

Narrabri South Solar Farm

Environmental Impact Statement

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Prepared for: Canadian Solar (Australia) Pty Ltd



Document Control

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Certification

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

EIS prepared by:	Shane Melotte, Melotte Consulting, BA (Urban and Regional Planning)
Applicant:	Yu Chan, Senior Manager - Canadian Solar (Australia) P/L
Proposed Development:	The Narrabri South Solar Farm proposal includes the construction, operation and decommissioning of a 60 Megawatt(MW) photovoltaic (PV) solar farm.
Land to be developed:	The Narrabri South Solar Farm proposal site would be located on Lot 6 on Deposited Plan 5732, Lots 197 and 198 Deposited Plan 754949. Part of Lot 83 Deposited Plan 754949. Part of Lot 1 Deposited Plan 1159855, Narrabri.
Certification:	I certify that I have prepared the contents of this Environmental Impact Statement in accordance with Schedule 2 of the <i>Environmental Planning and Assessment Regulations 2000</i> . To the best of my knowledge, this assessment contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure, and that information in the EIS is neither false nor misleading.

Name: Shane Melotte, Lead author Signature:

Date: 28/03/2018

Terms and Definitions:

Term	Definition
ACHCRP	Aboriginal Cultural Heritage Assessment Report
ACHCRP	Aboriginal cultural heritage consultation requirements for proponents
AEP	Annual Exceedance Probability
AHIMS	Aboriginal Heritage Information Management System
APZ	Area Protection Zone
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
BAR	Biodiversity Assessment Report
BOS	Biodiversity Offset Strategy
CASA	Civil Aviation Safety Authority
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
Community	This term is interchangeable with ‘stakeholder’. It refers to anyone who is affected by or has an interest in the operation or an associated activity. Local council and regulatory bodies should also be included as part of community.
Contractors and Service Providers	businesses that could contribute to the delivery of the project either directly or indirectly
Council	Narrabri Shire Councillors, management and staff
DMP	Decommissioning Management Plan
DA	Development Application
dB	Decibel
DP&E “The Department”	NSW Government Department of Planning and Environment
DPI	Department of Primary Industries
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Authority
EPBC Act	Environment Protection and Biodiversity Act 1999 (Cth)
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
FBA	Framework for Biodiversity Assessment
GW	Gigawatt
GWh	Gigawatt Hours
Media	Representatives from any media outlet including, radio, newspaper, television and online
MW	Megawatt
MWh	Megawatt Hours
The Narrabri community or “The community”	Any other community member from the wider region that has an interest in what is happening within the Narrabri Shire area.
NSSF	Narrabri South Solar Farm

OEH	Office of Environment and Heritage
Residents Neighbours	Residents and landowners located in close (3km) proximity to the proposed site
RBL	Background Noise Level
Site	The land area that the solar farm site and the land affected by the proposed grid connection powerline and substation to the south of the solar farm site
Solar Farm Site	Only the land that is proposed to accommodate the solar farm and excludes the land affected by the proposed grid connection powerline and substation to the south of the solar farm site
State Government and Federal Government Agencies	Agencies with direct relevance to the project
Large-scale	A scale of power infrastructure associated with generating, storing feeding energy into the grid to supply multiple end users (approx. 100+).
PV	Photovoltaic
RAP	Registered Aboriginal Party
TNSP	Transmission Network Service Provider
SAL	Strategic Agricultural Land
Values	Personal standards that direct our opinions and actions.

1 EXECUTIVE SUMMARY

1.1 PROJECT SNAPSHOT

Table 1: Project Snapshot

ELEMENT	DESCRIPTION
Proposal	60MW Solar Farm (Single axis tracking solar PV)
Proponent	Canadian Solar (Australia) P/L
Location	Old Gunnedah Road, Narrabri, NSW
Coordinates	-30.369963, 149.845494
Title Particulars	Solar Farm Site: Lot 6 on Deposited Plan 5732, Lots 197 and 198 Deposited Plan 754949. Part of Lot 83 Deposited Plan 754949. Part of Lot 1 Deposited Plan 1159855 Grid Connection Easement: Lots 1 and 2 Deposited Plan 1172982, Lot 7302 Deposited Plan 1142165
Site Area	Approx. 190 Hectares (Project Area)
Development Footprint	Approx. 152 Hectares (Solar farm, maintenance buildings, internal roads and parking)
Current Use	Farmland used for crop raising and grazing purposes
Tenure	Freehold
General Site Description	The site located 10 km to the southeast of Narrabri township. This site is generally comprised of flat, cleared farmland but includes some remnant vegetation. The immediately surrounding area is farmland with some farm dwellings.
Grid Access/Voltage	It is proposed to connect the site to the 66kV Essential Energy approximately 520m to the south of the site.

This Environmental Impact Statement (EIS) assesses the environmental issues related to the construction, operation and decommissioning of the Narrabri South Solar Farm (NSSF) being proposed by Canadian Solar (Australia) Pty Ltd. The NSSF involves a proposed 60MW solar photovoltaic (PV) farm on approximately 190Ha of land located 10km to the southeast of the regional township of Narrabri within Narrabri Shire Council.

Canadian Solar consider New South Wales and this region within New South Wales as particularly conducive to large-scale solar projects given its strong solar resource, opportunities to connect to the grid and highly suitable land. Canadian Solar (Australia) P/L has a proven track record of successfully delivering projects within Australia for almost a decade including one project in Normanton that has been commissioned and recent large-scale projects soon to be completed at Longreach and Oakey, QLD.

Melotte Consulting has prepared this EIS on behalf of Canadian Solar (Australia) P/L in accordance Part 4 of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) to support a Development Application (DA) to be lodged with the NSW Department of Planning and Environment (DPE).

1.2 THE PROPOSAL

The proponent, Canadian Solar, has entered into an Option to Purchase Agreement with the landowners of the site which is located approximately 10km southeast of Narrabri, NSW on Old Gunnedah Road. The proposed Narrabri South Solar Farm (NSSF) is intended to comprise a 60MW solar PV system with a footprint of approximately 152 Ha on a site with an area of approximately 190Ha.

The proposed project comprises the following key elements:

- Solar photovoltaic modules (panels) mounted on steel racking which run in north south rows comprising single axis trackers which enable the panels to track the sun throughout the day.
- Internal underground and above ground electrical wiring, power inverters and switching rooms and an electrical substation that supports the management of the generated electricity before being exported into the electricity network.
- Powerlines connecting the project to the electricity transmission network. This will involve a new underground powerline running approximately 520 metres south of the site (crossing Old Gunnedah Road) and substation connecting to the Essential Energy 66kV line which runs east/west to the south of Old Gunnedah Road. The substation may be accommodated within the solar site.
- Operations and maintenance building and associated parking area for staff.
- Construction of a new access point to the site from Old Gunnedah Road and internal all-weather access roads.
- Communications tower
- Landscaping to provide visual screening along part of the southern and western boundaries of the site
- Security fencing and lighting.

The project will include the following temporary elements will be provided during construction:

- Laydown areas.
- Construction site offices and amenities

- Car and bus parking areas for construction workers.



Figure 1: Visualisation of proposed solar farm

The key solar technology used in the project will be Canadian Solar’s propriety solar PV modules (panels) mounted on single axis tracking technology enabling the panels to track the sun east to west throughout the day. A Site Context Plan and Site Plan for the project is shown in annexed at Appendix B for reference. A Proposed Layout Plan is provided at Appendix C.

The project is effectively split into two “solar fields” (north and south fields) to protect existing native vegetation centrally located on the site. The project will comprise approximately 200,000 solar PV modules (panels) and the rows of single axis trackers will have a maximum height of approximately 3m metres above ground level as they track the sun throughout the day.

The substation will comprise containers for switching rooms and other key power connection equipment including large transformers to increase the voltage of the power to match the voltage of the Essential Energy 66kV Powerlines. The final specifications of the substation are still being determined through a grid connection application being progressed with Essential Energy. This process will also determine if the substation is to be located within the site or at the point of connection to the Essential Energy network 520m to the south of the site. Both options have been shown on the plans accompanying this EIS and form part of the proposal however only one will be constructed. The proposed new 520m powerline connecting the project to the Essential Energy network will be located within a proposed 30-metre-wide easement that will be registered on respective land titles (private).

The operations and maintenance (O&M) building will be located on the proposed laydown area which will then act as a carpark once the project is complete. This will be used by a relatively small number of site maintenance team and relatively infrequently by specialists undertaking maintenance works on the solar project which will be operated remotely. The new access point from Old Gunnedah Road will be designed to accommodate two-way entry and egress of heavy vehicles to the site. This project will be capable of producing enough renewable energy electricity to meet the annual demand of approximately 18,000 homes.

1.3 THE SITE

The site was selected using a multi-criteria selection process considering a range of land parcels and infrastructure requirements and constraints. Overall it was found that the advantages of this site, in terms of its proximity to existing power infrastructure and low environmental risks made it a highly suitable site for the proposed project.

The suitability was further verified by detailed site surveys and analysis by relevant specialist consultants including Cultural Heritage, Biodiversity and Flood Impact Assessment consultants.

The solar farm site is effectively “T: shaped and comprised of 5 titles with the following particulars

- Lot 1 Deposited Plan 1159855
- Lot 6 Deposited Plan 5732
- Lot 197 and 198 Deposited Plan 754949
- Part of Lot 83 Deposited Plan 754949

The site is used for agricultural production and largely cleared of vegetation excluding a stand of remnant native vegetation within the centre of the site, scattered paddock trees and trees along some fence lines. Most of the understorey is exotic species. The eastern boundary of the northern section of the site abuts Bullawa Creek and deeply recessed creek running north south. There is an existing access point in the south west corner of the site connecting to an existing internal access track which runs along the site boundary. Within the centrally located remnant vegetation there is an old derelict farm house and an old non-operational wind mill, which is understood to be the original house on site.

The grid connection powerline and easement and substation which extends to the south from the site will affect the following land:

- Old Gunnedah Road
- Lot 7302 Deposited Plan 1142165
- Lots 1 and 2 Deposited plan 1172982.

The powerline is proposed be installed underground, crossing under Old Gunnedah Road and then extending approximately 450m underground through Lots 1 and 2 Deposited plan 1172982 to the point of connection with the Essential Energy network within Lot 2 which could also include a small substation at this point. An internal access road will also be created to allow Essential Energy to access the asset where it is on private land. This land is currently cleared farm land and comprises a farm building in the north-west corner of Lot 1. The siting and undergrounding of the powerline will avoid any impacts on native vegetation.

1.4 THE PROJECT NEED AND BENEFITS

The proposed solar farm will make a valuable contribution to the local economy and the broader strategic directives to increase the renewable energy capacity within New South Wales and Nationally. The project needs, and benefits are summarised as follows:

- The proposal will provide important additional renewable energy capacity contributing to the national Renewable Energy Target (RET) which aims to achieve 33,000 Gigawatt hours of the national electricity supply from renewable energy sources (such as wind, solar and hydro-electric) by 2020. In doing this the project will also support the Australian Governments Nationally Determined Contributions (NDCs) committed to under the global response to climate change set out under the Paris Agreement (to keep global average temperature rise below 2 degrees Celsius and pursue efforts to limit temperature increase even further to 1.5 degrees Celsius).
- The proposal will provide important additional renewable energy capacity contributing to the objectives of the NSW Renewable Energy Action Plan which aims to achieve 20% renewable energy by 2020 and the goal is to:
 - Attract renewable energy investment
 - Building community support
 - Attract and grow renewable energy expertise
- The proposal is considered to be consistent with the New England North West Strategic Regional Land Use Plan which notes “The region is a prime location for the future generation of renewable energy and has been identified as one of the key renewable energy precincts in NSW.”
- The proposal will provide important economic development to the Narrabri Region and the opportunity to diversify skills and the local economy through the following means:
- Employment of local sub-contractors for delivery of key project elements such as civil works
- Employment and training/upskilling of people from the region during the construction period
- Employment of a small number of local people for ongoing operations and maintenance
- Attraction of additional visitors to the area to visit the project

1.5 CAPITAL INVESTMENT

The Narrabri South Solar Farm, Narrabri, will have an estimate capital cost of in of \$82 million.

Analysis undertaken by the proponent indicates that significant direct and indirect benefits to the NSW economy will result from the development of the Narrabri South Solar PV Facility. The construction and operation of the project will provide a means for an injection of investment into the local economy. Over the 6 – 9-month project construction period and approximate 35-year operation period, the Project will create total employment of approximately 565 job-years with total employee compensation totalling about \$35.1 million. These economic impacts reflect direct, indirect and induced economic impacts that will result from project-related construction spending and energy production.

Further, employees at the Narrabri South Solar Farm and related businesses affected by the project will spend their incomes on housing, transportation, medical services and a variety of household goods and services such as food and clothing in the area.

1.6 APPROVALS TRIGGERS

Under Clause 20 of Schedule 1 of State Environmental Planning Policy (State and Regional Development), the NSSF meets the criteria for a State Significant Development, meaning it should be assessed under Part 4 of the Environmental Planning and Assessment Act 1979 (NSW).

The main policy triggers requiring a response were found within the Narrabri Local Environmental Plan 2012 (Narrabri LEP), as the proposed site is zoned as RUI – Primary Production. Sustainable Energy Technologies are not included in the ‘permitted’ or ‘permitted with consent’ lists under the zone and are therefore prohibited in terms of RU1 Zone. However, under the Clause 34(7) of State Environmental Planning Policy (Infrastructure) (ISEPP) 2007, any development for the purpose of a solar energy system may be carried out by any person with consent on any land. Therefore, the NSSF is permissible with consent. Further details of the approvals triggers are addressed under Section 7 of this Statement.

1.7 STAKEHOLDER ENGAGEMENT

This EIS outlines proposed and completed community consultation, as extracted from the annexed Community and Stakeholder Engagement Strategy. Adhering to the principles of the 2004 International Association of Public Participation, the completed community consultation informed and consulted the community through media outlets, mail-outs, town hall meetings and public information stands. The community and stakeholders were involved in collaboration through Council meetings and home visits to nearby residents and a community information stand in the Narrabri Main Street and through phone and email contact. The ongoing consultation process will continually work with the community to keep them informed and to understand any issues or feedback.

Through all of the community and stakeholder consultation completed to date, only one nearby resident was concerned about visual impacts and impacts on local property values. Mitigation measures have been undertaken, including moving the access gate further away from his property and planting vegetation screening between him and the project. Continual consultation will be undertaken to ensure effective, ongoing liaison with the community and stakeholders. It is not considered the project will result in any unreasonable impacts on local property values, it will not be visually dominant in the landscape, be silent in operation and result in limited ongoing activity on site as part of its operation. Additionally, key stakeholders will continue to be engaged during the ongoing preparation, construction and operation process and the associated designs and management plans to support these processes. Detailed Management Plans for the project will be provided to relevant key stakeholders during the drafting phase to ensure the final draft meets their respective requirements.

1.8 KEY ENVIRONMENTAL ISSUES

A detailed assessment of the site constraints and risks undertaken for the project which included inputs from key stakeholders and specialist consultants. The potential environmental impacts are explored in detail in Section 9, with the key anticipated impacts of the proposal found to be:

- Biodiversity
- Aboriginal Heritage
- Land Impacts (Loss of productive land and Flood and Drainage)
- Visual impact
- Noise and vibration
- Traffic Impacts

A range of other lesser environmental risks and issues have also been assessed including:

- Biosecurity Risks (pest, disease and weeds)
- Compatibility with adjoining land use
- Bush Fire
- Electromagnetic Interference
- Socio-economic Impacts
- Soil impacts
- Water Requirements
- Groundwater
- Air Quality

1.9 BIODIVERSITY

A detailed biodiversity assessment of the site was undertaken by specialist AREA Environmental Consultants.

The potential presence of threatened flora and fauna species as candidate species was considered in the assessment of impacts and targeted surveys. Candidate species are listed species that are identified by the OEH in the FBA as ecosystem credit species, which are predicted to occur based on their known presence in the Interim Biogeographic Regionalisation for Australia (IBRA) sub-region, the presence of associated PCTs, and the size and condition of the vegetation patches on the site. Species credit species are those that cannot be reliably predicted from the habitat surrogates and their presence is to be assessed through habitat assessment and targeted surveys. From consideration of the default list of species identified in the BioBanking Credit Calculator (BBCC) and the background review and assessment of likelihood, two flora species and 19 fauna species were identified as candidate species on the Proposal.

