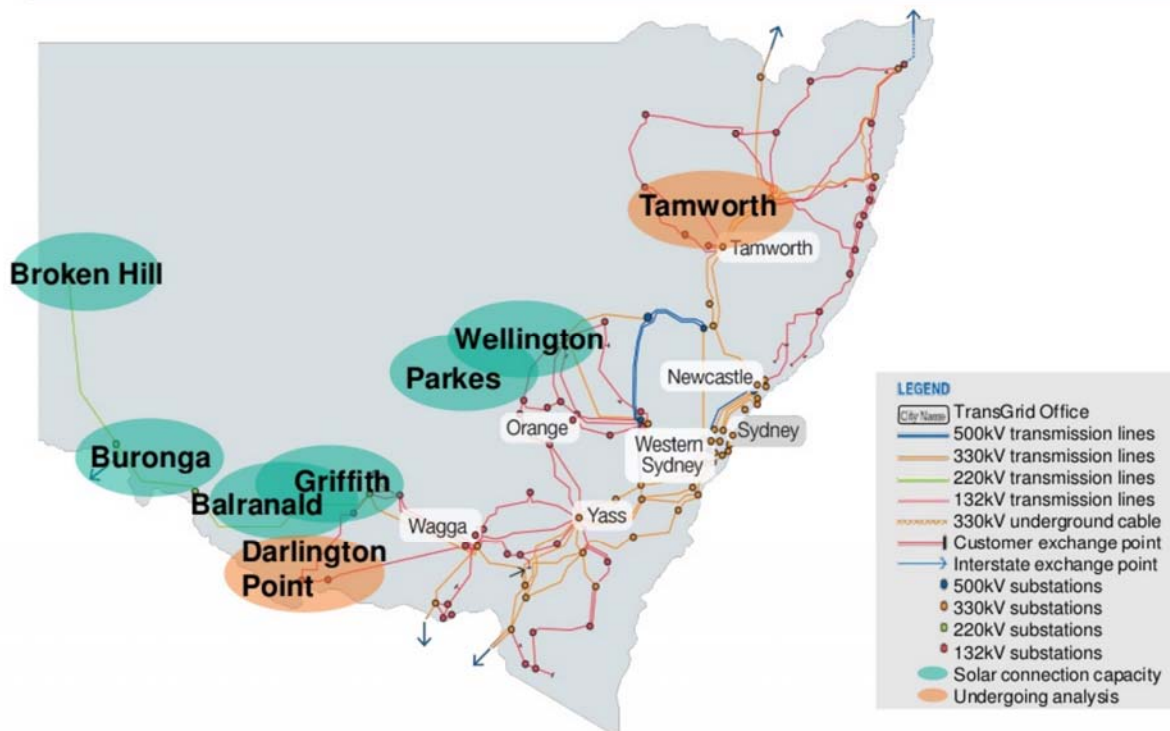


Figure 2-1 Regions of interest for large scale solar in NSW (source Transgrid 2015)

The Sunraysia SF is being developed as a green field solar farm by Maoneng's management team. Development of a greenfield site contrasts with the development of an asset through acquisition of a pre-developed site. This approach provides the benefits of having engaged local stakeholders during the site selection process, and ensures that the proponent has a thorough understanding of the proposal site and its associated constraints.

Understanding of substation capacity is also critical to utility scale solar power development. Having thoroughly examined various locations across NSW, Maoneng prioritised several non-congested areas of renewable energy penetration opportunities including but not limited to Balranald.

Maoneng has gone through a selection process that has involved identification of site constraints, that would allow for the development of a large scale solar farm with:

1. an acceptable and minimal environmental impact
2. meeting the objective of allowing for delivery of affordable renewable energy integrated into the Australian National Electricity Market.

In order to assist in identifying a proposal site minimising environmental impacts, an initial desktop constraints analysis was completed. This involved completion of a 'Radial Risk Assessment' (RRA), a desktop constraints analysis to assist in identifying potential solar farm sites within a 10 kilometre radius of the substation at Balranald. The objective of the RRA was to identify sites of sufficient size, and with low environmental constraints to allow for the development of a solar farm.

The following databases were accessed for preparation of the RRA:

- Aboriginal Heritage Information Management System database search.

- Commonwealth and State databases to determine whether any threatened flora and fauna species, populations, ecological communities, migratory species and critical habitats as detailed in State and Commonwealth legislation occur or are likely to occur within the study area. This included a search of Bionet (OEH Atlas of NSW Wildlife), OEH Vegetation Types Database, OEH BioBanking Threatened Species Profile Database, Primary Industries Records viewer, the EPBC Act Protected Matters search tool, and the Department of Primary Industries (DPI) noxious weed declarations for the Council area.
- State and local heritage registers.
- Aerial photography and VIS vegetation mapping.
- Land tenure databases.

The RRA, which is included as Appendix C, incorporated a risk rating for lands in relation to likely suitability for the development of a solar farm and associated infrastructure. Lands were given environmental risk ratings of 'low', 'moderate' and 'high' for various environmental constraints. Where a moderate to high risk level was identified within any site, additional investigations would be required to assess level of the specific constraint identified. The proposal site selected had a general risk rating of low.

Following the selection of a site, an environmental constraints analysis that included a site investigation to further distil potential constraints to the proposed development was completed. The aim of this work was to ensure that any site constraints were identified early in the planning and design phase. This constraints analysis provided Maoneng with an understanding of the potential issues that may be encountered on site during the design phase. Data obtained during the environmental constraints analysis was utilised in preparation of a scoping report, submitted on the 20 May 2016 to the NSW Department of Planning and Environment to obtain the SEARs.

The decision to propose the development of the Sunraysia Solar Farm at the Balranald site was based on access to land, a rigorous process of commercial and technical assessments and the environmental constraints assessment process described above.

### **Transmission line**

The location of the proposal as close to a suitable substation as possible was prioritised to minimise potential environmental impacts as a result of the creation of an electricity easement. Once the site was selected, approximately two kilometres away from the substation, several options for transmitting power from the solar farm to the substation were considered:

- Utilising the road reserve to reduce the impact of the development to encroach greenfield territory. This option would require a longer easement. It would also have more visual impacts than the other options due to its increased length and higher visibility along the road. It would have potentially more impacts to biodiversity and other environmental constraints, such as potentially preventing or making difficult any potential future road upgrades, due to increased length along the road reserve and TSR.
- Utilising private agricultural land to the north of the proposal site to create an easement. This option would potentially have the least impacts on biodiversity as the land is mostly cleared agricultural land. However, the use of this private land for an easement may constrain the possible future development of another solar farm currently being planned (Limondale Sun Farm). Furthermore, approval from the landowner could not be obtained.
- Utilising crown land within the TSR to create an easement. This option would create an easement along the western boundary of the TSR to minimise vegetation removal requirement. It would be of a similar length to the option above and be shorter than the

option of using the road reserve. This would reduce visual and other impacts. The Department of Primary Industries (Land) has agreed in principle to the creation of an easement within this land (refer to Section 5).

### **Vegetation clearing**

In selection of the solar farm site, a focus of the process was to avoid clearing of native vegetation where possible. The proposal footprint is approximately 815.6 hectares. Of this 98.52% (803.49 hectares) does not contain native vegetation. Impact to native vegetation from each infrastructure component is detailed in Table 7-4. A total of 12.11 hectares of native vegetation, that requires offsetting, would be impacted.

While it is acknowledged that there would be some impact from the development to native vegetation, avoidance of native vegetation to reach a nil-impact for a broad acre solar farm development is extremely difficult given the nature of the development, and constraints typically associated with obtaining right of access to a site and for the transmission of power from a site to a substation.

Minimising impact to native vegetation has been achieved via;

1. avoidance of larger patches of native vegetation (viz. Appendix D) that is located on the perimeter of the proposed solar array
2. Placement of the transmission line on the edge of native vegetation (adjacent to cleared agricultural land)
3. Use of an existing access track as access to the site.

The option of installing the transmission easement within the privately owned neighbouring land that is cleared of native vegetation was investigated, however access to an easement could not be obtained.

### **2.2.3 The size of the proposal**

The proposed solar farm is currently sized at a peak capacity of 200MWAC based on discussions with the transmission network services provider (Transgrid). The site can potentially accommodate a much larger solar farm, which could be considered in the future and be subject to additional environmental assessments.

The proposed Sunraysia SF allows for the staged development of the photovoltaic component of the solar farm in two stages, each being around 100MWAC. The development of integrating energy storage to support the network moving forward into the future would be an additional stage.

Once completed, the Sunraysia SF may be one of the largest solar farms in Australia and notable globally.

### **2.2.4 Alternative technologies**

Several solar technologies such as solar thermal and concentrated solar thermal were considered during early planning stages but as these technologies are still in their research and development stage in Australia, there are significant challenges associated with their deployment, and associated development costs.

Within this proposal, several types of solar photovoltaic technologies are considered, such as Monocrystalline, Polycrystalline and Thin-Film solar modules. These solar modules would be assembled on mounting systems that may be fixed or track the sun in order to maximise the efficiency of the solar farm.

## **2.3 THE SUNRAYSIA SOLAR FARM: BENEFITS AND JUSTIFICATION**

The Sunraysia SF would generate approximately 200 MWAC. This is enough electricity to supply the equivalent of approximately 120,000 average NSW homes. The generation of non-polluting renewable energy assists with the transition from fossil fuel generated electricity to a cleaner more sustainable alternative in line with the Government's Renewable Energy Target. This is in keeping with national and international agreements to which Australia is a party.

The Sunraysia SF would:

- Provide for further reduction in GHG emissions intensity for generation in the NEM.
- Help meet Australia's RET.
- Minimise environmental impacts through appropriate site selection and layout.
- Provide further investment in a local community which has shown support for renewable energy.
- Consider the possible implementation of large scale utility energy storage to support the transition of renewable energy future.

## 3 DESCRIPTION OF THE PROPOSAL

### 3.1 PROPOSAL SITE

The proposed solar farm would be located on Lot 9,10,11 and 14 of DP 751179, which covers an area of approximately 1000 hectares (Figure 1-1 and Appendix B). It is bounded by agricultural land (grazing land and crops) to the north, west and south and by Crown Land (traveling stock reserve) to the east. The site is accessed via Balranald-Tooleybuc Road at the south eastern corner of the site. The Cut Line is an unsealed track running along the southern boundary of the site providing access to surrounding agricultural farm, including the proposal site.

The site is slightly undulating with the centre of the site being on slightly higher ground than the peripheries (there is a difference of approximately 13 metres between the highest and lowest point of the proposal site.) The proposal site has been used for agriculture for several decades and is therefore highly modified from grazing and cropping including ploughing. Areas of native vegetation are, however, located along the southern boundary and western boundary of the site, with some smaller patches and isolated trees located throughout the proposal site. One abandoned and derelict residential building is located on the proposal site.

Figure 3-1 illustrates the site from its south eastern corner at its access point from Balranald-Tooleybuc Road. Figure 3-2 illustrates the Cut Line. Figure 3-3 illustrates the proposal site from its north eastern corner.



**Figure 3-1 View of proposal site from its south eastern access from Balranald-Tooleybuc Road**



**Figure 3-2 View of the Cut Line looking west from its entry at Balranald-Tooleybuc Road**



**Figure 3-3 View of proposal site from its north eastern corner**

### Balranald-Tooleybuc Road

Balranald-Tooleybuc Road, also known as Yanga Way and Mallee Highway, is a classified road managed by Roads and Maritime Services. It is a two lane road with a speed limit of 100 kilometres/hour. It is an approved route for High Mass Limit (HML) B-double vehicles of 25/26m, however, it does not form part of the National Land Transport Network of important road and rail infrastructure links, defined under the *National Land Transport Act 2014*. It connects the Balranald township north of the proposal site with Kyalite, Tooleybuc and Victoria to the south (Figure 1-1). Figure 3-4 illustrates Balranald-Tooleybuc Road.



**Figure 3-4 View of Balranald-Tooleybuc Road looking north**

### Transgrid substation

An existing Transgrid substation with a present capacity of 200MW and a future potential capacity of 700MW is located approximately two kilometres north of the proposal site boundary within Crown Land (Figure 1-1 and 11Appendix B).



**Figure 3-5 View of Transgrid substation two kilometres north of the proposal site**

#### **Other features surrounding the proposal site**

There are three residential properties within five kilometres of the proposal site (1.4 kilometres to the south, 4.6 kilometres to the north east and 5 kilometres to the south east) (Figure 1-1).

The proposal site includes man made farm dams. There are no irrigation channels or natural drainage channels within or near the proposal site. The nearest water courses are:

- Wee Wee Creek (5 kilometres to the south west)
- Murrumbidgee River (11 kilometres to the north west)
- Minor ephemeral drainage lines and irrigation channels (the closest is 2.2 kilometres to the south east)

Native vegetation in the surrounding region is generally restricted to nature reserves and riparian vegetation along the major creeks and rivers. The Murrumbidgee Valley National Park, Murray Regional Park and Murrumbidgee Valley SCA are located to the north, north east and east of the proposal site, 5.5 kilometres from the proposal site at their closest point (Figure 1-1). However, there are large patches of native vegetation in the landscape including along property boundaries and within the TSR running along Balranald-Tooleybuc Road from Balranald to Tooleybuc (Figure 1-1 and Figure 3-5).



**Figure 3-6 View of Travelling Stock Reserve from Balranald-Tooleybuc Road**

### **3.2 THE PROPOSAL**

Appendix B provides the proposed Infrastructure plan showing the layout of the Sunraysia SF including:

- Solar arrays: approximately 750,000 solar panels (variously spaced)
- Single axis tracking system units (east-west variety; approximately 10,000 units), north-oriented fixed-tilt units, east-west facing fixed-tilt units or a combination of these technologies
- Up to 100 PV Boxes or PV Skids, each of them containing an inverter and a 22 or 33kV transformer
- Delivery/Substation units
- Energy storage
- Onsite cabling and electrical connections between solar panels, combiner boxes and power conversion units (inverters), power cables, optic fibre cables, conduits, trenches. The internal reticulation of power would be at 22 or 33kV.
- Internal gravel access tracks to allow for construction traffic, site maintenance vehicles, gravel access road and parking for staff and visitors including upgrade of the site access from Balranald-Tooleybuc Road
- Permanent staff amenities and office and maintenance building
- Perimeter security fencing, approximately 2.5 metres high
- Landscaping buffer (if required)
- A 220kV overhead power line to connect into the existing Balranald Transgrid substation, approximately two kilometres north of the site, through the TSR
- Connection to the Balranald substation, including civil, electrical and communications works.

The site is around 1000 Ha of which about 800 Ha would be developed. Within the 800 Ha, ground disturbance would be limited to:

- The installation of the piles supporting the solar panels, which would be driven or screwed into the ground
- Construction of internal access tracks
- Establishment of PV boxes and delivery/substations
- Trenches for the installation of cables
- Establishment of staff amenities and offices
- Temporary facilities for construction staff including vehicle/caravan parking
- Construction of perimeter security fencing
- Erection of wireless communication towers
- Erection of solar farm viewing decks and spaces
- Establishment of canals and various water reticulation infrastructure to capture rain collected surface water which would be stored in an on-site water storage facility no more than 100ML in total capacity. This water would be used for the running of the solar farm where required (e.g. cleaning of solar panels, water for sheep that may graze the site).

As illustrated on the proposed infrastructure plan in Appendix B, the solar array area covers the majority of the site, however the ground disturbance from pile installation would disturb only about 0.3% of the total site area. Panels within the solar array area would sit above the ground and ground cover would be maintained under the panels. Additional ground disturbance outside the solar arrays would result from construction of the internal access tracks, trenches for cabling and footings for other equipment. The area of the site which would be affected by shading from the solar panels would be approximately 70% of the proposal site.

Excluding underground cabling, all electrical plant and equipment would be established at least 350mm above the surrounding finished surface levels.

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

- Material laydown areas
- Temporary vehicular and caravan car parks for construction workers and transportation. Once the solar has been commissioned a small car park would remain for the minimal staff required and occasional visitors
- Temporary construction site offices
- Staff amenities. Once constructed, the solar farm would be monitored and operated remotely and would therefore require a minimum number of maintenance personnel (0.5 full time equivalent staff) to be on site

It is noted that the location of the ancillary facilities on the proposed infrastructure plan in Appendix B are indicative only and final locations would be determined at the detailed design phase.

The annual output of the proposal would be approximately 527 Gigawatt hours (GWh), with a capacity factor of approximately 25 per cent depending on the technology. The construction phase of the project would be 7 to 12 months with a capital cost of approximately \$275 million. The proposal is expected to have a 30 year operating life.

### **3.2.1 Solar arrays**

The solar arrays would be comprised of approximately 750,000 solar panels, which would be either crystalline or thin-film technology.

The panels to be installed would be either single-axis trackers (which would have approximately 10,000 tracker units), north-oriented fixed-tilt, east-west facing fixed-tilt or a combination of these technologies.

Approximately 100,000 piles would be driven or screwed into the ground in order to support the solar array's mounting system and solar panels, with racking systems to allow the installation of solar panels to minimise ground disturbance.

The panel structures would be between 1.5 to 3m high. The mounting system to be installed on the poles would be dependent on the final technology to be determined during detailed design. Figure 3-7, Figure 3-8 and Figure 3-9 illustrate the construction and assembly stages of a solar PV array (for a single-axis tracking system).



**Figure 3-7 Tracking Piles**



**Figure 3-8 Tracker Frames at Mugga Lane Solar Park**



**Figure 3-9 Example of solar arrays at Mugga Lane Solar Park**

### **3.2.2 PV boxes or PV skids**

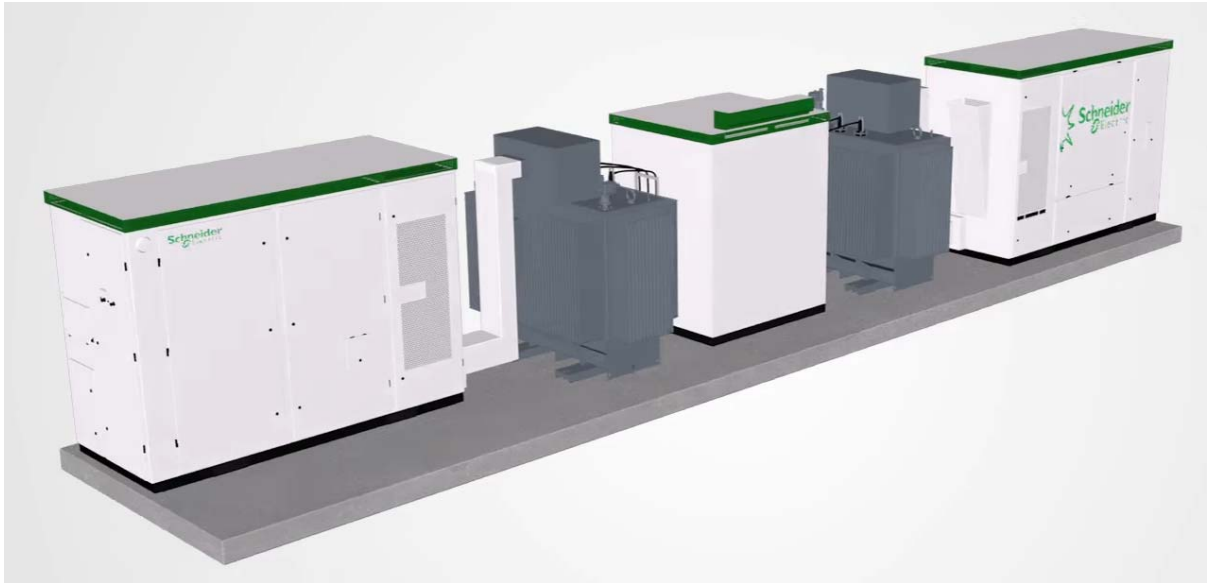
Approximately 100 PV boxes and/or PV skids would be installed and spread across the site. Each of them would contain an inverter and a transformer. The PV Boxes (containerised) or PV skids (on skid platforms) would measure up to 10m long x 4m high x 3m wide

The containerised PV boxes would contain inverter and transformer stations in containers, with an example illustrated in Figure 3-10.

The PV skids would be an inverter and transformer installed on a platform and would be similar to that illustrated in Figure 3-11.



**Figure 3-10 Example of a PV Box**



**Figure 3-11** Example of a PV skid

### **3.2.3** *Delivery/Substation units*

The main transformer and delivery/substation would have a similar appearance to the PV box or PV skid described above. The delivery/substation measurements may be comprised of several containers each measuring up to 10m long x 4m high x 3m wide (Figure 3-12).



**Figure 3-12** Example of a substation on delivery

### 3.2.4 Energy storage

Various energy storage solutions are proposed for this development to compliment large scale renewable energy generation and to prepare the network for more renewables in the future.

#### Proposed Technologies

Various energy storage technologies would be further investigated as part of the detailed design phase. The proposal is currently considering three types of energy storage technologies as detailed in Table 3-1.

**Table 3-1 Potential energy storage technologies**

Energy storage technology	Description
Electrochemical (Lithium Ion, Lead Acid and Supercapacitors)	Electrochemical Storage Devices store energy within the system as chemicals where energy is accumulated through reversible electrochemical reactions. The energy is stored/extracted in DC (Direct Current) and converted/inverted into AC (Alternating Current) by an accompanying Inverter sized to the storage capacity.
Chemical (Hydrogen Fuel Cell)	Chemical Storage Devices store energy within the system as chemicals that are separated by chemical reactions, such as electrolysis. The hydrogen energy storage system condenses gas, and combines with oxygen through reversible chemical reactions storing energy in AC and works in conjunction with a rectifier.
Mechanical (Compressed Air and Fly Wheel)	Flywheel Energy Storage devices store energy within the system as rotational energy. The energy is stored/extracted by way of manipulating the speed of discs which continuously rotate within a vacuum environment. The rotors are typically connected to an electric motor/generator and passes energy in DC.

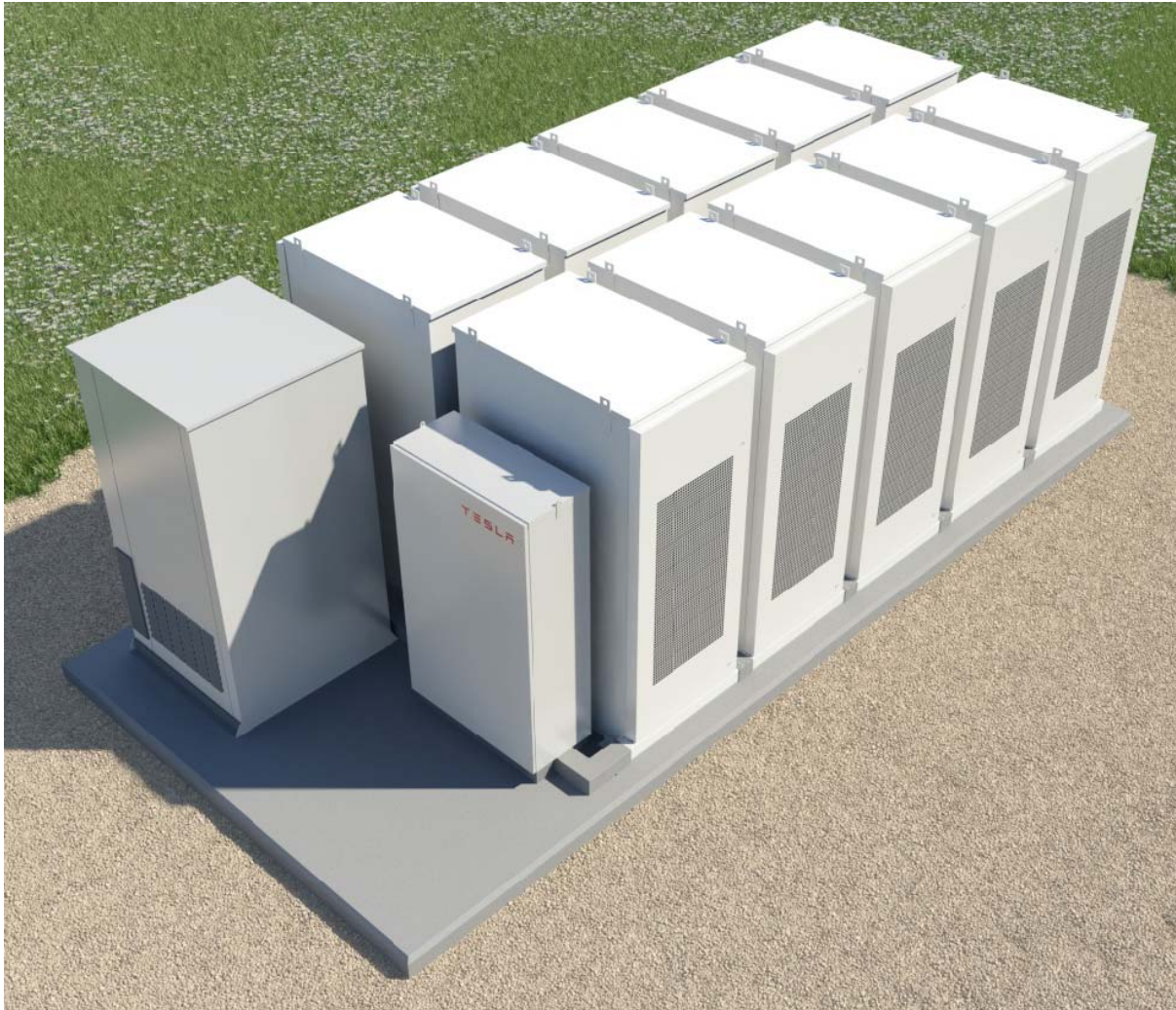
The final technology would be selected based on the following criteria:

- Ability to support the network to increase renewable energy penetration
- Ability to provide energy during periods of peak demands
- Minimal environmental impact
- Safety and ease of integration
- Demonstration and maturity of technology
- Value for money

Energy storage devices have potential to impact on the environment if they are not implemented and disposed of in the correct way. The proposed energy storage devices would be accompanied with MSDS (Material Safety Data Sheets) which details the exact chemical compounds of the technology and how best to use/dispose of it. In certain cases, and depending on the toxicity of the chemical, a recycling program may be accompanied by the technology manufacturer to reduce environmental impact. Energy storage devices which involve chemicals (or electrochemicals) would be designed to contain leaks or spillage with similar bunding protection as oil transformers.

## Footprint

Energy storage devices may be installed across the site (in a decentralised way), or at a central location near the proposed on-site substation (area marked as Laydown in north western section of the site). The maximum footprint shall not exceed five hectares and would be installed on the proposed laydown area (next to the proposed on-site substation) if a centralised solution is to be considered.



**Figure 3-13 Example of Lithium Ion Battery Pack**



Figure 3-14 Example of Hydrogen Fuel Cell

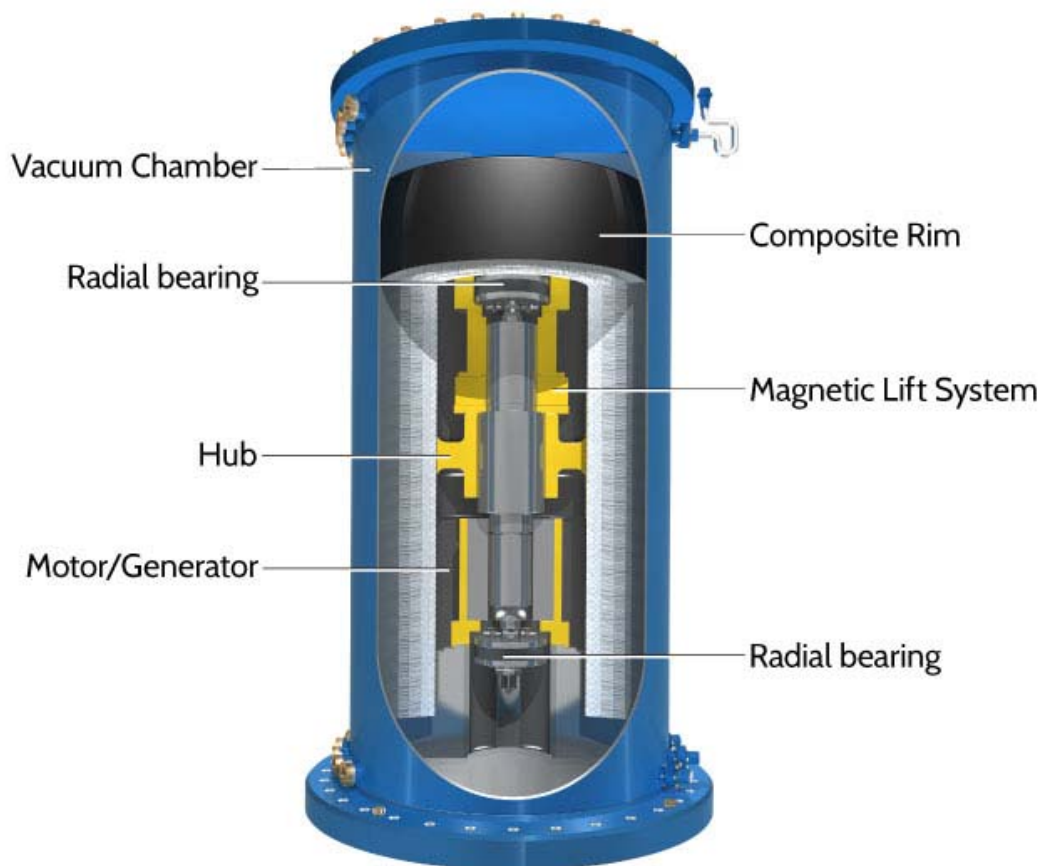


Figure 3-15 Example of flywheel energy storage system.

### 3.2.5 Underground cabling

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

Trenches would accommodate and protect the power and may include the following:

- Conduits to export the power from the solar arrays to the array boxes
- Conduits to export the power from the array boxes to the PV boxes or PV skids
- Suitably sized copper wires for equipotential bonding
- Medium voltage cables for the output of PV boxes or PV skids to the site substation
- A network of conduits or fibre optic cables for internal and external communication

### **3.2.6 Site access and internal access tracks**

Access to the site during construction and operation would be from an existing access track via Balranald-Tooleybuc Road at the south eastern corner of the site as illustrated on the proposal infrastructure plan in Appendix B. Balranald-Tooleybuc Road is suitable for heavy vehicle movements including the delivery of key equipment and buildings.

The access would be designed in accordance with RMS standards where north and southbound construction vehicles along Balranald-Tooleybuc Road would be able to turn into the site. A proposed concept design is included in the infrastructure plan included as Appendix B. The upgrade of Balranald-Tooleybuc Road would take around two weeks to complete.

The on-site access and management tracks would be made of a gravel compacted layer. If required, a geotextile would be laid between the soil and the travel.

Internal access tracks would be up to five metres wide to allow for the safe delivery, unloading and installation of key components such as the PV Boxes and various oversized substation equipment. The total length of the access track would be determined during the detailed design phase and it would be subject to the type of solar PV technology used. Internal access tracks are private roads designed and constructed suitable only for the construction, operation and maintenance of the solar farm, and not necessarily suitable for any other purpose. Access roads would be maintained over the life of the solar farm.

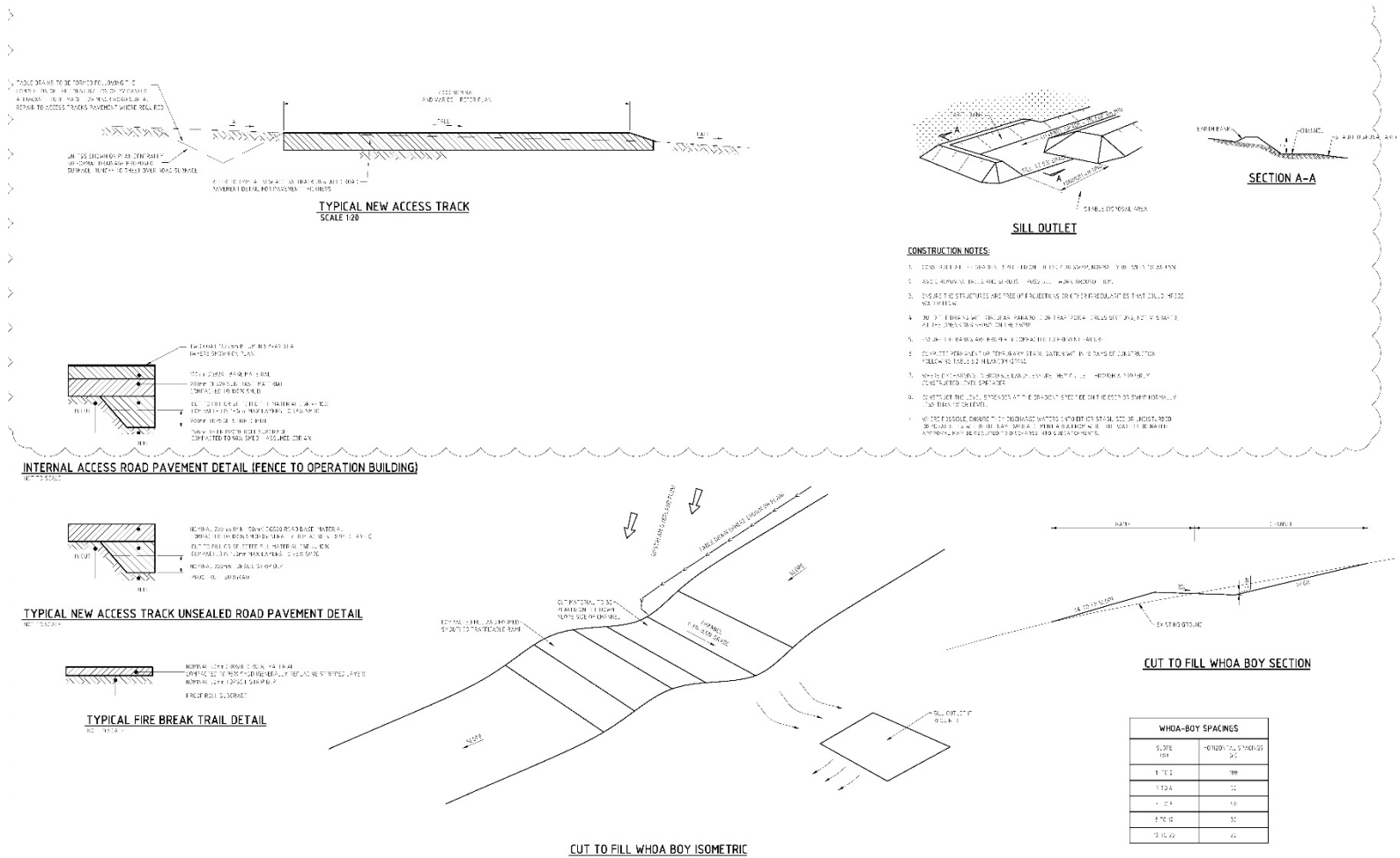


Figure 3-16 Example of internal access track

### **3.2.7 Permanent staff amenities and office and maintenance building**

An office and maintenance building with staff amenities up to 8.5 metres high would be constructed in the north eastern corner of the site. The building would include a viewing platform.

Another smaller building will be built at the entrance to the facility.

### **3.2.8 Perimeter security fencing**

The perimeter of the site would be fenced with approximately 2.5m high security fencing along the site boundaries. The fence would be made from fire resistant material.

### **3.2.9 Landscaping**

Landscaping would be undertaken on site to minimise visual impacts. Based on the result of a visual impact assessment undertaken for the proposal, landscaping is recommended along the southern boundary of the proposal site as shown in the relevant appendices of the visual impact assessment report (Appendix E). However, the requirement and extent of landscaping would be confirmed following construction of the solar farm following a verification process as identified in the visual impact assessment.

### **3.2.10 Transmission Line and connection works at substation**

The electrical connection from the site would be a 220kV overhead line running to the existing Balranald Transgrid substation, approximately 2.1 kilometres north of the site. The overhead powerline may be connected by up to 10 power poles at a maximum height of 50 metres, and will be approximately 2.3 kilometres in length. The proposed infrastructure plan in Appendix B illustrates the proposed route of the overhead powerline.

Connection at Balranald substation would require civil and electrical works, including site excavation and construction of footings for the proposed infrastructure. This infrastructure would include a 220 kV line bay, primary electrical equipment including control, and protection equipment, communications equipment, and any additional infrastructure required for the connection.



