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RENEWABLE INFRASTRUCTURE SPECIALISTS

Tamworth Solar Farm

Environmental Impact Statement

Volume 1

Prepared for: Tamworth Solar Farm Pty Ltd

January 2020

This Environmental Impact Statement has been prepared by PROJECTe on behalf of Tamworth Solar Farm Pty Ltd.

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Declaration

This environmental impact statement has been prepared by:

- Dr Daryl Brown (Bachelor Rural Science Hons I, PhD)
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I, Daryl Brown, declare that:

- This environmental impact statement has been prepared in accordance with Schedule 2 of the Environmental Planning and Assessment Regulation 2000.
- The environmental impact statement contains all available information that is relevant to the environmental assessment of the development.
- That the information contained in the statement is neither false nor misleading.

Daryl Brown
Senior Environmental Scientist
PROJECT.e

Executive Summary

Overview of the project

Tamworth Solar Farm Pty Ltd proposes to develop a solar farm near Somerton, approximately 25 km west of Tamworth, New South Wales. The proposed Site is within an area of agricultural land at "Bonnie Brae" 2209 Soldier's Settlement Road, Bective, on a single land title of approximately 230 hectares for which Tamworth Solar Farm Pty Ltd have secured an option to purchase. The rated output of the solar farm will be 65 MW (AC) and the facility will include a 19 MW/19 MWh battery energy storage system (BESS).

The 132 kV Tamworth to Gunnedah transmission line crosses over the southern part of the Site. A new substation will be built and a connection to the existing transmission line will be made from the new substation.

The proposed Site and surrounding area is mostly agricultural land, cleared of native vegetation, with current activities including grazing and dryland cropping. There are several scattered, isolated shade trees in poor condition. No permanent watercourses cross the property. There is an existing residential dwelling on the property which will be used as the Site administration office during operation.

In addition to the solar farm at Bonnie Brae, some roadworks are required along the transport route from the Oxley Highway. This work will include:

1. The construction of a deceleration lane on the Oxley Highway at the intersection with Babbinboon Rd.
2. The sealing of the intersection of Babbinboon Rd and Warminster Rd and the removal of one tree on this corner to improve the line of sight.

Strategic justification

The five coal-fired power stations currently operating in NSW are some of the oldest in Australia with the exception of Mt Piper. Over the next 10 to 15 years, at least three of these existing coal-fired power stations are likely to retire out of the NEM. These closures will leave a substantial gap in electricity generation capacity that will need to be filled.

Solar generation will play a significant role in the mix of new generation and storage that will be developed to replace aging coal-fired power stations in Australia. Solar generation can be firmed with either flexible gas, hydro, pumped hydro, batteries and other forms of energy storage. Firmed renewables are now the most cost-competitive form of new generation and cost less than the current wholesale electricity price (DPIE, 2019).

The 155 GWh of clean energy produced by the project each year will help Australia meet its targets as part of its commitments under the United Nations Paris Agreement on Climate Change. The NSW Government is also committed to effective action on climate change. They have recently developed the NSW Climate Change Policy Framework in support of the COP21 commitments and to

demonstrate action on climate change. This policy has a long-term objective of NSW achieving net-zero emissions by 2050.

At a regional level, there are also indications of broad support for large scale solar projects. One of the priorities for the Tamworth Regional Council, outlined within *the New England North West Regional Plan 2036,* is to "Identify and promote wind, solar and other renewable energy production opportunities." The Tamworth Regional Council are supportive of the project and see the benefits arising from job creation and increased economic activity.

Site selection

The proponent undertook an extensive screening process using geographical information systems and other data followed by ground truthing to identify a suitable site. The main criteria that were considered are listed below:

- Electricity grid assessment
- Land tenure
- Biodiversity
- Aboriginal cultural heritage
- Visual impact
- Land use
- Topography
- Access

The site was selected for the following reasons:

- An existing 132 kV line passes through the property that has the required capacity.
- The Site is close to the Tamworth load.
- There were no known Aboriginal heritage sites.
- The land had been cultivated for some time. The only native vegetation were isolated paddock trees.
- Only a limited number of surrounding houses had views to the land and views could be screened using vegetation.
- The topography is flat.
- The land is not mapped as Biophysical Strategic Agricultural Land.
- Access to the Site is good.

Project infrastructure

The project involves the construction and operation of a photovoltaic (PV) electricity generation facility with a lithium-ion battery energy storage system (BESS). The solar farm consists of the following elements:

- Photovoltaic modules and mounting frames (200,000 panels on single axis trackers),
- Power conversion units (19 units),
- 33 kV collector network of underground cables,
- Substation and control room,
- Battery Energy Storage System (BESS)(19 MW / 19 MWh),
- Security fence,
- Operations and maintenance buildings,

- Temporary construction facilities,
- Water tank for firefighting,
- Internal roads, and
- External road upgrades

Community and stakeholder engagement

The main stakeholders in the project are:

- Landholders adjacent to the solar farm,
- Landholders adjacent to the transport route,
- The Aboriginal community,
- The Tamworth Regional Council, and
- Other government authorities and representatives.

Tamworth Solar Farm Pty Ltd has held a number of consultation sessions with the main stakeholders to gain an understanding of their interests and concerns in the project. This information has been used to refine the design of the project and to develop appropriate mitigation measures.

These consultation sessions have included visiting landholders at their properties, a community information session, establishment of a web page, a BBQ consultation session with neighbouring landholders, meetings with Tamworth Regional Council and phone calls.

Landholders neighbouring the solar farm are primarily concerned about visual impact and what impact that might have on property prices. Landholders on the transport route are mainly interested in management of the road condition and dust.

Biodiversity

A contributing factor to the selection of this Site was that the area had been cleared and cultivated over 100 years ago and only scattered paddock trees remain (24 in total). The Site has been restricted to the area within the Bonnie Brae property that has been cultivated and defined in the property vegetation plan (PVP) as category 1 land.

An assessment of biodiversity has been conducted in accordance with the Biodiversity Assessment Method (OEH, 2017). The biodiversity assessment qualified as a streamlined paddock tree assessment as it met the definition of paddock trees. This means the cultivated agricultural land covered by the PVP does not require assessment, but the native trees do.

Within the solar farm Site, there were:

- 21 live White Box trees (*Eucalyptus albens*),
- 1 dead White Box tree, and
- 3 Blakely's Red Gum (*Eucalyptus blakelyi*).

At the sight distance Development Site, there is a single *Acacia stenophylla* that will be impacted by the development.

The deceleration lane Development Sites was dominated by Coolatai Grass (*Hyparrhenia hirta*) and other exotic species.

The Plant Community Type (PCT) that was determined to represent the remnant trees in the Development Site was PCT433 - White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, BBS Bioregion. This PCT is associated with a Threatened Ecological Community under the *NSW Biodiversity Conservation Act 2016.*

Nineteen of these trees will be cleared for the development. The project will incur credits to offset the impact of clearing the paddock trees under the Biodiversity Offset Scheme.

Aboriginal cultural heritage

An Aboriginal heritage assessment for the project has been conducted in accordance with the relevant codes of practice and guidelines. A field survey took place in September 2019 and was attended by three Registered Aboriginal Parties from the local Aboriginal community. Ground surface visibility was generally very high in all three Development Sites.

Twenty-three Aboriginal sites were recorded in total. The deceleration lane Site has one open camp site (OS) and the rest of the Aboriginal sites (22) were recorded on, or immediately next to the solar farm Site. These 22 sites consisted of 11 isolated artefacts, 8 open camp sites and three culturally modified trees (only one within the Site).

The culturally modified trees will be avoided and will not be impacted. A Cultural Heritage Management Plan (CHMP) will be developed in consultation with the Registered Aboriginal Parties. The potential mitigation options for the stone artefacts are as follows:

- Modify the design so that some of the artefacts near the edge of the current array are avoided.
- Provide sufficient protection so that the panels can be constructed without impacting the artefact.
- Salvage and relocate the artefacts.

Historic heritage

The historic heritage assessment comprised of a desktop assessment and a field assessment. Heritage databases were searched for the surrounding area. Places of historic heritage were confined to villages and Tamworth. The field assessment also found no historic items on Site.

Land

The solar farm Site is on the lower slopes and flats of the Babinboon soil landscape where Brown Vertosols are the dominant soil type. Vertosols in the Babinboon landscape are of moderate to high fertility with good moisture storage potential. However, they are prone to structural and organic matter decline under cultivation. Erodibility under non-concentrated water flows is

generally low to moderate but can be high under concentrated flows. Soil tests confirmed that the soil erodibility factor is low.

There is no Biophysical Strategic Agricultural Land on the site. The majority of the land within the Site is mapped as Class 4 for land and soil capability. Class 4 land has moderate to severe limitations and is best suited to lower impact uses such as grazing. The land has been extensively used for cropping and grazing in the past. Once the solar farm is constructed, the land will be used for sheep grazing which is consistent with the land capability. The distance between the rows of panels is sufficient to allow tractors and equipment to operate. This will allow for maintenance activities such as weed spraying or mowing. The solar farm will not impact on the ability of neighbouring landholders to conduct their normal farming operations.

Some Athel Pine plants have been found on the Site. These plants will be removed at the commencement of construction.

A Land Use Conflict Risk Assessment (LUCRA) has been conducted for the project in accordance with the DPI's *Land Use Conflict Risk Assessment Guide* (2011) (LUCRA Guide). The LUCRA has identified that most land use conflict risks can be mitigated through management measures. Visual impacts may be an exception depending on the effectiveness of the visual screens and the time taken to establish them.

There are no mineral, coal or petroleum titles on the Site.

Visual

There are six landholders within 2 km of the Site that have a view to the Site either from the house or the house yard. Thirteen viewpoints were selected for analysis from these residences and from the surrounding public roads.

Although some residences will have views to the proposal it will only form a small portion of the broader view from these properties as, due to the nature of the topography and distinct lack of vegetation, views from the properties are quite expansive. The proposal will also not inhibit views to other key landscape features including the vegetated ridge lines of the nearby Melville Ranges to the West and other distant ranges.

The impacts assessed ranged from moderate to high however it is worth noting that most of the viewpoints assessed were within 1km of the development. Beyond this distance there are very few opportunities to view the proposal due to topography, access and vegetation.

The layout has been designed so that there are no panels south of the transmission line to reduce the impact on the closest neighbours. Extensive vegetation plantings will be established to screen views to the Site. Existing shelter belts that have been planted around the property boundary will be retained and enhanced.

Due to the relatively low height of the panels, the flat topography and the broad scale of the view, the boundary planting surrounding the proposal is likely to be effective in mitigating impacts and to better integrate the development into the surrounding landscape.

Once the vegetation screens are established and are fragmenting the view of the development, the viewpoints that initially had a high potential visual impact will have a moderate residual impact. Those viewpoints that initially had a moderate potential visual impact will have a low residual impact.

Noise

The results of the noise assessment demonstrated that construction emissions satisfy relevant Noise Management Levels (NMLs) at all assessed receivers, except for one receiver when noise intensive works (piling) are at their closest proximity in the southern panel array area. At this receiver, the noise levels may be up to 5 dB above the NML for a period of two weeks during standard construction hours (Monday to Friday, 7am to 6pm and Saturdays, 8 am to 1 pm). To effectively manage noise emissions, a Noise Management Zone (NMZ) will be established in the south of the Site. Only one item of significant noise generating equipment (ie piling rig or concrete pump) will operate at any one time within the NMZ. The project will liaise with the potentially affected receiver regarding the work schedule and the likely duration of any noise generating activities.

Construction traffic noise levels are predicted to satisfy the relevant *NSW Road Noise Policy* criteria.

Operational noise levels are predicted to satisfy the *NSW Noise Policy for Industry* Project Noise Trigger Levels (NPI PNTLs) at all assessed receivers.

Transport

The transport route to the Site from Tamworth will be along the Oxley Hwy, Babbinboon Rd, Warminster Rd and a short section of Soldier Settlement Rd. Trucks bringing generating equipment from either the Port of Newcastle or Sydney will use the Hunter Expressway and New England Highway to access Tamworth. Babbinboon Rd, Warminster Rd and Soldier Settlement Rd are local unsealed roads with a width of approximately 6m allowing for two-way traffic.

The total number of heavy vehicle movements over the construction period will be in the order of 2,800 movements. During the peak construction period (6 months), it is estimated there will be 20 heavy vehicles two-way per day. Outside the peak construction period, the estimated number of heavy vehicles will be 15 two-way per day. These trucks movements will typically be spread out across the working day. The total number of oversize/over-mass vehicles will be 10 movements.

The estimated light vehicle traffic movements during the peak construction period is 70 vehicle movements inbound and outbound. Outside the peak period

the average light vehicle traffic movement is anticipated to be 40 movements inbound and outbound.

For the regional road network (Oxley Highway, New England Highway, Hunter Expressway) the total traffic flows will remain well within acceptable limits and as such will continue to operate to a good level of service for all road users. The increase in flows created by the delivery vehicles will be less than 2 % and as such existing drivers will experience a negligible increase in delays.

Warminster and Babbinboon Roads provide access to a number of rural land holdings and do not provide a direct access for through traffic movements nor do they provide direct access to a town or village. As such the traffic flows on these roads is considered to be less than 100 vehicles per day two-way. Therefore, the addition of 70 light vehicle movements associated with the staff movements and 20 daily truck movements (per direction) will have a minimal and acceptable impact upon the operation of these local roads during construction.

During operation there will be one or two permanent staff who will drive a light vehicle to Site.

The intersection of Oxley Highway and Babbinboon Rd will be upgraded to allow for a left turn deceleration lane. The upgrade of the intersection will significantly improve the safety of this intersection which will benefit existing road users. Along the transport route from the Oxley Highway to the Site entrance, bends and intersections will be sealed. The impacts of dust will be mitigated by either using water carts or sealing sections of Babbinboon Rd and Warminster Rd. A protocol will be implemented for both undertaking dilapidation surveys and making any necessary repairs to the local road network during construction.

Flooding

The solar farm Site is located approximately 4 km as the crow flies from the Peel River. The lowest point of the Site is approximately 40 m above the Peel River channel level. There are 3 Strahler 1st order waterways and 1 Strahler 2nd order waterway within the Site. These ephemeral waterways generally have no defined channel or riparian vegetation.

An assessment was conducted of the flood risk both from the Peel River and local watercourses within and around the site. It was concluded that the site is not at risk of flooding from the Peel River, however the site is large enough that runoff within the site can produce significant flow and flash flooding along the internal creeks.

The flood risk was mapped for the 1% Annual Exceedance Probability (AEP) event, under both existing site conditions and with the solar farm infrastructure. The assessment indicates that the proposed development will not impact on flood flows or levels beyond the site. The proposed development therefore would not significantly affect the existing SES community response planning.

The solar farm is compatible with the flood risk. Panels will not be placed within the 1% AEP event floodway, however parts of the array will be within the flood fringe and flood storage areas where water is shallow and slow moving. The height of the panels above the ground will ensure that panels are not impacted by flood water.

Flood risk will be included in the Site emergency response plan. The plan will provide for training about flood risks and provide direction about actions to take in case of flash flooding of creeks either within the site or on access roads to the site.

Water

The proposed development has potential to impact on water quality through erosion / sedimentation and contamination (eg hydrocarbon spills). During construction, erosion and sediment control mitigation measures will be implemented as part of the Construction Environmental Management Plan. Standard mitigation measures around refueling and storage and handling of hazardous materials will minimise the risks of spills. During operations, the Site will be under permanent pasture which will result in lower level of soil erosion relative to the current land use practice of mixed cropping and grazing.

During construction, approximately 10 ML of water will be required for dust suppression. This will be provided by the existing dams or externally sourced. During operations, a minimal quantity of water will be required for the staff amenities. This will be provided by rainwater tanks.

No groundwater will be used apart from providing stockwater for sheep. There is negligible risk of the project impacting on groundwater resources and there are no mapped potential Groundwater Dependent Ecosystems within the Site.

Hazards and risks

The proposal is not defined as being “potentially hazardous” as per the thresholds in SEPP 33. Consequently, a Preliminary Hazard Analysis was not required for this proposal. The proposal has also been assessed as not being a potentially offensive industry.

Lithium-ion batteries (LIB) will be used on Site in the BESS. The major hazard associated with LIB is fire if the battery is damaged, defective or improperly used. The risk of fire developing from the BESS is very low as the BESS has the following controls:

- A battery management system that ensures the battery cells are maintained within the operating parameters.
- A heating and cooling system for keeping the batteries at the optimal temperature,
- A fire detection and suppression system,
- Enclosures to physically protect the batteries, and
- A perimeter security fence.

Electric and magnetic fields (EMF) exist whenever electric current flows. Therefore, the solar farm infrastructure will emit EMF. However, the EMF levels associated with the infrastructure are well below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) reference levels and EMF levels attenuate rapidly with distance from the source. Furthermore, staff will only be intermittently exposed to the EMF sources. Consequently, the risk of human health being impacted by exposure to EMF is low. The risk to the general public is negligible as they will not have access to the site.

Bushfire

The Site and surrounding lands are not classified as bush fire prone, as they are managed agricultural lands predominantly used for grazing and cropping. However, the area will still carry a grassfire if the grass is dry and there is sufficient interlinked fuel. A fire could start outside the Site and threaten the solar farm. Conversely, ignitions from PV equipment is theoretically possible from electrical faults such as arc faults, short circuits, ground faults and reverse currents. Measure to mitigate the risk of bushfire include:

- A 20m Asset Protection Zone around all infrastructure,
- Access tracks
- Management of fuel loads,
- Provision of water supplies,
- Fire preparedness and response, and
- Measures to reduce the risk of ignitions on days of high fire danger.

Socio-economic

The Tamworth Solar Farm will have significant positive direct and indirect impacts for both the local region and other industries in Australia. These impacts include;

- Creation of employment during construction, operation and decommissioning.
- Contracts for the civil engineering and construction sectors. This work will include, site preparation, fencing, road construction and earthworks, steel assembly, electrical services, machinery hire, transport services, etc.
- Purchase of materials equipment such as switchgear, transformer, inverters, road base etc.
- Economic stimulus through employee demand for service industries such as accommodation, food, fuel and entertainment.

At the peak of construction there will be about 200 people working onsite. Approximately 50% of these workers will be local residents in the surrounding area. This will be a significant benefit to the community at a time when the local economy is suffering from one of the worst droughts on record.

There are at least 900 hotels rooms in Tamworth and occupancy rates are low (<50%). These businesses will appreciate the increase in economic activity generated by the project. Due to the large number of accommodation options and low occupancy rates, it is unlikely that accommodation of workers would restrict access to accommodation for tourists.

Waste

The project will produce a number of waste streams during the construction period. Minor quantities of waste will also be generated ongoingly during the operations phase.

All wastes produced by the project will be classified, stored and handled in accordance with the Waste Classification Guidelines – Part 1: Classifying Waste (EPA 2014). Waste management plans will be developed for construction, operation and decommissioning.

At the end of its operational life, the components of the solar farm will be reused or recycled where-ever possible. A solar panel recycling business has recently established in South Australia and it is anticipated that this industry will grow. Where components cannot be recycled, they will be disposed at an approved waste management facility.

Justification

The development of the Tamworth Solar Farm is in the public interest for the following reasons:

- There is a definite need to develop more generation capacity as existing coal fired generators retire out of the NEM.
- Firmed renewables are now the most cost-competitive form of new generation.
- The project will help Australia meet its targets as part of its commitments under the United Nations Paris Agreement on Climate Change.
- The Tamworth Regional Council is supportive of the project and it aligns with the council's stated objective to "Identify and promote wind, solar and other renewable energy production opportunities."
- During operation, the solar farm will not produce air emissions, or any significant noise emissions or any significant waste streams. It will also not consume water or other resources except sunlight.
- Agriculture will continue on the Site in a form that is commensurate with the land capability. The agricultural productivity of surrounding land will not be impacted.
- There will be visual impacts to 6 surrounding landholders, however these impacts will be mitigated through the establishment of vegetation screens.
- Impacts on biodiversity are low. The nineteen isolated paddock trees that will be cleared will be offset under the Biodiversity Offset Scheme.
- The impacts on Aboriginal cultural heritage will be managed through the Cultural Heritage Management Plan. The proponent has committed to employ local Aboriginal people as part of the construction team to help facilitate the management and protection of Aboriginal heritage.
- The proposal is consistent with the objects of the *EP&A Act*.
- The project is also consistent with the principles of ecologically sustainable development particularly the principle of inter-generational equity. The Tamworth Solar Farm will assist NSW in its transition to an affordable low carbon energy system.

- Tamworth Solar Farm Pty Ltd will develop a community benefit sharing scheme to support community projects in the local area.
- During the construction of the solar farm up to 200 jobs will be created. Approximately half of these will be from the local region.
- The construction and operation of this significant project will provide economic stimulus to the local economy.

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Abbreviations

AC	Alternating current
ADG code	The Australian Code for the Transport of Dangerous Goods by Road and Rail
AEMO	Australian Energy Market Operator
ARPANSA	The Australian Radiation and Nuclear Safety Agency
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BESS	Battery energy storage system
BOM	Bureau of Meteorology's
BOS	Biodiversity Offsets Scheme
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
DA	Development Application
DEMP	Decommissioning Environmental Management Plan
DoEE	Commonwealth Department of Energy and the Environment
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
ELF	Extremely Low Frequency
EMF	Electric and magnetic fields
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
EPA	Environment Protection Authority
EPL	Environment Protection Licence
FCAS	Frequency Control Ancillary Services
ICNG	NSW Interim Construction Noise Guideline
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IPC	Independent Planning Commission

IRENA	International Renewable Energy Association
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
kV	Kilovolt
LCOE	Levelised cost of electricity
LEP	Local environment plan
LGA	Local government area
LUCRA	Land Use Conflict Risk Assessment Guide
MNES	Matters of National Environmental Significance
MW	Megawatt
MWh	Megawatt-hour
NEM	National Electricity Market
NER	National Electricity Rules
NML	Noise Management Levels
NPI	Noise Policy for Industry
NPW Act	*National Parks and Wildlife Act 1974*
NSP	Network Service Provider
OEMP	Operational Environmental Management Plan
PANL	Project Amenity Noise Level
PCT	Plant Community Type
PHA	Preliminary Hazard Assessment
PINL	Project Intrusiveness Noise Level
PNTL	Project Noise Trigger Level
POEO Act	*Protection of the Environment Operations Act 1997*
PV	Photovoltaics
PVP	Property Vegetation Plan
RBL	Rating Background Level
RF Act	*Rural Fires Act 1997*
RNP	NSW Road Noise Policy
RTS report	Response to Submissions report

SCADA	Supervisory Control and Data Acquisition
SCR	Short Circuit Ratio
SEARs	Secretary's Environmental Assessment Requirements
SEECA	Social, Environmental, Economic Context Analysis
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TIA	Traffic Impact Assessment
TCP	Traffic Control Plan
VAR	Volt-ampere Reactive
WHO	World Health Organisation
WM Act	*NSW Water Management Act 2000*

1 Introduction

1.1 Overview of the project

Tamworth Solar Farm Pty Ltd proposes to develop a solar farm near Somerton, approximately 25 km west of Tamworth, New South Wales. The proposed Site is in an area of agricultural land at 2209 Soldier's Settlement Road, Bective, within a single land title of approximately 230 hectares for which Tamworth Solar Farm Pty Ltd have secured an option to purchase. The rated output of the solar farm will be 65 MW (AC) and the facility will include a 19 MW/19 MWh battery energy storage system (BESS).

The 132 kV Tamworth to Gunnedah transmission line crosses over the southern part of the project Site. A new substation will be built on Site as part of the project, and a connection to the existing transmission line will be made from the new substation.

Figure 1. 1 shows the regional context of the development and Figure 1. 2 provides a more detailed map of the Site location.

1.2 The proponent

The proponent for this project is Tamworth Solar Farm Pty. Ltd., a newly formed business whose team members individually have over 20 years' experience in large scale energy projects across Australia and internationally. The Responsible Person for Tamworth Solar Farm Pty. Ltd. is Victor Bocioc, Managing Director.

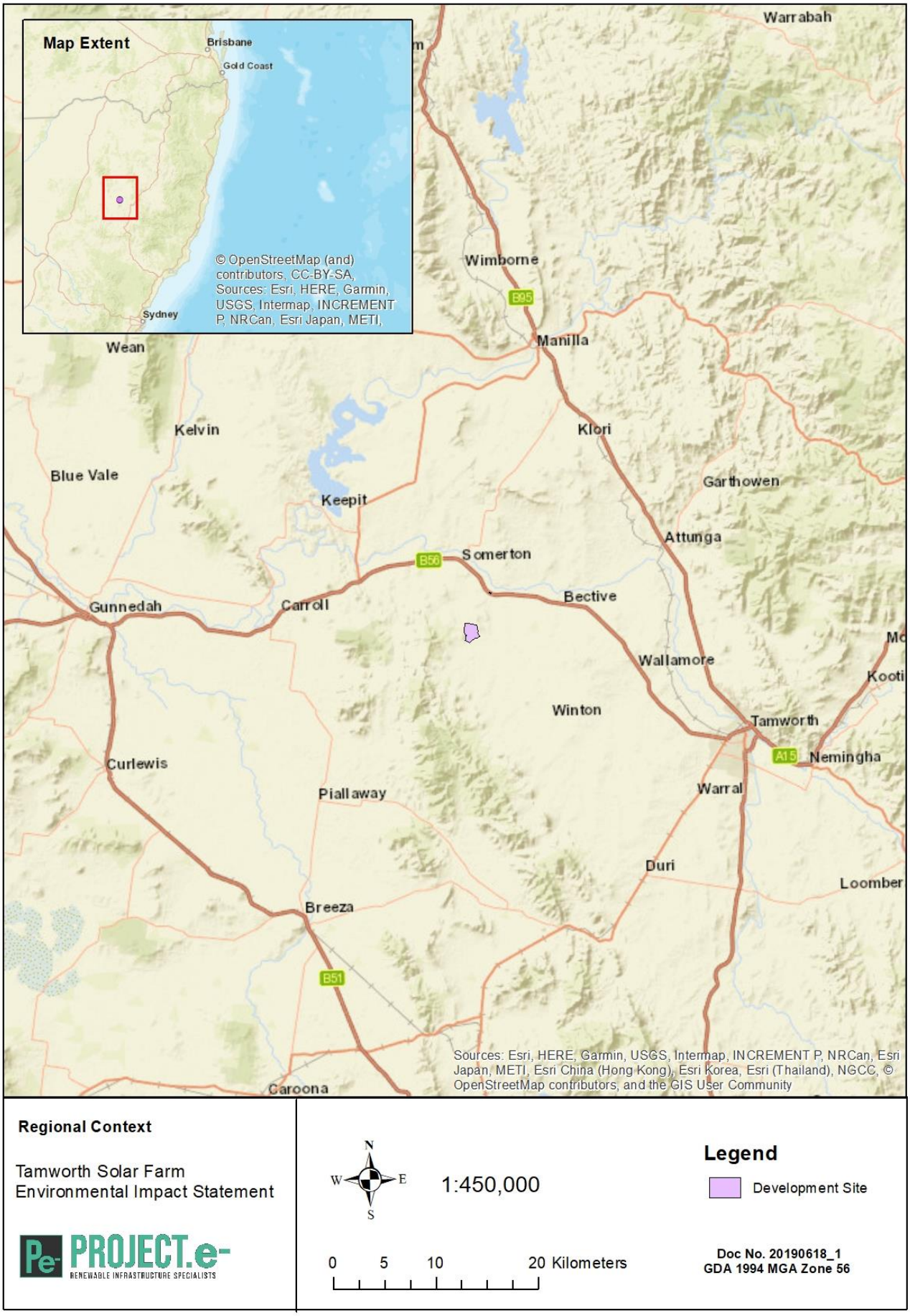
Address and ABN details are provided below:

Tamworth Solar Farm Pty Ltd
L17, 9 Castlereagh St.
Sydney. NSW. 2000.
ABN 19 622 261 232.

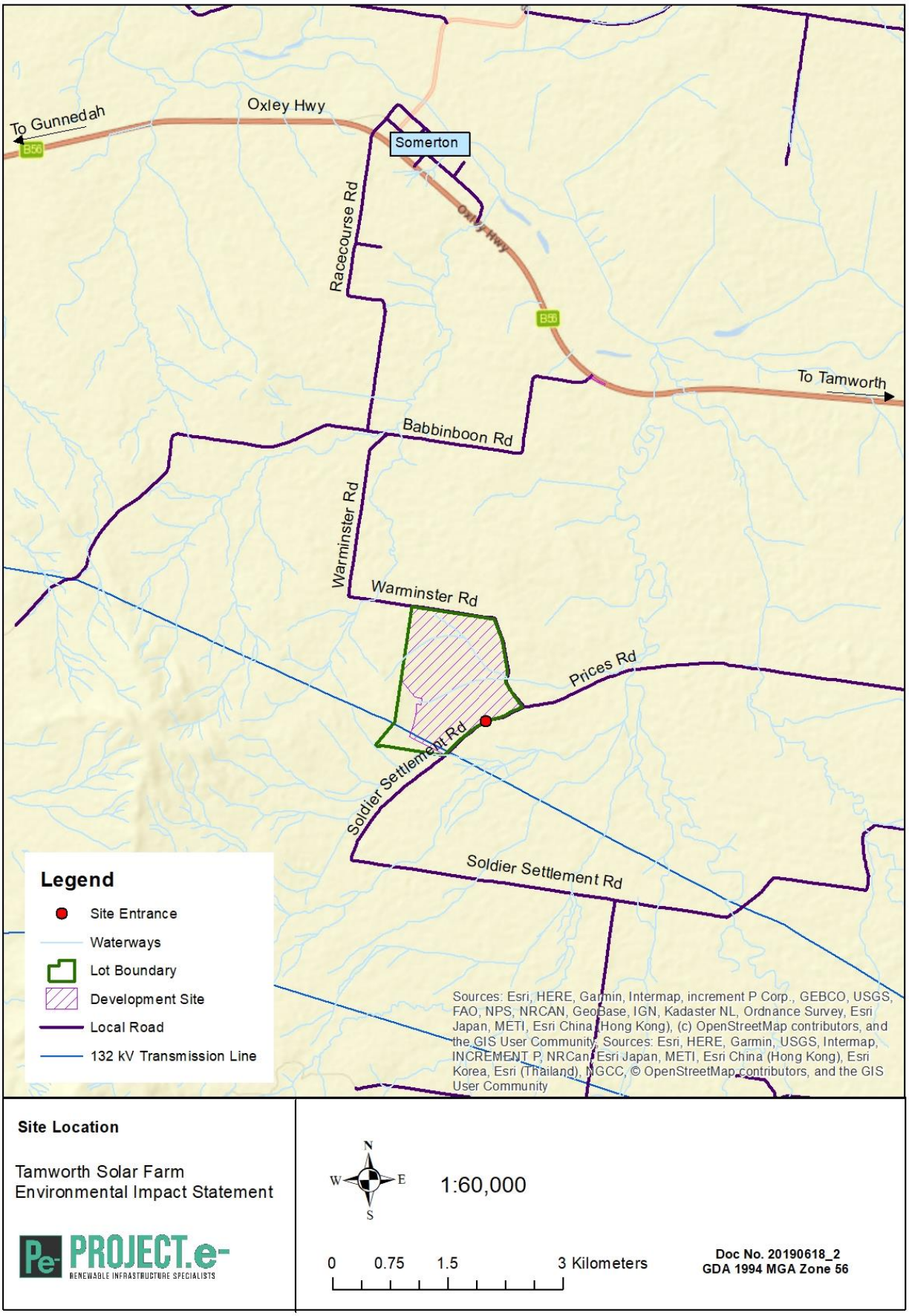
1.3 Project objectives

The objectives of the project are as follows:

- To produce electricity at a competitive price and sell that product into the National Electricity Market (NEM).
- To produce electricity with zero carbon emissions.



- **Figure 1. 1 Regional context**



- **Figure 1. 2 Site location**

1.4 Strategic justification of the development

1.4.1 Supply, demand and price imperatives

NSW currently produces less electricity than it consumes and relies on imported power from neighbouring states, predominantly Queensland, to fill the shortfall.

The five coal-fired power stations currently operating in NSW are some of the oldest in Australia with the exception of Mt Piper. Over the next 10 to 15 years, at least three of these existing coal-fired power stations are likely to retire out of the NEM. Liddell, which has a current operating capacity of 1680 MW, announced that they will commence closure in 2023. These closures will leave a substantial gap in electricity generation capacity that will need to be filled. Furthermore, as these power stations age, their reliability decreases, particularly on hot days when electricity demand is at its highest.

Development, financing, construction and commissioning of any new generation takes many years. To ensure that the grid is secure, planning for new generation must occur well in advance of when that generation is required. Solar generation is fortunate in that it is one of the quickest forms of new generation to progress from a project concept to energy production.

Solar generation will play a significant role in the mix of new generation and storage that will be developed to replace aging coal-fired power stations in Australia. Solar farms and wind farms are now the cheapest form of new generation in the grid (Lazard, 2019).

The cost of solar power has decreased dramatically in recent years and is likely to continue on this downward trajectory as the technology improves. The global weighted-average levelised cost of electricity (LCOE) of utility-scale solar PV has fallen by 77% between 2010 and 2018. Between 2017 and 2018, it fell by 13% (IRENA 2019).

Solar generation can be firmed with either flexible gas, hydro, pumped hydro, batteries and other forms of energy storage. The economics of solar firmed by these other energy sources is such that solar and wind are now the main source of new electricity being developed and purchased in the market. This fact is supported by the NSW Department of Planning Industry and Environment (DPIE) in the recently published NSW Energy Strategy where it states:

"*Firmed renewables are now the most cost-competitive form of new generation and cost less than the current wholesale electricity price. The economics of today's technologies create the opportunity for market forces to deliver on the NSW Government's three objectives for the electricity system*." (DPIE, 2019)

1.4.2 Security and reliability of the electricity grid

The Tamworth Solar Farm is currently being designed to meet a high level of Generator Performance Standards for inclusion as a generator in the NEM. The

solar farm will include a battery facility in order to store solar energy and dispatch at a time when the load requires, as well as participate in the ancillary services market. The Tamworth Solar Farm was specifically sized to fit in with the local conditions and prevailing transmission network. Due to its location near a large load (Tamworth) and the capacity of the connecting transmission line (Transgrid 969) the energy generated will be consumed nearby hence lowering the overall losses in the region.

The security features of Tamworth Solar Farm will include the following:

- Reactive current injection during a fault to the Automatic standard of the National Electricity Rules (NER),
- Continuous uninterrupted operation during shallow disturbances with the voltage bandwidth 0.9 – 1.1 as per the Automatic standard,
- Full operation down to a Short Circuit Ratio (SCR) of 2.5 which is well below the normal operating level of 10
- Duplicate communications for protection and SCADA, including a feed to the Australian Energy Market Operator (AEMO) of all relevant data points

Tamworth Solar Farm will be participating in the following markets:

- Dispatch - energy
- Frequency Control Ancillary Services (FCAS) – Regulation raise and lower
- FCAS – contingency (lower events – solar farm, raise events – battery)
- Assist in system restart by energising line 969 with the battery under certain conditions

To enable this participation, the Tamworth Solar Farm will have the appropriate communications and control facilities in place. This includes but not limited to Automatic Generation Control and Active Power Ramping. If required by the Network Service Provider (NSP), the Tamworth Solar Farm will also participate in the Volt-ampere Reactive (VAR) dispatch program in the region.

Overall, the Tamworth Solar Farm will act in a very similar manner to a traditional synchronous generator via the inclusion of the battery facility. The state-of-the-art inverters will act in a beneficial way to enhance the grid by providing security and reliability.

1.4.3 Climate change

The 155 GWh of clean energy produced by the project each year will help Australia meet its targets as part of its commitments under the United Nations Paris Agreement on Climate Change. At the COP21 climate talks in Paris (December 2015), the Australian Government committed to, and has since ratified, an emissions target of a 26-28% reduction by 2030 compared to 2005 levels.

The NSW Government is committed to effective action on climate change. They have recently developed the NSW Climate Change Policy Framework in support of the COP21 commitments and to demonstrate action on climate change. This policy has a long-term objective of NSW achieving net-zero emissions by 2050.

There is also strong community support for the development of renewable energy. The report *Community Attitudes to Renewable Energy in NSW* (Office of Environment and Heritage, 2015), acknowledges that there is broad public support in NSW for the adoption of alternative, renewable, low emission energy generation sources.

1.4.4 Local government support

At a regional level, there are also indications of broad support for large scale solar projects. The Mayor of Tamworth Regional Council, in discussion with the project team in January 2018, said that many people in his municipality were "telling us they want a focus on renewable energy". People see the benefits arising from renewable projects in terms of the creation of jobs and increased economic activity.

One of the priorities for the Tamworth Regional Council, outlined within *the New England North West Regional Plan 2036,* is to "Identify and promote wind, solar and other renewable energy production opportunities."

The Tamworth Solar Farm can play a part in fulfilling the local and global need for renewable, clean, reliable energy generation.

1.5 Alternatives considered

1.5.1 Do nothing

The case for the project is outlined in Section 1.4. In addition to these justifications, there are also the benefits of employment opportunities and the direct and indirect economic benefits to the local economy. These are discussed in more detail in Section 5.12.

The consequence of not proceeding with the project would be to forego the benefits to the local, regional and national energy systems, and the potential social and economic benefits from the project.

1.5.2 Alternative technology

As previously mentioned in Section 1.4, a range of technologies are likely to be deployed to meet increases in electricity demand and gaps left as existing coal-fired generators retire. These technologies include solar, wind, flexible gas plants, pump hydro and battery storage. Wind and solar PV will play a major role as they are currently the cheapest form of new power. Solar has some advantages over wind in that it has fewer impacts in relation to visual, noise and bird strike. Consequently, a broader range of sites are available to solar farms relative to wind farms.

1.5.3 Alternative locations

The proponent undertook an extensive screening process using geographical information systems and other data followed by ground truthing to identify a suitable site. This process resulted in the Tamworth project being front runner for their current focus in NSW. The criteria that were considered and the initial assessment of those criteria are detailed below.

1.5.3.1 Electricity grid assessment

Criteria. Ability to connect with low cost to extra-high voltage transmission line, with capacity to carry expected energy production. This criterion is critical to the project and is a major driver for site selection.
Assessment. The 132 kV line passes directly through the property. This is a significant advantage over sites where there is a need to construct a connecting transmission line over other landholdings. Furthermore, the transmission line connects to Tamworth which is a significant load. This proximity to a major load and the capacity of the line will mean that losses will be low.

1.5.3.2 Land tenure

Criteria. Straightforward land tenure to enable an option for purchase or lease from preferably just one landowner
Assessment. The land is owned by a single landholder who was willing to sign an option for the land.

1.5.3.3 Flora and fauna

Criteria. Minimal or no native vegetation. No known threatened species.
Assessment. The land proposed for the development is currently used for cropping and grazing. The project area has been cleared of native vegetation, with the exception of isolated paddock trees (approximately 20), for over 100 years. A Crown Plan from October 1918, found during the legal due diligence process, shows most of the title had been cleared at that time, other than the scattered trees. A Property Vegetation Plan (PVP) for the Site, approved by North West Local Land Services in 2014, verifies the vegetation over almost all of the property (excepting the rocky outcrop in the southwest corner) as 'Non protected regrowth' where clearing and agricultural activities are allowed.

1.5.3.4 Aboriginal cultural heritage

Criteria. No known sites and not close to perennial waterways.
Assessment. A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) in September 2017 found that there were no known heritage sites near the proposed solar farm. There are no perennial water bodies on site and none in the immediate vicinity.

1.5.3.5 Visual impact

Criteria. Few immediate neighbours that look down onto the site.

Assessment. The area surrounding the solar farm is not densely populated and is screened from many surrounding residents by the topography and vegetation. There are 6 houses within 2 km that have views to the solar farm either from the house or the surrounding yard.

1.5.3.6 Land use

Criteria. No significant land use conflicts with existing or potential neighbouring land uses. Not high value or specialized agricultural enterprise area.
Assessment. The surrounding land is predominantly used for cropping and grazing. The solar farm will have no impact on these land uses. The land is zoned RU1 Primary Production. One of the objectives of this zones is "To permit subdivision only where it is considered by the Council to be necessary to maintain or increase agricultural production". The minimum lot size for the area is 400 Ha. There are no surrounding lots that could be subdivided and maintain the minimum lot size. Residential accommodation is prohibited.
The project Site falls outside of the areas mapped as Biophysical Strategic Agricultural Land (BSAL).

1.5.3.7 Topography

Criteria. Flat or gently undulating topography with no flood risk.
Assessment. The land is sufficiently flat and is at the head of a catchment. There is no risk of any substantial flooding.

1.5.3.8 Access

Criteria. Good transport access.
Assessment. The Site is only 7 km south of the Oxley Highway along well-formed rural roads with no bridges. The Oxley Highway is a state-owned main road that connects Tamworth and Gunnedah (and beyond). Tamworth is a large regional centre with good transport connections including the New England Hwy that provides a link to the Hunter Region.

1.6 Purpose and structure of the document

This Environmental Impact Assessment (EIS) has been developed to meet the requirements of the Planning Secretary's Environmental Assessment Requirements for the Tamworth Solar Farm.

The main sections of the document are:

- Statutory planning framework
- Project description
- Community and stakeholder consultation
- Environmental impact assessment
- Conclusions and justification

2 Statutory planning framework

2.1 Permissibility

The proposed development is defined as *electricity generating works* and is permissible with consent under clause 34(1) of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP). Consent may be granted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) by the Minister for Planning, or their delegate.

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) declares the proposal to be State Significant Development (SSD) as it is development for electricity generating works with a capital cost of greater than $30 million (clause 20, Schedule 1).

Section 4.12 (formerly section 78A) of the EP&A Act requires a development application for SSD to be accompanied by an EIS prepared in accordance with the EP&A Regulation. This EIS has been prepared in accordance with Part 4 of EP&A Act and Schedule 2 of the EP&A Regulation.

2.2 NSW Environmental Planning and Assessment Act 1979

2.2.1 Approval process

The EP&A Act and the EP&A Regulation provide the framework for environmental planning and assessment in NSW. Part 4 of the EP&A Act relates to development assessment; Part 4, Division 4.1 relates to the assessment of development deemed to be significant to the State (or SSD). Section 4.36 (2) of the EP&A Act states that a:

> *...State environmental planning policy may declare any development, or any class or description of development, to be State significant development.*

Under 4.38 of the EP&A Act, the NSW Minister for Planning is the consent authority for SSD. However, pursuant to Section 2.4 of the EP&A Act, the Minister may delegate the consent authority function to the Independent Planning Commission (IPC), the Secretary or to any other public authority.

A DA for SSD must be accompanied by an EIS, prepared in accordance with the EP&A Regulation. Before preparing an EIS, an applicant must request SEARs which specify what must be addressed in an EIS. The SEARs for the project, issued in June 2019, are included in Appendix A.

The EIS will be placed on public exhibition for a minimum of 28 days by DPIE and submissions will be sought from local and State government agencies and the community. Any submissions received by DPIE will be reviewed and forwarded to the applicant to consider and respond to (via a Submissions Report).

Following receipt of the RTS report, DPIE will prepare its assessment report considering this EIS, all submissions received during the exhibition process and

the RTS report. This report is forwarded to the consent authority for consideration before determining the DA.

It should be noted that if the IPC is the consent authority, DPIE are still responsible for the administrative arrangements, which include charging the application fee, publicly exhibiting the application and preparing a report to the IPC about the application. However, DPIE's report is not binding on the IPC.

2.2.2 Matters for consideration

When assessing a DA for a SSD, the consent authority is required to take into consideration the matters outlined in Section 4.15 of the EP&A Act. These matters are outlined in Table 2. 1 below, with a reference to where they are addressed in this document, if required.

Table 2. 1 Matters for consideration – Section 4.15 of the EP&A Act

Provision	Consideration
Any environmental planning instrument	Relevant planning instruments are addressed in Section 2.3 below.
Any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority	There are no proposed instruments relevant to the project
Any planning agreement that has been entered into under Section 7.4, or any draft planning agreement that a developer has offered to enter into under Section 7.4.	There are no planning agreements relevant to the project.
The regulations (to the extent that they prescribe matters for the purposes of this paragraph).	The aims, structure and content of this EIS have incorporated the four principles of Ecologically Sustainable Development (ESD). The requirements of the EP&A Regulation 2000 are addressed specifically in Section 7.
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	This EIS describes the likely impacts of the project, on both the natural and built environments, and social and economic impacts in the local area, region and State. It complies with the requirements of Schedule 2 of the Environmental Planning and Assessment Regulation 2000, and the requirements of the issued SEARs. It also describes commitments proposed by Tamworth Solar Farm Pty Ltd to mitigate and manage these impacts.
The suitability of the site for the development.	The Site for this development is considered suitable for a solar farm for a number of reasons, as outlined in Sections 1.5.3 and 7 of this document.
Any submissions made in accordance with this Act or the regulations	This EIS will be placed on public exhibition for a minimum of 28 days by DPIE and submissions will be sought from local and State government agencies and the community. Any submissions received by DPIE will be reviewed and forwarded to Tamworth Solar Farm Pty Ltd to consider and respond to (via a Submissions Report). Following receipt of the Submissions Report, DPIE will prepare its assessment report

Provision	Consideration
	considering this EIS, all submissions received during the exhibition process and the Submissions Report.
The public interest	To assist the consent authority in determining whether the project is in the public interest, this EIS provides a justification for the project (refer to Sections 1.4 and 7), taking into consideration its potential environmental impacts, and the suitability of the development footprint for project infrastructure. The consent authority will also be required to consider all submissions received during the public exhibition of the EIS.

2.3 Environmental Planning instruments

There are a number of Environmental Planning Instruments relevant to this project, as outlined in the SEARs. These include:

- State Environmental Planning Policy (State and Regional Development) 2011
- State Environmental Planning Policy (Infrastructure) 2007
- State Environmental Planning Policy (Primary Production & Rural Development) 2019
- State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
- and Applying SEPP 33 (DoP 2011)
- State Environmental Planning Policy No. 44 – Koala Habitat Protection
- State Environmental Planning Policy No. 55 – Remediation of Land
- Tamworth Regional Local Environmental Plan 2010

These instruments and their relevance are outlined below.

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

The State Environmental Planning Policy (SEPP) (State and Regional Development) 2011, Clause 20 of Schedule 1, states that the following is considered state significant development:

> *Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that:*
>
> *(a) has a capital investment value of more than $30 million, or*
>
> *(b) has a capital investment value of more than $10 million and is located in an environmentally sensitive area of State significance.*

Tamworth Solar farm will have a capital investment value in excess of $30 million, therefore the proposal is classified as 'State Significant Development', or

SSD, under Part 4 of the EP&A Act.