No threatened flora or fauna species were recorded from the targeted survey on the site. Several other threatened fauna species not recorded are also considered to have a moderate likelihood of temporarily using habitat in the Proposal.

The assessment noted the site planning and selection process which included in its criteria, among other items, the intent to avoid impacts to remnant vegetation as much as possible, has resulted in selection of a largely cleared site and avoidance of remnant vegetation in the design layout.

Notwithstanding this process, the Project would involve the loss up to 57 native paddock trees. The impacts of the Project are described in the BAR along with measures to further avoid and mitigate potential impacts to biodiversity.

The direct loss of vegetation required for the project and the condition of this vegetation does not exceed the impact threshold identified in the FBA for offsetting, being impacts on PCTs that have a site value score ≥ 17 that are associated with threatened species habitat (all patches of remnant vegetation are avoided and impacts are limited to paddock trees). As such, biodiversity offsets are not required. A Biodiversity Offset Strategy (BOS) therefore has not been included but appropriate protection and management measures for loss of habitat values of 57 paddock trees are provided. These measures may include planting visual buffers with a species mix that include the paddock tree species, and where tree hollows are common, tree hollow salvage and erection in adjacent habitat areas (or nest boxes).

The AREA Report notes the Project would be unlikely to have a significant impact on any threatened species, populations or ecological communities listed under the TSC Act or the EPBC Act. Notwithstanding this the project is being referred under the EPBC Act to confirm it is not considered to be a controlled action.

On this basis, it is considered the project, with its site responsive approach to design, will not have any unreasonable impacts on the existing biodiversity values of the site. Furthermore, the proposed landscape screen along the boundaries of the southern array provide an opportunity to mitigate the loss of native paddock trees resulting from the proposed project.

1.10 ABORIGINAL HERITAGE

An Aboriginal Heritage Assessment of the site was undertaken by specialists, AREA Environmental Consultants, in consultation with the relevant Registered Aboriginal Party (RAP) and review of relevant policies, legislation and existing data sets. This assessment determined there are ten (10) Aboriginal sites on the property, all of which are culturally-modified or 'scarred' trees. Under the current design for the Proposal, one scarred tree would be removed and the other nine would be retained. All other sites have been avoided in the proposed layout.

The report notes that should the consent for the removal of any culturally-modified trees be given, a range of mitigation measures should be followed to protect the cultural heritage modified tree. In addition, a range of mitigation measures are also proposed to ensure the remaining cultural heritage trees on the site are suitably protected during the construction phase.

It was also noted that any CHMP developed for the management of cultural heritage will need to include an unexpected finds protocol that includes the obligations of a person who encounters an Aboriginal site. This protocol would form part of the induction for any workforce that is involved in the construction or operation of the solar farm.

It is considered with appropriate mitigation measures in place, impacts resulting from the project on Aboriginal Heritage will be adequately minimised.

1.11 VISUAL IMPACT

Due to the modest height of the solar arrays (approx. 3m) on a largely flat land that is not positioned on a crest or a hill or elevated position, the potential broader visual impacts of the NSSF will be largely mitigated by the natural landscape including the surrounding topography, existing vegetation, existing buildings. The project is set some 8km from the Mount Kaputar National Park to the north west which is the main dominant and locally valued landscape feature within region Narrabri Region.

A detailed assessment of nearby sensitive receptors was undertaken as part of the detailed impact assessment process. This included, where possible, speaking directly with all dwelling occupants within 2km of the site as part of the consultation and engagement process and leaving project flyers at the property where contact could not be made. Of the four dwellings within this area, one residence was deemed to be of high sensitivity and one of moderate sensitivity, both located on the south side of Old Gunnedah Road approximately 350m and 550m away from the site boundary respectively. Of these two only one resident raised any concerns with regard to the project which related to the visual impact of the project and its potential impact on the valuation of their dwelling. In addition to these receptors, Old Gunnedah Road was also considered to be a sensitive visual interface for the project.

In response to concerned sensitive receptor and the potential sensitivity of the Old Gunnedah Road interface, the project was modified to include a 60m setback from Old Gunnedah Road and landscape screen around the boundaries of the southern solar field. It is considered these measures will adequately mitigate any unreasonable impacts visual impacts of the project. This response was presented to the concerned resident who indicated that they still had concerns about the project and its impact on local land values.

1.12 LAND – LOSS OF PRODUCTIVE LAND

The project is proposed on agricultural land and will limit its ability to be used for any substantial productive purposes. However, it is noted the subject area is not within the Strategic Agricultural Land (SAL) in the new England North West Strategic Land Use Plan and some of the surrounding land has been partially fragmented through subdivisions which has modified the character and nature of the activities in the area. That being said it is proposed to use some animal grazing as part of maintaining the site and the project will not adversely affect any ongoing agricultural activities on any of the neighbouring or surrounding properties.

Furthermore, the PV Facility has been designed with the intent of reverting to agricultural use at the end of its life. Excluding the potential on-site substation, the project only requires very shallow or easily removable excavation for the steel piles and the underground cabling. Furthermore, the gravel from the internal roads will also be readily removable from site at the end of the projects life. On this basis, the barriers to remediating the site back to productive land are considered to be minimal. The footprint of the project has been designed to minimize the overarching size of the project whilst minimizing other environmental impacts such as the removal of existing remnant vegetation. On this basis, the project will not result in the permanent loss of productive land.

1.13 LAND - FLOOD

A preliminary flood risk review by Water & Environment Pty Ltd (Authors of the Narrabri Flood Study). This study looks at flood risk from nearby waterways of the Namoi River and Bullawa Creek and also looked at overland flow issues. The southern boundary of the site will be subject to the 1% AEP event from the Namoi River to a depth of 0.2m – 0.6m and the solar farm site area will be subject to some low-level flooding/overland flows from Bullawa Creek to a depth of 0.2m – 0.4m. The modelling also shows the potential substation at the proposed point of connection will be subject to a flood depth of up to 1.0m in a 1%AEP scenario.

The solar fields are setback beyond the flood extents of the Namoi River and the low-level flood risks (0.2 – 0.4m) from Bullawa Creek can be readily mitigated through the detailed civil and drainage design processes.

Similarly, the Namoi flood risks presented to the proposed new access point from Old Gunnedah Road and the powerline connection and substation can be readily mitigated through detailed civil and drainage design.

1.14 NOISE AND VIBRATION

Specialist acoustic consultants, ttm, were engaged to carry out a construction and operational noise assessment for the project.

ttm predicted noise levels from the various phases of construction at the nearest noise sensitive receiver's (NSR's), using a worst-case scenario of all plant associated with the various stages of construction being used at the same time on the nearest boundary to the respective NSR.

The predictions showed that there may be some minor exceedances of the relevant noise criteria. Any minor exceedances are expected to be short-lived before the work moves away from the nearest boundary, thereby reducing noise levels at the NSR. Good practice construction noise management procedures have been provided to minimise noise impact of the project to the community.

Construction traffic on public roads was assessed and the risk of adverse noise impact to residents living beside the road is considered low. Noise generated from the operation of the solar farm was also been assessed and found to be insignificant.

Overall the noise assessment report concluded that noise associated with the construction and operation of the Narrabri South Solar Farm is negligible.

1.15 TRAFFIC AND ACCESS

The project will have negligible impact on the local traffic conditions during operations. The construction of the project will however generate significant traffic including heavy vehicle traffic to and from the site for a temporary period.

A new access point with appropriate minimum site lines was integrated into the design to allow enable the creation of a safe two-way site access point for heavy vehicles whilst avoiding impacts on existing native vegetation within the road reserve.

A Traffic and Transport Assessment for the project was prepared by specialist consultants, Impact. This assessment concluded the project will not have any unreasonably adverse impacts on local traffic subject to the preparation of a detailed Traffic Management Plan prior to the commencement of the project. This report also provides an indicative layout for the proposed new access point from Old Gunnedah Road. Once the project construction is complete the site will generate only minimal traffic associated with the operations maintenance team members and occasional deliveries of spare parts and equipment. Traffic will be integrated into the Operations and Maintenance Plan to ensure traffic safety standards are met particularly in the rare event that a heavy vehicle needs to access the site.

The Decommissioning Plan should also ensure traffic management measures are put in place for this process and will require the preparation of updated Traffic Management Plan prior to decommissioning the project.

1.16 OTHER ENVIRONMENTAL IMPACTS

The lesser environmental impact risks are summarised in the Table 2.

Table 2: Other Environmental Impacts Summary

Environmental Risk	Impact Summary
Biosecurity Risks (pest, disease and weeds)	The biosecurity risks from construction, operation and decommissioning, primarily weeds and waste risks, will be mitigated through the appropriate inclusion of weed management and other rubbish and contamination management protocols included in the Construction Environmental Management Plan, Operations and Maintenance Plan and Decommissioning Plans to be developed for the project.
Compatibility with adjoining land use	The neighbouring properties to the site are used for low -medium intensity agricultural production. The project will not have any adverse impacts on the continuation of these operations.
Bush Fire	The subject land is largely cleared agricultural land and does not have any specific Bush Fire controls applied to it under the LEP and the site is not mapped as Bushfire Prone Land under the NSW Rural Fire Service Mapping Tool. The nearest bushfire prone land is located to the south of Namoi River and to the norther of Kaputar Rod indicating the broader area is low risk from a bushfire perspective. The proposed development was referred to the local RFS for comment and also discussed with Coffs Harbour RFS Customer Service during the preparation of the detailed EIA. The RFS raised no objections to the project but recommended a suite of mitigation measures which were adopted in full.

Environmental Risk	Impact Summary
	An Emergency Response Plan and Fire Management Plan will be developed for the project in consultation with the RFS and integrated with other site and project management plans as appropriate.
Electromagnetic Interference	The strength of electromagnetic fields produced by photovoltaic systems do not approach levels considered harmful to human health established by the International Commission on Non-Ionizing Radiation Protection. Moreover, the small electromagnetic fields produced by photovoltaic systems rapidly diminish with distance and would be indistinguishable from normal background levels within several metres. The nearest sensitive receiver is approximately 350 metres from the site.
Socio-economic Impacts	The project will contribute to the State and Nations energy transition required to meet the Paris target. The project will provide significant socio-economic benefits to Narrabri during construction and a smaller but valuable contribution in terms of ongoing jobs for operations and maintenance. Current services and subcontractors within the Narrabri township have adequate capacity to support the construction of the project. The site location and layout has been designed to minimise impacts on the amenity and use of neighbouring properties. The project is unlikely to conflict with any other major projects proposed for the region in terms of locality or demand for local resources.
Soil impacts	A Construction Environmental Management Plan and Operations and Maintenance Management Plan will ensure there are no unreasonable soil contamination or erosion impacts resulting from the project. On completion of construction, the site will be remediated, including exposed surfaces, as well as the removal of debris and vegetation to ensure no unreasonable impacts on soil and water.
Water Requirements	The amount of water required for this purpose will vary according to weather conditions during construction, however it is expected to be up to 2 ML in total. This volume is well within the supply capacity of the water bore and will have negligible impact to nearby surface water users. There are 5 water carting services within Narrabri Shire and contact has been made with two services who confirmed these water requirements could be met A static water supply (20,000L) for fire protection will be established on site during construction with appropriate fittings for access by local

Environmental Risk	Impact Summary
	brigade appliances. This facility will remain throughout the duration of the Project. Water supply for fire protection will also be sourced and imported to site similar to that for dust suppression on an as-required basis (expected to be extremely infrequent). It is anticipated that 200 kilolitres (kL) of water would be used during operations each year for cleaning, maintenance, and staff amenities. Water would be trucked in during periods when there is insufficient rainfall to fill onsite water tanks.
Groundwater	The depth to ground water is beyond the depth of any disturbance that will occur as part of the project. Measures set out in the Construction Environmental Management Plan, Operations Management Plan and Decommissioning Management Plan will ensure there are no adverse impacts on ground water through contamination.
Air Quality	Dust mitigation measures and emissions management measures will be established for the Construction Environmental Management Plan, Operations Management Plan and Decommissioning Management Plan. The project will not cause any other emissions to air.
Waste	Responsible waste management during all phases of the project will be critical but particular the construction and decommissioning phases. The CEMP, OMP and DMP will include measures that waste generated from the project is disposed of in a responsible manner that minimises environmental impacts. In addition, Canadian Solar Australia has pledged to a recycling program with Reclaim PV Recycling for old and damaged solar panels. This much-needed initiative commenced in 2015 and is on the forefront of tackling the PV waste management challenge facing the solar industry in the country. Waste water will be managed by licence contractors during construction and decommissioning. Soil testing and disposal permitting will be undertaken for a permanent on-site waste water treatment system for operation or managed by a licensed contractor.

1.17 DECOMISSIONING

At the end of the projects life it will be decommissioned, and the land will revert back to productive land (provided the rural residential fragmentation of the surrounding land does not continue to expand). The project elements, materials and construction method will mean that impacts on the land can be readily reversed. The decommissioning process will be completed under an approved Decommissioning Management Plan.

1.18 CONCLUSION

Using a multi-criteria process, this site was selected as it is proximate to critical infrastructure, highly modified land, and with a limited number of nearby sensitive interfaces. The proposal has been designed to avoid, minimize and then mitigate any environmental impacts, including avoiding significant remnant stands of vegetation on site, minimising impacts on cultural heritage and proposing vegetation screening to reduce any visual impacts. The proposal will have impacts on the amenity of nearby residents for a short period during construction through noise and traffic however these will be managed and mitigated through appropriate management plans and measures to ensure local safety and amenity is adequately protected.

It is considered the project is proposed in a highly suitable location with limited environmental and community/stakeholder impacts and will make a valuable contribution to the goals of the New South Wales Renewable Energy Action Plan and broader transition to renewable energy.

On this basis, the EIS concludes that the Proposal would not significantly affect environmental, cultural, social and economic values of the site, the surrounding area of the broader region. The proposal will make an important contribution to Australia and New South Wales response to climate change in alignment with the commitment to the Paris Agreement by reducing the carbon emissions associated with our stationary energy sources. As such it is concluded the proposed solar farm has a clear need, is justified in terms of impacts and is in the public interest.

2 INTRODUCTION

2.1 PROJECT OVERVIEW

The following Environmental Impact Statement (EIS) has been prepared in accordance with the Request for Secretary's Environmental Assessment Requirements (SEARs). It assesses the issues related to the construction, operation and decommissioning of the proposed Narrabri South Solar Farm.

The proponent, Canadian Solar, has entered into an Option to Purchase Agreement with the landowners of the proposed development site, located approximately 10km southeast of Narrabri, NSW on the north side Old Gunnedah Road. The proposed Narrabri South Solar Farm (NSSF), a large scale solar photovoltaic (PV) project, is intended to comprise a 60MW solar PV system with a footprint of approximately 152Ha on a site with an area of approximately 190Ha. As part of preparing this EIS Canadian Solar has undertaken a range of community and stakeholder engagement activities and the outcomes of these activities are included in this assessment.

Under Clause 20 of Schedule 1 of State Environmental Planning Policy (State and Regional Development), the NSSF was found to be a State Significant Development, meaning it should be assessed under Part 4 of the Environmental Planning and Assessment Act 1979 (NSW). On this basis, this EIS addresses the Secretary's Environmental Assessment Requirements (SEARs), provided by the NSW Department of Planning and Environment (DP&E). A copy of the SEARs is provided at Appendix A for reference. The proponent is seeking approval to operate the Proposal for up to 35 years.

This report provides:

- A detailed description of the site and surrounds;
- A detailed description of the temporary and permanent aspects of the project through to decommissioning at the end of its life;
- A full environmental impact assessment;
- A summary of the other relevant legislative provisions considered; and
- Details of the stakeholder engagement/consultation undertaken for the project.

The subject land, located approximately 10km to the south east of the Narrabri, which is an agricultural town approximately 460km inland due west from Coffs Harbour. A locality plan depicting the site with respect to Narrabri township is provided in Figure 2 below.





Figure 2: Site Locality Plan – 10km South East of Narrabri

2.2 PROJECT OBJECTIVES

The objectives of the project are as follows:

- To construct a large scale solar farm at the site that is site responsive and minimising environmental impacts;
- To contribute to the State and Federal renewable energy goals, targets and policy objectives;
- To support efforts to mitigate the effect of climate change through the transition to renewable energy;
- To work collaboratively with key stakeholders to ensure all relevant requirements are considered in the location, design, construction and operation of the project;
- To maximise local benefits during construction and operation of the project through use of local content and through local partnerships.