**Figure 3-17 Example of overhead powerline**

### **3.2.11 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 solar farm has been commissioned a small car park would remain for the minimal staff required and occasional visitors
- Staff amenities. Once constructed, the solar farm would be monitored and operated remotely and would therefore require a minimum number of maintenance personnel (at least 2 FTE staff) to be onsite
- Parking for staff and visitors

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

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

- Car park
- Sanitary modules with septic tank
- Changing rooms
- Dining hall
- Administrative office

- Undercover storage area
- Pedestrian paths allowing workers to go from the parking to the compound in security
- Muster point in case of emergency
- Genset for electrical supply

### 3.3 CONSTRUCTION AND COMMISSIONING

#### 3.3.1 Indicative Timeline

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

**Table 3-2 Indicative timeframe**

Phase	Approximate commencement	Approximate duration
Construction	July 2017	10 months
Commissioning	May 2018	2 months
Operation	July 2018	30 years
Decommissioning	~2050	3 months

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

#### 3.3.2 Construction activities

The construction and commissioning phase is expected to last approximately 7 to 12 months. The main construction activities would include:

- Site establishment and preparation for construction (establishment of ancillary facilities, fencing, preliminary civil works, access road and track construction, construction services and offices)
- Installation of steel post foundation system for the solar panels
- Installation of underground cabling (trenching), installation of PV boxes containers and delivery station, connection of communications equipment
- Construction of the 220kV transmission line (above ground), switch gear and equipment, and interconnection of the generator to the existing Balranald Transgrid substation
- Removal of temporary construction facilities and rehabilitation of disturbed areas
- Landscaping (if required)
- Post construction, ground cover would be rehabilitated and maintained beneath solar array areas.

As discussed in Section 3, the level of ground disturbance across the site is low. This is primarily because the piles supporting the solar array's mounting system would be driven or screwed into the ground, minimising ground disturbance. Therefore, ground disturbance would be minimal, would not involve levelling and would be limited to discrete tracks, piles and other elements described above. Post construction, ground cover would be rehabilitated and maintained beneath solar array areas.

## Construction of Energy Storage Facility

The construction and commissioning process for the energy storage facility is expected to last approximately 6 months (if carried out separate to the original construction of the solar farm). The main construction activities would include:

- Site establishment and preparations like the solar farm construction activities
- Installation of foundation suitable for energy storage systems
- Installation of underground cabling (trenching), installation of energy storage compliant power conversion units and control systems
- Augmenting and connecting into the site solar substation
- Removal of any temporary works and/or replacement of hardstand areas

The level of ground disturbance for this implementation is negligible considering that the energy storage system would be installed mainly on the proposed hardstand and construction phase car parking areas.

## Hours of construction

Works would be undertaken during standard working hours:

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

No night works or work on Sundays or public holidays are proposed. Any construction outside of standard construction hours would only be undertaken following approval from relevant authorities.

## Resourcing requirements

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

### Labour, machinery and equipment

It is anticipated that approximately 250 construction personnel would be required on site during the peak construction period (approximately 6 months). Construction supervisors and the construction labour force, made up of construction labourers and technicians, are intended to be hired locally where possible.

It is anticipated that most workers would be accommodated at existing accommodation within the local area or nearby towns such as Balranald, Swanhill and Mildura. It is proposed that bus transfers may be provided to minimise traffic volumes and transit risks during construction.

Equipment used during construction would include:

- Earth-moving equipment for civil works (excavators)
- Ten small piling or drilling rigs for installation of the posts of the solar arrays
- Diesel generators
- Trucks
- Cranes including 50T mobile crane

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 150 vehicles. The proposed timeline for the project indicates that approximately 60 employees may be required during the first month rising to 250 employees during the peak construction period (approximately 6 months). Up to 10 piling or drilling machines may be present on site during the first months of the works. During construction, up to 30 trucks a day will deliver equipment on site. A special convoy and a 50T mobile crane may be required for the offloading of the PV boxes or PV skids and the delivery station. On average, the peak period of the construction phase would add an additional 50 vehicles to the road network per day.

### Materials

In total, approximately 20,000 cubic metres of gravel may be required for access tracks, while PV boxes or PV skids peripheral backfill and compaction would require approximately 2,000 cubic metres of gravel.

Approximately 3,000 cubic metres of sand would be required for the burying of cables into about 70km of trenches. Approximately 2,500 cubic metres of sand may be required for the installation of the PV boxes or PV skids, subject to further geotechnical studies.

It is estimated that approximately 700 Mega Litres (ML) of water would be used during construction, mostly for dust suppression. The bulk of this would be non-potable water (or similar grade) that would be delivered by trucks as required. The water would either be purchased from Balranald Shire Council, obtained from a water holder or purchased via a water trade. The site is located in relatively close proximity to the Murrumbidgee Wakool or the Murray Rivers. A small amount of potable (drinking) water (approximately 0.2ML) would be reserved and imported on site during the construction period.

Several existing dams on the site may be retained to provide water for construction purposes. Rainwater tanks may be installed for use during construction and operation.

### **3.3.3 Operation phase**

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

- Routine visual inspections, general maintenance and cleaning operations of the solar arrays
- Vegetation management. Ground cover vegetation would be maintained beneath panels to resist erosion and weed infestation. A monitoring program would address any bare areas that develop, by seeding or armouring to avoid erosion. The site is capable of housing approximately 2,000 sheep which may also assist in the management of vegetation.
- Site security if a security event occurs
- Replacement/upgrade of equipment and infrastructure, as required
- CCTV and the use of drones to assist in the maintenance and surveillance of the site
- In total, approximately 3,500 man-hours (or at least 2 FTE staff) of work per year for preventative maintenance

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

### Hours of operation during operation

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

- Monday – Friday from 7am to 6pm
- Saturdays from 8am to 1pm

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

During summer months, the solar farm may continue to produce electricity after 6pm and prior to 7am when the days are longer. In the scenario where single axis trackers are installed, the operational hours may be slightly longer during those months.

### Resourcing requirements

During the operational phase, it is estimated that approximately 500 kilolitres (kL) of non-potable water may be used yearly for the cleaning and maintenance of the solar farm. This non-potable water would be sourced from a water holder (eg a local landholder or Balranald Shire Council), purchased via a water trade, or collected via the on-site rain water tank (up to 100ML) from retained dams on the site.

The retained dams and rainwater tanks would also provide water for the coexistence of sheep or farm animals.

### 3.3.4 Decommissioning

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

- The solar farm's generator would be disconnected from the Transgrid metering point
- The solar arrays would be removed, including the foundation posts. Materials would be sorted and packaged for removal from the site for recycling or reuse.
- All site amenities and equipment would be removed and materials recycled or reused, wherever possible
- Posts and cabling would be removed and recycled (some infrastructure 300 mm below ground may be left in place)
- Fencing may be removed
- The land would be returned to its prior agricultural use.

Based on the proximity to substation and the quality of the land, Maoneng, or the future land owner, may consider upgrading the solar farm to an improved technology in the future.

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

## 4 PLANNING CONTEXT

### 4.1 ASSESSMENT CONTEXT

#### 4.1.1 *Permissibility*

The State Environmental Planning Policy (Infrastructure) (SEPP (Infrastructure)) applies to the whole of the State. Clauses 34(7) and 34(8) of SEPP (Infrastructure) provide that development for the purpose of a solar energy system may be carried out by any person with consent on any land (other than on land in a prescribed residential zone).

Relevantly, a 'solar energy system' includes a photovoltaic electricity generating system. The Sunraysia SF development envelope is not located within a prescribed residential zone. Accordingly, the construction, operation, upgrade and decommissioning of the solar farm may be carried out with development consent.

#### 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 Sunraysia 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). This is considered further in Section 4.2 below.

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 Sunraysia 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 Sunraysia SF including key environmental issues. The request for SEARs was registered as SSD 7680.

On 17 June 2016, the Secretary issued the SEARs for the Sunraysia 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 1-1 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 include:

- The provisions of:
  - any environmental planning instrument;

- 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.
- Any development control plan.
- 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.
- The regulations (to the extent that they prescribe matters for consideration).
- Any coastal zone management plan (within the meaning of the Coastal Protection Act 1979). That apply to the land to which the development application relates.
- The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.
- The suitability of the site for the development.
- Any submissions made in accordance with this Act or the regulations.
- The public interest.

Each of these matters are considered further in Table 4-1.

Table 4-1 Matters under Section 79C of the EP&A Act.

Matters under Section 79C of the EP&A Act	Consideration
<p>The provisions of:</p> <ul style="list-style-type: none"> <li>○ any environmental planning instrument;</li> <li>○ any proposed instrument that is or has been the subject of public consultation under the EP&amp;A Act and that has been notified to the consent authority.</li> </ul> <p>Relevant planning instruments include:</p>	
<p><i>State Environmental Planning Policy (State and Regional Development) 2011</i></p>	<p>The aims of the <i>State Environmental Planning Policy (State and Regional Development) 2011</i> (SRD SEPP) are to identify development that is SSD, State Significant Infrastructure and Critical State Significant Infrastructure and to confer functions on joint regional planning panels to determine development applications.</p> <p><u>State Significant Development</u></p> <p>Clause 8 of the SRD SEPP provides that development is declared to be SSD for the purposes of the EP&amp;A Act if:</p> <ul style="list-style-type: none"> <li>a) the development is not permissible without consent under Part 4 of the EP&amp;A Act; and</li> <li>b) the development is specified in Schedule 1 or 2 of the SRD SEPP.</li> </ul> <p>Clause 20 of Schedule 1 of the SRD SEPP provides:</p> <p><i>“Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, bio-fuel, distillate and waste and hydro, wave, solar or wind power), being development that:</i></p> <ul style="list-style-type: none"> <li><i>(a) has a capital investment value of more than \$30 million, or</i></li> <li><i>(b) has a capital investment value of more than \$10 million and is located in an environmentally sensitive area of State significance.”</i></li> </ul>

Matters under Section 79C of the EP&A Act	Consideration
	<p>The Sunraysia SF is a development for the purpose of electricity generation and would have a capital investment value in excess of \$30 million. Accordingly, the Sunraysia Solar Farm is declared to be SSD for the purposes of the EP&amp;A Act.</p>
<p><i>State Environmental Planning Policy (Infrastructure) 2007</i></p>	<p>The <i>State Environmental Planning Policy (Infrastructure) 2007</i> (ISEPP) was introduced to facilitate the effective delivery of infrastructure across the State by improving regulatory efficiency through a consistent planning regime for infrastructure and services across NSW.</p> <p>Clause 34(7) of ISEPP provides that development for the purpose of ‘solar energy systems’ may be carried out with consent on any land, except as prescribed by subclause 34(8). Clause 34(8) provides that development for the purpose of a photovoltaic electricity generating system may be carried out by a person with consent on land in a prescribed residential zone only if the system has the capacity to generate no more than 100kW. Clause 34(8) does not apply to the Sunraysia SF given proposal site is not within a prescribed residential zone and would produce more than 100kW.</p> <p>Accordingly, the Sunraysia Solar Farm is permissible with development consent. Further information regarding permissibility is considered below in the context of applicable local environmental plans.</p> <p><u>Traffic generating development</u></p> <p>Clause 104 of ISEPP requires certain developments (identified in Column 1 of the Table in Schedule 3) to be referred to Roads and Maritime (known as traffic generating development). In the case of traffic generating development, the consent authority is required to take into account any submission made by Roads and Maritime in relation to the development.</p> <p>Electricity generation is not included in column 1 in the Table. Clause 104 of the SEPP applies to other development where there are 200 or more motor vehicles. Given the Sunraysia SF proposal would result in the generation of fewer than 200 vehicles per day during construction or operation, the requirements under clause 104 of the SEPP do not apply.</p>

Matters under Section 79C of the EP&A Act	Consideration
<i>State Environmental Planning Policy No. 55 - Remediation of Land</i>	There is a minor risk that contamination associated with agricultural activities, such as pesticides, could be present. However, given no contaminated sites are recorded on or near the proposed development and no evidence of contamination was observed during the site visit, it is considered unlikely that significant contamination exists on the Sunraysia SF proposal site. Furthermore, the construction activities would not significantly disturb soil and would not impact groundwater at the site.
<i>State Environmental Planning Policy (Rural Lands) 2008</i>	Clause 13 of the Rural Lands SEPP identifies land as being State significant agricultural land, as identified in Schedule 2. Schedule 2 does not include any land.
<i>State Environmental Planning Policy 44 - Koala Habitat Protection</i>	The SEPP applies to each local government area listed in Schedule 1. Balranald LGA is not listed in Schedule 1 of SEPP 44. As such, this SEPP does not apply to the proposal site.
<i>Balranald Local Environmental Plan 2010</i>	<p>The proposal site is located within the Balranald Local Government Area (LGA) and is subject to the Balranald Local Environmental Plan 2010 (Balranald LEP). The Balranald LEP aims:</p> <ul style="list-style-type: none"> <li>(a) to encourage sustainable economic growth and development,</li> <li>(b) to encourage the retention of productive rural land in agriculture,</li> <li>(c) to identify, protect, conserve and enhance Balranald’s natural assets,</li> <li>(d) to identify and protect Balranald’s built and cultural heritage assets for future generations,</li> <li>(e) to allow for the equitable provision of social services and facilities for the community,</li> <li>(f) to encourage and support growth in the Balranald and Euston townships,</li> <li>(g) to provide for future tourist and visitor accommodation in a sustainable manner that is compatible with, and will not compromise, the natural resource and heritage values of the surrounding area.</li> </ul>

Matters under Section 79C of the EP&A Act	Consideration
	<p><b><u>Permissibility</u></b></p> <p>The Balranald LEP states that the consent authority must have regard to the objectives of planning zones identified in the LEP when determining development applications. The Development Envelope is zoned RU1 - Primary Production.</p> <p>The objectives of the RU1 zone include:</p> <ul style="list-style-type: none"> <li>a) To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.</li> <li>b) To encourage diversity in primary industry enterprises and systems appropriate for the area.</li> <li>c) To minimise the fragmentation and alienation of resource lands.</li> <li>d) To minimise conflict between land uses within this zone and land uses within adjoining zones.</li> <li>e) To encourage development that is in accordance with sound management and land capability practices, and that takes into account the environmental sensitivity and biodiversity of the locality.</li> <li>f) To support rural communities.</li> <li>g) To ensure the provision of accommodation for itinerant workers.</li> </ul> <p>The Sunraysia SF is consistent with the objectives of the zone and, for the operational life of the Sunraysia SF, would harness a natural resource (solar energy). While the activity would impact on land availability for primary production, the land would meet objects c), d), e) and f) as identified above. The proposed solar farm would: not fragment resource lands; not generate land conflict with surrounding land uses; be developed in accordance with sound management and land capability practices and take into consideration the environmental sensitivities of the area; and would support the local rural community. Being fully reversible and involving limited ground disturbance, it would not remove the potential to use the land for primary production in the long term.</p>

Matters under Section 79C of the EP&A Act	Consideration
	<p>Under the LEP, electricity generation is not a permissible use in the RU1 Zone, however the provisions of ISEPP prevail over the LEP. Clause 8 of ISEPP provides that if there is an inconsistency between ISEPP and any other environmental planning instrument, whether made before or after the commencement of ISEPP, ISEPP prevails to the extent of the inconsistency. Sunraysia Solar Farm is permissible with consent under ISEPP.</p> <p>Part of the proposed development envelope is mapped as having Terrestrial Biodiversity values, therefore Clause 6.1 of the LEP applies. An assessment of the potential impacts of the proposed activities on terrestrial biodiversity was undertaken, as documented in Section 7.1 of this EIS and in full in Appendix F.</p>
The provisions of any development control plan	Clause 11 of the SRD SEPP provides that development control plans do not apply to state significant development.
The provisions of any relevant planning agreement	There are no planning agreements that have been entered into, nor are any planning agreements proposed, that relate to the Sunraysia SF.
The provisions of the EP&A Regulation	<p>Clause 92 of the EP&amp;A Regulation outlines the additional matters that requires consideration. These include:</p> <ul style="list-style-type: none"> <li>• the Government Coastal Policy for development applications in certain local government areas</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> </ul> <p>The Sunraysia SF does not involve either 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>

Matters under Section 79C of the EP&A Act	Consideration
The likely impacts of the development, including environmental impacts on both the natural built environments, and the social and economic impact in the locality	The likely impacts of the Sunraysia SF, 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 the proposal have to the extent, reasonably and feasibly possible, been avoided or minimised through careful project design.
Suitability of the site for the development	<p>As discussed in Section 2.2, 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, is its location 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 an abundant solar resource.</li> <li>• Availability of suitable land.</li> <li>• Suitability of the land in terms of factors that affect solar yield and construction costs (northerly aspect, relatively low relief topography).</li> <li>• Suitability of the land in terms of environmental factors that constrain development (absence of flood risk, previously disturbed site, low number of residential receivers)</li> </ul> <p>Further, the Sunraysia 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 on the development	Maoneng would consider and, as necessary, respond constructively to any submission made in relation to the Sunraysia SF. Consultation with stakeholders that has been undertaken during the planning stages including the preparation of this EIS is summarised in Section 5.
The public interest	The Sunraysia SF is in the public interest for a number of reasons. On an annual basis the plant would produce approximately 200MWAC. This would provide energy for approximately 120,000 average Australian homes. The solar farm would also assist to:

Matters under Section 79C of the EP&A Act	Consideration
	<ul style="list-style-type: none"> <li>• Generate local jobs and encourage regional development.</li> <li>• Boost the local economy by use of local supplies and services, where suitable.</li> <li>• Avoid approximately 430 mega tonnes of CO<sub>2</sub> equivalent per annum by replacing fossil fuel based energy with solar generated energy, reducing emissions that contribute to climate change.</li> <li>• Assist in meeting State and Australian Government policies to increase renewable energy supply in Australia.</li> <li>• Develop the solar power industry and supply chain in Australia, increasing the potential for job creation and environmental benefits that are associated with renewable energy supply across a broader area.</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 assessment and development process. Further details on the consultation process is provided in Section 5 and Appendices H &amp; I.</p>

## **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 Sunraysia 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 Sunraysia 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 Sunraysia 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 Sunraysia Solar Farm 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 *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.

Sunraysia SFTPL must ensure that all phases of the solar farm proposal are managed to prevent pollution, including pollution of waters.

Sunraysia SFTPL 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 Sunraysia 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 8.4 of the EIS.

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

#### **4.3.4 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 Sunraysia SF development envelope is within the Lower Murrumbidgee catchment. There are no watercourses within or in close proximity of the development envelope.

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

#### **4.3.5 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 addressed in Section 7.1 and Appendix F.

#### **4.3.6 National Parks and Wildlife Act 1974**

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

The provisions of the NPW Act have been considered for the Sunraysia SF. The proposed development envelope is not in or in the vicinity of any protected areas as defined in the Act.

An assessment of impacts to Aboriginal Heritage is provided in Section 7.2 of the EIS and Appendix G. An Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the NPW Act is not required for SSD under section 89J of the EP&A Act.

#### **4.3.7 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.

Noxious weeds and their management are discussed in Sections 7.1 and 7.5 of this EIS and Appendix F.

#### **4.3.8 Roads Act 1993**

The Roads Act provides for the classification of roads and for the declaration of the Roads and Maritime Services 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. This includes the erection or removal of structures, the excavation or disturbance to a public road surface, the pumping of water into a public road from any land adjoining the road or the connection of a road to a classified road.

The proposal would use one existing access points from Balranald-Tooleybuc Road for operation and construction. Upgrading of the site entry points from Balranald-Tooleybuc Road (widening and safety works) would take place prior to start of construction of the solar farm. Upgrading the site access points would involve work within the roads reserve. This would require a Section 138 approval from Balranald Shire Council with the concurrence of NSW Roads and Maritime Services.

#### **4.3.9 Crown Lands Act 1989**

The objective of the *Crown Lands Act* 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.

The creation of an electricity easement to connect the solar farm to the substation would be required within a Travelling Stock Reserve (Crown Land) (Lot 7301 DP 1157986). DPI (lands division) has been consulted and provided feedback on the steps required and issues to consider when applying for an easement (refer to Section 5 and Appendix H).

#### **4.3.10 Heritage Act 1977**

This act aims to conserve heritage values. The *Heritage Act 1977* defines ‘environmental heritage’ as those places, buildings, works, relics, moveable objects and precincts of State or local heritage significance. A property is a heritage item if it is listed in the heritage schedule of the local Council's LEP or listed on the State Heritage Register, a register of places and items of particular importance to the people of NSW.

Section 8.6 of this EIS addresses potential impacts on heritage items or places. No heritage items or places have been identified on or in the vicinity of the proposal site.

#### **4.3.11 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 there are no existing Mining Exploration Licences or other authorisations within the development envelope.

#### **4.3.12 Water Management Act 2000**

Under Section 89, a water use approval confers the right on its holder to use water for a particular purpose at a particular location.

The *Water Management Act 2000* (WM Act), 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 the present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and in-stream uses as well as to provide for protection of catchment conditions.

Fresh water sources throughout NSW are managed via Water Sharing Plans (WSPs) under the WM Act. Key rules within the WSPs specify when licence holders can access water and how water can be traded. The area is covered by the Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012.

Regarding the proposal, there would be no requirement to modify existing entitlements or seek new entitlements under the plan. The proposal has minimal water requirements that would be satisfied by purchasing water during construction, from existing dams on the site and from rain water collection during operation.

Water use approval is not required for SSD under section 89J (1)(g) of the EP&A Act.

## **4.4 COMMONWEALTH LEGISLATION**

### **4.4.1 *Environment 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 out within a 50km radius of the proposal site using the Commonwealth online Environmental Reporting Tool (report created 28 October 2016). A summary of the findings is provided in the tables below.

Table 4-2 Summary of Matters of National Environmental Significance (50km search radius).

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	3
Threatened Species	23
Migratory Species	7

Table 4-3 Summary of other matters protected by the EPBC Act (50km search radius).

Other Matters Protected by the EPBC Act	No.
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	13
Whales and Other Cetaceans	0
Critical Habitats	0
Commonwealth Reserves	0

Table 4-4 Summary extra information (50km search radius).

Extra Information	No.
State and Territory Reserves	1
Regional Forest Agreements	0
Invasive Species	19
Nationally Important Wetlands	1
Key Ecological Features (Marine)	0

Relevant matters are discussed within Section 7.1 (Biodiversity) and 7.2 and 8.5 (Heritage items). No MNES would be affected by the proposed activity and a referral under the EPBC Act is not considered to be required.

#### **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, hunting, gathering and collecting bush medicines. Further, when a native title claimant application is registered by the National Native Title Tribunal, the people seeking native title recognition gain a right to consult or negotiate with anyone who wants to undertake a project on the area claimed.

Native Title may exist in areas such as:

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

A search of the National Native Title Register (NNTR) for the Balranald Shire returned one result. This native title is known as “Barkandji Traditional Owners #8 (Part A)”. The proposed development envelope is not located on land subject to this native title. Previously a Native Title Application was submitted by the Mutthi Mutthi People. A decision of 27 November was made not to accept this application pursuant to Section 190A of the *Native Title Act 1993*.

#### **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 Renewable Energy Target (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 Sunraysia SF would ensure it is accredited as a Renewable Energy Generator to create Renewable Energy Certificates.

## **4.5 OTHER RELEVANT POLICIES AND PLANS**

### **4.5.1 Ecologically Sustainable Development (ESD)**

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

In NSW, the concept has been incorporated in legislation such as the EP&A Act and 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 Sunraysia 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 Sunraysia 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 Sunraysia 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.

- 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 Sunraysia SF on biodiversity, including EPBC listed species, have been assessed in detail in the Biodiversity Assessment in Appendix F 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 development envelope such as the existing native vegetation and land use capability have been valued in terms of their broader contribution to the catchment and catchment processes.

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

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 the creation of an electricity easement across Crown Land (Travelling Stock Reserve).</li></ul>
<b>Roads Act 1993</b>	<ul style="list-style-type: none"><li>• Section 138 approval for work within a public road reserve.</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 Department of Planning and Environment

As the proposal is classified as State Significant Development (SSD), SEARs were requested and were provided by DP&E on 17 June 2016 (refer Appendix A). In developing the SEARS, DP&E consulted with various other government agencies. 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 SEARs are listed in Table 1-1 with a cross reference to where specific issues are addressed within this EIS. Additional consultation was undertaken with several of other agencies to clarify some of the issues raised in the SEARs and/or to seek further advice. This additional consultation with agencies is summarised in the following sections.

#### 5.1.2 NSW Office of Environment and Heritage

NGH Environmental contacted OEH to seek further advice regarding the scope of the biodiversity assessment. OEH provided their letter that was sent to DP&E with matters that needed to be considered when developing the SEARs (Appendix H). For the completeness of the assessment, the OEH requirements for biodiversity and other matters are listed in Table 5-1 with a cross reference to where specific issues are addressed within this EIS.

**Table 5-1 OEH requirements**

Issue summary	Addressed in EIS
<b>Biodiversity</b>	
Biodiversity impacts related to the proposed Sunraysia Solar Farm are to be assessed and documented in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the <i>Threatened Species Conservation Act 1995</i> .	Appendix F and Section 7.1
Impacts on the following species, populations and ecological communities will require further consideration and provision of the information specified in s9.2 of the Framework for Biodiversity Assessment: <ul style="list-style-type: none"> <li>• <i>Acacia melvillei</i> shrub land in the Riverina and Murray- Darling Depression bioregions</li> <li>• <i>Austrostipa metatoris</i> (a Spear Grass)</li> <li>• <i>Falco subniger</i> (Black Falcon) – nest trees only</li> <li>• <i>Hieraaetus morphnoides</i> (Little Eagle) – nest trees only</li> <li>• <i>Circus assimilis</i> (Spotted Harrier) – nest trees only</li> <li>• <i>Santalum murrayanum</i> (Bitter Quandong)</li> </ul>	Appendix F and Section 7.1
<b>Aboriginal cultural heritage</b>	
The EIS must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the proposed Sunraysia Solar Farm and document these in the EIS. This may include the need for surface survey and test excavation. The identification of cultural heritage values should be guided by the <i>Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW (DECCW, 2011)</i> and consultation with OEH regional officers.	Appendix G and Section 7.2

Issue summary	Addressed in EIS
Where aboriginal cultural heritage values are identified, consultation with Aboriginal people must be undertaken and documented in accordance with the <i>Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW)</i> . The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the EIS.	Appendix G and Sections 5.2 & 7.2
Impacts on Aboriginal cultural heritage clause are to be assessed and documented in the EIS. The EIS must demonstrate attempts to avoid 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.	Appendix G and Section 7.2
<b>Historic heritage</b>	
The EIS must provide 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>a. Outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the NSW Heritage Manual (1996),</li> <li>b. Be undertaken by a suitable qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council’s Excavation Director criteria),</li> <li>c. Include a statement of heritage impacts for all heritage items (including significance assessment),</li> <li>d. 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>e. 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>	Section 8.5
<b>Water and soils</b>	
The EIS must map the following features relevant to water and soils including: <ul style="list-style-type: none"> <li>a. Acid sulfate soils (Class 1,2,3 or 4 on the Acid Sulfate Soil Planning Map).</li> <li>b. Rivers, streams, wetlands, estuaries (as described in Appendix 2 of the Framework for Biodiversity Assessment).</li> <li>c. Groundwater.</li> <li>d. Groundwater dependent ecosystems.</li> <li>e. Proposed intake and discharge locations.</li> </ul>	Relevant features present are mapped in Appendix C and discussed in Section 8.1
The EIS must describe background conditions for any water resource likely to be affected by the proposed Sunraysia Solar Farm, including: <ul style="list-style-type: none"> <li>a. Existing surface and groundwater</li> <li>b. Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations</li> <li>c. Water Quality Objectives (as endorsed by the NSW Government including groundwater as appropriate that represent the community’s uses and values for the receiving waters</li> </ul>	Relevant impacts on water quality are assessed in Section 8.1

Issue summary	Addressed in EIS
<p>d. Indicators and trigger values/criteria for the environmental values identified at © in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government.</p>	
<p>This EIS must assess the impacts of the proposed Sunraysia Solar Farm on water quality, including:</p> <p>a. The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the development protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction.</p> <p>b. Identification of proposed monitoring of water quality.</p>	<p>Relevant impacts on water quality are assessed in Section 8.1</p>
<p>The EIS must assess the impact of the proposed Sunraysia Solar Farm on hydrology, including,</p> <p>a. Water balance including quantity, quality and source.</p> <p>b. Effects to downstream rivers, wetlands, estuaries, main waters and floodplain areas.</p> <p>c. Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems.</p> <p>d. Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. River benches).</p> <p>e. Changes to environmental water availability, both regulated/licences and unregulated/rule based sources of such water.</p> <p>f. Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options.</p> <p>g. Identification of proposed monitoring of hydrological attributes.</p>	<p>Relevant impacts on water quality are assessed in Section 8.1</p>
<b>Flooding and costal erosion</b>	
<p>The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including:</p> <p>a. Flood prone land</p> <p>b. Flood planning area, the area below the flood planning level</p> <p>c. Hydraulic categorisation (floodways and flood storage area).</p>	<p>Flooding is not relevant to this proposal as discussed in Section 7.5</p>
<p>The EIS 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.</p>	<p>Flooding is not relevant to this proposal as discussed in Section 7.5</p>
<p>The EIS must model the effect of the proposed Sunraysia Solar Farm (including fill) on the flood behaviour under the following scenarios:</p> <p>a. Current flood behaviour for a range of design events as identified in 11 above. This includes the 1 in 200 and 1 in 500 year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.</p>	<p>Flooding is not relevant to this proposal as discussed in Section 7.5</p>
<p>Modelling in the EIS must consider and document:</p> <p>a. The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood.</p> <p>b. Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This</p>	<p>Flooding is not relevant to this proposal as discussed in Section 7.5</p>

Issue summary	Addressed in EIS
<p>may include redirection of flow, flow velocities, flood levels, hazards and hydraulic categories.</p> <p>c. Relevant provisions of the NSW Floodplain Development Manual 2005.</p>	
<p>The EIS must assess the impacts on the proposed Sunraysia Solar Farm on flood behaviour including:</p> <ul style="list-style-type: none"> <li>a. Whether there will be detrimental increases in the potential flood affection of other properties, assets and infrastructure.</li> <li>b. Consistency with Council floodplain risk management plans.</li> <li>c. Compatibility with the flood hazard of the land.</li> <li>d. Compatibility with the hydraulic functions of flow conveyance in floodways and storage in the flood storage areas of the land.</li> <li>e. Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site.</li> <li>f. Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.</li> <li>g. Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the SES and Council.</li> <li>h. Whether the proposal incorporates specific measures to manage risk to life form flood. These matters are to be discussed with the SES and Council.</li> <li>i. Emergency management, evacuation and access, and contingency measures for the development considering the full range or flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the SES.</li> <li>j. Any impacts the development may have on the social and economic costs to the community as consequence of flooding.</li> </ul>	<p>Flooding is not relevant to this proposal as discussed in Section 7.5</p>

### **5.1.3 Department of Primary Industries – Land**

The proposed electricity transmission line easement falls within a TSR which is Crown land. Maoneng held meetings with the Department early in the development stage of the proposal to determine the necessary requirements to facilitate the proposed electricity transmission line associated with the solar farm. The Department responded on 24 May with the steps to take to secure an easement including a series of requirements to consider (Appendix H). Relevant environmental requirements are listed in Table 5-2 with a cross reference to where specific issues are addressed within this EIS.

**Table 5-2 DPI (Lands) requirements**

Issue summary	Addressed in EIS
<p>A search of the Register of Native Title Claims (National Native Title Tribunal) indicates that there is an active claim registered over the Crown land within the project area, being NC2014/002 lodged by the Mutthi Mutthi People</p> <p>The Department has adopted the position that it will not undertake any dealings with Crown Land unless it can be satisfied to a high degree of certainty that Native Title does not exist in the land, except by means of one of the methods provided for under the <i>Commonwealth Native Title Act 1993</i>. Due consideration to whether Native Title affects the subject land before appropriate action (including easements and licencing) can be undertaken by the Department.</p> <p>If the project was to proceed, the Department’s Status Branch will undertake a comprehensive historical search to determine if there is any previous extinguishing tenure. There is no guarantee that the search will be successful.</p>	<p>Native Title Application, NC2014/002, lodged by the Mutthi Mutthi People, was subject to a decision on 27 November 2015 by a Delegate of the Native Title Registrar. The decision was that the application not be accept pursuant to Section 190A of the <i>Native Title Act 1993</i>.</p>
<p>Lot 7301 in DP 1157986 and other adjoining Crown Lots are currently subject to an undetermined Aboriginal Land Claim 13929, lodged by the New South Wales Aboriginal Land Council on behalf of the Balranald Aboriginal Land Council on 5 September 2006.</p> <p>It is not appropriate to grant any consent for licence, easement or development until ALC 13929 has been determined or the written consent from the New South Wales Aboriginal Land Council (NSWALC) has been obtained to the licence, easement or development.</p> <p>Even if the NSWALC consents to the development, it is highly likely that the above mentioned extinguishment process will need to be undertaken prior to the Crown being in a position to grant lawful occupation by either a licence or easement.</p>	<p>Maoneng has been in discussion with both the Balranald Aboriginal Land Council and NSW Aboriginal Land Council. Both provided in principle approval to use this land for an easement (Appendices G &amp; H).</p>
<p>Maoneng Australia will also be required to provide a full Environmental Impact Statement and Cultural and Heritage Report outlining any potential impacts on Crown Lands and identifying any possible Aboriginal places or sites.</p>	<p>This EIS assesses the easement and Appendix G provides a Cultural and Heritage Report which is also summarised in Section 7.2</p>
<p>Consent to the project may also be required to be obtained from and not limited to:</p> <ul style="list-style-type: none"> <li>• The Office of Environment and Heritage</li> <li>• Murray Local Land Services</li> <li>• Balranald Shire Council</li> <li>• NSW Aboriginal Land Council</li> <li>• NTSCorp</li> </ul>	<p>Consultation with the agencies has been undertaken as part of this proposal and as described in Section 5. It should be noted that the Murray Local Land Services advised that the correct agency to contact was the Western Local Land Services.</p>

#### **5.1.4 Local Land Services – Western Region**

Sunraysia SFTPL has sought concurrence from Local Land Services - Western Region (LLSWR) to enable the DPI - Crown Lands to create an easement for the proposed 220kv High voltage powerline. The easement would be within Crown Land vested with the Local Land Services as a Travelling Stock Reserve (TSR). This includes Travelling Stock Reserve No – 17969 on Lot 3701 DP 1157986 and Lot 48 DP 1015985.

LLSWR have provided a letter of concurrence in relation to a proposed easement over the TSR (Appendix H). The letter stated that the application for the easement be subject to number of conditions, these are summarised below;

- LLSWR would reserve the right to issue a Reserve Use Permit and Stock Use Permits under which permit holders must be afforded access according to the conditions of the permit to the TSR and any nearby Stock Watering Places. Where a permit is issued:-
  - activities must not impede or restrict the movement of stock.
  - activities must not impact or impede the operation, management or use of the TSR and adjoining Stock Watering Places
- The project is to be carried out in accordance with the conditions of the licence for the easement and any other regulatory requirements, consents and approvals relevant to the activity.
- The construction, operation and ongoing management of the infrastructure will be the sole responsibility of the licence holders.
- Sunraysia SFTPL is to contact the Local Land Services Western Region prior to commencement of any construction to ascertain if a reserve use permit or stock permit has been issued.
- All ancillary infrastructure such as access roads, laydown areas, construction areas are to be located within the easement and in areas that require minimal vegetation removal and disturbance. Access roads are to be located preferably along the western boundary fence line.
- Fences are to be repaired as required and maintained in good condition for the control of stock.
- The proponent must liaise with the NSW Forestry Corporation in regard to the timber reserve and the resources therein and obtain approvals as required.
- The licence is to include clauses relating to the indemnification of the Crown, Local Land Services and the NSW Government against claims for compensation, and appropriate insurance provisions.

#### **5.1.5 NSW Rural Fire Services**

The SEARS do not request a Bushfire Risk Assessment or specifically require consultation with the NSW Rural Fire Service (RFS). However, given the location of the proposal in proximity to bushfire prone land, this matter was discussed with the Development Assessment and Planning section of RFS. Their response was as follows:

*..... State Significant Development (SSD) does not require a bush fire safety authority (BFSA) under section 100B of the Rural Fires Act because:*

*The RFS usually gets involved in SSD where SEARs state that consultation with the RFS is to be undertaken. Where this requirement is not part of the SEARs, then it is entirely up to the proponent to decide whether to refer any project to the RFS (if they have concerns regarding bush fire). In this regard it is noted that the*

*bush fire prone land mapping in some areas of the western LGAs is not particularly up to date nor is it particularly accurate in some areas.*

*If, in covering off on the matters you assess as part of your EIS (like natural hazards) you have concerns regarding bush fire which aren't covered by engaging a suitably qualified bush fire consultant to prepare a bush fire report, you could refer the application through to the RFS for comment as part of your stakeholder engagement with agencies (or not), it is up to the proponent.*

Bushfire risks have been assessed in Section 8.3.