2.3.2 State Environmental Planning Policy (Infrastructure) 2007

The State Environmental Planning Policy (SEPP) (Infrastructure) 2007 was developed to improve the efficiency of the existing planning system in delivering essential public infrastructure and services.

The SEPP Infrastructure outlines the planning processes for infrastructure projects under Part 4, Part 5 and exempt development. Clause 34(1) permits electricity generating works to be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone. The prescribed zones include RU1 Zone, and accordingly electricity generating works are permitted on the land.

2.3.3 State Environmental Planning Policy (Primary Production & Rural Development) 2019

The State Environmental Planning Policy (Primary Production and Rural Development), known as the PPRD SEPP, is a new framework that commenced on 28 February 2019. It simplifies the NSW planning system by consolidating, updating and repealing provisions in five former agriculture-themed SEPPs, including the Rural Lands SEPP. The intention is to provide for better outcomes in balancing rural needs, including farming, and development, and to reduce the risk of land use conflict and rural land fragmentation. Many of the provisions in the repealed SEPPs were local-level land use planning matters, which have now been transferred to local LEPs. This aims to ensure local industry and community have greater access to and awareness of the agricultural land use planning provisions that apply. The intent of the new SEPP is to deal with agricultural land use matters of State or regional significance only.

The aims of the State Environmental Planning Policy (Primary Production and Rural Development) 2019 (Primary Production SEPP) are:

> *(a) to facilitate the orderly economic use and development of lands for primary production,*
> *(b) to reduce land use conflict and sterilisation of rural land by balancing primary production, residential development and the protection of native vegetation, biodiversity and water resources,*
> *(c) to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations,*
> *(d) to simplify the regulatory process for smaller-scale low risk artificial waterbodies, and routine maintenance of artificial water supply or drainage, in irrigation areas and districts, and for routine and emergency work in irrigation areas and districts,*
> *(e) to encourage sustainable agriculture, including sustainable aquaculture,*
> *(f) to require consideration of the effects of all proposed development in the State on oyster aquaculture,*

(g) to identify aquaculture that is to be treated as designated development using a well-defined and concise development assessment regime based on environment risks associated with site and operational factors.

The objectives of Part 2 (State Significant Agricultural Land) of Primary Production SEPP are as follows:

(a) to identify State significant agricultural land and to provide for the carrying out of development on that land,

(b) to provide for the protection of agricultural land:

i. that is of State or regional agricultural significance, and

ii. that may be subject to demand for uses that are not compatible with agriculture, and

iii. if the protection will result in a public benefit.

Land that is considered State Significant Agricultural Land is listed in Schedule 1 of the Primary Production SEPP. Schedule 1 of the SEPP is currently blank, with mapping yet to be publicly available per the NSW Dept Planning, Industry and Environment website. As such, reference to the significance of agricultural land from Schedule 2 of the previously repealed *State Environmental Planning Policy (Rural Lands) 2008* is applied within this EIS.

2.3.4 State Environmental Planning Policy (Rural Lands) 2008 (repealed)

The aims of the State Environmental Planning Policy (Rural Lands) 2008 (Rural Lands SEPP) are:

(a) to facilitate the orderly and economic use and development of rural lands for rural and related purposes,

(b) to identify the Rural Planning Principles and the Rural Subdivision Principles so as to assist in the proper management, development and protection of rural lands for the purpose of promoting the social, economic and environmental welfare of the State,

(c) to implement measures designed to reduce land use conflicts,

(d) to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations,

(e) to amend provisions of other environmental planning instruments relating to concessional lots in rural subdivisions.

The proposal area is not identified in Schedule 2 as state significant agricultural land.

2.3.5 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP 2011)

Under SEPP 33 a preliminary hazard assessment (PHA) prepared in accordance with the current circulars or guidelines must be submitted for potentially

hazardous or offensive development. The guideline Applying SEPP 33 (DoP 2011) includes a checklist and a risk screening procedure to determine whether a development is potentially hazardous or offensive.

A review of Applying SEPP 33 has identified that the project is not potentially hazardous, as it will not exceed the screening threshold for any of the hazardous material identified in Applying SEPP 33 (refer Section 5.10.2). Further, the project will not pose a significant risk to or have a significant adverse impact on human health, life, property or the biophysical environment (refer Sections 5.8, 5.10 and 5.11). The project is not a potentially hazardous or offensive industry and therefore, a PHA is not required.

2.3.6 State Environmental Planning Policy No. 44 – Koala Habitat Protection

SEPP 44 encourages the proper conservation and management of areas of natural vegetation that provide habitat for koalas. It applies to areas of native vegetation greater than 1 ha and in LGAs listed in Schedule 1 of SEPP 44.

Tamworth Local Government Area is not listed in Schedule 1.

2.3.7 State Environmental Planning Policy No. 55 – Remediation of Land.

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

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

A search of the NSW EPA Contaminated Land Register for the Tamworth Regional Council area yielded five notices, all of which are close to the centre of Tamworth and more than 20 km from the project site.

It is concluded that the risk of unexpected discovery of contaminated land during construction is low.

2.3.8 Tamworth Regional Local Environmental Plan 2010

The project site is land zoned RU1 Primary Production under the Tamworth Regional Local Environmental Plan (LEP) 2010. The project is broadly consistent with the objectives of the RU1 zone. The objectives are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.

- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To permit subdivision only where it is considered by the Council to be necessary to maintain or increase agricultural production.
- To restrict the establishment of inappropriate traffic generating uses along main road frontages.
- To ensure sound management of land which has an extractive or mining industry potential and to ensure that development does not adversely affect the extractive industry.
- To permit development for purposes where it can be demonstrated that suitable land or premises are not available elsewhere.

Electricity generation is not explicitly prohibited in the RU1 zone. Under the SEPP (Infrastructure) 2007, the project is permitted with consent as it is an electricity generating works. The LEP explicitly acknowledges that provisions of SEPPs prevail over the provisions of LEPs.

2.4 Other NSW legislation

2.4.1 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 (BC Act) establishes a new regulatory framework for assessing and offsetting the biodiversity impacts of proposed developments. The BC Act contains provisions relating to flora and fauna protection, threatened species and ecological communities listing and assessment, a biodiversity offsets scheme (BOS), a single biodiversity assessment method (BAM), calculation and retirement of biodiversity credits and biodiversity assessment and planning approvals. The Act is supported by the Biodiversity Conservation Regulation 2017.

Section 7.9(2) states that SSD development applications must be accompanied by a Biodiversity Development Assessment Report (BDAR) prepared in accordance with the BAM, unless the Secretary and Chief Executive of OEH have determined that the proposed development is not likely to have any significant impact on biodiversity values. A BDAR has been prepared as part of this EIS (Section 5.1).

2.4.2 Roads Act 1993

The Roads Act 1993 addresses authorities, functions and regulation of activities relating to the use and type of roads. Consultation with the Roads and Maritime Services (RMS) and Tamworth Regional Council will be undertaken to determine access and if necessary, any upgrading of access points to the proposed project.

Approval will be required under section 138 of the Roads Act for works done on Babbinboon Rd, Warminster Rd or Soldier Settlement Rd.

Section 89K of the EP&A Act provides that an approval under section 138 of the Roads Act cannot be refused if it is necessary for carrying out State significant development that is authorised by a development consent.

2.4.3 Native Vegetation Act 2003

The main objective of the Native Vegetation Act 2003 is to promote ecologically sustainable development, prevent broad scale clearing and protect and improve native vegetation.

Under section 89J of the EP&A Act, an authorisation referred to in section 12 of the Native Vegetation Act 2003 to clear native vegetation would not be required for a State Significant Development.

2.4.4 Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO Act) is the key piece of legislation for environmental protection in NSW. The POEO Act creates pollution offences relating to land, water, air and noise pollution and imposes a duty on polluters and occupiers to report pollution incidents to the EPA and other government agencies. An environment protection licence (EPL) under the Protection of the Environment Operations Act 1997 (POEO Act) is not typically required for electricity generation by solar power.

The Tamworth project will not require and EPL since it is not a hybrid system or combined energy generating system.

2.4.5 Crown Lands Management Act 2016

The main aims of the Crown Lands Management Act 2016 are to provide for the ownership and management of Crown land in NSW, and provide clarity concerning the law applicable to Crown land. Works within a Crown reserve require environmental, social, cultural heritage and economic considerations to be considered, and must facilitate the use of land by the NSW Aboriginal people.

The solar farm Site is on private freehold land. The Site of the deceleration lane at the intersection of the Oxley Highway and Babbinboon Rd is within the road reserve. Assessments of impact on biodiversity and cultural heritage have been made in Sections 5.1and 5.2 respectively. Prior to any works proceeding at this Site, a works authorisation deed is required from NSW Roads and Maritime Services.

2.4.6 NSW Water Management Act 2000

The NSW Water Management Act 2000 (WM Act) regulates the use and interference with surface and groundwater in NSW where a water sharing plan has been implemented. Due to the Site's proximity to the Peel River, access to water sources is in accordance with the State Governments Water Sharing Plan for the *Peel Valley Regulated, Unregulated, Alluvium and Fractured Rock Water Sources 2010* under Section 50 of the *Water Management Act 2000*.

The WM Act also provides for basic landholder rights, which enable landholders

to extract water from an aquifer underlying their properties for domestic and stock purposes without the need for a licence.

The WM Act also contains provisions relating to harvestable rights. Harvestable rights allow landholders to collect a proportion of the runoff from their property. Any runoff harvested from the development footprint would be within the volume permitted under harvestable rights.

A water use approval under Section 89 of the WM Act is not required for the project by virtue of Section 89J of the EP&A Act.

2.4.7 NSW Rural Fires Act 1997

The NSW Rural Fires Act 1997 (RF Act) aims to prevent, mitigate, and suppress bush and other fires in local government areas of the State. Section 63(2) of the RF Act requires the owners of land to prevent the ignition and spread of bushfires on their land. Under Section 4.41 of the EP&A Act, a bush fire safety authority under Section 100B of the RF Act is not required for SSD that is authorised by a development consent.

The Site is not mapped as bushfire prone. Bushfire risks and mitigations are discussed in Section 5.11.

2.4.8 NSW National Parks and Wildlife Act 1974

The NSW National Parks and Wildlife Act 1974 (NPW Act) provides for nature conservation in NSW including the conservation of places, objects and features of significance to Aboriginal people and protection of native flora and fauna. A person must not harm or desecrate an Aboriginal object or place without an Aboriginal heritage impact assessment under Section 90 of the NPW Act. However, a Section 90 permit is not required for SSD approvals by virtue of Section 4.41 of the EP&A Act.

Further discussion of the potential impacts to Aboriginal heritage sites resulting from the project are detailed in Section 5.2.

2.4.9 Conveyancing Act 1919

The purpose of the Conveyancing Act is to amend and consolidate the law of property and to simplify and improve the practice of conveyancing, and for such purposes to amend certain Acts relating thereto.

The land for the substation is likely to require subdivision as it may be owned by a different entity to the solar farm. This is discussed further in Section 5.4.3.5.

2.4.10 NSW Heritage Act 1977

The *NSW Heritage Act 1977* (Heritage Act) aims to protect and conserve the natural and cultural history of NSW, including scheduled heritage items, sites

and relics. Approvals under Part 4 or an excavation permit under section 139 of the Heritage Act are not required for SSD by virtue of Section 4.41 of the EP&A Act.

Historic heritage is discussed in Section 5.3 of the EIS.

2.4.11 Waste Avoidance and Resource Recovery Act 2001

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

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

Waste avoidance and management is addressed in Section 5.13.

2.5 Biosecurity Act 2015

The *Biosecurity Act 2015* aims to provide modern, flexible tools and powers that allow effective, risk-based management of biosecurity in NSW. The Biosecurity Act replaces the Noxious Weeds Act 1993 as the key piece of legislation that identifies and manages State and regional priorities for weeds in NSW, Australia.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. According to this Act, any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Specimens of Athel Pine (*Tamarix aphylla*) have been found at the Site. Control of this weed is addressed in Section 5.1.4.

2.6 Strategic Policies (eg Regional)

2.6.1 New England North West Regional Plan 2036

The New England North West region encompasses a total of 12 local government areas in regional NSW including the Tamworth Regional Council. The New England North West Regional Plan 2036 (NSW Government 2017) will guide the NSW Government's land use planning priorities and decisions in the New England North West region to 2036.

One of the primary goals of the New England North West Regional Plan 2036 is to develop a strong and dynamic regional economy within the region. The region's economy has historically been dependent on agricultural productivity (NSW Government 2017). In the short term, the focus of the plan is on

supporting cities, important farmland, renewable energy projects and tourism opportunities to help diversify the region's economy. To achieve this goal, the plan defines nine directions, one of which is to grow New England North West as the renewable energy hub of NSW.

2.6.1.1 Tamworth Regional

Tamworth Regional is strategically positioned in the south of the New England North West region with access to Sydney and Newcastle. Tamworth is a regional city that provides one in three of the region's homes and jobs and a variety of high-level services, including civic, entertainment and cultural venues.

One of the priorities outlined in the plan for Tamworth Regional Council is to "Identify and promote wind, solar and other renewable energy production opportunities".

2.7 Commonwealth legislation

2.7.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of Energy and the Environment (DoEE) and provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage place defined a 'matters of national environmental significance' (MNES).

The MNES are identified in the Act as the following:

- World heritage properties;
- National heritage properties;
- Ramsar wetlands of international significance;
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- Water resources.

The Commonwealth and NSW governments have signed a bilateral agreement under the EPBC Act that establishes a one stop shop for environmental assessment in NSW. The bilateral agreement accredits certain NSW processes for assessment which allows the Commonwealth Minister for the Environment and Energy to rely on specified NSW environmental impact assessment processes in assessing actions under the EPBC Act.

Under the bilateral agreement, the NSW Government will use its best endeavours to inform proponents that an action may need to be referred to the Commonwealth. The Commonwealth, in consultation with the NSW Government, will then make a determination about whether the action is a 'controlled action'

under the EPBC Act that requires approval. The NSW Government will confirm whether the action can be assessed under the bilateral agreement.

The NSW Government will then undertake an assessment of the development proposal and in doing so will ensure that there is sufficient information in its State Assessment Report on each relevant matter of National Environmental Significance (MNES) so that the Commonwealth can consider those impacts and make a decision whether to approve the action.

When NSW provides the Commonwealth with its State Assessment Report, it will also make a recommendation to the Commonwealth Minister about whether the action should be approved and, if so, what conditions (if any) should be attached to manage the impacts on MNES.

An assessment of the impacts of the project on threatened species, ecological communities and migratory species was conducted as part of the BDAR (Appendix B). The assessment found that there are no Commonwealth listed threatened species or communities that are impacted by the development. The other categories of MNES do not apply to the Site. Therefore, there is no requirement to refer the project under the EPBC Act.

2.8 Summary of licences

Table 2. 2 lists licences that have been identified as relevant to the proposal.

Table 2. 2 List of relevant licences

Instrument	Licence or approval requirement
EP&A Act	SSD applications require approval from the Minister for Planning or the Independent Planning Commission. This EIS has been prepared in accordance with the requirements of the Secretary of the DPIE. Construction certificate required prior to construction of certain structures (Tamworth Regional Council or private certifier). Occupation certificate required prior to use of certain buildings (Tamworth Regional Council or private certifier). Subdivision certificate (Tamworth Regional Council)
Roads Act, section 138	Any works to public or classified roads requires consent under this act from the road authority. Tamworth Regional Council is the roads authority for local public roads within the project area. RMS is responsible for the Oxley Hwy. Any works done on local roads will require a Section 138 Permit. Any works on the Oxley Highway will require a Work Authorisation Deed from RMS.
Local Government Act 1993, Section 68	Approval is required to operate an onsite sewage management system. Consent from Tamworth Regional Council would be required to operate an onsite sewage management system.
Workcover Notification	Exceedance of 10,000 kg of lithium-ion batteries requires Workcover notification.
Oversize Overmass Permit	An oversize overmass permit will be required from the relevant road authority (Council and/or RMS) for any oversized vehicles.

3 Project Description

3.1 Site location

The Site address is 2209 Soldiers Settlement Road, Bective, NSW, 2340. The property, known as "Bonnie Brae" is located approximately seven km south of the township of Somerton, and 25 km west of Tamworth as shown in Figures 1.1 and 1.2. The development is within the Tamworth Regional Council Local Government Area.

The proposal is contained entirely within a single land title (Lot 186 DP 755340) of private freehold land to which Tamworth Solar Farm Pty Ltd have secured an option to purchase.

The Site will be accessed from the Oxley Highway via Babbinboon Rd, Warmister Rd and a short section of Soldier Settlement Rd (refer to Figure 1.2). These unsealed local roads are managed by the Tamworth Regional Council.

3.2 Site description

The proposed Site and surrounding area is mostly flat agricultural land, cleared of native vegetation, with current activities including grazing and dryland cropping. There are several scattered, isolated shade trees in poor condition.

No permanent watercourses cross the property. There are three class 1 waterways and one class 2 waterway on the property (Strahler stream order). A class 4 waterway runs very close to the southern boundary. There are also three small dams and three bores (2 within the Development Site). One of the bores provides water for stock.

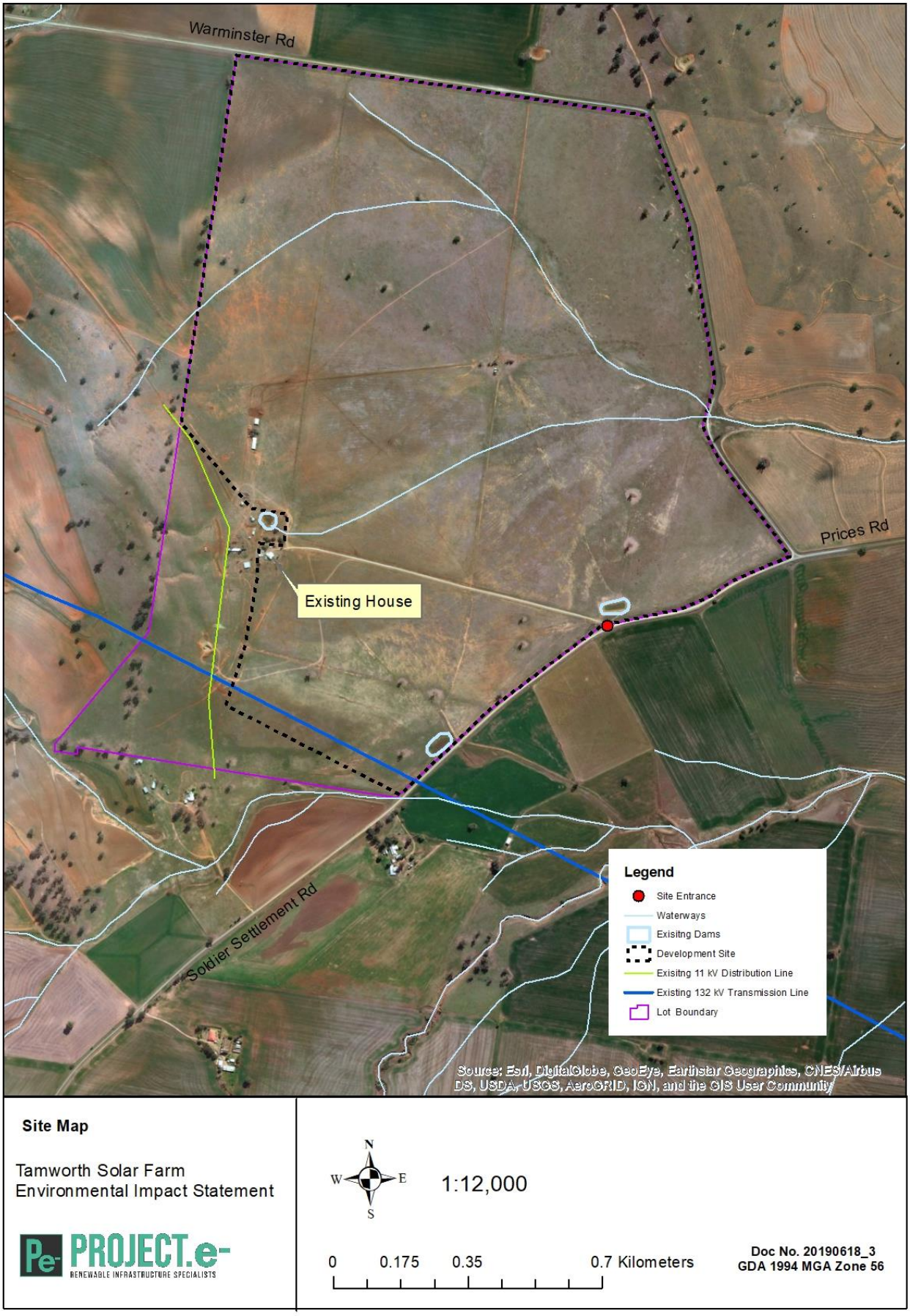
There is an existing residential dwelling on the property. This house will be used as the Site administration office during operation.

A Site map is shown in Figure 3.1. All development on Bonnie Brae will be confined to the area shown as the Development Site. Any reference to the "Site" in this EIS refers to the Development Site, an area of 206.65 Ha. Assessments described in this document including the Aboriginal heritage surveys and biodiversity assessments were undertaken for the whole of the Site. Disturbance could occur anywhere within this Site.

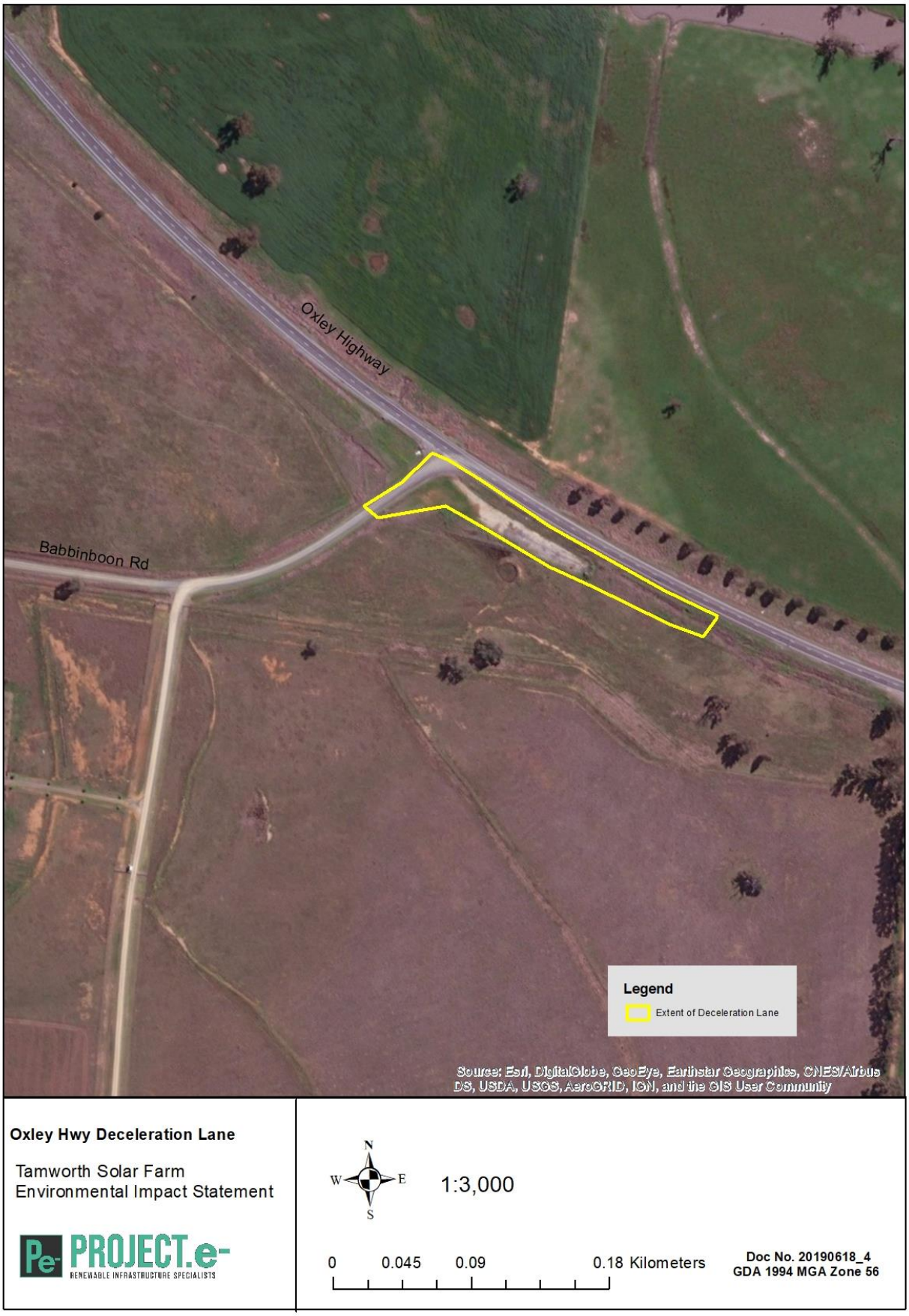
The Development Site includes the existing farm house but excludes a hilly section in the southwestern corner of the property and part of the land south of the existing extra-high voltage (132 kV) transmission line.

In addition to the development proposed for the Bonnie Brae property, the traffic impact assessment conducted as part of the EIS has determined that some roadworks are required along the transport route from the Oxley Highway. This work will include:

- The construction of a deceleration lane on the Oxley Highway at the intersection with Babbinboon Rd (refer to Figure 3.2). This deceleration lane will be for vehicles travelling from Tamworth and turning left into Babbinboon Rd. The deceleration lane will be within the existing road reserve.
- The sealing of the intersection of Babbinboon Rd and Warminster Rd and the removal of a shrub on this corner to improve the line of sight (refer to Figure 3. 3).



- **Figure 3. 1 Site map**



- **Figure 3. 2 Oxley Highway deceleration lane development Site**

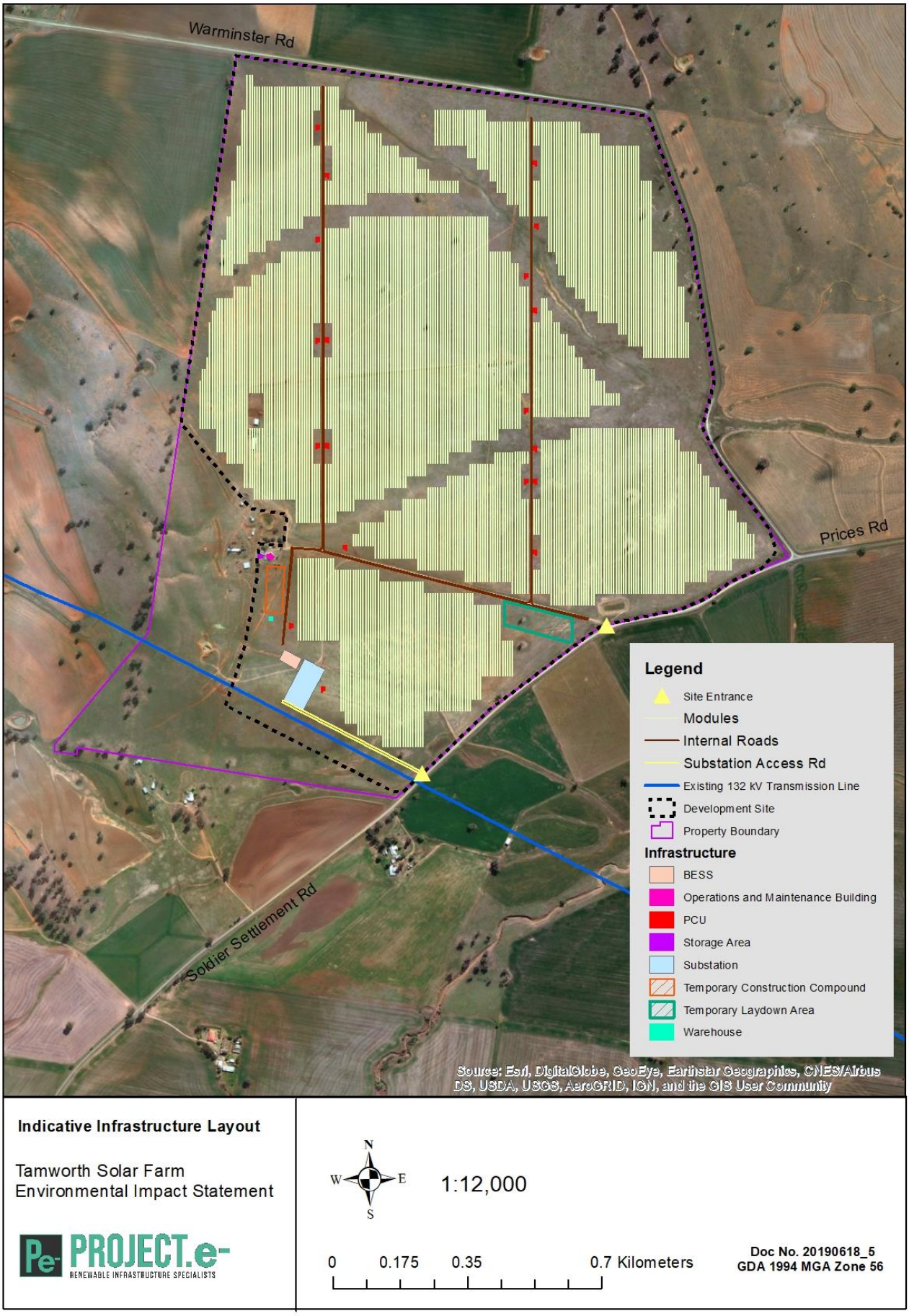
- **Figure 3. 3 Site distance development Site**

3.3 Project infrastructure

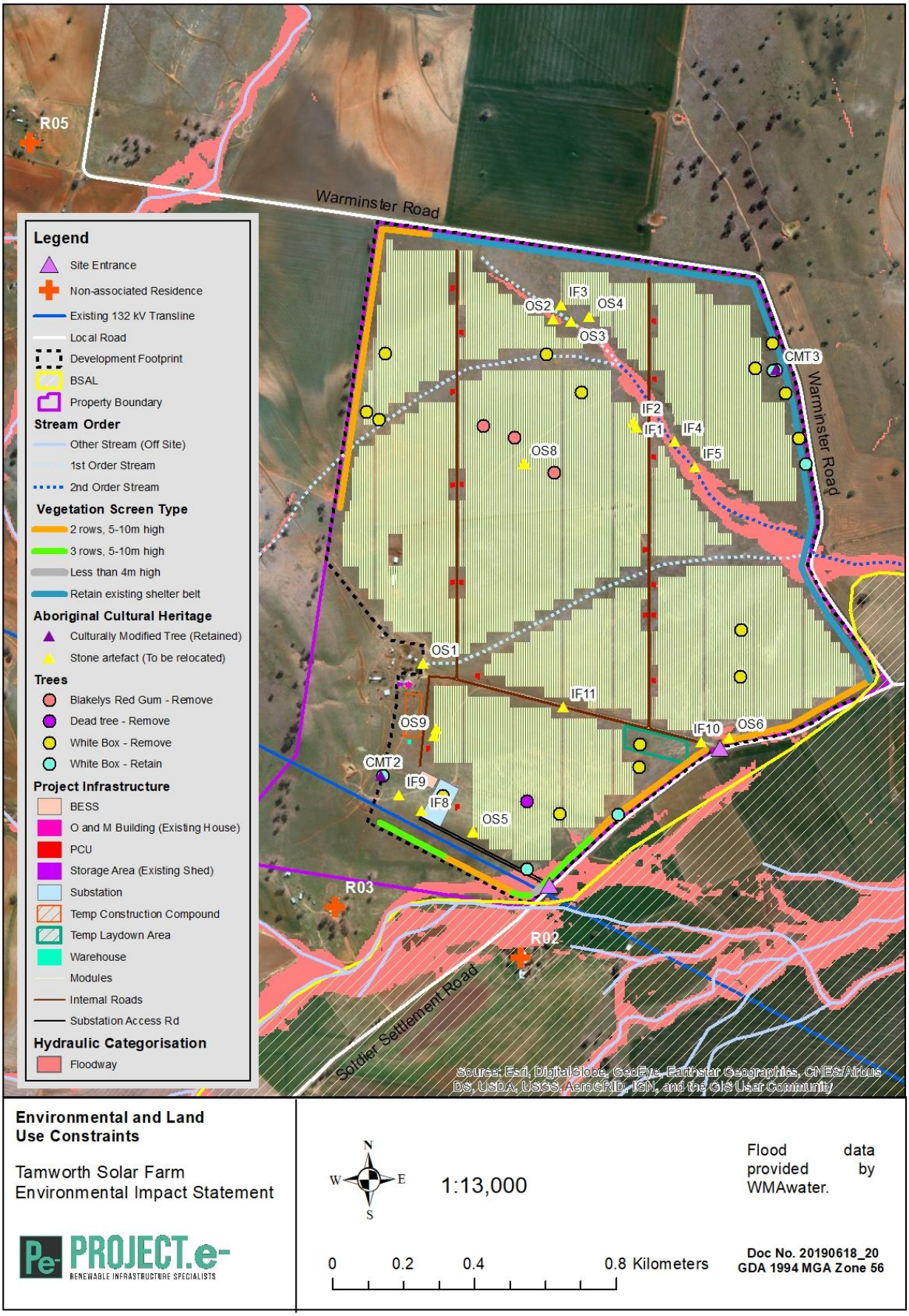
The project involves the construction and operation of a photovoltaic (PV) electricity generation facility with a lithium-ion battery energy storage system (BESS). The solar farm consists of the following elements:

- Photovoltaic modules and mounting frames,
- Power conversion units,
- 33 kV collector network of underground cables,
- Substation (132/33 kV) and control room,
- BESS (19 MW/19 MWh),
- Security fence,
- Operations and maintenance buildings,
- Temporary construction facilities,
- Water tank for firefighting,
- Internal roads, and
- External road upgrades

More detailed information on each of these aspects is provided below. An indicative layout of the infrastructure is provided in Figure 3. 4. A constraints map showing the main environmental and land use constraints is shown in Figure 3. 5. More detail on these constraints and how they have influenced the indicative layout is provided in Section 5.



- **Figure 3. 4 Indicative infrastructure layout**

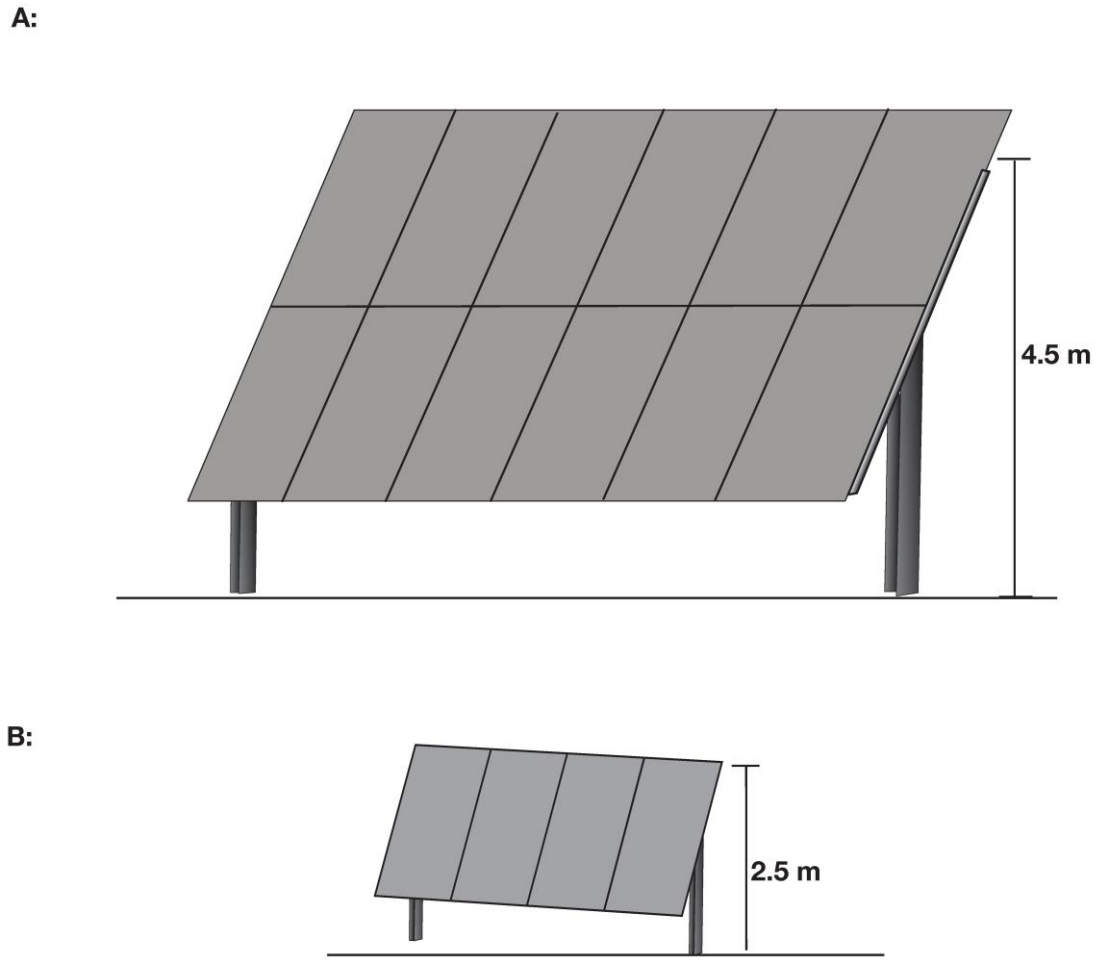


- **Figure 3. 5 Environmental and land use constraints**

3.3.1 Photovoltaic modules and mounting

It is anticipated that approximately 200,000 panels will be installed, depending on the type of technology used for the panels. The panels will be installed in rows that are aligned north-south. The panels are attached to a long boom (torque tube) that rotates which enables the panels to track the sun from east to west during the day. This mounting design is known as single axis tracking. This type of tracking system is used to maximise the yield from the panels relative to a system where the panels are fixed.

There are two options for the single axis tracking system. They are illustrated in Figure 3. 6. Option A is two panels in portrait. The maximum height for this configuration is 4.5 m. This maximum height is a conservative estimate and the height is more likely to be less than 4 m. A photo of Option A is shown in Figure 3. 7. Option B is a single panel in portrait attached to the boom. The maximum height for this configuration is approximately 2.5 m. An aerial photo of Option B is provided in Figure 3. 8. Another example is provided in Figure 3. 9 Note that both these photos were taken during construction and the ground cover is yet to fully establish.



- **Figure 3. 6 Options for single axis tracking configuration**

- **Figure 3. 7 Single axis tracker with two panels in portrait (Source: Arctech Solar)**

- **Figure 3. 8 Single axis trackers with one panel in portrait (Source: Arctech Solar)**

The distance between the rows of panels is between 5 to 9 metres depending on the mounting system used. There is adequate room between the rows to drive vehicles in order to maintain the panels. Tractors and equipment will also be

able to access the rows to maintain the pasture. For example, in the indicative design it is 4.3 m from panel edge to panel edge when the panels are horizontal.

Each panel has a surface area of 2 m^2. Therefore, the total surface area of panels is approximately 40 hectares. This area is about 20 % of the Development Site (207 Ha), which demonstrates that there is a lot of vacant land between and around the rows of panels.

The posts (or piles) that support the single axis tracking system will be driven into the ground to a depth of up to 4 m. There is no excavation of the footing and no use of concrete. There are small electric motors that slowly rotate the torque tube over the duration of the day so that the panels are always facing the sun.

The panels will be attached to mounting racks and connected through electrical panel wiring with the inverter stations.

3.3.2 Power conversion units

DC cabling will connect the panels to the power conversion units (PCU). The cabling will be attached to the underside of the panels and the mounting system then eventually an underground cable to the PCU.

At the PCU, electricity is converted from direct current (DC) to alternating current (AC) at 33 kV. The PCU contains inverters, switching gear, protection and other components. The solar farm will have approximately 19 PCUs dispersed throughout the PV panel areas. The type of PCU that will be used for the project is shown in Figure 3. 9.

- **Figure 3. 9 Power conversion unit (Source: SMA)**

3.3.3 Internal electricity network

A 33 kV internal electricity network will be used to collect the power from the inverter stations to the Site's substation. All cabling on the Site will be a minimum of 600 mm below the soil surface and installed in accordance with

relevant Australian standards. The 33 kV cable will be surrounded by sand at the bottom of the trench which helps protect the cable as well as facilitating heat dissipation. Trenches will be dug such that the topsoil is kept separate from the subsoil and replaced at the top once the cable is laid.

3.3.4 Substation and control room

A substation will be installed adjacent to the existing Transgrid 132 kV transmission line that runs through the south of Bonnie Brae (refer to Figure 3. 4). The substation broadly comprises the following elements:

- A switch room and control room that receives power from the PCUs via the internal electricity network.
- A transformer that converts the voltage from 33 KV to 132 KV.
- Other infrastructure for switching, metering and protection.
- A connection to the existing transmission line.
- Infrastructure for protecting the substation from lightning strikes. This is typically tall narrow poles around the outside of the substation that conduct the lightning safely.
- A security fence around the perimeter of the substation.

The area for the substation is approximately 120 m by 60 m including the security fence. The substation will be located immediately adjacent to the existing transmission line easement. The substation will be connected to the transmission line by three conductors that will span from a gantry within the substation to a new pole in the transmission line.

The area where the substation is to be constructed will need to be excavated in order to form a level hardstand area for the substation. If practicable, the spoil generated in this process will be used to form a bund parallel to the southern boundary of the substation. This spoil will be covered with topsoil from the substation area and sown with pasture or other vegetation. The purpose of the bund will be to form a partial visual screen for residents located south of the substation. The exact location of the bund will need to take into account the clearances of the existing 132 kV transmission line. The height of the bund will depend on the amount of material excavated during the construction of the substation and the length of the bund.

3.3.5 Battery Energy Storage System

A battery energy storage system (BESS) will be installed in a secure compound adjacent to the substation. The lithium-ion battery will have a capacity of approximately 20 MWh and a maximum output of 20 MW. The type of BESS to be used at the Tamworth Solar Farm is shown in Figure 3. 10.

The main components of the BESS are:

- Lithium ion batteries,
- Inverters,
- Transformers,

- A heating and cooling system for keeping the batteries at the optimal temperature, and
- Fire detection and suppression system.

The fire detection and suppression system uses an inert gas which is colorless, odorless and electrical non-conductive. The gas suppresses fire by reducing the oxygen concentration and breaking the chain reaction of the combustion process.

The fire detection and suppression system consists of:

- Control panel
- Firefighting agent cylinders
- Smoke detectors
- Heat sensors
- Internal horn and strobe
- External strobes
- Battery backup

Figure 3. 10 Battery energy storage system (Source: SMA)

3.3.6 Security fence

Australian Standards require that a security fence similar to that shown in Figure 3. 11 be constructed around the development. The fence will be approximately 2.0 m high. Where the fence crosses a waterline, the fence may need to be modified to enable the free flow of water past the fence. For safety reasons, the substation and BESS will be fenced separately to the rest of the plant to restrict access to these high voltage areas.

Figure 3. 11 Security fence

3.3.7 Operations and maintenance buildings

The existing farmhouse will be converted to serve as the operations and maintenance office. This will cater for the 1 to 2 people that are expected to work at the solar farm as permanent staff. There will also be a warehouse (farm shed) and a hardstand that will act as a storage area.

3.3.8 Temporary construction facilities

A temporary construction laydown area will be delineated as shown in Figure 3. 4. This will be a hardstanding area for construction activities and storage of materials and machinery. There will also be some car parking, crib huts and portable toilets.

There will also be a temporary construction compound also shown in Figure 3. 4. This will consist of site offices, toilets, crib huts and car parking. The toilets will have a holding tank that will be pumped out as required. Water for the toilets and drinking water will be transported to the Site. It is intended to locate the temporary construction compound to the east of the existing farmhouse so that power can be extended from the house rather than having to use generators.

Several crib rooms and portable toilets will be scattered throughout the Site during construction.

All temporary construction facilities will be removed at the end of construction. Hard standing areas will be pulled up and sown to pasture.

3.3.9 Internal roads

There will be a number of internal roads to allow access to the Site during construction and maintenance. These internal roads are shown in Figure 3. 4 and include:

- The main access to the Site which will be along the existing driveway to the farmhouse. This road will be widened and upgraded.
- A new access site and road will be constructed to the substation.
- A track around the outside of all infrastructure built to the standard of a 4 m Category 1 perimeter fire trail.
- There will be a gate in the far north western corner of the property to allow a second entry/exit point to the property during emergencies.
- Some roads through the centre of the panel arrays to provide access to the PCUs and the panels.

3.3.10 External road upgrades

The transport route for the project will be from the Oxley Highway to the Site via Babbinboon Rd, Warminster Rd and a short section of Soldier Settlement Rd. Traffic management is discussed in detail in Section 5.7. A number of road upgrades will occur along this transport route. They include:

- The construction of a deceleration lane at the junction of the Oxley Highway and Babbinboon Rd. This will be for vehicles travelling from Tamworth and turning left into Babbinboon Rd as shown in Figure 3. 2.
- Along the transport route from the Oxley Highway to the Site entrance, bends and intersections will be sealed.
- At the intersection of Babbinboon Rd and Warminster Rd, the removal of a single tree within the road corridor to improve the line of sight at this intersection.

3.4 Construction activities

Construction activities are expected to take approximately 12 months and require a peak workforce of up to 200 people for part of this time. The construction activities are described below.

3.4.1 Site preparation

The Site is predominantly cleared of woody vegetation and fairly flat, so minimal Site preparation will be required. Site establishment will include the following activities:

- Outbuildings and internal fences that are not required will be removed.
- Trees that are in the solar PV footprint will be cleared (refer to Section 5.1).

- Establishment of vegetation screens.
- The perimeter security fence will be built.
- Establishment of the temporary construction compound and the construction laydown area.
- Construction of the Site entrance and internal roads.
- Excavation work and preparation of the hardstand areas for the substation and BESS.

This phase of construction will use standard earthmoving equipment such as bulldozers, graders, trucks, skidders, front end loaders, roller compactors, trenchers, excavators and cranes. A water truck will be used as needed to manage dust and maintain air quality.

3.4.2 Installation

Following site preparation, installation will commence which is typically as follows:

- Driving the posts into the ground up to 2.5 m,
- Attaching the mounting system,
- Attaching panels to the mounting system,
- Installing DC cabling to the PCUs,
- Installing the PCUs on concrete footings, and
- Trenching of 33 kV cables from the PCUs

The substation and BESS works will progress in parallel with the construction of the main PV plant to ensure the substation is ready to receive power when the PV plant is completed.