2.3 PROJECT HISTORY

The project forms part of Canadian Solar's efforts to deliver large scale solar farms across Australia. Canadian Solar acquired this site from a solar developer who had already completed significant due diligence on the site and secured the option agreements for the land. Canadian Solar acquired a number of sites in the same portfolio and following a detailed internal screening process determined that this was a highly suitable site for progressing a large scale solar project on. As part of the preparation of this Environmental Impact Assessment Canadian Solar has liaised with a number of stakeholders and completed extensive community engagement activities. To date, the project has largely received overwhelming support from key stakeholders and the local community excluding one resident who has concerns regarding visual impacts that are dealt with in detail in this Statement.

2.4 NOT PROGRESSING THE DEVELOPMENT OPTION

If the development is not progressed, then the land would remain as underutilized but active agricultural land. However, the advantages of this site, in terms of its proximity to existing power infrastructure and low environmental risks makes the overall benefits of progressing the project better than maintaining the status quo. In addition, the project would not make its important contribution to decarbonising the stationary energy and supporting efforts to mitigate climate change.

2.5 ALTERNATIVE SITES

Alternative sites were explored through the site selection process as outlined in Section 2.5. This site was selected due to its attributes, which lends itself to being developed as a large scale solar farm. Critically the site is considered to be in a location where it can be both technically and cost effectively connected to the grid, there is excellent solar resource and the site features and context (including limited nearby sensitive receivers) make it highly suitable for a solar farm without impacting on high value agricultural land or the local amenity. Many of the other sites explored within the region had limiting factors around total land area, opportunities to connect to the grid, environmental sensitivities, productive land attributes and risk of impacts on local amenity. Therefore, on balance this was considered to be the most suitable site.

2.6 FORM AND CONTENT OF THIS STATEMENT

The purpose of this report is to provide an Environmental Impact Statement in support of a request for the Secretary's Environmental Assessment Requirements. Table 3 below provides a summary of the Environmental Impact Statement in accordance with the provisions of Schedule 2, Part 3 of the Environmental Planning and Assessment Regulation 2000. A summary of the Environmental Impacts is included in the Executive Summary to this report.

The EIS has been prepared to support the development application lodged with the DP&E for approval under Part 4 of the EP&A Act. The structure and content intended to satisfy the SEARs for the Proposal issued by DP&E as part of the SSD process. The content of the EIS is also consistent with the draft EIS guidelines recently released by DP&E (DP&E 2017a).

Table 3 below confirms that this statement has been prepared in a form consistent with the Regulations. The following sections of this report address the Regulations as follows:

Table 3: EIS Response references for SEARS Requirements

Secretary's Environmental Assessment Requirements	EIS Response Reference
a stand-alone executive summary;	Executive Summary
<i>a full description of the development, including:</i> <i>details of construction, operation and decommissioning;</i> <i>a Site Plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of a separate approvals process);</i> <i>a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development;</i>	Section 2 Section 3 Section 4 Section 5 Appendices B and C
A strategic justification of the development focusing on site selection and the suitability of the proposed site;	
<i>an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including:</i> <i>a description of the existing environment likely to be affected by the development;</i> <i>an assessment of the likely impacts of all stages of the development (which is commensurate with the level of impact), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice;</i> <i>a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below); and</i> <i>a description of the measures that would be implemented to monitor and report on the environmental performance of the development;</i>	Section 4 Section 9
a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; and	Section 9.14
<i>the reasons why the development should be approved having regard to:</i> <i>relevant matters for consideration under the Environmental Planning and Assessment Act 1979, including the objectives of the Act and how the principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development;</i> <i>the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses; and</i> <i>feasible alternatives to the development (and its key components), including the consequences of not carrying out the development.</i>	Section 7 Section 9.6.3 Section 2.5
In addition to the matters set out in Schedule 1 of the <i>Environmental Planning and Assessment Regulation 2000</i> , the development application must be accompanied by: <i>a signed report from a suitably qualified person that includes an accurate estimate of the capital investment value of the development (as defined in Clause 3 of the Environmental Planning and Assessment Regulation 2000), including details of all the assumptions and</i>	Appendix D Land owners consent provided separately

Secretary's Environmental Assessment Requirements	EIS Response Reference
<i>components from which the capital investment value calculation is derived; and</i> <i>the consent in writing of the owner of the land (as required in clause 49(1)(b) of the Environmental Planning and Assessment Regulation 2000).</i>	
The EIS must address the following specific issues:	
Biodiversity – including an assessment of the likely biodiversity impacts of the development, having regard to the <i>NSW Biodiversity Offsets Policy for Major Projects</i> , and in accordance with the <i>Framework for Biodiversity Assessment</i> , unless otherwise agreed by the Department;	Section 9.3
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;	Section 9.4 and 9.5
Land – including an assessment of the impact of the development on agricultural land and flood prone land, a soil survey to consider the potential for erosion to occur, and paying particular attention to the compatibility of the development with the existing land uses on the site and adjacent land (e.g. operating mines, extractive industries, mineral or petroleum resources, exploration activities, aerial spraying, dust generation, and risk of weed and pest infestation) during operation and after decommissioning, with reference to the zoning provisions applying to the land;	Section 9.6
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;	Section 9.7
Noise – including an assessment of the construction noise impacts of the development in accordance with the <i>Interim Construction Noise Guideline</i> (ICNG) and operational noise impacts in accordance with the <i>NSW Industrial Noise Policy</i> (INP), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria;	Section 9.8
Transport – including an assessment of the site access route (including Old Gunnedah Road), site access point and likely transport impacts of the development on the capacity and condition of roads (including on any Crown land), a description of the measures that would be implemented to mitigate any impacts during construction, and a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required);	Section 9.9
Water – including: details of water supply arrangements; and a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with <i>Managing Urban Stormwater: Soils & Construction</i> (Landcom 2004);	Section 9.12

Secretary's Environmental Assessment Requirements	EIS Response Reference
Hazards and Electromagnetic Interference – an assessment of potential hazards and risks associated with bushfires and the proposed grid connection infrastructure against the International Commission on Non- Ionizing Radiation Protection (ICNIRP) <i>Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields</i> ; and	Section 8.10
Socio-Economic – including an assessment of the likely impacts on the local community and a consideration of the construction workforce accommodation.	Section 9.11
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 Narrabri Shire Council. The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.	Section 8 Appendix G Appendix H

2.7 PROJECT PROPONENT

The project is being proposed by Canadian Solar (Australia) Pty Ltd. Canadian Solar is one of the largest and foremost solar power companies globally and brings more than a decade of industry experience. We are a leading cell, modules, and solar power solution provider. As a result of our success, our customers have installed more than 20GW of Canadian Solar modules in over 100 solar markets, and currently are developing over 20.4 GW of utility-scale PV pipeline projects globally.

Canadian Solar (Australia) has one of the most highly qualified and detailed project management teams in Australia, from technical support to extensive mechanical and electrical engineer experience to the construction of solar projects. Operating from our Melbourne based headquarters Canadian Solar (Australia) has a proven track record of delivering large-scale solar projects within Australia and successfully localising content in the delivery of these projects including our ARENA funded projects at Longreach and Oakey in Queensland. Canadian Solar is also committed to uplifting and promoting local industry in order to provide the skills and capacity to partake in the global market. This has been successfully achieved in our projects under construction in Queensland and anticipate it will be possible to replicate these successes in Narrabri.

3 STRATEGIC JUSTIFICATION OF THE DEVELOPMENT

3.1 STRATEGIC BENEFITS

On 10th November 2016 Australia ratified the Paris Agreement, the global response to the threat of climate change which aims to keep a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.

The New South Wales Government Climate Change Policy Framework commits NSW to aspiration objectives of achieving net-zero emissions by 2050 which is generally in alignment with carbon reductions required for New South Wales to play its role in meeting the aim of the Paris Agreement.

Central to meeting these aims and goals is reducing carbon emissions. A key pathway to reducing carbon emissions is transitioning our stationary energy sources to low or zero carbon alternatives such as solar power.

In addition to the above both the Federal Government and the New South Wales State Government have policies aimed at facilitating the delivery of renewable energy projects. These are in the form of the National Renewable Energy Target and the NSW Renewable Energy Action Plan which includes attracting renewable energy investment as its No.1 Goal.

Furthermore, The New England North West Strategic Regional Land Use Plan which notes “The region is a prime location for the future generation of renewable energy and has been identified as one of the key renewable energy precincts in NSW.”

The Narrabri South Solar Farm will clearly make a valuable contribution to these climate and renewable energy aims and strategic policies.

The proposal will not proceed without a grid connection agreement with Essential Energy, the relevant Network Service Provider. This agreement will only be provided once Canadian Solar has demonstrated the project can be connected without any risks to the reliability of the grid. Canadian Solar are in very advanced discussions with Essential Energy who indicated there is capacity to connect this project to the grid. As such the proposal is considered to represent an opportunity to connect renewable energy capacity to the grid without impact on the network reliability in the region.

In addition, the project will bring important economic development diversity to regional New South Wales through the use and local services, contractors and labour in the delivery of this project. Canadian Solar has already proven its ability to provide excellent opportunities to local content contributions in the construction of the critical infrastructure projects. Once complete the project will provide a small but important number of ongoing permanent operation and maintenance jobs again contributing to the local economy.

4 SITE DESCRIPTION AND CONTEXT

4.1 SUBJECT SITE – TITLES AND EASEMENTS

The subject site comprises approximately 190 Ha of land that forms part of an existing farm on Old Gunnedah Road Narrabri. Old Gunnedah Road (which extends southwest from the town centre).

The site comprises two key elements. The solar farm site which is comprised of 5 existing titles which are owned by a single owner. The second element is the area affected by a new easement and potential substation. The title details and are shown below and the existing configuration is shown in Figure 3 below.

Solar Farm Site Titles:	• Lot 1 Deposited Plan 1159855 • Lot 6 Deposited Plan 5732 • Lot 198 Deposited Plan 754949 • Lot 197 Deposited Plan 754949 • Lot 83 Deposited Plan 754949
Grid Connection Powerlines (Gen-Tie) Titles:	• Old Gunnedah Road • Lot 7302 Deposited Plan 1142165 • Lots 1 Deposited plan 1172982 • Lots 2 Deposited plan 1172982



Figure 3: Site Title Configuration

Part of a former local road reserve (Lot 1 DP1159855) runs through part of the site, extending from two points of Old Gunnedah Road and meeting at a right angle in the middle of the site and also extends north south through the northern part of the property. As a result of being a former road reserve this lot contains significant numbers of mature native trees however the understorey has been highly disturbed and impacted by introduced species.

The site is also impacted by two powerlines and their associated easements. These are detailed below and depicted in Figure 4.

1. 132 Kilovolt (kV) Powerline and easement owned by TransGrid which transects the south west corner of the sit.
2. 66 Kilovolt (kV) Powerline and easement owned by Essential Energy, located to the south of the site and south of Old Gunnedah Road running parallel with Old Gunnedah Road. This is the powerline the proposed solar farm is to be connected to via a proposed new line and easement running 520 metres to the south east from the southern boundary of the solar farm site.

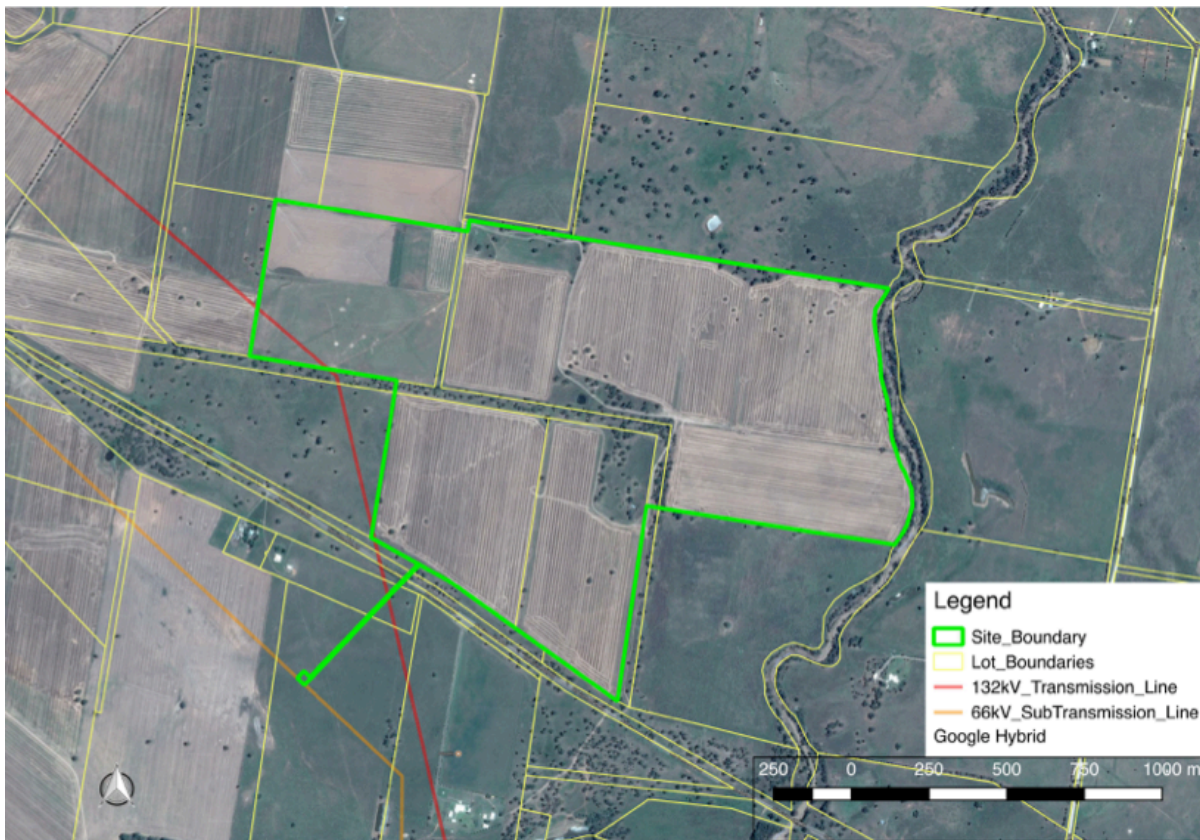


Figure 4: Powerline easements impacting the site

4.2 SITE CONSTRAINTS

The subject land is generally farmed for crop raising and some low intensive grazing. This long term productive use of the site has resulted in significant disturbance and modification from its original condition. The site constraints are shown on the Site Context and Site Plan provided at Appendix B and the Site Plan is also provided below for convenience



Table 4 summarises below the site constraints and this is followed by photos of site in Figure 6.

Table 4: Site Constraints Summary

Constraint	Description
Topography and vegetation	The site can generally be described as flat and cleared farm land. Narrabri Shire Council provided 1m contour lines for the site which show a total fall of approximately 10 metres over a distance of approximately 2000m equating to very gentle slope of approx. 0.5% from the north east to the south west.
Existing Vegetation	There are three stands of remnant native vegetation and several isolated paddock trees (native) located across the site. The stands of remnant vegetation contain a number of mature trees which are largely the result of being located within a former road reserve and around a former dwelling. Native or remnant understorey is limited throughout the site due to long term agricultural activities on the land.
Cultural Heritage	A number of Cultural Heritage sites identified on the land through the Cultural Heritage Assessment undertaken for this EIA. The Cultural Heritage sites are all related to trees on the site and are shown as Cultural Heritage Sites as opposed to trees on the Site Plan where they are one and the same.
Waterways, drainage and flood	The site does not contain any waterways but does some shallow drainage lines that generally follow the fall of the land from the north east to the south west. Furthermore, the site abuts Bullawa Creek to the east and have minor drainage lines that generally run from the north and northeast to the south and southwest consistent with the natural fall of the land. The site is not located within a flood zone under the Narrabri Local Environment Plan however detailed studies have not been completed for this area of the municipality (Details were completed for the Narrabri Township and the LEP was updated accordingly in 2017). On this basis, targeted flood studies were commissioned and revealed that part of the southern edge of the solar farm site and the area of land that will be affected by the grid connection powerline and substation are potentially subject to inundation in a 1%AEP associated with the Namoi and low level inundation/overland flows(up to 0.4m) across the site from the north east and Bullawa Creek are also predicted in the 1%AEP scenario.
Access	Access to the site would be via a new access point from Old Gunnedah Road which is a dual carriageway road with a speed limit of 100km at the site and has a large shoulder with a minimum width of 40m on the north side. There are several opportunities for access to the site from Old Gunnedah Road with selection based on safe access and minimising other environmental impacts such as vegetation removal. Within the site there are a number of existing basic internal dirt/gravel access ways along existing fence lines to enable movement of farm vehicles and equipment.
Easements	As noted ins Section 4.1, the solar farm site is transacted by a TransGrid easement for their 132kV transmission lines. The easement for this transmission line is 60m wide and prohibits the construction of any permanent structures associated with the solar farm within the easement other than access roads and fences. In addition, vehicular access to the easement also needs to be maintained.