### **5.1.6 Balranald Shire Council**

Maoneng has consulted with the members of Balranald Shire Council around this development through meetings and phone conversations.

Members of Balranald Shire Council have been extremely supportive of the development as they have assisted with:

- Hosting two community consultation meetings at the Theatre Royal (Balranald)
- Providing contacts and support around the development for ancillary services
- Introductions of other relevant developments (such as the Balranald Mineral Sand Project by Iluka Resources Limited) and key stakeholders (neighbouring farmers) within the region
- Providing background of the culture and heritage of Balranald

Balranald Shire Council has provided a letter of support for the proposal (Appendix H).

Balranald Shire Council confirmed that the proposal would not impact the Balranald Airport situated around 17 kilometres north of the proposal site or its flight paths (Appendix H).

Maoneng has committed to creating a safe and enjoyable environment during the development of the project. Maoneng will create collaboration opportunities with the local community through the expansion of the existing Discovery Centre with elements of Renewable Energy Integration. Maoneng has also committed to supporting the Balranald Central School by way of providing scholarship support for students and assisting in the training and skilling of work related to renewable energy.

### **5.1.7 Roads and Maritime Services**

Maoneng has consulted with Roads and Maritime Services around the key entry point to the proposal site along Balranald-Tooleybuc Road. Roads and Maritime Services responded on 24 November 2016 that the development proposal and its proposed access arrangement would be assessed when the proposal has been referred to them for comment (Appendix H).

### **5.1.8 Civil Aviation Safety Authority**

The Civil Aviation Safety Authority (CASA) confirmed in writing the proposal is unlikely to present a hazard to aircraft navigation due to its distance from the Balranald Airport (Appendix H).

## **5.2 ABORIGINAL COMMUNITY CONSULTATION**

Sunraysia SF and NGH Environmental acknowledge that Aboriginal people are the determinants of the significance of Aboriginal cultural heritage and should be involved in the assessment process, as the source of information about the cultural significance of Aboriginal cultural heritage, and how Aboriginal cultural

heritage is best protected and conserved. Moreover, the NSW Office of Environment and Heritage acknowledges that Aboriginal people should control how cultural information (including sensitive information) is used. Consultation is regarded as an integral part of the process of investigating and assessing Aboriginal cultural heritage (OEH 2011).

The consultation with Aboriginal stakeholders regarding this project 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.

Step 1 involved sending out letters on 28 September 2016 outlining the development proposal and the need to carry out an Aboriginal Cultural Heritage Assessment to the Balranald Aboriginal Land Council (Balranald LALC), and various statutory authorities including:

- NSW Office of Environment and Heritage;
- Native Title Services Corporation;
- Native Title Tribunal;
- Office of Registrar *Aboriginal Land Rights Act*;
- Western Local land services; and
- The Balranald Shire Council.

An advertisement was placed in the Guardian local newspaper on 30 September 2016 seeking registrations of interest from Aboriginal people and organisations.

As a result of this consultation process, the following groups registered themselves as Registered Aboriginal Parties for the project:

- The Balranald Local Aboriginal Land Council;
- Wakool Indigenous Corporation;
- Mutthi Mutthi Nations;
- The Pappin Family Corporation; and
- Mr John Jackson.

Step 2 of the consultation process involved providing all Registered Aboriginal Parties (RAPs) with the proposed methodology for the Aboriginal Cultural Heritage Assessment of the project. Both NGH Environmental and the proponent contacted the RAPs to ensure that all pertinent cultural information as well as any concerns were identified, recorded and addressed.

Step 3 of the consultation process involved the collation of cultural knowledge which included the survey of the project area conducted by a team of NGH Environmental archaeologists and representatives of the RAPs. The survey was undertaken with representatives of Mutthi Mutthi Nations, The Pappin Family Corporation, and the Wakool Indigenous Corporation from 6-9 December 2016.

Additional Aboriginal stakeholders have been included throughout the project, details of which are provided within the NGH Environmental Aboriginal Cultural Heritage Assessment Report.

### **5.3 COMMUNITY CONSULTATION**

Maoneng 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 undertaken in line with *Beyond Public Meetings: Connecting community engagement with decision making*, Twyford Consulting (2007).

### **5.3.1 Community consultation plan**

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

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

The aim of the plan is to:

1. Identify effective methods to inform the community about the Sunraysia SF
2. Facilitate engagement with the community, including input into the environmental assessment and project development

The plan identifies:

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

### **5.3.2 Community consultation activities to date**

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

- Public information session held by Maoneng in Balranald on 6 October 2016 to provide proposal information and answer questions (refer to section 5.3.3).
- A second detailed consultation event was held on 9 November 2016 to provide information about the technology and respond to any concerns the public may have.

### **5.3.3 Results of community consultation**

Twenty people attended the Sunraysia SF information session held in Balranald on 6 October 2016. The attendees included a range of government authorities, interest groups and the wider community. Government agencies that attended the information session included:

- Balranald Aboriginal Land Council
- Balranald Shire Council
- OEH

Key messages received during the information session from the stakeholders included:

- Farming culture. It is important to support the community to maintain the farming culture of the Balranald regional area. This would include maintaining the existing public access track along the southern side of the proposal site for neighbours and to ensure that any construction or operational activity does not impede on the impacts of the farmer's day to day lifestyle.
- Growing tourism. The community wishes to promote its Discovery Centre with a potential add-on for a solar element.

- Growing local solar expertise. There is limited electrical contracting experience within the Balranald Shire to support basic electrical needs.
- Growing local jobs. Sunraysia Solar Farm is anticipated to have a 12-month construction period commencing around Quarter 4 of 2017. Balranald has limited accommodation mechanisms and the employees of Sunraysia (during the construction period) will have limited avenues as a result.
- Contentious land. It is important to seek approvals from relevant Aboriginal stakeholders so as to properly appreciate the significance and cultural heritage of the land.

The second community consultation event, which was advertised in the local paper, was held on 9 November 2016. There were two attendees, including the landholder. No issues additional to those described above, nor objections were raised

#### **5.3.4 Continued engagement**

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

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

## 6 SCOPING

### 6.1 CONSTRAINTS MAPPING

A constraints and opportunities map was developed early in the assessment process following desktop review to inform the selection of a preferred site and early concept design. The constraints and opportunities map was further refined during the preparation of the Scoping Report and following 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 and opportunities map is provided in Appendix D and identifies all potential environmental constraints relevant to the proposed development. This includes:

- Biodiversity constraints such as endangered ecological communities and threatened species within the development envelope
- Nearby residential properties
- Crown Land including the TSR
- Existing mining exploration licenses

### 6.2 RISK ASSESSMENT

A Scoping Report was completed, as part of the request for SEARs, to identify the key environmental issues likely to be associated with the Sunraysia SF. The Scoping Report was prepared by NGH Environmental. It was based on a desktop review of available information and a site inspection.

After the site assessment, a risk assessment was undertaken to characterise the likely adverse environmental risks associated with the construction, operation, upgrade 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 submission, 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 and transmission line). This includes consideration of:

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

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. 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 risk assessment. Fourteen environmental risks were investigated. The unmitigated risk rating is the risk rating prior to assessment and is therefore precautionary. It considers a ‘worst case’ in the absence of specific information and helps determine the level of assessment required.

Table 6-2 Risk analysis of adverse environmental issues.

Environmental risk	Likelihood	Consequence	Risk rating (unmitigated)
Biodiversity	Likely	Moderate	Very High
Aboriginal heritage	Possible	Moderate	High
Visual	Possible	Moderate	High
Noise	Possible	Moderate	High
Land use	Likely	Moderate	Very High
Soils and water	Possible	Minor	Medium
Transport	Unlikely	Moderate	Medium
Hazards	Unlikely	Moderate	Medium
Resource Use and Waste Generation	Possible	Minor	Medium
Historic Heritage	Unlikely	Minor	Low
Climate	Unlikely	Minor	Low

Environmental risk	Likelihood	Consequence	Risk rating (unmitigated)
Socioeconomic	Possible	Minor	Medium
Cumulative impacts	Possible	Minor	Medium

In summary, the following environmental risks were considered to be key issues for the EIS:

- Biodiversity
- Archaeology
- Visual impacts
- Noise impacts
- Land use

Biodiversity, archaeology, visual and noise impacts were investigated by specialists. Summaries of these reports are included in Section 7. The full reports are attached as Appendices. Land use has been assessed in Section 7.5 and addresses guidance provided in *Primefact 1063: Infrastructure proposals on rural land* (DPI 2013) and *The land and soil capability assessment scheme* (OEH 2012). Lower risk issues are addressed in Section 8.

## 7 ENVIRONMENTAL IMPACT ASSESSMENT – KEY ISSUES

### 7.1 BIODIVERSITY

A specialist biodiversity assessment is provided in Appendix F and summarised below.

#### 7.1.1 Methodology

A specialist Biodiversity Assessment Report (BAR) was prepared by NGH Environmental to investigate and assess the potential impacts of the Sunraysia SF on biodiversity. The aim of the report was to address the requirements of the *Framework for Biodiversity Assessment (FBA)*, the NSW biodiversity offsets policy developed for Major Projects (OEH 2014) and the requirements of the SEARs in relation to biodiversity.

The assessment approach followed the FBA and involved literature reviews, database searches, and field surveys conducted in accordance with relevant survey guidelines.

Site assessment and field surveys were undertaken in November 2016. The field survey work included;

1. Linear transect searches and habitat assessment for threatened flora species;
2. Twelve biometric vegetation plots surveys;
3. Fauna habitat assessments within biometric plots;
4. Mapping of Hollow-bearing trees;
5. Targeted threatened bird surveys; and
6. Opportunistic surveys that included recording of fauna species observed during the fauna assessment.

A review of previous surveys completed in the local area was undertaken. This included those prepared as part of the Sunraysia SF scoping study, and surveys conducted for a solar farm proposal adjacent to the site.

The approach to undertaking the BAR included giving consideration to avoiding and minimising impacts to biodiversity throughout each phase of the Sunraysia SF Project. For example, early site selection options were assessed against key environmental, social and economic criteria, with several array locations being modified to avoid impacts to large intact remnants of vegetation, and to avoid heritage items. The option proposed and assessed in this EIS ensures the greatest avoidance and minimisation of impacts on biodiversity possible.

As part of the BAR, a BioBanking development credit assessment was completed for the Sunraysia SF. The proposal ID for the assessment is BCC Major Project 205/2016/4042MP Version 1 and the assessment type was selected as 'Major Project'. Section 2.10 of Appendix F of this EIS summarises the values entered into the Landscape values section of the BioBanking Credit Calculator (BCC).

#### 7.1.2 Existing environment

##### Landscape features

The proposal is located within The Murray Darling Depressions Bioregion and the South Olary Plain Subregion (IBRA v.7 2012). The dominant *Interim Biogeographic Regionalisation for Australia (IBRA)* subregion affected by the proposal is the South Olary Plain Subregion.

The following Mitchell Landscapes (Mitchell 2002) occur within the study area;

- Murrumbidgee Depression Plains occurs throughout the majority of the proposal area. The per cent cleared estimate for this landscape is currently 93% (OEH 2007).
- Mallee Cliffs Sandplains occurs in the western section of the proposal area. The per cent cleared estimate for this landscape is currently 30% (OEH 2007).

The total area of native vegetation mapped within the outer assessment circle is 3672.34 ha. Cleared areas in the proposal area are primarily used for agriculture and provide very little value in terms of fauna habitat. These areas provide suitable foraging habitat for raptors, parrots, cockatoos and macropods, and introduced species such as cats, foxes and rabbits. Approximately 803.49 ha (98.52%) within the proposal area is cleared (non-native vegetation) land.

There are no rivers or streams present at the site. There are four man-made dams occurring within the proposal area. These wetlands provide habitat for wetland birds and amphibians, although it is considered low quality due to a sparse covering of aquatic vegetation. The closest Nationally Important Wetland to the proposal area is Yanga Lake approximately eight kilometres to the north-east.

No state or regionally significant biodiversity links, as defined in the FBA (OEH) occur within the Development Envelope and within the inner and outer assessment circles.

Using the BioBanking Credit Calculator, the study area returned a landscape value score of 12.60.

### **Native vegetation**

Four distinct Plant Community Types (PCTs) were observed in the proposal area. These include:

1. Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
2. Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
3. Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
4. Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones

Cleared areas that were dominated by non-indigenous vegetation are not considered to provide habitat for native species and thus have not been included in the BCC calculations. The PCTs within the proposal area are illustrated on Figure 7-1

### **Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (PCT 170)**

Within the proposal area, PCT 170 occurred within the proposed transmission line and in remnant patches within the proposal area. The proposal will require complete removal of patches of this community located within the proposal area including within the proposed transmission line. This vegetation community is not listed as an EEC under the TSC Act or EPBC Act<sup>1</sup>.

The dominant tree species in the community consisted of White Mallee *Eucalyptus dumosa* and Red Mallee *E. socialis*. The mid-storey was generally open, with sparse shrubs including Thorny Saltbush *Rhagodia spinescens*, Ruby saltbush *Enchylaena tomentosa*, Emubush *Eremophila longifolia*, Black Bluebush *Maireana pyramidata* and Grey Copperburr *Sclerolaena diacantha*. The understorey was generally

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<sup>1</sup> Email advice received from Miranda Kerr (OEH Biobanking team) regarding EEC classification 9/11/2016

dominated by a diverse assemblage of exotic grass and forb species including Barley Grass *Hordeum leporinum*, Smooth Mustard *Sisymbrium erysimoides*, Wiry Noon-flower *Psilocaulon tenue*, Wolly Burr-medic *Medicago minima* and Wards Weed *Carrichtera annua*. A minor native understorey component was also apparent and included species such as Speargrass *Austrostipa scabra*, Crassula *Crassula colorata*, Calandrinia *Calandrinia eremaea*, Bluebells *Wahlenbergia luteola* and Ground-heads *Chthonocephalus pseudevax*.

This vegetation community provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting habitat for birds and arboreal fauna. The mid-storey provides foraging and nesting habitat for smaller birds, as well as refuge for small-medium sized mammals and reptiles. Ground cover plants, logs and fallen leaves also provide shelter and foraging habitat for terrestrial fauna. Where hollow-bearing trees are present, they may provide daytime resting habitat for bats and mammals, and roosting habitat for birds.

### **Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion**

Within the proposal area, PCT 58 occurred within the proposed transmission line in the north-east region. The proposed above ground transmission line will require some clearing of this community. This vegetation community is not listed as an EEC under the TSC Act or EPBC Act<sup>1</sup>.

The over-storey component of this community was dominated by Black Oak *Casuarina pauper*. The open mid-storey consisted of shrubs including Copperburr (*Sclerolaena obliquicuspis*), Ruby saltbush *Enchylaena tomentosa* and Grey Copperburr *Sclerolaena diacantha*. The understorey consisted of a diverse assemblage of native and exotic species including Wolly Burr-medic *Medicago minim*), Common White Sunray *Rhodanthe floribunda*, Wards Weed *Carrichtera annua*, Speargrass *Austrostipa scabra*, Crassula *Crassula colorata*, Calandrinia *Calandrinia eremaea*, Bluebells *Wahlenbergia luteola* and Ground-heads *Chthonocephalus pseudevax*.

This vegetation community provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting habitat for birds and arboreal fauna. The mid-storey provides foraging and nesting habitat for smaller birds, as well as refuge for small-medium sized mammals and reptiles. Ground cover plants, logs and fallen leaves also provide shelter and foraging habitat for terrestrial fauna. Where hollow-bearing trees are present, they may provide daytime resting habitat for bats and mammals, and roosting habitat for birds.

### **Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)**

Within the proposal area, PCT 16 occurred as a small isolated remnant patch in the south-east of the proposal area. The proposal will require some clearing of this community. This vegetation community is not listed as an EEC under the TSC Act or EPBC Act.

The over-storey component of this community was dominated by Black Box *E. Largiflorens*. The mid-storey was dominated by shrubs including Copperburr *Sclerolaena obliquicuspis* and Thorny Saltbush *Rhagodia spinescens*. The understorey was dominated by exotic species including Barley Grass *Hordeum leporinum* and Smooth Mustard *Sisymbrium erysimoides*.

This vegetation community provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting habitat for birds and arboreal fauna. The mid-storey provides foraging and nesting habitat

for smaller birds, as well as refuge for small-medium sized mammals and reptiles. Ground cover plants, logs and fallen leaves also provide shelter and foraging for terrestrial fauna. Where hollow-bearing trees are present, they may provide daytime resting habitat for bats and mammals, and roosting habitat for birds.

### **Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones**

Within the proposal area, PCT 23 occurred as remnant patches within the proposed transmission line in the north-east and the south-east regions of the proposal area. This vegetation community is listed as an EEC under the TSC Act – *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression Bioregions. The proposal will require some clearing of this community in both the north-east and south-east regions of the proposal area.

This over-storey component of this community was dominated by Yarran *Acacia melvillei*. The understorey consisted of a diverse assemblage of native and exotic species including Grey Copperburr *Sclerolaena diacantha*, Copperburr *Sclerolaena obliquicuspis*, Wolly Burr-medic *Medicago minima*, Wards Weed *Carrichtera annua*, Speargrass *Austrostipa scabra*, *Brachyscome dentate*, Hairy Rupturewort *Herniaria cinerea* and Perennial Ryegrass *Lolium perenne*.

This vegetation community provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting habitat for birds and arboreal fauna. The mid-storey provides foraging and nesting habitat for smaller birds, as well as refuge for small-medium sized mammals and reptiles. Ground cover plants, logs and fallen leaves also provide shelter and foraging habitat for terrestrial fauna. Where hollow-bearing trees are present, they may provide daytime resting habitat for bats and mammals, and roosting habitat for birds.

### **Cleared areas (exotic dominated cropped land)**

This highly disturbed or modified vegetation community occupies the majority of the site and is found where there is a prevalence of exotic or planted non-local flora species that make up groundcover layers and is confined to cropped land areas. Non-indigenous vegetation covers the majority of the proposal area, making it the most abundant community in the proposal area. The groundcover is mainly exotic with common crop species including Wheat *Triticum aestivum* and Lucerne *Medicago sativa*.

As this vegetation often lacked a native canopy cover and was either cleared or had over 50 % exotic species composition in the ground cover, then in accordance with the FBA, this vegetation community does not need to be assessed further.

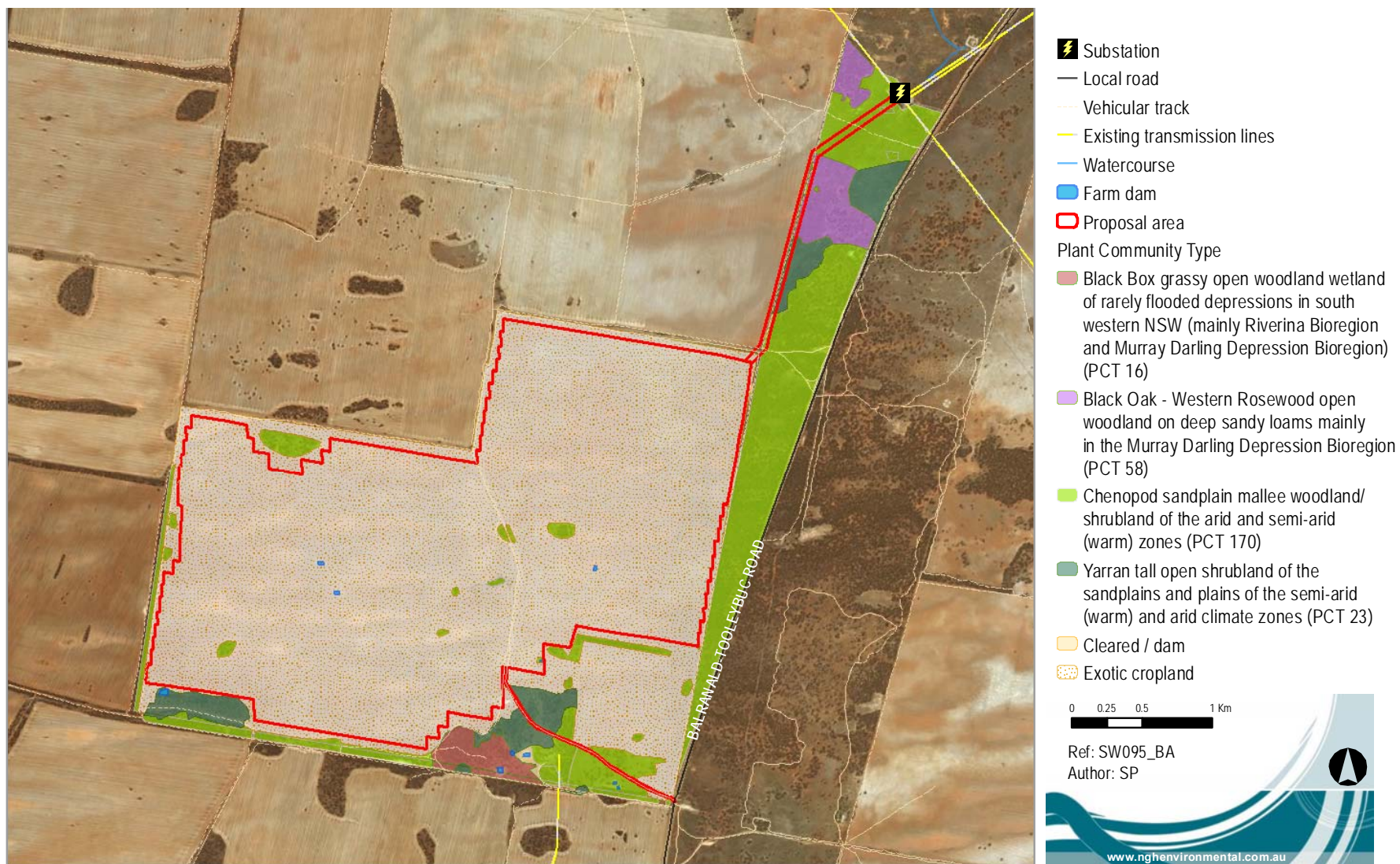


Figure 7-1 Plant Community Types (PCTs) located in the proposal area.

### Threatened species

The following threatened species were identified from the BCC as potentially being present and requiring targeted survey. The table below states whether each species was detected during onsite surveys (methodology and results provided below) and furthermore, if they are now expected to be impacted by the proposal.

Table 7-1 Threatened species returned from the BCC as requiring survey

Common name	Scientific name	Surveys	Present/presumed present	Affected by the proposal
Winged Peppercross	<i>Lepidium monoplacoides</i>	Not detected	No	Unlikely – not recorded within the proposal area, only one record within 20 km of site, marginal habitat
A spear-grass	<i>Austrostipa metatoris</i>	Not detected	No	Unlikely – not recorded within the proposal area
Grey Falcon	<i>Falco hypoleucos</i>	Not detected	No	Unlikely – not recorded within the proposal area
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	Not detected	No	Unlikely – not recorded within the proposal area
Bitter Quandong	<i>Santalum murrayanum</i>	Not detected	No	Unlikely – not recorded within the proposal area

Other threatened species of note that were identified in background searches with previous recordings within a 10km radius are included in Table 7-2.

Table 7-2 Additional species potentially present at the site

Common name / Status (TSC Act, EPBC Act)	Scientific name	Number of records (OEH/AoLA /NGH)*	Suitable habitat within the proposal area	Surveys	Present/presumed present	Affected by the proposal
Brown Treecreeper (Eastern subspecies) (V/-)	<i>Climacteris picumnus victoriae</i>	1/2/0	Marginal	Not detected	Not associated with PCTs present on site, records in the locality but unlikely to utilise proposal area as core habitat	Unlikely
Freckled Duck (V/-)	<i>Stictonetta naevosa</i>	1/0/0	Marginal	Not detected	Not presumed present, only two small waterbodies on site, unlikely to utilise these areas as core habitat	Unlikely

Common name / Status (TSC Act, EPBC Act)	Scientific name	Number of records (OEH/AoLA /NGH)*	Suitable habitat within the proposal area	Surveys	Present/presumed present	Affected by the proposal
Grey-crowned Babbler (Eastern subspecies) (V/-)	<i>Pomatostomus temporalis temporalis</i>	3/10/1 (adjacent)	Suitable	Detected adjacent to proposal area	Yes, presumed present, suitable habitat present and records adjacent to proposal area	Unlikely
Major Mitchell's Cockatoo (V/-)	<i>Lophochroa leadbeateri</i>	7/12/2	Suitable	Detected within proposal area	Yes, known to occur within moderate - good quality native vegetation within and adjacent to proposal area	Likely, included in offset calculator
Regent Parrot (Eastern subspecies) (E/V)	<i>Polytelis anthopeplus monarchoides</i>	2/0/3	Suitable	Detected within proposal area	Yes, known to occur within moderate - good quality native vegetation within and adjacent to proposal area	Likely, included in offset calculator
Southern Bell Frog (E/V)	<i>Litoria raniformis</i>	2/0/0	No	Not detected	Not presumed present	Unlikely
Spotted Harrier (V/-)	<i>Circus assimilis</i>	1/4/0	Suitable	Not detected	Yes, record immediately south of proposal area, suitable habitat present	Likely, included in offset calculator
Rainbow Bee-eater (-/M)	<i>Merops ornatus</i>	0/8/1	Suitable	Detected within proposal area	Yes, record immediately south of proposal area, suitable habitat present	Likely, included in offset calculator

### 7.1.3 Site surveys

#### Methodology

Site surveys were undertaken by a botanist and an ecologist in November 2016.

The aims of the site surveys were as follows:

1. Determine vegetation communities present within the proposal area, their condition and extent.
2. Identify potential EECs within the proposal area and determine their condition and extent.
3. Conduct targeted searches for threatened flora and fauna species predicted to occur in the proposal area.

4. Assess the availability and extent of flora and fauna habitat, particularly threatened species habitat, such as hollow-bearing trees.

The following survey methods were utilised during the survey:

1. Linear transect searches and habitat assessment for threatened flora species;
2. Twelve biometric vegetation plots surveys;
3. Fauna habitat assessments within biometric plots;
4. Mapping of Hollow-bearing trees;
5. Targeted threatened bird surveys; and
6. Opportunistic surveys that included recording of fauna species observed during the fauna assessment.

A full description of the survey methodology is outlined in Section 4.2.2 of Appendix F.

## Results

Seventy-three flora species and 31 fauna species were detected during the surveys. Three threatened species and one migratory species listed under the NSW TSC Act and EPBC Act were detected during the survey, including:

- Grey-crowned Babbler (Eastern subspecies) *Pomatostomus temporalis temporalis* – Vulnerable (TSC Act)
- Major Mitchell's Cockatoo *Lophochroa leadbeateri* – Vulnerable (TSC Act)
- Regent Parrot (Eastern subspecies) *Polytelis anthopeplus monarchoides* – Endangered/Vulnerable (TSC Act/ EPBC Act)
- Rainbow Bee-eater *Merops ornatus* – Marine/migratory (EPBC Act)

Four threatened species returned by the BCC assessment as requiring survey (and therefore with potential to generate species credits) were considered to have some potential to occur in the proposal area, however, based on the extensive survey effort undertaken within the optimal season (described in Appendix F, Section 4.32) and the areas that would be impacted by the proposal, none of these threatened species were considered likely to be *adversely impacted* by the proposal.

### 7.1.4 Potential impacts

#### Construction

The BAR identified the following potential direct and indirect impacts to biodiversity values of the site that would result during the construction phase.

Table 7-3 Potential biodiversity impacts as a result of the proposal.

Impact	Frequency	Intensity	Duration	Consequence
<b>Direct</b>				
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access	Regular	High	Construction phase	<ul style="list-style-type: none"> <li>• Direct loss of native flora and fauna habitat</li> <li>• Potential clearing of habitat outside of the proposal area</li> <li>• Injury and mortality to fauna during clearing of fauna habitat</li> </ul>

Impact	Frequency	Intensity	Duration	Consequence
<b>Direct</b>				
tracks) (see table below for breakdown of impact areas)				<ul style="list-style-type: none"> <li>• Introduction and spread of noxious weeds and pathogens</li> <li>• Disturbance to fallen timber, dead wood and bush rock</li> </ul>
<b>Indirect</b>				
Accidental spills and contamination from construction activities (including compound sites)	Rare	Moderate	Construction phase	Pollution of soils and dams
Earthworks	Regular	Moderate	Construction phase	Erosion and sedimentation of soils and dams
Noise	Regular	Low	Construction phase	Construction machinery and activities may disturb local fauna
Dust generation	Regular	Low	Construction phase	Inhibit the function of plant species and communities, soils and dams
Light spills during night works	Rare	Low	Construction phase	Night works may alter fauna activities/movements
General construction activities	Regular	Moderate	Construction phase	Feral pest, weed and/or pathogen encroachment
Increased Vehicle Traffic	Regular	Low	Operational phase	Increase potential for fauna mortality through vehicle strike

A summary of the direct impact from habitat clearance, in relation to each vegetation type versus infrastructure components is illustrated in Table 7-4 below.

Table 7-4 Impact area in relation to type, quantity and location of vegetation types resulting from the development of separate infrastructure components.

Plant Community Type	Array site (ha) <sup>2</sup>	Transmission line (ha)	Access track (ha)	Total area (ha)
Exotic vegetation	803.13	0.36	0	803.49
<b>PCT # 23 (EEC)</b> - BVT # MU609 Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	0	1.26	0.03	1.29
<b>PCT # 170</b> - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	5.13	4.37	0.09	9.59

<sup>2</sup> **Note:** The array site incorporates laydown, compound and battery storage areas. These infrastructure components would not impact on native vegetation.

Plant Community Type	Array site (ha) <sup>2</sup>	Transmission line (ha)	Access track (ha)	Total area (ha)
<b>PCT # 58 Black Oak</b> - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	0	1.23	0	1.23
<b>PCT # 16</b> - Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	0	0	0.001	0.001
<b>Total</b>	808.26	7.22	0.121	815.60

A range of mitigation measures would be implemented to ensure that impacts on biodiversity during the construction phase are avoided where possible, and minimised where they cannot be avoided. The mitigation measures that would be employed during the construction phase are provided in Section 7.1.6 below. Mitigation measures have considered methods of clearing, clearing operations, timing of construction and other measures that would minimise impacts of the Sunraysia SF Project on biodiversity values.

### Operation

The BAR identified the following potential direct and indirect impacts to biodiversity values of the site during the operational phase.

Impact	Frequency	Intensity	Consequence
<b>Direct</b>			
Existence of new and permanent solar infrastructure	Constant	Moderate	<ul style="list-style-type: none"> <li>Permanent removal of flora and fauna habitat</li> <li>Collision risk to birds and microbats to exterior barbed-wire fencing</li> </ul>
Inappropriate landscaping	Constant	Moderate	Reduction in the quality of habitat for native flora and fauna species
<b>Indirect</b>			
Light spill	Regular	Low	Alter movements of fauna through the landscape
Weed encroachment	Regular	Moderate	Ingress of weeds along the boundary of the development
Increased Vehicle Traffic	Regular	Low	Increase potential for fauna mortality through vehicle strike
Solar Array Microclimate	Regular	Moderate	Alter movement of fauna within site and through the landscape, potential shelter habitat for pest species
Fences	Regular	Moderate	Alter movement of fauna within site and through the landscape.
Pest animals	Irregular	Low	Increase in pest species specialising in edge habitats

Measures to avoid and minimise impacts that may occur during the operational phase would be implemented as part of the Sunraysia SF Project. Where practical, measures to avoid impacts on biodiversity during operation have been identified. Where impacts are unavoidable measures to minimise impacts would be implemented.

### 7.1.5 Requirement for biodiversity offsets

Use of the BCC for the Sunraysia SF Project concluded that there are the following impacts to Plant Community Types and threatened species habitats occurring within the proposal area:

**Table 7-5 Vegetation zones within the proposal**

Vegetation Community	Threatened Ecological Community (TSC Act or EPBC Act)?	PCT Id	Ecosystem species habitat	BioMetric vegetation condition	Extent of vegetation (ha) impacted in proposal area
<b>PCT#170</b> <b>BVT # MU534</b> <b>Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones</b>	No	170	Chestnut Quail-thrush <i>Cinclosoma castanotum</i> , Corbens Long-eared Bat <i>Nyctophilus corbeni</i> , Gilberts Whistler <i>Pachycephala inornata</i> Hooded Robin (south-eastern form) <i>Melanodryas cucullata</i> subsp. <i>Cucullata</i> , Little Eagle <i>Hieraetus morphnoides</i> , Major Mitchells Cockatoo <i>Lophochroa leadbeateri</i> , Pied Honeyeater <i>Certhionyx variegatus</i> , Regent Parrot (eastern subspecies) <i>Polytelis anthopeplus</i> subsp. <i>Monarchoides</i> , Spotted Harrier <i>Circus assimilis</i> , Varied Sittella <i>Daphoenositta chrysoptera</i> .	Moderate - good	9.59
<b>PCT # 58</b> <b>BVT # 517 Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion</b>	No	58	Australian Bustard <i>Ardeotis australis</i> , Bush Stone-curlew <i>Burhinus grallarius</i> , Corbens Long-eared Bat <i>Nyctophilus corbeni</i> , Diamond Firetail <i>Stagonopleura guttata</i> , Grey-crowned Babbler (eastern subspecies) <i>Pomatostomus temporalis</i> subsp. <i>Temporalis</i> , Hooded Robin (south-eastern form) <i>Melanodryas cucullata</i> subsp. <i>Cucullata</i> , Little Eagle <i>Hieraetus morphnoides</i> , Major Mitchells Cockatoo <i>Lophochroa leadbeateri</i> , Painted Honeyeater <i>Grantiella picta</i> , Pied Honeyeater <i>Certhionyx variegatus</i> , Regent Parrot (eastern subspecies) <i>Polytelis anthopeplus</i> subsp. <i>Monarchoides</i> , Spotted Harrier <i>Circus assimilis</i> , Varied Sittella <i>Daphoenositta chrysoptera</i>	Moderate - good	1.23
<b>PCT # 16</b> <b>BVT # MU514</b> <b>Black Box grassy open woodland wetland of rarely</b>	No	16	Australian Bustard <i>Ardeotis australis</i> , Barking Owl <i>Ninox connivens</i> , Bush Stone-curlew <i>Burhinus grallarius</i> , Diamond Firetail <i>Stagonopleura guttata</i> , Gilberts Whistler <i>Pachycephala inornata</i> , Diamond Firetail <i>Stagonopleura guttata</i> ,	Moderate - good	0.001

Vegetation Community	Threatened Ecological Community (TSC Act or EPBC Act)?	PCT Id	Ecosystem species habitat	BioMetric vegetation condition	Extent of vegetation (ha) impacted in proposal area
<b>flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)</b>			Grey-crowned Babbler (eastern subspecies) <i>Pomatostomus temporalis subsp. Temporalis</i> , Hooded Robin (south-eastern form) <i>Melanodryas cucullata subsp. Cucullata</i> , Little Eagle <i>Hieraaetus morphnoides</i> , Magpie Goose <i>Anseranas semipalmata</i> , Major Mitchells Cockatoo <i>Lophochroa leadbeateri</i> , Painted Honeyeater <i>Grantiella picta</i> , Pied Honeyeater <i>Certhionyx variegatus</i> , Regent Parrot (eastern subspecies) <i>Polytelis anthopeplus subsp. Monarchoides</i> , Spotted Harrier <i>Circus assimilis</i> , Varied Sittella <i>Daphoenositta chrysoptera</i> .		
<b>PCT # 23 BVT # MU609 Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones</b>	Yes - <i>Acacia melvillei</i> Shrubland in the Riverina and Murray-Darling Depression Bioregions	23	Australian Bustard <i>Ardeotis australis</i> , Corbans Long-eared Bat <i>Nyctophilus corbeni</i> , Grey-crowned Babbler (eastern subspecies) <i>Pomatostomus temporalis subsp. Temporalis</i> , Hooded Robin (south-eastern form) <i>Melanodryas cucullata subsp. Cucullata</i> , Little Eagle <i>Hieraaetus morphnoides</i> , Major Mitchells Cockatoo <i>Lophochroa leadbeateri</i> , Painted Honeyeater <i>Grantiella picta</i> , Pied Honeyeater <i>Certhionyx variegatus</i> , Spotted Harrier <i>Circus assimilis</i> , Varied Sittella <i>Daphoenositta chrysoptera</i> .	Moderate - good	1.29
<b>Total Vegetation</b>	-	-	-	-	<b>12.11</b>

A total of **391** ecosystem credits have been generated for the proposal area (BCC Major Project 205/2016/4042MP Version 1). No species credits have been generated for the proposal area. The BCC full credit report is provided in Appendix F of this EIS.