The installation phase will utilize equipment such as pile drivers, forklifts, welders, oxy acetylene, trench diggers, excavators, tilt tray trucks, water trucks, elevated work platforms, flatbed trucks and cranes.

3.4.3 Transport of materials

Traffic during construction would include construction workers and delivery vehicles. Typical peak daily vehicle movements will be in the order of 70 light and 20 heavy vehicles two-way (70/20 inbound, 70/20 outbound) per day. For the light vehicles, the vast majority of these will be inbound movements in the morning bringing workers to the Site with these vehicles then remaining on Site for the full working day before leaving at the end of the working day.

Heavy vehicles will be predominantly semi-trailers (not B-doubles) carting components such as the modules, posts, mounting infrastructure, cables etc. There will also be low-loaders to transport construction machinery and truck and dogs to cart road base and sand. There will be some over-size loads such as the temporary site office buildings and the transformer. More detail on traffic movements and management is provided in Section 5.7.

3.5 Commissioning

Following installation of the PV modules, PCUs and all electrical connections, pre-commissioning of the system can commence. This phase includes making terminations, testing, calibration and troubleshooting.

Testing and commissioning will then commence for the transformer and switchgear followed by an outage for the 132 kV connection, carried out by Transgrid. Once all QA documentation is completed the substation scope is complete.

3.6 Operations

The solar farm has an operational design life of 30 years. During this time, it is possible that the PV modules and ancillary equipment may be upgraded or repowered, depending on the commercial viability at the time. Any upgrading and repowering would involve removal of existing equipment, disposing of these responsibly off site, and installing the latest technology on the existing support infrastructure. Recommissioning would then occur. This repowering of the Site could extend the lifespan of the project to up to 60 years.

The completed solar farm will operate with one or two permanent staff on Site. Monitoring systems installed at the farm will notify an off-site location of any performance issues, and operators will respond to any irregular issues.

A routine maintenance program will be established which will conduct regular maintenance activities including:

- Equipment and systems inspection and maintenance,
- Fence, internal access and site office management,
- Vegetation management to maintain minimal fuel loads during the fire season,
- Weed management,
- Inverter replacement when required,
- Solar PV module washing, as needed,
- Security monitoring, and
- Communications with stakeholders as needed.

Some of the maintenance activities on Site will require specialist technicians that will travel to Site to conduct the works. Other activities, such as maintenance of the security fence or spraying of weeds, might be contracted to local businesses.

In addition to the operation of the solar farm, Bonnie Brae will continue to support a productive agricultural enterprise. After construction has been finalised, the land will be reinstated to productive pasture. The right to graze sheep on the property will be leased to a local landholder. A protocol will be developed to ensure that the two activities of solar farm and sheep grazing can operate safely and without any risk to equipment, the livestock or the environment.

3.7 Decommissioning

At the end of its operational life, the solar farm will be decommissioned. The connection to the electricity grid would be disconnected, and the solar farm components removed. The Site will then be rehabilitated and returned to agricultural use.

Decommissioning of the solar farm will require a similar amount of labour and vehicle movements as the construction process. Wherever possible, the components of the solar farm will be reused or recycled. A solar panel recycling business has recently established in South Australia and it is anticipated that this industry will grow. Where components cannot be recycled, they will be disposed at an approved waste management facility.

3.8 Summary of commitments

A summary of the mitigation measures relating to the project description is provided in Table 5. 1.

Table 5. 1 Summary of commitments related to the project detail.

Reference	Mitigation Measure
PD1	The maximum height of the solar panels will be 4.5 m.
PD2	All cabling on the Site will be a minimum of 600 mm below the soil surface and installed in accordance with relevant Australian standards.
PD3	Trenches will be dug such that the topsoil is kept separate from the subsoil and replaced at the top once the cable is laid.
PD4	If practicable, the spoil generated from the substation will be used to form a bund parallel to the southern boundary of the substation. This spoil will be covered with topsoil from the substation area and sown with pasture or other vegetation.
PD5	On decommissioning of the solar farm, all infrastructure will be removed including cables.
PD6	During decommissioning, wherever possible, the components of the solar farm will be reused or recycled.

4 Community and stakeholder engagement

4.1 Introduction

This section provides an overview of the consultation activities conducted with the community and other stakeholders. The requirements of the SEARs for consultation are:

During the preparation of the EIS, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders.

In particular, you must undertake detailed consultation with affected landowners surrounding the development and Tamworth Regional Council.

The EIS must describe the consultation process and the issues raised and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.

4.1.1 Objectives of consultation

Tamworth Solar Farm Pty Ltd understands that early consultation with a wide range of stakeholders is important and valuable for the project to identify and respond to any concerns and to set the scene for an open, responsive and transparent process with interested stakeholders. The objectives of this consultation process have been:

- To inform stakeholders about the rationale for the project, what it will look like, how it will be developed and what impact it might have on them,
- To understand from the stakeholders their interest in the project and how it may affect them,
- Provide an opportunity for stakeholders to give feedback which can then be fed back into the design and other management measures,
- To let stakeholders know about the planning process and how they can participate in it, and
- To collect information about the local environment that will inform the development of the project.

4.1.2 Stakeholders

Stakeholders in the project include:

- Community
    - Landholders adjacent to the solar farm Site,
    - Landholders adjacent to the transport route,
    - The Aboriginal community,
    - Community groups such as Landcare, CWA, and
    - The general public
- State Government Authorities and representatives

    - The State Member for Tamworth,
    - NSW Department of Planning Industry and Environment,
        - Environment, Energy and Science Group (including the EPA)
        - Resources and Geoscience Division,
    - Roads and Maritime Services,
    - Department of Primary Industries,
    - North West Local Land Services,
    - Rural Fire Service,
- Local Government Authorities
    - Tamworth Regional Council (including the airport),
- Federal Government Authorities
    - Commonwealth Department of Environment and Energy,
    - Civil Aviation Safety Authority,
- Businesses
    - Transgrid,
    - Local contractors and suppliers,
    - Local food accommodation providers, and
    - Other local businesses.

4.2 Community

The following sections describe the consultation process for the community, in particular those landholders that live adjacent to the proposed solar farm Site and those that live along the transport route to the Oxley Highway. These landholders have the most potential to be affected by the project due to their proximity.

The locations of potentially sensitive receptors are shown in Figure 4. 1. The landholders at R01 to R06 are within 2 km of the Site and either:

- have a view to the Site from their house, or
- have trees surrounding their house that screen their view but have a view to the Site from the surrounds of their house (ie. the yard or near the yard).

Landholders at R07, R08, R10 and R11 are greater than 2 km from the Site and due to the topography or vegetation, do not have a view to the Site. R08 and R06 are owned by the same family who also own land adjacent to the Site on the western side. The resident at R11 is a tenant of the landholder at R06. At R09, the house has vegetation on the western side that would screen views to the Site, but there may be views from the surrounds.

Residences at R12 to R21 are located along the transport route to the Oxley Highway. Due to the topography, they don't have a view to the Site from the house, however, R13 and R14 are on lots that border the Site on the northern side. R16 is not on the transport route but is close enough to be potentially impacted.

4.2.1 Landholders adjacent to the solar farm Site

Consultation with landholders commenced in late June 2019. At this stage, most adjacent landholders were aware that a solar farm had been proposed for the Bonnie Brae property. Landowners were contacted by phone with the intention of letting them know about the proposed development and to invite them to an information session and BBQ. Landholders of R01 to R10 (except R09) were contacted directly. R07 and R10 communicated that they were not impacted by the project and felt no need to be part of further consultation. R09 was contacted by a neighbor and expressed that he didn't wish to be part of the consultation process. Many of the other landholders had prior commitments and consequently, the information session was postponed until October.

As an interim measure, individual meetings were arranged with some of the landholders including those at R01, R14, R06 and R08 either at their own property or at the Site.

The information session and BBQ was held at the Site on the 12th October and was attended by the landholders of R01 to R04, R06, R08 and R14. Information that was discussed at the meeting included:

- The Site layout. Maps were distributed showing the indicative layout and the Development Site.
- The substation and battery storage system including fire control systems.
- The proposed locations of vegetation screens. Photomontages from the visual impact assessment were distributed along with a map showing the location of the proposed vegetation screens.
- The security fence and asset protection zone.
- Arrangement of panels and heights.
- Traffic, including the transport route, the expected number of vehicles, road upgrades, dust control and construction traffic speed limits.
- Noise, including working hours, noise limits and the results of the noise assessment.
- Likely timeframes for the planning approval process and construction.
- The planning approval process and how landholders can have input.
- The results of the flood study including maps.
- The results of the Aboriginal cultural heritage surveys and biodiversity surveys.

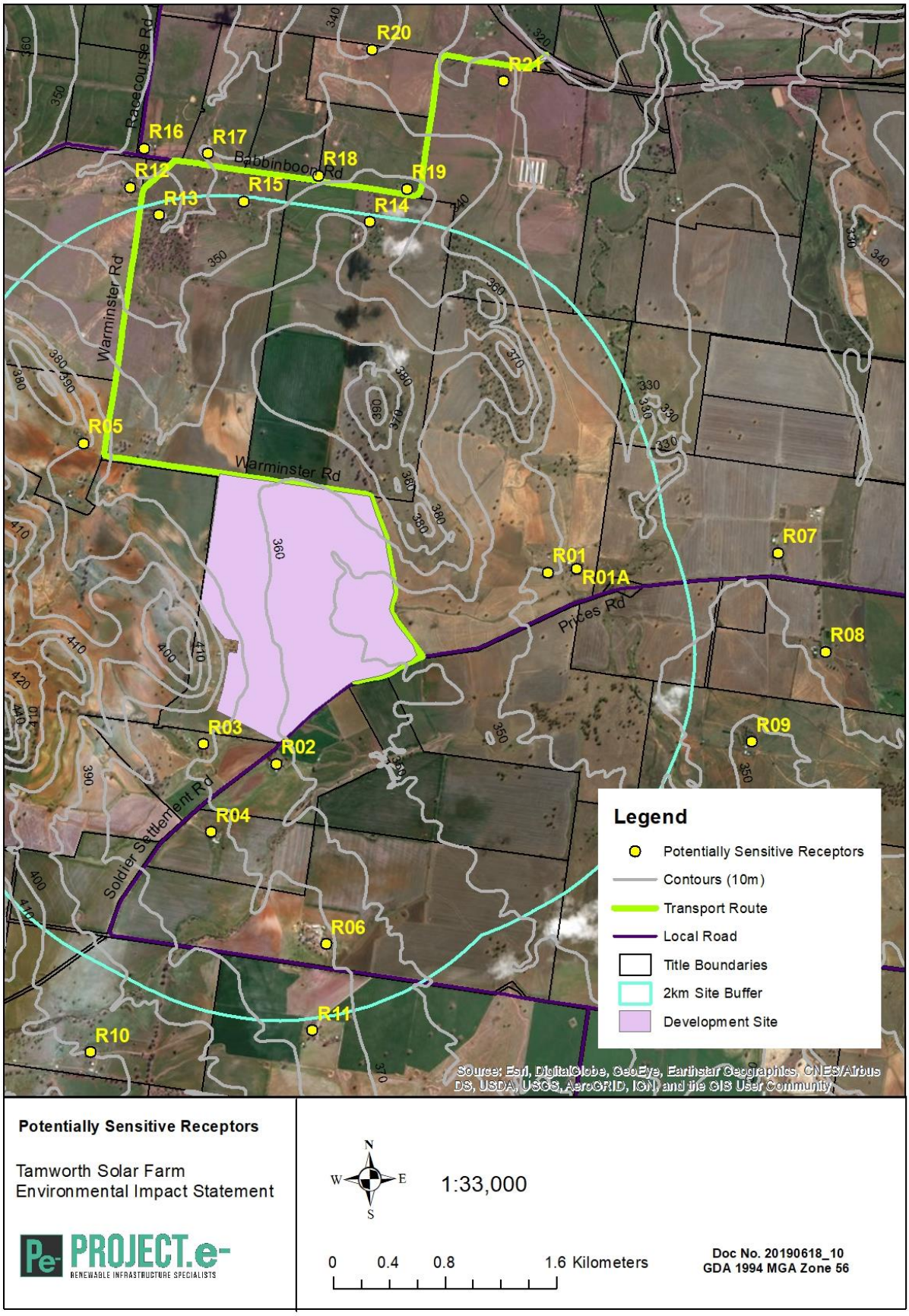
Tamworth Solar Farm Pty Ltd also explained their intention to develop a fund for community projects during the operation of the solar farm. Two consultants were present at the meeting as part of their role to undertake a Social, Environmental, Economic Context Analysis (SEECA) for the Tamworth Solar Farm. They were able to explain to the landholders that the SEECA is an internal analysis that is undertaken to identify the best ways for the Tamworth Solar Farm to engage with local stakeholders and to create shared value.

During the meeting issues were raised and discussed with the group. After the group discussion, landholders had the opportunity to talk through issues in more detail with the directors of Tamworth Solar Farm Pty Ltd and the Project.e

consultant. Issues raised by the adjacent landholders are included in Table 4. 1 with a reference as to where the issue is addressed in the EIS.

The landholders of R05 were unable to make the information session in October and consequently a meeting was arranged at their house on the 24th September. This meeting was attended by the directors of Tamworth Solar Farm Pty Ltd and a Project.e consultant. Issues raised at this meeting are included in Table 4. 1.

A second meeting was held on Site with adjacent land holders on the 5th December. This meeting included more members of the Tamworth Solar Farm Pty Ltd development team and allowed for further consultation and feedback from the landholders.



- **Figure 4. 1 Location of potentially sensitive receptors**

Table 4. 1 Feedback provided by landholders adjacent to the solar farm Site

Aspect	Matter Raised	Reference for Mitigation
Visual	The main issue raised was the impact of the development on the visual amenity and what affect that might have on the property values. Furthermore, landholders were concerned about the time it would take for vegetation screens to establish, whether they would be tall enough to screen the panels and whether they would be watered and maintained. If landholders wanted or needed to sell in the near future, the rate of establishment of the vegetation screens might influence the selling price and the likelihood of sale. Neighbouring landholders felt that there should be some sort of benefit sharing to offset the potential for loss of land value in addition to the community projects proposed by Tamworth Solar Farm. The landholder of R04 also expressed that they would like to have input into the species selection for the vegetation screens.	Section 5.5.4 Section 4.5
Flood	The impact of the solar panels on the rate of runoff and its potential impact on flood levels was raised by the landholder of R01.	Section 5.8.3 Section 5.4.3.1
Erosion	The potential for soil erosion as water falls from the lowest edge of the panel.	Section 5.4.3.1
Noise	Noise levels during construction, particularly at R02.	Section 5.6.4
Agricultural productivity	Concern was raised about the productivity of the agricultural land under the solar panels. The proximity of the vegetation screens to the western boundary was also raised by the landholder of R06. The concern was that if trees were planted on the boundary, the tree roots would be extracting soil moisture from the neighbouring property impacting crop production.	Section 5.4.2.6 Section 5.4.3.3 Section 5.5.4
Stock movement	Warminster Rd is currently used to move stock from one area to another. It was pointed out that it is important to maintain the boundary fences to facilitate this practice. Increased traffic levels during construction will also require management measures in order for stock to be moved safely along the road.	Section 5.4.4.4
Weeds	It was noted in the past that the property had been neglected for a long period of time resulting in the property becoming very weedy. Since that time, the weeds have been controlled but this level of control will need to continue.	Section 5.4.4.2
Road condition	The section of Warminster Rd that runs east from R05 can get very boggy when wet. Conversely the section running north of R05 can get rutted.	Section 5.7.4.2
Grazing	A few adjacent landholders expressed interest in having the right to graze sheep on the property after construction is complete.	Noted, for follow up during operation
Employment	A couple of adjacent landholders have expressed interest in the potential for work during construction and operation.	Noted, for follow up during construction

As presented in Table 4. 1, one of the primary concerns of adjacent landholders is the impact on visual amenity and what affect this might have on property values. There are no known Australian studies looking at the impact of solar farms on adjacent property values. The proponent acknowledges the concern around visual impact and has committed to mitigating visual impacts as much as practicable through the measures described in Section 5.5.4.

4.2.2 Landholders adjacent to the transport route

On Sunday the 13th October, a community consultation session was held at the Somerton Hall for landholders adjacent to the transport route and the general public. Three weeks prior to the consultation session, a letter was dropped in the mailbox of residents along the transport route. The event was also advertised through the following means:

- An advertisement in the Northern Daily Leader,
- A full-page notice in the Somerton Primary School newsletter, and
- A poster in the Somerton Hotel and the Somerton Roadhouse.

The consultation session ran from 11 am to 3 pm. Information posters were laid out within the hall and the directors of Tamworth Solar Farm Pty Ltd and a Project.e consultant were present to talk to people.

Landholders from R05, R12, R13 and R16 attended the consultation session. The landholders from R17 and R18 were unable to make the consultation session but rang the week prior to find out information and to explain the matters that they would like addressed should the project proceed. A subsequent meeting was held with the landholder from R18 on the 5th December. The landholder from R14 had attended the information and BBQ on the 12th October. R15 is a rental property leased by the landholder of R13. No contact was made with the landholders of R15, R19, R20 or R21.

Generally speaking, the landholders along the transport route were positive in regard to the project provided the matters raised in Table 4. 2 were addressed.

Table 4. 2 Feedback provided by landholders adjacent to the transport route

Aspect	Matter Raised	Reference for Mitigation
Road condition	Several landholders commented that during wet periods, the condition of the road can deteriorate quickly due to the clayey nature of the underlying material. The solution that was offered by the landholders was to seal the road for the length of Babbinboon Rd and the top section of Warminster Rd to just past the driveway of R13.	Section 5.7.3 Section 5.7.4
Dust	The issue of dust was raised by several landholders. One landholder has children that suffer from asthma. A related matter was the availability of water. One landholder noted that water should not be used for dust control if there was still drought at the time of construction.	Section 5.7.4
Road safety	Landholders were generally very positive about the measures being taken to improve safety, particularly the road upgrades, most notably the deceleration lane off the Oxley Highway.	Section 5.7.4
Infrastructure	There is a Telstra cable underneath the trees on the corner of Babbinboon Rd and Warminster Rd which will need to be taken into account during the road upgrades. There is also a water pipe under the road south of the driveway for R13. It is about 1 m under the pavement, but less on the edges.	Section 5.7.4

4.2.3 Businesses and community groups

In addition to the landholders along the transport route, there were two other parties that attended the community consultation session at the Somerton Hall. They were:

- A local civil contractor that was interested in tendering for work should the project proceed, and
- Two representatives of the local Landcare group who were interested in the project. They suggested the project make contact with the Tamworth Regional Landcare Association as they have teams of people for planting and maintaining trees and would also be a good source of information regarding species selection.

4.2.4 Aboriginal Community

Consultation has been carried out with the local Aboriginal community according to the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. A range of organisations were contacted offering an opportunity to be consulted on the project. At the end of this process, the following Registered Aboriginal Parties (RAPs) were recognised:

• AT Gomilaroi Cultural Consultancy (Aaron Talbott)

• Gomeroi People Registered Native Title Claimants (Steve Talbott)
• Tamworth Local Aboriginal Land Council (2 representatives).

Three members of the RAPs undertook the cultural heritage assessment and the RAPs also worked with Aboriginal heritage consultant and the proponent in the development of the Cultural Heritage Management Plan.

For details of the consultation process, refer to Section 3 of Appendix D.

4.3 Government authorities

4.3.1 Tamworth Regional Council

There have been a number of meetings and communications with the Tamworth Regional Council that are summarised in Table 4. 3. Discussions with the Council have been very positive and supportive of the project. The project aligns with one of the Council's stated priorities which is to "Identify and promote wind, solar and other renewable energy production opportunities" (NSW Government, Planning and Environment, 2017). The Council is supportive of such projects because of the opportunities for employment and increased economic activity.

Table 4. 3 Consultations with the Tamworth Regional Council

Date	Attendees	Purpose/Outcomes
Jan 2018	Mayor, Manager of Development and Approvals, Director of Planning and Compliance, Directors of Tamworth Solar Farm Pty Ltd.	An initial briefing on the project.
July 2019	Mayor, Town Planner, Directors of Tamworth Solar Farm Pty Ltd, Project.e consultant.	Project update and discussion of subdivision requirements.
July 2019	Manager Tamworth Regional Airport, Project.e consultant.	Preliminary discussion of requirement in relations to glare/reflectivity. The Manager indicated that they were not concerned about reflectivity and there was no requirement to contact CASA
Oct 2019	Town Planner, Coordinator, Economic and Destination Development, and Acting Planning Director. Tamworth Solar Farm consultants	• Briefing on the current status of the project. • Opportunities for engaging with the community and local businesses. • Road maintenance. • Tamworth Regional Airport. • Council is generally agreeable with solar farm projects as they complement the Council's economic strategy.
Nov 2019	Manager, Tamworth Regional Airport and Project.e consultant	Email communications regarding light reflectivity section of visual impact assessment.
Nov 2019	Operations Manager for Works and Project.e consultant	Initial phone and email communications regarding potential road upgrades on the transport route. Any works on Council Roads will require a section 138 permit.

4.3.2 Member for Tamworth

A briefing was organized for the State Member for Tamworth Legislative Assembly) in October. Unfortunately, he was unable to attend, but a briefing was provided to his Media Advisor.

4.3.3 Civil Aviation Safety Authority (CASA)

David Alder of CASA was contacted on the 11th November 2019. CASA have no specific requirements in relation to solar farms and would normally only be interested if the solar farm was within 5 km of the airport and in line with the approach. The Tamworth Solar Farm is 18.9 km from the western end of the Tamworth Regional Airport runway. CASA have indicated that they are not seeking any further information on the proposal.

4.3.4 Other government authorities

During the preparation of the EIS, a number of government departments have been contacted including:

- Roads and Maritime Services as discussed in Appendix H,
- Department of Planning Industry and Environment as part of the process for Aboriginal cultural heritage consultation (refer to Section 3 of Appendix D), and
- Department of Planning Industry and Environment (Dubbo Office) to discuss the Biodiversity Development Assessment Report (BDAR) process.

4.4 Project web page

A project web page was established in July 2019 to provide an ongoing source of information on the project and as a means of making contact with the project team. The address is www.tamworthsolarfarm.com.au The web page has the following elements:

- Site location,
- Project description including the number of panels, the amount of power produced, the battery storage system etc.,
- Grid connection,
- Environmental benefits of the project and the environmental impact assessment,
- Project statistics,
- Facts about project, FAQ list, and
- A "contact us" facility which is monitored by Tamworth Solar Farm.

4.5 Community benefit sharing program

Tamworth Solar Farm Pty Ltd is committed to developing a community benefit sharing program. This program will have two components:

- A benefit for those landholders whose house is within 2 km of the Site and have a view to the development from the house or the house yard. These landholders have been offered the choice of either a 6 kW solar system or a residential battery for those who already have a solar system. The systems will be installed when the project commences construction. This offer will continue to provide a benefit for the landholders over the life of the PV system and reflects the Tamworth Solar Farm's commitment to renewable energy.
- An ongoing community benefit sharing program where the Tamworth Solar Farm Pty Ltd will work with the local community to identify community projects that the company can support.

4.6 Ongoing stakeholder consultation

Tamworth Solar Farm Pty Ltd is committed to ongoing community consultation through the planning approvals phase and into construction and operation. This

will be done through regular communication with landholders adjacent to the solar farm and transport route as well as through updates on the Tamworth Solar Farm web page.

5 Environmental impact assessment

5.1 Biodiversity

5.1.1 Overview

An assessment of biodiversity has been conducted by AREA Environmental Consultants and Communication in accordance with the Biodiversity Assessment Method (OEH, 2017). The full report on the assessment is provided in Appendix B.

This assessment was conducted to meet the following requirements of the SEARs:

Biodiversity – including:

- *an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless OEH and DPE determine that the proposed development is not likely to have any significant impacts on biodiversity values;*
- *the BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM; and*
- *an assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the Fisheries Management Act 1994, and a description of the measures to minimise and rehabilitate impacts;*

This biodiversity assessment qualifies as a streamlined paddock tree assessment as it meets the following definition of paddock trees in Appendix 1 of the Biodiversity Assessment Method (OEH, 2017):

Vegetation meets the definition of paddock trees if:

a) the trees located on category 2 land are surrounded by category 1 land on the regulatory maps under the Biodiversity Conservation Act, or

According to this definition, for this project the paddock trees are considered as category 2 land, while the surrounding groundcover is category 1 land. The surrounding land (groundcover regrowth) is designated as category 1 land as allowable under an existing Property Vegetation Plan. This plan is relevant in perpetuity and authorises the removal of non-protected regrowth groundcover (refer to the section below). This means the cultivated agricultural land covered by the PVP does not require assessment, but the native trees in the Development Site do.

5.1.1.1 Property vegetation plan

The area is designated is currently managed under a Property Vegetation Plan (PVP) – number 22PVP00121. This PVP commenced on 15 December 2014.

Under this PVP the following is allowable:

- **Management Action**: Clearing non-protected regrowth via Change of Regrowth Date
- **Duration of Management Action**: In perpetuity
- **Management Action Details:**
    1. The landholder may clear native vegetation consisting of groundcover considered to be verified non-protected regrowth in the area identified as Map Unit 1, as permitted by section 9(2) of the Native Vegetation Act 2003 and clause 10(a)(b) of the Native Vegetation Regulation 2013, via the Change of Regrowth Date provisions. In this instance, the regrowth date has been changed from 1990 to 1968.
    2. The landholder may use all relevant Routine Agricultural Management Activities (RAMAs) in the area identified as Map Unit 1.

The PVP showing the area mapped as Map Unit 1 is provided as Appendix C.

5.1.2 Existing Environment

5.1.2.1 Landscape features

IBRA regions and subregions and NSW Landscape

The project is in the lower middle portion of the Nandewar Bioregion, Peel subregion (The Nandewar Bioregion lies in northern NSW and across the Qld border. The bioregion is bounded by the North Coast, New England Tablelands and Brigalow Belt South bioregions in the south, east and west respectively. It spans an area of 2,700,313 hectares, with 2,069,604 Ha or 76.6 per cent of it falling in NSW and occupying 2.59 per cent of the state.

The bioregion encompasses Inverell and Tamworth and the smaller towns of Quirindi, Bingara, Barraba, Manilla and Bendemeer.

The development is entirely within the Tamworth – Keepit Slopes NSW Landscapes (refer to Figure 1-10 in Appendix B)

Native vegetation in the surrounding landscape

The extent of native vegetation within 1500 metres of the Development Site is estimated at approximately five percent (refer to Figure 1-11 in Appendix B).

Rivers and streams

The MacIntyre, Gwydir and Namoi catchments are in the bioregion, and the Peel, Macdonald, McIntyre, Namoi, Severn and Gwydir Rivers traverse the bioregion.

The Solar Farm Development Site has three Strahler First Order drainage lines and a second Order drainage line. These drain east into Sandy Creek, which in turn drains north for eight kilometres into the Peel River.

The Deceleration Lane on the Oxley Highway does not possess a drainage line but is 840 metres south of the Peel River.

The intersection of Warminster Rd and Babbinboon Rd is near Onus Creek, a Strahler third order drainage line. Onus Creek drains north for four kilometres into the Peel River and is mapped as Key Fish Habitat.

Wetlands

Farm dams are the only wetlands, or other water bodies, within 1500 metres of the Development Area.

Connectivity features

Few connectivity features exist in the Development Area. The landscape is highly disturbed, historically cleared, and intensely managed for agriculture or transport infrastructure.

Cliffs, caves and ridges

No cliffs, caves or outcropping rocky ridges occur in the Development Site.

5.1.2.2 Native vegetation

A survey of native vegetation was conducted during Tuesday 17 to Thursday 19 September 2019. The survey effort for this assessment was divided into eight arbitrary survey units, as follows:

- Unit 1 is the deceleration lane Development Site,
- Unit 2 is the sight distance Development Site, and
- Units 3 to 8 are in the solar farm Development Site.

All paddock trees were identified, measured for Diameter at Breast Height (DBH) and checked for hollows. Within the solar farm Development Site, there were:

- 21 live White Box trees (*Eucalyptus albens*),
- 1 dead White Box tree, and
- 3 Blakely's Red Gum (*Eucalyptus blakelyi*).

At the sight distance Development Site, there is a single *Acacia stenophylla* that will be impacted by the development.

The deceleration lane Development Sites was dominated by Coolatai Grass (Hyparrhenia hirta) and other exotic species.

The Plant Community Type (PCT) that was determined to represent the remnant trees in the Development Site was PCT433 - White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, BBS Bioregion.

The PCT from which the paddock trees are derived (PCT433 - White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, BBS Bioregion) is associated with a Threatened Ecological Community under the BC Act and the EPBC Act.

BC Act
Endangered: White Box Yellow Box Blakely's Red Gum Woodland (Part) wholly subset of. This listing has been recognised in the BAMC for the paddock tree credit calculations.

EPBC Act
Critically Endangered: White Box Yellow Box Blakely's Red Gum Woodland (Part) wholly subset of.

The community has fewer than 20 mature trees per hectare (the solar farm Development Site, for example, is fewer than one mature tree per hectare), and therefore the Development Site is not consistent with the criteria for the Critically Endangered: White Box Yellow Box Blakely's Red Gum Woodland (Part) wholly subset of, under the EPBC Act.

There are no groundwater dependent ecosystems (GDE) mapped at the Site (refer to Section 5.9.2.4).

5.1.2.3 Threatened species

Desktop threatened species, population and community database searches were conducted prior to the field assessment. One threatened species, Spotted Harrier (*Circus assimilis*) has been recorded within 1500 metres of the Site. Threatened species found within 10 km of the Site are provided in Table 1-9 of Appendix B.

Targeted surveys were conducted to detect threatened species occurring in the category 1 land and the presence of threatened fauna in the Development Site. The category 1 land was the subject of search transects to detect threatened flora species to meet biodiversity and impact assessment requirements of Part 7 of the *NSW Biodiversity Conservation Act 2016*.

Two ultrasonographic bat call recorders were deployed at the Site. One threatened species, Eastern Cave Bat (*Vespadelus troughtoni*) was detected in the three nights of survey. There are no suitable roosting sites for this species on the Development Site, and it is expected this animal was travelling though the Site from roosting habitat greater than 1500 metres to the east, likely to feeding resources associated with the Peel River. This species is a cave roosting species, not known to roost in trees or in human structures such as sheds (although it has been known to roost in mine workings which resemble caves).

5.1.2.4 Weeds

Specimens of Athel Pine (*Tamarix aphylla*) were found at the Site. This species is listed as a Weed of National Significance and as a High Threat Exotic.

5.1.3 Assessment of Impacts

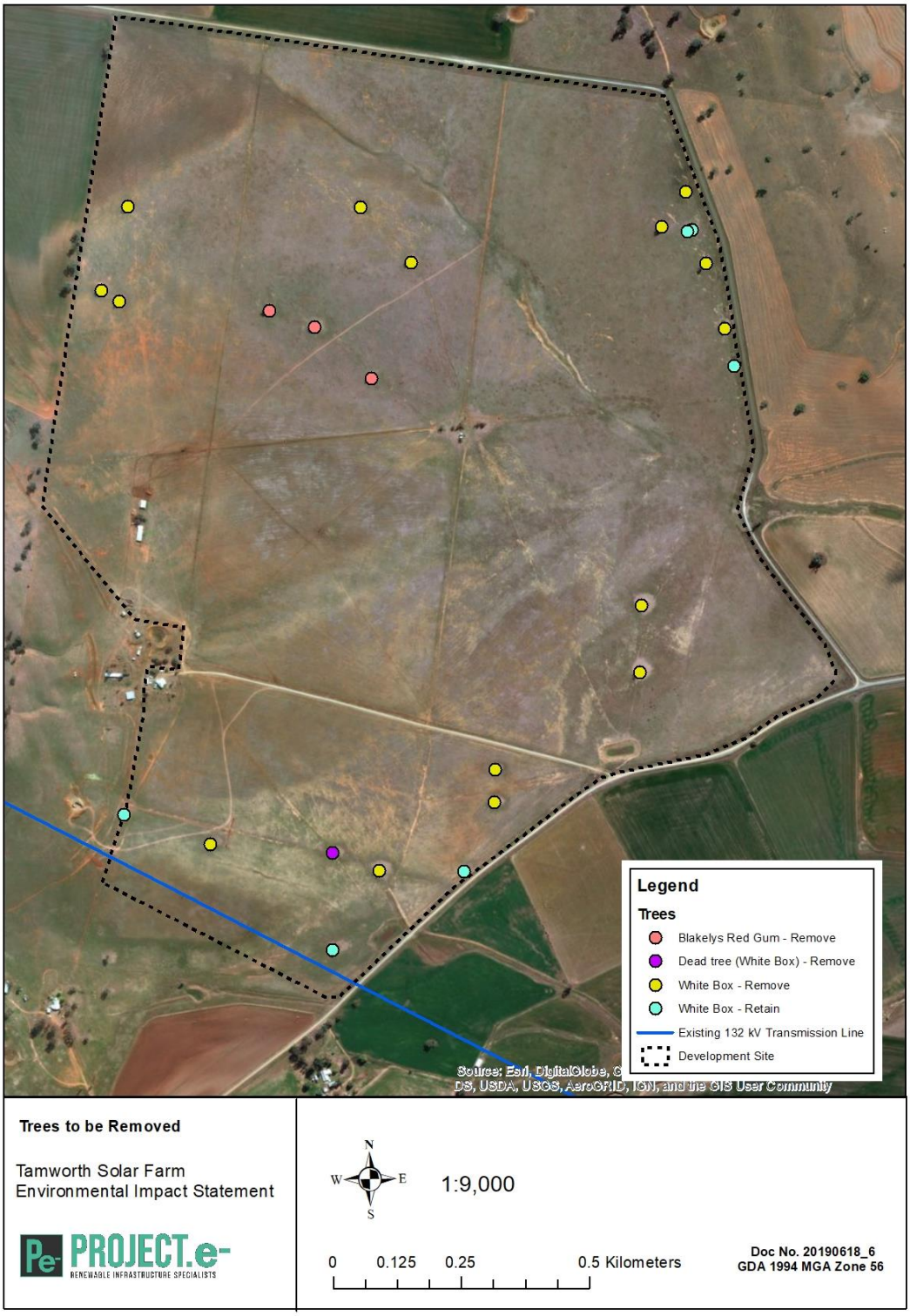
5.1.3.1 Serious and irreversible impacts

No serious and irreversible impacts were identified by the Biodiversity Assessment Method Calculator (BAMC).

5.1.3.2 Impact requiring offsets

Removal of 19 paddock trees, one of which is dead, will require offset under the BC Act. Credit requirement has been calculated using the BAMC (Paddock tree assessment module).

The trees that are to be removed are shown in Figure 5. 1.



- **Figure 5. 1 Trees to be removed**

5.1.3.3 Impact not requiring offsets

The groundcover and woody weeds in the solar farm Development Site is consistent with Category 1 land as authorised by the Property Vegetation Plan. This area does not require offset.

Removal of one *Acacia stenophylla* without disturbing ground cover in the sight distance Development Site does not require offsets.

Removal of Coolatai Grass (*Hyparrhenia hirta*) and other exotic species in the deceleration lane Development Site does not require offsets.

5.1.3.4 Areas not requiring assessment

The solar farm Development Site is Category 1 land as authorised by the Property Vegetation Plan. This area does not require assessment.

5.1.4 Mitigation Measures

Impacts on native vegetation have been minimised by restricting the Site to the area mapped as Map Unit 1 on the PVP. This area has been cleared of native vegetation for over 100 years. A Crown Plan from October 1918 shows most of the title is cleared at that time, other than a few scattered trees. In more recent years, the area has been extensively cropped.

Prior to the clearing of any trees:

- A preclearing survey will be conducted to determine if there are nests or animals in hollows.
- A qualified fauna handler will be onsite during tree clearing operations to rescue and relocate any animals that are in hollows.
- Trees that are not to be cleared will be clearly demarcated (eg exclusion fencing) so that there is no possibility of them being inadvertently cleared.

Any specimens of Athel Pine on the Site will be removed prior to construction commencing.

5.1.4.1 Credit summary

The project will incur credits to offset the impact of clearing the paddock trees. Credits will be retired through payment to the Biodiversity Stewardship Payments Fund. The credit summary in Table 5. 2 has been generated by the BAMC (paddock tree assessment). The Plant Community Type used for this assessment is PCT433 - White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, BBS Bioregion.

Table 5. 2 Credit summary – paddock tree assessment

Scientific name	Common name	Size class	Number of trees	Contains hollows	Ecosystem credits per tree	Credits required
Eucalyptus albens	White Box	3	15	Yes	1	15
Eucalyptus albens	White Box (dead)	2	1	Yes	0.75	1
Eucalyptus blakelyi	Blakely's Red Gum	3	2	Yes	1	2
Eucalyptus blakelyi	Blakely's Red Gum	2	1	Yes	0.75	1
					Total	**19**

5.1.4.2 Summary of mitigation measures

A summary of the mitigation measures for biodiversity is provided in Table 5. 3.

Table 5. 3 Summary of mitigation measures for biodiversity

Reference	Mitigation Measure
B1	The *Acacia stenophylla* at the junction of Babbinboon and Warminster Roads will be removed with a saw without disturbing the ground cover.
B2	Prior to the clearing of any trees: • A preclearing inspection will be conducted to determine where possible, if there are nests or animals in hollows. If fauna is present, they will be managed by a suitable qualified fauna handler. • A procedure will be established to ensure that any fauna injured during the clearing or construction process are appropriately managed. All staff will be made aware of the local wildlife carer's contact details. • Trees that are not to be cleared will be clearly demarcated (eg exclusion fencing) so that there is no possibility of them being inadvertently cleared.
B3	Any specimens of Athel Pine on the Site will be removed prior to construction commencing.

5.2 Aboriginal cultural heritage

5.2.1 Overview

An Aboriginal heritage assessment for the project has been conducted by AREA Environmental Consultants & Communication and the Registered Aboriginal Parties for the project (Appendix D). This assessment was conducted in accordance with the following policies and guidelines:

- Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (NSW OEH 2011a)
- Guide to Investigating, Assessing and Reporting on Aboriginal Heritage in NSW (NSW OEH 2011b)
- Aboriginal Heritage Consultation Requirements for Proponents (ACHCRs).

The assessment has also considered the following Acts and applied the following additional policy, guidelines and standards where relevant:

- *The Burra Charter* (Australia ICOMOS 2013)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *National Parks and Wildlife Act 1974* (NPW Act).

The assessment was conducted to meet the following requirements of the SEARs:

Heritage – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents.

5.2.2 Existing Environment

A field survey took place on Tuesday to Thursday 17 to 19 September 2019 as part of the assessment. It was attended by three Registered Aboriginal Parties from the local Aboriginal community and two staff members from AREA Environmental Consultants. The Registered Aboriginal Parties headed the site assessment, planning and identification of Aboriginal objects while AREA did the recording and assisted with surveys.

The proposal is comprised of three Development Sites as described in Section 3.2:

- The solar farm,
- The deceleration lane at the intersection of Oxley Highway and Babbinboon Road,
- An area requiring one tree, a mature acacia, removed to improve sight distance at Babbinboon Road and Warminster Road intersection.

Ground surface visibility was generally very high in all three Development Sites.

5.2.2.1 Solar farm Site

The solar farm Development Site is on Category 1 Land as defined under the *Local Land Services Act 2013.* Property Vegetation Plan approval number 22PVP00121 (17 December 2014, Appendix C) allows routine agricultural management activities such as ploughing. Due to ploughing and the depth of surface soils, this assessment finds there is a low likelihood for significant sub-surface remains of Aboriginal cultural heritage. The solar farm Development Site has 24 native paddock trees of an age to possess a cultural modification.

5.2.2.2 Deceleration land Site

The entire deceleration lane Development Site has been subject to intensive soil disturbance from road work and as an NSW Roads and Maritime Service stockpile site for gravel. Only small sections of undisturbed areas remain. Road work has directly impacted the uppermost 30 cm of soil. Removal of native vegetation has also destabilised soils to an unknown depth and natural flood events (it is next to the Peel River floodplain) combined with heavy rainfall has washed soils away. It is likely the natural surface soils present are the upper surface of the B horizon (possessing a more erosion resistant higher clay content).

5.2.2.3 Sight distance Site

The entire sight distance Development Site has been subject to intensive soil disturbance from road work and causeway construction and maintenance. No areas of undisturbed areas remain. Road work has had a direct impact on approximately the uppermost 30 cm of the soil. Removal of native vegetation and destabilised soils to an unknown depth, combined with natural flood events of Onus Creek and heavy rainfall has likely washed soils away.

5.2.2.4 Heritage sites recorded

Twenty-three Aboriginal sites were recorded in total. The deceleration lane Site has one open camp site (OS) and the rest of the Aboriginal sites (22) were recorded on, or immediately next to the solar farm Site.

The site were:

- Eleven isolated finds (stone artefact, IF),
- Nine open camp sites (more than one stone artefact within 50 metres of another, OS) and
- Three culturally modified trees (CMT) were recorded.

The location of Aboriginal sites is shown in Figure 3. 5

5.2.3 Assessment of Impacts

Based on the layout at the time of the survey, the impact to the Aboriginal sites can be summarised as:

- Culturally modified trees – three identified but only one in the Development Site: all avoided
- Isolated finds – 11 identified: Five avoided and six impacted
- Open sites – nine identified: Four avoided and five including the one at the deceleration lane Development Site will be impacted.

The actual impact will be determined by the mitigation measures employed.

5.2.4 Mitigation Measures

On the 9th December 2019 a workshop was conducted onsite to commence the development of a Cultural Heritage Management Plan (CHMP). The workshop was attended by all the RAPs, the Aboriginal heritage consultant and a Director of Tamworth Solar Farm Pty Ltd. The following matters were agreed at the workshop and will be documented in the CHMP:

- The culturally modified trees will be fenced and protected with signage as specified in the CHMP.
- Culturally modified tree #3 is an excellent example of this Aboriginal site type and will be used for educational interpretation for both Aboriginal and non-Aboriginal school children to learn about Aboriginal culture.
- All stone artefacts are to be collected and moved to their closest modified tree and placed within the fenced buffer.
- There will be opportunities for employment of Aboriginal people during construction. These people will receive a short training course (2 day) in artefact detection.
- If more artefacts are found on site, they will be removed to the nearest culturally modified tree in accordance with the procedure specified in the CHMP.

A summary of mitigation measures for Aboriginal heritage is provided in Table 5. 4.

Table 5. 4 Summary of mitigation measures for Aboriginal heritage

Reference	Mitigation Measure
AbH1	A Cultural Heritage Management Plan will be developed in consultation with the Registered Aboriginal Parties. Management of the Aboriginal sites will be in accordance with the Cultural Heritage Management Plan.
AbH2	The culturally modified trees will be avoided and will not be impacted.
AbH3	Any removal of artefact including salvage and relocation of impacted items to a suitable location will be in accordance with the Code of Practice of archaeological Investigation of Aboriginal Objects in NSW.
AbH4	Any conditions that accompany the consent for the removal of Aboriginal objects must be followed.
AbH5	An Aboriginal Site Impact Recording form will be submitted for each site damaged or destroyed.
AbH6	The locations of the cultural heritage sites will be provided to the relevant supervisors responsible for the construction and operation of the solar farm and ancillary infrastructure. They are to be informed cultural heritage sites are protected under the NPW Act and no harm is to come to them. The presence of the cultural heritage sites will be made clear to the workforce as part of an induction.
AbH7	Fencing should be sturdy enough to present noticeable physical resistance to the machinery required to construct the solar farm and include high-visibility elements. During the operation of the solar farm, fencing can be downgraded to temporary, high-visibility fencing. Fencing for CMT1 will not be undertaken as it is on a neighbouring property.
AbH8	Should any of the culturally modified trees fall or deteriorate to the point that they are a safety risk during the operation of the solar farm, further management measures will be formulated with the assistance of the local Aboriginal community and a heritage professional.
AbH9	Any CHMP developed for the management of cultural heritage will include an unexpected finds protocol which includes the obligations of a person who encounters an Aboriginal object. This protocol should form part of the induction for any workforce that is involved in the construction or operation of the solar farm.

5.3 Historic heritage

5.3.1 Overview

An historic heritage assessment for the project has been conducted by AREA Environmental Consultants & Communication. The results of this assessment are presented in this section. This assessment was conducted in accordance with the NSW Heritage Manual (OEH) and considered the following Acts and charter where relevant:

- The Burra Charter (Australia ICOMOS 2013)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *National Parks and Wildlife Act 1974* (NPW Act)
- Section 139 of the *Heritage Act 1977*.

This assessment was conducted to meet the following requirements of the SEARs:

"Heritage – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, incorporating adequate consultation with the local Aboriginal community"

5.3.2 Existing Environment

5.3.2.1 Desktop assessment

The heritage databases listed in Table 5. 5 were searched to provide a historical context for the surrounding area. The State Heritage Inventory, the Australian Heritage Database and Schedule 5 (environmental heritage) of the Tamworth LEP 2010 all contained within the region. These places were largely within villages and the city of Tamworth and none were listed nearby to the Site.

Table 5. 5 Summary of the results of the register search for the Site

Database	Date of Search	Parameters	Results
State Heritage Inventory (also State heritage office web-based data on SEED)	30/11/19	Tamworth LGA	No places of historical heritage were listed within or nearby the Site.
Tamworth LEP 2010	30/11/19	Schedule 5	No places of historical heritage were listed within or nearby the Site.
Australian Heritage Database	30/11/19	Tamworth LGA	No places of historical heritage were listed within or nearby the Site.
The National Trust	30/11/19	Tamworth	No places of historical heritage were listed within or nearby the Site.
Australia's National Heritage List	30/11/19	NSW	No places of historical heritage were listed within or nearby the Site.
World Heritage List	30/11/19	Interactive Map	No places of historical heritage were listed within or nearby the Site.

5.3.2.2 Site condition

The Tamworth Solar Farm is comprised of three Development Sites:

- The Solar Farm (refer to Figure 3. 1),
- The deceleration lane at the intersection of Oxley Highway and Babbinboon Road (refer to Figure 3. 2)
- An area requiring one tree, a mature acacia, removed to improve sight distance at Babbinboon Road and Warminster Road intersection (refer to Figure 3. 3).

The Solar Farm Development Site is on Category 1 Land as defined under the *Local Land Services Act 2013* and has been regularly cultivated. Due to ploughing and the depth of surface soils, this assessment finds there is a low likelihood for significant sub-surface remains of historic cultural heritage.

The entire Deceleration Lane Development Site has been subject to intensive soil disturbance from road work and as an NSW Roads and Maritime stockpile site for gravel for this state highway. Only small slithers of undisturbed areas remain. Road work has directly impacted the uppermost 30 cm of soil. Removal of native vegetation has also destabilised soils to an unknown depth and natural flood events (it is next to the Peel River floodplain) combined with heavy rainfall has washed soils away. It is likely the natural surface soils present are the upper surface of the B horizon (possessing a more erosion resistant higher clay content).