Constraint	Description
Buildings and infrastructure	An old abandoned farm dwelling and associated wind mill are located on the southern edge of the remnant vegetation. Whilst this house is not considered to be of significant heritage value it will not be impacted by the proposed project. The solar farm site is also divided by a number of fences and contains several small watering troughs and a small irrigation line along part of the western boundary.



Photo 1: Looking north across site from middle vegetation stand



Photo 2: 132kV Powerline crossing site corner



Photo 3: Remnant vegetation in middle of site



Photo 4: Looking east across site from centre towards Bullawa Creek



Photo 5: Looking east across site from western end of site towards remnant vegetation



Photo 6: Looking north east towards site across Old Gunnedah Road

Figure 6: Site Photos

Figure 7 below shows all of the sensitive receptors (dwellings) within 2km of the site that are considered to have potential views of the site from their property

The views from these receptors have been rated as Low, Moderate or High. Most of the dwellings are comfortably set away from the site or their views to the site are screened or filtered by existing vegetation within the landscape.

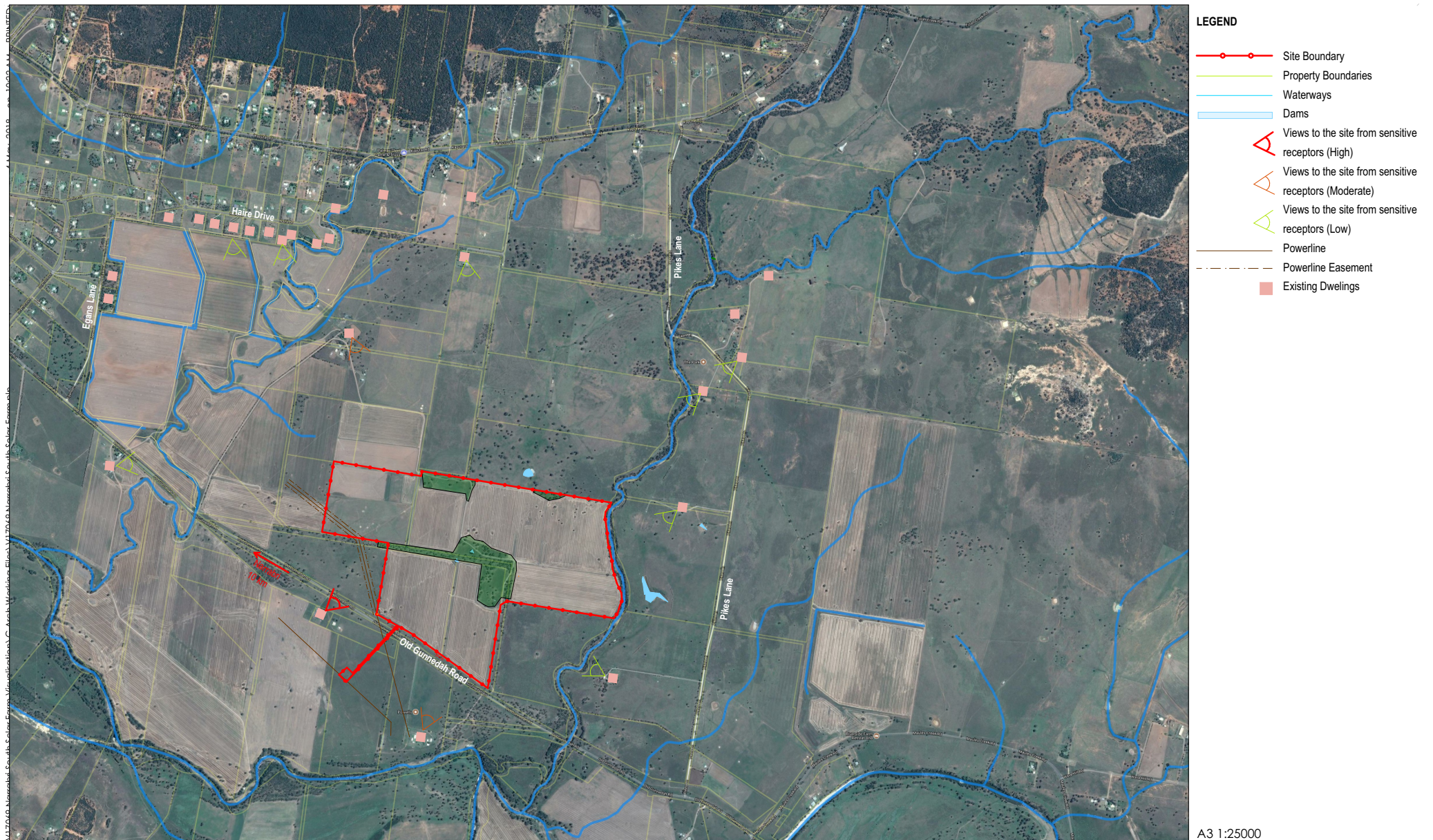


Figure 7: Dwellings within 2km of the site assessed for possible views of the project

Of these sensitive receptors, there are 4 dwellings within 1 km of the site that are likely to have more change of a view of the site excluding the owners dwelling. The locations of these dwellings are shown on the plan provided at Figure 8. Of these receptors, located to the east of Bullawa Creek appropriately 440m and 540m from the nearest boundary of the site respectively, are rated as having low views to the site due to screening from existing vegetation, one is rated as moderate and one is rated as high.

Sensitive receptor 2, rated as moderate is located on the south side of Old Gunnedah Road and is setback approximately 620 metres from the solar farm site boundary and a minimum of approximately 610m from the proposed powerline alignment and substation. Sensitive receptor 1 is rated as high and is located approximately 360 from the solar site boundary and 400 metres from the powerline alignment and substation.

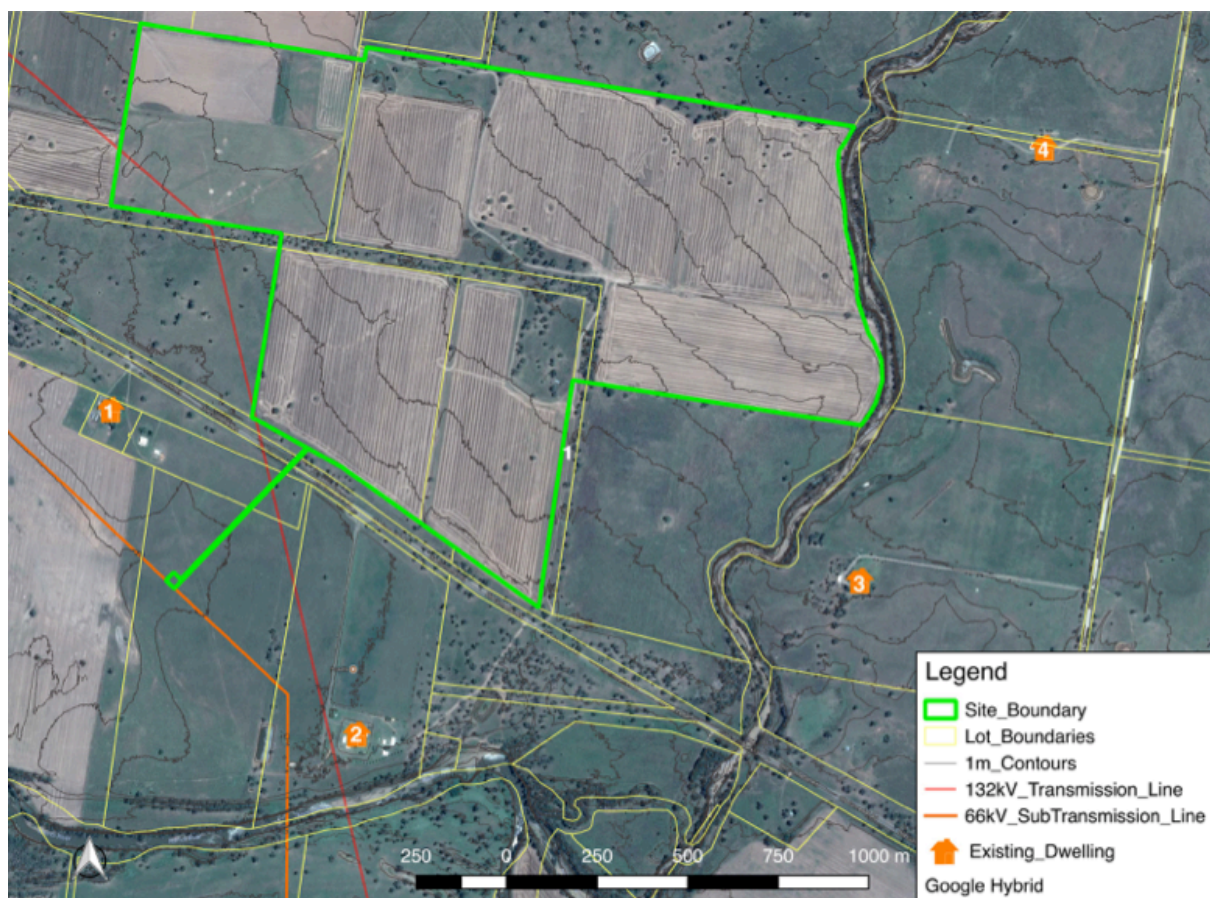


Figure 8: Sensitive receptors (Existing dwellings) plan

4.3 SURROUNDING CONTEXT

The surrounding area is generally characterised by productive farm land excluding a rural residential subdivision located approximately 1.8km to the north west and a large area of remnant native vegetation approximately 1km to the north of the subject site. Heading west from the site towards the Narrabri Township the land becomes increasingly fragmented on the north side of Old Gunnedah road and supports more rural living lots, and there is also a large medium-term accommodation facility that supports the local mining industry on the south side of Old Gunnedah Road as you approach the Narrabri Township.

On the opposite side of Old Gunnedah Road is agricultural land, which is bounded by the Namoi River to the south. South of the Namoi River are smaller rural land holdings and the Kamilaroi Highway. A Site Context Plan is provided at Appendix B for reference and an extract is provided below in Figure 9 for reference.

Approximately 10km to the east and north of the site is Mount Kaputar and the associated National Park. The topography starts to increase in elevation approximately 4.5 km to the north of the site and it is likely the project will be partly visible from these elevated dwellings however views will be filtered, and the project will not be a visually dominant feature.

Approximately 3km to the south west of the site and 8km to the south of the Narrabri Township is the Jacks Creek State Forest.

Approximately 5.75km to the north west of the site is the southern end of the Narrabri Airport. The Narrabri Airport is located on Airport Road (Shire Road 8), on the north side of Kaputar Road when travelling east towards Mt Kaputar National Park from Narrabri. The main sealed landing strip at the airport runs north/south and with the above setbacks the project will not be directly located within direct view of the approach of take-off from the airport.

As shown on the context plan, a 132kV power line (red line) passes along the southeast of the site and intersects part of the site allowing for easy connection to the grid and negating the need for a high impact direct line back to the substation. There is also a 66kV line running generally in parallel to the 132 kV line through the area traversing along the south side of the Old Gunnedah Road.

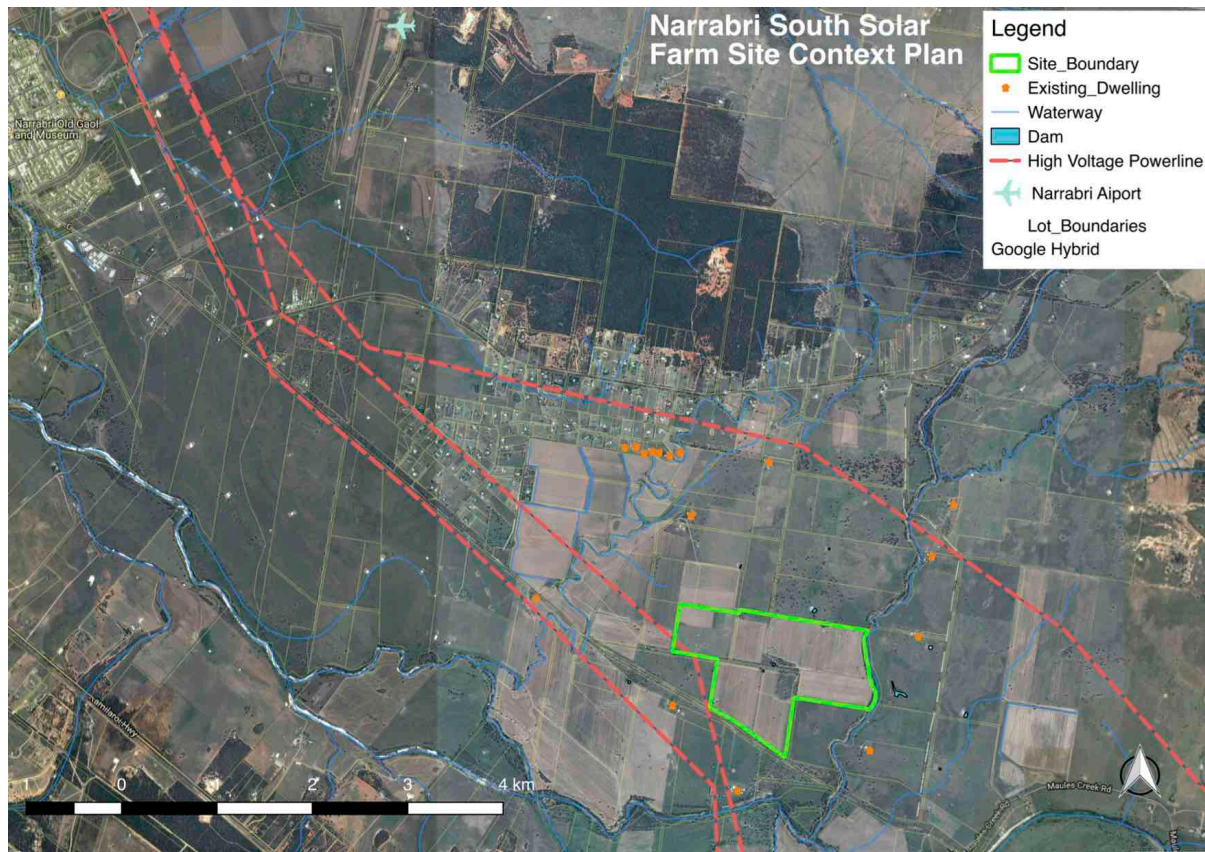


Figure 9: Site Context Plan

4.4 SITE SELECTION

The proposed PV Facility has been designed in a similar manner to other solar facilities, which the proponent has undertaken in the United States of America and Canada. The process to select this location for the proposed PV Facility has involved ongoing discussions with landowners, local and regional community members, developers and engineers, and has been carefully undertaken to ensure the highest design standards and location for the PV Facility, as well as minimal impact to be imposed on the surrounding community.

The subject site was selected following extensive site analysis and due diligence within the region. This includes consideration of but not limited to the following key elements:

- Solar Resource
- Power Network Capacity
- Planning Policy Context
- Topographic, Hydrology and soil
- Productive land impacts
- Environmental Considerations
- Cultural Heritage Considerations
- Neighbouring land uses and context
- Proximity to a regional centre to support delivery
- Land Costs
- Landowner receptivity

Narrabri is located in a position where there is an intersection between a strong electricity network and good solar resource. Further inland can yield better solar resource but has a reduced capacity within the electricity network.