### Ecosystem credits

Ecosystem credits are required for the following PCTs:

- PCT 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones – 291 Credits
- PCT 23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones – 47 Credits
- PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion – 53 Credits
- PCT 16 - Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion) – 0 Credits

## Species credits

No species credits are required according to the BCC.

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.

### 7.1.6 Environmental safeguards

The following mitigation measures would be implemented to reduce the impacts to biodiversity during the construction, operation and decommissioning phases of the Sunraysia SF Project:

No.	Environmental Safeguard	Solar farm		
		C	O	D
BIO 1	<ul style="list-style-type: none"> <li>Preparation of Flora and Fauna Management Plan (FFMP) that would incorporate mitigation strategies below. The FFMP would form part of the Sunraysia Solar Farm Construction Environmental Management Plan.</li> </ul>	C		
BIO 2	<ul style="list-style-type: none"> <li>Native vegetation to be retained (EEC and trees) would be delineated (fencing or other method), and construction activities would be excluded from these areas. Clearing and construction contractors would be given inductions that make clear the importance of these features.</li> </ul>	C		
BIO 3	<ul style="list-style-type: none"> <li>A 'Clearing and Grubbing Plan' would be developed. This would include;               <ul style="list-style-type: none"> <li>best practice methods for the removal of woody vegetation and non-woody vegetation</li> <li>Where trees are to be retained, an adequate tree protection zone</li> <li>A provision for mulch reuse onsite, particularly to stabilise disturbed areas</li> <li>An unexpected threatened species finds procedure</li> </ul> </li> </ul>	C		
BIO 4	<ul style="list-style-type: none"> <li>Stockpile and compound sites would be located using the following criteria:               <ul style="list-style-type: none"> <li>Within the Development Envelope.</li> <li>In areas of low ecological conservation significance (i.e. cropped land, and avoiding drip line of native trees).</li> </ul> </li> </ul>	C		
BIO 5	<ul style="list-style-type: none"> <li>The location of transmission line towers will be designed to minimise native vegetation clearing</li> </ul>	C		
BIO 6	<ul style="list-style-type: none"> <li>Use non barbed-wire on exterior fencing, unless required for public safety.</li> </ul>	C		
BIO 7	<ul style="list-style-type: none"> <li>Rehabilitation would be undertaken in all areas disturbed during construction. Where plantings are to be carried out they will utilise local native species to increase the diversity of the existing vegetation, as well as to improve the connectivity between patches in the landscape.</li> </ul>	C		
BIO 8	<ul style="list-style-type: none"> <li>Prepare a weed management plan that;               <ul style="list-style-type: none"> <li>Is consistent with DPI's <i>Prime Fact 1063 Infrastructure proposals on rural land</i> (DPI 2013)</li> <li>Allows for management of declared noxious weeds in accordance to the requirements stipulated by the <i>Noxious Weeds Act 1993</i></li> </ul> </li> </ul>	C	O	

No.	Environmental Safeguard	Solar farm		
		C	O	D
	<ul style="list-style-type: none"> <li>○ Develops a protocol for weed hygiene in relation to plant, machinery and importation and management of fill</li> </ul>			
BIO 9	<ul style="list-style-type: none"> <li>• Vegetation groundcover, particularly beneath the low edge of the panels, would be monitored and any bare areas or erosion addressed (i.e. planting, jute mesh armouring etc.) to resist erosion and weed infestation.</li> </ul>		O	
BIO 10	<ul style="list-style-type: none"> <li>• Carry out refuelling of plant and equipment, chemical storage and decanting at least 50 m away from farm dams in impervious bunds. Ensure that dry and wet spill kits are readily available</li> </ul>	C		
BIO 11	<ul style="list-style-type: none"> <li>• If night work is unavoidable, ensure lights are directed away from remnant vegetation.</li> </ul>	C		
BIO 12	<ul style="list-style-type: none"> <li>• Develop a pest management plan, to cover all pest management issues at the Sunraysia SF site.</li> </ul>	C	O	

## 7.2 ABORIGINAL HERITAGE

An Aboriginal Heritage Assessment of the proposal has been undertaken by NGH Heritage. The report is provided in full in Appendix G and summarised below.

### 7.2.1 Aboriginal Heritage and the EIS

The solar farm proposal would involve ground disturbance that has the potential to impact on Aboriginal heritage sites and objects which are protected under the NSW *National Parks and Wildlife Act 1974* (NPW Act). The purpose of the Aboriginal Cultural Heritage Assessment (ACHA) was to investigate the presence of any Aboriginal sites and to assess the impacts and management strategies that may mitigate any impact.

The requirements of the SEARs were addressed within the ACHA. They require that impacts on Aboriginal cultural heritage values are to be assessed and documented in the EIS. The EIS must include an assessment of the likely Aboriginal (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.

### 7.2.2 Aboriginal Cultural Heritage Assessment of the Proposal

The 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).

The assessed area of the proposed solar farm comprises Lot 9/ DP 751179, Lot 10/ DP 751179, Lot 11/ DP 751179 and Lot 14/ DP 751179 with transmission lines along Lot 7301/ DP 1157986 to an existing substation on Lot 48/ DP 1015985 in the Balranald Shire Council Local Government Area.

### **7.2.3 Aboriginal Consultation**

The consultation with Aboriginal stakeholders is described in section 5.2 above 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 registered Aboriginal parties for this project are:

- The Balranald Local Aboriginal Land Council;
- Wakool Indigenous Corporation;

### **7.2.4 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 Aboriginal Heritage Information Management System database. No Aboriginal sites had previously been recorded within and adjacent to the proposal area. The closest sites to the proposal area are four hearths with PADs (AHIMS # 47-6-0603, # 47-6-0604, # 47-6-0605 and # 47-6-0606) located north-east of the existing substation between 100 and 500 metres away from the originally proposed transmission line. Assessment of Aboriginal site models suggest that there appears to be a pattern of site location that relates to the presence of a water source. While the proposed Solar Farm has a lack of permanent water sources Aboriginal people have lived in the region for tens of thousands of years and there is potential for archaeological evidence to occur.

### **7.2.5 Survey Results**

Archaeological survey of the proposal area was undertaken between 6-9 December by NGH Archaeologists and up to five representatives from three separate Registered Aboriginal Parties. Survey transects were undertaken on foot and traversed all of the proposal area including the arrays, infrastructure and powerline easement. The survey was impeded by poor visibility within the northern paddock but there was good visibility in the southern paddock.

Between the survey participants, over the course of the field survey, approximately, 277.8 km of transects were walked across the main solar farm proposal area. Allowing for an effective view width of 5 m each person, this equates to a surface area of 138.9 ha, representing 17.4.9% of the 800 hectare proposal area. However, allowing for the visibility restrictions, the effective survey coverage is reduced to 48.6 ha, or 5.6% of the project area. The survey for the powerline examined 4.4 ha of the 11 ha easement, representing 40% but allowing for visibility restrictions, the effective survey coverage was 1.3 ha or 12% of the corridor.

Despite the variable visibility encountered during the survey, there were eight stone artefacts found across the proposal area and three hearths as well as two clusters of burnt clay recorded as ovens. The hearths and seven of the artefacts were recorded as a single site, Sunraysia Solar Open Site1, while the two ovens were recorded separately, Sunraysia Solar Oven 1 which included a stone artefact and Sunraysia Solar Oven 2.

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

The models of site location for the Sunraysia area have been shown to be accurate, with the current survey confirming the predicted distribution and nature of archaeological material.

The research potential of the site Sunraysia Solar Open Site 1 is assessed as moderate and the cultural significance of this groups of features was described as important by the Aboriginal representatives on site. The two oven sites, consisting of scattered material are considered to have low scientific significance and negligible research potential.

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

### **7.2.6 Potential Heritage Impacts**

The proposal involves the construction of a solar farm and includes connection to the nearby substation with an above ground transmission line. 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.

The impact to the scientific values if the sites within the proposal area were to be impacted by the current proposal is considered low. The sites 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 artefact and heat retainers and in the development of Aboriginal site modelling, which has largely now been realised by the recording.

Table 7-6 below provides a summary of the Aboriginal heritage sites identified during the survey and the assessment of impact resulting from the solar farm proposal. Sunraysia Solar Open Site 1, a site of good integrity, will be protected from impact as a short section of the powerline been modified to avoid this site.

Table 7-6 Identified Heritage Site Impact Assessment Summary

Site name	Site integrity	Type of harm	Degree of harm	Consequence of harm	Recommendation
Sunraysia Solar Oven 1	Poor – 100+ year history of agricultural use	Direct	Complete	Minimal loss of value	No action
Sunraysia Solar Oven 2	Poor – 100+ year history of agricultural use	Direct	Complete	Minimal loss of value	No action
Sunraysia Solar Open Site 1	Good – eroding from in situ deposit	Nil- outside works corridor using the revised transmission alignment	Nil - outside works corridor using the revised transmission alignment	Not applicable- outside works corridor using the revised transmission alignment	Avoid

### 7.2.7 Environmental safeguards

No.	Environmental Safeguard	Solar farm		
		C	O	D
Arch 1	<ul style="list-style-type: none"> <li>The proposed works be designed to avoid the site Sunraysia Solar Open Site 1 as described in the ACHA report.</li> </ul>	C		
Arch 2	<ul style="list-style-type: none"> <li>The development proposal would be able to proceed with no additional archaeological investigations.</li> </ul>	C		
Arch 3	<ul style="list-style-type: none"> <li>If complete avoidance of the recorded sites within the proposed solar farm area (Sunraysia Solar Oven 1 and Sunraysia Solar Oven 2) is not possible, the artefact identified should be collected and moved to a safe area within the property, as close as possible to their original location, but which will not be subject to ground disturbance. The collection and relocation should be undertaken by representatives of the registered Aboriginal parties. A new AHIMS site card will need to be completed identifying the new location of the moved artefacts.</li> </ul>	C		
Arch 4	<ul style="list-style-type: none"> <li>If Sunraysia Solar Open Site 1 cannot be avoided, further archaeological research should be undertaken in the form of surface salvage, which should be accompanied by excavations in order to establish the presence or absence sub surface deposits. Surface salvage and excavations would need to be conducted prior to any earthworks taking place. A technical report should be produced describing the surface salvage and excavations methodology and results.</li> </ul>	C		
Arch 5	<ul style="list-style-type: none"> <li>Sunraysia prepares a Cultural Heritage Management Plan (CHMP) to address the potential for finding additional Aboriginal artefacts during the construction of the Solar Farm. The CHMP will outline an unexpected finds protocol to deal with construction activity. Preparation of the CHMP should be undertaken in consultation with the registered Aboriginal parties.</li> </ul>	C		
Arch 6	<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		
Arch 7	<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 parties and may include further field survey.</li> </ul>	C		

## 7.3 VISUAL

A specialist visual impact assessment is provided in Appendix E and summarised below.

### 7.3.1 Methodology

This Visual Impact Assessment (VIA) includes a full assessment of the visual impacts associated with the Sunraysia SF. It includes an assessment of:

- Landscape character and scenic vistas (including significant or sensitive vistas).
- Potential impacts on representative viewpoints, including residences and road corridors.
- Potential impacts on air traffic

<b>Study area</b>	Defined as within 16km of the proposed solar farm site (maximum view distance).
<b>Proposal site / site</b>	The lot boundaries within which the solar farm development is proposed, excluding offsite infrastructure such as access upgrades or transmission lines and connections.
<b>Proposal</b>	All infrastructure and activities required for the construction, operation and decommissioning of the solar farm.
<b>Landscape character unit (LCU)</b>	LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a way to categorise the existing scenic quality of the receiving environment and consider the ability of the environment to absorb visual change at the landscape scale.
<b>Landscape management zone (LMZ)</b>	LMZs are derived by combining scenic quality with viewer sensitivity and proximity to the proposed infrastructure at the landscape scale. A three-tiered management hierarchy sets out appropriate management objectives for each zone.
<b>Zone of Visual Influence (ZVI)</b>	ZVI modelling uses GIS modelling and topography to determine areas which would be shielded from views of infrastructure at the proposed solar site. It does not take into account other existing or proposed screening features such as vegetation or built structures.

### Defining landscape character zones and potential visual receivers

Mapping and modelling were undertaken to:

- Identify and classify LCUs within 16km of the proposed solar farm. Sixteen kilometres is generally considered the maximum distance a viewer can see infrastructure similar to that proposed on a clear day. This was done based on aerial imagery. LCUs are a way to summarise differences in landscape amenity and the sensitivity of different areas within the landscape to visual impacts. Their scenic quality are rated as follows:
  - A high scenic quality rating describes areas with outstanding, unusual or diverse features.
  - A moderate scenic quality rating applies to areas with the features and variety normally present in the character type.

- A low scenic quality rating is given for areas lacking outstanding, unusual or diverse features or variety.
- Define areas in which the infrastructure may be visible, using Zone of Influence (ZVI) modelling. A map identifying the ZVI (or viewshed) of the proposal was produced. This method uses topographic information to determine areas in which views of infrastructure would not be visible. It does not account for other features that may provide shielding such as vegetation or buildings. Topography was based on a 25m resolution Digital Elevation Model (DEM) sourced from Commonwealth of Australia (Geoscience Australia) (2016). Two ZVI models were prepared, one for the infrastructure located on the proposal site and one for the overhead powerline with up to 50 metre high poles. The infrastructure on the proposal site was modelled as 4m high rectangular blocks for the solar arrays/PV boxes and 8.5 metre high rectangular blocks for the buildings. This was undertaken to differentiate the impact as a result of the powerlines, which may be visible from a longer distance but may have a lower impact due to existing powerlines in the area, from the solar farm which covers a larger area and may have a higher impact at shorter distances. Following ground truthing, existing vegetation screening were added to the ZVI modelling to refine the viewshed results.
- Identify key viewpoints such as major travel routes, public recreation areas, potential receivers (dwellings and other structures, within 2km of the proposed solar farm), and built up areas. This step generally excluded areas deemed not to be visible from the ZVI modelling.
- Understand the feasibility of screening to mitigate visual impacts.

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

Criteria for proximity and sensitivity are as follows:

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

Residences were assessed to have moderate sensitivity, even where they are located in areas of low scenic quality (agricultural areas). In agricultural areas, gardens and plantings have often been incorporated into house lots, most likely to provide shade as well as screening (views, dust, noise) from the intensively worked agricultural lands. These areas provide an ‘oasis’ within the broader LCU. They are also likely to offer some visual screening to views of the solar farm.

Similar to residences, views from the TSR were assessed to have moderate sensitivity. While the TSR is agricultural in nature, providing pasture reserves for travelling or grazing stock, it provides visual amenity through its native vegetation which contrasts with the surrounding cropped land. The vegetated TSR would provide some visual screening to views of the solar farm dependent on the location of the viewer within the TSR (along the boundary of the proposal site vs closer to Balranald-Tooleybuc Road).

**Assessing potential visual impacts**

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

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

- Define LMZ, for the representative viewpoints, based on:
  - The scenic quality of the study area’s LCUs.
  - The expected sensitivity at representative viewpoints.
- Evaluate the degree of contrast the solar farm would result in at representative viewpoints and in consideration of the management objectives of the relevant LMZ.
- Determine the acceptability of the contrast with the management objectives of the relevant LMZ; this is the resultant visual impact, rated as high, medium or low.

Visual Landscape Management Zones (LMZ) were developed for the study area. These zones were derived by combining information about scenic quality (from the LCU), viewer sensitivity and the distance of the area from the viewpoints. Combined they produce a three-tiered management hierarchy: A – C, as shown in Table 7-7.

**Table 7-7 Visual Landscape Management Zone decision matrix**

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

Each zone has associated objectives to guide management of visual change and to help evaluate proposed project impacts. These are shown in Table 7-8..

**Table 7-8 Visual Landscape Management Zone management objectives**

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

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 LMZ 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.

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

### **7.3.2 Landscape character units**

Three key LCUs were identified within 16 kilometres of the proposal site (Table 7-9 and Figure 7-2).

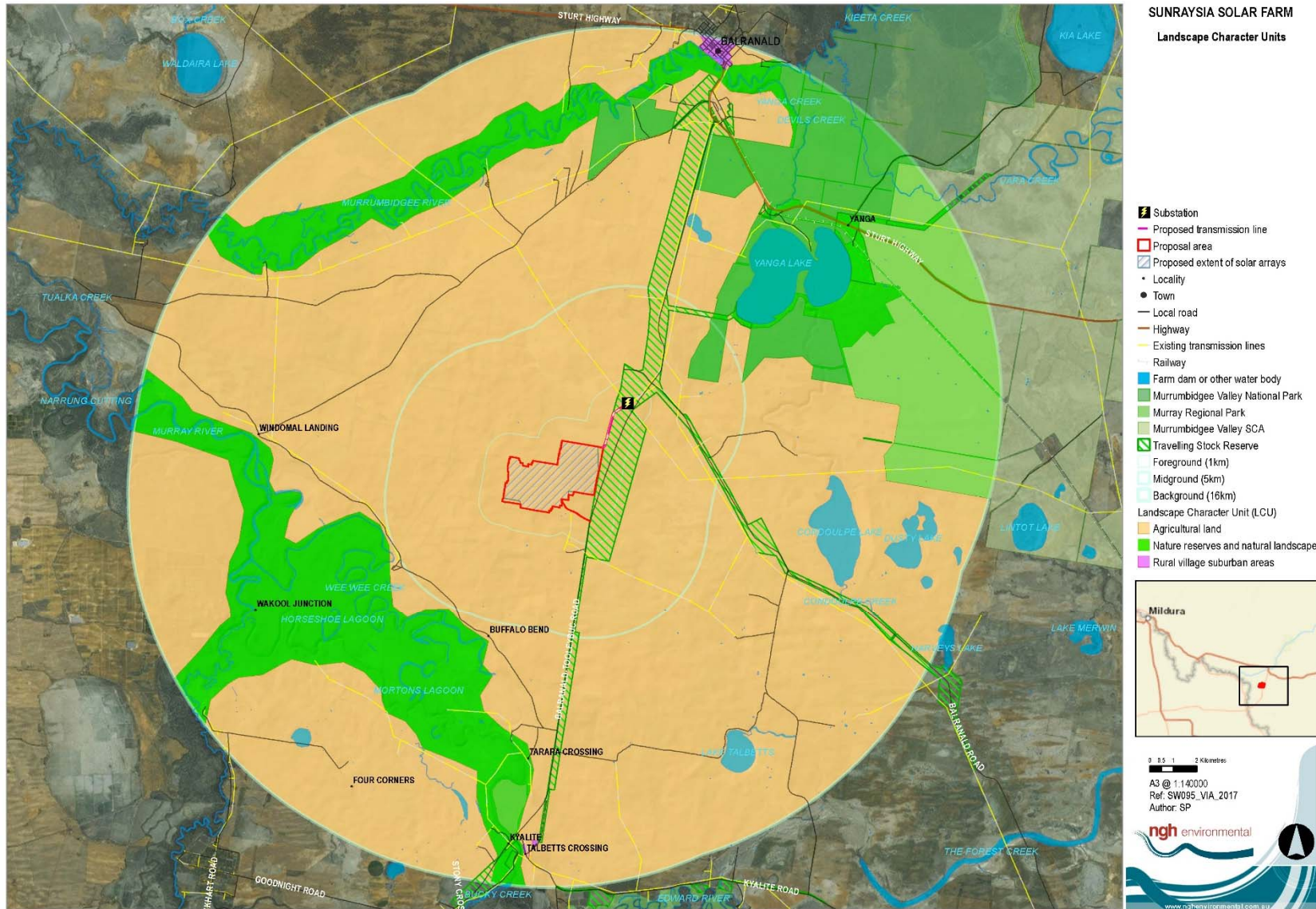


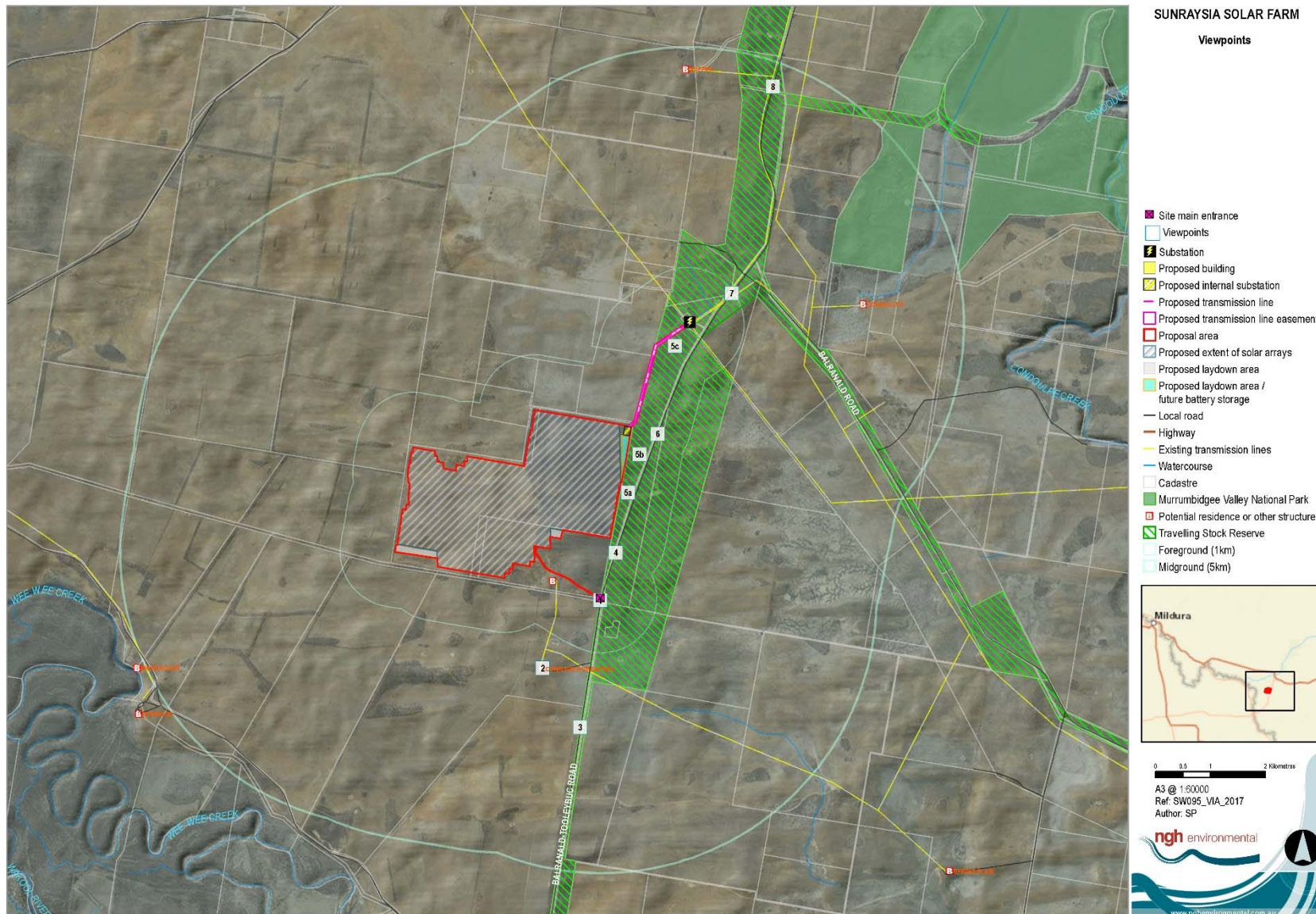
Figure 7-2 Landscape character units

Table 7-9 Landscape character units

Landscape Character Unit	Key features
Agricultural	<p>Cropped and irrigated rectangular paddocks form a collection of intensively worked agricultural areas with various crops. This results in a mosaic of well-defined rectangular patches of varying colours (green to ochre) dependent on the season. The paddocks are often separated from one another by strips of remnant native vegetation. The proposed solar farm site is located within this LCU.</p> <p>The paddocks and their crops are of low relief on slightly undulating terrain, producing a uniform landscape. This is dissected by roads, sealed and unsealed, irrigation channels and powerlines that reinforce the linear patterns of the landscape and its key role as a primary production landscape. The powerlines provide a rare vertical element. Powerlines are relatively abundant in proximity of site, with at least 3 existing lines radiating from a substation in different directions. This includes a high voltage powerline cutting through the landscape. The substation is located about 2 kilometres north of the proposal site.</p> <p>This LCU also includes the vegetated TSR which runs along Balranald-Tooleybuc Road. TSRs are parcels of Crown land reserved under legislation for use by travelling stock, providing pasture reserves for travelling or grazing stock.</p> <p>Residences within this LCU are commonly well screened with vegetation whether planted or remnant native vegetation. Other infrastructure is clustered and includes sheds and silos and low fences.</p> <p><b>Scenic quality is generally low. These areas are generally uniform in colour and form, lacking variety. Elements are production related. Existing infrastructure mostly includes powerlines, roads, houses and farm buildings. This LCU is the most extensive in the study area.</b></p>
Nature reserves and natural landscapes	<p>The Murrumbidgee Valley National Park, Murray Regional Park and Murrumbidgee Valley SCA, Wee Wee Creek and the Murrumbidgee River are all located in the study area and offer nature based experiences and visual amenity. They include large expanses of remnant vegetation and wetlands. Isolated homesteads are also located along the boundaries of these areas.</p> <p><b>Scenic quality is considered moderate. These areas include large areas of native vegetation and scenic water views of wetlands, rivers and creeks. This LCU is common in the study area. The proposal is not visible from this LCU.</b></p>
Rural village, suburban areas	<p>Two small rural villages occur in the study area, Balranald and Kyalite. These are service hubs, with retail facilities and agricultural suppliers. Residences are well maintained with well-maintained yards and gardens. Outlooks on the outskirts of the towns are generally broad, onto low relief cropping paddocks. Views of powerlines and roads are common.</p> <p><b>Scenic quality is considered moderate. There is variety in colour and form throughout this character type. Elements include recreational aspects; parks and gardens. This LCU is not common in the study area. The proposal is not visible from this LCU.</b></p>

### 7.3.3 Viewpoints and their sensitivity

Representative viewpoints are presented in Table 7-10 and Figure 7-3.



**Figure 7-3 Key viewpoints**

**Table 7-10 Representative viewpoints (ID) with reference to the Sunraysia Solar Farm**

Viewpoint ID	LCU	Scenic quality	Viewpoint	Proximity	Sensitivity
1	Agricultural	Low	Road	Foreground	Low
2	Agricultural	Low	Residence	Middle ground	Moderate
3	Agricultural	Low	Road	Middle ground	Low
4	Agricultural	Low	Road	Foreground	Low
5a	Agricultural	Low	TSR	Foreground	Moderate
5b	Agricultural	Low	TSR	Foreground	Moderate
5c	Agricultural	Low	TSR	Middle ground	Moderate
6	Agricultural	Low	Road	Foreground	Low
7	Agricultural	Low	Road	Middle ground	Low
8	Agricultural	Low	Road	Middle ground	Low
9	Agricultural	Low	Road	Background	Low

### 7.3.4 Potential impacts

#### Solar farm infrastructure excluding overhead powerline

The visual impacts of the solar farm infrastructure, excluding the overhead powerlines, on the representative viewpoints to the proposal site are summarised below and in Table 7-11. A more detailed assessment is provided in Appendix E.

#### Medium impact – mitigation could be considered

Medium impacts are seen from:

- The residence 1.4 kilometres to the south (viewpoint 2). Located away from the site, the intervening vegetation along the southern boundary of the proposal site would partially obscure the view such that the low height infrastructure proposed is not likely to be dominant. Some additional vegetation screening has been proposed to further minimise visual impacts, however, this requirement would need to be confirmed following the construction of the proposal.
- The TSR along the eastern boundary of the site (viewpoints 5a, 5b and 5c). The vegetation would partially obscure the proposal site from users of the TSR. There is limited opportunity to further reduce the impacts. The impacts, however, are considered acceptable.
- Users of Balranald-Tooleybuc Road approaching the proposal site from the south (viewpoint 3). Given the 100km/hr speed limit on the road and existing vegetation screening, impacts would already be minimised but additional onsite screening has the potential to further reduce impacts if required.

A suggested screening plan has been developed (refer Appendix E) that includes screening.

#### Low impact – no mitigation

Low impacts are seen for all other viewpoints. The short duration of views (experienced from moving vehicles or while working on nearby farms), as well as existing screening, represented by buildings and

vegetation, existing built structures (such as powerlines) ensure the views of the site will be acceptable in these areas. General measures to reduce visual impacts are recommended for these locations.

**Table 7-11 Visual impact at representative viewpoints with reference to the Sunraysia Solar Farm**

View ID	Scenic quality	Proximity	Sensitivity	LMZ	Contrast	Visual Impact
1	Low	Foreground	Low	C	Medium	Medium impact
2	Low	Middle ground	Moderate	C	Medium	Medium impact
3	Low	Middle ground	Low	C	Medium	Medium impact
4	Low	Foreground	Low	C	Low	Low impact
5a	Low	Foreground	Moderate	C	Medium	Medium impact
5b	Low	Foreground	Moderate	C	Medium	Medium impact
5c	Low	Middle ground	Moderate	C	Medium	Medium impact
6	Low	Foreground	Low	C	Low	Low impact
7	Low	Middle ground	Low	C	Low	Low impact
8	Low	Middle ground	Low	C	Low	Low impact
9	Low	Back ground	Low	C	Indistinct	Low impact

### Overhead powerlines

In regards to the overhead powerlines which would be visible from a greater distance than the proposed solar farm, the visual impacts are considered to be low from all viewpoints for the following reasons:

- Powerlines are not uncommon in the study area.
- A high voltage powerline with large truss towers cuts through the landscape from east to west in proximity to the proposed powerline which dominates the landscape.
- The proposed powerline would run parallel to Balranald-Tooleybuc Road which would minimise visual impacts from road users coming from the north or south.
- The length of the proposed powerline has been minimised as far as practicable to two kilometres (i.e. it starts at the most north eastern corner of the proposal site and takes the shortest route possible to the substation).

### 7.3.5 Environmental safeguards

No.	Environmental Safeguard	Solar farm		
		C	O	D
V 1	<ul style="list-style-type: none"> <li>• The mitigation measures detailed in the visual impact assessment (NGH Environmental 2016, Appendix E) including the following must be implemented:               <ul style="list-style-type: none"> <li>• Onsite vegetation screening for viewers for which a medium impact is confirmed following construction of the solar farm (refer to verification process below). This would be aimed at ‘breaking up’ not blocking views of onsite infrastructure.</li> <li>• General methods to reduce visual impact. This would centre on the colour, form and positioning of infrastructure, to reduce the overall visual contrast of the project.</li> <li>• A process for verification of predicted and actual impacts. This would improve the reliability of the measures and provide a trigger to undertake additional mitigation if required.</li> </ul> </li> </ul>	<b>C</b>	<b>O</b>	<b>D</b>

## 7.4 NOISE

A specialist noise assessment is provided in Appendix J and summarised below.

### 7.4.1 Methodology

Noise and vibration impacts were assessed in accordance with a number of policies, guidelines and standards, including:

- NSW ‘Interim Construction Noise Guideline’ (ICNG – Department of the Environment and Climate Change, 2009)
- NSW ‘Industrial Noise Policy’ (INP – EPA, 2000)
- ‘Assessing Vibration: A Technical Guideline’ (Department of the Environment and Climate Change, 2006)
- NSW ‘Road Noise Policy’ (RNP – Department of Environment, Climate Change and Water, 2011)

Background noise varies over the course of any 24 hour period, typically from a minimum at 3am in the morning to a maximum during morning and afternoon traffic peak hours. Therefore, the NSW ‘Industrial Noise Policy’ (INP – Environment Protection Authority NSW 2000) requires that the level of background and ambient noise be assessed separately for the daytime, evening and night-time periods.

The NSW INP defines these periods as follows:

- Day is defined as 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sundays and Public Holidays.
- Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays.

- Night is defined as 10:00pm to 7:00am, Monday to Saturday and 10:00pm to 8:00am Sundays and Public Holidays.

### 7.4.2 Existing noise environment

To quantify the existing ambient noise environment, long-term (unattended) noise monitoring was conducted at the nearest affected receiver between Tuesday 11th and Thursday 20th October 2016. The nearest affected receiver was identified during a site visit and through aerial maps as follows:

- Receiver R1 – 3003 Balranald-Tooleybuc Road, Kyalite. Residential property located approximately 1,400m directly south of the proposal site.

The next nearest receiver is located over four kilometres from the proposal site and deemed too far to warrant an acoustic assessment.

Existing background and ambient noise levels are presented in Table 7-12.

**Table 7-12 Measured existing background (L<sub>90</sub>) and ambient (L<sub>eq</sub>) noise levels, dB(A)**

Location	L90 Background Noise Levels			Leq Ambient Noise Levels		
	Day	Evening	Night	Day	Evening	Night
3003 Balranald-Tooleybuc Road, Kyalite	25	18	17	46	44	40

The identified receivers surrounding the proposal site are all classified as rural under INP guidelines. It was found that the background noise levels are representative of residences in a rural environment with day time, evening and night time background noise levels below 30dB(A).

Based on page 24 of the INP, 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 during all assessment periods.

### 7.4.3 Potential Impacts

#### Construction including upgrades and decommissioning

Table 7-13 reproduced from the ICNG, sets out the noise management levels and how they are to be applied for residential receivers.

Table 7-13 Noise Management Levels at residential receivers

Time of day	Management Level ( $L_{Aeq(15min)}$ )	How to apply
<p>Recommended standard hours:</p> <p>-Monday to Friday 7 am to 6 pm</p> <p>-Saturday 8 am to 1 pm</p> <p>-No work on Sundays or public holidays</p>	<p>Noise affected</p> <p>RBL + 10dB(A)</p>	<p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <p>Where the predicted or measured <math>L_{Aeq}</math> (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</p> <p>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</p>
	<p>Highly noise affected</p> <p>75dB(A)</p>	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <p>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:</p> <ul style="list-style-type: none"> <li>• times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)</li> <li>• if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ul>
<p>Outside recommended standard hours</p>	<p>Noise affected</p> <p>RBL + 5dB(A)</p>	<p>A strong justification would typically be required for works outside the recommended standard hours.</p> <p>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</p> <p>Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community.</p> <p>For guidance on negotiating agreements see section 7.2.2 of the ICNG.</p>

Table 7-14 presents the construction noise management levels established for the nearest noise sensitive residential receivers based upon the noise monitoring undertaken, the proposed construction hours and the above ICNG requirements.

**Table 7-14 Construction noise management levels at residential receivers**

Location Description	Day LA90 Background Noise Level (RBL)	Day Noise Management Level LAeq(15min)
All residential receivers	30*	40

\*Construction works occur during the daytime period only, hence only the day period assessed

Table 7-15 lists plant and equipment likely to be used by the contractor to carry out the necessary construction works for the project.

**Table 7-15 Typical construction equipment and sound power levels**

Plant description	Number of items	LAeq Sound Power Levels, dB(A) re. 1pW Single Item
Pile Drilling Rig	Up to 10	111
Powered Hand Tools	Up to 10	110
Mobile Crane	Up to 10	110
Truck and Dog	Up to 10	108
Excavator	Up to 10	107
Generator	Up to 10	100
Delivery Van	Up to 10	88

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using CadnaA (version 4.6) noise modelling computer program. The program calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site. Table 7-16 presents noise levels likely to be experienced at the nearby affected receiver locations during the construction works. The presented levels are a worst case maximum with all plant and equipment operating concurrently.

**Table 7-16 Predicted  $L_{Aeq, 15min}$  construction noise levels at receiver location, dB(A)**

Receiver location	Noise Management Level1	Predicted Construction Noise Levels, $L_{Aeq, (15min)}$ 2	Comply? (Yes/No)
3003 Balranald-Tooleybuc Road, Kyalite	40	<20-32	Yes

Based on the predicted construction noise levels presented in the table above, predicted noise levels from construction activities at the nearest receiver comply with the construction noise management levels under the worst case scenario where all plant items are operating concurrently. Therefore, no further reasonable and feasible noise mitigation measures are required to reduce construction noise impacts.