The entire Sight Distance Site has been subject to intensive soil disturbance from road work and causeway construction and maintenance. No areas of undisturbed areas remain. Road work has had a direct impact on approximately the uppermost 30 cm of the soil. Removal of native vegetation and destabilised soils to an unknown depth, combined with natural flood events of Onus Creek and heavy rainfall has likely washed soils away.

Ground surface visibility was generally very high in all three Development Sites.

5.3.2.3 Field assessment

A field assessment of the Site did not identify any items that were of historical significance. There were no remains relating to the history of agriculture within the Site that were worth recording. The existing homestead cottage dates to about the 1960s and an array of items of farm infrastructure and machinery (movable heritage) recorded during the archaeological survey of the Site were of a similar or more recent time periods.

It was considered highly likely the property was sold off from a larger adjoining block back in the 1960s explaining an absence of older dating historic objects. This observation fits into the historical context of the area, at a time when there was a shift from transient grazing and timber felling to more intensive agriculture.

5.3.3 Assessment of Impacts

Under Section 139 of the *Heritage Act 1977*, it is prohibited to disturb land leading to the damage or movement of a relic. A 'relic' is defined as any deposit, artefact, object or material evidence that (a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and (b) is of State or local heritage significance.

No historic items were found on Site. Additionally, it is assessed that no sub-surface remains are likely to be within the Site. Therefore, the proposed development will not have any impact on historic heritage.

5.3.4 Mitigation Measures

A summary of the mitigation measures for historic heritage is provided in Table 5. 6.

Table 5. 6 Summary of mitigation measures for historic heritage

Reference	Mitigation Measure
HH1	An unexpected finds protocol will be developed in the case that any potential relics of historic heritage are encountered during construction or operation. The obligations of a person who encounters an historical object will form part of the Site induction.

5.4 Land

5.4.1 Overview

This section addresses matters including land capability, erosion hazard, impacts on agricultural productivity, potential conflicts with neighbouring enterprises and landholders, zoning and subdivision requirements, potential impacts on resource extraction industries and biosecurity. As part of the assessment, a soil survey and soil erodibility assessment were conducted (Appendix E).

This section meets the following requirements of the SEARs:

- *an assessment of the potential impact of the development on existing uses on the site and adjacent land, including:*
    - *a consideration of agricultural land, flood prone land, Crown lands;*
    - *a soil survey to determine the soil characteristics and consider the potential for erosion to occur; and*
    - *a cumulative impact assessment of nearby developments;*
- *an assessment of the compatibility of the development with the existing land uses during operation and after decommissioning, including:*
    - *consideration of the zoning provisions applying to the land, including subdivision; and*
    - *completing a Land Use Conflict Risk Assessment in accordance with the Department of Industry's Land Use Conflict Risk Assessment Guide; and*
- *a description of measures that would be implemented to remediate the land following decommissioning in accordance with State Environmental Planning Policy No 55 - Remediation of Land.*

Information on hydrology and flood prone land is presented in Section 5.8. The impact of the project on surface and groundwater resources is addressed in Section 5.9

5.4.2 Existing Environment

5.4.2.1 Topography

The Site is located at an elevation of between 348 m and 385 m AHD. Contours (10 m) for the Site are shown in Figure 5. 2. The majority of the Site is very gently inclined with a slope of less than 2 %. In the south western section of the Site, the slope increases to between 2 and 4 %, with a small area (<5 Ha) having slopes up to 7 %.

5.4.2.2 Geology

The soils of the Site have been formed from alluvium and colluvium derived from and overlying Devonian conglomerates and argillites of the Keepit Conglomerates and the Baldwin Formation (Geological map code Duk and Dub). Exposures of these parent materials in gullies reveal that the soil materials are

seldom >5 m deep and that bedrock is frequently a highly weathered rock or structured saprolite.

5.4.2.3 Soil landscape and soil capability

The Site is part of the Babinboon soil landscape (9035bb). This section provides a summary of the Babinboon soil landscape as described by Banks, 2001. The Babinboon soil landscape is at the footslopes of Devonian conglomerate and argillite hills in the northern Melville Ranges. In the upper footslopes of the landscape, the soils have deep, moderately well-drained Red Chromosols (Non-calcic Brown Soils). Mid to lower footslopes are dominated by deep, moderately well-drained Red Chromosols (Redbrown Earths). Lower slopes and flats are dominated by moderately deep, imperfectly drained Brown Vertosols (Brown Clay). The solar farm Site is on the lower slopes and flats where Brown Vertosols are the dominant soil type.

The topsoil (A1 and A2 horizons) of the Brown Vertisol is a hardsetting brown clay with a light to medium heavy clay texture, strong pedality, angular blocky (5-50 mm) smooth faced peds with a pH of 6.0 to 7.0. The typical erodibility of this topsoil type is shown in Table 5. 7.

Table 5. 7 Erodibility of hardsetting brown clay topsoils (bb3)

Erosion Type	Erodibility
Non-concentrated water flows	low-moderate
Concentrated water flows	high
Wind	Very low

Source: (Banks 2001)

Vertosols in the Babinboon landscape are of moderate to high fertility with good moisture storage potential and as such are used for cropping. However, they are prone to structural and organic matter decline under cultivation. Consequently, cropping phases should be shorter than pasture phases and should include no till rotational systems.

5.4.2.4 Soil survey and erodibility assessment

A soil survey and erodibility assessment was conducted for the Site by Orkney Management Pty Ltd. The survey report is included as Appendix E. The survey confirmed that the soils on Site are Imperfectly Drained Brown Vertosols. Some Red Chromosols were observed in the vicinity of the location but did not occur in the proposed Site. Soil colour differences were observed across the Site, with red/brown vertosols located higher on the footslope, and brown/grey vertosols further down the slope.

A range of soil tests were conducted to assess the soil erodibilty factor (K-factor) and other attributes of the soil. Texture is the principal factor affecting the K-factor, but structure, organic matter, and permeability also contribute. The results of the soils tested over the Site indicate a low soil erodibility factor.

The topsoils tested on Site had clay contents greater than 45%. They therefore have the potential for strong cracking and slickensides. Heavy plastic clays can be difficult to cultivate especially when they are wet. Typically soils containing in excess of 45 % clay have some shrinking and swelling properties which can be beneficial to soil structure, by having the ability to repair some compaction layers produced by cultivation and machinery.

Soil samples taken to a depth of 60 cm showed the calcium portion of the cation exchange capacity were adequate and sodium levels were low indicating that there is low potential for dispersion of topsoils upon wetting. Samples taken at a depth of 60-90cm indicated some sodicity, but at this depth should not present significant management issues.

Some of the areas of the Site show some evidence of hard setting surface properties, which may elevate the risk of soil erosion from the Site from a low to moderate status under typical rainfall conditions, particularly if the soil does not have surface cover such as in a cropping fallow phase.

5.4.2.5 Biosecurity

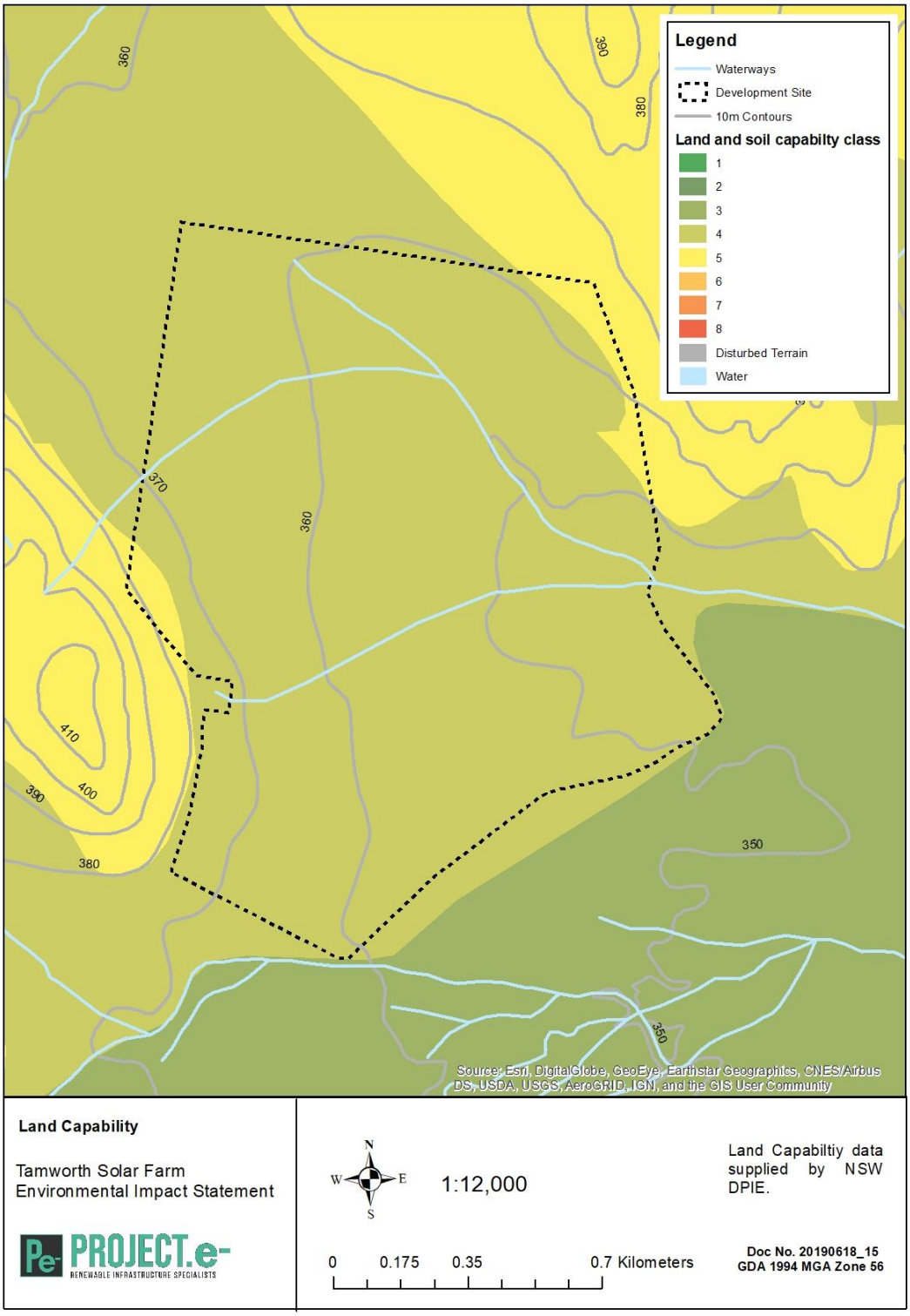
Weed species occurring in the Site includes Athel Pine (*Tamarix aphylla*). This species is listed as a Weed of National Significance and as a High Threat Exotic. Wherever this species occurs in the Development Area, it will be removed.

5.4.2.6 Agricultural productivity

The land and soil capability classes for the Site and surrounding areas are shown in Figure 5. 2. The majority of the land within the Site is Class 4. There is also a small amount of Class 5. There is Class 3 adjacent to the Site to the south-east, but none within the Site. The location of the Class 3 land also corresponds to the location of Biophysical Strategic Agricultural Land (BSAL) for this mapping extent. BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity. Definitions for the relevant land and soil capability classes are provided below:

- Class 3. Moderate limitations. Land capable of sustaining high impact land uses using more intensive, readily available and accepted management practices.
- Class 4. Moderate to severe limitations. Land generally not capable of sustaining high impact land uses unless using specialized management practices with high level of knowledge, expertise, inputs, investment and technology. Limitations are more easily managed for lower impact land uses (e.g. grazing).
- Class 5. Severe limitations. Land not capable of sustaining high impact land uses except where resources allow for highly specialised land management practices to overcome limitations (e.g. high value crops). Lower impact land uses (e.g. grazing) can be managed by readily available practices.

High impact land-uses refers to cultivation (conventional cropping). In the past, the land has been extensively cropped using conventional methods which is not compatible with the long-term capability of the land.



- **Figure 5. 2 Land and soil capability class**

5.4.2.7 Zoning

The area of the Development Site and all land within 4 km of the Site is zoned RU1 Primary Production with a minimum lot size for subdivision of 400 Ha. The largest lot in this area is 666 Ha, therefore, there is no potential for rural residential subdivisions (or similar) close to the proposed development.

Electricity generation is permitted with consent in the RU1 zone under the Tamworth LEP.

The objectives of the RU1 Primary Production zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base,
- To encourage diversity in primary industry enterprises and systems appropriate for the area,
- To minimise the fragmentation and alienation of resource lands,
- To minimise conflict between land uses within this zone and land uses within adjoining zones,
- To permit subdivision only where it is considered by the Council to be necessary to maintain or increase agricultural production,
- To restrict the establishment of inappropriate traffic generating uses along main road frontages,
- To ensure sound management of land which has an extractive or mining industry potential and to ensure that development does not adversely affect the extractive industry, and
- To permit development for purposes where it can be demonstrated that suitable land or premises are not available elsewhere.

5.4.2.8 Contaminated land

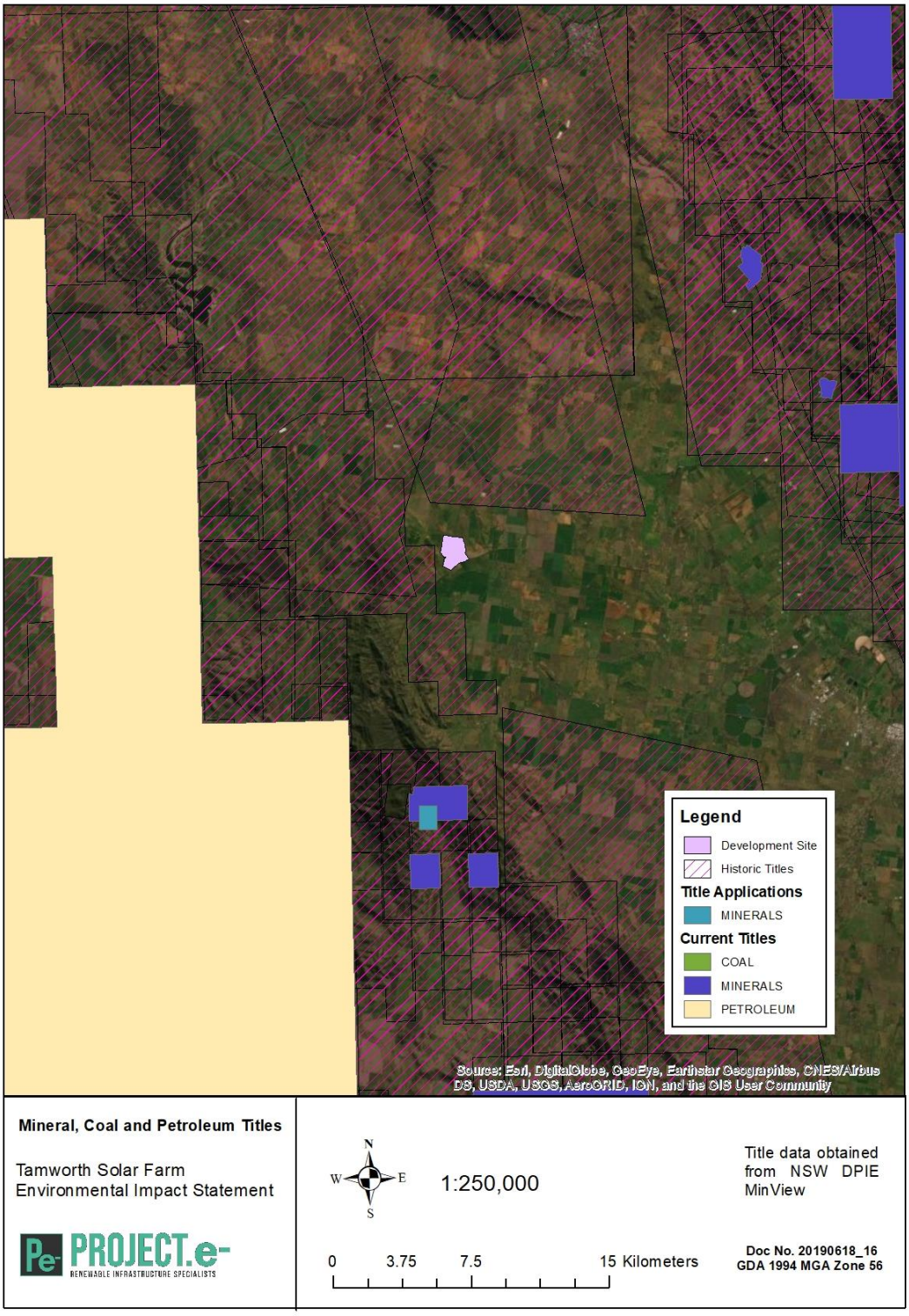
A search of the NSW EPA contaminated land record and the NSW EPA list of notified sites did not reveal any known contaminated sites in or near the development. During surveys of the land, no sites were identified as being potentially contaminated (ie. sheep dips).

5.4.2.9 Crown land

There is no Crown land near the solar farm development. The title on which the development is taking place is freehold title as are all the surrounding titles. The Site of the deceleration lane at the intersection of the Oxley Highway and Babbinboon Rd is within the road reserve (Crown land). Assessments of impact on biodiversity and cultural heritage have been made in Sections 5.1and 5.2 respectively. Prior to any works proceeding at this Site, a works authorisation deed is required from NSW Roads and Maritime Services.

5.4.2.10 Mineral, coal and petroleum titles

A search for mineral, coal and petroleum titles was conducted utilizing the DPIE MinView application. The search included current titles, applications and past titles. The results of the search are shown in Figure 5. 3. There are no current titles or title applications within 10 km of the Development Site.



- **Figure 5. 3 Mineral, coal and petroleum titles**

5.4.3 Assessment of Impacts

5.4.3.1 Soil erosion

The development of a solar farm at the Site will change the agricultural land use from a cropping and grazing enterprise to sheep grazing only. Traditionally cropping activities and the methods that have been employed at this Site involve cultivating the soil to prepare the seed bed. Paddocks were also left fallow (bare) between crops. At these times when the soil has been cultivated or left bare, the soil is very prone to erosion for the following reasons:

- There is no vegetation to slow water runoff and promote infiltration.
- There are no roots to bind the soil together.
- In heavy rainfall events, the impact of rain droplets directly hitting the soil can dislodge clay particles that block pore spaces at the very soil surface and act to seal the soil to infiltration. This increases runoff which leads to increased erosion. This does not occur when there is vegetation cover.
- Cropping tends to reduce organic carbon levels which leaves the soil more prone to erosion over time.
- Soil that has been cultivated has had its structure disturbed making it more prone to erosion.

As a consequence of moving away from a cropping regime, the level of soil erosion will be reduced once a permanent pasture has been established at the Site.

The low gradient and the low erodibility of the topsoil at the Site provides for a low erosion risk under sheet flow conditions. However, some of the areas of the Site show some evidence of hard setting surface properties, which may elevate the risk of soil erosion from the Site from a low to moderate status under typical rainfall conditions if the soil has no vegetation cover.

During community consultation exercises, concern has been raised about the panels concentrating water to one location. The maximum length of the panels in 2 m and hence water can only be concentrated over this distance. For systems where there are two panels in portrait or four in landscape, gaps between the panels let water fall to the ground. The ground will have cover to prevent soil being eroded. Furthermore, the panels move regularly during the day, so water is not always landing in the same location.

5.4.3.2 Biosecurity assessment

The main potential biosecurity risk is from the growth of weeds that could spread to neighbouring properties. These weeds could come from three sources:

1. An existing seed bank on the property,
2. Weed seeds carried onto the property by construction machinery, particularly earth moving machinery, and
3. The existing Athel Pine plants.

The risk of importing plant or animal diseases is low. During construction, there will be no crops or stock on Site and therefore few potential hosts of disease. Once operational, it is anticipated that the solar farm area will be leased to one of the neighbours to graze sheep.

5.4.3.3 Agricultural productivity

When the solar farm is developed, the land will be sown to a permanent pasture and grazed by sheep. This type of enterprise is commensurate with the long-term capability of the land as described in Section 5.4.2.6. Anecdotal evidence suggests that stock carrying capacities are at least 70% of what would be possible without solar panels. The only real impact that the panels have on pasture growth is a decrease in irradiance which on some hot days would have a positive impact.

The distance between the rows of panels is sufficient to allow tractors and equipment to operate although selection of implements will need to take into account the space constraints. This will allow for maintenance activities such as weed spraying or mowing.

The solar farm will not impact on the ability of neighbouring landholders to conduct their normal farming operations. The solar farm will not restrict their requirements for aerial spraying, fertilizing, cultivation etc. The only potential conflicts relating to agricultural production are weed management and minor potential land use conflicts that have been documented in the land use conflict risk assessment (Section 5.4.3.4).

When the project is decommissioned, the infrastructure and facilities will be removed. Once the equipment has been removed and areas such as the substation, BESS and CPUs have been rehabilitated, the land can return to whatever agricultural enterprise the new owner desires. After being in pasture for the duration of the solar farm, the soils should be in better condition than their current state with increased soil organic matter and improved structure.

5.4.3.4 Land Use Conflict Risk Assessment

A Land Use Conflict Risk Assessment (LUCRA) has been conducted for the project in accordance with the DPI's *Land Use Conflict Risk Assessment Guide* (2011) (LUCRA Guide). The findings of this assessment have been recorded in Table 5. 11.

The LUCRA Guide is a method to identify, asses and potentially mitigate potential conflicts that might occur between landholders in a rural location. The guide provides a risk assessment matrix that has been used in the assessment. The risk matrix is provided in Table 5. 8, the probability table as Table 5. 9 and the measure of consequence in Table 5. 10. A risk rating of 1 is representative of the lowest risk and a risk rating of 25, the highest risk.

The landholders surrounding the solar farm Site are a mixture of family owned farming enterprises and lifestyle blocks ranging in size from 47 Ha to large

holdings (>500 ha). These properties are engaged in a mixture of dryland cropping and grazing.

- **Table 5. 8 Risk ranking matrix (Source: DPI 2011)**

PROBABILITY	A	B	C	D	E
Consequence					
1	25	24	22	19	15
2	23	21	18	14	10
3	20	17	13	9	6
4	16	12	8	5	3
5	11	7	4	2	1

- **Table 5. 9 Probability table (Source: DPI 2011)**

Level	Descriptor	Description
A	Almost certain	Common or repeating occurrence
B	Likely	Known to occur, or 'it has happened'
C	Possible	Could occur, or 'I've heard of it happening'
D	Unlikely	Could occur in some circumstances, but not likely to occur
E	Rare	Practically impossible

Table 5. 10 Measure of consequence (Source: DPI 2011)

Level: 1	Descriptor: Severe
Description	• Severe and/or permanent damage to the environment • Irreversible • Severe impact on the community • Neighbours are in prolonged dispute and legal action involved
Example/ Implication	• Harm or death to animals, fish, birds or plants • Long term damage to soil or water • Odours so offensive some people are evacuated or leave voluntarily • Many public complaints and serious damage to Council's reputation • Contravenes Protection of the Environment & Operations Act and the conditions of Council's licences and permits. Almost certain prosecution under the POEO Act
Level: 2	**Descriptor: Major**
Description	• Serious and/or long-term impact to the environment • Long-term management implications • Serious impact on the community • Neighbours are in serious dispute
Example/ Implication	• Water, soil or air impacted, possibly in the long term • Harm to animals, fish or birds or plants • Public complaints. Neighbour disputes occur. Impacts pass quickly • Contravenes the conditions of Council's licences, permits and the POEO Act • Likely prosecution
Level:3	**Descriptor: Moderate**
Description	• Moderate and/or medium-term impact to the environment and community • Some ongoing management implications • Neighbour disputes occur
Example/ Implication	• Water, soil or air known to be affected, probably in the short term • No serious harm to animals, fish, birds or plants • Public largely unaware and few complaints to Council • May contravene the conditions of Council's Licences and the POEO Act • Unlikely to result in prosecution
Level: 4	**Descriptor: Minor**
Description	• Minor and/or short-term impact to the environment and community • Can be effectively managed as part of normal operations • Infrequent disputes between neighbours
Example/ Implication	• Theoretically could affect the environment or people but no impacts noticed • No complaints to Council • Does not affect the legal compliance status of Council
Level: 5	**Descriptor: Negligible**
Description	• Very minor impact to the environment and community • Can be effectively managed as part of normal operations • Neighbour disputes unlikely
Example/ Implication	• No measurable or identifiable impact on the environment • No measurable impact on the community or impact is generally acceptable

Table 5. 11 Land use conflict risk assessment

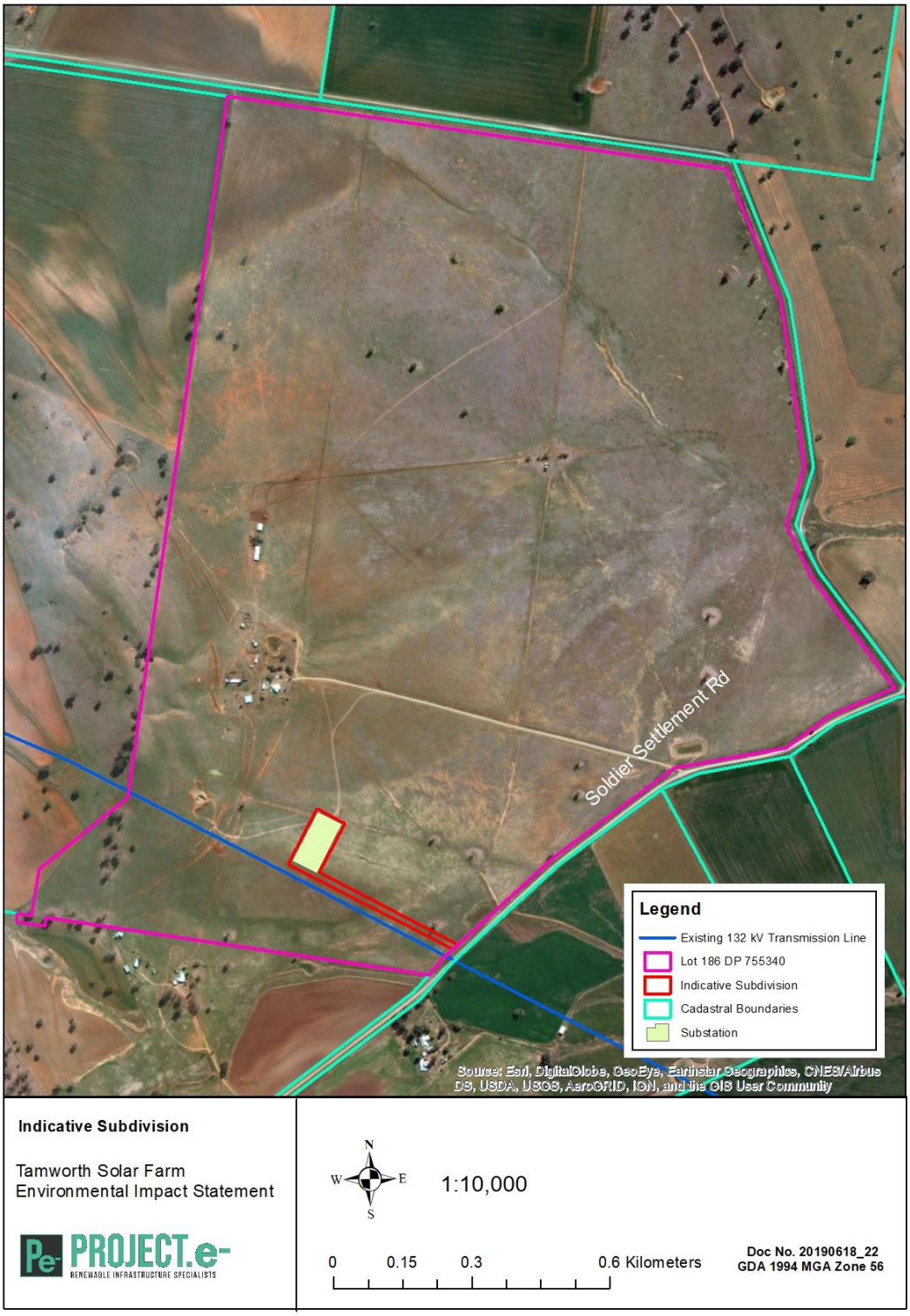
Identified Potential Conflict	Risk Ranking	Management Strategy	Revised Risk Ranking
Noise. Construction noise impacts.	17 (B4)	Construction noise may exceed the relevant criteria at one dwelling for a short period (up to 14 days). Management measures are detailed in Section 5.6.4	8 (C4)
Traffic. Potential impact on road safety from increased traffic and trucks.	13 (C3)	Management measures for road safety during construction are described in Section 5.7.4.3.	9 (D3)
Traffic. Dust from increased traffic.	21 (B2)	Management measures for road dust control during construction are described in Section 5.7.4.1	8 (C4)
Traffic. Impacts on road condition.	21 (B2)	Management measures for maintain the local roads in adequate condition during construction are described in Section 5.7.4.2	8 (C4)
Traffic. Movement of stock along local roads.	12 (B4)	Neighbouring landholders regularly use local roads (including Warminster Rd) to move livestock from one area to another. Increased construction traffic will make this more difficult. A protocol will be developed whereby neighbouring landholders can notify the project of the desire to move livestock at a certain time and measures are put in place to limit vehicle movements at that time to the extent that is practicable. As part of project inductions, workers and drivers will be informed of the required response should they encounter stock being moved on the road. Boundary fences along Warminster Rd and Soldier Settlement Rd will be maintain in a serviceable state to facilitate movement of stock along the road.	8 (C4)
Flooding. Changes to flood heights	3 (E4)	Neighbours have expressed concerns that the peak flood height could rise. Modelling has shown that there will be no impact on flood heights outside of the Site boundary. Refer to Section 5.8.	3 (E4)
Biosecurity. Potential importation of weeds during construction and spread of weeds if not controlled on Site.	17 (B3)	Mitigation measures for weed management are described in Section 5.4.4.2.	5 (D4)
Visual impact. Impact on the visual amenity of neighbouring residents.	17 (B3)	Mitigation measures for visual impact are described in Section 5.5.4	12 (B4)
Visual impact. The perceived impact on land values.	17 (B3)	Mitigation measures for visual impact are described in Section 5.5.4	12 (B4)
Bushfire risk.	22 (C1)	Mitigation measures for visual impact are described in Section 5.11.4	9 (D3)

The LUCRA has identified that most land use conflict risks can be mitigated through management measures. Visual impacts may be an exception depending on the effectiveness of the visual screens and the time taken to establish them.

5.4.3.5 Subdivision for the substation

The land for the substation and access road to the substation will require subdivision as it will be owned by a different entity to the solar farm. The area of land to be subdivided will be determined once design is complete, but it is expected that it will be less than 2 Ha. A map showing the indicative location of the subdivision is shown in Figure 5. 4. All the land within the Development Site is zoned RU1 Primary Production with a minimum lot size of 400 Ha. Consequently, the proposed subdivision would require the approval of the Minister for Planning under the provisions of Section 4.38 of the EP&A Act.

The subdivision was discussed at a meeting held with the Tamworth Regional Council on the 4th July 2019 including the Mayor and Planner, Lucy Walker. There were no issues raised by the Council regarding the proposed subdivision.



- **Figure 5. 4 Indicative subdivision boundary**

5.4.4 Mitigation Measures

5.4.4.1 Soil erosion

The primary mitigation for soil erosion will be to maintain a dense and productive pasture over the life of the project. If the schedule and the season permits, the Site will be sown to permanent pasture prior to construction commencing. Consideration will be given to direct drilling the pasture (rather than conventional cultivation) in order to limit soil disturbance. This will provide firm ground for construction as well as minimise the risk of dust and the establishment of weeds. If the pasture cannot be sown prior to construction, the Site will be sown as soon as possible after construction.

Specific erosion control measures during construction and decommissioning are discussed in Section 5.9.4.

5.4.4.2 Biosecurity

A weed management plan will be developed as part of the CEMP, OEMP and DEMP. These weed management plans will include:

- A section identifying notifiable and problematic environmental and agricultural weeds.
- Training of relevant staff in weed identification.
- Regular monitoring schedule for weeds and control where necessary.
- A protocol to ensure that all earthmoving equipment and other machinery that comes on to Site is clean and free of any weed material.

The specimens of Athel Pine will be removed at the commencement of the project.

Developing a productive permanent pasture will assist in reducing the weed burden. Consequently, a permanent pasture should be established as soon as possible as discussed in Section 5.4.4.1.

5.4.4.3 Agricultural productivity

When the project is decommissioned, all infrastructure and facilities will be removed. Areas where topsoil has been removed such as the substation, BESS and CPUs will be reprofiled and the original topsoil spread back over the disturbed area and sown. During construction of the substation, BESS and CPUs , topsoil will be stored separately from other spoil so that it can be used for rehabilitation as part of decommissioning. The topsoil stockpile will not be more than a metre high and will be sown with cover vegetation.

5.4.4.4 Summary of mitigation measures

A summary of the mitigation measures for land is provided in Table 5. 12.

Table 5. 12 Summary of mitigation measures for land

Reference	Mitigation Measure
L1	If the schedule and the season permits, the Site will be sown to permanent pasture prior to construction commencing. If the pasture cannot be sown prior to construction, the Site will be sown as soon as possible after construction.
L2	During operation, where practicable, stock will be removed from the Site before the grass is grazed too low and soil exposure is increased.
L3	A weed management plan will be developed as part of the CEMP, OEMP and DEMP. These weed management plans will include: • A section identifying notifiable and problematic environmental and agricultural weeds. • Training of relevant staff in weed identification. • Regular monitoring of weeds and control where necessary. • A protocol to ensure that all earthmoving equipment and other machinery that comes on to Site is clean and free of any weed material.
L4	When the project is decommissioned, all infrastructure and facilities will be removed. Areas where topsoil has been removed such as the substation, BESS and CPUs will be reprofiled and the original topsoil spread back over the disturbed area and sown. During construction of the substation, BESS and CPUs , topsoil will be stored separately from other spoil so that it can be used for rehabilitation as part of decommissioning. The topsoil stockpile will not be more than a metre high and will be sown with cover vegetation.
L5	During the construction, operation and decommissioning of the solar farm, there will be a designated person for neighbouring landholders to contact should any issues arise.
L6	A protocol will be developed whereby neighbouring landholders can notify the project of the desire to move livestock at a certain time and measures will be put in place to limit vehicle movements at that time to the extent that is practicable. As part of project inductions, workers and drivers will be informed of the required response should they encounter stock being moved on the road.
L7	Boundary fences along Warminster Rd and Soldier Settlement Rd will be maintain in a serviceable state to facilitate movement of stock along the road.

5.5 Visual

5.5.1 Overview

A visual impact assessment for the project has been conducted by Moir Landscape Architecture and can be found in Appendix F.

This assessment was conducted to meet the following requirements of the SEARs:
Visual – including an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners;

There are no specific guidelines for visual impact assessment and mitigation for the development of solar farms, other than SEARS, in NSW.

5.5.2 Existing Environment

5.5.2.1 Existing Landscape Character

Land Use

The landscape typical of the region is predominantly cleared for agricultural land, consistent with its historical land use as cropping and grazing. Rural dwellings and agricultural structures intersperse the landscape. There are screening plantings around some residences but the landscape character is generally scattered or partial vegetation.

Roads

The Site is bordered by Warminster Road to the north and north-west and Soldiers Settlement Road to the south-east which service the rural dwellings in the surrounding locality. The study area is serviced by a network of local access roads, mostly unsealed, providing access to the rural farming properties. For most residents, Soldiers Settlement Road is the major road link to the Oxley Highway, which provides access to Tamworth to the south-east. Warminster Road and Babbinboon Road is used by residents to access Somerton to the north.

Towns

Somerton is located approximately 7 km north of the development. It is a small village that services commuters on the Oxley Highway. It has a population of approximately 573 according to the 2011 Census. There is a primary school, roadhouse, hotel, residential dwellings and memorial hall. The town is situated close to the Peel River.

The major regional hub of Tamworth is located approximately 25 km to the east with a population of around 63,000.

Infrastructure

Infrastructure in the area is generally limited to agricultural structures, highways, dirt roads and transmission lines. This contrasts with the rural setting but forms part of the existing landscape character.

Tamworth Regional Airport services the area and is located approximately 20km from the development.

Vegetation

The area sits within Nandewar bio-region and the Peel sub bio-region. The native vegetation of the surrounding area has been largely cleared for agricultural use. Native vegetation is generally confined to watercourses, creek lines, gullies, fence lines and surrounding ranges. Small groupings of native and exotic species provide varying levels of visual screening for some of the rural residences. Minimal, predominantly native vegetation is scattered throughout the agricultural land.

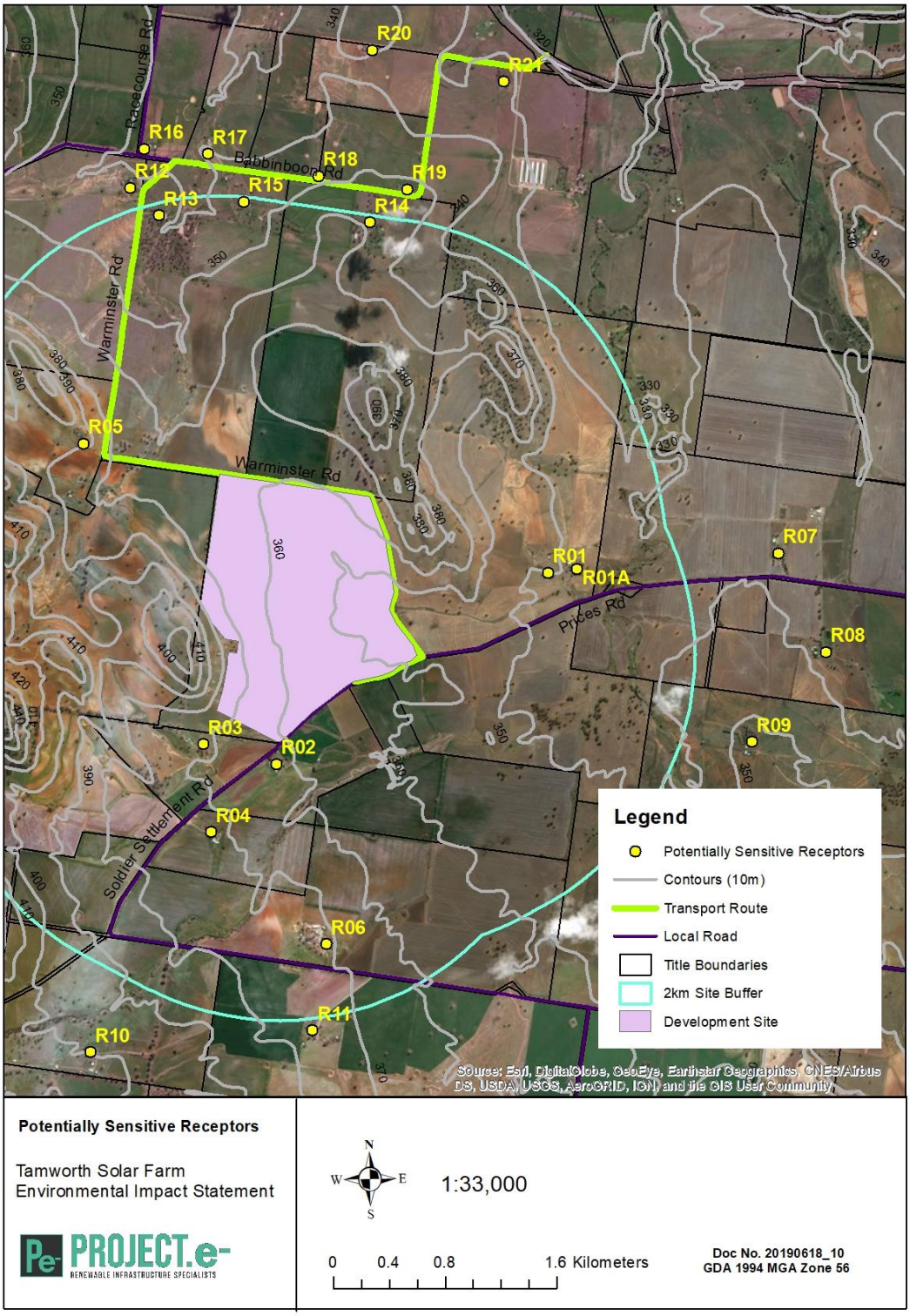
The Site itself has some remnant scattered trees and very little other vegetation due to the drought. For more information on vegetation on the Site, refer to Section 5.1.

Topography

The area is characterised by the Melville Ranges that slope down to meet the Peel River, creating the productive soils of the Peel River flats. The topography of the region is mostly flat to slightly undulating.

5.5.2.2 Location of surrounding residences

The location of surrounding residences (potentially sensitive receptors) is shown in Figure 5. 5. Some are residences for commercial farms, others are smaller lifestyle blocks.



- **Figure 5. 5 Location of potentially sensitive receptors**

5.5.3 Assessment of Impacts

5.5.3.1 Heights of infrastructure

The infrastructure proposed for the development is described in Section 3.3. The height of the infrastructure contributes to how visible they are. Estimated heights for infrastructure are provided in Table 5. 13.

- **Table 5. 13 Estimated heights of infrastructure**

Infrastructure		Estimated Height
PV Panels		Up to 4.5m
PCU		Up to 3.6 m
Operations and maintenance building		Up to 4 m
BESS		Up to 3.6 m
Substation	Switchroom/Control Building	Up to 6 m
	Transformer	Up to 10 m
	Lightning poles	Up to 20 m
	Gantry	Up to 18 m
	Other HV equipment	Up to 6 m

5.5.3.2 Assessment methodology

The potential visual impact of the proposal was assessed based on the relationship between the visual sensitivity and visual effect.

Visual sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the proposal (EDAW, 2000). For example, a significant change that is not frequently seen may result in a low visual sensitivity although its impact on a landscape may be high. Generally, the following principles apply:

- Visual sensitivity decreases as the viewing time decreases.
- Visual sensitivity decreases as the number of potential viewers decreases.
- Visual sensitivity can also be related to viewer activity (e.g. a person viewing an affected site whilst engaged in recreational activities will be more strongly affected by change than someone passing a scene in a car travelling to a desired destination).

Sensitivity ratings are defined as high, moderate or low and are shown in Table 5. 14.

- **Table 5. 14 Visual sensitivity rating table (adapted from Urbis, 2009)**

	Distance from Site				
Land use	**0 - 0.5 km**	**0.5 -1 km**	**1 - 2.5 km**	**2.5 - 4 km**	**> 4 km**
Townships	High	Moderate	Moderate	Moderate	Low
Recreational Reserve	High	Moderate	Moderate	Moderate	Low
Residence	High	Moderate	Moderate	Low	Low
Rural Township	High	Moderate	Low	Low	Nil
Main Highway	Moderate	Low	Low	Low	Nil
Local Roads	Moderate	Low	Low	Low	Nil
Farm Road	Low	Low	Low-Nil	Nil	Nil
Agricultural Land	Low	Low	Low-Nil	Nil	Nil

Visual effect

Visual effect is defined as the interaction between a proposal and the existing visual environment. It is often expressed as the level of visual contrast of the proposal against its setting or background in which it is viewed.

Low level: occurs when a proposal blends in with its existing viewed landscape due to a high level of integration of one or several of the following: form, shape, pattern, line, texture or colour. It can also result from the use of effective screening ie. topography and vegetation.

Moderate level: occurs where a proposal is visible and contrasts with its viewed landscape however, there has been some degree of integration (e.g. good siting principles employed, retention of significant existing vegetation, provision of screen landscaping, appropriate colour selection and/or suitably scaled development).

High level: results when a proposal has a high visual contrast to the surrounding landscape with little or no natural screening or integration created by vegetation or topography.

Visual impact

Visual impact refers to the change in appearance of the landscape as a result of development. Visual impact is the combined effect of visual sensitivity and visual effect. Various combinations of visual sensitivity and visual effect will result in high, moderate and low overall visual impacts as suggested in Table 5. 15below (URBIS, 2009).

- **Table 5. 15 Visual impact rating (adapted from Urbris, 2009)**

	Visual Effect		
Visual Sensitivity	**High**	**Moderate**	**Low**
High	High Impact	High Impact	Moderate Impact
Moderate	High Impact	Moderate Impact	Low Impact
Low	Moderate Impact	Low Impact	Low Impact

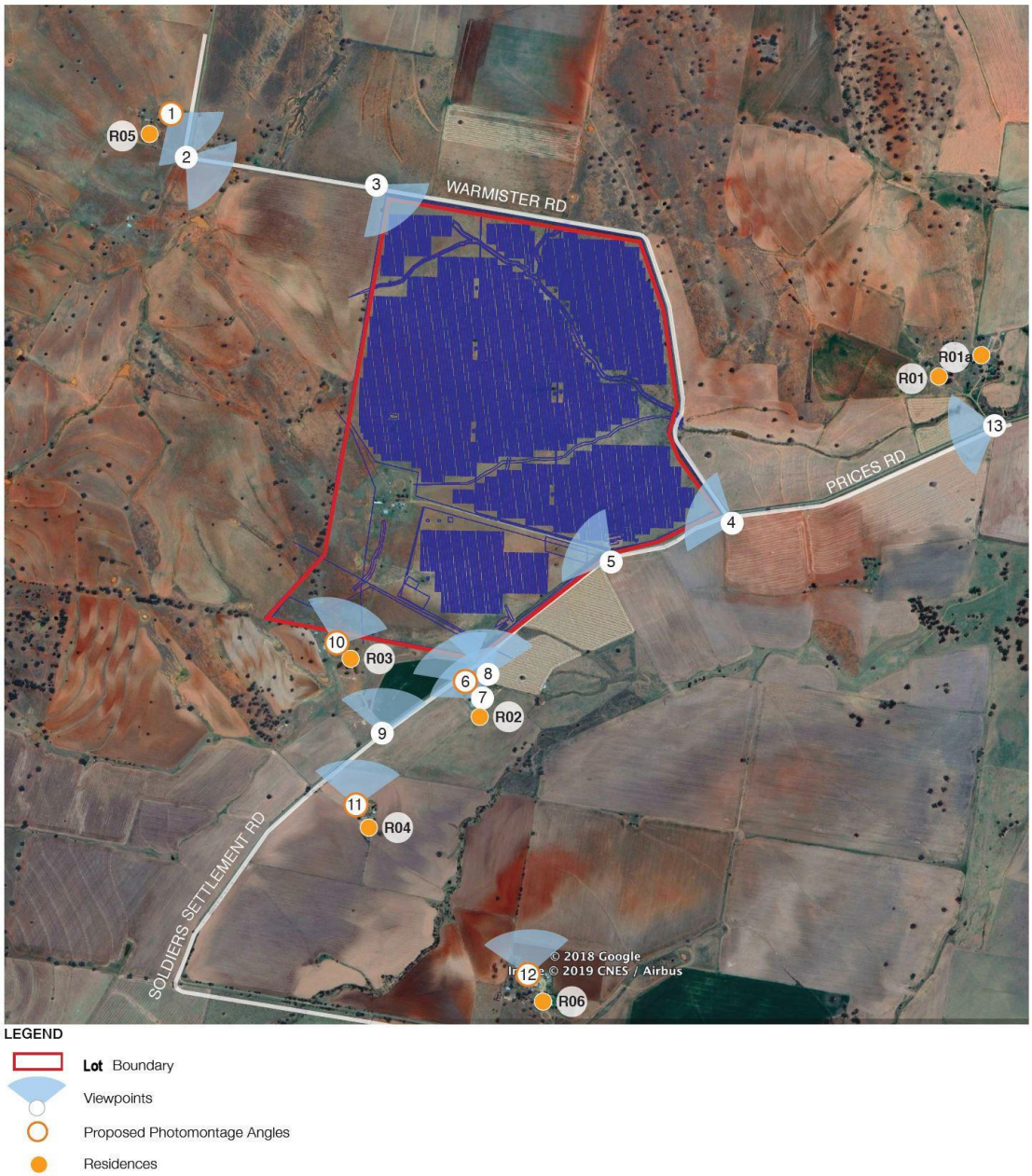
Viewpoint analysis methodology

A digital terrain model was used to determine a zone of visual influence (ZVI). This is the area over which the development can theoretically be seen, but it does not take into account the screening effect of trees and other structures. Once the ZVI had been determined, a total of 13 viewpoints were selected from which to analyse the potential visual impact.