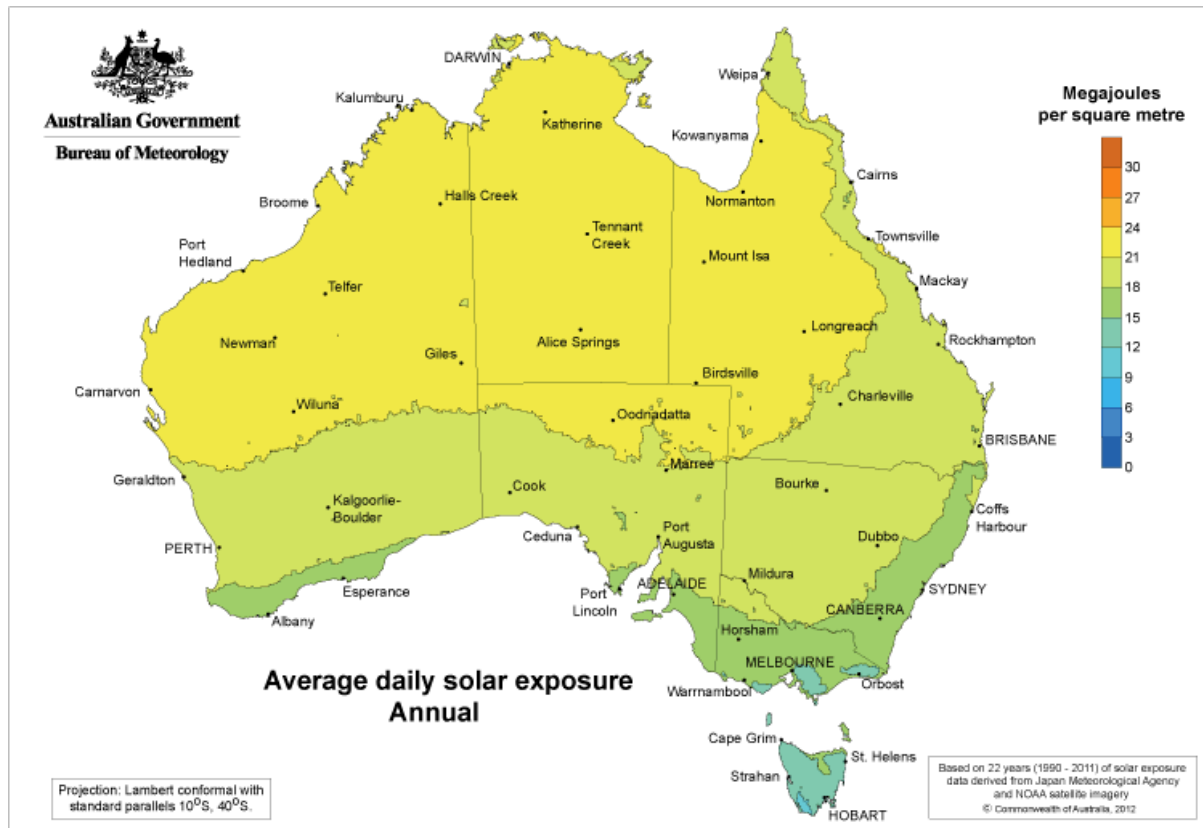


Figure 10: Solar Resource – Average Global Horizontal Irradiance (Source: Bureau of Meteorology)

Critically, it is noted that land zoned for rural purposes is really the only practical land for such a development based on the land area and land values required to make such a project viable. This is the case with all other large-scale solar farms developed in Australia to date and typical of solar farms developed around the world.

Whilst the subject land is productive agricultural land it is within a broader area that has become highly fragmented and as such starting to present to conflict around intensive agricultural production and residential land uses.

It is also noted that the PV Facility has been designed with the intent of reverting to agricultural use at the end of its life. As the lifespan of the PV Facility is approximately 35 years, the site is to be returned to its former state as agriculturally productive land. As such, the project will not result in the permanent loss of the agricultural potential of the land.

The project is not positioned on land that is elevated or prominent within the landscape and in many instances, is screened by surrounding vegetation. In addition, there are only a small number of dwellings that are proximate to the site and only two of these within 1km that will have views of the project. The impact of these receptors has been considered in the design and layout of the project.

Desktop analysis of the site and surrounding area, set out in the Preliminary Environmental Assessment did not indicate that the site was considered to be highly sensitive from a cultural heritage, biodiversity or flood perspective. This was generally confirmed by the site surveys. Where there were sensitivities appropriate responses and mitigation measures have been factored into the project design.

Finally, the project adds important economic development and diversity to the type of economic activities that can occur in a rural area without a long-term net loss of rural land, which is considered to add to the long-term economic resilience of the area.

Accordingly, the proposed development has been designed to minimise the impact on the landscape and surrounding environs as much as possible and practicable, with respect to a range of factors such as: the existing environment; agricultural land designation and activities occurring on-site and off-site; storm water; and visual impact considerations.

5 DEVELOPMENT DESCRIPTION

5.1 OVERVIEW OF PROPOSED DEVELOPMENT

The development proposed involves the construction of a 60MW Photovoltaic (PV) Facility with a footprint of approximately 152 Ha on approximately 190Ha of farmland located 10km to the southeast of the regional township of Narrabri. A Proposed Layout Plan is annexed at Appendix C.

Canadian Solar has secured the land, via an Option to Purchase agreement. The project is expected to operate for approximately 35 years but could continue operating beyond this time frame depending on technology and market conditions at this time.

The PV project intends to generate electrical power by converting solar radiation into electricity via the use of photovoltaic power generation. The project is proposed to comprise solar PV panels mounted on single axis trackers which enable the panels to track the trajectory of the sun from east to west throughout the day. The facility is intended to operate year-round to generate electricity during daylight hours, when electricity demand in New South Wales is at its peak, with the capacity to generate electricity for 17,000 NSW homes.

The site is proposed to be connected to the power network via 66kV line running along the south side of Old Gunnedah Road approximately 520 metres from the site. An option for creation of the relevant easement to enable this connection has been negotiated with the relevant land owner.

The system is to be operated remotely with physical presence on the site limited to maintenance activities and ongoing inspections.

In order to facilitate the development and activity, the land will require rearrangement to title boundaries within the site.

During the construction of the solar farm a range of temporary items are required, including temporary access roads, and laydown areas as shown on the proposed layout plan.

At the completion of the operation of the facility it will decommissioned. It is intended that the PV Facility will have minimal impact when decommissioned, as the development components do not require substantial and deep foundations or excavation that will be difficult to remediate. This will leave the land suitable for other development or a return to agricultural production.

5.2 DETAILED PROJECT DESCRIPTION

5.2.1 Solar Farm Components

The various components of the solar farm are detailed in the following sections. In broad terms the solar farm project will comprises similar components and have similar appearance to many of the solar farms built around the world and more recently within Australia such as the 70MW solar farm built at Moree, NSW.



Figure 11: Moree Solar Farm (Source: www.frv.com)

The PV facility will consist of the following key components:

- 200,000 Solar panels (also known as “modules”);
- Steel piles, module mounts and single axis trackers;
- Electrical transformers;
- 10 containerised inverter rooms;
- An electrical switching station for grid connection located either on site or offsite 520 metres to the south where the connection to the existing 66kV lines is proposed;
- Above ground and underground Electrical wiring;
- Telecommunications equipment (approximate seven metre high pole if required);
- Electrical metering and switchgear housed inside a cabin;
- Informal employee parking area for 10 vehicles;
- Perimeter fencing and access gates;
- Site entry and access gates from Old Gunnedah Road;
- Internal all weather access tracks;
- Underground 66kV extending to the existing 66kV lines 520 metres to the south;
- Native vegetation screen planting;
- Subdivision of the project site and potentially for the electrical switching station; and
- Security lighting.

Solar Arrays

The proposal will involve the deployment of approximately 200,000 of Canadian Solar's tier 1 solar modules (panels), regarded as one of the most reliable and bankable modules in the world.

Canadian Solar's new Dymond Solar PV Panel, also known as the double-glass module, this innovative product uses heat-strengthened glass instead of the traditional polymer backsheet, and it has no metal frame so it requires no grounding. This eliminates the cause of Potential Induced Degradation (PID) and the panel can withstand high humidity, high temperatures, sandstorms, ultraviolet and corrosion. Each panel is approximately 98cm wide, 164cm long and 4cm wide.

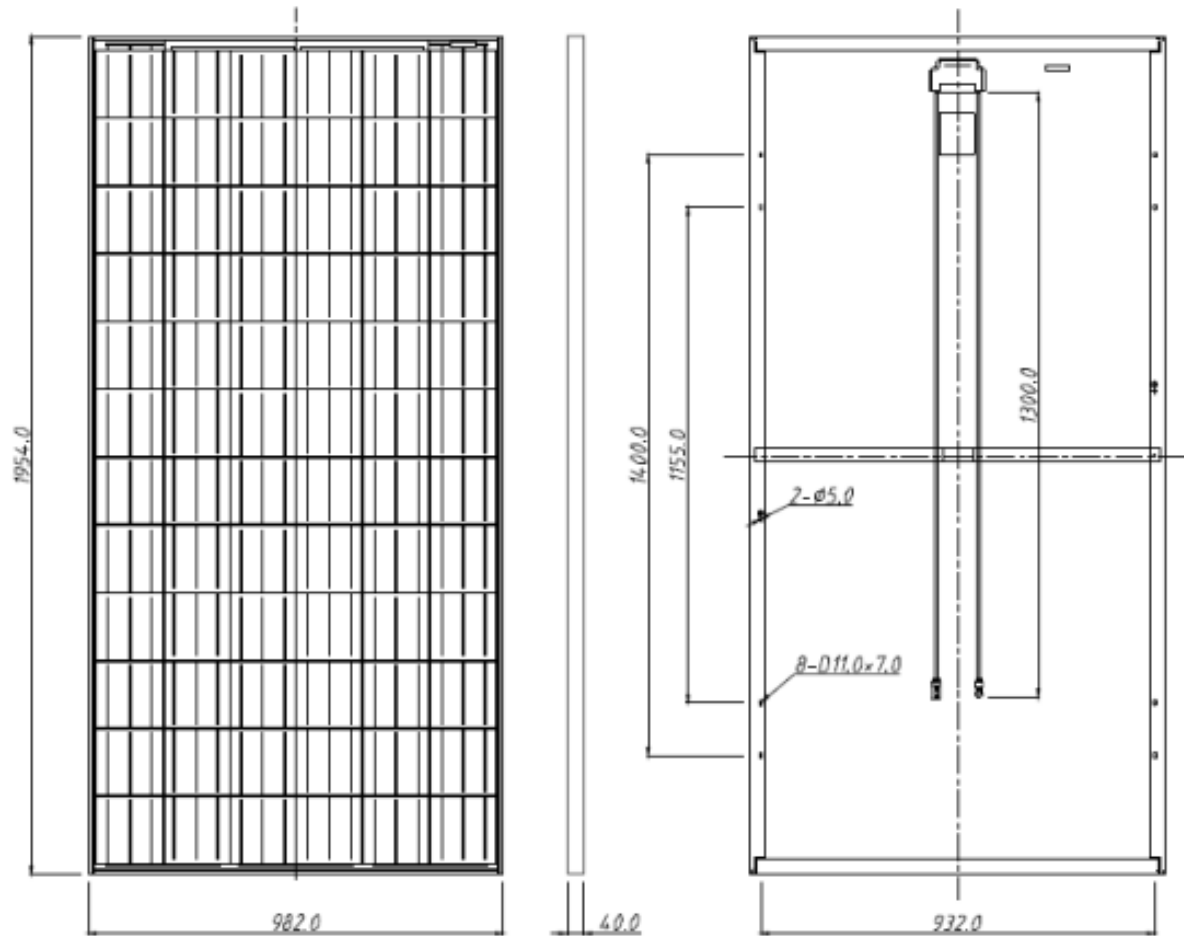


Figure 12: Canadian Solar Module - Typical Dimensions

Canadian Solar has selected single axis tracking technology for the design. Panels are to be arranged in solar arrays, consisting of linear strings of mounted modules motorised framework that enables the arrays to track the sun along 180 degrees along a single horizontal axis. Conceptually, panels are to be positioned 0.4 metres above ground level and mounted in a fixed position on pile structures (1.5 metre long x 1.5 metre high, in strings of 100 metres, with a 5 metre gap between centres). The fixed tilt technology option will have a height of approximately 3 metres above natural ground level.

Each power block is to include a central pad or skid mounted inverter/transformer station that will convert the direct current (DC) energy into grid-compatible alternating current (AC) energy. A diagram of the development layout for the single axis tracking technology option is provided in Figure 13 below for reference.

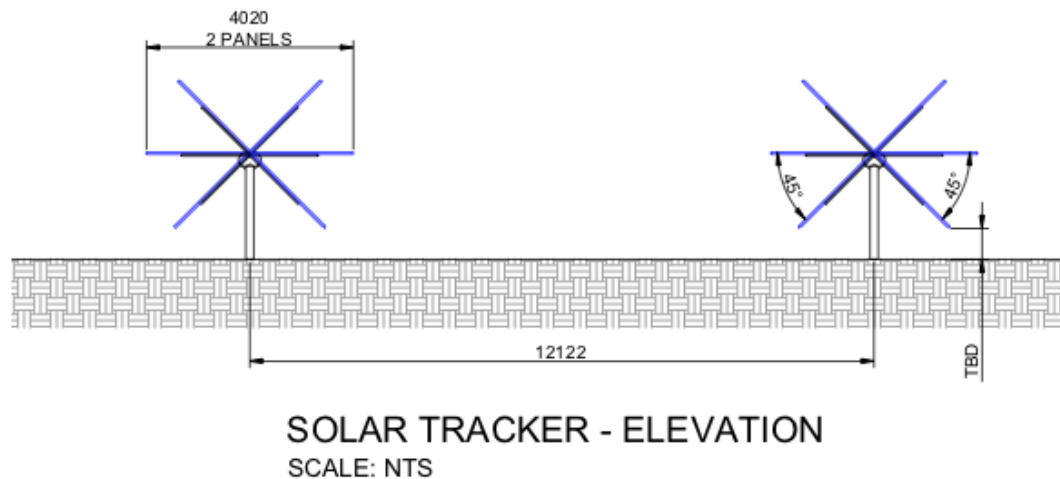


Figure 13: Elevation of Solar Tracker



Figure 14: Example of installed double portrait single axis tracking solar PV installations

The rows of panels are deployed in a norther west alignment to allow the single axis trackers to face the east in the morning and track across to the west in the afternoon. One individual row of panels is called a string which is approximately 90 metres in length. A solar farm is comprised of solar field “blocks” which typically comprise 34 rows of panels and 4 strings within each row.

A standard block ends up being approximately 400 metres wide and 400 metres square. This layout is shown in Figure 15 below.