#### Construction traffic noise

Based on functionality, Balranald-Tooleybuc Road is categorised as an arterial road. For existing residences affected by additional traffic on existing arterial roads generated by land use developments, the RNP road traffic noise criteria apply. For day time hours (7am to 10pm), the criteria is  $L_{Aeq(15hours)} 60dB(A)$ .

As the proposed vehicle access to the proposal site is much greater during the construction stage than the operational stage, road traffic noise assessment is only considered for the construction stage. Compliance during the construction stage would result in compliance during the operational stage.

As discussed previously, 60 truck movements per day would occur along the surrounding road network during the construction stage. Truck movements would only occur during the day time period when construction works occur.

Results of the road traffic noise predictions are presented in Table 7-17. It is noted that the predicted noise levels represent the traffic noise contribution from the truck movements associated with the construction works and does not take into account existing traffic noise levels due to existing general traffic flows.

**Table 7-17 Predicted road traffic noise contribution levels along public roads, dB(A)  $L_{Aeq}(15hours)$**

Receiver	Criteria	Truck Traffic Movements	Speed (km/h)	Distance to Road	Predicted Noise Level	Exceed?
Residences on Balranald-Tooleybuc Road	$L_{Aeq}$ , (15 hour) 60	60 per day	100	20m	51	No

From the above table it can be seen that road traffic noise level contributions from the truck movements associated with the construction works are at least 9dB(A) below the applicable noise criterion based on dwellings being 20 metres from the road. Given that residences are located within a rural environment, distances between the road and the dwellings would likely be significantly greater than 20 metres.

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

## Operational

### Operational noise impacts

Noise impact from the general operation of the proposed solar farm is assessed against the NSW Industrial Noise Policy (INP). The assessment procedure in terms of the INP has two components:

- Controlling intrusive noise impacts in the short term for residences
- Maintaining noise level amenity for particular land uses for residences and other land uses.

In accordance with the INP, noise impact should be assessed in terms of both intrusiveness and amenity.

#### *Intrusiveness*

According to the NSW INP, the intrusiveness of a mechanical noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the  $L_{Aeq}$  descriptor), measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5dB(A). Based on the monitored background noise levels, the intrusiveness noise criteria would be  $30 + 5 = 35$  dB(A) for day, evening and night.

#### *Amenity*

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels for rural residential properties as detailed in Table 7-18.

**Table 7-18 Applicable amenity noise criteria**

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq}$ Amenity Noise Level	
			Acceptable	Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45

Comparing the amenity and the intrusiveness criteria shows that the intrusiveness criteria are more stringent for day, evening and night periods. Compliance with the intrusiveness criteria would result in compliance with the amenity criteria. Therefore, the intrusiveness criteria would be assessed for from herein.

The proposed solar farm will operate 750,000 solar panels, which would be installed as one of three options; single-axis trackers, north-oriented fixed-tilt or east-west facing fixed-tilt or a combination of these technologies. Of the three options the highest noise generating operation is the single-axis trackers as the tracking systems involve the panels being driven by motors to track the arc of the sun to maximise the solar effect. Therefore, the tracking motors are a potential source of mechanical noise and are included in this assessment. Up to a total of 10,000 NexTracker tracking motors will be employed to drive the 750,000 solar

panels and are to be evenly distributed across the solar farm area. The tracking motors would turn no more than five (5) degrees every 15 minutes and would operate no more than one (1) minute out of every 15 minute period.

In addition to the trackers, the site will require the operation of approximately 100 PV boxes or PV skid, each of which would contain an inverter and a transformer. The PV boxes or PV skids will be evenly distributed across the solar farm area.

During operations, it was assumed that two (2) staff member will attend site daily during the day time period to inspect the equipment. It was assumed that the staff members will travel around the subject site in a light vehicle.

Based on the above, Table 7-19 lists associated plant and equipment likely to be used for the operation of the proposed solar farm and their corresponding sound power levels.

**Table 7-19 Typical operational plant and equipment and sound power levels**

Plant description	L <sub>Aeq</sub> Sound Power Levels, dB(A) re. 1pW
NexTracker Motor (10,000 in total)	78 (each)
PV Skid (100 in total)	94 (each)
Light vehicle (2 in total)	88 (each)

Further to the above and in accordance with the INP, where the character of the noise in question is assessed as particularly annoying (ie. if it has an inherently tonal, low frequency, impulsive or intermittent characteristic), then an adjustment of 5dB(A) for each annoyance aspect, up to a total of 10dB(A), is to be added to the predicted value to penalise the noise for its potential increase in annoyance. For the assessment of the solar farm, the noise from the inverters with integrated transformers is considered to be tonal in nature. Therefore, a 5dB(A) penalty has been applied to the predicted noise contributions from the inverters with integrated transformers.

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using CadnaA (version 4.6) noise modelling computer program. The program calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction model takes into account:

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

Furthermore, in accordance with the INP noise predictions were prepared for each of the following meteorological conditions:

- Calm & isothermal conditions (acoustically neutral) – no wind and no temperature inversion

- Slight to gentle breeze – 3m/s wind velocity at 10m from ground level between each noise source and each noise receiver (as per INP default wind conditions). Wind direction was based on wind travelling from the source to the receiver.
- Moderate temperature inversion – applicable for noise predictions during night time periods only

Table 7-20 below presents the predicted noise levels for the worst case scenario based on concurrent operation of all the plant and equipment shown in Table 7-19. The NexTracker motors were time corrected based on their operation of one (1) minute out of a 15 minute period.

**Table 7-20 Predicted  $L_{Aeq,15min}$  Operational Noise Levels at Receiver Locations, dB(A)**

Receiver	Intrusiveness criteria	Predicted Operational Noise Levels, $L_{Aeq, 15min}$			Comply? (Yes/No)
		Calm & isothermal conditions	Slight to gentle breeze	Moderate temperature inversion	
3003 Balranald-Tooleybuc Road, Kyalite	35	22	29	29	Yes

Based on the predicted operational noise levels presented in the table above, predicted noise levels at the nearest receiver would comply with the nominated criteria under all scenarios and meteorological conditions. Therefore, no further reasonable and feasible noise mitigation measures are required to reduce operational noise impacts.

#### *Sleep disturbance*

In accordance with NSW EPA and as detailed in Appendix J, the sleep disturbance criteria for the proposal is 15dB(A) above the  $LA_{90}(15min)$  of 30 dB(A). The sleep disturbance criteria above which sleep disturbance may occur is therefore 45dB(A).

During the night time period, only mechanical plant would be operating, including the tracking motors and inverters with integrated transformers. Noise emissions from these plant items are considered to be continuous with no potential for high peak noise level events. Therefore, the  $L_{Amax}$  noise levels experienced at the identified receivers would be similar to the predicted  $L_{Aeq,15min}$  noise levels shown in Table 7-20. It is expected that the  $L_{Amax}$  noise levels experienced at the identified receivers would be well below the nominated sleep disturbance criteria of 45 dB(A).

#### Vibration impacts

Vibration generating activities would occur only during the construction phase of the project. There are no vibration generating activities expected during the operational phase. As the nearest identified receivers are in excess of 100m from the proposal site and there are no high vibration producing plant items to be used, potential vibration impacts are not expected.

#### 7.4.4 Environmental safeguards

There is unlikely to be any impacts from noise and vibration as a result of the construction or operation of the proposal. As such no safeguards are required.

### 7.5 LAND USE

Land use has been assessed with guidance provided in *Primefact 1063: Infrastructure proposals on rural land* (DPI 2013) and *The land and soil capability assessment scheme* (OEH 2012).

#### 7.5.1 Existing environment

##### Soil and Land Capability

The geology of the proposal site is described in the Balranald 1:250,000 Geological maps (Figure 7-4). The proposal site is located close to the centre of the Murray Basin. The Murray Basin is a large structurally controlled depression filled with Tertiary marine and non-marine sediments. This sequence has subsequently been overlain by Quaternary aged aeolian, fluvial and lacustrine sediments and contains the Woorinen Formation below the site. The surface geology is comprised of Quaternary aged sediments that have been extensively reworked by the Murrumbidgee, Wakool and Murray Rivers. In the locality, the result is a variety of clay and sandy soils and distant overflow lakes. There are also abandoned Pleistocene channels and basins, however, these are not evident at the proposal site.

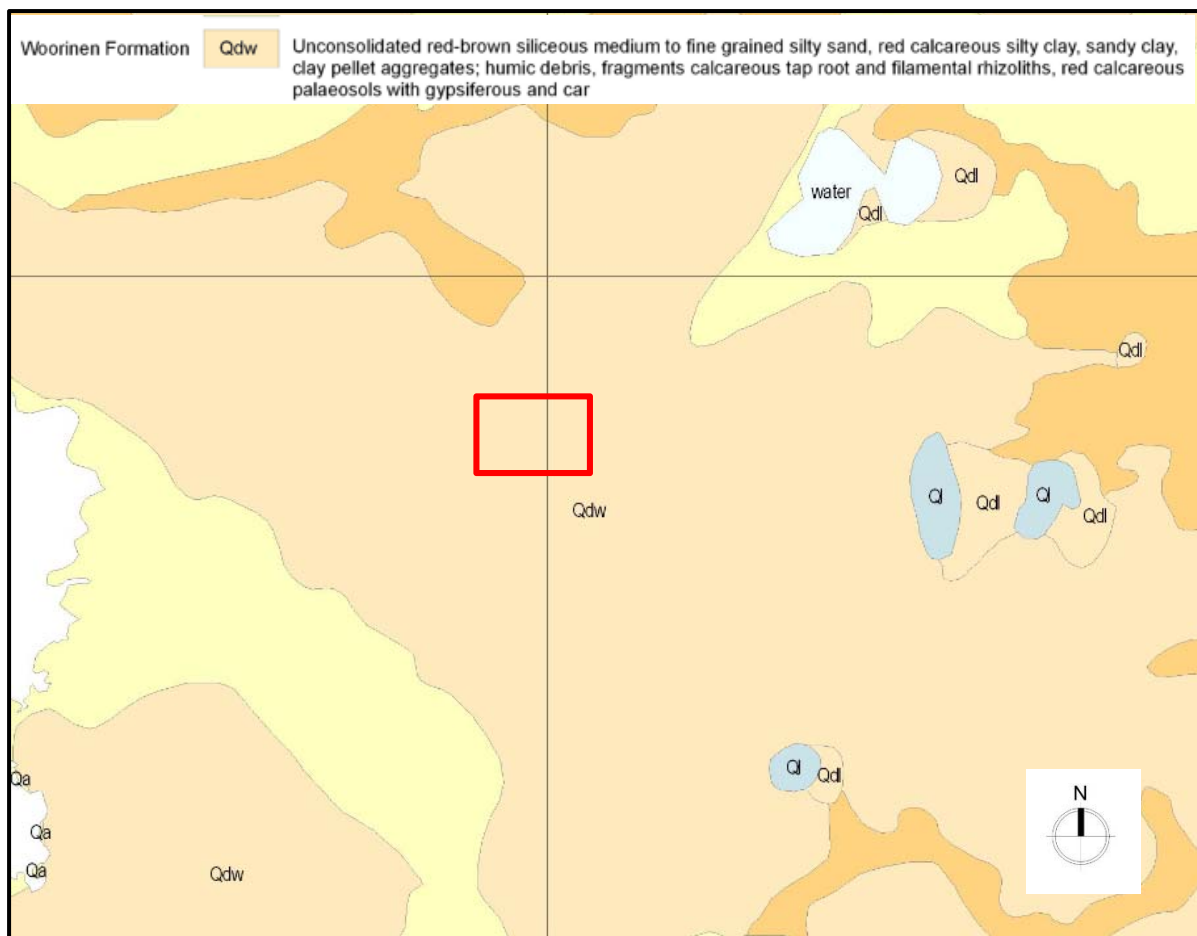
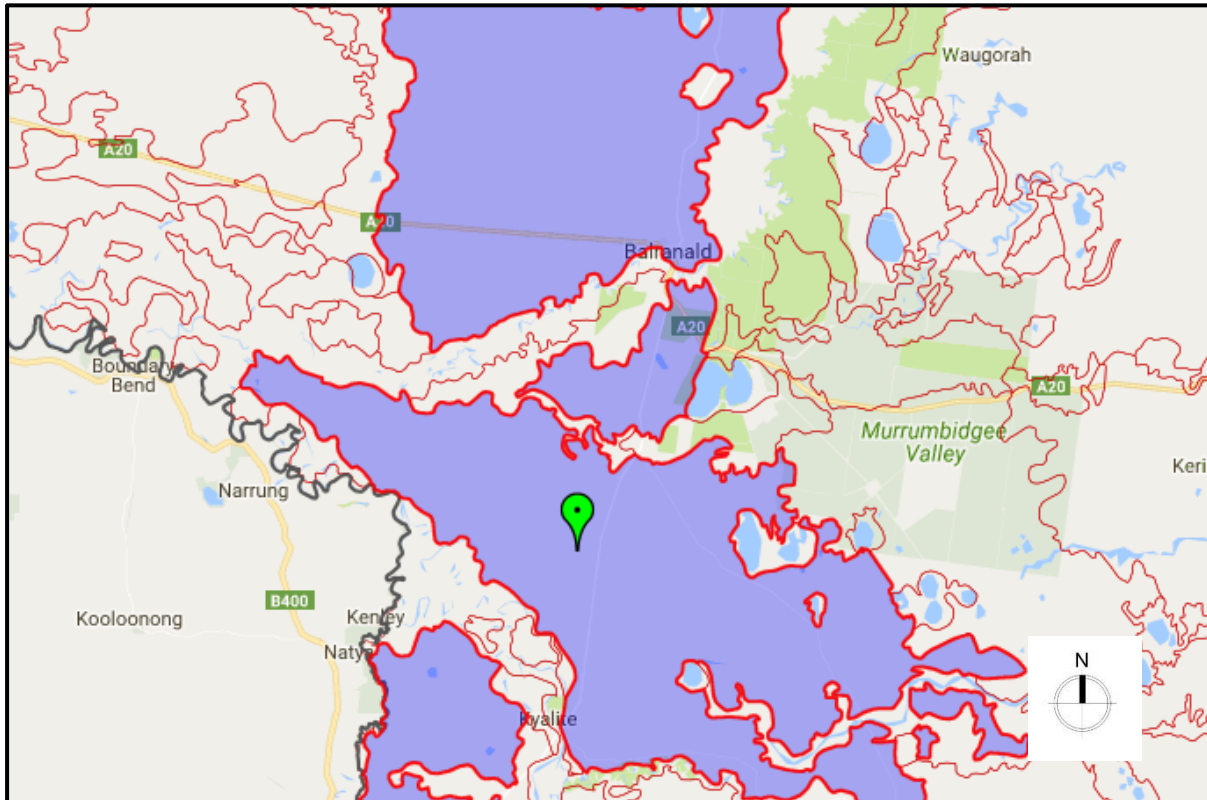


Figure 7-4 Balranald 1:250,000 Geological Map and location of the proposal site indicated in red

The soils at the proposal site are consistent with the geology described above. The site is within the Condoupe Land System (Espade) (Figure 7-5). The geomorphology of the site is a sandplain with a slope of about 2%, derived from the materials described above. Within the sandplain, sand dunes up to five metres high exist with a general length way east west orientation and slopes up to 3%. Between the dunes the landform is composed of swales and flats with a slope of about 2%. The dunes and swales can drain to terminal drainage depressions about 2-3m below the surrounding landscape.



**Figure 7-5 Condoupe Land System of the Balranald Area**

The soils associated with the dunes (Profile 117 D. Eldridge 1981) are reddish sands with a massive earthy structure and slightly alkaline (field pH 7.5) at the surface. Between 200 and 500mm in depth the soil has a dark reddish brown colour and the loamy sand has a pH of 8.5. Below half a metre the soils colour is a lighter red and the texture is a sandy clay loam. The field pH is 8.5 and some calcareous precipitates begin to emerge. Course fragments are not evident.

The soils above are free draining with little water and nutrient holding capacity. The sandy soils of the dunes, swales and planes are prone to wind erosion and drift. When vegetation is highly disturbed or removed the potential for wind erosion is greatly increased. Heavy rainfall resulting in deep percolation through the profile can lead to perched water tables on top of the clay loam soils below the sands. The resultant ponding can lead to localised salt scalding.

The soils associated with drainage lines and terminal depressions (Profile 118 D. Eldridge 1981) are brown greyish light clays with a field pH of 8.5 to 500mm in depth. Below half a metre the soil become a medium clay of greyish olive appearance and a pH of 9. These cracking clays have strong pedality and are imperfectly drained. The grey clays present little erosion but can be subject to some localised salt scalding. The clays universally underlie the sands described above.

## Land capability

Land capability on the proposal site has been described using the NSW land Classification (OEH 2012). The site land capability is described as having very severe limitations (Figure 7-6). Very severe limitations is defined as:

*“Land incapable of sustaining many land use practices (e.g. cultivation, moderate to high intensity grazing and horticulture). Highly specialised practices can overcome some limitations for high value products. Land often used for low intensity land uses (low intensity grazing).”*

A review of current and historic aerial photography indicates that the proposal site has largely been used for grazing interspersed with opportunistic cereal cropping. The author has been to this area several times in the last thirteen years and can confirm cereal cropping at the proposal site in previous wet years. The cereal cropping at the proposal site has included cultivation prior to and at the time of planting.

Across the site native vegetation and ground covers have been largely removed. Several large patches of vegetation and numerous clumps of paddock trees have been retained across the site. On the southern, western and eastern side of the site large irregular shaped areas of mature native vegetation have been retained. Cultivation of the area for cereal cropping leaves the soils exposed to erosion for a period while the cereal plants establish. As cropping is not recommended for this land capability it is expected that some erosion and due drift may have occurred. Further, the removal of woody perennial vegetation may have increased water infiltration and resulted in localised salt scalding.

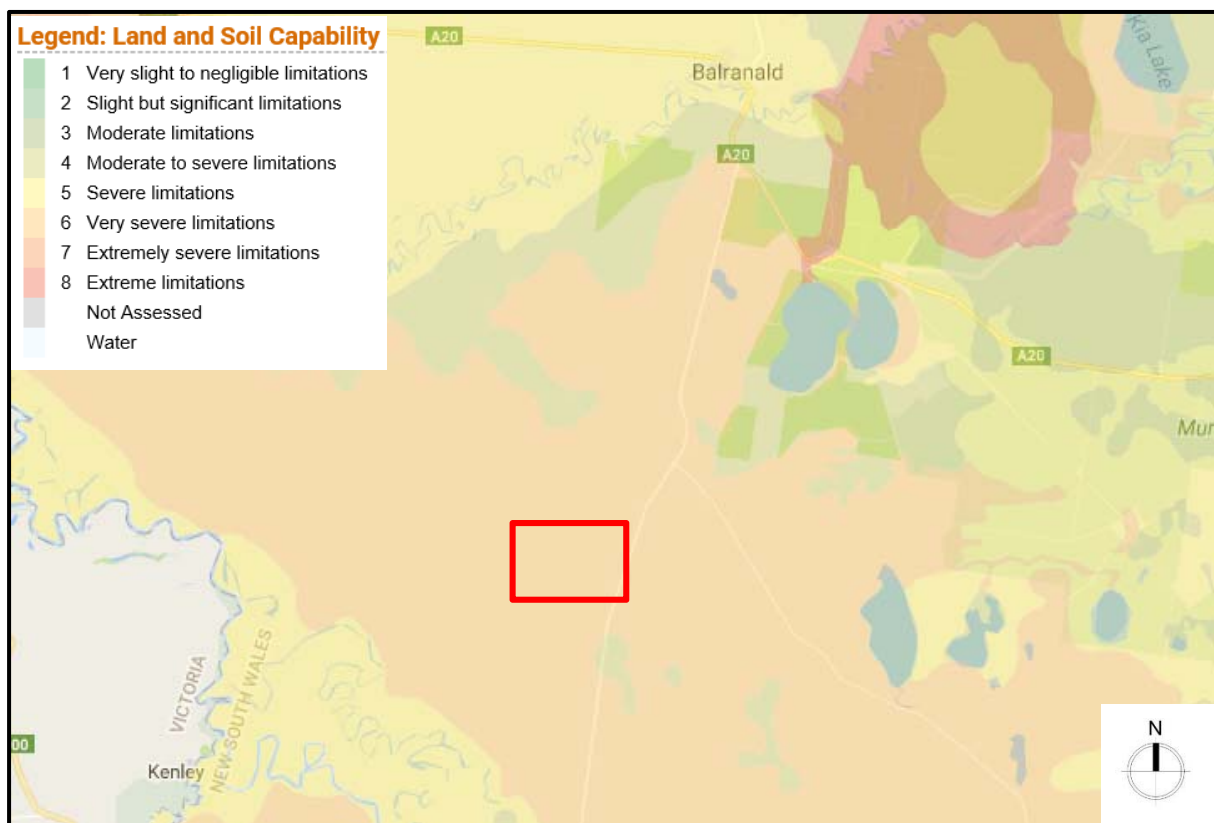


Figure 7-6 Land capability at the proposal site (red Box)

Despite the fragile nature of the soils across the site the area has been cropped and grazed for many years. The Melbourne Argus on Friday the 22 July 1927 reported that a train of farming experts had

visited Balranald 21 July 1927 from Victoria to provide advice on “improving the soil .....wheat and pasture production, wool, sheep and dairying” (Trove.nla.gov.au). The use and development of land around Balranald and the site for agriculture has a long history.

### Land use

The proposal site is located within the western end of the Riverina Region of NSW. Land uses within this region include the following industries:

- Agriculture
- Mining
- Manufacturing and transport.

Agriculture, forestry and fishing employ 31 % of the Balranald LGA workforce. Manufacturing, transport and logistics employ about 10.6% of the Balranald LGA workforce (ABS: 2006 Census community profile). Mining of Mineral sands north of Balranald commenced in 2006 and is a significant employer for the Balranald LGA.

The development envelope, and the land immediately surrounding it in the Balranald Shire Council LGA, is zoned RU1 Primary Production. The objectives of the RU1 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 encourage development that is in accordance with sound management and land capability practices, and that takes into account the environmental sensitivity and biodiversity of the locality.*
- *To support rural communities.*
- *To ensure the provision of accommodation for itinerant workers.*

The existing primary land use within the proposal site is agriculture.

Surrounding land to the east of the proposal site is crown land dedicated as traveling stock reserve, road reserve and crown reserve for the preservation of timber. Beyond the road reserve to the east is a strip of forested land about one kilometre wide. The strip of land is within the Murray River (Formerly Wakool) Shire Council LGA and is zoned as RU3 Forestry. The objectives of the RU3 zone are:

- *To enable development for forestry purposes.*
- *To enable other development that is compatible with forestry land uses.*

This zone is outside the development envelope.

### Agriculture

Balranald is one of the oldest settlements on the lower Murrumbidgee. The Balranald LGA encompasses the junction of both the Murray and Wakool Rivers and the Murray and Murrumbidgee Rivers. The area comprises saltbush and Mallee plains. Settlement of the area began in 1840 following exploration of the area by Thomas Mitchell. While some irrigated agriculture occurs in the LGA, dryland grazing is the

dominant enterprise. This grazing is predominantly sheep although cattle grazing does occur. The Balranald LGA is 2,169,130 ha of which 2,075,748 ha or 96% is used for agriculture, 1% is used for cropping while 95% is used for grazing (ABS 2011). This largely reflects the availability of rainfall for cropping and the ability to distribute water for irrigation.

In 2001, the value of dryland agricultural production was about \$78 million while irrigated fruit production was valued at about \$23 million. In 2006 dryland agricultural production was about \$82 million while nursery production was valued at \$39 million and irrigated fruit production was valued at about \$38 million. Trends in agricultural land use and production and their drivers (e.g. climate, irrigation water availability, commodity prices, interest rates) strongly influence the region's communities and economy.

The proposal site is used for dryland cropping and grazing. Irrigated agriculture has not occurred at the proposal site and the closest irrigation canals is over 4.5km north east of the site. The agricultural production of the site is directly linked to the rainfall received. The site receives a mean annual rainfall of 323mm. The highest annual rainfall recorded is 692.3 mm and the lowest 121.7mm. Months with no rainfall are quite common (Table 7-21). As such agricultural production is both seasonal and highly varied. Evaporation rates at Balranald are about 2000mm per years, 900mm in summer, 400mm in Autumn, 200mm in Winter and 500mm in spring (Australian BOM). These high evaporation rates strip the soil of most moisture in the hotter months. Above average rainfall and water conservation management are important in achieving winter cereal crop success. Endemic grasses and groundcovers better adapted the arid conditions can produce growth and complete productive life cycles in most years. Grazing for wool and meat production can utilise failed crops and native pasture deriving income even in dry years. Drought conditions in very dry years' stymie production of most commodities.

Land holdings in the area tend to be large (<500ha) square or rectangular shaped parcels of land or a combination of both. The proposed site is approximately 1060ha and is a flat "L" shape. It is typical of land holdings in the area. It is bordered on the east by Balranald-Tooleybuc Road and on the south by an unclassified road reserve known as The Cut Line, an unsealed track. To the north an unclassified unnamed road reserve, also an unsealed track, exists along half of the northern boundary. The northern and southern boundary road reserves provide access to surrounding agricultural lands, including the proposal site. No residences are accessed from those tracks.

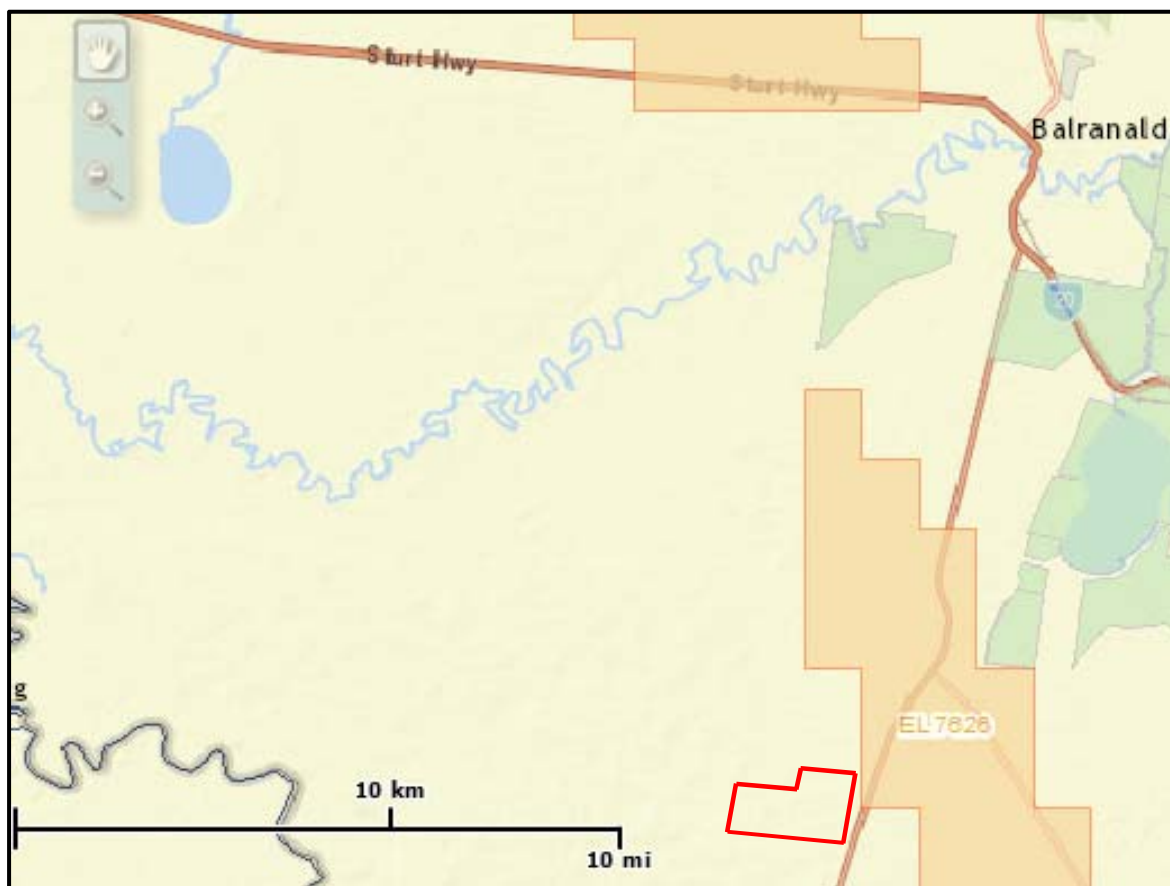
Table 7-21 Rainfall statistics Balranald (Australian Bureau Meteorology 1879 to 2016)

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<u>Mean rainfall (mm)</u>	22.6	25.4	22.2	23.7	31.4	29.6	26.6	29.5	29.4	30.5	27.9	25.6	323.4
<u>Highest rainfall (mm)</u>	137.6	141.5	133.3	125.7	117.4	137.5	82.3	85.2	106.6	130	125	145.3	692.3
<u>Date</u>	1984	2011	1956	1990	1906	1963	1923	1973	2016	1975	2010	1954	1973
<u>Lowest rainfall (mm)</u>	0	0	0	0	0	0.5	0	0.4	0.5	0	0	0	121.7
<u>Date</u>	2009	2009	2015	1999	1934	1958	1889	1982	1914	2006	1967	1984	1967
<u>Decile 1 rainfall (mm)</u>	0	0	0.3	1.3	3.9	7.6	7.4	8	7.1	3.7	2	1.3	203.3
<u>Decile 5 (med) rainfall (mm)</u>	11	12.9	14.3	15.5	25.1	24.8	23.2	25.8	23.5	22.4	19.6	16.6	312.3
<u>Decile 9 rainfall (mm)</u>	60.4	69.2	59.4	59.4	67.5	56.2	51.6	53.3	59.2	71.7	67.4	57.6	465.8
<u>Highest daily rainfall (mm)</u>	71.8	81.3	62.7	93.3	57.9	70.6	39.4	53.3	55.6	61	71.6	61	93.3

## Mining

A search of Department of Industry's MinView database (Department of Industry 2016) found there are no existing Mining Exploration Licences within the proposal site. Exploration and extraction licences are in existence for the minerals sands north west of the Balranald township. An Iluka presentation (R Croft 2011) described an Iluka exploration tenement over the proposal site. This presentation described a tenement that covered the entire proposal site. However, this tenement has lapsed since the time of the presentation.

A renewal application has been made (EL 7626 (1992)) for an exploration licence for an area of 89 Units running as a 30km long strip from Kyalite Road to just south of Murrumbidgee Valley National Park. The renewal application was made by Iluka Resources Limited for mineral sands exploration. The exploration license application covers areas immediately to the east of the proposal site within the development envelope (Figure 7-7). It is not expected that the proposal would be a barrier to drilling for mineral exploration.



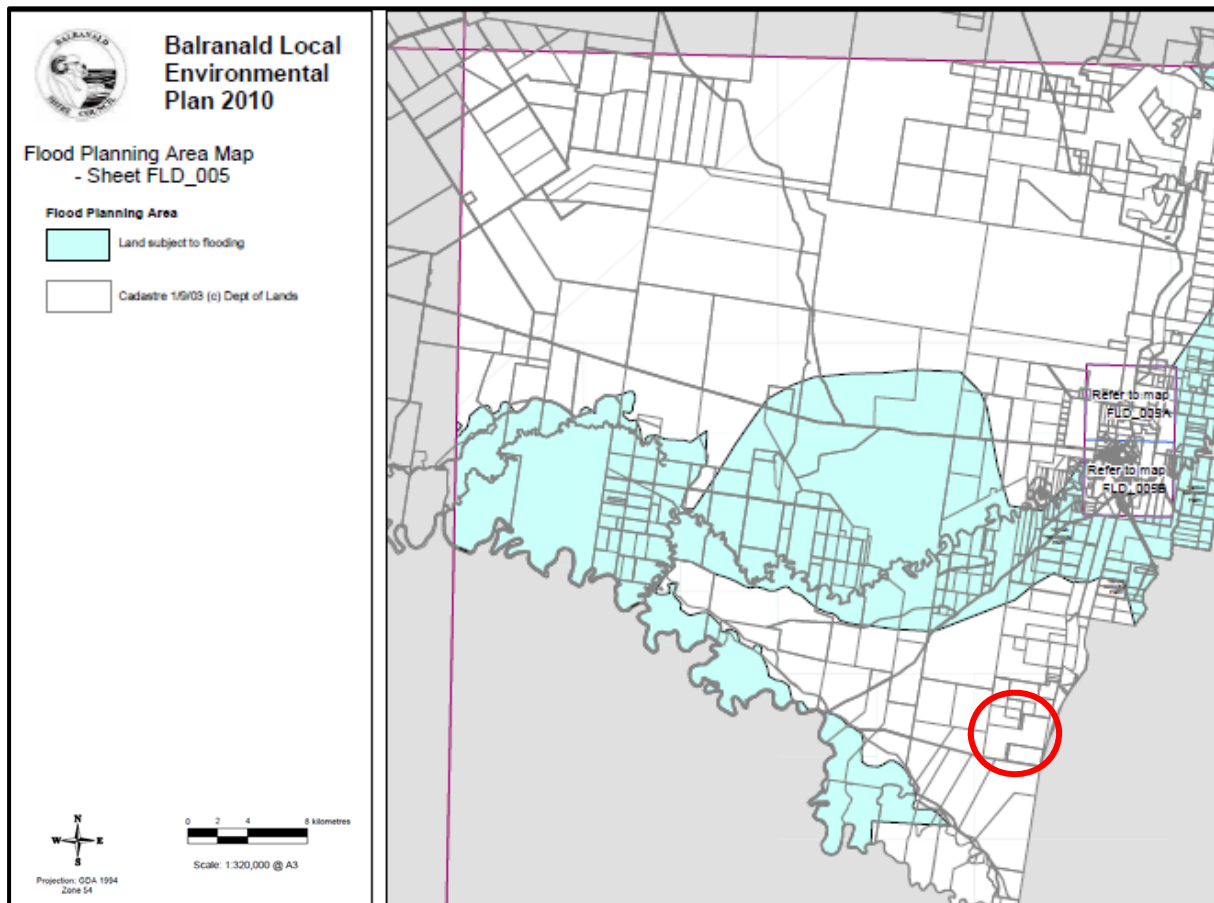
**Figure 7-7 Proximity of the site to the mineral sands exploration licence renewal (EL7672)**

## **Flood prone land**

The proposal site is 20 kilometres south of the Murrumbidgee River at Balranald. The elevation of Balranald is 60 metres Australian Height Datum (AHD). Areas adjacent to Balranald are subject to inundation in high river flows. The elevation of the Wakool River at the junction with the Murray River 10 kilometres south west of the site is 58 metres AHD. The elevation of the proposal site varies between 64 metres AHD and 77

metres AHD. As such the site is between 4 and 17 metres higher than the flood prone areas of the river channels.

The Balranald LEP 2010 describes land subject to flooding (Figure 7-8). The site is not shown as subject to inundation in the Balranald LEP. The Murray River (Wakool) LEP does not show any water courses or wetlands to the east of the site. Based on the elevation differences above and the zoning with in the LEP it is highly unlikely that the site will be subject to inundation during flood events.



**Figure 7-8 Flood Prone Land for the Balranald LGA (Proposal site = Red circle)**

### Travelling stock and timber reserves

Crown reserves exist to the east of the site in both the Balranald Shire and the Murray River (Wakool) Shire. The crown land is unevenly bisected by Balranald-Tooleybuc Road. In the Wakool LEP the land is zoned as RU3 forestry as described above. In the Balranald Shire LEP the land is zoned as RU1 Primary production.

NSW Department of Industry Office of Lands records and describes the crown lands. The land in part is managed by Local Land Services (LLS). Two crown reserves interact with two parcels of land to effectively create three land uses (Figure 7-9). Land within lot 7301 (DP1157986) to the west of Balranald Tooleybuc Road is Reserve Number 17969. Reserve 17969 is reserved for *traveling stock use* and is managed by LLS. Land within lot 7301 (DP1157986) to the east of Balranald Tooleybuc Road is Reserve Number 38825. Reserve 38825 within lot 7301 is reserved for *traveling stock use* and *the preservation and growth of timber*,

it is also managed by LLS. Land within lot 7300, also east of the road is Reserve Number 38825. Reserve 38825 within lot 7300 is reserved for *the preservation and growth of timber*. The manager of this land is not known.