Viewpoints were selected to be representative of the range of views within the study area. Viewpoints were selected to illustrate a combination of the following:

- Areas of high landscape or scenic value.
- Visual composition (eg: focused or panoramic views, simple or complex landscape pattern).
- Range of distances.
- Varying aspects.
- Various elevations.
- Various extent of development visibility (full and partial visibility).
- Views from major routes.

Once the viewpoints had been selected, panoramic photographs were taken. For each viewpoint, the potential visual impact was analysed through the use of a combination of the 3D terrain modelling, topographic maps and on site analysis.



■ **Figure 5. 6 Viewpoints used for visual assessment**

5.5.3.3 Visual Catchment

The residents that are able to see the solar farm from their house or the surrounding yard are summarized in Table 5. 16. None of these landholders are associated with the project. There is a house on the Site, but this will be converted to the operations and maintenance facility.

Table 5. 16 Visibility of the solar farm from surrounding residences

Receptor (residence)	Distance from the Site (km)	Solar Farm Visible from the House.	Solar Farm Visible from the House Yard.
R01[1]	1.15	Possible	Yes
R01A[1]	1.35	Unlikely	Possible
R02	0.32	Yes	Yes
R03	0.36	Yes	Yes
R04	0.88	Yes	Yes
R05	1.0	Yes	Yes
R06	1.64	No	Yes
R07	2.82	No	No
R08	3.0	No	No
R09[1]	2.57	Unlikely	Possible
R10[1]	2.70	No	No
R11	2.24	No	No
R12 to R21	>1.9	No	No

[1] A Site inspection was not conducted for these residences and therefore, whether the solar farm can be seen is a best estimate given the topography and vegetation.

Residents R05 & R03 are located on elevated land to the north-east and southeast of the proposal respectively and will see a large area of panels. Residents R02, R04 & R06 are located on the flat land to the south of the Site where there is high visibility of the solar panels. Both R02 & R06 have some dense vegetation along the fence line which will fragment the view.

A ZVI is provided in Figure 4 of Appendix F. However, it should be noted that as the ZVI does not take into account vegetation and buildings, the real zone of visibility of the Tamworth Solar Farm is far less than that shown in the ZVI.

5.5.3.4 Potential visual impact

The visual sensitivity and visual effect of each viewpoint have been assessed and, when combined, result in an overall visual impact for the viewpoint (Refer to Table 5. 17). Photographs taken for each viewpoint are provided Appendix F and photomontages have been provided for viewpoints 01, 06, 10, 11 and 12.

Of the 13 viewpoints,1 received a Visual Impact Rating of Low, 5 received a Visual Impact Rating of Moderate and 7 received a Visual Impact Rating of High. It is noted that the visual impacts associated with the proposed development are likely to be higher during the construction phases and mitigated overtime with screening.

The viewpoints which were rated as having a high visual impact are within close proximity of the proposal in locations where there was an absence of existing vegetation to screen views into the proposed development. Primarily viewpoints that were rated as “moderate” consisted of views into the Site that were from a greater distance to the Site and already had partial screening by topography or existing established vegetation. The addition of screen planting would further reduce the visual impact.

Generally, viewpoints that were rated as low contained limited views to the Site, were taken from a long distance to the solar panels or had adequate screening, roadside vegetation and landforms to obscure views.

Table 5. 17 Viewpoint visual impact summary

Viewpoint	Type	Visual Sensitivity	Visual Effect	Potential Visual Impact
VP01	Private: R05	Moderate	High	High
VP02	Public	Low	High	Moderate
VP03	Public	Moderate	High	High
VP04	Public	Moderate	High	High
VP05	Public	Moderate	High	High
VP06	Private: R02	Moderate	High	High
VP07	Private: R02	High	Low	Moderate
VP08	Private: R02	High	Moderate	High
VP09	Public	Moderate	Moderate	Moderate
VP10	Private: R03	High	Moderate	High
VP11	Private: R04	Moderate	Moderate	Moderate
VP12	Private: R05	Moderate	Moderate	Moderate
VP13	Public	Low	Low	Low

Overall the proposed development will result in the modification of the existing visual landscape. The modification will be a staged process which occurs overtime and the visual impacts associated with the proposal will vary depending on the viewing location. The highest visual effect from the PV panels is likely to be seen from the east and west when the panels are at their maximum height of around 4.5 m.

There will be areas within publicly accessible land where the development can be viewed in its entirety. However, a combination of the speed of travel, roadside vegetation, undulating topography and general road direction would limit the opportunities to areas in close proximity to the development.

It is likely six of the surrounding residences would have varying degrees of visibility toward the Development Site. However, some residences would have fragmented views due to the existing topography, roadside and boundary vegetation.

Of the six residences that have been identified as having a view of the proposed development R05, R02 & R03 are likely to have high visual impact levels. R04 & R06 are likely to have moderate visual impact levels. Although viewpoints were not obtained from R01, viewpoints from the driveway of the residence would suggest that R01 would have low visual impact levels.

Substation

The substation is situated in the south-western corner of the Development Site. The substation is approximately 120 m x 60 m, although only half of this will be

built form. The majority of the substation will less than 10 m high, although the lightning poles will reach up to 20 m high. Whilst the final design is yet to be confirmed, there will be some impact on views from the public domain and two surrounding lots R03 and R02.

Night lighting

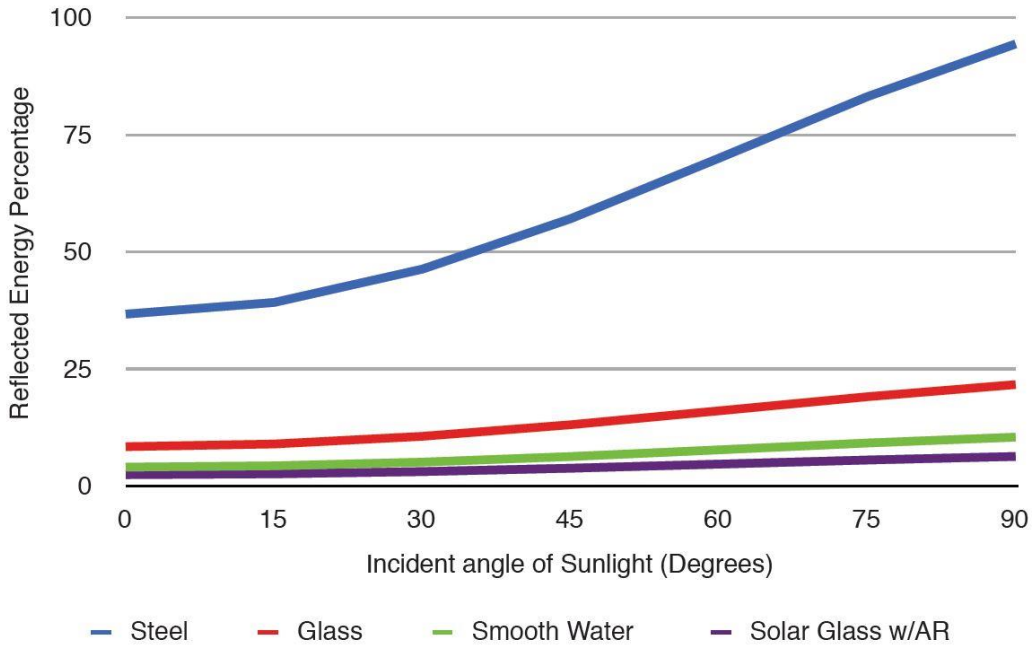
There will be no permanent night lighting installed. Night lighting will only be used if required during maintenance and would be designed to ensure minimal disturbance to neighbouring properties.

5.5.3.5 Reflectivity

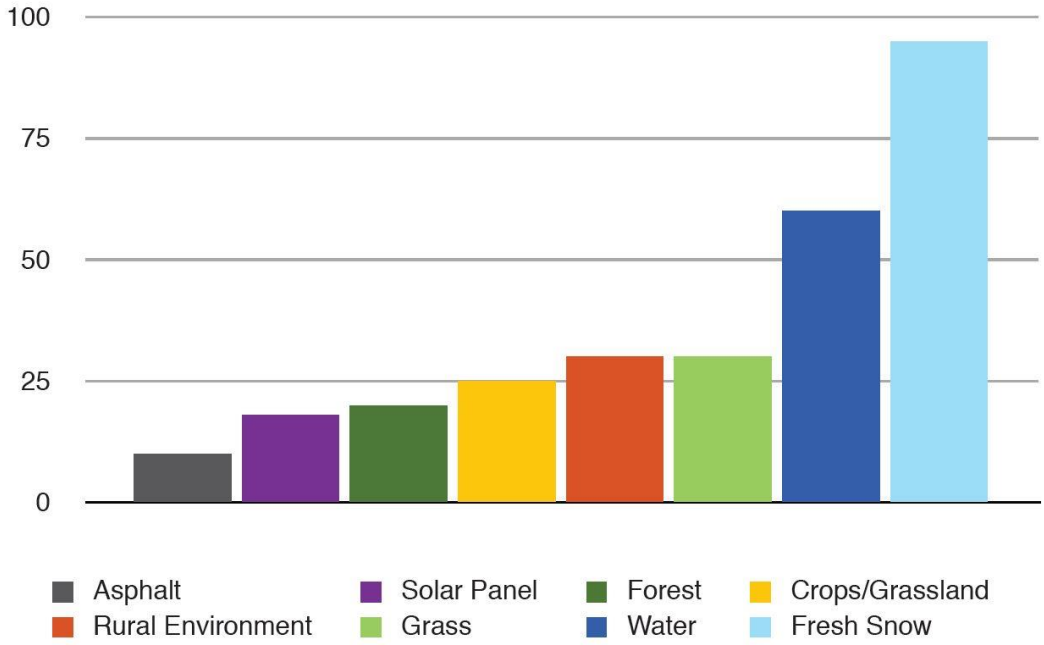
Due to the materials used in the construction of PV panels being primarily glass and steel there is a perceived issue of glint and glare surrounding the reflectivity solar panels. As a result of the perceived reflection levels, there is a concern of possible distractions to motorists, aircraft (particularly with the close proximity to Tamworth Airport) and the hazard of eye damage.

Solar panels are designed to absorb the sun energy and directly convert it to electricity. Current PV modules absorb approximately 93.5% of the light received. The solar panels are designed using antireflective solar glass effectively reducing reflectivity. Thin slivers of metal stripping on the face of the panels further reduce any potential glare issues that may occur.

The level of glare and reflectance from the PV solar panels are considerably lower than the level of glare and reflectance of common surfaces, particularly those surrounding the proposed solar plant. The PV panels would reflect approximately 6.5% of energy which is less than typical rural environments which have a reflectivity of approximately 15-30%. It is also worth noting that because they will be single access tracking, the incident angle will always be relatively low. Figure 5. 7 shows the percentage of reflective energy from solar panel glass, normal glass, smooth water and metal. The reflected energy from solar panel glass does not increase significantly with increasing incident angle. Figure 5. 8 shows the comparative reflection from various ground covers.



- **Figure 5. 7 Analysis of typical material reflectivity (Source: Spaven Consulting 2011)**



- **Figure 5. 8 Comparative reflection analysis (Source: Spaven Consulting 2011)**

Note: Units are percentage of relative reflectivity.

5.5.3.6 Tamworth Regional Airport.

The Site is approximately 19 km from the western end of the runway of the Tamworth Regional Airport. Both CASA and the Tamworth Regional Airport

were contacted regarding the project and neither organisation perceived any risk to the operation of the airport. CASA is not interested unless the development is within 5 km and close to the approach flight path.

5.5.4 Mitigation Measures

The following mitigation measures will be implemented to reduce the visual impact of the development.

5.5.4.1 Design measures

The following design considerations will be employed at the Site:

- Visual impacts to surrounding residents will be considered when siting the PCU's and shed/warehouse within the proposed Development Site. They should be located at a suitable distance from residences.
- Consideration will be given to the material and colours of the PCU's, the battery, and storage shed to ensure minimal contrast and to help blend into the surrounding landscape. Where practicable, materials will be nonreflective and painted in neutral colours that are sensitive to the surrounding landscape.
- If practicable, spoil from the construction of the substation and BESS will be placed in a bund near the southern side of the substation to provide some screening.

5.5.4.2 Vegetation screening

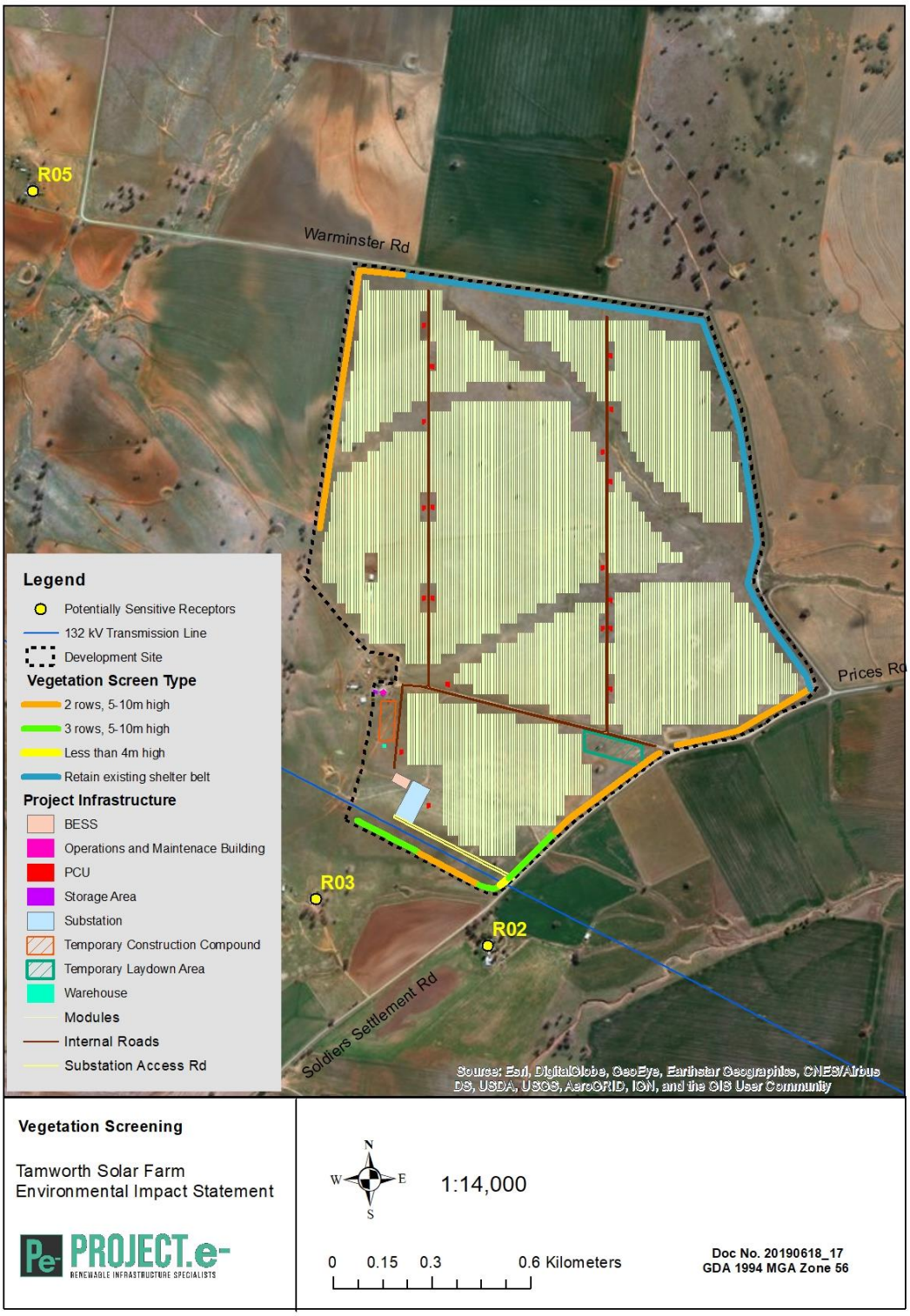
Vegetation screening will be established as shown in Figure 5. 9. The trees planted will be fast growing species that are drought tolerant, fire resistant and grow to a height of 5 to 10 m. It is preferable that they are a native species. In Figure 5. 9, the number of rows refers more to the width of the planting. Trees do not need to be planted in straight rows. Trees or shrubs planted in the transmission line easement will comply with any requirements specified by Transgrid. The tree canopy will not infringe into the asset protection zone (APZ).

The existing shelter belt along the edge of Warminster Rd will be retained and additional trees planted where the density is low.

Tree screens will be planted as soon as practicable following the commencement of the project taking into account the season and availably of suitable seedlings. Tree screens will be regularly watered and weeds controlled around the trees for at least 2 years after planting to facilitate maximum growth rate. Any plants that die will be replaced.

The tree screen on the western boundary of the property will be planted at sufficient distance to the boundary to ensure that when the trees are mature, the dripline is generally within the property boundary. The purpose of this condition is to limit the amount of soil water that the tree roots are utilizing from the neighbouring property.

The security fence will be located on the inside of the tree screens.



- **Figure 5. 9 Vegetation screening**

5.5.4.3 Residual impact

The visual impacts assessed for the project ranged from moderate to high, however it is worth noting that most of the viewpoints assessed were within

1km of the development. Beyond this distance there are limited opportunities to view the proposed solar farm due to topography.

Although these nearby residences will have views to the proposal it will only form a small portion of the broader view from these properties as, due to the nature of the topography and distinct lack of vegetation, views from the properties are quite expansive. The proposal will also not inhibit views to other key landscape features including the vegetated ridge lines of the nearby Melville Ranges to the west and other distant ranges.

Due to the relatively low height of the panels, the flat topography and the broad scale of the view, the boundary planting surrounding the proposal is likely to be effective in mitigating impacts. Implementation of the mitigation measures will address the key views from both the public and private domain areas. These measures have the potential to minimise the visual impact of the proposal and to better integrate the development into the surrounding landscape.

Table 5. 18 outlines the potential residual impact of the development with the proposed mitigation measures. That is, once the vegetation screens are established and are fragmenting the view of the development within the context of the landscape. As the table demonstrates, the viewpoints with a high potential visual impact have a moderate residual impact with mitigation. Viewpoints with a moderate potential visual impact have a low residual impact with mitigation.

Table 5. 18 Residual visual impact with mitigation

Viewpoint	Type	Potential Visual Impact	Residual Impact with Mitigation
VP01	Private: R05	High	Moderate
VP02	Public	Moderate	Low
VP03	Public	High	Moderate
VP04	Public	High	Moderate
VP05	Public	High	Moderate
VP06	Private: R02	High	Moderate
VP07	Private: R02	Moderate	Low
VP08	Private: R02	High	Moderate
VP09	Public	Moderate	Low
VP10	Private: R03	High	Moderate
VP11	Private: R04	Moderate	Low
VP12	Private: R05	Moderate	Low
VP13	Public	Low	Low

5.5.4.4 Summary of mitigation measures

A summary of the mitigation measures for land is provided in Table 5. 19.

Table 5. 19 Summary of mitigation measures for visual impact

Reference	Mitigation Measure
V1	Vegetation screening will be established as shown in Figure 5. 9. The trees planted will be fast growing species that are drought tolerant, fire resistant and grow to a height of 5 to 10 m. It is preferable that they are a native species
V2	Tree screens will be planted as soon as practicable following the commencement of the project, taking into account the season and availably of suitable seedlings.
V3	Tree screens will be regularly watered and weeds controlled around the trees for at least two years after planting to facilitate maximum growth rate. Any plants that die will be replaced.
V4	The tree screen on the western boundary of the property will be planted such that when the trees are mature, the dripline is generally within the property boundary. The purpose of this condition is to limit the amount of soil water that the vegetation screen is utilizing from the neighbouring property.
V5	The tree canopy will not infringe into the Asset Protection Zone (APZ).
V6	The security fence will be located on the inside of the tree screens.
V7	Visual impacts to surrounding residents will be considered when siting the PCU's and shed/warehouse within the proposed Development Site. They should be located at a suitable distance from residences.
V8	Consideration will be given to the material and colours of the PCU's, the battery, and storage shed to ensure minimal contrast and to help blend into the surrounding landscape. Where practicable, materials will be nonreflective and painted in neutral colours that are sensitive to the surrounding landscape
V9	If practicable, spoil from the construction of the substation and BESS will be placed in a bund near the southern side of the substation to provide some screening.
V10	Any lighting installed will be in accordance with AS4228-1997 - *Control of Obtrusive Effects of Outdoor Lighting.*

5.6 Noise

5.6.1 Overview

A noise impact assessment for the project has been conducted by Muller Acoustic Consulting and can be found in Appendix G. This assessment was conducted in accordance with the following policies and guidelines:

- NSW Department of Environment and Climate Change, NSW Interim Construction Noise Guideline (ICNG), 2009;
- Environment Protection Authority's (EPA's), Noise Policy for Industry (NPI), 2017; and
- NSW Department of Environment, Climate Change and Water, NSW Road Noise Policy (RNP), 2011.

The assessment has also considered and applied the following additional policy, guidelines and standards where relevant:

- Australian Standard AS 2436–2010 (R2016) (AS 2436) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites;
- Australian Standard AS 1055:2018 (AS 1055) – Description and Measurement of Environmental Noise;
- Australian Standard AS IEC 61672.1–2019 (AS 61672) – Electro Acoustics -Sound Level Meters Specifications Monitoring; and
- Australian Standard AS IEC 60942-2004 (AS 60942) – Electroacoustics – Sound Calibrators.

This assessment was conducted to meet the following requirements of the SEARs:
"Noise – including an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG) and operational noise impacts in accordance with the NSW Noise Policy for Industry 2017, cumulative noise impacts (considering other developments in the area), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria;"

5.6.2 Existing Environment

5.6.2.1 Potentially Sensitive Receivers

Potentially sensitive receivers that may be affected by noise from operations, construction activities and related road traffic are listed in Table 5. 20 and presented in Figure 4. 1. They are all residential dwellings and are not associated with the proposed project in any way. R14 is the closest house on Babbinboon Rd to the solar farm and has been used as the representative of houses along Babbinboon Rd for noise coming from the Site during construction and operation.

With respect to the transport route, there are three dwellings along Warminster Road and eight dwellings along the section of Babbinboon Rd that will be used

for the transport route. On Babbinboon Rd, the closest house to the transport route is R18 which is set back approximately 25 m from the road.

Table 5. 20 Potentially sensitive receivers

ID	ID Description/ Address	Easting	Northing
R01	Lot 176-DP755340	276945	6568046
R01A	Lot 176-DP755340	277152	6568069
R02	2134 Soldiers Settlement Road	274994	6566671
R03	Lot 21-DP719649	274470	6566813
R04	2050 Soldiers Settlement Road	274524	6566184
R05	222 Warminster Road	273607	6568972
R06	Lot 2-DP579848	275349	6565377
R07	390 Prices Road Bective	278595	6568185
R08	367 Prices Road Bective	278939	6567476
R09	Lot 176-DP755319	278407	6566830
R10	1871 Soldiers Settlement Road	273660	6564600
R11	1761 Soldiers Settlement Road	275252	6564757
R12	38 Warminster Road	273945	6570810
R13	49 Warminster Road	274150	6570613
R14	27 Babbinboon Road	275661	6570564
R15	Lot 178-DP755340	274759	6570710
R16	Lot 1- DP249697	274046	6571089
R17	Lot 2- DP249697	274502	6571055
R18	Lot 3-DP249697	275295	6570894
R19	Lot 4-DP249697	275931	6570800
R20	Lot 5-DP249697	275679	6571799
R21	Lot 175-DP755340	276625	6571571

Coordinates are in GDA 1994 MGA Zone 56

5.6.2.2 Ambient Noise Levels

Background noise monitoring has not been conducted for this project and hence, the minimum applicable Rating Background Levels (RBL) of 35 dBA for the daytime and 30 dBA for the evening and nighttime periods have been adopted as per Noise Policy for Industry (NPI) methodology.

5.6.3 Assessment of Impacts

5.6.3.1 Description of Works, Construction Hours and Potential Impacts

A description of the proposed construction works including the construction traffic generated by the project has been described in Section 3.4. Operational activities have been described in Section 3.6.

Construction hours for the project will be in accordance with the ICNG recommended standard hours for construction. These are:

- Monday to Friday – 7am to 6pm
- Saturdays – 8am to 1pm
- Sundays or Public Holidays – No construction

There are no out of hours work proposed for this project unless it can be managed such that it is not audible.

Road traffic noise associated with the transportation of equipment to Site during construction has also been assessed for receivers along the proposed transport route.

5.6.3.2 Noise Policy and Guidelines

Construction

The assessment and management of noise from construction work is completed with reference to the Interim Construction Noise Guideline (ICNG). The ICNG sets out procedures to identify and address the impact of construction noise on residences and other sensitive land uses.

The ICNG provides two methodologies for the assessment of construction noise emissions; 1) quantitative and 2) qualitative. This study has adopted the quantitative assessment which requires a more complex approach, involving noise emission predictions from construction activities to the nearest relevant receivers.

Operation

The impact of noise levels during operation has been assessed against the Noise Policy for Industry which was released in October 2017. The policy sets out a process for industrial noise management involving the following key steps:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels, above which noise management measures are required to be considered. They are derived by considering two factors; shorter-term intrusiveness due to changes in the noise environment and maintaining the noise amenity of an area.
2. Predict or measure the noise levels produced by the development.
3. Compare the predicted or measured noise level with the PNTLs, assessing impacts and the need for noise mitigation and management measures.
4. Consider residual noise impacts, that is, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures.
5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.
6. Monitor and report environmental noise levels from the development.

The PNTL is the lower (ie, the more stringent) value of the Project Intrusiveness Noise Level (PINL) and Project Amenity Noise Level (PANL) determined in accordance with Section 2.3 and Section 2.4 of the NPI.

The NPI also requires a maximum noise level assessment. This considers the potential for sleep disturbance from maximum noise level events during the night-time period. Where night-time noise levels from a development at a residential location exceed the following criteria, a detailed maximum noise level event assessment should be undertaken:

- LAeq(15min) 40dB or the prevailing RBL plus 5dBA, whichever is the greater, and/or
- LAmax 52dB or the prevailing RBL plus 15dBA, whichever is the greater,

Road Traffic

The road traffic noise criteria are provided in the Road Noise Policy (RNP), 2011. The policy sets out noise criteria applicable to different road classifications for the purpose of quantifying traffic noise impacts.

5.6.3.3 Noise Assessment Criteria

As previously discussed, background noise monitoring has not been conducted for this project and hence, the minimum applicable Rating Background Levels (RBL) of 35 dBA for the daytime and 30 dBA for the evening and nighttime periods have been adopted.

Construction

The relevant Noise Management Levels (NML) for standard construction hours and out of hours periods are summarised in Table 5. 21. As construction activities are planned for standard hours, the NML for construction activities for all residential receivers is 45dB LAeq(15min) (RBL +10dB).

Table 5. 21 Construction Noise Management Levels

Location	Assessment Period	RBL, dBA	NML dB LAeq(15min)
All Residential Receivers	Day (Standard Hours)	35	45 (RBL+10dBA)
	Evening (OOH Period 1)	30	35 (RBL+5dBA)
	Night (OOH Period 2)	30	35 (RBL+5dBA)

Operation

The Project Noise Trigger Levels (PNTLs) for the assessment of the solar farm are provided in Table 5. 22. For this assessment, the night time PNTL of 35dB LAeq(15min) is the limiting criteria.

Table 5. 22 Project Noise Trigger Levels

Catchment	Assessment Period[1]	PINL dB LAeq(15min)	PANL dB LAeq(15min)	PNTL dB LAeq(15min)
Residential Receivers (Rural)	Day	40	53	40
	Evening	35	48	35
	Night	35	43	35

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

The maximum noise level screening criterion shown in Table 5. 23 is based on night time RBLs and trigger values as per Section 2.5 of the NPI. The highest of the two criteria are adopted as the screening criteria.

- **Table 5. 23 Maximum noise assessment trigger levels for residential receivers.**

	LAeq(15min)	LAmax
Tigger value	40	52
Value based on RBL	35	45
Criteria (highest of the two values)	**40**	**52**

Road Traffic

Road noise criteria relevant to this assessment are presented in Table 5. 24 for residences along Warminster Rd and Babbinboon Rd.

- **Table 5. 24 Road traffic noise assessment criteria**

Day (7am to 10pm)	Night (10pm to 7am
55dBA LAeq(1hr) external	50dBA LAeq(1hr) external

5.6.3.4 Modelling Methodology

A computer model was developed to quantify project noise emissions to neighbouring receivers for typical construction activities and operations. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. Additionally, the model uses relevant noise source data, ground type, shielding such as barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Plant and equipment were modelled at various locations and heights, representative of realistic construction and operational conditions for assessed scenarios.

Meteorological Analysis

Noise emissions from industry can be significantly influenced by prevailing weather conditions. Meteorological conditions that enhance received noise levels include source to receiver winds and the presence of temperature inversions. To determine the prevailing conditions for the project, weather data from the Bureau of Meteorology's (BOM) Tamworth Airport weather station (2014 to 2016) was analysed using the EPA's Noise Enhancement Wind Analysis program.

Construction

Construction activities are proposed to be progressive (trenching, piling and assembly) and will occur at several locations simultaneously. Noise emissions were modelled for the following three scenarios:

- earthworks involving trenching for cabling;
- piling of panel supports; and
- assembly of the panels.

It is envisaged that all three construction scenarios have the potential to occur simultaneously at up to ten locations across the Site. All significant noise generating construction activities will be limited to standard construction hours. Where low intensity construction activities are required to be undertaken

outside standard construction hours, such as cabling, minor assembly, use of hand tools etc, they will be managed such that they are not audible.

Operation

For this assessment, noise predictions were modelled for a typical worst-case operational scenario over a 15-minute assessment period based on the assumptions, quantities and sound power levels in Table 5. 25.

Table 5. 25 Operational Equipment Sound Power Levels, Lw dBA re 10^{-12} W

Noise Source/Item	Activity	Quantity	Lw/Item	Total Lw
PV Panel Tracking Motor	All tracking motors in operation 1 minute per 15-minute period	3400	78	96
Inverter Cabin (CPU)	Constant	10	81	97
Battery Storage System	Constant	1	83	83
Substation	Constant	1	90	90
Light Vehicle	2 vehicles arrive and depart from Site	2	76	79

Road Traffic

The United States (US) Environmental Protection Agency's road traffic calculation method was used to predict the LAeq noise levels from construction vehicles travelling past receivers along public roads.

5.6.3.5 Results

Construction

Table 5. 26 summarises the maximum predicted noise level from each of the construction scenarios (trenching, piling and assembly) at the identified residential receivers. The predicted maximum noise levels would be expected when construction work is occurring at the closest point to the receivers.

Table 5. 26 Predicted construction noise levels

Receiver ID	Description/ Address	Highest Predicted Noise Level dB LAeq(15min)	NML Standard Hours dB LAeq(15min)	Compliance
R01	Lot 176-DP755340	38	45	Yes
R02	2134 Soldiers Settlement Road	50	45	No
R03	Lot 21-DP719649	44	45	Yes
R04	2050 Soldiers Settlement Road	41	45	Yes
R05	222 Warminster Road	41	45	Yes
R06	Lot 2-DP579848	35	45	Yes
R07	390 Prices Road Bective	<30	45	Yes
R08	367 Prices Road Bective	<30	45	Yes
R09	Lot 176-DP755319	30	45	Yes
R10	1871 Soldiers Settlement Road	<30	45	Yes
R11	1761 Soldiers Settlement Road	32	45	Yes
R12	38 Warminster Road	30	45	Yes
R13	49 Warminster Road	32	45	Yes
R14	27 Babbinboon Road	32	45	Yes

The predicted exceedance of the NML at Receiver R02 on Soldiers Settlement Road is due to piling activities. These levels would be experienced when construction activities (piling, trenching, assembly) occur simultaneously within 600 m of R02. Scheduling of construction activities (particularly piling) to minimise the number of work fronts along the southern boundary would reduce noise levels by approximately 3 dB in most situations.

The time period in which the noise level is expected to be above the NML at R02 is less than 2 weeks.

Operation

The predicted operational noise levels at each assessed sensitive receiver was 30 dB LAeq(15min) or less, including at night with an inversion layer present. This is below the limiting PNTL of 35 dB LAeq(15min) and therefore, complies with the Noise Policy for Industry.

Road Traffic

Predicted LAeq(1hr) noise levels from project related construction traffic at the closest receiver on Warminster Rd and Babbinboon Rd are presented in Table 5. 27.

Table 5. 27 Predicted construction road traffic noise levels

Road Name	Nearest Offset Distance to Receiver	Predicted Noise Level	Criteria (Day)	Comply
Warminster Road	80m	42dB LAeq(1hr)	55dB LAeq(1hr)	Yes
Babbinboon Road	25m	48dB LAeq(1hr)[1]	55dB LAeq(1hr)	Yes

Note 1: Assumes that all worker transportation enters and exits the Site in one hour as a worst-case assessment.

Results demonstrate that project construction traffic noise levels satisfy the relevant RNP criteria.

5.6.4 Mitigation Measures

As previously discussed, construction noise emissions are anticipated to satisfy relevant NMLs, except when piling, trenching or earthworks activities occur within 600 m of Receiver R02. To effectively manage noise emissions, only one item of significant noise generating equipment (ie piling rig, backhoe or concrete pump) will operate at any one time within the area defined as the Noise Management Zone (NMZ) in Figure 5. 10. This will reduce the noise levels to within 5 dB of the NML. It is anticipated that the time required to trench and drive piles within the NMZ will be less than 2 weeks. Furthermore, the project will notify the potentially affected receiver(s) of the work schedule proposed and the likely duration of any noise generating activities.

All significant noise generating construction activities will be limited to standard construction hours. Where low intensity construction activities are required to be undertaken outside standard construction hours, such as cabling, minor assembly, use of hand tools etc, they will be managed such that they are not audible.

The project will adopt the following procedures where practicable to reduce noise emissions to the surrounding community:

- a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community;
- where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the Site boundary and/or a residential receiver including areas in constant or regular use (eg unloading and laydown areas);
- operating plant in a conservative manner (no over-revving) and be shutdown when not in use;
- avoidance of noisy plant/machinery working simultaneously where practicable;
- minimise impact noise wherever possible;
- utilise a broadband reverse alarm in lieu of the traditional hi frequency type reverse alarm;

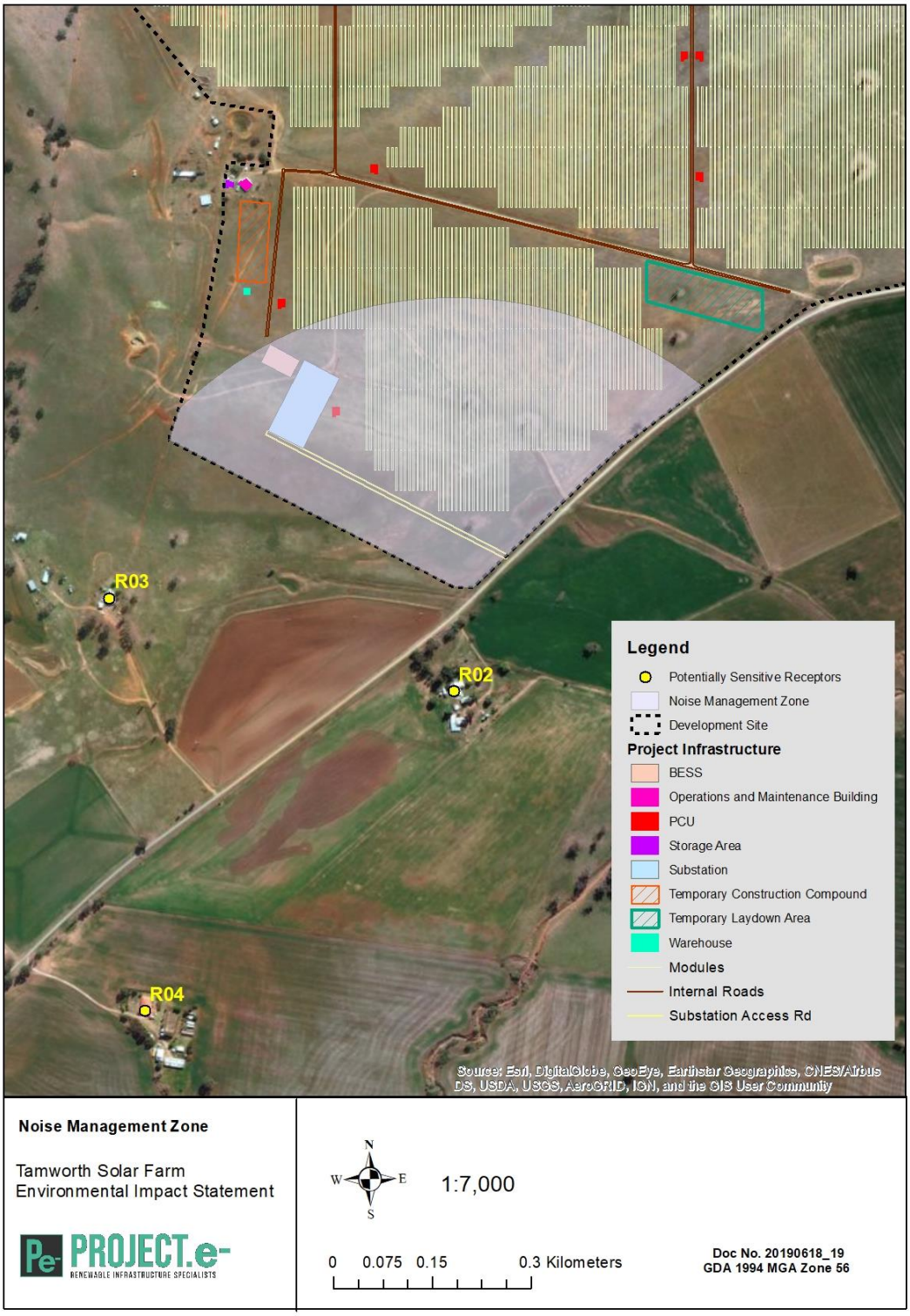
- provide toolbox meetings, training and education to drivers and contractors visiting the Site during construction so they are aware of the location of noise sensitive receivers and to be cognisant of any noise generating activities; and
- signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site.

5.6.4.1 Summary of mitigation measures

A summary of the mitigation measures for noise is provided in Table 5. 30.

Table 5. 28 Summary of mitigation measures for noise

Reference	Mitigation Measure
N1	Only one item of significant noise generating equipment (ie piling rig, backhoe or concrete pump) will operate at any one time within the area defined as the Noise Management Zone (NMZ) in Figure 5. 10.
N2	The project will notify the potentially affected receiver(s) of the work schedule proposed and the likely duration of any noise generating activities.
N3	All significant noise generating construction activities will be limited to standard construction hours. Where low intensity construction activities are required to be undertaken outside standard construction hours, such as cabling, minor assembly, use of hand tools etc, they will be managed such that they are not audible.
N4	The project will adopt the following procedures where practicable to reduce emissions to the surrounding community: • a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community; • where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the Site boundary and/or a residential receiver including areas in constant or regular use (eg unloading and laydown areas); • operating plant in a conservative manner (no over-revving) and be shutdown when not in use; • avoidance of noisy plant/machinery working simultaneously where practicable; • minimise impact noise wherever possible; • utilise a broadband reverse alarm in lieu of the traditional hi frequency type reverse alarm; • provide toolbox meetings, training and education to drivers and contractors visiting the Site during construction so they are aware of the location of noise sensitive receivers and to be cognisant of any noise generating activities; and • signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site.



- **Figure 5. 10 Noise Management Zone**

5.7 Transport

5.7.1 Overview

A traffic impact assessment (TIA) for the project was undertaken by SECA solution and can be found in Appendix H. This assessment was conducted in consultation with relevant government agencies to meet the following requirement of the SEARs:

- *an assessment of the peak and average traffic generation, including over-dimensional vehicles and construction worker transportation;*
- *an assessment of the likely transport impacts to the site access route (including Oxley Highway, Babbinboon Road, Warminster Road, Prices Road, Soliders Settlement Road and Bective Lane), site access points and any Crown Land, particularly in relation to the capacity and conditions of the roads;*
- *a cumulative impact assessment of traffic from nearby developments;*
- *a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required); and*
- *a description of the measures that would be implemented to mitigate any transport impacts during construction;*

5.7.2 Existing Environment

5.7.2.1 Transport route

The construction of the solar farm will involve the following broad categories of vehicles:

- Trucks bringing generating equipment from either the Port of Newcastle or Sydney. This would include modules, mounting equipment, cables, CPUs etc.
- Trucks bringing equipment or materials from the local area. For example, this may include road base material or removal of waste material.
- Vehicles carrying construction workers including light vehicles and small buses.

All construction vehicles accessing the Site will use the transport route designated in Figure 5. 11. This route utilizes Babbinboon Rd, Warminster Rd and a short section of Soldier Settlement Rd.

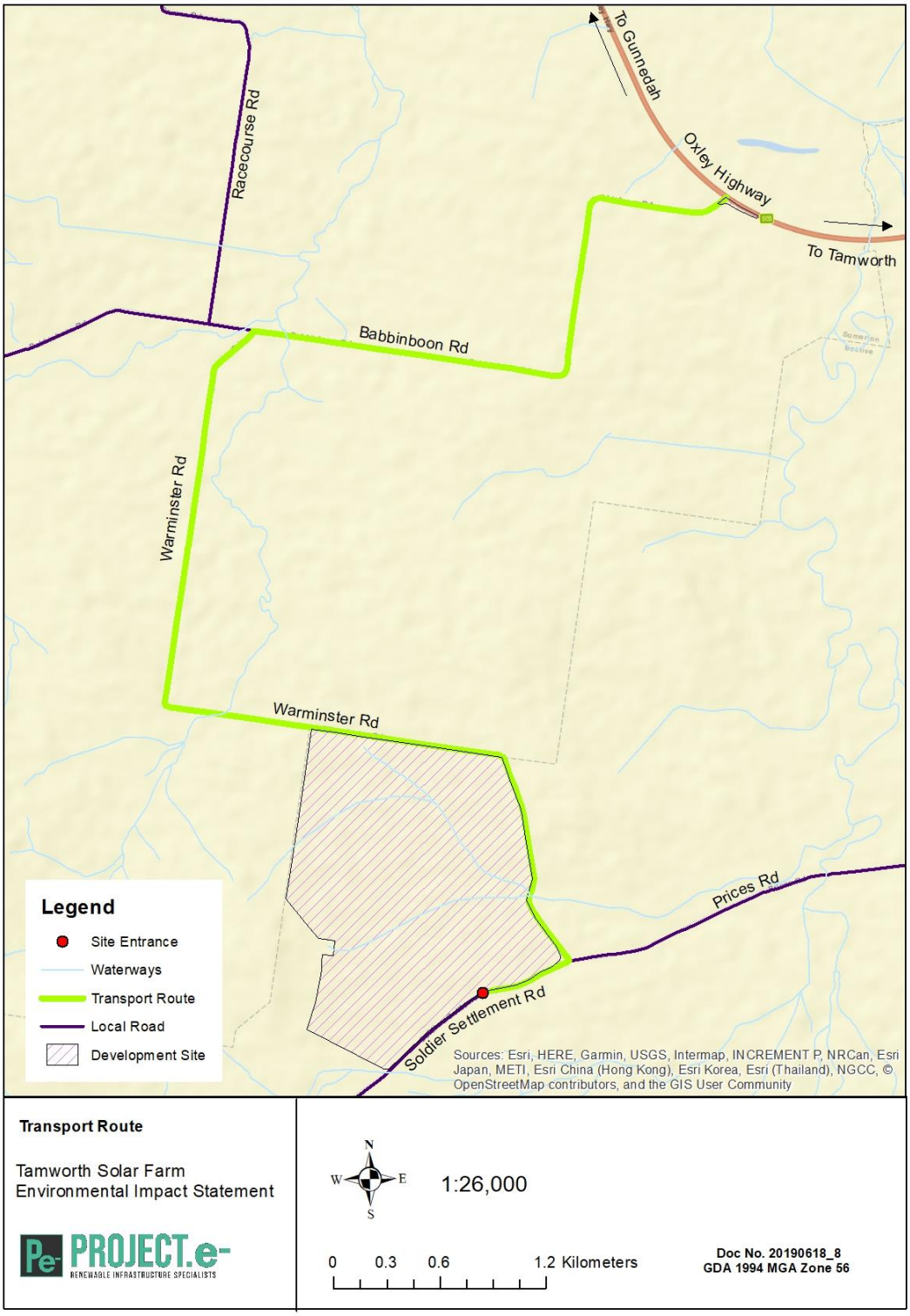
As part of the site work, two other access options were considered for the project:

- Bective Lane which connects with the Oxley Highway then along Prices Road, and
- Soldiers Settlement Road which connects with the Oxley Highway then along Prices Road.