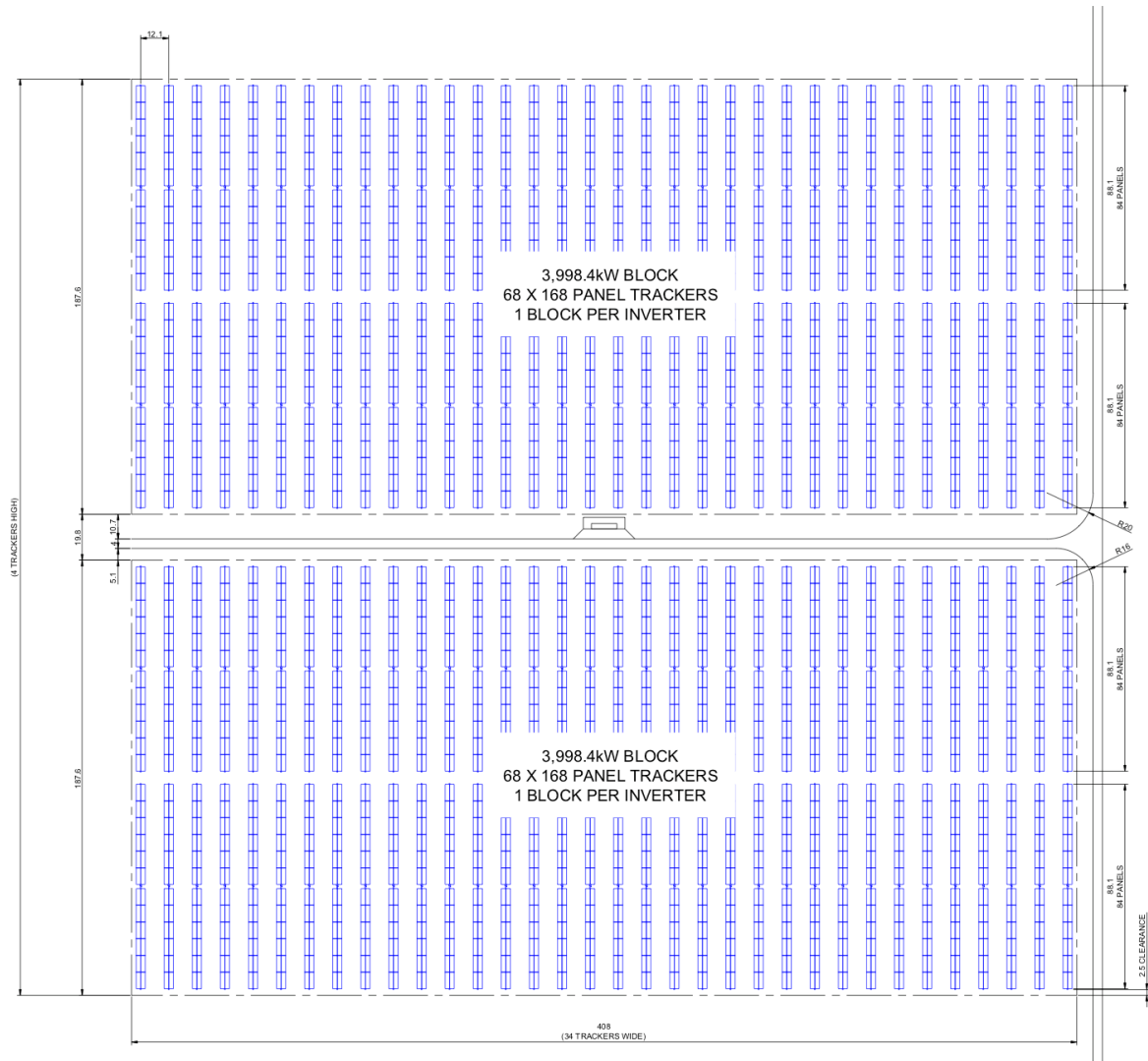


Figure 15: Solar block layout

To create the solar farm, the series of these joined blocks are connected together where the energy from each block is collected via internal cabling and transported to the substation where it is converted to the correct voltage before being exported into the grid. It is noted however that the block length can vary depending on the project and in the case of Narrabri the blocks vary in length to respond to the constraints on the site. Narrabri has two solar arrays comprised of these blocks known as the northern array and the southern array which again is a product of responding to the remnant vegetation which dissects the site. The final layout of the project is shown in Figure 16 below and full-size version is provided at Appendix C for reference.

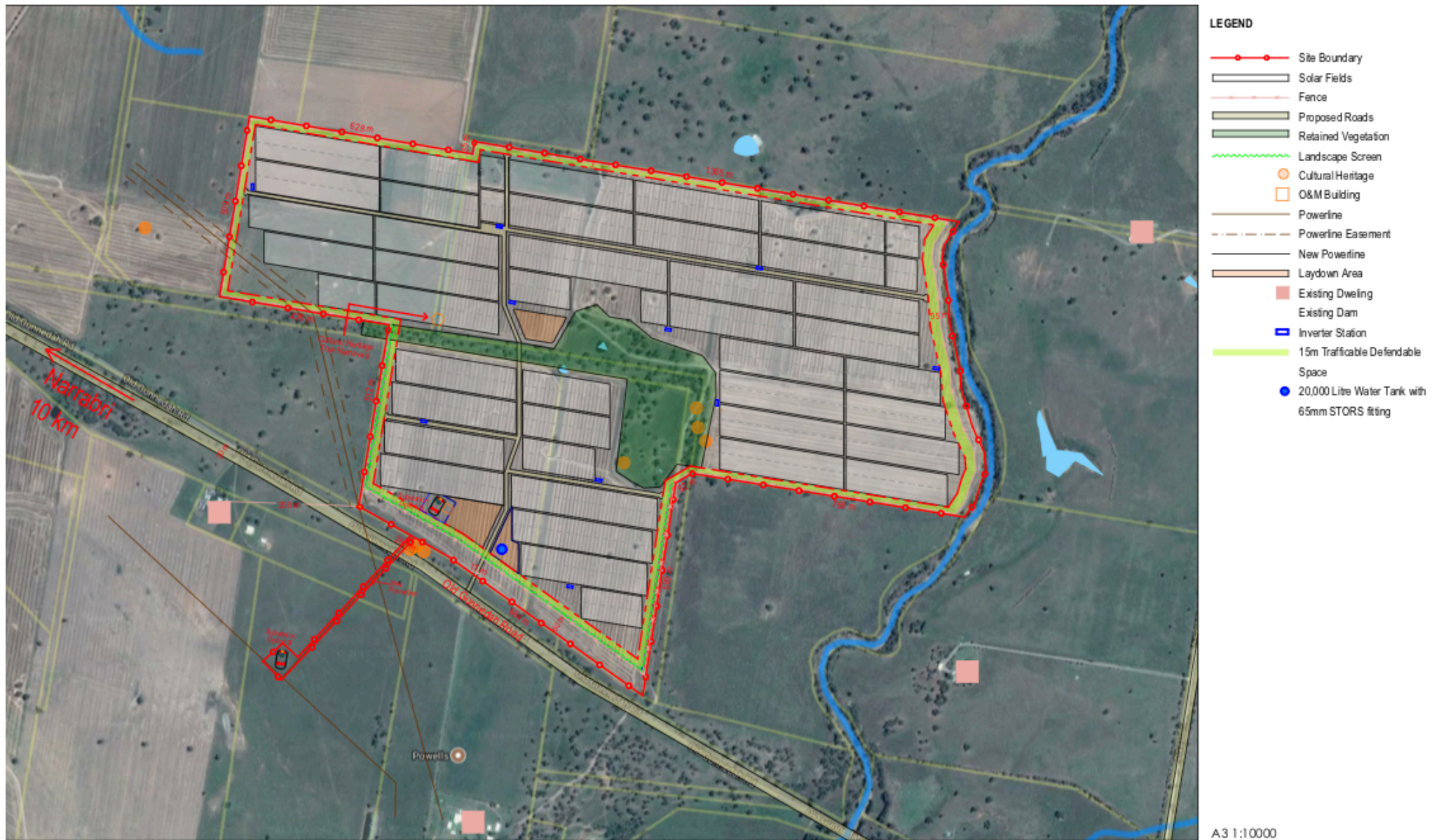


Figure 16: Narrabri Solar Farm Proposed Layout Plan- dissected east west by remnant vegetation

During a heavy storm or extreme weather event the trackers are set to move to a stow position, which is just off parallel from the ground to avoid any risk of the increased wind loading damaging the system.

The trackers will be mounted on approximately 20,000 steel piles which are driven into the ground to a depth of approximately 2 metres.



Figure 17: Steel Piles

The underground cabling will be installed throughout the site and will be laid in trenches that are typically a depth of between 900mm and 1.2m.

The electricity generated will be collected at a securely housed switching and metering room and transferred via a 66 kilovolt line grid connection through what is known as a “T in” or “Cut in” connection.

Switching station and Inverter Rooms

The “T in” or “Cut in” connection will require a substation to be constructed either on site or at the point where the line meets the existing 66kV powerline 520 metres south of the site. Regardless of which solution is selected it is proposed to place the new powerline underground so the only component that will be visible will be the substation which will occupy a total area of approximately 0.5 Ha and have a similar appearance to that depicted in Figure 18 below. An access

road to the substation will also be required and will be constructed along the easement alignment subject to final detailed design and agreement with Essential Energy.



Figure 18: Example of substation

The layout shows approximately 10 power inverter stations that will be positioned throughout the site. The power conversion units are typically housed in a standard shipping container or a unit that is similar in size, materials and colour. The containers typically have the following approximate dimensions of a height of 2.6 metres, length of 6.1 metres and width of 2 metres.



Figure 19: Example of containerised inverter rooms deployed in a solar field

Operations and Maintenance buildings

The operation and maintenance building is proposed to be located adjacent to the substation on site. This building will be a simple rural shed structure which will be used to store equipment and materials for maintaining the site and spare parts for the solar farm. The building will be single storey with a maximum height of 5 metres and footprint of approximately 15 metres by 15 metres.

Site access and access tracks

A new site access is proposed to be constructed to enable the project to proceed. The site access will be designed to allow two-way access for heavy vehicles with a maximum length of 26.0 metres. Additional traffic management measures will be required to enable access for a small number of over dimensioned vehicles that will need to access the site for delivery of the substation during construction.

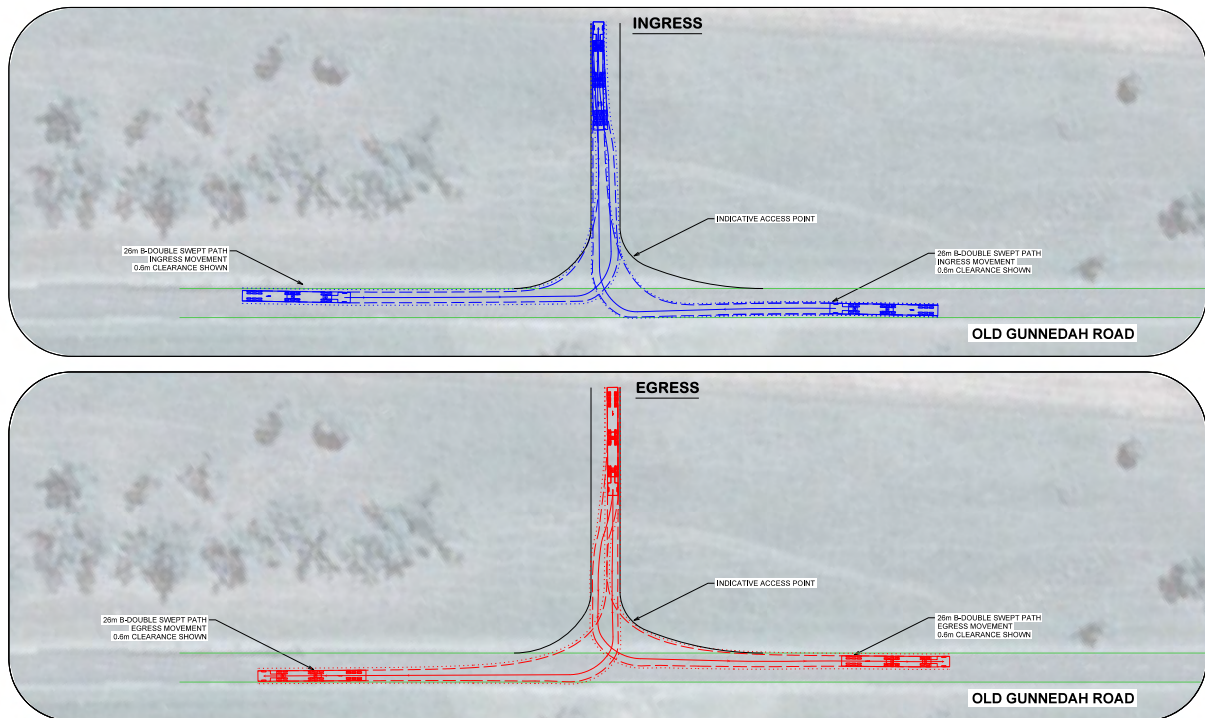


Figure 20: Preliminary design for proposed access point from Old Gunnedah Rd (see Figure 39 below and page 18 of Appendix N)

The internal access track leading from the main entrance will be graded and surfaced with crushed rock and there will be no formalised internal roads provided between panels. The internal access tracks will have a minimum width of 6.0 metres and allow all-weather access throughout the site for emergency vehicles with appropriately dimensioned turning areas to enable vehicles to turn and egress the site in a forward direction. As noted above a minor access track for the substation will also be created along the easement alignment.

Landscaping

A 5.0 metre native vegetation landscape screen is proposed to be located along the eastern, southern and western boundaries of the southern array. The landscape screen will be limited to a height of 2 metres along the eastern and western boundaries to provide screening without creating any shadow impacts on the solar arrays. There will be no need to limit the height of the landscaping along the southern boundary as it will not have any shadowing effects. The species selected for the vegetation screening will be determined using criteria including but not limited to:

- providing the intended screening outcomes;
- avoiding unreasonable shadowing effects along the eastern and western boundaries;
- selecting a local native species suitable for the area to the satisfaction of Council;
- minimising fire risk;
- retention of the planting within the site boundaries;
- minimising maintenance requirements;

The existing soil will be retained and re-seeded to provide grass coverage over the site. Grass will be maintained through periodic slashing or potential grazing opportunities.

Canadian Solar (Australia) Pty Ltd has an extensive solar development portfolio and is one of World's largest solar development providers. The company has successfully delivered solar energy developments to a range of regional communities around the world.

The growing costs for power and growing environmental concern has led to the need to provide clean, reliable, and affordable energy sources in Australia.

The development of this PV facility is intended to result in benefits for the surrounding communities, including new investment, use of local labour and construction services during project construction, ongoing revenue for the landholders demonstrating a diversification option and potential for tourism. The energy output from the solar farm will have potential to service 17,000 New South Wales homes at the conclusion of the development.

5.2.2 Construction Process

Construction of the project is to proceed in the manner outlined below:

1. Site Access, Site Preparation and Interconnection Installation;
2. Photovoltaic Panel System Installation (15 to 21 weeks in duration, beginning mid-way through the site preparation phase);
3. Inverters, Transformers, and Electrical Collector System Installation (12 to 17 weeks, beginning mid-way through the PV System Installation Phase);
4. Grid Connection, Operation and Maintenance building, parking (6 - 8 weeks in duration);

Site Access, Site Preparation and Interconnection Installation

One of the first construction activities will be the new access point from Old Gunnedah Road. The access will be designed to allow two-way access for all vehicle sizes that will need to enter the site. An existing access point in the south eastern corner of the site will also be upgraded to provide an emergency exit point for the site however this will not be used for daily access purposes.

A construction laydown area is to be established near the main site entrance and a second area to the east of the site, and equipment mobilised to the site. The site is then cleared, grubbed, graded, and compacted, with the on-site informal roadway system staked and established. Roads would be treated to create a durable, dust-minimising surface to ensure minimisation of dust emissions, and security fencing would be installed around the site perimeter.

The pad for the interconnection will be installed in the final selected location. If switching station location is determined to be adjacent to the existing 66kV lines to the south of the site this will involve creating a temporary access point and access road into the respective paddock to allow this construction to proceed. In addition, the new underground line from the point of connection back to the site will be installed.

This will involve trenching where there are open cleared paddocks and underground directional boring under Old Gunnedah Road. Once the appropriate foundations are in place the substation will be delivered to the site.

Photovoltaic Panel System Installation

Following the Site Preparation and Interconnection Installation Phase, the PV Panel system will be installed. The structure supporting the PV module arrays consists of steel piles (e.g., cylindrical pipes, H-beams, or similar), which would be driven into the existing soil through pneumatic techniques.

Single Axis tracking technology has been selected for the installation. This includes motorised equipment that allow the panel faces to move from east to west to follow the movement of the sun across the sky. Following the steel pile installation, the associated motors, torque tubes, and drivelines would be placed and secured. For some single-axis tracking systems a galvanized metal racking system, which secures the PV panels to the installed foundations, would be field-assembled and attached according to the manufacturer's guidelines.

The PV Panel System Installation Phase is likely to require the use of equipment such as pickup trucks, water trucks, flatbed trucks, skid steers, pile drivers, forklifts, welders and trenchers.



Installed "H" beam piles



Torque tube connectors for trackers



Row of installed trackers with panel brackets



Panel installation

Figure 21: Construction Process Photos

Inverters, Transformers and Electrical Collector System Installation

Once the PV Panel System has been installed, the underground cables connecting the panel strings will be connected using ordinary trenching techniques. After trenching, cable rated for direct burial or cables installed inside a polyvinyl chloride (PVC) conduit are to be installed in the trench, and the excavated soil would likely be used to fill the trench and be lightly compressed.



Figure 22: Trenches and for underground cabling

The electrical inverters, transformers and electrical storage enclosures are then to be placed on concrete foundation structures or steel skids.