Travelling stock using the route have ready access to both reserves. In general, the reserves are well timbered. The northern 25% of both reserves are more open areas with less trees and a greater proportion of lower growing vegetation. The reserves including the road reserve for the Balranald-Tooleybuc Road include electrical and telecommunications utilities.

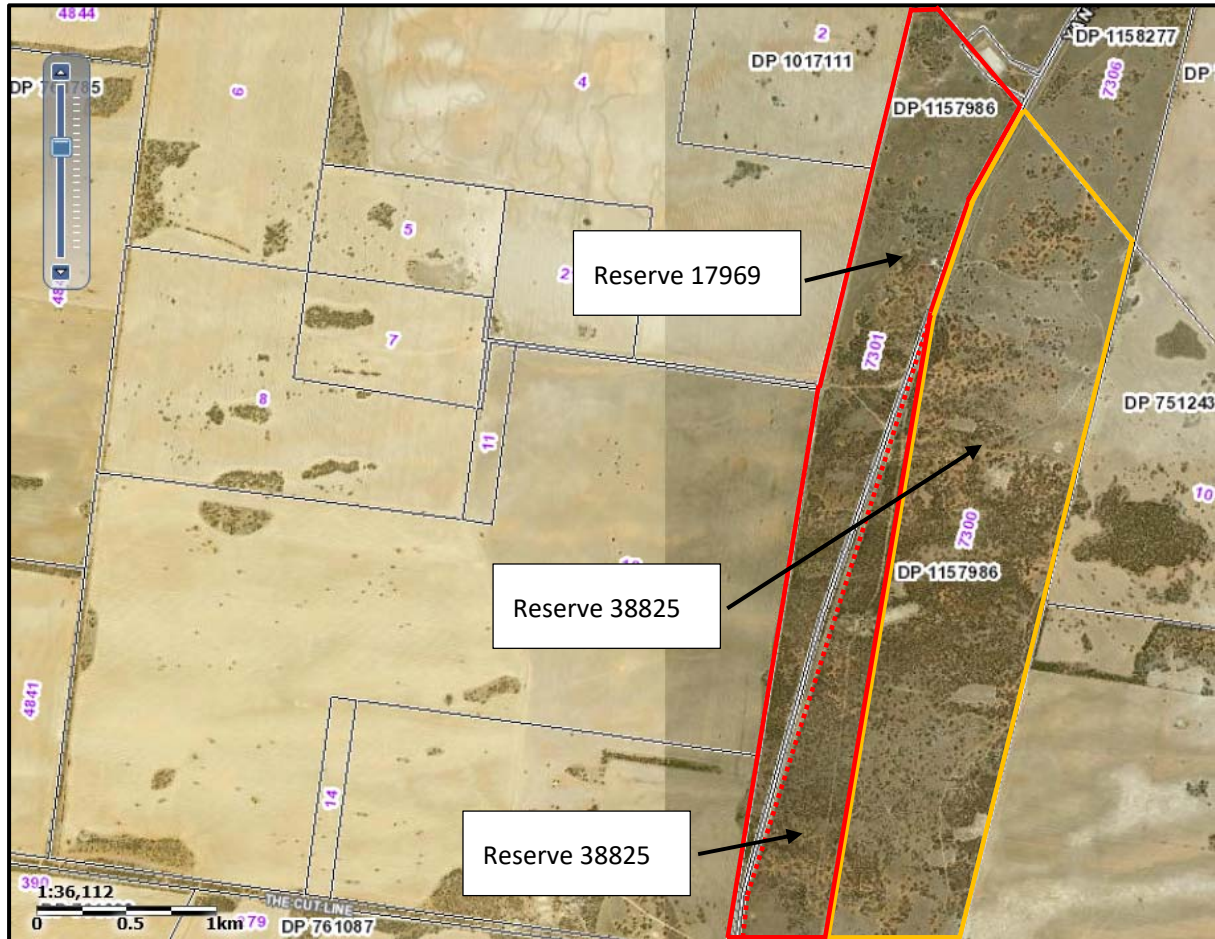


Figure 7-9 Crown Reserves East of the proposal site

## 7.5.2 Potential Impacts

### Agricultural impacts

The development of a solar farm within the site would potentially result in the following agricultural impacts:

- Limited resource loss associated with each solar panel installation.
- The end of opportunistic cereal cropping at the subject site for the lifetime of the operation.
- Reduced pasture production and reduced grazing potential at the proposal site due to shading.
- A potential reduction in biosecurity, through reduced pest and weed control opportunity.
- Potential bushfire risks if not routinely grazed (DPI 2013).

Upon decommissioning of the Sunraysia SF, the site would require rehabilitation to restore it to its pre-existing agricultural condition.

#### RESOURCE LOSS AND FRAGMENTATION

The proposal would not impact on land identified by the NSW Government as BSAL. The proposal would result in the development of a solar farm with an operational life of 30 years. Construction works involve only minor excavation works with minimal disturbance to soils and soil profiles, and minimal risk of soil loss (refer to Section 8.1 for soil and water quality impacts). At the end of the operational period, solar farm infrastructure would be removed, the land would be rehabilitated to its pre-existing condition and available for agricultural use. The Sunraysia SF would not result in the permanent removal of land that is of moderate to low agricultural value.

The Sunraysia SF has been designed to minimise the development footprint. Additionally, the proposal has been sited close to existing infrastructure avoiding the need to construct a new substation and/or long transmission lines. The transmission line required to connect the solar farm with the adjacent substation would be located within the TSR and would be around two kilometres long. This would minimise impacts to adjacent farm land. Travelling stock movement would not be impacted by the transmission line or the adjacent solar farm. The adjacent reserve east of the Balranald-Tooleybuc Road would not be impacted by the proposal. The crown reserve for forest production within the Murray Rivers LGA would not be directly or indirectly impacted by the Sunraysia SF. Forest activities on that land would not impact on the proposed Sunraysia SF. Forest activities such that it is (firewood and some furniture timber collection) would continue without impact. Infrastructure associated with the proposed Sunraysia SF does not impact on land reserved for forestry.

#### DISTURBANCE TO FARMING OPERATIONS AND LIVESTOCK

During construction, agricultural activities within the proposal site would be restricted to approximately 1000 ha of non BSAL. The land that would otherwise be used for either grazing or opportunistic cropping would be restricted to grazing use. Within the broader Balranald LGA, this is equivalent to 0.051% of the land that is currently used for non irrigated agriculture. Development of the Sunraysia SF would impact the identified site during the construction, operation and decommissioning phases.

The land capability of the proposed Sunraysia SF site is less suitable for cropping and is better suited for light grazing. The erodible nature of the soils are not suitable for the continuous disturbance of cropping. Strategic cell grazing would be used to maintain soil cover, while reducing weed populations and dry plant material posing a fire potential. During operation shielding from the solar panels would reduce soil temperatures and wind speeds lowering evaporation rates. This would improve site conditions for livestock and provide additional moisture for fodder production.

Adjacent farming operations are compatible with the proposed Sunraysia SF. Noise from nearby farming practices irrespective of the time of day would not impact on the solar farm. The proposed Sunraysia SF construction and decommissioning would largely occur in daylight hours and as such not conflict with adjacent farming activity. The grazing below the solar farm during operation would be consistent with grazing on adjoining land. Fencing of the proposed Sunraysia SF would minimise adjacent livestock from inadvertently accessing the site. The use of pesticides on the proposed Sunraysia SF and adjacent agricultural land would be similar and at similar times of the year to control weeds of a common origin. After a period of time live stock adjacent the facility would become accustomed to the Sunraysia SF panels as they are to hundreds of installations currently on farms around the state.

During operation, the solar farm would be fenced for security and stock management. Strategic sheep grazing would be allowed within the solar farm site. The strategic sheep grazing would be used to reduce vegetation biomass and put grazing pressure on weeds adjacent the solar panels. The grazing would maintain agricultural income from the Sunraysia SF site and thus support businesses reliant on grazing, such as mulesing and shearing contractors.

Some dams may be filled and or modified for the proposal while others would be kept. These dams could be rebuilt during any future decommissioning of the Sunraysia SF.

The Sunraysia SF would not adversely impact the land owner's access to external road networks, including the Cut Line. The Cut Line and other roads and access tracks adjacent to the proposal site would remain and allow for the movement of stock and other commodities locally, regionally and interstate.

#### INCREASE IN BIOSECURITY RISKS – PEST, DISEASES AND WEED RISKS

The Sunraysia SF would result in the increased movement of vehicles and people to the proposal site. Higher numbers would access the site during the construction and decommissioning phases. The primary risk to biosecurity is the spread of weeds that may result from the increased movement of vehicles in and out of the site. Weed seeds can be transported through and from the site on the tyres and undercarriages of vehicles and on the clothing of staff. The risk of weed dispersal would primarily be mitigated by confining vehicle and machinery movements to formed access tracks during all phases of the proposal and implementing a wash down procedure for vehicles entering the site.

To assist in the management of weeds at the site, a Weed Management Plan would be prepared for the construction and decommissioning phases, based on the Balranald Weed Management Policy and NSW DPI requirements. Management measures would focus on early identification of invasive weeds and effective management controls. An Operational Weed Management Plan would also be prepared to manage impacts associated with weeds such as the risk of weed ingress along the boundary of the development envelope and the importation and spread of weeds through vehicle movements. The plan would also focus on weed control techniques including herbicide and grazing pressure.

Establishment of a temporary construction site compound, specifically rubbish bins containing food, can potentially increase the risk of pest animals at the site (mostly cat and fox). Covered rubbish bins and regular waste removal during construction and operation would minimise this risk by removing the food source. Rabbit and fox numbers would be controlled through targeted pest management during the operational phase of the project. Grazing pressure and reduced plant matter would also reduce resources and cover for pest species.

#### SUMMARY

The removal of relatively low value land from agricultural production during construction and decommissioning, has been considered. The restricted grazing potential during operation of a solar farm has also been considered. While the agricultural output from the farm would be reduced by the operation of the solar farm this would be a very small fraction of agricultural output of the Balranald area. Additionally, the Sunraysia SF would not impact on horticultural production which is steadily increasing in the Balranald area. The Sunraysia SF land would continue to produce meat and fibre from grazing over the proposal's life. Consequently, the land would continue to contribute to agricultural production in the district and contractors dependant on grazing enterprises.

Any obstruction to farming operations and to the wellbeing of livestock is considered to be manageable with the implementation of controls. Adjacent farming, livestock movement and forestry operations can

continue unabated. The Sunraysia SF is reversible and would not result in the permanent loss of agricultural land.

Mining Impacts

The Sunraysia SF is not located within an area that has been identified as a mining resource and there is no current mining exploration licence over the proposal site. Impacts on mining would be negligible. In the long term (after decommissioning), the solar farm infrastructure would be removed and the site would be available for alternative land uses, including for mining purposes, if desirable.

Renewable Energy impacts

The Sunraysia SF Project is for the construction of a solar farm. Only beneficial impacts, such as increased renewable energy generation, would result from the Sunraysia SF.

**7.5.3 Environmental safeguards**

No.	Environmental Safeguard	Solar farm		
		C	O	D
LU 1	<ul style="list-style-type: none"> <li>Construction and operations personnel would drive carefully and below the designated speed limit, to minimise disturbance to livestock, crops and pasture, and dust generation.</li> </ul>	C	O	D
LU 2	<ul style="list-style-type: none"> <li>The site would be rehabilitated to allow continued agricultural land uses following decommissioning of the Sunraysia SF.</li> </ul>			D
LU 3	<ul style="list-style-type: none"> <li>Prepare a pest and weed management plan to manage the occurrence of noxious weeds and pest species across the site during construction and operation. The plans must be prepared in accordance with the Balranald Weed Management Policy and NSW DPI requirements.</li> <li>Where possible integrate weed and pest management with adjoining landowners.</li> </ul>	C	O	
LU 4	<ul style="list-style-type: none"> <li>Allow continued grazing on the site during operation.</li> </ul>		O	

## 8 ENVIRONMENTAL IMPACT ASSESSMENT – LOW RISK ISSUES

### 8.1 SOILS AND WATER QUALITY

#### 8.1.1 Existing Environment

##### Soils and topography

Geology as well a description of the soils and topography is described in detail in Section 7.5 and summarised here:

- The surface geology is comprised of Quaternary aged sediments that have been extensively reworked by the Murrumbidgee, Wakool and Murray Rivers. The result is a variety of clay and sandy soils and distant overflow lakes.
- The proposal site is within the Condoulpe Land System (Figure 7-5). The geomorphology of the proposal site is a sandplain with a slope of about 2%. Within the sandplain, sand dunes up to five metres high exists with a general length way east west orientation and slopes up to 3%. Between the dunes the landform is composed of swales and flats with a slope of about 2%. The dunes and swales can drain to terminal drainage depressions about 2-3 metres below the surrounding landscape.
- The soils above are free draining with little water and nutrient holding capacity.
- The sandy soils of the dunes, swales and planes are prone to wind erosion and drift. When vegetation is highly disturbed or removed the potential for wind erosion is greatly increased.
- Heavy rainfall resulting in deep percolation through the profile can lead to perched water tables on top of the clay loam soils below the sands. The resultant ponding can lead to localised salt scalding.
- The site is slightly undulating with the centre of the site being on slightly higher ground than the peripheries. (There is a difference of approximately 13 metres between the highest and lowest point of the proposal site.)

A search of the EPA contaminated lands register (OEH 2016) did not reveal any records within the Balranald LGA. It is possible that contamination associated with past agricultural activities (e.g. pesticides) could be present on the site, however, given no contaminated sites are recorded on or adjacent to the proposed development, it is unlikely that significant contamination exists at the proposal site.

##### Waterbodies

There are no natural waterways or drainage lines within the development envelope. The nearest water courses are:

- Wee Wee Creek (5 kilometres to the south west)
- Murrumbidgee River (11 kilometres to the north west)
- Minor ephemeral drainage lines and irrigation channels (the closest is 2.2 kilometres to the south east)

The proposal site contains a number of farm dams used for irrigation of crops and/or by sheep.

## Groundwater

A search of the Australian Groundwater Explorer (BOM 2016) identified a bore along the south eastern boundary of the proposal site along Balranald-Tooleybuc Road. Recorded groundwater levels from 1979 to 2011 indicate that groundwater varied from 15.11 metres deep to 14.47 metres deep during this time period.

The proposal site is not mapped as 'groundwater vulnerability' land in accordance with Balranald LEP mapping (Figure 8-1).

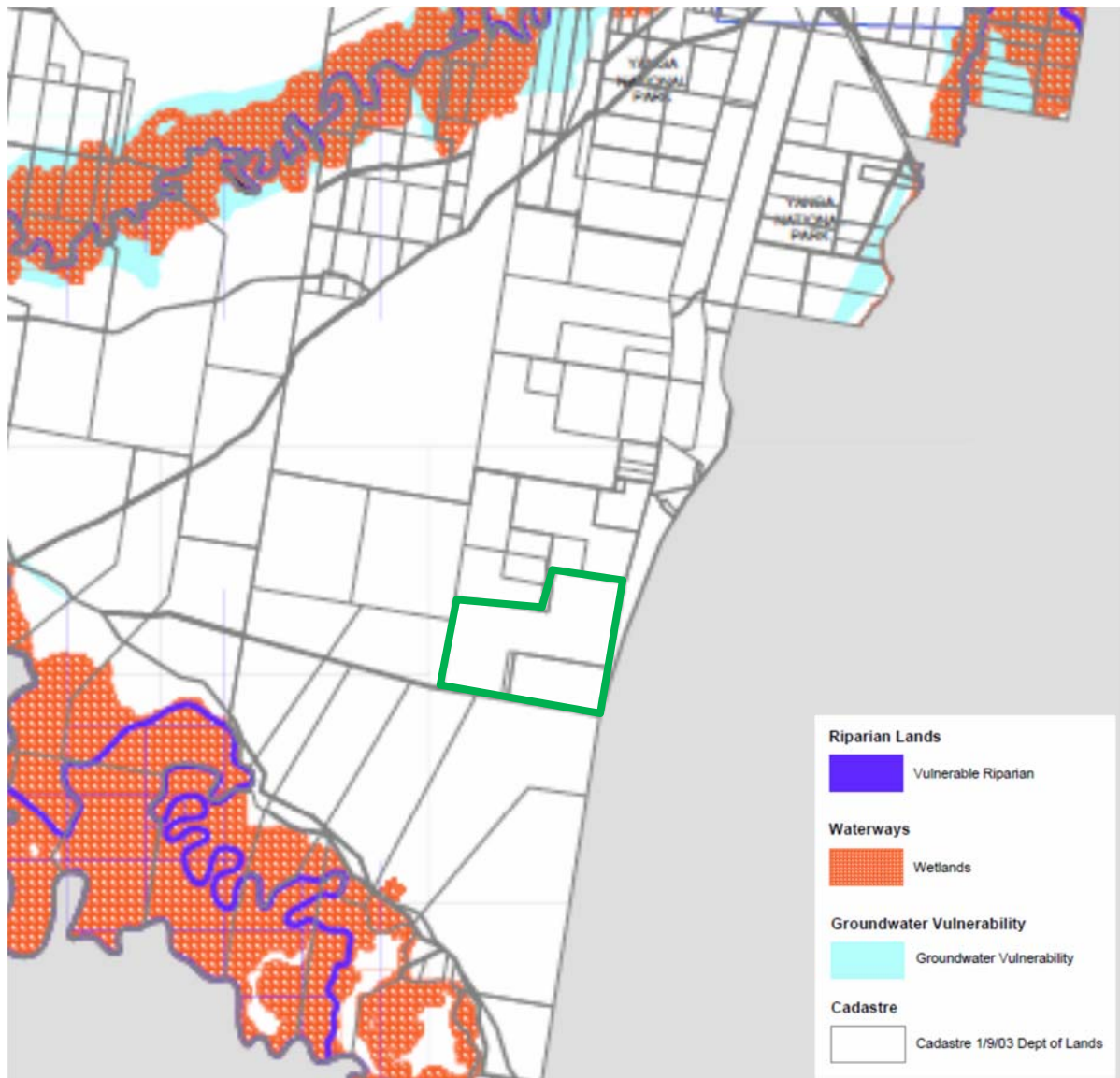


Figure 8-1 Riparian land map, waterways map and groundwater vulnerability map (Balranald LEP 2010). The proposal site is indicated in green.

## **8.1.2 Potential impacts**

### **Soils**

#### Construction including upgrades and decommissioning

Risks to soil include soil loss through erosion, soil compaction or contamination. Topsoils are critical for agriculture and cannot be easily replaced within a human time scale. Adverse soil impacts can also have ecological impacts, affecting habitat condition and water quality. Risks to soils are influenced by landscape position, slope, soil type, hydrology, wind climate and land use.

General construction activities, such as excavation and trenching, have the greatest potential to cause soil erosion and subsequent sedimentation at the site. Soil erosion could potentially occur when trenches for underground cables are excavated and during construction of the access road into the site and the internal access tracks. The use of construction vehicles on the proposal site following heavy rain could also increase the risk of soil erosion, soil loss and tracking of soil on Balranald-Tooleybuc Road.

Large scale bulk earth works would not be required as part of the works. There may be some very limited land shaping works, including localised cut and fill areas, achieve more consistent gradients beneath the array and clear and level the site compound and laydown area.

The localised excavation activities would remove vegetation cover and disturb soils, potentially decreasing their stability and increasing susceptibility to erosion, in particular from wind erosion. Soil disturbance areas would be relatively small and isolated and site rehabilitation following installation would aim to stabilise these areas. Support posts for the solar panels would be pile driven or screwed into the ground with much of the surrounding groundcover retained across the site. Most of the works would take place on ground that is relatively flat to gently sloping, reducing the potential for downslope sedimentation. Impacts are considered manageable with the implementation of works in accordance with provisions of the Managing Urban Stormwater: Soils and Construction series, in particular:

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

Soil compaction would occur as tracks are constructed and when driving the steel posts supporting the PV modules into the ground. Compaction reduces soil permeability thereby increasing run off and the potential for concentrated flows and reduced vegetative cover.

The use of fuels and other chemicals on site pose a risk of soil contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and herbicides.

It is possible that contamination associated with past agricultural activities (e.g., pesticides) could be present on the site, however, given no contaminated sites are recorded on or adjacent to the proposed development, it is unlikely that significant contamination exists at the proposed site. Furthermore, construction activities would not significantly disturb soil. If contamination is identified during site construction, it would be managed in accordance with a Construction Environmental Management Plan (CEMP).

#### 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 minor risk of soil contamination in the event of a chemical spill (fuels, lubricants, herbicides).

Concentrated runoff from the PV modules could lead to increased soil erosion below the modules or along access tracks during significant rain or wind events. The cleaning of solar panels with water could also have similar impacts. Retaining vegetation cover would assist in reducing potential for erosion from rainfall runoff and wind. Monitoring the solar farm for scouring following significant rain and wind events and undertaking works to stabilise any bare soil would also minimise the impact.

### Water quality

There are no natural waterbodies within the proposal site or within two kilometres of the proposal site. The only water bodies present within the proposal site are farm dams. Some of these would be maintained to continue grazing practices and/or for combatting bushfire while others would be filled to allow the development of the proposal. Risks of water quality impacts as a result of construction, upgrades and decommissioning are from the following activities:

- Excavation works which could lead to erosion impacts and subsequent sedimentation. These risks are described above.
- Potential accidental spills from construction plants

During operation, the risk of water quality impacts would be limited considering the nature of the proposed development. Maintenance vehicles may be a potential source of accidental spills.

### Groundwater

Impacts to groundwater during construction, operation, upgrades and decommissioning are unlikely to occur due to depth of groundwater (around 14 metres) at the proposal site and limited subsurface disturbances that would be required. No groundwater from the proposal site would be required for the proposed works.

#### 8.1.3 Environmental safeguards

No.	Environmental Safeguard	Solar farm		
		C	O	D
SW 1	<ul style="list-style-type: none"> <li>• An erosion and sediment control plan must be prepared prior to construction and decommissioning phase and any upgrades that may disturb soils and implemented. The plan must be prepared in accordance with:                             <ul style="list-style-type: none"> <li>• Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition (Landcom 2004), known as ‘the Blue Book’.</li> <li>• Volume 2A Installation of Services (DECC 2008a).</li> </ul> </li> </ul>	C		D
SW 2	<ul style="list-style-type: none"> <li>• The internal access track network must be built as a priority to minimise soil loss.</li> </ul>	C		
SW 2	<ul style="list-style-type: none"> <li>• Groundcover plantings must be placed and maintained below the solar panels and any other disturbed areas to minimise erosion.</li> </ul>		O	
SW 3	<ul style="list-style-type: none"> <li>• The proposal site must be monitored following heavy rain or wind events to ensure no erosion and sedimentation has occurred. Any issues recorded must be promptly rectified to prevent any further soil loss.</li> </ul>	C	O	D
SW 4	<ul style="list-style-type: none"> <li>• A Spill Response Plan must be prepared and include measures to:</li> </ul>	C	O	D

No.	Environmental Safeguard	Solar farm		
		C	O	D
	<ul style="list-style-type: none"> <li>○ Manage the storage of any potential contaminants onsite</li> <li>○ Mitigate the effects of soil and water contamination by fuels or other chemicals (including emergency response and EPA notification procedures).</li> <li>○ Prevent contaminants affecting adjacent pastures and dams.</li> </ul>			

## 8.2 TRANSPORT

### 8.2.1 Existing Environment

The proposal site is located on the western side of Balranald-Tooleybuc Road, approximately 17 km south of Balranald.

Balranald-Tooleybuc Road is a sealed classified road with two lanes, one in each direction, that is maintained by RMS. It is about 50 kilometres long and generally runs in a north-south direction from just south of Balranald to the Victorian border at Tooleybuc. The speed limit along Yanga Way is signposted at 100 kilometres per hour.

Balranald-Tooleybuc Road is an approved route for High Mass Limit (HML) B-double vehicles of 25/26m, however, it does not form part of the National Land Transport Network of important road and rail infrastructure links, defined under the *National Land Transport Act 2014*.

The Average Annual Daily Traffic (AADT) along Balranald-Tooleybuc Road measured 90 metres north of Kyalite Road in 2012 is 568 vehicles taking into account traffic moving in both directions. Of these 73 per cent were standard vehicles and 27 per cent were heavy vehicles.

Balranald-Tooleybuc Road provides access to a number of properties including the proposal site at the south eastern corner. These access points are generally from informal unsealed tracks.

There are no formalised parking/rest areas along the road in proximity to the proposal site.

The closest cross roads on Balranald-Tooleybuc Road from the proposal site are:

- Balranald Road, unsealed local road, about 6.4 kilometres north of the proposal site entrance gate.
- Unnamed road, sealed local road, about 9 kilometres south of the proposal site entrance.

The Cut Line, an unsealed local access track, runs along the southern boundary of the proposal site. Another unsealed access track also runs along the northern boundary of the proposal site. They are used to access adjacent farming land via Balranald-Tooleybuc Road. Additional unsealed tracks run around the periphery and across of the proposal site. Access tracks are also present within the TSR. The TSR in proximity to the proposal site is accessible from some of these tracks via Balranald-Tooleybuc Road.

## **8.2.2 Potential impacts**

### **Construction including upgrades and decommissioning**

#### Traffic generation

Key traffic and transport impacts for the Sunraysia SF mostly relate to the generation of additional traffic on the external road network. The road that would be used to access the proposal site would be Balranald-Tooleybuc Road with limited requirements to use any local roads.

Sunraysia SF activities with the potential to generate traffic can be separated into two categories, the first includes activities that would require traffic controls to manage road traffic and the second includes those activities that may increase the number of vehicles on the local road network.

The only activity that would require temporary traffic controls would be the construction of a new upgraded intersection from Balranald-Tooleybuc Road to the proposal site. The upgrade would take around two weeks to complete. Impacts are likely to be minor and would not require any detours to be put in place. Once the site access has been built, it would allow construction vehicles to access the site safely without impacting through traffic.

Activities that would increase the number of vehicles on the road network include:

- Delivery of the site compound materials, temporary buildings and compound set up.
- Delivery of construction materials including PV modules, posts, mounting frames, cabling and inverter substations, battery storage, gravel and fencing.
- Delivery of water for dust suppression.
- Foundation excavation and construction activities.
- Worker and staff personnel access to the site.

The proposed timeline for the proposal indicates that approximately 60 employees may be required during the first month rising to 250 employees during the peak construction period (approximately 6 months of the 10 month construction period). Preliminary plans for the site propose parking for approximately 150 vehicles. During construction, up to 30 trucks a day will deliver equipment on site. A special convoy and a 50T mobile crane may be required for the offloading of the PV boxes or PV skids and the delivery station. Additionally, light vehicles would also be required to transport personnel. To minimise traffic impacts, car pooling and buses would be organised to transport personnel to and from the proposal site. On average, the peak period of the construction phase would add an additional 50 vehicles to the road network per day.

Increased vehicle numbers on the public road network during the Sunraysia SF construction phase could potentially result in impacts to:

- Traffic efficiency including:
  - Minor delays to trip times caused by movements of vehicles through Balranald or other towns and along the major transport routes, principally Balranald-Tooleybuc Road.
  - Delays as a result of road works. Traffic management including reduced speeds may be required when Balranald-Tooleybuc Road is upgraded to improve access to the proposal site.
- Safety, particularly increased collision risks with other vehicles, cyclists, pedestrians, stock and wildlife.
- Road pavement life or damage to local road infrastructure is avoided as deliveries are on main roads and highways.

- The Cut Line which could be temporarily impacted during the construction of the site access at Balranald-Tooleybuc Road. Maintaining access to The Cut Line throughout construction and operation was raised as a concern by the local community as it provides important access to surrounding agricultural land.

Decommissioning would involve the removal of all infrastructure associated with the solar farm and rehabilitation of the site. Traffic generated during decommissioning and associated impacts would be similar to the construction phase.

### Operation

During solar farm operations, it is expected that approximately 3,500 man-hours (or at least 2 FTE staff) of work per year for preventative maintenance would be required. Additionally, security personnel may also access the site. During normal operation, it is likely that no vehicles would be present at the site on a permanent basis, with only occasional visits by standard vehicles. During major outages, up to 50 vehicles may be present at any one time. Traffic volumes for the operational period will be low and would not significantly increase the current AADT of Balranald-Tooleybuc Road. Risks to road safety from operational traffic would be very minimal and no additional safeguards are proposed.

### 8.2.3 Environmental safeguards

No.	Environmental Safeguard	Solar farm		
		C	O	D
TT 1	<ul style="list-style-type: none"> <li>• A traffic control plan must be prepared and approved by RMS prior to construction and decommissioning. The traffic management plan must ensure that access to the Cut Line is maintained at all times.</li> </ul>	C		D
TT 2	<ul style="list-style-type: none"> <li>• Balranald-Tooleybuc Road must be upgraded prior to starting any other works on the proposal site.</li> </ul>	C		
TT 3	<ul style="list-style-type: none"> <li>• Ongoing consultation with stakeholders including Roads and Maritime Services, Balranald Council, local landholders and emergency services must be undertaken to inform them of changes to road use and conditions during construction and decommissioning.</li> </ul>	C		D
TT 4	<ul style="list-style-type: none"> <li>• A direct contact phone number must be provided to all stakeholders to enable any issues or concerns relating to traffic and access to be rapidly identified and addressed.</li> </ul>	C	O	D
TT 5	<ul style="list-style-type: none"> <li>• To minimise traffic impacts, car pooling and buses would be organised to transport personnel to and from the proposal site.</li> </ul>	C		D

## 8.3 HAZARDS

### 8.3.1 Electromagnetic interference

#### Background

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 whereas magnetic fields are produced by current. When electricity flows, EMFs exist close to the wires that carry electricity and close to electrical devices and appliances while operational (WHO 2007). Electric and magnetic field strengths reduce rapidly with distance from the source, and while electric fields are insulated by air and insulation material, 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).

Over decades of EMF research, no major public health risks have emerged but uncertainties remain (WHO undated). While it is accepted that short-term exposure to very high levels of electromagnetic fields can be harmful to health, the International EMF Project, established by the World Health Organisation, 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 Sunraysia SF.

Exposure to ELF *magnetic* fields is mostly considered to be harmless, however, a policy of prudent avoidance has been taken as a result of any doubt. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA 2015) advises that 'the scientific evidence does not establish that exposure to ELF EMF found near power lines is a hazard to human health'.

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 8-1.

Table 8-1 ICNIRP reference levels (ICNIRP 2010)

Exposure characteristics	Electric field strength (kVolts per metre - kV/m)	Magnetic flux density (microteslas - $\mu$ T)
<b>Occupational</b>	10	1000
<b>General public</b>	5	200

Research into electric and magnetic fields undertaken at utility scale photovoltaic installations in California<sup>3</sup> by Chang and Jennings (1994), indicated that magnetic fields were 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.

### Potential impacts

Potential for EMF impacts occurs only during the operational phase of the solar farm when electrical infrastructure is capable of generating EMFs. Due to the type and configuration of the solar farm infrastructure proposed, the electromagnetic fields would vary in different locations onsite, as discussed below.

#### Cabling

The Sunraysia SF Project would require the installation of internal reticulated 22kV or 33 kV cabling. Cables used in the onsite reticulation cabling would contain three core conductors in trefoil (three lobed) arrangements to reduce the effects of magnetic fields from adjacent conductors.

During detailed design and construction, the electric and magnetic fields produced by the cable would be maintained at much lower levels than the ICNIRP reference levels for the general public.

#### Inverters

Approximately 100 PV boxes (inverter and transformer in a metal container) or PV skids (inverter and transformer on skid platforms) would be installed across the site. The PV boxes or skids would have a total output of 20 MW (AC). The inverters would have an AC power frequency range between 47 and 63 Hz and fall into the Extremely Low Frequency (ELF) range of 0-300 Hz. Within this range, the EMFs are not considered to be a hazard to human health. In addition, the PCBs would be located within the fenced solar farm site with no public access and would operate only during the day time reducing the total time that EMFs are generated by the infrastructure.

#### Substation

A substation is proposed in the north-eastern corner of the proposal site. For substations and transformers the magnetic fields at distances of 5-10m away are generally indistinguishable from typical background levels in a home. The fenced exclusion area around the substation components is sufficient to reduce the EMF to negligible levels.

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<sup>3</sup> Note the U.S.A electricity supply operates at 60 Hz frequency.

### **Solar array**

The Sunraysia SF would require installation of DC wiring between panels and the PCBs. This cabling would be underground and would conduct about 6.85A at between 30 and 50 V. Electromagnetic interference as a result of the underground cable are considered to be negligible.

### **Battery**

Three energy storage technologies are under consideration, including;

1. Electrochemical (Lithium Ion, Lead Acid and Supercapacitors)
2. Chemical (Hydrogen Fuel Cell)
3. Mechanical (Compressed Air and Fly Wheel)

The final technology would be selected based on a variety of criteria including safety, and minimal environmental impact.

Environmental risks associated with energy storage devices include;

- i Electrochemical and chemical technologies utilise chemicals (or electrochemicals). The technologies utilised would be proprietary systems and would be operated under MSDS (Material Safety Data Sheets). Risk of spill or leakage would be managed via implementation of the MSDS. The storage facility would be designed to contain leaks or spillage with similar bunding protection as oil transformers where required.
- ii Replacement of energy storage facilities would be required at the end of their design life. These would be disposed of in the correct way, as per manufacturers and legislative requirements. In certain cases, and depending on the toxicity of the chemical, a recycling program may be accompanied by the technology manufacturer to reduce environmental impact.
- iii Energy storage devices may emit heat whilst energy is stored or converted from one form into another. These temperatures are generally regulated and monitored by the energy storage device itself in a similar way the inverters (or Power Conversion Units) are controlled. The residual heat that would be dispersed into the environment would be insignificant.
- iv Energy storage devices may emit low amounts of noise during a charging or discharging phase. The noise levels would vary depending on the type of technology that is selected. However, the noise that would be emitted by the energy storage device would be negligible compared to the overall operation of the solar farm.

### **Transmission line**

A 220kV overhead transmission line would run from the proposed substation to the existing Balranald Transgrid Substation located approximately two kilometres north of the site. The magnetic field exposure will vary according to the amount of current carried by the powerline and the distance from the powerline. Generally, distances that are more than 50 metres from a high voltage powerline are not expected to have higher than typical magnetic fields. Figure 8-2 shows a range of magnetic field levels measured by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) around powerlines and in Australian homes. As can be seen, these are well below the exposure limit in the international guidelines of 200  $\mu$ T (2000 mG).

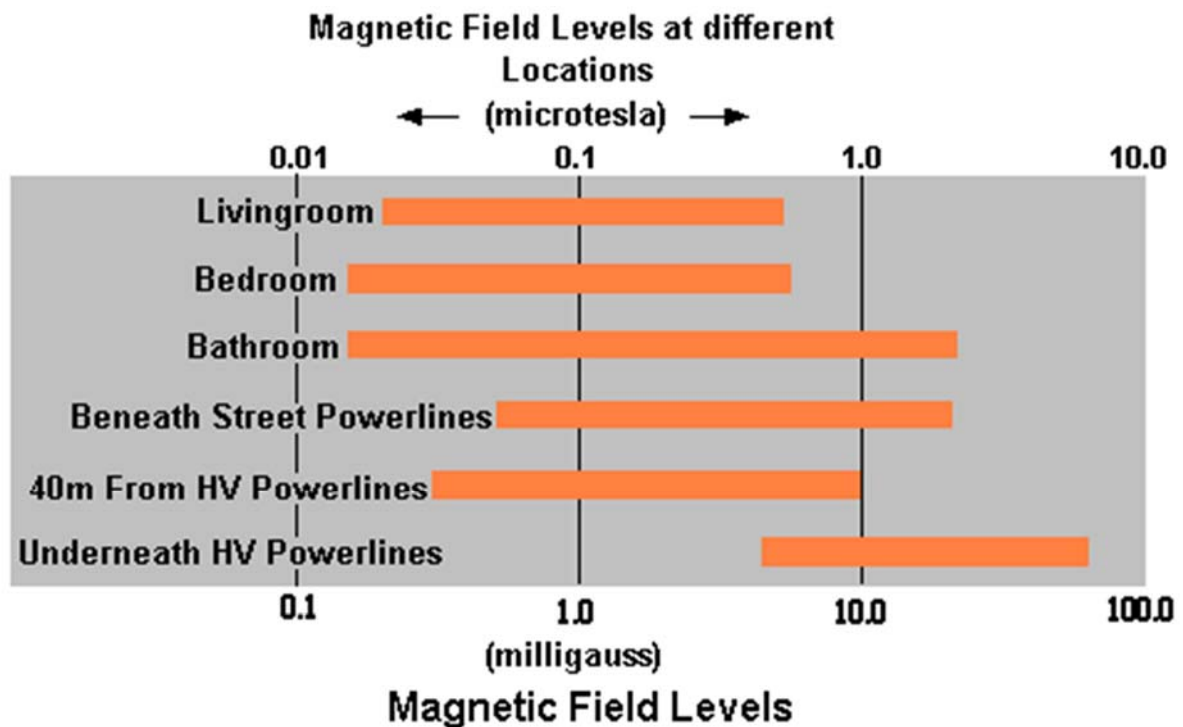


Figure 8-2 Magnetic field levels at different locations

#### Receptors – public safety

There is one dwelling located within two kilometres of the solar farm site. The areas proposed for installation of the solar farm infrastructure would have no public access. Access would be restricted to appropriately trained and qualified maintenance staff. Property owners accessing the site for ongoing agricultural use would have no reason to spend extended periods near the infrastructure, which would not be located near frequent use areas such as sheds, yards and residences.