Whilst both Bective Lane and Soldiers Settlement Road are sealed and provide a good alignment and road surface for access (including heavy vehicles) to the Site, Prices Road is not considered to be a valid route for heavy vehicles to access the Site. The width of the unsealed formation of Prices Road is restrictive and would

require substantial work to allow for two-way heavy vehicle movements. The major concern relates to two separate water crossings, which have steep approach and departure ramps. These are unsealed and in the event of a storm would not be passable. The vertical alignment will also create issues for longer vehicles as well as safety concerns relating to sight visibility lines for drivers approaching these water crossings. The straight alignment of Prices Road may also encourage drivers to speed in an inappropriate manner. The proposed route along Warminster Rd and Babbinboon Road to the Oxley Highway is also the shortest distance along local roads to the Oxley Highway at 9.5 km as compared to Bective Lane (12.3 km) or Soldiers Settlement Rd (15.8 km).

Information on the segments of the transport route is provided in the following sections.



- **Figure 5. 11 Transport route**

5.7.2.2 Warminster Road

Warminster Road is a local road (managed by Tamworth Regional Council) which fronts the northern boundary of the Site. Warminster Road is a typical country road providing access to a number of rural lots with agricultural use. It is

unsealed for much of its length with seal only provided at water crossings to mitigate against washing away during storm events. It allows for two-way traffic movements with a width of approximately 6 m (refer to Figure 5. 12) and at the time of the site inspections was in good condition, with grading work having been completed by Council. Warminster Road connects with Babbinboon Road at its northern end via a simple T intersection with Babbinboon Road being the priority road. To the south the road connects with Prices Road and Soldiers Settlement Road via a T intersection.

5.7.2.3 Soldiers Settlement Road

Soldiers Settlement Road runs along the southern boundary of the Site and is of a similar standard as Warminster Road, providing an unsealed surface. The access to the Site is approximately 500 m west of the intersection with Warminster Road and this access is currently the main access to the existing farm activities on the land and to the homestead.

5.7.2.4 Babbinboon Road

Babbinboon Road is an un-sealed two-way road for much of its length with an overall width in the order of 6 m. At its northern end, it connects with the Oxley Highway via a T intersection, where approximately 200 m of the road is sealed. There are a couple of water crossings where road seal has been provided to limit washing away of the road during storm conditions (refer to Figure 5. 14). Babbinboon Road provides a generally straight alignment but follows the boundaries of properties requiring 90 degree bends which limit vehicle speeds accordingly.

5.7.2.5 Oxley Highway

Babbinboon Road connects with the Oxley Highway via a simple T intersection, with the Oxley Highway being the priority road. The Oxley Highway forms part of the State road network that is a key freight route in NSW and forms part of the road network designated by the Roads and Maritime Services to carry oversize, over mass vehicles. It typically provides a single lane of travel in both directions and operates under the posted speed limit of 100 km/h outside of the urban areas where the alignment permits. As part of the regional road network, the Oxley Highway carries a mixture of local and regional traffic with a significant number of trucks including B-double combinations. Based on RMS data from the count station on the Oxley Highway near Bective Reserve Road (station I.D 6194) the road carries a high level (17 %) of heavy goods vehicles.

The Oxley Highway provides a direct route to Tamworth to the south and through to connect to the wider state road network. This will provide a connection for staff and local supplies for the project. For specialist supplies via the Port of Newcastle or Sydney the state road network along the New England Highway provides a connection to Tamworth from the south.

- **Figure 5. 12 Warminster Rd**

- **Figure 5. 13 View down Soldier Settlement Rd from the intersection with Warminster Rd and Prices Rd.**

Figure 5. 14 Babbinboon Rd showing waterway crossing

5.7.2.6 Existing traffic volumes

Traffic volumes in the immediate vicinity of the Site are very low, reflective of the rural environment. Warminster and Babbinboon Roads provide access to a number of rural land holdings and do not provide a direct access for through traffic movements nor do they provide direct access to a town or village. As such the traffic flows on these roads is considered to be less than 100 vehicles per day two-way.

As part of the regional road network, it can be seen that the Oxley Highway carries higher traffic flows, associated with both local and regional demands. The RMS web page for traffic count data shows that in 2019 the two-way traffic flow north of Bective Reserve Road was 3,264 vehicles per day (count I.D 6194) with 17 % heavy vehicle content.

Observations on site during a typical morning peak period (Tuesday 6th August 2019) shows that the current road network in the vicinity of the Site operates very well with minimal delays and congestion. The local access route proposed to be used for the project carries negligible traffic flows and operates with no delays except for those associated with drivers slowing down to observe traffic flows on the approaches to the various intersections and negotiating the intersections and 90 degree curves.

5.7.3 Assessment of Impacts

5.7.3.1 Light vehicle traffic volumes during construction

The construction of the solar farm is expected to be completed within 12 months. There will be a 6 month peak of construction where up to 200 people are working on Site. Staff will be asked to car pool as part of the Code of Conduct for the project (refer Appendix H) and contractors will be encouraged to provide minibuses to reduce vehicle traffic. The estimated light vehicle traffic movements during the peak construction period is 70 vehicle movements inbound and outbound. Outside the peak period the average light vehicle traffic movement is anticipated to be 40 movements inbound and outbound. The maximum number of light vehicle movements per day will be 100.

Construction hours will be in accordance with the Interim Construction Noise Guidelines (DECC 2009) (ICNG) being:

- 7:00am and 6:00pm Monday to Friday
- 8.00 AM to 1.00 PM on a Saturday
- No construction work is to be carried out on a Sunday or public holiday.

Therefore, the majority of light vehicles will arrive prior to the working day and leave once work has completed. All construction light vehicles will be able to park on Site, near the laydown area or the office compound area as required.

5.7.3.2 Heavy vehicle traffic volumes during construction

The level and type of heavy vehicles accessing the Site will vary throughout the project timeframe. At the beginning of the project there will be a requirement for some earthwork moving equipment to construct the access roads, the pad for the substation and BESS and the temporary construction hardstanding area. This may require an excavator, graders, rollers etc. which will be transported to Site on a low loader. Road base material will be carted to Site in truck and trailers or semi-tippers.

Once the earthworks have been completed, the balance of the construction work will commence requiring machinery including pile drivers and trenching equipment as well as other equipment such as telehandlers, elevated work platforms, cranes etc. At the same time, mounting structures and solar panels will be transported from the Port of Newcastle or Port Botany in Sydney. Sand will be trucked in for backfilling trenches. A summary of the expected vehicle movements associated with the construction work is provided in Section 3.5 of Appendix H. The total number of heavy vehicle movements over the construction period will be in the order of 2,800 movements. The total number of oversize/over-mass vehicles will be 10 movements.

During the peak construction period, it is estimated there will be 20 heavy vehicles two-way per day. Outside the peak construction period, the estimated number of heavy vehicles will be 15 two-way per day. These trucks movements will typically be spread out across the working day. For the solar panel and mounting structure deliveries, trucks are travelling from the Port of Newcastle or

Port Botany in Sydney and the journey length will be 5 hours or more and therefore unlikely to arrive at the same time. All other heavy vehicles will also be spread out over the normal working day with no concentration of heavy movements expected.

The maximum number of heavy vehicle movements per day will be 30.

5.7.3.3 Traffic volumes during operation

During operation there will be one or two permanent staff who will drive a light vehicle to Site. When a larger maintenance or repair job is required, there will be more light vehicles and potentially some heavy vehicles, but these will be uncommon. There will be a maximum number of two heavy vehicle movements per day during operations.

5.7.3.4 General traffic impacts

The project will require the delivery of the solar panels and other specialist equipment from Newcastle or Sydney with the access route via:

- Newcastle metropolitan regional road network
- Sydney metropolitan regional road network
- M1 Pacific Motorway
- Hunter Expressway / New England Highway
- New England Highway to Tamworth
- New England Highway in Tamworth to Oxley Highway (approved B-double route)
- Oxley Highway from Tamworth to Babbinboon Road and then the nominated access route shown in Figure 5. 11.

With the exception of Babbinboon Rd and Warminster Rd, these roads all form part of the road freight routes within the State road network and all currently carry heavy vehicle movements including B-double access for the full length of the routes. Some of this freight is associated with local and regional agricultural demands. These agricultural demands are seasonal in nature and occur 24 hours a day often involving night travel and operations. There are a number of farms in the general locality of the Site as well as in the wider Tamworth area that use these local and regional roads during these seasonally high demand periods. Due to the seasonal nature of this work and the requirement for quick turnaround of crop deliveries it is considered that it is not appropriate to limit truck movements for these existing farms. Similarly, it is considered that it is not appropriate to limit truck movements to and from the project Site at these times as the traffic movements on the local roads will continue to remain low.

For the regional road network (Oxley Highway, New England Highway, Hunter Expressway) the total traffic flows will remain well within acceptable limits and as such will continue to operate to a good level of service for all road users. The increase in flows created by the delivery vehicles will be less than 2 % and as such existing drivers will experience a negligible increase in delays. Current

daily traffic flows on these highways are summarised in Table 5. 29, based on data available from the RMS web page.

Table 5. 29 Current daily traffic flows

Road	Location	Daily flow	Heavy vehicle content (%)	Peak hour flows (based on 10% daily flows)
Oxley Highway	North of Tamworth	3,405 (2018)	18	340
New England Highway	Aberdeen	10,311 (2018)	17	1,031
Hunter Expressway	Sawyers Gully	22,800 (2018)	15	2,280
Hunter Expressway	Buchanan	31,782 (2019)	11	3,180

The RMS Guide to Traffic Generating Developments indicates that for rural roads, allowing for 15 % heavy vehicles the two-way flow for a level of service of B is 530 vehicles. This value is considered appropriate for the Oxley Highway. The level of service on these roads will remain at B with the additional traffic associated with the peak construction period of the solar farm.

The traffic flows along the local roads (Babbinboon Rd and Warminster Rd) are currently very low based on-site observations. Therefore, the additional 70 light vehicle movements associated with the staff movements and 20 daily truck movements (per direction) will have a minimal and acceptable impact upon the operation of these local roads during construction. Once operational, the traffic movements are much lower with two staff on Site per day typically and as such the ongoing impact will be negligible.

There will be no public vehicle access within the work site during the construction works, with a fence provided at the commencement of the project along the entire Site boundary. This fence will remain once the project is constructed for security purposes with a locked gate to be provided at the Site access off Soldiers Settlement Road.

There will be no impact upon public transport services with no diversions required. No bus stops nor school bus routes will be impacted by the proposal. There will be minimal impact for emergency vehicles and heavy vehicles with no diversions for vehicles required. There will be minimal impact upon any other development within the locality of the Site.

There will be minimal impact upon adjoining Council areas. Traffic routes in and out of the locality will be along the arterial road network which will experience minimal impacts from construction activities.

5.7.3.5 Noise impact

For noise impacts on residents along the transport route, refer to section 5.6.

5.7.3.6 Dust impact

There is potential for dust from the additional construction traffic to have an impact on some of the houses along the transport route (Babbinboon Rd and Warminster Rd). There are 11 houses along the transport route ranging in distance to the road from 25 m to 500 m.

5.7.3.7 Impacts on road pavement

There is the potential for the local roads on the transport route to be damaged during construction. This is particularly the case for heavy vehicles during wet weather given the clayey nature of the material underneath the road base.

5.7.3.8 Impacts on road safety

It is recognised that as part of the project work, there will be in the order of 2,800 heavy vehicle movements associated with the construction work which will impact along the local road network. The major road safety impact is associated with the delivery trucks accessing the Site and their impact upon the operation of the intersections.

Regional roads such as the New England Highway and Oxley Highway currently provide a high standard of road and allow for the movement of local, regional and national road freight and carry B-double trucks. It is considered that the additional truck movements associated with the construction activities for the project will have a minimal and acceptable impact upon road safety along these roads.

For the local traffic impacts between the Oxley Highway and the Site, consideration has been given to the existing alignment of the road, intersection layouts, current traffic flows and existing users along the route. Observations on site with regard to road safety are summarised below:

- Existing traffic flows on the local road are very low.
- The generally un-sealed width of the road allows for two-way traffic movements.
- The alignment of the road is good, with 90 degree bends forcing vehicles to slow down.
- The 90 degree bends operate at speeds below 100 km/h (the default speed limit) but there are no advisory speed signs provided in advance of these bends.
- Heavy vehicles will currently travel along the local roads associated with the farming activities. However, these flows will be very low.

The vehicle route through Tamworth currently caters for a large number of heavy vehicles including B-double combinations and allows for safe two-way movement of trucks along the various roads. The intersections along this route are well laid out and provide good visibility in all directions to allow for the safe turning movements of vehicles. It is considered that this route through the town can safely accommodate the additional traffic movements associated with the project.

Intersection of Oxley Highway and Babbinboon Road

The intersection of the Oxley Highway and Babbinboon Road is controlled by a simple T intersection with no turn lanes. It allows for all turning movements and operates under the posted speed limit of 100 km/h. Whilst no speed surveys have been completed at this location as part of the project, it is considered that drivers will travel at or above the speed limit in this location, due to the good alignment and low traffic demands. The sight distance available is approximately 500 m in both directions, safely allowing a driver to determine a suitable gap for exiting Babbinboon Road to enter the highway via a right turn.

Austroads Guidelines Part 4a provides advice with regards to safe intersection sight distance (SISD) which is the distance required for a driver to safely enter the main road off a side road. For the posted speed limit of 100 km/h, the SISD is 262 metres for a reaction time of 2.5 metres. The sight distance available (500 metres) exceeds the requirements for a design speed of 130 km/h (383 metres) and is therefore considered acceptable.

For the left turn into Babbinboon Road, visibility is good allowing a driver to observe a vehicle braking to turn left into the side road. There is however, no left turn deceleration lane provided at this location nor a wide shoulder. The current peak flow at this location could be in the order of 330 vehicles per hour two-way. Turning traffic currently is very low, however the traffic movements associated with the project could be in the order of 90 vehicles or more during the morning for the left turn in, associated with staff movements and delivery vehicles.
Based on the construction traffic demands and associated increase in heavy vehicle demands, this intersection will need to be upgraded to allow for a left turn deceleration lane.

Overall it is considered that this intersection provides an appropriate level of control and, subject to the provision of a short left turn deceleration lane, operates at an acceptable safety standard to accommodate the traffic movements associated with the proposed solar farm (both construction and operation phases).

Intersection of Babbinboon Road and Warminster Road

This intersection operates as a T intersection with Babbinboon Road being the priority road. This intersection is well laid out and provides good visibility for vehicles turning in and out of the side road (Warminster Road). It is currently un-sealed and rutting occurs due to the turning movements of traffic. It is proposed that this intersection be upgraded to allow for a sealed road surface, to reduce damage to the road surface especially when wet. This will also reduce the potential issue of dust associated with heavy vehicles turning. As part of the traffic management measures during construction, a Traffic Control Plan (TCP) will be prepared for this location to advise drivers of trucks of an appropriate speed limit.
A tree is located to the west of this intersection which will need to be removed to allow for improved visibility.

Intersection of Warminster Road and Soldiers Settlement Road

This intersection is a simple three-way give way controlled intersection, with no priority signage to delineate controls at this location. It is well laid out and there are no trees in this location to impact upon sight lines for drivers.

Alignment of Warminster Road and Babbinboon Road

The alignment of both of these roads is generally straight and allows for 2-way traffic movements. However, it provides an un-sealed surface which will suffer from wear associated with the significant increase in vehicles movements, especially the heavy vehicles. There are 90 degree bends on these roads that discourage drivers from speeding, together with the un-sealed surface.

Site access point on Soldiers Settlement Road

The access to the Site will be via the existing access off Soldiers Settlement Road, approximately 500 m west of the intersection with Warminster Road. This access point will provide access for the construction work as well as form the permanent access for the solar farm and substation and is located on a straight and flat length of road, ensuring good visibility is provided in both directions. As part of the project construction work, a TCP will be provided to highlight the Site access and provide a speed reduction through the access location on Soldiers Settlement Road to maintain road safety.

This Site access will allow for a length of sealed section of driveway within the Site together with a shaker to stop dirt being carried from the Site onto the road.

5.7.4 Mitigation Measures

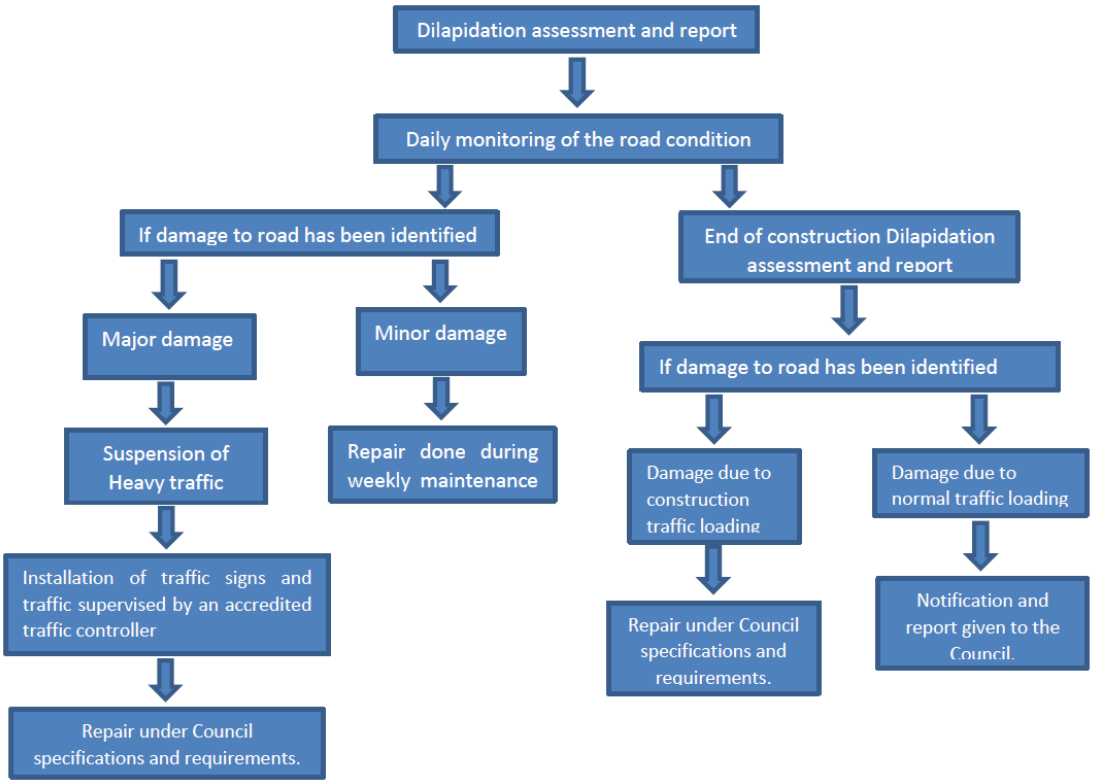
5.7.4.1 Dust impact

The impacts of dust will be mitigated by either using water carts or sealing sections of Babbinboon Rd and Warminster Rd. The strategy employed will depend largely on the availability of water at the time of construction. If water is not available, or in short supply, sealing will be undertaken. Any roadworks will only be conducted after consultation with Tamworth Regional Council and once the required approvals have been obtained.

5.7.4.2 Road pavement

A protocol will be implemented for both undertaking dilapidation surveys and making any necessary repairs following construction to Babbinboon Road and Warminster Road (refer to Figure 5. 15). The dilapidation surveys will assess the existing condition of road surface prior to construction and the repair of the road pavement should it be identified in the dilapidation surveys to have been damaged during construction.

With regards to any emergency repairs required, the contractor on site would contact the relevant authorities and will ensure the road is safe. Repairs will be made in accordance with the relevant authority standard.



- **Figure 5. 15 Dilapidation Assessment Protocol**

5.7.4.3 Safety

All construction traffic will use the transport route shown in Figure 5. 11.

The intersection of Oxley Highway and Babbinboon Rd will be upgraded to allow for a left turn deceleration lane. The upgrade of the intersection will significantly improve the safety of this intersection which will benefit existing road users.

During construction, a Traffic Control Plan will be prepared for the intersection of Babbinboon Rd and Warminster Rd to advise truck drivers of an appropriate speed limit. A tree is located to the west of this intersection which will need to be removed to allow for improved visibility.

A Traffic Control Plan will be provided for the Site access point on Soldier Settlement Rd to highlight the Site access and provide a speed reduction.

Along the transport route from the Oxley Highway to the Site entrance, bends and intersections will be sealed.

Residents along the transport route will be notified in writing of the construction works and other relevant activities as required.

The principal contractor will ensure that the document “Safe Construction Activities” (refer to Appendix A of Appendix H) is complied with during construction.

All construction workers and truck drivers will complete the "Driver's Code of Conduct" as part of their site induction (refer to Appendix B of Appendix H)

5.7.4.4 Summary of mitigation measures

A summary of the mitigation measures for transport is provided in Table 5. 30.

Table 5. 30 Summary of mitigation measures for transport

Reference	Mitigation Measure
T1	The impacts of dust on the transport route will be mitigated by either using water carts or sealing sections of Babbinboon Rd and Warminster Rd.
T2	The protocol in Figure 5. 15 will be implemented for both undertaking dilapidation surveys and making any necessary repairs to Babbinboon Road and Warminster Road during the construction period.
T3	All construction traffic will use the transport route shown in Figure 5. 11.
T4	The intersection of Oxley Highway and Babbinboon Rd will be upgraded to allow for a left turn deceleration lane.
T5	During construction, a Traffic Control Plan will be prepared for the intersection of Babbinboon Rd and Warminster Rd to advise truck drivers of an appropriate speed limit. A tree is located to the west of this intersection will be removed to allow for improved visibility. This tree will be cut down with a saw rather than being pushed out due to the presence of a Telstra cable in this area.
T6	During construction, a Traffic Control Plan will be provided for the Site access point on Soldier Settlement Rd to highlight the Site access and provide a speed reduction
T7	Along the transport route from the Oxley Highway to the Site entrance, bends and intersections will be sealed.
T8	Residents along the transport route will be notified in writing of the construction works and other relevant activities as required.
T9	The principal contractor will ensure that the document "Safe Construction Activities" (refer to Appendix A of Appendix H) is complied with during construction.
T10	All construction workers and truckdrivers will complete the "Driver's Code of Conduct" as part of their site induction.
T11	There is a private water pipe in the vicinity of the driveway of landholder R13. This pipe will be identified and protected from any road upgrade works.

5.8 Flooding

5.8.1 Overview

WMAwater have undertaken a flood assessment of the Site to determine the existing flood risk and any impact of the proposed solar farm (refer to Appendix I). This assessment was conducted to meet the following requirements of the SEARs:

An assessment of the potential impact of the development on existing uses on the site and adjacent land, including:

- *A consideration of agricultural land, flood prone land, Crown lands.*

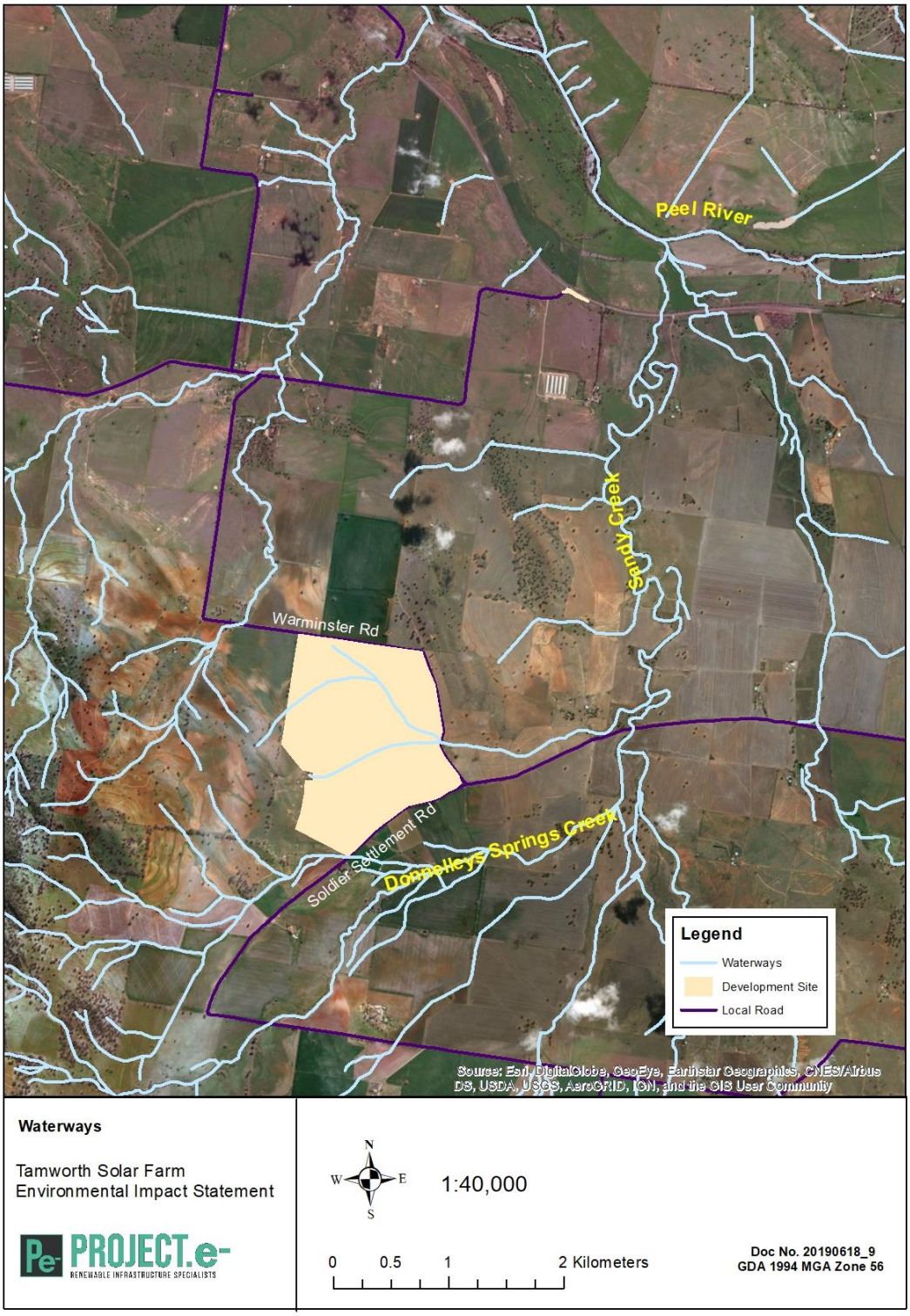
5.8.2 Existing Environment

5.8.2.1 Waterways

The Site is approximately 4 km from the Peel River at its closest point, as it runs east to west between Bective and Somerton (see Figure 2). This reach of the river is downstream of Tamworth. The Peel River system is regulated by Chaffey Dam which is located in the upper catchment near the town of Woolomin, approximately 45 km from Tamworth.

The proposed solar farm has an elevation of between 350 m and 410 m above sea level and is located close to the top of a hill. It encompasses a large enough catchment area to have developed internal ephemeral creek channels within the Site, which are unnamed. The main creek branch within the Site runs from the north-west corner at Warminster Road, and leaves the Site near the midpoint of the eastern boundary. This unnamed creek meets Sandy Creek, approximately 1.3 km downstream (east) of the Site, which in turn flows into the Peel River. A tributary of Donnellys Spring Creek runs close to the southern extent of the Site. Donnellys Spring Creek has a total catchment area of approximately 2,235 ha and also runs into Sandy Creek to the east of the Site. These creeks are shown in Figure 5. 16. A photo of the unnamed waterway in shown in Figure 5. 17. This photo was taken from Warminster Road looking upstream. It shows that at this point, the ephemeral waterway has no defined channel or riparian vegetation. It is otherwise indistinguishable from the surrounding paddock apart from the fact that it is the lowest point in the immediate landscape. In the past, the waterway has been ploughed and sown to crop.

There are no contour banks within the Development Site.



- **Figure 5. 16 Waterways**

Figure 5. 17 Unnamed waterway immediately upstream of Warminster Road.

5.8.2.2 Existing Flood Information

WMAwater was unable to find a previous Flood Study or Floodplain Risk Management Study/Plan that assessed flood risk at the Site.

5.8.2.3 Peel River Flood Assessment

The objective of the Peel River component of the assessment was to understand whether the Site is subject to flooding from the Peel River. The solar farm Site is located approximately 4 km as the crow flies from the Peel River, and approximately 7 km via local creek drainage lines. The lowest point of the Site is approximately 40 m above the Peel River channel level. Therefore, the main objective of the assessment was to determine, from available records, whether flooding of the Peel River to sufficient depth to reach the Site is feasible.

To conduct the assessment, historical records were analysed using Flood Frequency Analysis (FFA) of nearby stream gauges. The closest gauges on the Peel River are at Somerton and Bective. Both sites were used for the assessment. The Somerton gauge is located approximately 3.5 km downstream of where the runoff from the Site enters the Peel River, and the Bective site is located a similar distance upstream.

The results of the Flood Frequency Analysis for flood level at Bective showed that the 1 % Annual Exceedance Probability (AEP) flood level is significantly below the Site. A 1 % AEP flood has a level of approximately 327.6 mAHD with a

90 % confidence interval of between 325.8 mAHD to 329.6 mAHD. This is at least 20 m below the Site's lowest point (349.3mAHD).

A preliminary assessment of the Probable Maximum Flood (PMF) was made considering the Bective gauge rating curve. The waterway area in the Peel River cross section up to the elevation of the Site indicates that there is floodplain capacity to pass orders of magnitude greater flow than the 1% AEP and it is highly likely that the Site is above the Peel River PMF level.

The NSW State Emergency Services Local Flood Plan (NSW SES 2013) refers to a dam break assessment of Chaffey Dam that could potentially produce greater flows in the Peel River than a "natural" (i.e. without the presence of the dam) PMF level. The estimated dam-break flood wave depth is quoted as 11 m at Woolomin, just downstream of the dam wall, reducing to 3.5 m at Tamworth. This means that a depth of over 20 m at Bective, which is much further downstream than Tamworth, would not occur.

Based on the above considerations, the Site is assessed to not be within the Peel River floodplain, even for extreme floods.

5.8.2.4 Local Catchment Flood Assessment

Although the Site is close to the top of a hill, it is large enough that runoff within the Site can produce significant flow and flash flooding along the internal creeks. Furthermore, Donnellys Springs Creek has a relatively large local catchment area of 2,235 ha, so it was necessary to determine whether flooding in this creek or other nearby creeks could potentially affect the Site.

Given there are no stream gauges for these local watercourses that provide a record of flood levels, the appropriate methodology to estimate the local catchment flood risk is rainfall-runoff modelling using design rainfalls from the BoM, and typical regional modelling parameters. Australian Rainfall and Runoff (ARR) 2019 (Reference 1) guidelines for design flood modelling were adopted for this study,

A simple hydrologic model was developed in Watershed Bounded Network Model (hydrologic model) for the local catchment to determine the critical duration. This process was undertaken for the Donnellys Springs Creek catchment and the unnamed local creek catchment within the Site.

WMAwater also developed a 2D TUFLOW hydraulic model using "rainfall on grid" developed for the local catchments to determine flood depths, velocities, extents, etc. through and around the Site.

The flow response at the catchment outlet was compared between the hydrologic and hydraulic models, and catchment parameters were adjusted to produce a reasonable match between these two models as a form of validation.

The results of the hydraulic modelling for the existing environment are shown in Figure 5. 18. The figure shows 1 % AEP peak flood levels and depths in and around the Site. The depth of flood water is generally below 0.5 m except for an area just upstream of where the unnamed creek flows across Warminster Road where the depth is up to 0.75 m. The small areas shown as greater than 1 m are farm dams.

5.8.2.5 Flood Function Categorisation

Identification of flood function involves mapping the floodplain to indicate which areas are most important for the conveyance of floodwaters, and the temporary storage of floodwaters. This can help in planning decisions about which parts of the floodplain are suitable for development, and which areas need to be left as-is to ensure that flooding impacts are not worsened compared to existing conditions.

The 2005 NSW Government's Floodplain Development Manual defines three hydraulic categories which can be applied to different areas of the floodplain depending on the flood function:

- Floodways;
- Flood Storage; and
- Flood Fringe.

Floodways are areas of the floodplain where a significant discharge of water occurs during flood events and by definition, if blocked would have a significant effect on flood levels and/or distribution of flood flow. Flood storages are important areas for the temporary storage of floodwaters and if filled would result in an increase in nearby flood levels and the peak discharge downstream may increase due to the loss of flood attenuation. The remainder of the floodplain is defined as flood fringe.

For this study, hydraulic categories were defined by the following criteria using the 1% AEP flood modelling:

- Floodway is defined as areas where:
    - the peak value of velocity multiplied by depth (V x D) > 0.25 m2/s, AND peak velocity > 0.25 m/s, OR
    - peak velocity > 1.0 m/s AND peak depth > 0.1 m, OR
    - defined channels (from bank to bank) on creeks or tributary flow paths.
- The remainder of the floodplain is either Flood Storage or Flood Fringe,
- Flood Storage comprises areas outside the floodway where peak depth > 0.2 m, and
- Flood Fringe comprises areas outside the Floodway where peak depth ≤ 0.2 m.

Figure 5. 19 shows the flood function categorisation for the 1% AEP modelling.

5.8.3 Assessment of Impacts

To determine the impacts of the project on local catchment flooding, the hydraulic models were run with the following variations:

- Roughness values and loss rates were modified to reflect the proposed hardstand areas.
- The proposed solar panel mounting posts were represented by assumed a 10 % blockage of the flow path area covered by the panels. This figure is considered to be highly conservative given that the posts in each row are approximately 8 m apart and the rows are 5 to 9 m apart.
- Site boundary fences were assumed to be blocked by 40 % to account for the obstruction of the fence and debris build-up along the fence line from overland flows. This level of blockage assumes that the standard mesh security fence is installed across the waterways.

The impact that these variations had to the flood levels are shown in Figure 5. 20. The figure shows the 1 % AEP changes in peak flood levels and flows resulting from the proposed development compared to the existing conditions. The results indicate there would not be a significant change in flood behaviour downstream of the solar farm caused by the proposed development. Changes in flood level on the Site were very small (<5 cm) and did not take into account the mitigation measures F1 and F2 in Table 5. 31.

There is also a potential risk that if posts are placed in the floodway, there may be some erosion at the base of the posts during flood events. This could be caused by high velocity water hitting the posts, creating turbulence and thereby creating some scouring at the base of the post. The risk of this occurring is considered to be low and should it occur, it would not impact the structural integrity of the post as the posts are driven into the ground at least 1.8 m.

5.8.4 Mitigation Measures

The layout of solar panels will exclude the floodway as defined in Figure 5. 19.

Where the unnamed waterway and the security fence intersect on the eastern boundary of the Site, the design of the security fence will be such that it allows water to pass freely and does not become clogged with debris. This may include vertical bars that are close enough to exclude humans but will allow water to pass freely. The intention of this mitigation measure is to prevent damage to the security fence during intense rainfall events.

5.8.4.1 Emergency Response Management

As previously discussed, the assessment indicates that the proposed development will not produce adverse impacts on flood flows or levels beyond the Site. The proposed development therefore would not significantly affect the existing SES community response planning. However, the development is in an area where generally a high degree of self-sufficiency would be assumed for the local population, including:

- Sufficient supplies and tolerance for being isolated from urban areas for at least a day; and

- Reasonable awareness of the risks of driving through floodwaters.

There will likely be very little warning of flooding, apart from very heavy local rainfall. It will not be possible in real time during a flood to understand what the peak of the flood will be for this Site. This is because:

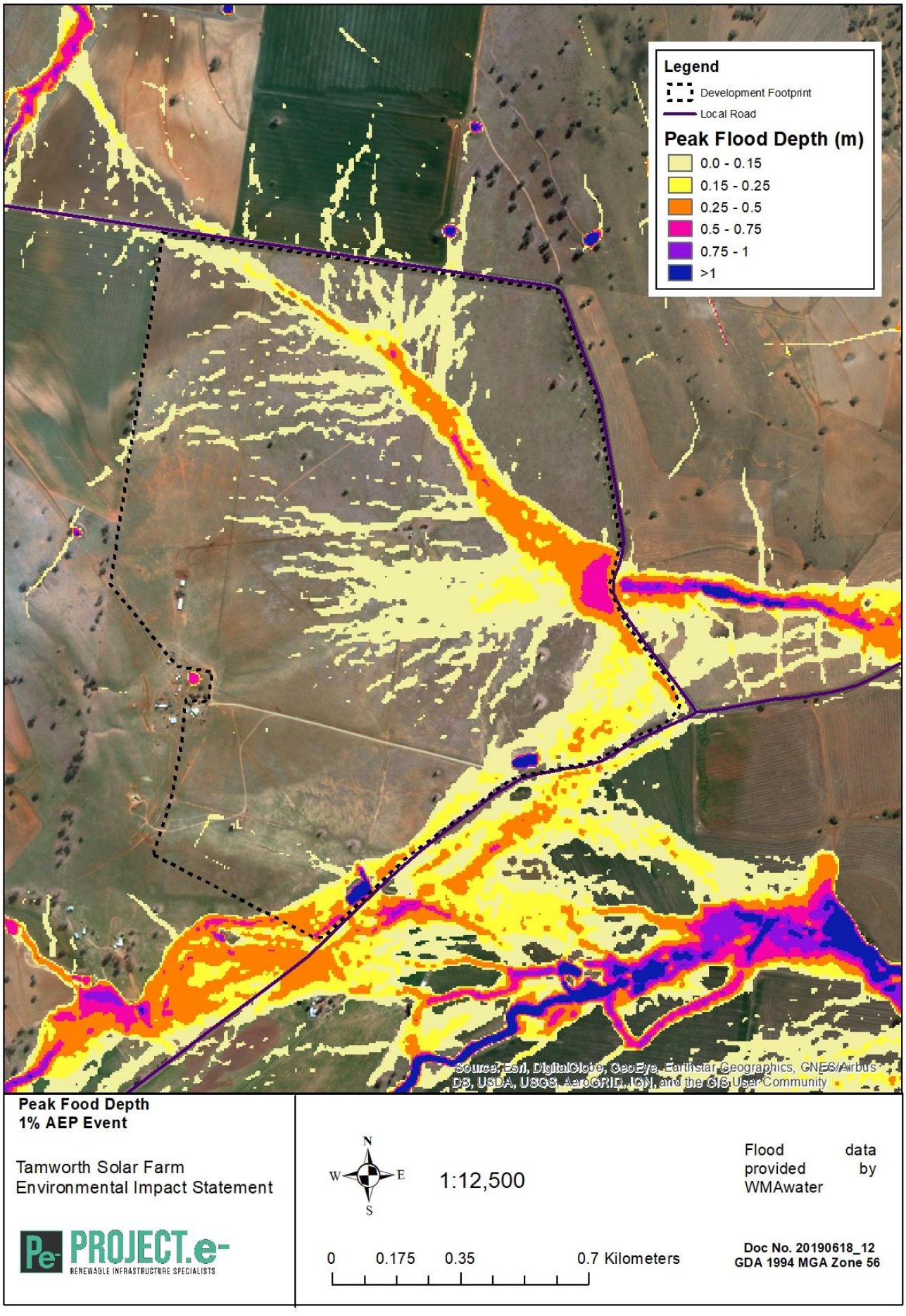
- the time between the rainfall occurring and flooding occurring is short (generally less than an hour, and possibly as short as 15 minutes for local flash flooding on-site),
- the location of the most intense rainfall bursts for flood-producing storms in small catchments such as this cannot be predicted accurately ahead of time; and
- as a result of the above, there are no formal flood warning systems in place for the catchment.

Therefore, the Site Emergency Response Plans for construction and operation of the solar farm will include a section on flooding. This plan would provide for training of personnel about flood risks and provide direction about actions to take in case of flash flooding of creeks either within the Site or on access roads to the Site.

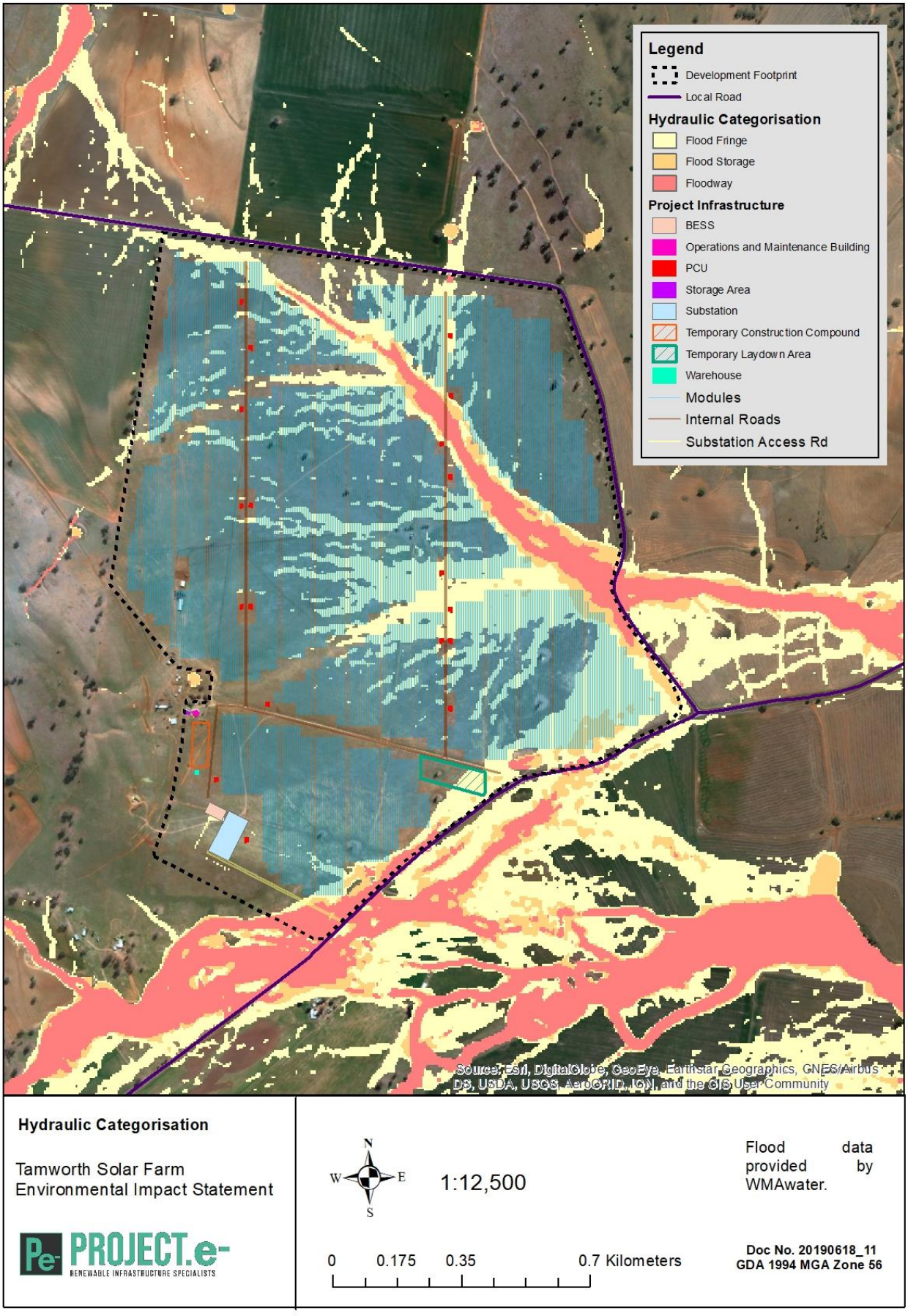
A summary of the mitigation measures for flood is provided in Table 5. 31.

Table 5. 31 Summary of mitigation measures for flooding

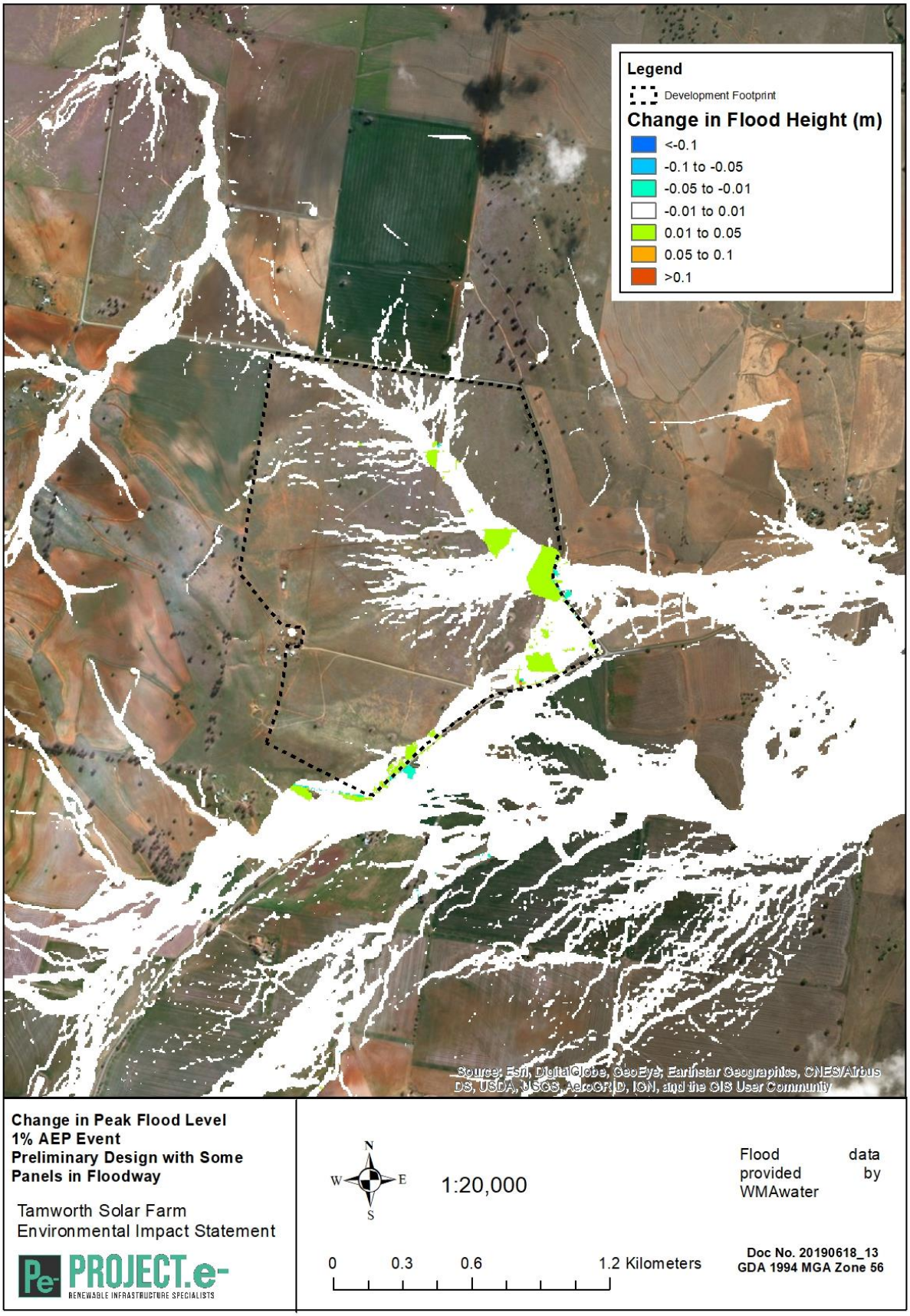
Reference	Mitigation Measure
F1	The layout of solar panels will exclude the floodway as defined in Figure 5. 19.
F2	Where the unnamed waterway and the security fence intersect on the eastern boundary of the Site, the design of the security fence will be such that it allows water to pass freely and does not become clogged with debris.
F3	The Site Emergency Response Plans for construction and operation of the solar farm will include a section on flooding. This plan would provide for training of personnel about flood risks and provide direction about actions to take in case of flash flooding of creeks either within the Site or on access roads to the Site.