Once all inverters, transformers and electrical collector systems have been installed, commissioning can occur. Commissioning of equipment will include testing, calibration of equipment, and troubleshooting. The inverters, transformers, collector system, storage system, and PV array system would be tested prior to commencement of commercial operations to ensure any potential glitches or system issues are rectified. Upon completion of successful testing, the equipment would be energised.

This phase of the construction process is likely to require skid steers, pile drivers, trenchers, backhoes, cranes, aerial lifts, and concrete trucks.

Grid Connection

Once construction of the main solar field is completed, Canadian Solar will move to construct the grid connection infrastructure, which will involve connecting the 66kV lines that run from northeast to southwest just to the south of the site, intersecting one of the south-western corners of the site. Additional electrical infrastructure, including substations and transformers, will be constructed at ground level either at the point where it connects to the existing 66kV line or within the site.

O & M buildings

The Operations and Management building is the final building to be added to the project. This building will be modest in scale, finished with muted tones and largely used for storage purposes. The building will be built on a concrete slab.

Parking and Access areas

A single access point for the site has been nominated for the project. This access point has excellent visibility from a distance of greater than 500 metres when approached in both directions. The main access point has been proposed in a location where a large single access point can be provided without requiring any tree removal. The proposed internal parking area will be formed by gravel and provide parking for approximately 10 cars, which will be ample for the anticipated staff and visitors to the site. A secondary emergency access point will be constructed making minor improvements to the existing access point in the north west corner of the site.

Site Power

Site Power Diesel generators will be available for power supply through the construction period. Should low voltage power be available in the vicinity, the Project may utilise power from the existing network. Once operational, it is anticipated that the Project will utilise power generated from the solar farm rather than a grid connected service.

Water and Sewerage Supply

Temporary toilets will be available throughout the construction period for use by contractors. These toilets will be pumped out by a local licenced waste contractor. Once operational, it is anticipated that the development will collect water from building roofs and utilise onsite water storage tanks (2 x 35,000L tanks). It is anticipated that 200 kilolitres (kL) of water would be used during operations each year for cleaning, maintenance, and staff amenities.

Water would be trucked in during periods when there is insufficient rainfall to fill onsite water tanks. Sewage generated during operations will be treated by an onsite bio-cycle system, installed to comply with Berrigan Shire Council regulations and Building Code of Australia (BCA) requirements.

Communications

It is anticipated that the development will use both the mobile and fixed line networks for communication purposes. There is an existing Telstra 4G tower located adjacent to the north boundary of the Project site that provides coverage across the entire development area. Where a connection is made to the fixed line network cabling will follow existing access tracks and road reserves to minimise ground disturbance.

5.2.3 Subdivision and Easements

The proposal will require subdivision and changes to the existing land arrangements to enable its transfer of ownership for the project to proceed.

Specifically, this will require:

- Consolidation of part of an old road reserve known as Lot 1 DP 1159855 (where the road was not constructed) into the adjoining allotments and the division of Lot 83 DP 654949 into two parts, the eastern part being consolidated into the northern proposed new Lot 2 of the Solar Farm site and the remaining creating a new residual lot.
- The remaining areas of the road reserve, Lot 1 DP 1159855, would remain as is or this opportunity could be used to consolidate it into adjoining lots.
- The two southern lots, lot 197 and 198 Deposited Plan 754949 are proposed to be configured into a single lot for the southern array of the solar farm.

The project will also require the creation of an easement for the proposed new powerline that will extend 520 metres to the south of the site to where the existing 66kV lines and potentially a new 0.5-hectare lot for the substation. Figure 23 below shows the existing title configuration on site with respect to the site boundary and Figure 24 shows the proposed title configuration.



Figure 23: Existing title arrangements within the site boundary

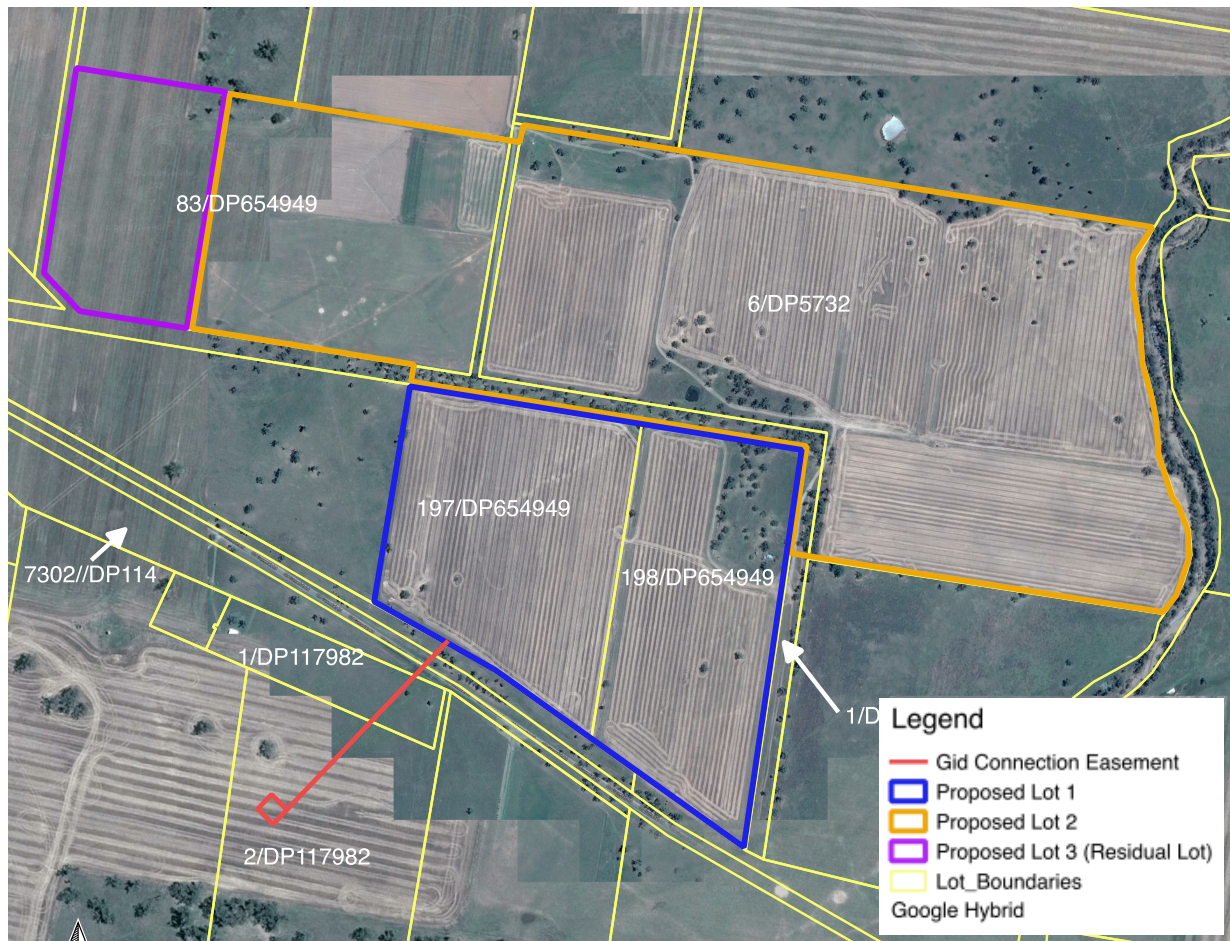


Figure 24: Proposed changes to title arrangements & new easement alignment

5.2.4 Operation

Upon the commissioning of equipment, the PV Facility will begin the Operations Phase.

The solar modules at the site are to operate during daylight hours, seven days per week, 365 days per year, for a period of approximately 35 years. No permanent employees are to be stationed on-site throughout the duration of project operations; however, a total of 10 people will be employed off-site for maintenance, inspection, and emergency situations.

Operational activities at the Project site are generally limited to:

- Solar module washing;
- Vegetation, weed, and pest management;
- Equipment maintenance and inspection;
- Responding to automated electronic alerts based on monitored data, including actual versus expected tolerances for system output and other key performance metrics;
- Security detail; and
- Communicating with customers, transmission system operators, and other entities involved in facility operations.

Solar Module Washing

The solar modules are to be periodically washed to remove any excess dirt, dust or other matter (i.e. bird droppings), which may prevent sunlight from effectively reaching the solar cells and subsequently reducing the electricity production output. The solar panels are anticipated to be cleaned via means of water spray from a water truck driven through the informal roadways constructed on-site. No chemicals will be added to the water so as to ensure minimal impact to the surrounding environment through runoff. As noted above it is anticipated this will consume approximately 200kL of water per annum

Vegetation, Weed and Pest Management

Weed and vegetation control will be conducted throughout the project site for the duration of project operations. Weed control is likely to consist of any or all of the following methods: biological (sheep grazing), mechanical or manual, or chemical methods. Site conditions are to be evaluated prior to the selection of the management method to ensure the method employed is the most appropriate to the environmental conditions of the subject site.

The frequency and method of weed and vegetation control will be determined by the project operator based on fuel load, weed type and location, environmental conditions and availability of equipment or resource.

Should a pesticide application be required concurrently or within two months prior to sheep grazing, the sheep operator shall be consulted to confirm that herbicide type and application timing will not have a detrimental impact on sheep. All pesticide label restrictions related to livestock grazing shall be adhered to in order to protect the health of grazing animals.

Security Detail

PV Facility security will be managed through a range of different measures employed on-site. Site access arrangements will be regulated for staff through identification requirements. Access to the PV Facility is to be restricted to the one ingress/egress point, with the perimeter of the facility appropriately fenced with chain mesh fence and potentially 3-strand barbed wire. In addition, the lighting employed on site will act as a deterrent to possible nefarious activity. It is noted this lighting is not permanently on but reacts to sophisticated sensors when there is unauthorised entry into the site. The lighting is designed not to react to birds and animals etc. entering the site.

5.2.5 Decommissioning

Canadian Solar is committed to ensuring their project sites are fully rehabilitated at the “end of life” in a sustainable fashion. A detailed Decommissioning Plan for site rehabilitation will be developed to ensure that decommissioning at the end the projects useful life during considered in the detailed design phase of the project and to ensure that the majority of materials used on site can be directed to recycling streams. This decommissioning plan also includes a comprehensive review of how equipment will be dismantled and removed from site.

Canadian Solar has supply arrangements in place with all of the equipment manufacturers used on their projects to ensure warranty support as well as provide end of life services to ensure the equipment can be safely disposed of in a sustainable manner.

Dismantling, packing, transport and recycling will be contracted for all system parts and components and will be defined during a decommissioning contractor bidding process. All works will be supervised and performed by skilled workers. The Decommissioning Plan will include but not be limited to the following key elements:

- The piles (foundations) for the solar technology will be pulled out or where breakage occurs either be screwed or hammered directly into the ground to a depth of greater than 1m
- The trenches for the underground cabling will have a depth of no more than 600mm enabling their easy removal with appropriate equipment.
- The gravel from the internal roads can be scraped from site and deployed elsewhere after treatment.
- Security fencing can be easily removed with shallow foundations.
- Other electrical elements may require shallow cement foundations which again can easily be removed from site adverse lasting impacts on the soil.
- Compaction of the soil can be rectified through mechanical ripping.
- Any operations buildings can be demolished and removed from site like any other regular demolition process.
- Cleaning of the solar PV panels (occurring 1 – 4 times per year) will be done using chemical free methods and therefore leaving no adverse impacts on the soil (or water and air).
- Significant elements of the project including the steel and solar PV panels can be readily recycled through existing reclamation channels.

Once dismantled, the components of the PV plant will be separated and temporarily stored on site. The key components that the form the solar plant would be the solar modules, panels, cables, electronics (inverters, junction boxes, transformers, isolators and switches, monitoring electronics etc.), steel posts, metals (aluminium, steel), switch rooms and general building construction demolition waste. As the quantities of the different wastes are relatively high, they can be easily collected separately at a reasonable cost for transport to specialised recyclers or landfill sites.

Relatively small quantities of hazardous materials would be used during project construction and operation. Materials of concern that would be used during construction and operation include gasoline, diesel fuel, transformer cooling oil and sulfur hexafluoride. Special care will be taken with these materials and the decommissioning and removal of these items will conform to all regulatory codes and standards as well as manufacturers recommendations.

PV Module Recycling Partnership in Australia

As a leader of product quality in the solar industry and taking environmental issues very seriously, Canadian Solar Australia has pledged to a recycling program with Reclaim PV Recycling for old and damaged solar panels. This much-needed initiative commenced in 2015 and is on the forefront of tackling the PV waste management challenge facing the solar industry in the country.

The partnership is expected to start an efficient recycling system which will greatly decrease the overall environmental footprint of solar modules and build awareness for sustainable waste management. Crystalline solar panels are manufactured using few components; predominantly aluminium, glass and silicon – and over 90% of a panel's weight can be recycled.

A recently published global report predicts the total annual recycled product value of crystalline silicon solar panels will hit USD \$12 billion in 2035. Canadian Solar 2016 Sustainability Plan that outlines our global sustainability commitments and initiatives has been included with this response. Canadian Solar (and their nominated decommissioning contractor) will be responsible for the logistics of collecting and recycling the PV modules and to minimize the potential for modules to be discarded.

6 CAPITAL INVESTMENT

Under *State Environmental Planning Policy (State and Regional Development) 2011*, electricity generating works including renewable energy proposals such as solar farms with a capital cost of more than \$30 million (or \$10 million in an environmentally sensitive area) are considered as State Significant Development under Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW).

The Narrabri South Solar Farm, Narrabri, will have an estimate capital cost of in of \$82 million. An independent Capital Investment Valuation(CIV) for the project is provided at Appendix D for reference.

Analysis undertaken by the proponent indicates that significant direct and indirect benefits to the NSW economy will result from the development of the Narrabri South Solar PV Facility. A significant local benefit will be the addition of energy supply. In addition, the construction and operation of the project will provide a means for an injection of investment into the local economy.

The economic benefits were estimated by Canadian Solar, who have completed numerous operational facilities of similar or equivalent size in multiple locations globally. All amounts are estimates and subject to refinement based on final project details.

Over the 6-9-month project construction period and approximate 35-year operation period, the Project will create total employment of approximately 565 job-years with total employee compensation totalling about \$35.1 million. These economic impacts reflect direct, indirect and induced economic impacts that will result from project-related construction spending and energy production.

Direct Economic Impacts

The direct economic impacts arising from the project will consist of the following:

- During the 6-9 month construction period, the proponent will spend approximately \$16 million on project construction labour, materials and related services and support 75 full-time equivalent ('FTE') job-years on site.
- Employment is expected to peak at approximately 112 workers on-site directly involved in the project's construction.
- These 75 FTEs will include construction managers, electricians, engineers and other skilled labour. Recurrent Energy estimates that these workers will earn a total of approximately \$10.5 million in wages and benefits.
- Over 35 years, the ongoing operation of the proposed project will employ approximately 5.1 FTEs each year or 178 jobs-years earning a total of approximately \$12.3 million (including benefits).

Induced Economic Impacts

Aside from the direct economic output and employment at the project site, local construction and operating expenditures for the project will indirectly stimulate an estimated total of \$29.1 million dollars of economic output for supply businesses in the area and support 195 job-years over the 6 -9 month construction period and an approximately 35-year operations period.

Examples of these “indirect” impacts include local sales of construction equipment, construction materials, fuel, security services and other goods and services that support the construction and operations of the PV Facility.

Further, employees at the Narrabri South Solar Farm and related businesses affected by the project will spend their incomes on housing, transportation, medical services and a variety of household goods and services such as food and clothing in the area. These employee expenditures are expected to induce additional economic activity which will support more jobs in retail, health care, etc., and those induced workers will also spend money in the economy, thereby creating “induced multiplier effect.” In total, induced economic activity is expected to generate approximately \$14.4 million of economic output and support an estimated 178 job-years in the local area during construction and operation of the project.

7 PERMISSIBILITY AND STRATEGIC PLANNING

7.1 NSW LEGISLATION

7.1.1 Environmental Planning and Assessment Act 1979

Development in NSW is subject to the requirements of the Environmental Planning and Assessment (EP&A Act) 1979 and its associated regulations.

Environmental planning instruments prepared pursuant to the Act set the framework for approvals under the Act. The Narrabri South Solar Farm proposal would be assessed under Part 4 of the EP&A Act.