#### Receptors – electrical devices

The PCB's to be used for the Sunraysia SF Project would behave similar to other typical electrical and household devices. Additionally, they are designed to reduce all possible interference emissions via the circuit's technical avoidance of high frequency currents, the deployment of filters and the use of grounded metal housings.

#### Summary of impacts

Acute impacts are not anticipated as a consequence of the low exposure rates in combination with the low likelihood that people or stock would be within range of high exposure levels for extended periods.

Onsite, underground cabling with conductors in a trefoil (three lobed) arrangement would be used where practicable which would assist in shielding EMFs and would ensure that the EMF exposure to receptors including the public and workers are well below the 200 $\mu$ T levels considered prudent for public health.

Overall research has not shown to date that long-term low-level low frequency exposure has detrimental effects on health. Using the Principle of Prudent Avoidance to design and site this infrastructure, exposure to EMFs and potential for adverse health impacts can be avoided or reduced. Adverse health impacts from EMFs are therefore unlikely as a result of the proposal.

### Environmental safeguards

No.	Environmental Safeguard	Solar farm		
		C	O	D
EMF 1	<ul style="list-style-type: none"> <li>All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia.</li> </ul>	C		

### 8.3.2 Aviation

#### Existing environment

Balranald Airport is located about 18 kilometres north-east of the Sunraysia SF, on the north-eastern outskirts of Balranald. The airport is a small airport that is used by light aircraft, private charter flights and medical services.

Two private rural airstrips are located 3.6 kilometres south-west and the other approximately 8.5 kilometres south-east of the proposal site.

#### Potential impacts

The identified risk to aviation from the Sunraysia Solar Farm is 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.
- Temporary construction site buildings.

The potential for glint or glare associated with non-concentrating PV systems which do not involve mirrors or lenses is relatively limited. PV 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).

A comparative reflection analysis against other surfaces is shown in Figure 8-3. The figure shows that 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 will not generally create noticeable glare compared with an existing roof or building surfaces. This issue is also discussed in Appendix E.

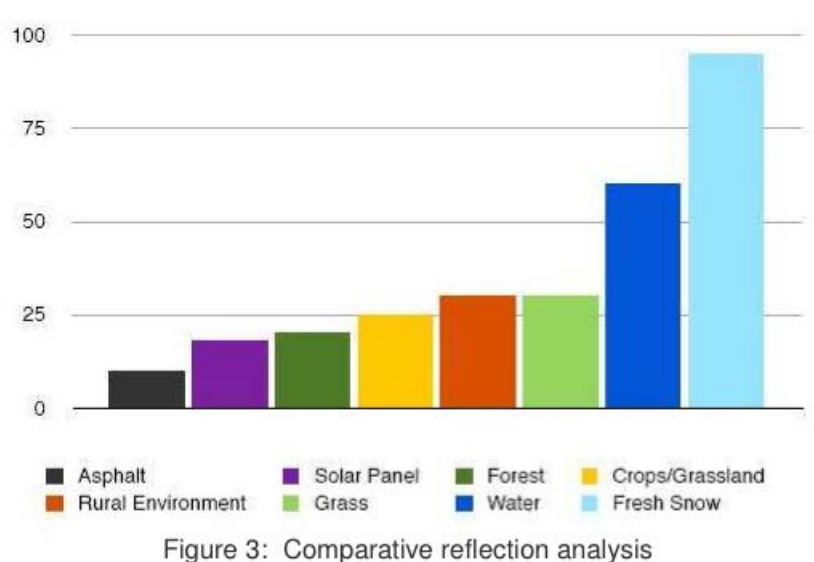


Figure 8-3 Comparative reflection analysis (Spaven 2011)

With regard to aviation, the largest glare hazard is the sun (Spaven 2011).

For other infrastructure on site such as the buildings and steel support posts, 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 Sunraysia SF infrastructure are considered to be minor and can be effectively managed with the implementation of the mitigation measure outlined below.

### Environmental safeguards

The following mitigation measures would be implemented to reduce aviation impacts.

No.	Environmental Safeguard	Solar farm		
		C	O	D
AV 1	<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		

### 8.3.3 Bushfire

#### Existing environment

Bushfire prone land mapping provided by Balranald Shire Council shows that the land adjacent to the proposal site to the south and west has been mapped as Bushfire Prone Land – Vegetation Category 2. A 30 metre vegetation buffer is also located along the southern and western boundaries of the proposal site (Figure 8-4). It should be noted that the NSW Rural Fire Service (RFS) advised that bushfire prone land mapping for some areas in Western NSW are not particularly accurate and therefore the proposal site may also be considered bushfire prone land.

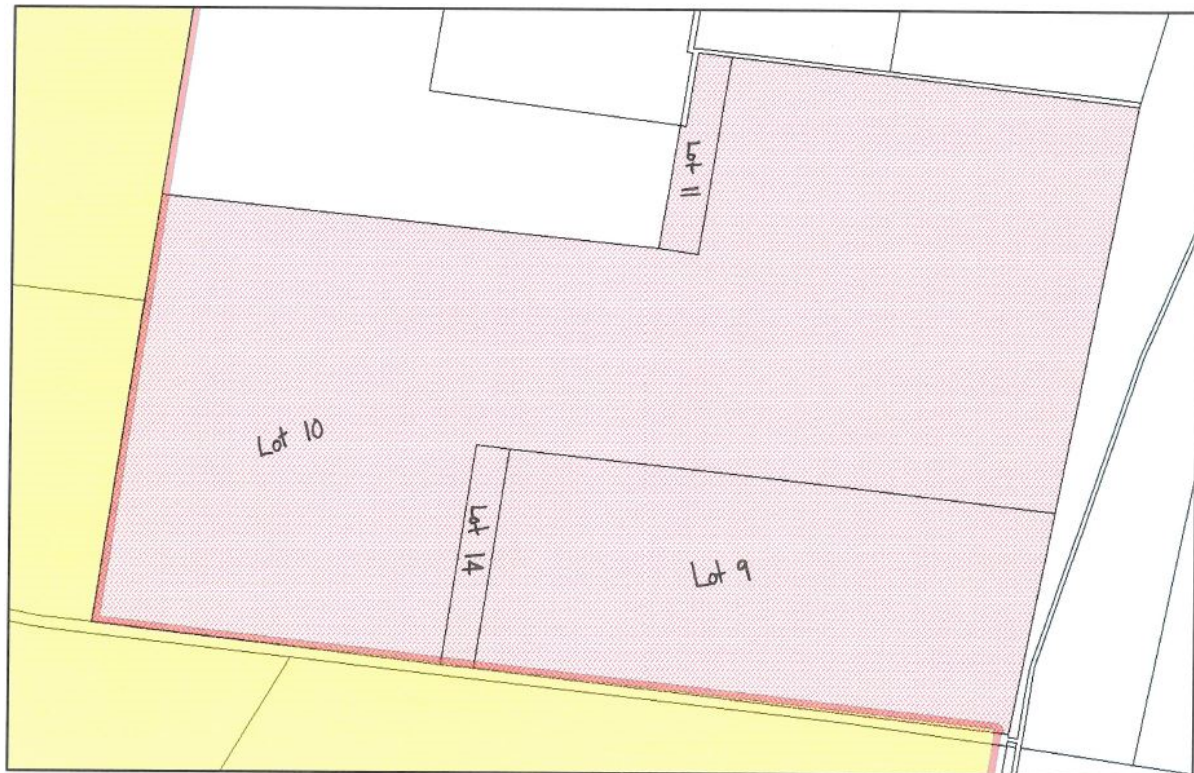


Figure 8-4 Bushfire prone land (Development Envelope shown pink) (Source: Balranald Shire Council 2016)

The proposal site and surrounding land is gently sloping (< 5 degrees). The land is currently cultivated and has been largely cleared of overstorey vegetation. There are patches of remnant native vegetation and isolated trees dispersed throughout the proposal site. More extensive remnant native vegetation is located in the south eastern area of the proposal site as well as along the southern, western and eastern boundary. A Crown reserve used as a TSR is located along the eastern boundary of the site. The reserve is generally well timbered with some more open areas of lower growing vegetation, in particular to the north.

The bushfire danger period for the Balranald LGA is generally between 1 October and 31 March, but can vary subject to local conditions. Summer conditions can be dry and hot with likely ignition sources including machinery movement in long grass, hay storage, lightning strikes, storage of fuel and farm chemicals, and cigarette butts thrown from cars travelling along Balranald-Tooleybuc Road. Climate Change is also likely to increase the risk of bushfires occurring in the region as well as their intensity. The 2011/12 supplementary State of Environment Report for the Riverina and Murray Regional Organisation of Councils provides information on bushfires in the region. The number of bushfire occurrences and the number of hectares burnt through the region are summarised in Figure 8-5.

Table 4 - Bushfire data <sup>1</sup>					
LGA	Area of bushfire prone land	Bushfire events <sup>2</sup>	Area burnt <sup>2</sup>	Fire trucks maintained by council <sup>2</sup>	Rural Fire Brigades in LGA
Balranald	733,335ha	15 (+15)	13,500ha	23	10
Berrigan	12,288ha	49 (+28)	24ha (+32ha)	0	5
Carrathool	n/a	58	1,170ha	50	25
Conargo	5,588ha	7 (-51)	1,150ha (-20ha)	26	13
Corowa	15,757ha	38 (+17)	30ha (-120ha)	28	12
Deniliquin	1,796ha	5	50ha	4	1
Greater Hume	198,600ha	67	54	72	35
Hay	n/a	n/a	n/a	n/a	n/a
Jerilderie	n/a	n/a	n/a	17	10
Leeton	250ha	n/a	n/a	14	4
Murray	n/a	n/a	n/a	0	10
Murrumbidgee	11,667ha	12	437ha	15	8
Narrandera	n/a	n/a	n/a	29	19
Wakool	19,736ha	36	33ha	24	15
Wentworth	1,525,387ha	19 (-7)	900ha (+740ha)	31	17

<sup>1</sup>Sourced from relevant councils

Figure 8-5 Bushfire data

All NSW Fire Brigade fire stations are equipped with trained personnel and resources for dealing with hazmat incidents. Balranald Fire Station is the closest NSW fire brigade to the proposal site, located in the town centre about 17 kilometres to the north.

There are three NSW Rural Fire Services brigades within the vicinity of the proposal site, including Weimby Rural Fire Brigade located approximately 11 kilometres to the west, Kyalite Rural Fire Brigade approximately 13 kilometres to the south and the Balranald Headquarters Rural Fire Brigade approximately 17 kilometres to the north.

### Potential impacts

Bushfire hazards fall in two categories when assessing the development, the risk of the development causing a bushfire and the risk of any bushfires damaging the asset.

#### Construction, upgrades and decommissioning

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

- Smoking and careless disposal of cigarettes on site.
- Hot works activities such as welding, soldering, grinding and use of a blow torch.
- Use of petrol powered tools.
- 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.
- Electrical faults during testing and commissioning.
- Storage of chemicals and hazardous materials.

Considering the sparse and fragmented nature of the woodland and forest remnants flanking the Development Envelope, it is considered unlikely that 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 any upgrades or 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

Bush fire risks during operation of the solar farm are considered highly manageable considering the majority of the proposal site has been cleared. Risks to the infrastructure from bushfires (and risk of the infrastructure creating a bushfire) lies mainly in those areas in proximity to remnant vegetation, in particular along the eastern boundary of the proposal site.

Planning for bush fire protection (PBP) (NSW RFS 2006) applies to all “development applications” on land that is classified as “bush fire prone land” (BPL). While the guideline generally applies to residential developments, it states that other developments should consider the aims and objectives of the PBP:

*The aim of PBP is to use the NSW development assessment system to provide for the protection of human life (including firefighters) and to minimise impacts on property from the threat of bush fire, while having due regard to development potential, onsite amenity and protection of the environment.*

*More specifically, the objectives are to:*

- (i) afford occupants of any building adequate protection from exposure to a bush fire;*
- (ii) provide for a defensible space to be located around buildings;*
- (iii) provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;*
- (iv) ensure that safe operational access and egress for emergency service personnel and residents is available;*
- (v) provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ); and*
- (vi) ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire fighting).*

Applications for developments that are not residential/rural residential subdivisions, SFPPs or residential infill should:

- Note the range of available bush fire protection measures (in Section 3 of the PBP)
- Satisfy the aim and objectives of PBP
- Consider any matters listed for the specific purpose (in Section 4 of PBP)
- Propose an appropriate combination of bush fire protection measures, with evidence that the intent of each measure (with reference to the relevant Tables in sections 4.1.3 and 4.2.7 of the PBP) is satisfied.

In accordance with the PBP, an acceptable level of protection from bush fires is achieved through a combination of strategies which:

- Control the types of development permissible in bush fire prone areas (see Box);
- Minimise the impact of radiant heat and direct flame contact by separating the development from the bush fire hazard;
- Reduce the rate of heat output (intensity) of a bush fire close to a development through control of fuel levels;
- Minimise the vulnerability of buildings to ignition from radiation and ember attack;
- Enable relatively safe access for the public and facilitate fire-fighting operations;
- Provide adequate water supplies for bush fire suppression operations;
- Implement community education programs, focusing on property preparedness, including emergency planning and property maintenance requirements; and
- Facilitate the maintenance of APZs, fire trails, access for firefighting and on-site equipment for fire suppression.

In a development assessment context, there are six key Bush Fire Protection Measures (BPMs). By incorporating these into the proposed development, it will ensure the aims and objectives of the PBP are met. Table 8-2 provides assess how the proposal would meet the six key Bush Fire Protection Measures above.

Bush fire risks during operation of the solar farm are considered highly manageable considering the majority of the proposal site has been cleared.

Table 8-2 Key Bush Fire Protection Measures

Key Bush Fire Protection Measures	Development response
<p>The provision of clear separation of buildings and bush fire hazards, in the form of fuel reduced APZ (and their subsets, inner and outer protection areas and defensible space)</p>	<p>Calculation of an appropriate APZ is detailed in Appendix 2 of the BPB and relies on the following:</p> <ul style="list-style-type: none"> <li>• Vegetation formations within 140 metres of the proposal. The vegetation formations are considered semi-arid woodlands.</li> <li>• Effective slope of the land. The effective slope of the land is more than 0 degrees but less than 5 degrees</li> <li>• Fire (weather) area (FDI rating). The FDI rating is 80 for the Balranald area.</li> </ul> <p>Based on the above an APZ of 10 metres is required. The proposal includes a minimum 10 metre buffer between any infrastructure and remnant vegetation. This includes an access track around 5 metres wide running around the periphery of the proposal site.</p> <p>An above ground transmission line would include appropriate clearance of the easement to minimise the risk of bushfires.</p>
<p>Construction standards and design</p>	<p>The proposal is considered to include buildings of class 5 to 8 and 10 of the Building Code of Australia (BCA). These classes of buildings include offices, factories, warehouses, public car parks, fencing and other commercial or industrial facilities. The BCA does not provide for any bush fire specific performance requirements and as such AS 3959 Construction of buildings in bush-fire prone areas does not apply as a set of 'deemed to satisfy' provisions. The general fire safety construction provisions are taken as acceptable solutions, but the aim and objectives of PBP apply in relation to other matters such as access, water and services, emergency planning and landscaping/vegetation management as detailed in this table. However, at the planning level, class 10b buildings in bush fire prone areas (e.g. fencing) should be non-combustible. This would be the case for the proposed security fence.</p> <p>All electrical components would be designed to minimise potential for ignition.</p>

Key Bush Fire Protection Measures	Development response
Appropriate access standards for residents, fire fighters, emergency service workers and those involved in evacuation	The proposal site would be accessed via Balranald-Tooleybuc Road through an upgraded intersection. An access track up to five metres wide would run around the periphery of the proposal site as well as across the site between the solar arrays. This would provide adequate access for fire fighters, emergency service workers and those involved in evacuation.
Adequate water supply and pressure	<p>Water supplies to be provided on site that could be used for firefighting would include:</p> <ul style="list-style-type: none"> <li>• Farm dams</li> <li>• Water tank (up to 100ML)</li> </ul> <p>The provision for suitable connection for RFS and/or NSW Fire Brigades purposes in relation to water supplies would be made available during detailed design in consultation with relevant authorities.</p>
Emergency management arrangements for fire protection and/or evacuation	This would be dealt with through an appropriate evacuation plan to be prepared as part of the operation of the facility.
Suitable landscaping, to limit fire spreading to a building	Some landscaping is proposed to reduce visual amenity impacts. The landscaping will mostly be targeted to the southern boundary of the proposal site. Some low ground cover may also need to be promoted on the site below the solar panels to minimise potential wind and water erosion of the soils. A managed grazing regime would assist in reducing fuel loads at the site.

### 8.3.4 Environmental safeguards

The following mitigation measures would be implemented to reduce bushfire impacts:

No.	Environmental Safeguard	Solar farm		
		C	O	D
BF 1	<ul style="list-style-type: none"> <li>All electrical equipment would be designed in accordance with all applicable codes and industry best practice standards in Australia.</li> </ul>	C		
BF 2	<ul style="list-style-type: none"> <li>Buildings would comply with the Building Code of Australia (BCA).</li> </ul>	C		
BF 3	<ul style="list-style-type: none"> <li>Safety management processes to highlight to all staff and contractors through an induction process the potential hazards of activities onsite. This should include preparation and compliance with job-specific WMSs and emergency preparation/response drills.</li> </ul>	C	O	D
BF 4	<ul style="list-style-type: none"> <li>The NSW RFS be provided with a contact point for the Sunraysia SF, during construction and operation.</li> </ul>	C	O	D
BF 5	<ul style="list-style-type: none"> <li>Designation of a Sunraysia onsite safety representative responsible for ensuring implementation of safeguards. This representative would also regularly consult with the local NSW RFS to ensure familiarity with the Sunraysia Project and assist the RFS and emergency services as much as possible if there is a fire on-site during construction.</li> </ul>	C	O	D
BF 6	<ul style="list-style-type: none"> <li>Basic training of all staff in the use of fire-fighting equipment.</li> </ul>	C	O	D
BF 7	<ul style="list-style-type: none"> <li>Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction of the Sunraysia Project. This equipment will include fire extinguishers, a 1000 litre water cart retained on site as a precautionary basis, particularly during blasting and welding operations. Equipment lists would be detailed in Work Method Statements (WMS's).</li> </ul>	C		D
BF 8	<ul style="list-style-type: none"> <li>Slashing of vegetation on construction site before construction starts and as required to manage fuel loads.</li> </ul>	C	O	D
BF 9	<ul style="list-style-type: none"> <li>Ensure bulk matter fuel loads across the site are monitored during spring and that grazing pressure is available over spring and summer to minimise vegetation bulk and fuel loads prior to the bushfire danger period.</li> </ul>		O	
BF 10	<ul style="list-style-type: none"> <li>All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bush fire emergencies.</li> </ul>	C	O	D
BF 11	<ul style="list-style-type: none"> <li>Maintain a permanent source of water on site for fire fighting purposes during operation. The volume and location where water should be kept would be finalised in consultation with NSW RFS.</li> </ul>	C	O	D
BF 12	<ul style="list-style-type: none"> <li>The use of a Hot Works Permit system to ensure a number of pre-requisites are satisfied prior to works commencing. Fire extinguishers would be present during all hot works.</li> </ul>	C	O	
BF 13	<ul style="list-style-type: none"> <li>Where possible restrict the performance of Hot Works to specific areas (such as the Construction Compound temporary workshop areas).</li> </ul>	C	O	

No.	Environmental Safeguard	Solar farm		
		C	O	D
BF 14	<ul style="list-style-type: none"> <li>• Adequate site communications to ensure a fire event is communicated quickly. Measures would include:               <ul style="list-style-type: none"> <li>○ Use of mobile phones.</li> <li>○ Use of two-way radios.</li> <li>○ Fire Danger Warning signs located at the entrance to the site compounds.</li> </ul> </li> </ul>	C	O	
BF 15	<ul style="list-style-type: none"> <li>• Specific management activities/controls for hot works, vehicle use, smoking, use of flammable materials, blasting.</li> </ul>	C	O	D
BF 16	<ul style="list-style-type: none"> <li>• Consultation with the NSW Rural Fire Service during construction, operation and decommissioning.</li> </ul>	C	O	D
BF 17	<ul style="list-style-type: none"> <li>• An APZ of minimum 10 metres must be kept between any remnant vegetation and solar farm infrastructure.</li> </ul>	C	O	

## 8.4 RESOURCE USE AND WASTE GENERATION

### Resource use

#### Construction

Key resources (pending the completion of the detailed project design) required to construct the Sunraysia SF include:

- Structural metal components for mounting system, PV boxes and delivery system containers, fencing and site buildings.
- Masonry products, including concrete for slabs and footings.
- Glass for panels.
- Packing for transporting solar panels.
- Aluminium for underground cables and inter-panel wiring.
- Fuels and lubricants associated with operation of machinery and motor vehicles minimal.
- Gravel for work and service tracks and backfill.
- Sand for burying cables.
- Non-potable water, for cleaning and dust suppression.
- Potable water, for human consumption.

Approximately 700 ML of non-potable (or similar grade) water would be required during the construction phase of the proposal. Water would be brought to the site by water truck. Water would be sourced from a water holder (eg a local landholder or Balranald Shire Council), purchased via a Water Trade, or collected via the on-site rain water tank (up to 100ML), and obtained from dams on the site.

It is estimated that 0.2ML of potable (drinking) water would be required during the construction phase. This water would be obtained from a commercial potable water supplier. Bottled water would be brought to the site as required.

#### Operation

During operation, resources used would be associated with maintenance/upgrade activities and use of machinery and vehicles. Some balance of system electrical components (e.g., PCB's, 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 items.

Non-potable water would be required by the proposal during operation, primarily for the cleaning of solar panels. Sources of water during operation would be similar to those used during construction. The annual estimated volumes of water required during operation are small (500 kL) and the associated potential impact of this water use are considered low risk. Water use during operation would be minimised as far as possible.

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 Sunraysia SF are not currently limited or restricted. In the volumes required, the Sunraysia SF is unlikely to place significant pressure on the availability of local or regional resources. The use of the required resources is considered reasonable in light of benefits of offsetting fossil fuel electricity generation.

### **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 European and US photovoltaic module manufacturing companies over the 2005/2006 period. The 'energy payback time' for polycrystalline PV modules has been estimated at two years for a solar installation in Southern Europe. This is consistent with the estimation that the Sunraysia SF would have an energy payback period of approximately 1.5 years (refer 908165120.5.174018768).

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

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 Sunraysia SF Project.
- Potential to reuse and recycle component parts.

### **Waste generation**

Legal requirements for the management of waste are established under the *Protection of the Environment Operations (POEO) Act 1997* and the *POEO (Waste) Regulation 2005*. Unlawful transportation and deposition of waste is an offence under section 143 of the POEO Act.

The *Waste Avoidance and Resource Recovery Act 2001* establishes a hierarchy for which resource management options should be considered against. The order of this hierarchy is as follows:

- Avoidance of unnecessary resource consumption,

- Resource recovery (including reuse, reprocessing, recycling and energy recovery),
- Disposal.

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

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

Construction

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

- Packaging materials
- Excess building materials
- Scrap metal and cabling materials
- Plastic and masonry products
- Vegetation clearing
- Waste from toilets on site (pump out and transport to Council treatment facility)

Overall, volumes of waste would be short term and manageable.

Operation including upgrades

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

**8.4.2 Environmental Safeguards**

No.	Environmental Safeguard	Solar farm		
		C	O	D
RW 1	<ul style="list-style-type: none"> <li>• Waste and energy management would be incorporated into the Construction Environmental Waste Management Plan, this would cover the risks associated with construction of the WRSF.</li> </ul>	C		

## 8.5 HISTORIC HERITAGE

The proposed solar farm site is currently a working farm that has been owned by the Nield family for over 100 years. The farm called, *Hit or Miss*, consists of a Homestead precinct located in the southeast of the property. This area and the collection of farm buildings there are not part of the proposed solar farm footprint. There are no statutory listed items of historic heritage in the vicinity of the farm.

### 8.5.1 Historic Heritage Database searches

A search of the following databases has been undertaken for the Balranald LGA on 5 December 2016:

- State Heritage Inventory
- Balranald LEP 2010 heritage schedule
- Australian heritage database

The searches revealed the following items (Table 8-3).

**Table 8-3 Historic heritage items**

Database	Number of items	Closest item to proposal site
State Heritage Inventory	1 Aboriginal place, 1 item listed on State Heritage Register and 25 items listed on local government and state agencies	Dippo Ceremonial Ground, around 16 kilometres north of the proposal site
Balranald LEP heritage schedule	7 items of local significance and 1 item of state significance	Dippo Ceremonial Ground, around 16 kilometres north of the proposal site
Australian heritage database	13	Balranald post office and courthouse, non statutory listing, around 16 kilometres north of the proposal site

### 8.5.2 Site survey results

A site survey of the proposed solar farm proposal area and the immediate surrounds was undertaken by a heritage consultant on 9 December 2016. No historic heritage items were identified within the proposal area.

### 8.5.3 Potential impacts

The Sunraysia solar farm proposal poses no potential impact to historic heritage.

## 8.6 AIR QUALITY AND CLIMATE

### 8.6.1 Existing environment

#### Air quality

OEH does not monitor general air quality data for the Balranald LGA, however considering the Balranald LGA has a relatively small and diffuse population, a lack of major pollution generating industries and a regular rainfall pattern, air quality would be considered to be good. The closest facility that is required to report their emissions as part of the National Pollution Inventory is located over 25 km away (Australian Government 2016).

Within the Balranald LGA, it is considered that local air quality would be affected by agriculture, mining, transport, residential development and burning. At the proposal site, agricultural activities from surrounding farmland and transport fumes from Balranald-Tooleybuc Road are the primary air polluting activities. These activities can lead to emissions of greenhouse gases, vehicle emissions, dust, odours, spray drift of pesticides and herbicides and emissions of pollutants such as nitrogen and phosphorus. The sandy soils of the dunes, swales and planes are prone to wind erosion and drift. When vegetation is highly disturbed or removed the potential for wind erosion and creation of dust is greatly increased.

The closest sensitive receivers is a rural dwelling located approximately 1.4 kilometres south of the proposal site boundary. There are two other rural dwelling located within five kilometres of the Development Envelope, one being approximately 4.6 kilometres to the north-east and the other approximately 5 kilometres to the south-west.

#### Climate and climate change

The Riverina bioregion has a semiarid climate with low, winter-dominant rainfall, hot summers and cool winters.

The following climate data<sup>4</sup> for the Balranald RSL Weather Station (the closest to the Sunraysia SF), elevation 61m is available from the Bureau of Meteorology (BOM):

- The mean maximum temperature is 24.3°C with a range between 33.0° C (January) and 15.7°C (July).
- The mean minimum temperature is 10.0°C with a range between 16.5° C (January) and - 3.5°C (July).
- The annual mean rainfall is 323.5 mm.
- Highest rainfalls generally occur during May and average 31.4 mm. Lowest rainfalls occur in March with an average of 22.3 mm. Although rainfall is generally evenly distributed throughout the year, rainfall is lowest between January and April.
- Wind speeds average between about 8 and 22 km per hour at 9am, and between 9 and 14 km per hour at 3pm.

The projected climate change impacts on the far west region are discussed in OEH (2014) and summarised in Figure 8-6 for the near future (2030) and far future (2070).

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<sup>4</sup> Available data is generally between 1879 - 2016






Projected temperature changes	
 Maximum temperatures are projected to <b>increase</b> in the near future by 0.3 – 1.0°C	Maximum temperatures are projected to <b>increase</b> in the far future by 1.8 – 2.7°C
 Minimum temperatures are projected to <b>increase</b> in the near future by 0.4 – 0.8°C	Minimum temperatures are projected to <b>increase</b> in the far future by 1.4 – 2.7°C
 The number of hot days will <b>increase</b>	The number of cold nights will <b>decrease</b>
Projected rainfall changes	
 Rainfall is projected to <b>decrease</b> in spring	Rainfall is projected to <b>increase</b> in summer and autumn
Projected Forest Fire Danger Index (FFDI) changes	
 Average fire weather is projected to <b>increase</b> in summer and spring	Number of days with severe fire weather is projected to <b>increase</b> in summer and spring

Figure 8-6 Projected climate change impacts for the far west region of NSW (OEH 2014)

### 8.6.2 Potential impacts

#### Construction including upgrades and decommissioning

Dust is likely to be generated from excavation activities and other earthworks as well as the movement of trucks and work vehicles along unsealed access tracks. Earthwork associated with construction would be relatively minor and mostly involve levelling the ground to construct the access road and laydown area, and trenching work for cable installation. Posts for the solar array framework would be either pile driven or screwed into the ground which would generate little dust. No extensive cut and fill earthworks are proposed.

Air emissions would be generated from the use of construction machinery including earth-moving equipment, diesel generators, trucks, cranes and pile driving equipment. Vehicles accessing the site, including the daily construction labour force and haulage traffic delivering construction components, would also generate air emissions.

Dust and air emissions can be a nuisance to nearby receivers including residences, farm workers and traffic. The degree of impact can be influenced by weather and climate. Work carried out during long periods of dry weather and high winds have greater potential to generate dust which can impact air quality. Rainfall at Balranald is generally evenly distributed throughout the year, however evaporation rates in winter would be lower. Construction work during summer months may require greater dust suppression measures to manage any increased impacts.

The construction phase is expected to be approximately twelve months in duration with a peak period lasting six months. Given the location of the Sunraysia SF within a rural setting (only one residence within a two kilometre setting), the impacts of the Sunraysia SF during the construction and decommissioning phases are considered manageable with regard to air quality. Mitigation strategies that would be employed during these phases to manage the potential for adverse air quality impacts are presented in the section below.

Construction activities for the solar farm would not impact on climate. Haulage traffic and plant and equipment would generate emissions however, the short duration of the work and the scale of the Sunraysia SF suggests this contribution would be negligible in a local or regional context.

### Operation

Wind erosion of bare soils has the potential to create airborne dust. The proposal would ensure that

It is now generally accepted that the release of certain gases including, most notably carbon dioxide, contribute to global climate change. These gases are collectively referred to as 'greenhouse gases'. Construction and maintenance activities where plant and equipment uses diesel, gasoline and other hydrocarbons, result in greenhouse gas emissions and are likely to contribute to climate change. However, the construction, operation, upgrading and decommissioning of the Sunraysia SF would produce minimal CO<sub>2</sub> emissions when compared to conventional coal and gas fired powered stations; refer to Table 8-4.

Table 8-4 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
Solar PV plant	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)

Operation of the Sunraysia SF would help reduce greenhouse gas emissions and move towards cleaner electricity generation. Approximately 430 mega tonnes of CO<sub>2</sub> equivalent per annum would be avoided while the Sunraysia SF is operational, as compared to equivalent fossil-fuel based energy generation.

### 8.6.3 Environmental Safeguards

No.	Environmental Safeguard	Solar farm		
		C	O	D
AQ 1	<ul style="list-style-type: none"> <li>The CEMP would include protocols to minimise and control dust. Measures may include:                             <ul style="list-style-type: none"> <li>Use of a water cart (truck) to wet the access track and exposed dusty surfaces as appropriate to the conditions of the site.</li> <li>Stabilisation of any disturbed areas that expose soil and increase erosion risks.</li> </ul> </li> </ul>	C		D
AQ 2	<ul style="list-style-type: none"> <li>Works must cease if airborne dust cannot be controlled.</li> </ul>	C		D
AQ 3	<ul style="list-style-type: none"> <li>Groundcover must be maintained to minimise dust from wind erosion.</li> </ul>		O	
AQ 4	<ul style="list-style-type: none"> <li>Construction plant and vehicles must be maintained according to manufacturer's requirements.</li> </ul>	C		D
AQ 5	<ul style="list-style-type: none"> <li>Alternative sources of energy (solar panels) must be considered for any temporary compound sites.</li> </ul>	C		D

## **8.7 SOCIO-ECONOMIC FACTORS**

### **8.7.1 Existing environment**

#### **People**

The Balranald Local Government area (LGA) had a population of approximately 2,353 people in the 2011 census, with a median age of 42.7. About 7% of the total population were of Aboriginal and Torres Strait Islander descent and 15% of the population were born overseas. The working age population (15-64 years) was around 64% in 2011. The median working age for full time employment is 45, compared with the Australian average of 40 (ABS 2011).

#### **Industries**

The main local industries for employment within the Balranald LGA is agriculture, forestry and fishing which provides approximately 30.9% of employment (ABS 2014). In the past the local economy has been predominantly reliant on grains, wool, sheep and cattle farming. New industries are now emerging such as viticulture, horticulture and niche agricultural industry (council). Tourism in the region becoming an important economic driver (Balranald Shire Council 2016).

Health care and social assistance was the second largest industry at 9.9%. This was followed by the retail trade at 9.5% and the accommodation and food service industries at 7.1%. The unemployment rate for the area is 4.4%, which is lower than the Australian average of 5.6% (ABS 2014). The renewable energy industry appears to be an emerging industry in the area, with SEARS issued on 4 November 2016 for another solar farm application on land adjoining the proposal area to the north.

#### **Renewable energy solar projects and the Balranald LGA community**

Research indicates there is widespread support for solar energy as a source of energy for electricity generation in Australia; 78% of respondents are in favour of large scale solar energy facilities and 87% are in favour of domestic installations (ARENA n.d). The large scale solar energy sector is still at a relatively early stage of development in Australia. While most members of the community are aware of large scale solar energy, many do not know a great deal about their impacts (ARENA n.d.). This EIS addresses the associated impacts and mitigation measures to reduce the impact on the local community and the environment.

#### **Community feedback on the proposal**

A Community Consultation Plan has been prepared for the Sunraysia SF to guide all community engagement activities (Appendix I). Community update newsletters have been distributed to the community and community consultation meetings were held on 6 October and 9 November 2016. To date responses from the community have been positive with key issues raised relating to employing and training the local labour force, availability of accommodation, ensuring Aboriginal Cultural heritage is respected, incorporating a tourism component and ensuring access along The Cut Line remains open for neighbouring farms (refer to Section 5 for details).

## **8.7.2 Potential impacts**

### **Construction, upgrades and decommissioning**

During construction, the Sunraysia SF would provide a significant benefit to the local and regional economy through generation of employment and demand for goods, services and accommodation. It is estimated the Sunraysia SF would generate employment for up to 250 staff at peak construction. Many of these could be drawn from the local area. Additional workers moving to the area temporarily would stimulate local economic activity.

Conversely, the temporary influx may place pressures on local services such as accommodation and health services. The first has been raised during early consultation with the local community. Additional demands for accommodation and additional traffic may present an adverse effect on local tourism, if coinciding with local festivals for example. Mitigation strategies to address these impacts centre on consultation with the community, so that benefits can be maximised and conflicts resolved where possible. Drawing a workforce from the local area could also minimise the pressure on certain services such as accommodation.

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

### **Operation**

The development of rural land uses compatible with agricultural activities, such as solar power generation, have potential to provide increased economic security to rural economies through diversification of employment opportunities and income streams.

Considering the local economy is dominated by agriculture, it is relevant to note that projected global warming will increase potential evaporation and water demand, potentially reducing the capacity of arable land.

Pittock (AGO, 2003) observed that a significant proportion of Australian exports are agricultural products sensitive to global warming impacts. Federal Government publications note that failure to adequately mitigate increases in emissions will lead to greater costs for adaptation to consequences of climate change.