- **Figure 5. 18 Peak flood depth for a 1% annual exceedance probability event**



- **Figure 5. 19 Flood categorisation for a 1% annual exceedance probability event.**



- **Figure 5. 20 Change in peak flood level.**

5.9 Water and Soils

5.9.1 Overview

Eco Logical Australia have undertaken a soil and water impact assessment for the Site (refer to Appendix J). The report provides a description of the Site's existing hydrological conditions and considers potential impacts associated with the Proposal on water quality and quantity, having regard to the receiving waters for both surface water and groundwater sources. All potential impacts associated with the proposal are considered across the entire lifespan of the development including the construction, operational and decommissioning phases.

This assessment was conducted to meet the following requirements of the SEARs:

- *an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including drainage and irrigation channels, wetlands, riparian land, farm dams, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts;*
- *details of water requirements and supply arrangements for construction and operation; and*
- *a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004);*

Information on hydrology and flood prone land is presented in Section 5.8.

5.9.2 Existing Environment

The Site lies within the upper reaches of the Namoi River Catchment which is a major sub catchment for the Murray Darling Basin. This catchment occupies 42,000 km^2 and incorporates extensive areas of the North-West Slopes and Plains, bounded by the Great Dividing Range near Tamworth in the east, the Liverpool Ranges and Warrumbungle Ranges in the south, and the Nandewar Ranges and Mount Kaputar to the north. The closest major water course is the Peel River which is located approximately 4 km north east of the Site and joins the Namoi River approximately 25 kms away. The Peel River catchment area (also known as Peel Valley) is considered an important contributor to flows in the wider Namoi Catchment.

The majority of the rivers in the Namoi catchment area are regulated, and water is supplied for irrigation, stock and domestic purposes as well as supplementary town water supplies for some regional centres. These water sources include Keepit Dam on the Namoi River, Split Rock Dam on the Manilla River and Chaffey Dam on the Peel River. Due to the effects of regulation, streamflows in the rivers of the Namoi Catchment area are generally only affected during dry periods and

drought conditions where water availability is low, and demand from users is comparatively high.

5.9.2.1 Acid Sulphate Soils

Acid sulfate soils and potential acid sulfate soils are naturally occurring soils that contain iron sulfides which, on exposure to air, oxidise and create sulfuric acid. This increase in acidity can result in the mobilisation of aluminium, iron and manganese from the soils. Other impacts include the deoxygenation of water.

A review of the current mapping indicates that the Site is not mapped as being a risk area for acid sulfate soils (refer to Figure 6 in Appendix J). Based on the site geomorphology, drainage and observed soils, it is highly unlikely that acid sulfate soils or potentially acid sulfate soils would exist or pose a problem at the Site.

5.9.2.2 Surface Water

The Site contains very limited surface water resources comprising three small farm dams and minor drainage lines, being 1st and 2nd order streams that divert surface water runoff to Sandy Creek, which is approximately 1.7 kms to the east (refer to Figure 5. 16). Water from Sandy Creek then flows into the Peel River which joins the Namoi River downstream of Keepit Dam (regulated water supply). The 1st and 2nd order streams onsite are highly ephemeral in nature, and flows depend on rainfall and surface water runoff from the catchment area. Onsite streams resemble broader drainage areas within existing paddocks, rather than streams with a defined bed and banks as a result of the flat topography and historic land clearing for agriculture.

Due to proximity to the Peel River, access to water sources is in accordance with the State Governments Water Sharing Plan for the *Peel Valley Regulated, Unregulated, Alluvium and Fractured Rock Water Sources 2010* under Section 50 of the *Water Management Act 2000*.

The objectives of this Plan (in part) seek to:

- protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources,
- contribute to the maintenance of water quality, and
- provide recognition of the connectivity between surface water and groundwater.

The physical characteristics of the soil and topography of the area mean the Peel Regulated River commonly loses water to the Peel Alluvium along most of its length, only gaining water from groundwater further down the valley, below Attunga. The general flow direction of the groundwater is away from the river and then down gradients parallel to the river. The unregulated tributaries of smaller creeks and drainage lines in the catchment are largely ephemeral, losing water to the groundwater in times of high flow then gaining groundwater again

until the level of the groundwater drops below the bed of the creeks resulting in the creeks drying up during dry times.

5.9.2.3 Groundwater

The Site is located within the Peel Alluvium Groundwater Management Area which comprises two major types of groundwater sources, the alluvial aquifers associated with the river and its tributaries and the fractured rock aquifers of the upper valley slopes. The alluvial groundwater and surface water of the Peel catchment and some of its major unregulated tributaries are linked, however, generally have low impact to instream flows in the catchment. A search of The Department of Primary Industries (Office of Water) groundwater database identified several potable groundwater bores at the subject Site and on surrounding agricultural properties (refer to Figure 5 of Appendix J)

A review of the WaterNSW (n.d.) online *All Groundwater Map* and the BoM (2018) *Groundwater Explorer database* identifies two bores within the Site and another bore within the lot boundary, used for water supply and stock & domestic purposes. Data for these bores (Table 5. 32) indicate relatively deep groundwater levels.

- **Table 5. 32 Location and depth of on-site bores**

Bore ID	Latitude	Longitude	Registered use	Total depth (m)	Salinity
GW003291.1.1	-31.001203	150.649742	Water Supply	39.6	potable
GW022856.1.1	-31.000091	150.646408	Stock & Domestic	45.7	potable
GW015518.1.1	-31.009258	150.634742	Unknown	36.6	potable

Limited baseline groundwater quality data is available, however, recorded yields typical of fractured rock aquifers of the Peel Valley are typically low (<1L/s) with the salinity of bores within two kilometres of the Site being described as "potable" and registered for use as water supply and stock & domestic water supply. Information on these bores is provided in Table 2 of Appendix J.

5.9.2.4 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDEs) are ecosystems that have their species composition and natural ecological processes wholly or partially determined by groundwater (Geoscience Australia, 2017).

A search of the Bureau of Meteorology's (BoM) *Groundwater Dependent Ecosystem Atlas* (BoM 2017) indicates there are no mapped potential GDEs within the Site and two low potential interaction locations within a 2 km buffer. Groundwater bores and groundwater interaction points, or potential GDEs, within a 2km radius of the Site are shown in Figure 5 of Appendix J.

5.9.2.5 Aquatic Ecosystems

Downstream of the Site, the Peel River & Namoi River are classified as Key Fish Habitat under the Fisheries Management Act (NSW DPI, n.d.). Within the Site, the unnamed dam and drainage lines are classified as *unlikely fish habitat* (Class 4 waterway - Fairfull, 2013).

5.9.2.6 Namoi River Water Quality Objectives

Water Quality Objectives (as endorsed by the NSW Government) is a pathway for assessing and monitoring the environmental values of the proposed development, as represented by the community, on water quality and identifies the steps required to protect these values and uses, now and in the future.
Namoi River Water Quality Objectives are provided for the following attributes:

- Aquatic ecosystems
- Visual amenity
- Secondary contact recreation
- Primary contact recreation
- Livestock water supply
- Irrigation water supply
- Homestead water supply
- Drinking water – disinfection only, or
- Drinking water – clarification and disinfection
- Drinking water – groundwater
- Aquatic foods (cooked)
- Industrial water supplies

No surface water quality data is available for the Development Site. Under such circumstances water quality indicators and trigger values would generally align to ANZECC guidelines for the protection of aquatic ecosystems and/or other fit for purpose trigger values. However, due to the highly ephemeral nature of the 1st and 2nd order streams located within the Development Site, water quality associated with these streams will be strongly driven by localised rainfall/drying cycles, but with limited impact to downstream users.

5.9.3 Assessment of Impacts

Potential impacts to water quality and aquatic ecosystems for both surface and groundwater resources during construction (and decommissioning) and operational phases of the development are considered in the following sections.

5.9.3.1 Water quality

The proposed development has potential to impact on water quality through the following processes:

- Erosion and sedimentation
- Contamination of water resources

Surface water quality

Construction and decommissioning

The potential to impact upon soils and surface water quality on the Site is greatest during the construction phase. During this period the soils will be subject to disturbance associated with site preparation and infrastructure installation/removal. Construction works for the proposed solar farm include removal of minor areas of vegetation and soil during site preparation and excavation for the proposed substation, battery energy storage system, access roads, temporary laydown area and underground cabling. The upper layer of soil would be subject to temporary disturbance which may lead to erosion and potential sedimentation of waterways during periods of rainfall.

The use of fuels, lubricants, herbicides and other chemicals during construction pose a risk of surface water contamination in the event of a spill. Management of sewage systems pose a risk to surface water quality should spills occur.

Operation

The potential for the proposed solar farm to impact upon soils and surface water quality during the operational phase, after the disturbed areas and construction compound have been rehabilitated, is minimal. Routine maintenance and monitoring will be the extent of the day-to-day activities and is not likely to have any impact to surface water quality. The potential impact of the solar farm on water quality will be less than the current land use practice.

The use of fuels, lubricants, herbicides and other chemicals during operation pose a risk of surface water contamination in the event of a spill. Management of sewage systems pose a risk to surface water quality should spills occur.

Groundwater quality

Water quality impacts to groundwater during construction and operation are considered very unlikely due to the recorded depth of groundwater at the Site and the limited excavation proposed for the installation of panels and ancillary structures.

Panels will be installed on driven piles installed not more than 2.5 m below the ground surface, while excavation works (approximately 1 m) would be undertaken for trenching for underground cabling as well as internal access roads.

5.9.3.2 Hydrology

The proposed development has potential to impact on hydrology through the following processes:

- Changes to water balance
- Altered rainfall runoff pathways

Surface water hydrology

Water for construction and operational purposes will be from the sources listed in Table 5. 1.

Table 5. 33 Water use categories

Use	Source
Dust Suppression	Existing surface water & externally sourced
Amenities & facilities	Externally sourced & on-site rainwater
General construction	Externally sourced
General maintenance	Existing surface water & on-site rainwater
Agricultural activities	Surface water & groundwater

Potable water supplies will be procured via a licenced water supplier and delivered and stored onsite for use. Potable water supplies may be augmented by rainwater supplies collected on-site and stored in rainwater tanks associated with buildings.

Water from existing surface water dams may be used for dust suppression activities during construction and decommissioning phases and as a water source for sheep grazing during operation.

Additional non-potable water may need to be sourced externally for dust control during construction. Tamworth Solar Farm Pty Ltd has contacted a local water supplier, R&H Water Supply, to confirm the availability of non-potable water. R&H Water Supply have subsequently contacted the Tamworth Regional Council and confirmed that the water is available.

Groundwater hydrology

No groundwater is proposed to be used for construction or decommissioning of the proposed development. Existing groundwater bores on the Site may be used to provide stock water for sheep grazing during the operational phase.

The proposal is not likely to influence groundwater systems directly or indirectly, nor would an aquifer interference approval as per the *NSW Aquifer Interference Policy* be required.

5.9.4 Mitigation Measures

This section of the report provides a summary of the proposed safeguards and environmental mitigation measures that will be undertaken to address potential impacts to waterways, water quality and water quantity. It includes a description of the measures that would be implemented to monitor and report on the environmental performance of the development.

5.9.4.1 Waterway buffers

In accordance with the NSW Department of Primary Industries, Guidelines for Riparian Corridors on Waterfront Land, panels will not be constructed within 10 m of a 1st order waterway and within 20 m of a second order waterway. A survey will be conducted in order to determine the location of these waterways if existing lidar data is not adequate.

5.9.4.2 Water quality

Construction & decommissioning

The potential impacts to soils and water quality do not present any major constraints that cannot be managed. All construction and demolition activities for the proposed solar farm will be undertaken in a manner that prevents erosion and sediment impacts at the subject Site and within the catchment area of Sandy Creek and the Peel River.

Post approval, a Construction Environmental Management Plan (CEMP) will be prepared by the proponent that identifies erosion and sediment control mitigation measures prior to works commencing. All erosion and sedimentation controls will be designed and undertaken in accordance with the provisions of *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) and
- Volume 2C Unsealed Roads (DECC, 2008b).

Where appropriate, mitigation measures would be in place at the commencement of construction until suitable groundcover/stabilisation has been established. Preliminary mitigation measures are identified below, however these will be subject to more detail and final design in the preparation and implementation of a CEMP for the project.

- If practicable the Site will be sown to permanent pasture prior to the establishment of the solar farm and repaired where necessary after construction. If this is not practicable, the Site will be sown to a permanent pasture as soon as possible after the construction of the solar farm, taking into account the seasonal conditions and appropriate timing for pasture establishment.
- Access tracks shall be maintained in good condition, ensuring that associated drains and/or sedimentation traps are monitored and maintained so that potential erosion associated with the tracks, which could lead to impacts on water quality, is minimised. Wherever possible, traffic will remain on constructed internal roads to minimise the level of soil disturbance and compaction. Internal access tracks will be designed to minimise impacts to flow pathways and appropriate drainage will be employed to ensure runoff volumes and velocity are controlled.
- In areas where there has been significant disturbance and erosion is likely, the type of measures that will be implemented include:
    - Stabilisation of the soil with polymers or by seeding,
    - Establishment of cut-off drains to divert water away from the disturbed area and ensure runoff volumes and velocity are controlled,
    - Establishment of control measures such as sediment basins with drains that divert sediment laden water to these sediment control devices.
- Construction works would be staged as per the requirements set out in the CEMP to include progressive stabilisation of disturbed areas and topsoil. Where practicable, rehabilitation of all disturbed areas will be progressive and not left to the completion of construction.

Management of sewerage and wastewater from the temporary site offices and amenities buildings during construction and decommissioning will be documented in the CEMP/DEMP. Waste produced from toilets shall be stored in the holding tanks on the demountable buildings until it is trucked offsite and disposed in accordance with the relevant legislative requirements.

After construction works finish, hazardous materials (fuels, lubricants, construction chemicals, herbicides, etc) will be transported offsite or disposed in accordance with the relevant legislative requirements under the POEO Act and Council requirements. Onsite refuelling shall occur within designated areas that are located more than 100 m from drainage lines and within an impervious bund. Daily inspections of contractor's machinery will be undertaken to ensure no oil, fuel or fluids are leaking. Contractors and staff will undertake regular toolbox talks and be notified of the hazards of accidental spills and potential impacts to water quality.

A Spill Response Plan (SRP) will be developed and included as part of the Emergency Response Plan (ERP). All contractors and staff will be trained regarding appropriate spill response strategies. Should a spill occur, incident management procedures provided in the SRP will be implemented and the EPA will be notified of any incidents that cause harm to the environment, pursuant to sections 147 – 153 of the POEO Act.

Operation

An Operations Environmental Management Plan will be implemented that includes the day-to-day procedures and allocation of responsibilities to minimise impact to water quality throughout the operational life of the solar farm. To maintain water quality, the objectives of the OEMP seek to establish a healthy, self-sustaining, improved pasture over the solar farm that will minimise erosion, provide fodder for sheep grazing and be manageable in terms of weed control and hazard reduction (fuel loads). Localised erosion will be managed if present.

Once the proposed solar farm is in the operational phase there will be minimal requirement to source water for the day-to-day operations of the facility. Staff amenities, including toilet and handwashing basins, will be provided by small rainwater tanks connected to the staff amenities building and waste water would be managed onsite subject to seeking separate approval from Council under Section 68 of the Local Government Act, approval to operate an Onsite Sewerage Management System (OSSMS).

Very few dangerous substances or chemicals are associated with the day-to-day activities of the solar farm and as such there is very little risk of pollution of local waterways by chemical residues or other contaminants. Despite this, as a mitigation measure, all activities with the potential for spillages or overflow of fuels or chemicals would not be undertaken within 50 m of the existing farm dam or drainage lines and a suitable spill response and containment kit will be available on Site whenever and wherever this type of higher risk activity is undertaken. Additionally, storage, handling or use of any potentially dangerous

substances would be in accordance with the relevant Australian Standards and *Guidelines for Storage and Handling of Dangerous Goods* by WorkCover NSW.

5.9.4.3 Water quantity

Construction

During the construction phase some potable water will be required for staff amenities comprising custom built transportable buildings containing bathroom and kitchen facilities. Potable water would be sourced locally and trucked onsite on an as needs basis and stored within temporary rainwater tanks.

Some non-potable water will also be required for dust suppression, depending on the schedule of works and the climatic conditions experienced at the time the works are undertaken. The volume of non-potable water required would be significantly higher during extended periods of hot, dry weather or where groundcover is disturbed for an extended period of time. Assuming a maximum daily use, in excessively dry and windy conditions, would be 150 kL, and that these conditions are experienced 50 % of the time during the six month construction peak, this equates to approximately 10 ML of water used for the life of the construction period. All water for dust suppression would be sourced from either the existing small dam or local water suppliers (trucked onsite). Potable water would not be used for dust suppression at any stage during the construction phase.

Operation

Once the proposed solar farm is in the operational phase there will be minimal requirement to source water for the day-to-day operations of the facility. Staff amenities, including toilet and handwashing basins, will be provided by small rainwater tanks connected to the staff amenities building and wastewater would be managed onsite via the existing Onsite Sewerage Management System (OSSMS).

Some non-potable water may be required for watering screening trees depending on the seasonal conditions at the time of establishing the landscaping buffers. In general, only a small quantity of water used during operations would be required.

5.9.4.4 Summary of mitigation measures

A summary of mitigation measures for water and soils is provided in Table 5. 34

Table 5. 34 Summary of mitigation measures for water and soils

Reference	Mitigation Measure
W1	As part of the Construction Environmental Management Plan (CEMP) erosion and sediment control mitigation measures will be identified prior to works commencing. All erosion and sedimentation controls will be designed and undertaken in accordance with the provisions of Managing Urban Stormwater: Soils and Construction series.
W2	If practicable the Site will be sown to permanent pasture prior to the establishment of the solar farm and repaired where necessary after construction. If this is not practicable, the Site will be sown to a permanent pasture as soon as possible after the construction of the solar farm, taking into account the seasonal conditions and appropriate timing for pasture establishment.
W3	Access tracks including drains and sediment traps shall be maintained in good condition, to minimise erosion which could impact on water quality, is minimised. Wherever possible, traffic will remain on constructed internal roads to minimise the level of soil disturbance and compaction. Internal access tracks will be designed to minimise impacts to flow pathways and appropriate drainage will be employed to ensure runoff volumes and velocity are controlled.
W4	In areas where there has been significant disturbance and erosion is likely, the type of measures that will be implemented include: • Stabilisation of the soil with polymers or by seeding, • Establishment of cut-off drains to divert water away from the disturbed area and ensure runoff volumes and velocity are controlled, and • Establishment of control measures such as sediment basins with drains that divert sediment laden water to these sediment control devices.
W5	Waste produced from toilets shall be stored in the holding tanks on the demountable buildings until it is trucked offsite and disposed in accordance with the relevant legislative requirements.
W6	After construction works finish, hazardous materials (fuels, lubricants, construction chemicals, herbicides, etc) will be transported offsite or disposed in accordance with the relevant legislative requirements under the POEO Act and Council requirements.
W7	Onsite refuelling shall occur within designated areas that are located more than 100 m from drainage lines and within an impervious bund.
W8	Daily inspections of contractor's machinery will be undertaken to ensure no oil, fuel or fluids are leaking.

Reference	Mitigation Measure
	Contractors and staff will undertake regular toolbox talks and be notified of the hazards of accidental spills and potential impacts to water quality.
W9	A Spill Response Plan (SRP) will be developed as part of the Emergency Response Plan (ERP). All contractors and staff will be trained regarding appropriate spill response strategies. Should a spill occur, incident management procedures provided in the SRP will be implemented and the EPA will be notified of any incidents that cause harm to the environment, pursuant to sections 147 – 153 of the POEO Act.
W10	The Operations Environmental Management Plan will include the day-to-day procedures and allocation of responsibilities to minimise impact to water quality throughout the operational life of the solar farm.
W11	All activities with the potential for spillages or overflow of fuels or chemicals would not be undertaken within 50 m of the existing farm dam or drainage lines and a suitable spill response and containment kit will be available on Site whenever and wherever this type of higher risk activity is undertaken.
W12	All water for dust suppression would be sourced from either the existing small dam or local water suppliers (trucked onsite). Potable water would not be used for dust suppression at any stage during construction phase.
W13	Panels will not be constructed within 10 m of a 1st order waterway and within 20 m of a second order waterway. A survey will be conducted in order to determine the location of these waterways if existing lidar data is not adequate.

5.10 Hazards and risks

5.10.1 Overview

A hazard and risk assessment has been conducted to meet the following requirements of the SEARs:

The EIS must address Hazards and Risks by conducting;

- *A preliminary risk screening in accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP, 2011) and if the preliminary risk screening indicates the development is "potentially hazardous", a Preliminary Hazard Analysis (PHA) must be prepared in accordance with Hazard Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011); and*
- *an assessment of all potential hazards and risks including but not limited to bushfires, spontaneous ignition, electromagnetic fields or the proposed grid connection infrastructure against the International Commission on Non-Ionising Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.*

A hazard is defined as something that has the potential to harm the environment or people. A hazard will have an associated risk which is the possibility that the hazard will cause harm. The hazards associated with the proposal are the storage and handling of hazardous materials, electromagnetic fields, bushfires and flooding. Hazardous materials and electromagnetic fields are addressed in this section, bushfires are addressed in Section 5.11 and flooding is addressed in Section 5.8.

5.10.2 Hazardous Materials

Determination of whether the development is "potentially hazardous" has been undertaken by following the guidelines described in Applying SEPP 33 (DoP,2011). Appendix 3 of the Applying SEPP33 guidelines provides a list of industries that may be potentially hazardous. It also refers to the IAEA Table 11 Checklist in the Multi-Level Risk Assessment Guidelines (NSW Government, Planning & Infrastructure, May 2011) which lists additional industry types and gives an indication of some potentially hazardous substances that are typically associated with such industries. Solar farms and energy storage facilities are not listed in the Applying SEPP 33 guidelines or the IAEA Checklist as being potentially hazardous.

The Applying SEPP33 guidelines provide a checklist and risk screening procedure to assist in determining whether a development proposal falls with the definition of a potentially hazardous industry. It provides thresholds for Dangerous Goods above which a Preliminary Hazard Analysis would be required. Table 1 shows the hazardous materials that will be transported to or from the Site and stored on Site during construction or operation of the solar farm. These substances do not exceed the SEPP 33 thresholds and therefore the proposal is not defined as being "potentially hazardous". Consequently, according to Applying SEPP33 a Preliminary Hazard Analysis is not required for this proposal.

- **Table 5. 35 Hazardous materials that may be used on Site.**

Hazardous Materials	Storage Threshold	Transport Threshold Movements	Transport Threshold Quantity	Anticipated quantities	Mode of Storage (bulk or packages/containers) Distance from the boundary for class 1.1,2.1 and 3	Exceedance of SEPP33 thresholds
Class 2.1: Flammable Gases						
LPG	10 tonne or 16 m^3 if stored above ground	>500 cumulative annually >30 per week	2 tonne bulk 5 tonne packages	< 1 tonne	Cylinders stored in a secure area within the Proposal boundary (specify distance from boundary see fig 9)	No
Class 2.2: Non-flammable, non-toxic gases						
Fire suppression gas	NA	Not subject to regulations	Not subject to regulations	2 tonnes		No
Class 3: Flammable Liquids (PG II)						
Fuel – Petrol	5 tonnes	>750 cumulative annually >45 per week	3 tonne bulk 10 tonne packages	< 1 tonne	Stored in drums in a bunded area. Only stored with other Class 3 materials.	No
Class 6.1: Toxic and infectious substances (PGII, PGIII)						
Pesticides (herbicides)	2.5 tonnes	all	1 tonne bulk 3 tonnes packages	< 1 tonne	Stored in a secure area within the Proposal Boundary	No

5.10.2.1 C1 Combustible liquids

The main source of fuel for vehicles used on Site will be diesel which is classified as a C1 combustible liquid and is not considered to be dangerous according to the Australian Dangerous Goods Code. Combustible liquids are not included in the SEPP 33 risk screening process. The Applying SEPP 33 guidelines state that if C1 combustible liquids are stored on Site in a storage area where there are no flammable liquids stored they are not considered to be potentially hazardous.

C1 combustible liquids provide a risk when stored with flammable liquids because they contribute to the fire load when involved in a fire. To minimise this risk the storage of diesel on Site will comply with *AS1940 The Storage and Handling of flammable and Combustible liquids* and will not be stored with flammable liquids.

5.10.2.2 Class 2.2 Non-flammable, non toxic gases

Non-liquified inert gases will be stored on Site for fire suppression. These gases can comprise of argon, neon or helium and can also include blends of inert gases with other gases such as argon and nitrogen. Inert fire extinguishing gases are classified as Class 2.2 – Non-flammable, non toxic gases and are not included in the SEPP 33 risk screening process. They are not considered to be potentially hazardous with respect to off-site risk.

Release of fire suppression gases is an asphyxiant hazard and can cause suffocation by diluting or displacing oxygen. The risk can be minimised through the following actions;

- Provision of oxygen detection systems and alarms in gas storage rooms.
- Providing adequate ventilation where gas cylinders are stored.
- Providing training for workers in
    - the risk of asphyxiation and control measures
    - procedures for working in rooms with gas storage
    - operation and maintenance of the fire-suppression system equipment.
    - proper use of personal protective equipment
    - emergency plan implementation
- Installation of safety signage in accordance with AS ISO 14520.1 Gaseous fire extinguishing systems
- The use of placarding where the total water capacity of all gas cylinders exceeds 1,000 litres.
- Installing HAZCHEM signage at every site entrance.

5.10.2.3 Class 9 Miscellaneous dangerous substances and articles

Lithium-ion batteries (LIB) will be used on Site to store energy. They are classified at Class 9 Dangerous Good which includes environmentally hazardous substances which are not covered by the other classes of dangerous goods. Class 9 Dangerous Goods are not included in the SEPP 33 risk screening process. The major hazard associated with LIB is fire if the battery is damaged, defective or improperly used.

The Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG code) requires that dangerous goods are transported in a safe manner. Table 3.2.3 in the ADG code specifies 'special provisions' and 'packing instructions' for transporting LIB (NTC Australia, 2018). This applies to transportation of batteries to Site and removal as a waste material at the end of their life.

The risk of fire developing from the BESS is very low as the BESS has the following controls:

- A battery management system that ensures the battery cells are maintained within the operating parameters.
- A heating and cooling system for keeping the batteries at the optimal temperature,
- A fire detection and suppression system as described in Section 3.3.5,
- Enclosures to physically protect the batteries, and
- A perimeter security fence.

5.10.2.4 Hazardous goods risk mitigation

The proposal will not involve the storage or transport of incompatible materials. The transport, storage and use of all hazardous goods will comply with requirements stated in the following documents where relevant;

- *Australian Code for the Transport of Dangerous Goods by Road & Rail*, Edition 7.5, 2017
- *Storage and Handling of Dangerous Goods – Code of Practice,* NSW Government, 2005
- AS1940-2004: *The storage and Handling of Flammable and Combustible Liquids*

5.10.3 Potentially Offensive Industry determination

The Applying SEPP 33 guidelines require information relating to pollution potential. The potential sources of pollution are listed below;

5.10.3.1 Air quality

Air quality will be affected by vehicles and machinery use during the construction of the proposal which will result in dust from soil disturbance and exhaust. Dust will be controlled on the solar farm Site through the following methods:

- If the schedule and the season permits, the Site will be sown to permanent pasture prior to construction commencing. Consideration will be given to direct drilling the pasture (rather than conventional cultivation) in order to limit soil disturbance. This will reduce the likelihood of dust and also provide firm ground for construction. It also minimises the risk of soil erosion and the establishment of weeds.
- Minimise the level of soil disturbance wherever practical.
- In areas of high traffic areas consideration is to be given to installing a hard surface that will emit less dust.
- Water carts will be used to control dust.

Control of dust on the transport route is discussed in Section 5.7.4.1.

5.10.3.2 Noise

Noise impacts are discussed in Section 5.6.

5.10.3.3 Water

The project's potential impacts on water quality are discussed in Section 5.9.

The impact of the proposal in relation to potential pollution is deemed to be low and therefore the proposal is not assessed as being a potentially offensive industry.

5.10.4 Electric and Magnetic Fields

Electric and magnetic fields (EMF) exist whenever electric current flows. Electric fields are produced through electric charge and can be shielded by common materials such as wood and metal (WHO, 2007). Magnetic fields are produced through the flow of electric charge (current) and can easily pass through common materials. Both fields are strongest at the source and decrease in magnitude with distance.

The frequency of electrical generation, distribution and use in Australia is 50 Hz which is within the Extremely Low Frequency (ELF) range of 0 – 3000 Hz. ELF EMF can be measured to determine the degree of exposure to a source. Electric fields are measured in volts per metre (V/m) and magnetic field is measured in amperes per metre (A/m) and expressed in terms of magnetic flux density measured in units of Tesla (ARPANSA, 2019a).

5.10.4.1 Potential risks of ELF EMF

People can be exposed to EMF from power lines, electrical wires and common appliances. The Australian Radiation and Nuclear Safety Agency (ARPANSA) states that "the scientific evidence does not establish that exposure to the electric and magnetic fields found around the home, the office or near powerlines causes health effects." (ARPANSA, 2019b)

In 2005 the World Health Organisation (WHO) assessed the risks to health that might exist from exposure to ELF electric and magnetic fields. It concluded that "*there are no substantive health issues related to ELF electric fields at levels generally encountered by members of the public.*" (WHO, 2007). They also came to the following conclusions related to the effects of ELF magnetic radiation;

- Short term effects of external ELF magnetic fields at very high field strengths, cause nerve and muscle stimulation and changes in nerve cell excitability in the central nervous system.
- There is not strong enough evidence to consider ELF magnetic fields a cause of childhood leukaemia.
- Scientific evidence supporting an association between ELF magnetic field exposure and health effects of other childhood cancers, cancers in adults, depression, suicide, reproductive dysfunction, developmental disorders, immunological modifications, neurobehavioural effects and neurodegenerative disease is much weaker than for childhood leukaemia.
- Scientific evidence suggests that there is no causal link with cardiovascular disease or breast cancer.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has issued Guidelines for Limiting Exposure to Time Varying Electric and Magnetic Fields (up to 100kHz) which are aimed at preventing the established health effects resulting from exposure to ELF EMF. There are separate reference levels for general public and occupational exposure since the level and control of exposure to these groups will vary. The general public comprises individuals of all ages and of varying health status and which have varied degrees of susceptibility to EMF exposure. They are also not expected to be aware of their exposure or take precautions to limit the effect. Occupational exposure occurs to adults in their workplace who are generally exposed to EMF under known conditions and are trained to be aware of potential risk and to take appropriate precautions. Therefore, the guidelines are more stringent for public exposure compared to occupational exposure (ICNIRP, 1998). The ICNIRP reference levels for EMF at 50Hz are provided in Table x.

Table 5. 36 ICNIRP reference levels for EMF at 50Hz

Exposure	Electric Field (kV/m)	Magnetic Field (μT)
General Public	5	200
Occupational	10	1000

5.10.4.2 Potential sources of EMF

EMF may be emitted from the following infrastructure components on Site:

1. Solar Panels
2. PCUs
3. BESS
4. 33kV underground cables
5. 132kV overhead transmission lines.
6. Substation

A study was conducted to characterise the EMF between the frequencies of 0 Hz and 3 GHz at two solar farms operated by Southern California Edison Company in Porterville, CA and San Bernardino, CA. The static magnetic fields were very small compared to the ICNIRP levels. The highest magnetic fields were measured adjacent to transformers and inverters. The magnetic fields measured complied in every case with ICNIRP occupational exposure limits. The electric fields measured were negligible compared to ICNIRP levels (Tell et al, 2015).

The potential EMF levels from different infrastructure is discussed in the following sections.

33kV underground cables

Underground cables do not emit external electric fields. A typical 33 kV underground cable will produce a maximum magnetic field of approximately 1 μT at one metre above ground level. The magnetic field will be indistinguishable from the background magnetic field at distances greater than 20 metres away from the source (National Grid: EMF Information, 2019). These values are below the reference levels.

132kV overhead transmission lines

The magnetic field exposure near high voltage power lines depends on the amount of current carried by the power line and the distance from the power line. For distances greater than 50 metres from a high voltage power line the magnetic field is not expected to be higher than typical magnetic fields found in the home from electrical wires and appliances (ARPANSA, 2019b).

The typical value of magnetic field measured directly underneath a high voltage transmission line at 1 metre above ground level is 1-20 μT. At the edge of the easement the magnetic field is typically and 0.2-5 μT (ARPANSA, 2019d), below the reference levels.

The overhead power line used by the proposal is an existing power line and therefore will not pose any greater risk of EMF than already exists.

Substation

The main sources of magnetic fields in a substation are buswork, transformers, air core reactors, switch gear, cabling, capacitors, circuit breakers, battery chargers and computers. The strongest magnetic fields at the boundary fence come from incoming and outgoing transmission lines. (Edvard, 2003). The typical measurement of magnetic field of a substation at the substation fence is measured at 1-8 μT (ARPANSA, 2019d). The electric field from a substation is buffered due to the screening effect provided by grounded steel structures used by electric bus and equipment support.
Magnetic fields at distances of 5 – 10 metres from substations and transformers are expected to be at similar levels as background levels in the home (ARPANSA, 2019b).

5.10.4.3 EMF risk mitigation

The following steps will be taken to limit the risk of exposure to EMF.

- All electrical equipment will be designed, constructed and implemented according to relevant international and Australian standards and best codes of practice.
- The Site boundary will have a security fence to restrict public access to the Site.
- There will be an Asset Protection Zone of 20 metres between any infrastructure and the security fence. There will also be at least another 10 metres between the security fence and the boundary which will limit exposure of EMF to members of the public.

Considering that the EMF levels associated with the infrastructure are below the ICNIRP reference levels and that EMF attenuates with distance the risk of human health being impacted by exposure to EMF is low.

5.10.5 Summary of mitigation measures

A summary of the mitigation measures for hazards and risks is provided in Table 5. 37.

Table 5. 37 Summary of mitigation measures for hazards and risks

Reference	Mitigation Measure
H1	The storage of diesel on Site will comply with *AS1940 The Storage and Handling of flammable and Combustible liquids* and will not be stored with flammable liquids.
H2	Lithium-ion batteries will be transported in accordance with Table 3.2.3 of the ADG code.
H3	The BESS will include a fire detection and suppression system and a temperature control system.
H4	The transport, storage and use of all hazardous goods will comply with requirements stated in the following documents where relevant; • *Australian Code for the Transport of Dangerous Goods by Road & Rail*, Edition 7.5, 2017 • *Storage and Handling of Dangerous Goods – Code of Practice,* NSW Government, 2005 • AS1940-2004: *The storage and Handling of Flammable and Combustible Liquids*
H5	Dust will be controlled on the solar farm Site through the following methods: • Establish a permanent pasture as soon as practicable. • Minimise the level of soil disturbance wherever practical. • In areas of high traffic areas consideration is to be given to installing a hard surface that will emit less dust. • Water carts will be used to control dust.
H6	All electrical equipment will be designed, constructed and implemented according to relevant international and Australian standards and best codes of practice.
H7	The Site boundary will have a security fence to restrict public access to the Site.

5.11 Bushfire

5.11.1 Overview

Eco Logical Australia have undertaken a bushfire risk assessment for the Site (refer to Appendix K). This assessment was conducted in accordance with the requirements of the SEARs:

an assessment of all potential hazards and risks including but not limited to bushfires, spontaneous ignition, electromagnetic fields or the proposed grid connection infrastructure against the International Commission on Non-Ionising Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.

5.11.2 Existing Environment

5.11.2.1 Climate

The greatest potential for bushfire events at the Site occurs November - January when drier westerly winds are predominant (Tamworth Bush Fire Management Committee (BFMC) 2011) and contribute to significant grass curing, making the landscape more susceptible to ignitions starting and spreading.

Whilst the declared bushfire season occurs from 1 October to 31 March annually, it can be extended when the usually wetter summers remain dry. The bushfire season can also be brought forward when a drier than average winter results in the landscape being more susceptible to fires starting and spreading in late spring and early summer.

5.11.2.2 Fuel hazard

The Site and surrounding lands are not classified as bush fire prone, as they are managed agricultural lands predominantly used for grazing and cropping. The closest bushfire hazard mapped as bushfire prone land is located approximately 2.5 km west of the subject Site. These areas not classified as bush fire prone, may still carry a grassfire if:

- Grasses are cured,
- Grass loads are heavier, and
- Pasture grass fuels are continuously linked across the landscape.

Grass fire spread can be held up or stopped where continuous cured grass cover is broken up by local roads, ploughed or fallow paddocks, green creek lines, arterial public roads, firebreaks, fully eaten-out areas and farm breaks/tracks. Such features occur in the landscape surrounding the Site. These features make it unlikely that large areas of the surrounding landscape can easily support a continuous (fully linked) cured grass cover, which will then allow development of a large-scale grassfire.

5.11.2.3 Fire history and ignition sources

There is no fire history documented for the Site but the broader Tamworth Regional Council (LGA) experiences on average 200 bushfires per annum, with up to 15 which are considered major fires (Tamworth BFMC 2011). Across these LGAs the main sources of fire ignition are identified as:

- Lightning Strikes;
- Agricultural Burns;
- Arson;
- Escaped Pile Burns;
- Farm machinery or equipment;
- Burning without a permit; or
- Welding/Grinding and associated construction activities.

5.11.3 Assessment of Impacts

5.11.3.1 Potential ignition sources within the solar farm

During site construction and operations, the following are potential ignition sources:

- Earth moving equipment;
- Vehicles;
- Power tools (such as welders, grinders);
- Mowers and slashers; and
- Accidental ignitions (such as discarded cigarettes).

The solar panels are non-reflective and present no risk of ignitions from concentrated solar energy. Ignitions from other PV equipment is theoretically possible from electrical faults such as arc faults, short circuits, ground faults and reverse currents (Allianz Risk Consulting 2012). Arcing issues are normally created from the following:

- Incorrect connecting of the inter module connectors;
- Corroded inter module connectors caused from incorrect storage of modules on Site;
- Electrical connections on isolators / DC combiners; or
- Mismatch of inter module connectors causing insufficient electrical connections.

It is conceivable that arcs or melted components resulting from a fault could if conditions were suitable ignite grass fuels and start a bushfire. However, the level of risk from faults cannot be assessed at this stage because there is no case history available.

There is also a very low risk that a fire could start within the BESS. This is discussed further in Section 5.10.2.3.

5.11.3.2 Hazard to firefighters and public safety

The usage of the general area surrounding the Site will be mostly limited to neighbouring landholders and the operators of the solar farm Site. The fire-

fighters likely to respond to a bushfire in this area would be FRNSW fire fighters (located in Tamworth, Manilla and Gunnedah) and/or volunteers from the NSWRFS (located at Tamworth). Potential risks to fire-fighter safety associated with a fire burning the solar panels and associated equipment include:

- Electrocution – solar panels would be energised under any natural or artificial light conditions – isolation of DC current can only occur external to any solar array because there is no single point of disconnect internally (Backstrom and Dinni 2011);
- Safe use of water spray or foam application is only possible from the perimeter of the solar arrays and could not reach the 250 to 500 m required to reach the furthest internal distance (without an aerial ladder platform appliance); and
- Inhalation of potentially toxic fumes and smoke from any plastic components such as cables (although the main structure of the panels will be glass and aluminium) or other decomposed products of the panels (Allianz Risk Consulting 2012).

The burning of materials such as the solar panel backing sheet and ethylene vinyl acetate (EVA) will produce hazardous gasses and therefore may require breathing apparatus.

5.11.4 Mitigation Measures

A number of mitigation measures for bushfire are discussed below. These measures are guided by the aims and objectives of the document *Planning for Bush Fire Protection* (NSWRFS 2018) in the context of the bush fire risk factors present at the Site. They include requirements for asset protection zones and defendable space, site landscaping, access, water and utilities, and fire preparedness and response.

5.11.4.1 Asset protection zones

An Asset Protection Zone (APZ) is defined (NSWRFS 2018) as:

> *A fuel reduced area surrounding a build asset or structure which provides a buffer zone between the bushfire hazard and an asset. The APZ includes a defendable space within which firefighting operations can be carried out*.

APZs do not eliminate the fire risk and under adverse conditions fire may spot over, or embers travel through asset protection zones. However, they may lower fire risk it to an extent where fire control is more feasible under most conditions or damage to the asset is reduced or eliminated. They can assist in reducing the potential for a fire to impact the Site, as well as spread from the Site.

An APZ will be established around the perimeter of all PV panels and accompanying structures. The APZ will be at least 20m wide and will include a mineral earth perimeter Category 1 fire trail (trafficable 4m width with passing bays every 250 metres) maintained in accordance with NSWRFS fire trail standards (NSWRFS 2019). The remainder of the APZ will be grass that is kept at a height of less than 100 mm. Leaf material and other debris including

woodchips will be removed. The APZ will be established at the start of the construction and maintained until the solar farm has been completely decommissioned.

An APZ will also be established around the substation. The APZ will be 20 m width from any substation infrastructure.

5.11.4.2 Visual screen plantings

The visual screen plantings that will be established on the outside of the APZ on increases the risk of burning embers carrying across the APZ and creating the potential for a spot fire to spread on the other side (Cheney and Sullivan 2008). The following measures will be implemented to mitigate the risk of embers carrying into the solar farm:

- The visual screen will be planted using species suitable for the environment that have low fire spotting characteristics (such as smooth bark or evergreen species) and are not high flammability species;
- Visual screens, where practicable, will be planted as a continuous windbreak with no breaks of sufficient size to allow winds to funnel through;
- Screen plantings will be placed on the outer side of the APZ (away from the asset); and
- Routine maintenance will be conducted prior each fire season to reduce dead materials, dead plant growth and leaf litter from within the APZ.

5.11.4.3 Management of fuel loads

During the bushfires season, pastures within the Development Site (including under panels) will be maintained with minimal fuel load (<100 mm grass height). Overgrazing will be avoided to maintain the groundcover and reduce the potential for erosion.

5.11.4.4 BESS

The BESS will have a fire detection and suppression system based on Novec 1230 or equivalent. For more information refer to Section 3.3.5.

5.11.4.5 Design specifications

Solar panels and other components (such as cables) may be exposed to flame contact if a fire were to spread within the solar farm footprint. Therefore, it is recommended that, where practicable, components that are vulnerable to damage from temperatures associated with flame contact are shielded as far as possible. Design should consider the following features:

- Burial of cables underground; and
- Shielding of above ground cables and circuitry.

Electrical equipment and installation works will be in accordance with all relevant Australian legislation, regulation, standards and codes of practice.

5.11.4.6 Construction

Should construction of the solar farm occur during the fire season (1 December and 31 March), the following measures will be implemented to control the risk of grass fire ignitions:

- All plant, vehicles and earth moving machinery are cleaned of any accumulated flammable material (e.g. vegetation);
- A suitable fire appliance is present on Site with at least two personnel trained in bushfire fighting;
- On days when Very High FDR or worse is forecast for Tamworth, the "fires near me' app is to be checked hourly for the occurrence of any fires likely to threaten the Site; and
- A hot works permitting system is in place; and
- All operations involving earth moving equipment, vehicles, slashers and hot works (e.g. grinders, welders) cease while the Grassland Fire Danger Index is or forecast to be 35 or greater, or high winds are forecast.

5.11.4.7 Operations

Days of Very High or worse fire danger

To minimise the risk of grass fire ignitions, all operations on the Site involving vehicles and slashers or other works that could start a fire will cease while the GFDI is or forecast to be 35 or greater, or high winds are forecast. This will require establishing an operational procedure for onsite recording of temperature, relative humidity and wind speed, as well as associated training.

Fire-fighter safety

The safety hazards for fire-fighters from PV panels and local fire-fighting capability are such that fire suppression within the footprint of the solar farm cannot be expected or relied upon. The only exception to this would be aerial water bombing, however, these resources may not be available at short notice. Fire suppression is most likely only to be feasible from the APZ or beyond and no internal access for firefighting is proposed.

Given the possible toxicity of smoke from burning solar farm components, fire-fighters, operations staff and neighbours should avoid working down wind of any fire burning within the solar farm.

An Emergency Response Plan (ERP) will be prepared for the solar farm that provides the following:

- Addresses foreseeable on-site and off-site fire events;
- Clearly states work health safety risks and procedures to be followed by fire-fighters, including
    - personal protective clothing;
    - minimum level of respiratory protection;
    - minimum evacuation zone distances;
    - a safe method of shutting down and isolating the PV system (or noting if this is not possible for safe internal access);
    - any other risk control measures required to be followed by fire-fighters;

- Evacuation triggers and protocols; and
- Suppression response strategies and tactics, including aerial suppression options/management.

Two copies of the ERP should be permanently stored in a prominent 'Emergency Information Cabinet' to be located at the main entrance point to the solar farm, external to any security fence or locked gate, and a copy provided to local emergency responders.

Once constructed and prior to operation, contact will be made by the site operator with the Local Emergency Management Committee to establish emergency management procedures with relevant authorities for the safety hazards presented by the Site. The operator of the solar farm should brief the local volunteer fire brigades and neighbouring farmers at appropriate intervals, for example, at annual pre-season fire meetings, on safety issues and procedures.

Access

In addition to the main access off Soldiers Settlement Rd, a secondary access for emergencies will be provided in the far north east corner of the Development Site onto Warminster Rd.

Water

A dedicated firefighting water supply of at least 20,000 litres fitted with NSWRFS compatible Storz couplings will be provided as a filling points for fire tankers, located on the main access road near the existing farm dwelling.

Fire preparedness and response

A bushfire management plan will be prepared that addresses the mitigation measures listed in Section 5.11.4. It should also include:

- storage of flammable materials,
- training for onsite personnel,
- responses to an emergency alert being issued by fire authorities, and
- incident management and control arrangements.