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

Maoneng has committed to creating a safe and enjoyable environment during the development of the project. Maoneng would create collaboration opportunities with the local community through the expansion of the existing Discovery Centre with elements of Renewable Energy Integration. Maoneng has also committed to supporting the Balranald Central School by way of providing scholarship support for students and assisting in the training and skilling of work related to renewable energy.

The following specific socio-economic issues have also been discussed in more details in other sections of this EIS:

- Traffic: Section 8.2
- Noise: Section 7.4
- Visual: Section 7.3
- Land use: Section 7.5
- Air quality: Section 8.6

### 8.7.3 Environmental safeguards

No.	Environmental Safeguard	Solar farm		
		C	O	D
SOE 1	<ul style="list-style-type: none"> <li>Community consultation will be undertaken in accordance with the Sunraysia Solar Farm Community Consultation Plan (NGH Environmental 2016).</li> </ul>	C	O	D
SOE 2	<ul style="list-style-type: none"> <li>The workforce must be engaged locally where feasible to minimise pressures on local accommodation.</li> <li>Temporary accommodation at the proposal site through temporary demountables should be considered during the peak construction period to minimise pressure on available accommodation.</li> </ul>	C		D
SOE 3	<ul style="list-style-type: none"> <li>Maoneng to commit to initiatives to promote the renewable energy sector within the local community. Initiatives could include:                             <ul style="list-style-type: none"> <li>expanding the existing Discovery Centre with elements of Renewable Energy Integration.</li> <li>supporting the Balranald Central School by providing scholarship support for students.</li> <li>assisting in the training and skilling of work related to renewable energy.</li> </ul> </li> </ul>	C	O	D

## 8.8 CUMULATIVE IMPACTS

### 8.8.1 Existing environment

Cumulative impacts, for the purpose of this assessment, relate to the potential interaction with other projects in the local area. Cumulative impacts can occur concurrently or sequentially.

In terms of cumulative impacts, there are two potential projects which may have cumulative impacts with the Sunraysia SF:

- The Balranald Mineral Sands Project being proposed by Iluka Resources Limited. It includes the construction, mining, primary processing and rehabilitation of two linear mineral sand deposits located 12 kilometres and 66 kilometres north west of Balranald. The proposed construction start date is not known. Specific impacts are discussed below.
- The Limondale Sun Farm being proposed by Overland Sun Farming Company Pty Ltd on the land to the north and adjacent to the proposal site. The Limondale Sun Farm would have a capacity of around 100 MWAC and connect to the same Balranald substation as the Sunraysia SF (EMM 2016). The proposed construction start date is not known. Specific impacts are discussed below.

### 8.8.2 Potential impacts

#### Balranald Mineral Sands Project

Considering the distance of this project from the Sunraysia SF proposal site, there is unlikely to be any cumulative impacts during construction or operation. The only potential cumulative impacts that could result are socio-economic impacts resulting from additional pressure on availability of accommodation for

the labour force to be employed. However, the Balranald Mineral Sands Project would include a workforce accommodation facility on site which would remove any pressures.

## **Limondale Sun Farm**

### Construction

#### **Noise impact**

Noise impacts through the use of plant machinery and vehicles would be heightened if the works on both solar farm are undertaken concurrently. However, residential and other noise sensitive are a considerable distance from both solar farms and construction noise from the Sunraysia SF are considerable lower than noise management levels (refer to Section 7.4). Cumulative impacts are therefore unlikely to increase construction noise impacts above noise management guideline levels. Overall, cumulative noise impacts are expected to be minor and would be managed within a Noise Management Plan, that considers both solar farm, where relevant. Should the two solar farms be built successively this may increase the duration construction may be heard by receivers. However, as explained above,

#### **Biodiversity**

The clearing of native vegetation, which is a key threatening process at both State and Commonwealth level, is considered a major factor in the loss of biological diversity. At least 61 per cent of the native vegetation in NSW has been cleared or highly modified since European settlement (NSW Scientific Committee 2001), and the removal of vegetation for the Sunraysia SF is contributing to this process. The cumulative impact of similar renewable energy projects, particularly where EECs are involved, can be considerable given that many poorly-conserved vegetation communities have a substantial portion of their extents represented on private land where the majority of renewable energy projects are proposed. Small losses of such communities, which may be insignificant at a project level, may accumulate over time to cause a significant reduction in the extent of remnant patches.

Cumulative impacts are considered best addressed by avoiding and minimising. Where avoidance is not possible, the impacts of each contributing project is assessed on a case by case basis. Long term mechanisms like offsetting through the BioBanking assessment methodology, are structured to address the ongoing impacts of multiple projects in a cohesive manner. For the Sunraysia SF, credits were generated through the BCC, therefore offsetting of biodiversity impacts has been considered.

#### **Traffic impacts**

Construction traffic along Balranald-Tooleybuc Road would increase if the Sunraysia SF and Limondale Sun Farm occur concurrently.

Similar to the Sunraysia SF, Balranald-Tooleybuc Road may need to be upgraded for construction and operational vehicles to enter the Limondale Sun Farm. The access to the latter would not be at the same location as Sunraysia SF access, which means two locations of the road, likely separated by a few kilometres, would need to be upgraded. This may increase delays experienced by motorists, though delays would remain low as motorists would need to slow down while passing through the road works. No detours would be required.

#### **Economic and resource impacts**

There is potential for positive cumulative economic effects of the Sunraysia SF and Limondale Sun Farm during the construction phase. They would potentially generate more jobs for local residences and income for local business suppliers. However, there may be some negative impacts if construction works are

undertaken concurrently. This includes additional pressure on availability of accommodation for the labour force to be employed.

Operation

During operation, cumulative impacts would be minimal. Impacts are identified as follows:

**Visual**

The VIA determined the Sunraysia SF to have an overall low level of visual impact. The addition of the Limondale Sun Farm would extend the overall area to be occupied by solar infrastructure. However, the visual impacts of the combined projects are expected to be similar and would be managed according to each project’s management measures.

**Noise**

Cumulative noise impacts during operation of the solar farms would be minimal and noise levels are likely to comply with the criteria conservatively established in accordance with the NSW Industrial Noise Policy 2000 without any specific acoustic treatment.

**Biodiversity**

The combined solar farm projects would pose minimal operational risks to biodiversity; specifically, no impacts to bird and bats during the solar farm operation, including barriers to fauna movement, are anticipated.

**Economic impacts**

The two solar farms would result in additional staff being employed within the locality resulting in positive employment impacts.

**Resource use**

The Balranald substation has a potential capacity of up to 700 MW. It would therefore currently have enough capacity to connect both the Sunraysia SF and Limondale Sun Farm proposals.

**Greenhouse gas emissions and air quality impacts**

The cumulative impact of additional renewable energy generator in the region would have positive impacts for NSW in terms of provision of electricity to meet increasing demand as well as the reduction of coal fired electricity generation with the associated environmental benefits.

**8.8.3 Environmental safeguards**

No.	Environmental Safeguard	Solar farm		
		C	O	D
C 1	<ul style="list-style-type: none"> <li>All construction management plans prepared for the Sunraysia SF must take into consideration the Limondale Sun Farm project should both projects occur concurrently.</li> </ul>	C		

## 9 ENVIRONMENTAL MANAGEMENT

### 9.1 ENVIRONMENTAL FRAMEWORK

The environmental risks associated with the Sunraysia SF would be managed by implementing a project-specific suite of mitigation measures detailed in Sections 7 and 8 and summarised in Section 9.2 below.

All commitments and environmental safeguards would be managed through the implementation of a Project Environmental Management Plan (PEMP) adapted to the phase of development (construction/upgrading, operation, decommissioning).

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, environmental work method statements, complaint response procedures and adaptive management mechanisms to encourage continuous improvement.

### 9.2 ENVIRONMENTAL SAFEGUARDS

The construction and operational environmental management plans and sub-plans required would be finalised reflecting both the risks identified in this EIS and the final infrastructure layout.

No.	Environmental Safeguard	Solar farm		
		C	O	D
Biodiversity				
BIO 1	<ul style="list-style-type: none"> <li>Preparation of Flora and Fauna Management Plan (FFMP) that would incorporate mitigation strategies below. The FFMP would form part of the Sunraysia Solar Farm Construction Environmental Management Plan.</li> </ul>	C		
BIO 2	<ul style="list-style-type: none"> <li>Native vegetation to be retained (EEC and trees) would be delineated (fencing or other method), and construction activities would be excluded from these areas. Clearing and construction contractors would be given inductions that make clear the importance of these features.</li> </ul>	C		
BIO 3	<ul style="list-style-type: none"> <li>A 'Clearing and Grubbing Plan' would be developed. This would include;               <ul style="list-style-type: none"> <li>best practice methods for the removal of woody vegetation and non-woody vegetation</li> <li>Where trees are to be retained, an adequate tree protection zone</li> <li>A provision for mulch reuse onsite, particularly to stabilise disturbed areas</li> <li>An unexpected threatened species finds procedure</li> </ul> </li> </ul>	C		
BIO 4	<ul style="list-style-type: none"> <li>Stockpile and compound sites would be located using the following criteria:               <ul style="list-style-type: none"> <li>Within the Development Envelope.</li> <li>In areas of low ecological conservation significance (i.e. cropped land, and avoiding drip line of native trees).</li> </ul> </li> </ul>	C		
BIO 5	<ul style="list-style-type: none"> <li>The location of transmission line towers will be designed to minimise native vegetation clearing</li> </ul>	C		

No.	Environmental Safeguard	Solar farm		
		C	O	D
BIO 6	<ul style="list-style-type: none"> <li>Use non barbed-wire on exterior fencing, unless required for public safety.</li> </ul>	C		
BIO 7	<ul style="list-style-type: none"> <li>Rehabilitation would be undertaken in all areas disturbed during construction. Where plantings are to be carried out they will utilise local native species to increase the diversity of the existing vegetation, as well as to improve the connectivity between patches in the landscape.</li> </ul>	C		
BIO 8	<ul style="list-style-type: none"> <li>Prepare a weed management plan that;               <ul style="list-style-type: none"> <li>Is consistent with DPI's <i>Prime Fact 1063 Infrastructure proposals on rural land</i> (DPI 2013)</li> <li>Allows for management of declared noxious weeds in accordance to the requirements stipulated by the <i>Noxious Weeds Act 1993</i></li> <li>Develops a protocol for weed hygiene in relation to plant, machinery and importation and management of fill</li> </ul> </li> </ul>	C	O	
BIO 9	<ul style="list-style-type: none"> <li>Vegetation groundcover, particularly beneath the low edge of the panels, would be monitored and any bare areas or erosion addressed (i.e. planting, jute mesh armouring etc.) to resist erosion and weed infestation.</li> </ul>		O	
BIO 10	<ul style="list-style-type: none"> <li>Carry out refuelling of plant and equipment, chemical storage and decanting at least 50 m away from farm dams in impervious bunds. Ensure that dry and wet spill kits are readily available.</li> </ul>	C		
BIO 11	<ul style="list-style-type: none"> <li>If night work is unavoidable, ensure lights are directed away from remnant vegetation.</li> </ul>	C		
BIO 12	<ul style="list-style-type: none"> <li>Develop a pest management plan, to cover all pest management issues at the Sunraysia SF site.</li> </ul>	C	O	
<b>Aboriginal heritage</b>				
Arch 1	<ul style="list-style-type: none"> <li>The proposed works be designed to avoid the site Sunraysia Solar Open Site 1 as described in the ACHA report.</li> </ul>	C		
Arch 2	<ul style="list-style-type: none"> <li>The development proposal would be able to proceed with no additional archaeological investigations.</li> </ul>	C		
Arch 3	<ul style="list-style-type: none"> <li>If complete avoidance of the recorded sites within the proposed solar farm area (Sunraysia Solar Oven 1 and Sunraysia Solar Oven 2) is not possible, the artefact identified should be collected and moved to a safe area within the property, as close as possible to their original location, but which will not be subject to ground disturbance. The collection and relocation should be undertaken by representatives of the registered Aboriginal parties. A new AHIMS site card will need to be completed identifying the new location of the moved artefacts.</li> </ul>	C		
Arch 4	<ul style="list-style-type: none"> <li>If Sunraysia Solar Open Site 1 cannot be avoided, further archaeological research should be undertaken in the form of surface salvage, which should be accompanied by excavations in order to establish the presence or absence sub surface deposits. Surface salvage and excavations would need to be conducted prior to any earthworks taking place. A technical report should be produced describing the surface salvage and excavations methodology and results.</li> </ul>	C		

No.	Environmental Safeguard	Solar farm		
		C	O	D
Arch 5	<ul style="list-style-type: none"> <li>Sunraysia prepares a Cultural Heritage Management Plan (CHMP) to address the potential for finding additional Aboriginal artefacts during the construction of the Solar Farm. The CHMP will outline an unexpected finds protocol to deal with construction activity. Preparation of the CHMP should be undertaken in consultation with the registered Aboriginal parties.</li> </ul>	C		
Arch 6	<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		
Arch 7	<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 parties and may include further field survey.</li> </ul>	C		
<b>Visual</b>				
V 1	<ul style="list-style-type: none"> <li>The mitigation measures detailed in the visual impact assessment (NGH Environmental 2016, Appendix E) including the following must be implemented: <ul style="list-style-type: none"> <li>Onsite vegetation screening for viewers for which a medium impact is confirmed following construction of the solar farm (refer to verification process below). This would be aimed at 'breaking up' not blocking views of onsite infrastructure.</li> <li>General methods to reduce visual impact. This would centre on the colour, form and positioning of infrastructure, to reduce the overall visual contrast of the project.</li> <li>A process for verification of predicted and actual impacts. This would improve the reliability of the measures and provide a trigger to undertake additional mitigation if required.</li> </ul> </li> </ul>	C	O	D
<b>Land use</b>				
LU 1	<ul style="list-style-type: none"> <li>Construction and operations personnel would drive carefully and below the designated speed limit, to minimise disturbance to livestock, crops and pasture, and dust generation.</li> </ul>	C	O	D
LU 2	<ul style="list-style-type: none"> <li>The site would be rehabilitated to allow continued agricultural land uses following decommissioning of the Sunraysia SF.</li> </ul>			D
LU 3	<ul style="list-style-type: none"> <li>Prepare a pest and weed management plan to manage the occurrence of noxious weeds and pest species across the site during construction and operation. The plans must be prepared in accordance with the Balranald Weed Management Policy and NSW DPI requirements.</li> <li>Where possible integrate weed and pest management with adjoining landowners.</li> </ul>	C	O	
LU 4	<ul style="list-style-type: none"> <li>Allow continued grazing on the site during operation.</li> </ul>		O	

No.	Environmental Safeguard	Solar farm		
		C	O	D
<b>Soils and water</b>				
SW 1	<ul style="list-style-type: none"> <li>An erosion and sediment control plan must be prepared prior to construction and decommissioning phase and any upgrades that may disturb soils and implemented. The plan must be prepared in accordance with: <ul style="list-style-type: none"> <li>Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition (Landcom 2004), known as 'the Blue Book'.</li> <li>Volume 2A Installation of Services (DECC 2008a).</li> </ul> </li> </ul>	C		D
SW 2	<ul style="list-style-type: none"> <li>The internal access track network must be built as a priority to minimise soil loss.</li> </ul>	C		
SW 2	<ul style="list-style-type: none"> <li>Groundcover plantings must be placed and maintained below the solar panels and any other disturbed areas to minimise erosion.</li> </ul>		O	
SW 3	<ul style="list-style-type: none"> <li>The proposal site must be monitored following heavy rain or wind events to ensure no erosion and sedimentation has occurred. Any issues recorded must be promptly rectified to prevent any further soil loss.</li> </ul>	C	O	D
SW 4	<ul style="list-style-type: none"> <li>A Spill Response Plan must be prepared and include measures to: <ul style="list-style-type: none"> <li>Manage the storage of any potential contaminants onsite</li> <li>Mitigate the effects of soil and water contamination by fuels or other chemicals (including emergency response and EPA notification procedures).</li> <li>Prevent contaminants affecting adjacent pastures and dams.</li> </ul> </li> </ul>	C	O	D
<b>Transport</b>				
TT 1	<ul style="list-style-type: none"> <li>A traffic control plan must be prepared and approved by RMS prior to construction and decommissioning. The traffic management plan must ensure that access to the Cut Line is maintained at all times.</li> </ul>	C		D
TT 2	<ul style="list-style-type: none"> <li>Balranald-Tooleybuc Road must be upgraded prior to starting any other works on the proposal site.</li> </ul>	C		
TT 3	<ul style="list-style-type: none"> <li>Ongoing consultation with stakeholders including Roads and Maritime Services, Balranald Council, local landholders and emergency services must be undertaken to inform them of changes to road use and conditions during construction and decommissioning.</li> </ul>	C		D
TT 4	<ul style="list-style-type: none"> <li>A direct contact phone number must be provided to all stakeholders to enable any issues or concerns relating to traffic and access to be rapidly identified and addressed.</li> </ul>	C	O	D
TT 5	<ul style="list-style-type: none"> <li>To minimise traffic impacts, car pooling and buses would be organised to transport personnel to and from the proposal site.</li> </ul>	C		D
<b>Hazards</b>				
EMF 1	<ul style="list-style-type: none"> <li>All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia.</li> </ul>	C		

No.	Environmental Safeguard	Solar farm		
		C	O	D
Aviation				
AV 1	<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		
Bushfire				
BF 1	<ul style="list-style-type: none"> <li>All electrical equipment would be designed in accordance with all applicable codes and industry best practice standards in Australia.</li> </ul>	C		
BF 2	<ul style="list-style-type: none"> <li>Buildings would comply with the Building Code of Australia (BCA).</li> </ul>	C		
BF 3	<ul style="list-style-type: none"> <li>Safety management processes to highlight to all staff and contractors through an induction process the potential hazards of activities onsite. This should include preparation and compliance with job-specific WMSs and emergency preparation/response drills.</li> </ul>	C	O	D
BF 4	<ul style="list-style-type: none"> <li>The NSW RFS be provided with a contact point for the Sunraysia SF, during construction and operation.</li> </ul>	C	O	D
BF 5	<ul style="list-style-type: none"> <li>Designation of a Sunraysia onsite safety representative responsible for ensuring implementation of safeguards. This representative would also regularly consult with the local NSW RFS to ensure familiarity with the Sunraysia Project and assist the RFS and emergency services as much as possible if there is a fire on-site during construction.</li> </ul>	C	O	D
BF 6	<ul style="list-style-type: none"> <li>Basic training of all staff in the use of fire-fighting equipment.</li> </ul>	C	O	D
BF 7	<ul style="list-style-type: none"> <li>Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction of the Sunraysia Project. This equipment will include fire extinguishers, a 1000 litre water cart retained on site as a precautionary basis, particularly during blasting and welding operations. Equipment lists would be detailed in Work Method Statements (WMS's).</li> </ul>	C		D
BF 8	<ul style="list-style-type: none"> <li>Slashing of vegetation on construction site before construction starts and as required to manage fuel loads.</li> </ul>	C	O	D
BF 9	<ul style="list-style-type: none"> <li>Ensure bulk matter fuel loads across the site are monitored during spring and that grazing pressure is available over spring and summer to minimise vegetation bulk and fuel loads prior to the bushfire danger period.</li> </ul>		O	
BF 10	<ul style="list-style-type: none"> <li>All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bush fire emergencies.</li> </ul>	C	O	D
BF 11	<ul style="list-style-type: none"> <li>Maintain a permanent source of water on site for firefighting purposes during operation. The volume and location where water should be kept would be finalised in consultation with NSW RFS.</li> </ul>	C	O	D
BF 12	<ul style="list-style-type: none"> <li>The use of a Hot Works Permit system to ensure a number of pre-requisites are satisfied prior to works commencing. Fire extinguishers would be present during all hot works.</li> </ul>	C	O	

No.	Environmental Safeguard	Solar farm		
		C	O	D
BF 13	<ul style="list-style-type: none"> <li>Where possible restrict the performance of Hot Works to specific areas (such as the Construction Compound temporary workshop areas).</li> </ul>	C	O	
Resource use and waste Generation				
RW 1	<ul style="list-style-type: none"> <li>Waste and energy management would be incorporated into the Construction Environmental Waste Management Plan, this would cover the risks associated with construction of the WRSF.</li> </ul>	C		
Air Quality				
AQ 1	<ul style="list-style-type: none"> <li>The CEMP would include protocols to minimise and control dust. Measures may include: <ul style="list-style-type: none"> <li>Use of a water cart (truck) to wet the access track and exposed dusty surfaces as appropriate to the conditions of the site.</li> <li>Stabilisation of any disturbed areas that expose soil and increase erosion risks.</li> </ul> </li> </ul>	C		D
AQ 2	<ul style="list-style-type: none"> <li>Works must cease if airborne dust cannot be controlled.</li> </ul>	C		D
AQ 3	<ul style="list-style-type: none"> <li>Groundcover must be maintained to minimise dust from wind erosion.</li> </ul>		O	
AQ 4	<ul style="list-style-type: none"> <li>Construction plant and vehicles must be maintained according to manufacturer's requirements.</li> </ul>	C		D
AQ 5	<ul style="list-style-type: none"> <li>Alternative sources of energy (solar panels) must be considered for any temporary compound sites.</li> </ul>	C		D
Socio-economic				
SOE 1	<ul style="list-style-type: none"> <li>Community consultation will be undertaken in accordance with the Sunraysia Solar Farm Community Consultation Plan (NGH Environmental 2016).</li> </ul>	C	O	D
SOE 2	<ul style="list-style-type: none"> <li>The workforce must be engaged locally where feasible to minimise pressures on local accommodation.</li> <li>Temporary accommodation at the proposal site through temporary demountables should be considered during the peak construction period to minimise pressure on available accommodation.</li> </ul>	C		D
SOE 3	<ul style="list-style-type: none"> <li>Maoneng to commit to initiatives to promote the renewable energy sector within the local community. Initiatives could include: <ul style="list-style-type: none"> <li>expanding the existing Discovery Centre with elements of Renewable Energy Integration.</li> <li>supporting the Balranald Central School by providing scholarship support for students.</li> <li>assisting in the training and skilling of work related to renewable energy.</li> </ul> </li> </ul>	C	O	D
Cumulative impact				
C 1	<ul style="list-style-type: none"> <li>All construction management plans prepared for the Sunraysia SF must take into consideration the Limondale Sun Farm project should both projects occur concurrently.</li> </ul>	C		

## 10 CONCLUSION

The Sunraysia SF proposal site is located around 17km south of the Balranald town centre and around 140km south east of Mildura, within the Balranald Shire Council Local Government Area (LGA).

The Sunraysia SF would have a nominal capacity of up to approximately 200 megawatts (MW) (AC) which may be built in stages and include energy storage. The objectives of the Sunraysia SF are to:

- Select and develop a site which is suitable for commercial scale solar electricity generation to 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.
- Develop a project which is acceptable to the local community.
- Provide local and regional employment opportunities and other social benefits during construction and operation.
- Construct a project with minimal adverse environmental impacts.

NGH Environmental has prepared this EIS on behalf of the proponent, Sunraysia Solar Farm Pty Ltd. This EIS has assessed the broader Sunraysia SF development envelope where infrastructure may be located.

Overall, the Sunraysia SF would represent a further contribution, at this locality, to Australia's transition to a low emission energy generation economy. The Sunraysia SF is considered compatible with existing land uses and highly reversible upon decommissioning, returning the site to its previous agricultural capacity.

The key environmental risks have been investigated through specialist investigations:

- Biodiversity impacts – the BAR concluded that no significant impacts to threatened species and ecological communities would result. However, offsets would be required. No referrals under the EPBC or TSC Act are considered to be required.
- Aboriginal heritage impacts – the Aboriginal Heritage survey and assessment identified eight stone artefacts found across the proposal area and three hearths as well as two clusters of burnt clay recorded as ovens. The heritage assessment identified that the impact to scientific values, if the sites within the proposal area were to be impacted by the current proposal, is considered low. The sites have little research value apart from what has already been gained from the information obtained during the assessment undertaken. The hearths and seven of the artefacts were recorded as a single site identified as Sunraysia Solar Open Site1. This site will be protected from impact, a result of modification to a section of the proposed transmission line.
- Visual impact - the VIA concluded that the construction, activities and operations would have a very low visual impact on the majority of people living in or travelling through the landscape surrounding the proposed solar farm. Some landscaping may be required but would be confirmed through a verification process following completion of construction.
- Noise impacts – the noise assessment concluded that noise impacts during construction, operation and decommissioning would be within the accepted noise criterion. Noise exceedances would not occur.
- Land use - While the agricultural output from the farm would be reduced by the operation of the solar farm this would form a very small reduction in the agricultural output of the Balranald area. The Sunraysia SF is reversible and would not result in the permanent loss of agricultural land.

A suite of management measures have been developed to address environmental impacts and risks to these and other physical, social and environmental impact areas. Key management strategies centre on

the development of management plans and protocols to minimise impacts and manage identified risks. The impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Impacts are considered justifiable and acceptable.

## 11 REFERENCES

- ABS, 2011 Balranald 2011 Census QuickStats, accessed 17 October 2016 from [http://www.censusdata.abs.gov.au/census\\_services/getproduct/census/2011/quickstat/LGA10300?opendocument&navpos=220](http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/LGA10300?opendocument&navpos=220).
- ABS, 2014, Balranald (LGA) Census regional summary, accessed 17 October 2016 from [http://stat.abs.gov.au/itt/r.jsp?RegionSummary&region=10300&dataset=ABS\\_REGIONAL\\_LGA&geocodeconcept=REGION&datasetASGS=ABS\\_REGIONAL\\_ASGS&datasetLGA=ABS\\_REGIONAL\\_LGA&regionLGA=REGION&regionASGS=REGION](http://stat.abs.gov.au/itt/r.jsp?RegionSummary&region=10300&dataset=ABS_REGIONAL_LGA&geocodeconcept=REGION&datasetASGS=ABS_REGIONAL_ASGS&datasetLGA=ABS_REGIONAL_LGA&regionLGA=REGION&regionASGS=REGION)
- Alsema, E.A. de Wild-Scholten, M.J, Fthenakis, V.M, (2006). *Environmental Impacts of PV Electricity Generation - A Critical Comparison of Energy Supply Options*. 21st European Photovoltaic Solar Energy Conference, Dresden, Germany, 4-8 September 2006.
- ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government
- ARENA (n.d) *Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry* [http://apo.org.au/files/Resource/ipsos-arena\\_solarreport.pdf](http://apo.org.au/files/Resource/ipsos-arena_solarreport.pdf) accessed 18 February 2016.
- Australian Energy Market Operator (AEMO) (2015). *National Electricity Forecasting Report - For the National Electricity Market (NEM) 2015*, <http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report>, accessed January 2016.
- Australian Greenhouse Office (AGO). (2003). *Climate change: An Australian Guide to the Science and Potential Impacts*. Australian Greenhouse Office, edited by B Pittock, 2003.
- Australian Government (2016) *National Pollutant Inventory* <http://www.npi.gov.au/npidata/action/load/map-search;jsessionid=50A28D3D44C5AA19C4BEA62526871D7F>, accessed 10 February 2016
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) (2015). *Fact Sheet: Electricity and health*, [http://www.arpansa.gov.au/RadiationProtection/Factsheets/is\\_electricity.cfm](http://www.arpansa.gov.au/RadiationProtection/Factsheets/is_electricity.cfm) accessed 28 February 2016.
- Balranald LEP (2010) [http://www.austlii.edu.au/au/legis/nsw/consol\\_reg/blep2010282/](http://www.austlii.edu.au/au/legis/nsw/consol_reg/blep2010282/)
- BOM (2016) Australian Ground Water Explorer <http://www.bom.gov.au/water/groundwater/explorer/>
- Chang, G.J. and Jennings, C. (1994). *Magnetic Field Survey at PG&E Photovoltaic Sites*, <http://www.osti.gov/bridge/servlets/purl/82309-WOEtJb/webviewable/82309.pdf>, accessed 3 August 2012.
- Clean Energy Regulator (2015) Renewable Energy Target, Annual targets webpage, <http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/The-certificate-market/The-renewable-power-percentage/Annual-targets>, accessed 25 January 2016
- Department of Environment and Climate Change (DECC) (2008a). *Managing Urban Stormwater: Soils and Construction Volume 2A –Installation of Services*. DECC, Sydney South.

- Department of Environment and Climate Change (DECC) (2008b). *Managing Urban Stormwater: Soils and Construction Volume 2C –Unsealed Roads*, DECC, Sydney South.
- Department of Environment and Climate Change (DECC) (2009). *Interim Construction Noise Guidelines*. Sydney.
- Department of Environment, Climate Change and Water (DECCW) (2010). *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*.
- Department of Environment, Climate Change and Water (DECCW) (2011). *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*.
- Department of Environment, Climate Change and Water (DECCW) (2011). *NSW Road Noise Policy*. DECCW, Sydney.
- Department of Environment and Conservation. (2006). *Assessing Vibration: a technical guideline*. Sydney: Department of Environment and Conservation.
- Department of Climate Change and Energy Efficiency (DCCEE) (2010) *Impacts of climate change*, webpage, <http://www.climatechange.gov.au/climate-change/impacts.aspx>, accessed 23 January 2016
- Department of Environment (2016) Quarterly update of the National Greenhouse Gas Inventory <https://www.environment.gov.au/system/files/resources/48275b92-3f4b-44d0-aa4e-50ece408df86/files/nggi-quarterly-update-jun-2016.pdf>
- Department of Industry, Resources and Energy (2016) MinView home page, <http://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/geoscience-information/services/online-services/minview#features-of-min-view> accessed 23 January 2016
- Department of Primary Industries (DPI) (2013) *Prime Fact, Infrastructure proposals on rural land*. [http://www.dpi.nsw.gov.au/data/assets/pdf\\_file/0020/359030/infrastructure-proposals-on-rural-land.pdf](http://www.dpi.nsw.gov.au/data/assets/pdf_file/0020/359030/infrastructure-proposals-on-rural-land.pdf) accessed 6 February 2016.
- EMM (2016), Limondale Sun Farm Request for Secretary's Environmental Assessment Requirements. <https://majorprojects.affinitylive.com/public/1fe89124497577af25240899e612b331/02.%20Limondale%20Solar%20Farm%20-%20Preliminary%20Environmental%20Assessment.pdf>
- EPA. (2000). *NSW Industrial Noise Policy*. Sydney: EPA.
- Fthenakis, V.M., Kim, H.C. and Alsema, E. (2008). *Emissions from Photovoltaic Life Cycles* Environment Science & Technology, 2008, 42 (6), pp 2168–2174, <http://pubs.acs.org/doi/full/10.1021/es071763g>, accessed 12 February 2016.
- Fthenakis, V., Kim, H.C., Frischknecht, R., Raugei, M., Sinha, P., Stucki, M. (2011). Life Cycle Inventories and Life Cycle Assessment of Photovoltaic Systems, International Energy Agency (IEA) PVPS Task 12, Report T12 - 02:2011
- IBRA v.7 (2012) <http://www.environment.gov.au/land/nrs/science/ibra#ibra>
- Intergovernmental Panel of Climate Change (IPCC) (2013) : *Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

- International Commission on Non-Ionizing Radiation Protection (ICNRP 1998) *ICNRP Guidelines for limiting exposure to time - varying electric, magnetic and electromagnetic fields (up to 300 ghz)* <http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf> accessed 14 February 2016.
- International Commission on Non-Ionizing Radiation Protection (ICNRP 2010) Fact Sheet on the *Guidelines for limiting exposure to time - varying electric, magnetic and electromagnetic fields (1hz to 100kHz)* <http://www.icnirp.org/cms/upload/publications/ICNIRPFactSheetLF.pdf> accessed 28 February 2016.
- International Commission on Non-Ionizing Radiation Protection (ICNRP 2016) Low Frequency 1Hz to 100kHz webpage <http://www.icnirp.org/en/frequencies/low-frequency/index.html> accessed 28 February 2016
- Landcom (2004). *Managing Urban Stormwater, Soils & Construction* (Volume 1). NSW Government.
- Mitchell, P (2002). Descriptions for NSW (Mitchell) Landscapes. Report prepared for the NSW National Parks and Wildlife Service.  
<http://www.environment.nsw.gov.au/resources/conservation/LandscapesDescriptions.pdf> accessed 10 February 2016.
- NGH Environmental (2016) Visual Impact Assessment Sunraysia Solar Farm, Balranald.
- NSW Department of Planning (2010). Discussion Paper On Planning For Renewable Energy Generation - Solar Energy, prepared April, 2010.
- NSW Environment Protection Authority (2016) Contaminated lands register.  
<https://www.epa.nsw.gov.au/prclmapp/searchregister.aspx> accessed 10 February 2016
- NSW Government (2005) Floodplain Development Manual, the management of flood liable land.
- NSW Government (2013) *NSW Renewable Energy Action Plan*, accessed 19 January 2016.
- NSW Office of Environment and Heritage (OEH) 2007 *Mitchell Landscapes with per cent cleared estimates*.
- NSW Office of Environment and Heritage (OEH) 2014 *Framework for Biodiversity Assessment - NSW Biodiversity Offsets Policy for Major Projects*
- NSW Rural Fire Services (2006) Planning for bush fire protection.
- NSW Trade and investment (NSW T&I) (2015). *Electricity generation*, webpage,  
<http://www.resourcesandenergy.nsw.gov.au/energy-consumers/energy-sources/electricity> accessed 19 January 2016.
- National Renewable Energy Laboratory (NREL 2012), Renewable Electricity Futures Study.  
[http://www.nrel.gov/analysis/re\\_futures/](http://www.nrel.gov/analysis/re_futures/)
- Office of Environment & Heritage (OEH 2011) *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*.Ltd.
- Office of Environment & Heritage (OEH 2012), The land and Soil capability assessment scheme,  
<http://www.environment.nsw.gov.au/resources/soils/20120394lsc2s.pdf>
- Office of Environment & Heritage (OEH 2014)  
<https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjm1MvL-4jRAhUEUbwKHeB-DlwQFggbMAA&url=http%3A%2F%2Fwww.climatechange.environment.nsw.g>

[ov.au%2F~%2Fmedia%2FNARCLim%2FFiles%2FRegional%2520Downloads%2FClimate%2520Change%2520Snapshots%2FFarWestsnapshot.pdf&usg=AFQjCNHm195V9pkb1lEqdM6wCtfN190Tw&caid=rja](http://ov.au%2F~%2Fmedia%2FNARCLim%2FFiles%2FRegional%2520Downloads%2FClimate%2520Change%2520Snapshots%2FFarWestsnapshot.pdf&usg=AFQjCNHm195V9pkb1lEqdM6wCtfN190Tw&caid=rja)

- Repacholi M (2003) *An overview of WHO's EMF Project and the Health Effects of EMF Exposure*  
<http://www.who.int/peh-emf/meetings/archive/en/keynote4repacholi.pdf> accessed 11 January 2016
- Schleisner L. (2000). *Life cycle assessment of a wind farm and related externalities Renewable Energy*, vol. 20, pp. 279-288.
- Spaven Consulting (2011). *Solar Photovoltaic Energy Facilities: Assessment of potential for impact on aviation*. Report prepared January 2011, for RPS Planning and Development.
- Twyford Consulting. (2007). *Beyond Public Meetings: Connecting community engagement with decision making*, prepared by Twyford Consulting.
- Weisser, D (n.d) *A guide to life-cycle greenhouse gas (GHG) emissions from electric supply technologies*. International Atomic Energy Agency,  
[https://www.iaea.org/OurWork/ST/NE/Pess/assets/GHG\\_manuscript\\_pre-print\\_versionDanielWeisser.pdf](https://www.iaea.org/OurWork/ST/NE/Pess/assets/GHG_manuscript_pre-print_versionDanielWeisser.pdf) accessed 25 January 2016.
- World Health Organisation (WHO) (2007). *Electromagnetic fields and public health: Exposure to extremely low frequency fields*, Fact sheet N°322, June 2007.  
<http://www.who.int/mediacentre/factsheets/fs322/en/index.html>, accessed 01 August 2012.
- World Health Organisation (WHO) (2012). *Electromagnetic Fields* <http://www.who.int/peh-emf/about/WhatisEMF/en/>, accessed May and August 2012.
- World Health Organisation (WHO) (undated). *The International EMF Project brochure*,  
[http://www.who.int/peh-emf/about/emf\\_brochure\\_webversion.pdf](http://www.who.int/peh-emf/about/emf_brochure_webversion.pdf), accessed 01 August 2012.
- Wright, M. and Hearps, P. (2010). *Australian Sustainable Energy Zero Carbon Australia Stationary Energy Plan*, University of Melbourne Energy Research Institute- Beyond Zero Emissions.