5.11.5 Summary of mitigation measures

A summary of the mitigation measures for hazards and risks is provided in Table 5. 38.

Table 5. 38 Summary of mitigation measures for bushfire risks

Reference	Mitigation Measure
F1	An APZ will be established around the perimeter of all PV panels and accompanying structures. The APZ will be at least 20m wide and will include a mineral earth perimeter Category 1 fire trail (trafficable 4m width with passing bays every 250 metres) maintained in accordance with NSWRFS fire trail standards (NSWRFS 2019). The remainder of the APZ will be grass that is kept at a height of less than 100 mm. Leaf material and other debris including woodchips will be removed. The APZ will be established at the start of the construction and maintained until the solar farm has been completely decommissioned.
F2	An APZ will also be established around the substation. The APZ will be 20 m width from any substation infrastructure.
F3	The following measures will be implemented to mitigate the risk of embers carrying into the solar farm: • The visual screen will be planted using species suitable for the environment that have low fire spotting characteristics (such as smooth bark or evergreen species) and are not high flammability species; • Visual screens, where practicable, will be planted as a continuous windbreak with no breaks of sufficient size to allow winds to funnel through; • Screen plantings will be placed on the outer side of the APZ (away from the asset); and • Routine maintenance will be conducted prior each fire season to reduce dead materials, dead plant growth and leaf litter from within the APZ.
F4	During the bushfires season, pastures within the Development Site (including under panels) will be maintained with minimal fuel load (<100 mm grass height). Overgrazing will be avoided to maintain the groundcover and reduce the potential for erosion.
F5	Where practicable, components that are vulnerable to damage from temperatures associated with flame contact are shielded as far as possible.
F6	Electrical equipment and installation works will be in accordance with all relevant Australian legislation, regulation, standards and codes of practice.
F7	Should construction of the solar farm occur during the fire season (1 December and 31 March), the following measures will be implemented to control the risk of grass fire ignitions: • All plant, vehicles and earth moving machinery are cleaned of any accumulated flammable material (e.g. vegetation);

Reference	Mitigation Measure
	• A suitable fire appliance is present on Site with at least two personnel trained in bushfire fighting; • On days when Very High FDR or worse is forecast for Tamworth, the "fires near me' app is to be checked hourly for the occurrence of any fires likely to threaten the Site; and • A hot works permitting system is in place; and • All operations involving earth moving equipment, vehicles, slashers and hot works (e.g. grinders, welders) cease while the Grassland Fire Danger Index is or forecast to be 35 or greater, or high winds are forecast.
F8	During operation of the solar farm, all works on the Site involving vehicles and slashers or other works that could start a fire will cease while the GFDI is or forecast to be 35 or greater, or high winds are forecast. This will require establishing an operational procedure for onsite recording of temperature, relative humidity and wind speed, as well as associated training.

F9	An Emergency Response Plan (ERP) will be prepared for the solar farm that provides the following:
	• Addresses foreseeable on-site and off-site fire events;
	• Clearly states work health safety risks and procedures to be followed by fire-fighters, including
	  o personal protective clothing;
	  o minimum level of respiratory protection;
	  o minimum evacuation zone distances;
	  o a safe method of shutting down and isolating the PV system (or noting if this is not possible for safe internal access);
	  o any other risk control measures required to be followed by fire-fighters;
	• Evacuation triggers and protocols; and
	• Suppression response strategies and tactics, including aerial suppression options/management.
	
	Two copies of the ERP should be permanently stored in a prominent 'Emergency Information Cabinet' to be located at the main entrance point to the solar farm, external to any security fence or locked gate, and a copy provided to local emergency responders.

F10	Contact will be made by the site operator with the Local Emergency Management Committee to establish emergency management procedures with relevant authorities for the safety hazards presented by the Site.

Reference	Mitigation Measure
F11	A secondary access for emergencies will be provided in the far north east corner of the Development Site onto Warminster Rd.
F12	A dedicated firefighting water supply of at least 20,000 litres fitted with NSWRFS compatible Storz couplings will be provided as a filling points for fire tankers, located on the main access road near the existing farm dwelling.
F13	A bushfire management plan will be prepared that addresses the mitigation measures listed in Section 5.11.4. It should also include: • storage of flammable materials, • training for onsite personnel, • responses to an emergency alert being issued by fire authorities, and • incident management and control arrangements.

5.12 Socio-economic

5.12.1 Overview

This section provides an assessment of the socio-economic impact of the project. The requirements of the SEARs for socio-economic are:

Socio-Economic including an assessment of the likely impacts on the local community and a consideration of the construction workforce accommodation.

5.12.2 Existing Environment

Tamworth has a population of over 62,000 (ABS Estimated Resident Population, 2018) (Tamworth Regional Council, 2019) and is the major centre for a catchment area of around 200,000 people. Tamworth's population has grown for the past ten years and is expected to grow to 68,000 within the next 15 years, which is the highest projected population growth rate in regional NSW (Tamworth Regional Council, 2016)

The economic activities in Tamworth are diverse and are based around manufacturing, health and community services, education, construction, retail trade, agriculture and food processing, and tourism and hospitality. Table 5. 39 shows number of people employed and proportion employed in each industry for the top 7 industries.

Table 5. 39 Numbers of people employed by industry sector in Tamworth.

Employing industry	Number of people employed (2016)	Proportion of employment %
Health Care and Social Assistance	3,900	15
Retail Trade	2,879	11.1
Education and Training	2,330	9
Construction	2,036	7.8
Manufacturing	1,953	7.5
Accommodation and food services	1,761	6.8
Agriculture, Forestry and Fishing	1,581	6.1

Source: (Tamworth Regional Council, 2019)

The Gross Regional Product (GRP) of the Tamworth region was $2.71 billion (June 2014) which was a 10% increase over the previous five years. The sectors which represent the highest proportion of GRP are Health Care and Social Assistance (11.4%), Manufacturing (9.9%), Construction (9.1%) and Financial and Insurance Services (9.1) (Tamworth Regional Council, 2016). The Tamworth LGA has over 5,500 registered businesses with the majority being in Agriculture, Forestry and Fishing sector.

The Tamworth region has a highly skilled workforce with 53% of the workforce being formally qualified. Table 5. 40 shows occupations of Tamworth residents in 2016.

Table 5. 40 Occupations of Tamworth residents

Occupation	Number of people	Proportion
Managers	3,400	13.1
Professionals	4,556	17.5
Technicians and Trades Workers	3,741	14.4
Community and Personal Service Workers	2,571	10.6
Clerical and Administrative Workers	3,110	12.0
Sales workers	2,559	9.8
Machinery Operators and Drivers	1,785	6.9
Labourers	3,768	14.2

Source: (Tamworth Regional Council, 2019)

Tamworth is host to a variety of cultural events and experiences such as the Tamworth Country Music Festival, the ten-day Taste Tamworth Festival, the Tamworth Marsupial Park and Adventure Playground, art galleries and museums. These events and attractions draw over 1.1 million visitors each year. In 2014, tourism generated over $239 m and employed over 1245 residents directly.

There is a range of accommodation available in Tamworth including caravan parks, heritage pubs, guesthouses, motels and farm stays. Table 5. 41 shows the tourist accommodation available in the Tamworth LGA. The information for hotel rooms does not include establishments with 15 rooms or less and other accommodation such as AirBnB.

Table 5. 41 Short term accommodation capacity in Tamworth

Accommodation	Capacity
Number of hotels/motels/serviced apartments	26
Number of rooms	898
Room occupancy rate	49.2%
Number of caravan parks	7
Number of on-site vans	62
Number of cabins/flats/units/villas	89
Total caravan park capacity	618
Site occupancy rate	46.5%

Source: Destination NSW (2015) for hotel rooms. Tamworth Regional Council (2014) for caravan parks.

5.12.3 Impact Assessment

The *New England North West Regional Plan 2036* describes one of the key goals for the region as becoming a strong and dynamic regional economy. This includes growing New England North West as a renewable energy hub. Investment in large scale renewable energy projects is expected to generate employment and investment from construction, operations and connection to the State's electricity grid (NSW Government Planning and Environment, 2017).

The Tamworth Solar Farm will have significant positive direct and indirect impacts for both the local region and other industries in Australia. These impacts include;

- Creation of employment during construction, operation and decommissioning.
- Contracts for the civil engineering and construction sectors. This work will include, site preparation, fencing, road construction and earthworks, steel assembly, electrical services, machinery hire, transport services, etc.
- Purchase of materials equipment such as switchgear, transformer, inverters, road base etc.
- Economic stimulus through employee demand for service industries such as accommodation, food, fuel and entertainment.

Workforce impacts are discussed in Section 5.12.4. There is also potential for some negative social impacts during construction and to a lesser extent, operation. These impacts relate primarily to amenity and include to noise (Section 5.6), visual (Section 5.5) and transport (Section 5.7). There will also be some minor impacts to the productivity of the agricultural land. During construction, the land will not be used for agriculture, however during operations, the land will be used for grazing (refer to Section 5.4.3.3).

5.12.4 Workforce impact

The construction of the solar farm is expected to commence in late 2020 and take 12 months. At the peak of construction there will be about 200 people working onsite. Approximately 50 % of these workers will be local residents in the surrounding area. This will be a significant benefit to the community at a time when the local economy is suffering from one of the worst droughts on record. Local farmers in particular may appreciate the opportunity to have some off-farm income.

The remainder of the workforce will be from outside the region and will stay in local short-term accommodation such as short-term rentals, caravan parks, motels, AirBnB etc. As described in Section 5.12.2 there are at least 900 hotels rooms in Tamworth and occupancy rates are low. These businesses would appreciate the increase in economic activity generated by the project. Due to the large number of accommodation options and low occupancy rates, it is unlikely that accommodation of workers would restrict access to accommodation for tourists. The only potential exception to this is during the Tamworth Country Music Festival. However, for the 2021 festival the project should be in the ramp-up phase and for the 2022 festival the project should be in the commissioning

phase. At these times, worker numbers will be low compared to the times of peak construction.

The project will employ one to two full time staff during operation who will reside in the area. There will also be requirements for contract work for activities such as vegetation management.

5.12.5 Management and mitigation

The following measures will be undertaken to maximise the benefits and minimise any potential adverse impacts:

- Employment will be preferentially sourced from the local area where appropriate skills and expertise exist.
- The local community will be provided with information regarding the timing of the project, the opportunities for employment and the need for services from local businesses.

A summary of the mitigation measures for socio-economic is provided in Table 5. 42

Table 5. 42 Summary of mitigation measures for socio-economic

Reference	Mitigation Measure
SE1	Employment will be preferentially sourced from the local area where appropriate skills and expertise exist.
SE2	The local community will be provided with information regarding the timing of the project, the opportunities for employment and the need for services from local businesses.

5.13 Waste

5.13.1 Overview

The project will produce a number of waste streams during the construction period. Minor quantities of waste will also be generated ongoingly during the operations phase.

All wastes produced by the project will be classified, stored and handled in accordance with the Waste Classification Guidelines – Part 1: Classifying Waste (EPA 2014).

5.13.2 Types of waste generated

Types of waste likely to generated during the construction phase of the project are listed in the table below, together with the proposed management approach for each type.

Waste Material and Description	Management measures
General Solid Waste (Non putrescible)	
Trees	Limbs can be chipped and used for mulch. Trunks used for timber or firewood if there is demand or chipped.
Wood Pallets and cable drums	Will be separated for reuse or recycling. Pallets can be recycled by processing the wood into products like particleboard, wood chips, mulch, animal bedding, biofilters (for storm water) or used as biomass - a source of renewable energy.
Plastic Plastic wrapping and straps associated with packaging of solar infrastructure.	To be disposed to landfill
Paper and cardboard From packaging of solar infrastructure	To be sent to a recycling facility
Electrical components Repair, replacement or removal of infrastructure components	To be recycled or sent to approved disposal facility
Metals Repair, replacement or removal of infrastructure components	Metals will be separated for recycling in clearly labelled skip bins
Construction waste Metal, steel, timber, fittings	Clearly labelled skip bins will be installed on-site to encourage waste separation, and general waste bins will be provided for disposal of materials that cannot be cost-effectively recycled
General domestic waste Paper, cardboard, aluminum cans, steel, plastics, glass, food waste, plastic wrap, etc. generated by onsite staff	
Liquid Waste	
Oil, fuels, etc. Contaminated water from equipment washing	Onsite testing may be carried out on the waste water generated onsite to see if it is within discharge limits. If the waste water is not within discharge limits the wastewater collected in the tanks would be pumped out and taken to an offsite licenced facility on a regular basis.
Sewage	Biological waste will be collected as part of a service agreement with the temporary amenity hire contractor and disposed of appropriately

5.13.3 Assessment of impacts

Potential impacts from poor management of waste include contamination of land and water, air emissions, loss of amenity, and human and animal health impacts

5.13.4 Mitigation

5.13.4.1 Waste Management Plan

A Waste Management Plan (WMP) for construction will be prepared and implemented in consultation with the Tamworth Regional Council.

Tamworth Regional Council operates a large regional waste management facility ten minutes from the CBD of Tamworth, approximately 35 km east of the project site. The Tamworth Waste Management Facility provides a recycling point for commercial clients.

Council also operate smaller waste management facilities in the rural areas of the region, including Somerton Landfill on the outskirts of Somerton township, approximately 10km North of the project site.

During the development of the WMP, discussion with Tamworth Regional Council will aim to ensure that the local community and businesses are not disadvantaged by exhausting capacity at any of the Council facilities.

Council will also be consulted on appropriate notification times before any large quantities of waste are deposited at any of the waste management facilities.

The WMP will include:

- Measures to manage, reuse, recycle and safely dispose of waste generated by the project
- Procedures for assessing, classifying and storing waste in association with EPA Waste Classification Guidelines (EPA 2014)
- Procedures for storage, transport and disposal of waste
- Monitoring, record keeping and tracking including demonstration of lawful disposal of contaminated products wastes or residues generated by the project.

5.13.5 Additional mitigation measures

Further mitigation measures to minimise, avoid or eliminate potential impacts from poor waste management include:

- An Unexpected Finds (Waste) procedure will be established and implemented to guide responses to any unexpected finds of contaminated, hazardous or unsuitable material during construction.
- Waste management plans, procedures and mitigation measures will be communicated to all employees and contractors during site induction, prior to commencing works at the Site.
- The project will comply with the relevant Protection of Environment Operations Act waste-tracking requirements for any wastes assessed or classified as hazardous waste, industrial waste or “Group A” waste (such as solvents, paints or oils).
- Waste generated by the project will be managed in accordance with the principles of the waste hierarchy:

  - reduce waste production;
  - recover resources; and
  - dispose of waste appropriately.
- A WMP will be prepared and implemented as part of the Operational Environmental Management Plan to manage any waste generated during the operational phase.
- At the end of its operational life the components of the solar farm will be reused or recycled where-ever possible. A solar panel recycling business has recently established in South Australia and it is anticipated that this industry will grow. Where components cannot be recycled, they will be disposed at an approved waste management facility.

5.13.6 Summary of mitigation measures

A summary of the mitigation measures for hazards and risks is provided in Table 5. 43.

Table 5. 43 Summary of mitigation measures for waste

Reference	Mitigation Measure
W1	A Waste Management Plan (WMP) for construction will be prepared and implemented in consultation with the Tamworth Regional Council. The WMP will include: • Measures to manage, reuse, recycle and safely dispose of waste generated by the project • Procedures for assessing, classifying and storing waste in association with EPA Waste Classification Guidelines (EPA 2014) • Procedures for storage, transport and disposal of waste • Monitoring, record keeping and tracking including demonstration of lawful disposal of contaminated products wastes or residues generated by the project. • An unexpected finds procedure.
W2	Waste management plans, procedures and mitigation measures will be communicated to all employees and contractors during site induction, prior to commencing works at the Site.
W3	Waste generated by the project will be managed in accordance with the principles of the waste hierarchy.
W4	A WMP will be prepared and implemented as part of the Operational Environmental Management Plan to manage any waste generated during the operational phase.
W5	At the end of its operational life the components of the solar farm will be reused or recycled where-ever possible. Where components cannot be recycled, they will be disposed at an approved waste management facility.

5.14 Cumulative impacts

There are currently three other State Significant Developments in the region surrounding the Tamworth Solar Farm. They are:

- The Gunnedah Solar Farm which is approximately 9 km north-east of Gunnedah within the Gunnedah LGA,
- The Orange Grove Solar Farm which is 12 km east of Gunnedah in the Gunnedah LGA, and
- The Rushes Creek Poultry Production Farm which is approximately 12 km north west of Somerton in the Tamworth LGA.

Aspects where they may be cumulative impacts are traffic and accommodation. These aspects are discussed below. The Tamworth Solar Farm will not contribute to a visual cumulative impact as it is not located in an area that receives any significant public through traffic and consequently, visual impact is largely confined to neighbouring landholders.

5.14.1 Traffic

Cumulative impacts on traffic are only possible for the regional road network (Oxley Highway, New England Highway, Hunter Expressway) as the projects nearby to the Tamworth Solar Farm will not be utilizing Babbinboon Rd or Warminster Rd. Furthermore, cumulative traffic impacts are only possible during construction of the project as vehicle movements during operation are minimal.

The Gunnedah Solar Farm and the Orange Grove Solar Farm are close to Gunnedah and it is anticipated that the construction workforce would predominantly find accommodation in Gunnedah rather than Tamworth. Conversely, the Tamworth Solar Farm is closer to Tamworth and most of the construction workforce would be expected to find accommodation in Tamworth. Consequently, the construction workforces for Gunnedah Solar Farm and the Orange Grove Solar Farm will not travel on the same roads as the construction workforce for the Tamworth Solar Farm.

Heavy vehicles travelling to Tamworth Solar Farm from either Newcastle or Sydney will remain on the New England Highway to Tamworth where they will then head west along the Oxley Highway. Trucks travelling to Gunnedah Solar Farm or Orange Grove Solar Farm will leave the New England Hwy at Willow Tree and use the Kamilaroi Hwy to Gunnedah, so only the southern section of the New England Hwy will be shared if construction of the solar farms occurs at the same time.

The Rushes Creek Poultry Production Farm will use the Oxley Hwy from Tamworth as part of their transport route. They expect to have approximately 23 heavy vehicle movements and 12 light vehicle movements per day. For the Tamworth Solar Farm during construction, traffic numbers are anticipated to be 20 heavy vehicles and 70 light vehicles. This increase in flows over the 12 month

construction period represents an increase on the road network of less than 2% and as such existing drivers will experience a negligible increase in any delays.

5.14.2 Accommodation

At the peak of construction, there will be approximately 200 workers at the Tamworth Solar Farm. Approximately half of these workers will live locally and the rest will need to find accommodation, most likely in Tamworth. Tamworth Regional Council estimates that there are over 900 hotel rooms in Tamworth not including AirBnB, short term rentals etc. Occupancy rates are low at an average of 47%. It is therefore expected that the project will have a positive impact on accommodation businesses in Tamworth without impacting on the availability of accommodation in Tamworth. More information is provided in Section 5.12.4.

6 Summary of mitigation and management measures

A consolidated summary of the mitigation and management measures for the Tamworth Solar Farm is provided below.

Project description

Reference	Mitigation Measure
PD1	The maximum height of the solar panels will be 4.5 m.
PD2	All cabling on the Site will be a minimum of 600 mm below the soil surface and installed in accordance with relevant Australian standards.
PD3	Trenches will be dug such that the topsoil is kept separate from the subsoil and replaced at the top once the cable is laid.
PD4	If practicable, the spoil generated from the substation will be used to form a bund parallel to the southern boundary of the substation. This spoil will be covered with topsoil from the substation area and sown with pasture or other vegetation.
PD5	On decommissioning of the solar farm, all infrastructure will be removed including cables.
PD6	During decommissioning, wherever possible, the components of the solar farm will be reused or recycled.

Biodiversity

Reference	Mitigation Measure
B1	The *Acacia stenophylla* at the junction of Babbinboon and Warminster Roads will be removed with a saw without disturbing the ground cover.
B2	Prior to the clearing of any trees: • A preclearing inspection will be conducted to determine where possible, if there are nests or animals in hollows. If fauna is present, they will be managed by a suitable qualified fauna handler. • A procedure will be established to ensure that any fauna injured during the clearing or construction process are appropriately managed. All staff will be made aware of the local wildlife carer's contact details. • Trees that are not to be cleared will be clearly demarcated (eg exclusion fencing) so that there is no possibility of them being inadvertently cleared.
B3	Any specimens of Athel Pine on the Site will be removed prior to construction commencing.

Aboriginal heritage

Reference	Mitigation Measure
AbH1	A Cultural Heritage Management Plan will be developed in consultation with the Registered Aboriginal Parties. Management of the Aboriginal sites will be in accordance with the Cultural Heritage Management Plan.
AbH2	The culturally modified trees will be avoided and will not be impacted.
AbH3	Any removal of artefact including salvage and relocation of impacted items to a suitable location will be in accordance with the Code of Practice of archaeological Investigation of Aboriginal Objects in NSW.
AbH4	Any conditions that accompany the consent for the removal of Aboriginal objects must be followed.
AbH5	An Aboriginal Site Impact Recording form will be submitted for each site damaged or destroyed.
AbH6	The locations of the cultural heritage sites will be provided to the relevant supervisors responsible for the construction and operation of the solar farm and ancillary infrastructure. They are to be informed cultural heritage sites are protected under the NPW Act and no harm is to come to them. The presence of the cultural heritage sites will be made clear to the workforce as part of an induction.
AbH7	Fencing should be sturdy enough to present noticeable physical resistance to the machinery required to construct the solar farm and include high-visibility elements. During the operation of the solar farm, fencing can be downgraded to temporary, high-visibility fencing. Fencing for CMT1 will not be undertaken as it is on a neighbouring property.
AbH8	Should any of the culturally modified trees fall or deteriorate to the point that they are a safety risk during the operation of the solar farm, further management measures will be formulated with the assistance of the local Aboriginal community and a heritage professional.
AbH9	Any CHMP developed for the management of cultural heritage will include an unexpected finds protocol which includes the obligations of a person who encounters an Aboriginal object. This protocol should form part of the induction for any workforce that is involved in the construction or operation of the solar farm.

Historic heritage

Reference	Mitigation Measure
HH1	An unexpected finds protocol will be developed in the case that any potential relics of historic heritage are encountered during construction or operation. The obligations of a person who encounters an historical object will form part of the Site induction.

Land

Reference	Mitigation Measure
L1	If the schedule and the season permits, the Site will be sown to permanent pasture prior to construction commencing. If the pasture cannot be sown prior to construction, the Site will be sown as soon as possible after construction.
L2	During operation, where practicable, stock will be removed from the Site before the grass is grazed too low and soil exposure is increased.
L3	A weed management plan will be developed as part of the CEMP, OEMP and DEMP. These weed management plans will include: • A section identifying notifiable and problematic environmental and agricultural weeds. • Training of relevant staff in weed identification. • Regular monitoring of weeds and control where necessary. • A protocol to ensure that all earthmoving equipment and other machinery that comes on to Site is clean and free of any weed material.
L4	When the project is decommissioned, all infrastructure and facilities will be removed. Areas where topsoil has been removed such as the substation, BESS and CPUs will be reprofiled and the original topsoil spread back over the disturbed area and sown. During construction of the substation, BESS and CPUs , topsoil will be stored separately from other spoil so that it can be used for rehabilitation as part of decommissioning. The topsoil stockpile will not be more than a metre high and will be sown with cover vegetation.
L5	During the construction, operation and decommissioning of the solar farm, there will be a designated person for neighbouring landholders to contact should any issues arise.
L6	A protocol will be developed whereby neighbouring landholders can notify the project of the desire to move livestock at a certain time and measures will be put in place to limit vehicle movements at that time to the extent that is practicable. As part of project inductions, workers and drivers will be informed of the required response should they encounter stock being moved on the road.
L7	Boundary fences along Warminster Rd and Soldier Settlement Rd will be maintain in a serviceable state to facilitate movement of stock along the road.

Visual

Reference	Mitigation Measure
V1	Vegetation screening will be established as shown in Figure 5. 9. The trees planted will be fast growing species that are drought tolerant, fire resistant and grow to a height of 5 to 10 m. It is preferable that they are a native species
V2	Tree screens will be planted as soon as practicable following the commencement of the project, taking into account the season and availably of suitable seedlings.
V3	Tree screens will be regularly watered and weeds controlled around the trees for at least two years after planting to facilitate maximum growth rate. Any plants that die will be replaced.
V4	The tree screen on the western boundary of the property will be planted such that when the trees are mature, the dripline is generally within the property boundary. The purpose of this condition is to limit the amount of soil water that the vegetation screen is utilizing from the neighbouring property.
V5	The tree canopy will not infringe into the Asset Protection Zone (APZ).
V6	The security fence will be located on the inside of the tree screens.
V7	Visual impacts to surrounding residents will be considered when siting the PCU's and shed/warehouse within the proposed Development Site. They should be located at a suitable distance from residences.
V8	Consideration will be given to the material and colours of the PCU's, the battery, and storage shed to ensure minimal contrast and to help blend into the surrounding landscape. Where practicable, materials will be nonreflective and painted in neutral colours that are sensitive to the surrounding landscape
V9	If practicable, spoil from the construction of the substation and BESS will be placed in a bund near the southern side of the substation to provide some screening.
V10	Any lighting installed will be in accordance with AS4228-1997 - *Control of Obtrusive Effects of Outdoor Lighting.*

Noise

Reference	Mitigation Measure
N1	Only one item of significant noise generating equipment (ie piling rig, backhoe or concrete pump) will operate at any one time within the area defined as the Noise Management Zone (NMZ) in Figure 5. 10.
N2	The project will notify the potentially affected receiver(s) of the work schedule proposed and the likely duration of any noise generating activities.
N3	All significant noise generating construction activities will be limited to standard construction hours. Where low intensity construction activities are required to be undertaken outside standard construction hours, such as cabling, minor assembly, use of hand tools etc, they will be managed such that they are not audible.
N4	The project will adopt the following procedures where practicable to reduce emissions to the surrounding community: • a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community; • where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the Site boundary and/or a residential receiver including areas in constant or regular use (eg unloading and laydown areas); • operating plant in a conservative manner (no over-revving) and be shutdown when not in use; • avoidance of noisy plant/machinery working simultaneously where practicable; • minimise impact noise wherever possible; • utilise a broadband reverse alarm in lieu of the traditional hi frequency type reverse alarm; • provide toolbox meetings, training and education to drivers and contractors visiting the Site during construction so they are aware of the location of noise sensitive receivers and to be cognisant of any noise generating activities; and • signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site.

Transport

Reference	Mitigation Measure
T1	The impacts of dust on the transport route will be mitigated by either using water carts or sealing sections of Babbinboon Rd and Warminster Rd.
T2	The protocol in Figure 5. 15 will be implemented for both undertaking dilapidation surveys and making any necessary repairs to Babbinboon Road and Warminster Road during the construction period.
T3	All construction traffic will use the transport route shown in Figure 5. 11.
T4	The intersection of Oxley Highway and Babbinboon Rd will be upgraded to allow for a left turn deceleration lane.
T5	During construction, a Traffic Control Plan will be prepared for the intersection of Babbinboon Rd and Warminster Rd to advise truck drivers of an appropriate speed limit. A tree is located to the west of this intersection will be removed to allow for improved visibility. This tree will be cut down with a saw rather than being pushed out due to the presence of a Telstra cable in this area.
T6	During construction, a Traffic Control Plan will be provided for the Site access point on Soldier Settlement Rd to highlight the Site access and provide a speed reduction
T7	Along the transport route from the Oxley Highway to the Site entrance, bends and intersections will be sealed.
T8	Residents along the transport route will be notified in writing of the construction works and other relevant activities as required.
T9	The principal contractor will ensure that the document “Safe Construction Activities” (refer to Appendix A of Appendix H) is complied with during construction.
T10	All construction workers and truckdrivers will complete the “Driver’s Code of Conduct” as part of their site induction.
T11	There is a private water pipe in the vicinity of the driveway of landholder R13. This pipe will be identified and protected from any road upgrade works.

Flood

Reference	Mitigation Measure
F1	The layout of solar panels will exclude the floodway as defined in Figure 5. 19.
F2	Where the unnamed waterway and the security fence intersect on the eastern boundary of the Site, the design of the security fence will be such that it allows water to pass freely and does not become clogged with debris.
F3	The Site Emergency Response Plans for construction and operation of the solar farm will include a section on flooding. This plan would provide for training of personnel about flood risks and provide direction about actions to take in case of flash flooding of creeks either within the Site or on access roads to the Site.

Water and soils

Reference	Mitigation Measure
W1	As part of the Construction Environmental Management Plan (CEMP) erosion and sediment control mitigation measures will be identified prior to works commencing. All erosion and sedimentation controls will be designed and undertaken in accordance with the provisions of Managing Urban Stormwater: Soils and Construction series.
W2	If practicable the Site will be sown to permanent pasture prior to the establishment of the solar farm and repaired where necessary after construction. If this is not practicable, the Site will be sown to a permanent pasture as soon as possible after the construction of the solar farm, taking into account the seasonal conditions and appropriate timing for pasture establishment.
W3	Access tracks including drains and sediment traps shall be maintained in good condition, to minimise erosion which could impact on water quality, is minimised. Wherever possible, traffic will remain on constructed internal roads to minimise the level of soil disturbance and compaction. Internal access tracks will be designed to minimise impacts to flow pathways and appropriate drainage will be employed to ensure runoff volumes and velocity are controlled.
W4	In areas where there has been significant disturbance and erosion is likely, the type of measures that will be implemented include: • Stabilisation of the soil with polymers or by seeding, • Establishment of cut-off drains to divert water away from the disturbed area and ensure runoff volumes and velocity are controlled, and • Establishment of control measures such as sediment basins with drains that divert sediment laden water to these sediment control devices.
W5	Waste produced from toilets shall be stored in the holding tanks on the demountable buildings until it is trucked offsite and disposed in accordance with the relevant legislative requirements.
W6	After construction works finish, hazardous materials (fuels, lubricants, construction chemicals, herbicides, etc) will be transported offsite or disposed in accordance with the relevant legislative requirements under the POEO Act and Council requirements.
W7	Onsite refuelling shall occur within designated areas that are located more than 100 m from drainage lines and within an impervious bund.
W8	Daily inspections of contractor's machinery will be undertaken to ensure no oil, fuel or fluids are leaking. Contractors and staff will undertake regular toolbox talks and be notified of the hazards of accidental spills and potential impacts to water quality.
W9	A Spill Response Plan (SRP) will be developed as part of the Emergency Response Plan (ERP). All contractors and staff will be trained regarding appropriate spill response strategies. Should a spill occur, incident management procedures provided in the SRP will be implemented and the EPA will be notified of any incidents

Reference	Mitigation Measure
	that cause harm to the environment, pursuant to sections 147 – 153 of the POEO Act.
W10	The Operations Environmental Management Plan will include the day-to-day procedures and allocation of responsibilities to minimise impact to water quality throughout the operational life of the solar farm.
W11	All activities with the potential for spillages or overflow of fuels or chemicals would not be undertaken within 50 m of the existing farm dam or drainage lines and a suitable spill response and containment kit will be available on Site whenever and wherever this type of higher risk activity is undertaken.
W12	All water for dust suppression would be sourced from either the existing small dam or local water suppliers (trucked onsite). Potable water would not be used for dust suppression at any stage during construction phase.
W13	Panels will not be constructed within 10 m of a 1st order waterway and within 20 m of a second order waterway. A survey will be conducted in order to determine the location of these waterways if existing lidar data is not adequate.

Hazards and risks

Reference	Mitigation Measure
H1	The storage of diesel on Site will comply with *AS1940 The Storage and Handling of flammable and Combustible liquids* and will not be stored with flammable liquids.
H2	Lithium-ion batteries will be transported in accordance with Table 3.2.3 of the ADG code.
H3	The BESS will include a fire detection and suppression system and a temperature control system.
H4	The transport, storage and use of all hazardous goods will comply with requirements stated in the following documents where relevant; • *Australian Code for the Transport of Dangerous Goods by Road & Rail*, Edition 7.5, 2017 • *Storage and Handling of Dangerous Goods – Code of Practice,* NSW Government, 2005 • AS1940-2004: *The storage and Handling of Flammable and Combustible Liquids*
H5	Dust will be controlled on the solar farm Site through the following methods: • Establish a permanent pasture as soon as practicable. • Minimise the level of soil disturbance wherever practical. • In areas of high traffic areas consideration is to be given to installing a hard surface that will emit less dust. • Water carts will be used to control dust.
H6	All electrical equipment will be designed, constructed and implemented according to relevant international and Australian standards and best codes of practice.
H7	The Site boundary will have a security fence to restrict public access to the Site.

Bushfire

Reference	Mitigation Measure
F1	An APZ will be established around the perimeter of all PV panels and accompanying structures. The APZ will be at least 20m wide and will include a mineral earth perimeter Category 1 fire trail (trafficable 4m width with passing bays every 250 metres) maintained in accordance with NSWRFS fire trail standards (NSWRFS 2019). The remainder of the APZ will be grass that is kept at a height of less than 100 mm. Leaf material and other debris including woodchips will be removed. The APZ will be established at the start of the construction and maintained until the solar farm has been completely decommissioned.
F2	An APZ will also be established around the substation. The APZ will be 20 m width from any substation infrastructure.
F3	The following measures will be implemented to mitigate the risk of embers carrying into the solar farm: • The visual screen will be planted using species suitable for the environment that have low fire spotting characteristics (such as smooth bark or evergreen species) and are not high flammability species; • Visual screens, where practicable, will be planted as a continuous windbreak with no breaks of sufficient size to allow winds to funnel through; • Screen plantings will be placed on the outer side of the APZ (away from the asset); and • Routine maintenance will be conducted prior each fire season to reduce dead materials, dead plant growth and leaf litter from within the APZ.
F4	During the bushfires season, pastures within the Development Site (including under panels) will be maintained with minimal fuel load (<100 mm grass height). Overgrazing will be avoided to maintain the groundcover and reduce the potential for erosion.
F5	Where practicable, components that are vulnerable to damage from temperatures associated with flame contact are shielded as far as possible.
F6	Electrical equipment and installation works will be in accordance with all relevant Australian legislation, regulation, standards and codes of practice.
F7	Should construction of the solar farm occur during the fire season (1 December and 31 March), the following measures will be implemented to control the risk of grass fire ignitions: • All plant, vehicles and earth moving machinery are cleaned of any accumulated flammable material (e.g. vegetation); • A suitable fire appliance is present on Site with at least two personnel trained in bushfire fighting; • On days when Very High FDR or worse is forecast for Tamworth, the “fires near me’ app is to be checked hourly for the occurrence of any fires likely to threaten the Site; and • A hot works permitting system is in place; and • All operations involving earth moving equipment, vehicles, slashers and hot works (e.g. grinders, welders) cease while

Reference	Mitigation Measure
	the Grassland Fire Danger Index is or forecast to be 35 or greater, or high winds are forecast.
F8	During operation of the solar farm, all works on the Site involving vehicles and slashers or other works that could start a fire will cease while the GFDI is or forecast to be 35 or greater, or high winds are forecast. This will require establishing an operational procedure for onsite recording of temperature, relative humidity and wind speed, as well as associated training.

F9	An Emergency Response Plan (ERP) will be prepared for the solar farm that provides the following:
	• Addresses foreseeable on-site and off-site fire events;
	• Clearly states work health safety risks and procedures to be followed by fire-fighters, including
	  o personal protective clothing;
	  o minimum level of respiratory protection;
	  o minimum evacuation zone distances;
	  o a safe method of shutting down and isolating the PV system (or noting if this is not possible for safe internal access);
	  o any other risk control measures required to be followed by fire-fighters;
	• Evacuation triggers and protocols; and
	• Suppression response strategies and tactics, including aerial suppression options/management.
	
	Two copies of the ERP should be permanently stored in a prominent 'Emergency Information Cabinet' to be located at the main entrance point to the solar farm, external to any security fence or locked gate, and a copy provided to local emergency responders.

F10	Contact will be made by the site operator with the Local Emergency Management Committee to establish emergency management procedures with relevant authorities for the safety hazards presented by the Site.
F11	A secondary access for emergencies will be provided in the far north east corner of the Development Site onto Warminster Rd.
F12	A dedicated firefighting water supply of at least 20,000 litres fitted with NSWRFS compatible Storz couplings will be provided as a filling points for fire tankers, located on the main access road near the existing farm dwelling.
F13	A bushfire management plan will be prepared that addresses the mitigation measures listed in Section 5.11.4. It should also include: • storage of flammable materials, • training for onsite personnel, • responses to an emergency alert being issued by fire authorities, and • incident management and control arrangements.

Socio-economic

Reference	Mitigation Measure
SE1	Employment will be preferentially sourced from the local area where appropriate skills and expertise exist.
SE2	The local community will be provided with information regarding the timing of the project, the opportunities for employment and the need for services from local businesses.

Waste

Reference	Mitigation Measure
W1	A Waste Management Plan (WMP) for construction will be prepared and implemented in consultation with the Tamworth Regional Council. The WMP will include: • Measures to manage, reuse, recycle and safely dispose of waste generated by the project • Procedures for assessing, classifying and storing waste in association with EPA Waste Classification Guidelines (EPA 2014) • Procedures for storage, transport and disposal of waste • Monitoring, record keeping and tracking including demonstration of lawful disposal of contaminated products wastes or residues generated by the project. • An unexpected finds procedure.
W2	Waste management plans, procedures and mitigation measures will be communicated to all employees and contractors during site induction, prior to commencing works at the Site.
W3	Waste generated by the project will be managed in accordance with the principles of the waste hierarchy.
W4	A WMP will be prepared and implemented as part of the Operational Environmental Management Plan to manage any waste generated during the operational phase.
W5	At the end of its operational life the components of the solar farm will be reused or recycled where-ever possible. Where components cannot be recycled, they will be disposed at an approved waste management facility.

7 Justification

7.1 Overview

The SEARS requires that the EIS provide reasons why the development should be approved having regards to the following points:

- relevant matters for consideration under the *Environmental Planning and Assessment Act 1979,* including the objects of the Act and how the principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development;
- the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses; and
- feasible alternatives to the development (and its key components), including the consequences of not carrying out the development.

The 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 co-ordination of the orderly and economic use and development of land,

(iii) the protection, provision and co-ordination of communication and utility services,

(iv) the provision of land for public purposes,

(v) the provision and co-ordination of community services and facilities, and

(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, and

(vii) ecologically sustainable development, and

(viii) the provision and maintenance of affordable housing, and

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

The principles of ecologically sustainable development (ESD) are defined in Clause 7(4) of Schedule 2 of the *NSW Environmental Planning and Assessment Regulation 2000* (EP&A Regs). They are as follows:

(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,

(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,

(c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

(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.

7.2 Strategic justification

As discussed in Section 1.4.1, over the next 10 to 15 years, at least three of the existing coal-fired power stations in NSW are likely to retire out of the NEM, the first closing in 2023. These retiring sources of supply will need to be replaced with new forms of generation well before each existing generator retires.

Firmed renewables are now the most cost-competitive form of new generation and cost less than the current wholesale electricity price (DPIE, 2019). Solar PV cells are extraordinary technology in that once constructed, they have no emissions, consumes no water or other resources except sunlight and produce no noise. Solar generation and battery energy storage also has the benefit of being one of the quickest forms of new generation to progress from a project concept to energy production.

Feasible alternatives to the development include new fossil fuel generators and wind energy. To replace the existing coal fired generators with new fossil fuel generators will result in higher electricity prices and significantly higher impacts on the environment, particularly in relation to greenhouse gas emissions. Wind energy production shares the cost competitiveness and low emissions attributes of solar PV, but the number of suitable sites for wind is less than that for solar as wind has greater visual, noise and avifauna impacts

The 155 GWh of clean energy produced by the project each year will help Australia meet its targets as part of its commitments under the United Nations Paris Agreement on Climate Change. At a State level, the project will support the long-term objective of NSW achieving net-zero emissions by 2050 under the NSW Climate Change Policy Framework.

7.3 Site suitability

Site selection for renewable energy projects within the NEM is predominantly being driven by the availability of a suitable connecting point. The NEM is becoming increasingly congested in rural areas that are suitable for development.

The Site of the Tamworth Solar Farm is located on an existing transmission line and close to the load of Tamworth. No additional transmission lines are required which reduces the environmental impact. Environmental studies have confirmed the suitability of the proposed site. The main findings are summarized below but are detailed in Section 5 of the EIS.

Biodiversity

The site has been used for cropping and grazing for 100 years. Native vegetation on the site consists of 25 native trees scattered over the 200 Ha site (0.13 trees per hectare). Nineteen of these trees will be removed. Under NSW legislation, these trees constitute a threatened community and as such compensation will be paid for their removal. Under Commonwealth legislation, the trees are not a threatened community as the density of trees is well below the 20 trees per hectare criteria. There are also no threatened fauna species on Site so there is no requirement for referral under the EPBC Act.

Aboriginal cultural heritage

Twenty-three Aboriginal sites were recorded in two Development Sites, the solar farm (22 sites) and the deceleration lane at the intersection of Oxley Highway and Babbinboon Road (one site). Eleven isolated finds (stone artefact), nine open camp sites (more than one stone artefact within 50 metres of another) and three culturally modified trees were recorded (two of which were just outside the Development Site). The deceleration lane Development Site has one open camp site and the rest of the Aboriginal sites were recorded on, or immediately next to the solar farm Development Site.

The culturally modified tree will not be impacted. Half of the artefact sites will be impacted by the project. A Cultural Heritage Management Plan will be developed with the Registered Aboriginal Parties.

Land

The project will not have any impact on the productive capacity of surrounding properties. Once the solar farm has been constructed, the land will be used for grazing sheep which is consistent with the land capability class of the land. Having permanent pasture on the land will decrease the risk of erosion relative to the current land use of mixed dryland cropping and grazing.

By establishing a solar farm while at the same time maintaining a productive grazing enterprise, the land has a dual purpose and greater economic productivity. When the solar farm is decommissioned, the property can return to solely an agricultural enterprise without any impact on the capability of the land. The soil will have benefited from improvements in soil organic matter and structure having been in a pasture phase for that period.

Visual

There are six residences within 2 km that will have a view to the solar farm either from their house or the surrounding yard. The visual impact to these residents will be mitigated through the planting of tree screens around the Site perimeter. A benefit sharing scheme will also be established to mitigate against the change to the visual landscape.

Transport

Transport impacts are confined to construction and decommissioning. Dust and road condition will need to be managed on local roads. Safety issues resulting from increased traffic will be managed through road upgrades and traffic control plans.

Noise

Noise impacts are confined to the construction phase, in particular, a two week period when posts are being installed south of the main access road. This is the only time that predicted noise will marginally exceed the relevant noise management level of 45 dB.

Flood

The site is well above the flood levels of the Peel River. Minor localized flooding of the site does occur after heavy rainfall events. The layout of the panels will exclude the floodway. There will be no change to flood levels downstream of the solar farm.

Bushfire

The site is not in an area mapped as bushfire prone. Mitigation measures such as the inclusion of an asset protection zone around all infrastructure will minimise the risk of bushfire.

7.4 Socio -economic benefits

In addition to providing clean, reliable power to the NEM, the project will provide up to 200 jobs during construction at a time when the economies of rural areas are struggling due to the prolonged drought. Approximately half of these people will be employed in the local area. The remaining half of the employees will need to find food, accommodation and other services in the region which will further benefit the local economy.

The project will also be letting significant contracts for:

- Civil works including road upgrades,
- Trenching and laying of cables,
- Construction of the substation, BESS and PCUs,
- Transport of equipment,
- Driving the posts,
- Supply and assembly of the single access tracking system, and
- Construction of security fencing

During the operation phase the project will employ two permanent staff and will also engage contractor for a range of requirements such as electrical services, vegetation control, fence maintenance and cleaning.

The project will also develop a community benefit sharing program comprising of two components as outlined in Section 4.5. These programs will support the project's immediate neighbours and broader community over the life of the project and beyond.

7.5 Objects of the EP&A Act

The objects of the EP&A Act have been implicit in the development of the project as described in this EIS. They have been considered in all aspects of the project including, selection of technology type, site selection, design, and mitigation and management measures. The project is consistent with the relevant objects of the EP&A Act as described in the sections below.

7.5.1 Proper management, development and conservation of resources

Object: *To encourage 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*.

The resources at the Site include solar radiation, agricultural land, Aboriginal heritage, water and very limited biodiversity value. The project intends to utilize both the radiation and the agricultural land to bring socio-economic benefits to the Tamworth Region and the broader community. Aboriginal heritage values will be managed by working closely with Registered Aboriginal Parties to develop the CHMP.

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7.5.2 The orderly and economic use and development of land

Object: *To encourage the promotion and co-ordination of the orderly and economic use and development of land.*

The development of the Project will see the land move from agricultural production to both agricultural and energy production. The agricultural enterprise will be consistent with the land's capability. There will be no impact to the agricultural productivity of surrounding land.

7.5.3 Communication and utility services

Object: *To encourage the protection, provision and co-ordination of communication and utility services.*

The project will provide a utility service that will be required by the NEM. The project will not adversely impact existing communication and utility services.

7.5.4 Protection of the environment

Object: *To encourage 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.*

One of the main factors influencing the selection of this Site was that it has been used for cropping and grazing over a long period of time. The only remnant native vegetation consists of scattered paddock trees, approximately 1 in every 10 hectares. The loss of 19 of these paddock trees will be offset by payments under the biodiversity offset scheme.

7.5.5 Ecologically sustainable development,

Object: *To encourage ecologically sustainable development.*

How the project meets the principles of ecologically sustainable development are addressed below.

7.5.5.1 The precautionary principle

Specialist consultants have undertaken detailed assessments of the potential impacts of the projects. These studies have not identified any potential for serious or irreversible damage to the environment. Mitigation measures have been developed to manage potential impacts.

7.5.5.2 Inter-generational equity

By developing renewable energy projects, Australia is improving the likelihood of inter-generational equity. Continued use of fossil fuels is resulting in the degradation of the environment for future generations.

With respect to this project Site in particular, the site selection process, design, mitigation measures and offsets that have been described in the EIS will ensure that there will be negligible if any degradation of the environment.

7.5.5.3 Conservation of biological diversity and ecological integrity

Refer to Section 7.5.4.

7.5.5.4 Improved valuation, pricing and incentive mechanisms

The project has committed to mitigation measures and design modifications that will increase the cost of the project in order to minimise ecological impacts. This demonstrates that a value has been placed on environmental assets. An example is the payment of credits for the loss of the paddock trees. This payment is the most cost-effective way to compensate for the loss of the environmental value.

7.6 Public involvement and participation

The community and other stakeholders have been actively consulted during the preparation of the EIS. These engagement activities are described in detail in Section 4

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