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

Clause 20 of Schedule 1 of State Environmental Planning Policy (State and Regional Development) 2011 states that the following is considered a 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.'

State Significant Developments are major projects, which require approval from the Minister for Planning and Environment. While the Minister for Planning and Environment is the consent authority for State Significant Development, the Minister may delegate the consent authority function to the Planning Assessment Commission (PAC), the Secretary or to any other public authority.

An Environment Impact Statement (EIS) is prepared in accordance with the requirements of the SEARs set out by the Minister for Planning and Environment.

Response:

The proposed Narrabri South Solar Farm has a capital investment cost estimate of more than \$82 million, therefore, the proposal is classified as "State Significant Development" under Part 4 of the EP&A Act and will be considered under this process.

7.1.3 State Environmental Planning Policy (Infrastructure) 2007

Clause 34(7) of State Environmental Planning Policy (Infrastructure) (ISEPP) 2007 provides that development for the purpose of a solar energy system may be carried out by any person with consent on any land (except land in a prescribed residential zone). A solar energy system includes a PV electricity generating system.

Response:

The proposal is therefore permissible with consent.

In addition, Clause 104 of the ISEPP requires certain developments (identified in Column 1 of the Table in Schedule 3 and known as traffic generating development) to be referred to Roads and Maritime Services (RMS). The consent authority would then be required to take into account any submission made by Roads and Maritime in relation to the development.

Power generation is not included in column 1 in the table. Section 104 of the ISEPP applies to other development where there are 200 or more motor vehicles. Since the Proposal would result in the generation of fewer than 200 vehicles per day during construction or operation, the requirements under clause 104 of the SEPP do not apply. Section 9.9 of the EIS assesses the impact of the Proposal on traffic and transport.

7.1.4 State Significant Development status

Clause 20 of Schedule 1 of State Environmental Planning Policy (State and Regional Development) 2011 defines SSD as including:

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.

Response:

The Proposal has an estimated capital investment cost greater than \$30 million and is therefore considered SSD under Part 4 of the EP&A Act.

The application and Scoping Report for the Project proposal was submitted to DP&E. SEARs for the assessment were issued by DP&E and a summary of the SEARs and corresponding sections in the EIS are provided in Table 3.

7.1.5 State Environmental Planning Policy (Rural Lands) 2008

The aims of this SEPP include:

- to identify Rural Planning Principles and the Rural Subdivision Principles 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
- to implement measures designed to reduce land use conflicts
- 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.

7.1.5.1 Subdivision

Details of the proposed easement for the on-site substation are provided in section 5.2.3. The proposed subdivision is considered to be consistent with the rural planning principles given the following

- The site is within an area that already been subject to fragmentation and is contiguous with a large highly productive area
- The subdivision will consolidate existing lots creating less fragmentation of rural land
- The development will provide for economic diversity and the development of a sustainable energy source that contributes to actions to mitigate climate change
- The site has the ability to return to a productive use at the end of the life of the project.

Response:

This proposed development will facilitate the establishment of a SSD that is consistent with the principles of strategy endorsed by of the DP&E. The subdivision and PV Plant are also not likely to adversely affect other land uses on land adjoining the site or in the vicinity of the site. Noise, visual and other potential impacts on neighbouring properties are assessed in section 9. The property is sited within a rural (RU1 Primary Production) zone under the Narrabri LEP and is located a considerable distance from the nearest rural residential or urban zones.

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

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) encourages the conservation and management of natural vegetation that provides habitat for Koalas. Koalas are listed under the Biodiversity Conservation Act 2016 (BC Act) as a vulnerable species.

The Narrabri LGA is subject to this SEPP and cannot approve development in an area affected by the policy without an investigation of core koala habitat. SEPP 44 aims to identify areas of potential and core Koala Habitat. These are described as follows:

- Potential Koala Habitat: areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component; and
- Core Koala Habitat: an area of land with a resident population of Koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.

Response:

This Biodiversity Assessment at Appendix E and its summary in Section 9.3 address SEPP 44.

The report concludes on page 29 the following “Loss of habitat associated with removal of 57 paddock trees. There are five secondary koala food tree species including two also listed as SEPP 44 trees known from on the proposal site. The actual loss of habitat is minor on a local and regional scale based on the size and availability of similar habitats.

Given the proposed increased traffic associated with the facility this would increase the risk of vehicle strike with Koalas if they are indeed present. The proposal will not impact on an important movement corridor or affect the movements of the species.”

On this basis, it is considered the proposal is considered to be consistent with objectives of SEPP44.

7.1.6 Roads Act 1993

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

Response:

Approval from the roads authority (RMS and/or Narrabri Shire Council) would be required under section 138 of the Roads Act to erect a structure or carry out a work in, on or over a public road. The Engineering Department of Narrabri Shire Council and RMS have been consulted regarding the proposed temporary and permanent road works and raised no preliminary objections in relation to the project. The traffic impacts of the project are discussed in further detail in Section 9.9 of this report.

7.1.7 Native Vegetation Act 2003

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

It should be noted that 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.

Response:

The potential to impact native vegetation is discussed in detail in Section 9.3 of this report.

7.1.8 Threatened Species Conservation Act 1996 (Replaced by Biodiversity Cons. Act 2016)

The Threatened Species Conservation Act 1995 (TSC Act) provided for the conservation of threatened species, populations and ecological communities of animals and plants. The TSC Act sets out a number of specific objects relating to the conservation of biological diversity and the promotion of ecologically sustainable development. The EIS submission was made prior the repeal of this Act and therefore still considered under the provision of this Act.

Under Section 79B(2A) of the EP&A Act, concurrence under Section 79B including concurrence under the TSC Act would not be required for a State Significant Development.

Response:

The potential to impact threatened species, populations and ecological communities listed under this Act is discussed in Section 9.3 of this report.

7.1.9 National Parks and Wildlife Act 1974

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

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

Response:

The potential impact to Aboriginal heritage and native fauna and flora are discussed in Section 9.4 and 8.3 of this report.

7.1.10 Biosecurity Act 2015

The *Biosecurity Act 2015* repealed the *Noxious Weeds Act 1993* and provides a framework for the prevention, elimination and minimisation of biosecurity risks. The Act and supporting Biosecurity Regulation 2017 provide for the establishment and functions of Local Control Authorities for weeds (LGA or County Councils) and weed control obligations on public and private land.

Response:

The EIS provides for the control of noxious weeds occurring at the Proposal Site as part of the proposed works (refer section 9.6.2).

7.1.11 Heritage Act 1977

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

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

Response:

The proposal would not impact directly or indirectly on any items of heritage significance (refer to Sections 9.3 and 9.4).

7.1.12 Crown Lands Act 1989

The objectives of this Act are to ensure that Crown land is managed for the benefit of the people of New South Wales and in particular to provide for:

- (a) a proper assessment of Crown land,*
- (b) the management of Crown land having regard to the principles of Crown land management contained in this Act,*
- (c) the proper development and conservation of Crown land having regard to those principles,*
- (d) the regulation of the conditions under which Crown land is permitted to be occupied, used, sold, leased, licensed or otherwise dealt with,*
- (e) the reservation or dedication of Crown land for public purposes and the management and use of the reserved or dedicated land, and*
- (f) the collection, recording and dissemination of information in relation to Crown land.*

For the purposes of this Act, the principles of Crown land management are:

- (a) that environmental protection principles be observed in relation to the management and administration of Crown land,*
- (b) that the natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible,*
- (c) that public use and enjoyment of appropriate Crown land be encouraged,*
- (d) that, where appropriate, multiple use of Crown land be encouraged,*
- (e) that, where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity, and*
- (f) that Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles.*

Under Part 3 of the Act, the Minister for Lands must be satisfied that the land has been assessed prior to any allocation action, i.e. reservation, dedication, sale, lease, license or permit. The purpose of a land assessment is to ensure decisions made in relation to Crown land are in accordance with the principles of Crown land management by (amongst other matters) including an assessment of the capabilities of Crown land and the identification of suitable land uses.

Response:

Connection of the solar farm to the power network will require an easement across Old Gunnedah Road to access the 66kV line to the south. This could either be an overhead or underground power line and will be negotiated with Council and Essential Energy.

7.1.13 Heritage Act 1977

This Act aims to conserve heritage values. The Heritage Act defines 'environmental heritage' as *those places, buildings, works, relics, moveable objects, and precincts, of State or local heritage significance*. A property is a heritage item if it is listed in the heritage schedule of the local Council's Local Environmental Plan or listed on the State Heritage Register, a register of places and items of particular importance to the people of NSW. Under Section 89J of the EP&A Act, an approval under Part 4 or a permit under Section 139 of the *Heritage Act 1977* would not be required for a State Significant Development. The proposal is unlikely to directly or indirectly affect any items of heritage significance (refer sections 9.3 and 9.4).

7.1.14 Aboriginal Land Rights Act 1983

The Aboriginal Land Rights Act 1983 provides a mechanism for compensating Aboriginal people of NSW for loss of their land. The role of the Department of Aboriginal Affairs is to administer the Act on behalf of the Minister for Aboriginal Affairs.

Response:

As above, the proposed works are not located on Crown land. However, if Canadian Solar proposes to have any impact on Crown land, an Aboriginal Lands Claims search should be undertaken.

7.1.15 Contaminated Land Management Act 1997

Section 60 of the Contaminated Land Management Act 1997 ('CLM Act') imposes a duty on landowners to notify OEH, and potentially investigate and remediate land if contamination is above levels set by the Environmental Protection Authority ('EPA').

Response:

The CLM Act also contains provisions relating to the regulation of 'significantly contaminated land' by the EPA. The potential for contamination at the site is discussed in Section 9.1. A search of the EPA contaminated land record revealed there was no record of contamination on the site. Furthermore, no evidence of contamination such as buried rubbish was encountered during the preliminary geotechnical investigations completed for the site and there was no anecdotal evidence uncovered through discussions with the land holders or Narrabri Shire Council.

7.1.16 Mining Act 1992

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

A database search conducted in March 2018 of the Resource and Energy Title Services portal revealed the following applications or licences, assessment lease applications or leases, or mining or production applications or leases for the site or locality in the DP&E (Resources and Energy) Minview database or Common Ground Viewer, including for coal, minerals, petroleum and gas. This revealed the land is affected by the following exploration licences. Full details of these licences are attached at appendix F for reference.

Table 5: Summary of Resources Exploration Licences Affecting the Land

Licence Type	Title	Applicant
Coal Exploration Licence.	AUTH 216	Secretary of the Department of Planning and Environment
Petroleum Exploration Licence	PEL 238	Santos New South Wales P/L

Response:

The Department of Planning and Environment (Resources & Energy) were contacted in relation to the project. A response was not received prior to submitting this assessment however it is not expected to represent and concern for the project.

The project is outside of the current Santos key focus area and outside of the project area defined by Santos in the Environmental Impact Assessment for this project (The Narrabri Gas Project, SSD 6456) currently being considered by DPE. The Narrabri Solar Farm site is approximately 6.0km from the nearest edge of the proposed Narrabri Gas Project Area.

Representatives from Santos have been consulted in relation to the project and have not raised any objections to the project and an ongoing dialogue is being maintained with the Santos stakeholder engagement team operating out of their Narrabri Office.

7.1.17 Protection of the Environment Operations Act 1997

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

- *Section 148 of this Act requires notification of pollution incidents*
- *Section 120 of this Act provides that it is an offence to pollute waters*
- *Schedule 1 of the POEO Act describes activities for which an Environment Protection Licence is required. Under section 48 of the POEO Act, premises-based scheduled activities (as defined in Schedule 1 of the POEO Act) require an Environment Protection Licence (EPL). Clause 17 of Schedule 1 of the POEO Act concerns electricity generation works, however does not include solar power. The proposal would not be a scheduled activity under the Act and an EPL is not required. The proposal would be managed to ensure pollution risks are minimised during the construction and operation phases. Measures have been incorporated into the EIS to ensure risks to soils, waterways and air quality are avoided or minimised. The Environment Protection Authority would be notified if a 'pollution incident' occurs that causes or threatens 'material harm' to the environment. Legal requirements for the management of waste are also established under the POEO Act and the Protection of the Environment Operations (Waste) Regulation 2005. Unlawful transportation and deposition of waste is an offence under Section 143 of the POEO Act. Waste minimisation and management is addressed in section 9.12 of the EIS.*

Response:

No licences are considered to be required under this Act for the project. In the highly unlikely event that a pollution event occurs the appropriate notification measures will be undertaken immediately. The CEMP and OMP will contain measures to mitigate the risk of a pollution and waste occurring during construction, operation and decommissioning of the project. This will include engaging a contractor to collect the significant waste from the transport packaging used on the solar PV panels.

Furthermore, as a leader of product quality in the solar industry and taking environmental issues very seriously, Canadian Solar Australia has pledged to a recycling program with Reclaim PV Recycling for old and damaged solar panels. This much-needed initiative commenced in 2015 and is on the forefront of tackling the PV waste management challenge facing the solar industry in the country.

The partnership is expected to start an efficient recycling system which will greatly decrease the overall environmental footprint of solar modules and build awareness for sustainable waste management. Crystalline solar panels are manufactured using few components; predominantly aluminium, glass and silicon – and over 90% of a panel's weight can be recycled. A recently published global report predicts the total annual recycled product value of crystalline silicon solar panels will hit USD \$12 billion in 2035. Canadian Solar 2016 Sustainability Plan that outlines our global sustainability commitments and initiatives has been included with this response.

7.1.18 Conveyancing Act 1919

Section 88B Conveyancing Act 1919 (commencing 16 June 1964) provides for the creation of easements, profits à prendre, restrictions on the use of land and positive covenants by the registration of an instrument attached to the plan.

Response:

It is proposed to create an easement for the powerline connecting the project to the grid. This will be done as part of lot reconfiguration and subdivision proposed under Section 7.2.3 of this Statement below.

7.1.19 Draft Large-Scale Solar Energy Guideline – For State Significant Dev- Nov 2017

The NSW Government supports the sustainable development of a solar industry and is establishing a greater consistency and transparency in regulation and assessment of solar developments.

The aim of the Draft Large-Scale Solar Energy Guideline is to provide the community, industry, and regulators with guidance on the planning framework for the assessment and approval of large-scale solar energy development proposals under the Environmental Planning and Assessment Act 1979 (EP&A Act).

The Guideline outlines the key assessment issues for State significant solar energy projects, such as land use conflict, biodiversity and visual impacts. It also seeks to encourage genuine and early consultation with the community and stakeholders, consistent with best practice engagement principles.

The draft was put out for public comment in early 2018, and submissions were received. These are now under consideration by the NSW Government.

Response:

Site selection and design for this project was commenced prior to the release of the draft guidelines, however the project is consistent with the key principles which highlight the importance of site selection and community engagement, and the state government strategic considerations. The Guidelines then explain the EIS process and assessment, including the matters that have been assessed in this report.

7.1.20 Draft New England North West Regional Plan (Draft)

The NSW Department of Planning and Environment are seeking feedback on the Draft New England North West Regional Plan, which outlines a sustainable 20-year vision that takes advantage of the region's diverse climates, landscapes, and resources to create great places to live and work.

The draft plan has five goals for the region including:

1. *A growing and diversified agricultural sector*
2. *A diversified economy through the management of mineral and energy resources, including renewable energy generation*
3. *Communities resilient to change, with housing choice and services that meet shifting needs and lifestyles*
4. *Prosperous urban centres with job opportunities*
5. *Protected water, environment and heritage*

Response:

Direction 2.3 of the Plan aims to “Increase opportunities for renewable energy generation” through a range of actions including “the development of renewable energy projects in line with the NSW Renewable Energy Action Plan”. The project is considered consistent with this Direction and the broader goals of the Plan.

7.2 LOCAL GOVERNMENT

7.2.1 Narrabri Local Environmental Plan 2012

The site is located within the Narrabri Shire Council and is therefore subject to the provisions of the Narrabri Local Environmental Plan 2012 (Narrabri LEP). The Narrabri LEP states:

- (1) This Plan aims to make local environmental planning provisions for land in Narrabri in accordance with the relevant standard environmental planning instrument under section 33A of the Act.
 - (2) The particular aims of this Plan are as follows: (a) to encourage the orderly management, development and conservation of resources by protecting, enhancing and conserving:
 - (i) *land of significance for agricultural production, and*
 - (ii) *timber, minerals, soil, water and other natural resources, and*
 - (iii) *areas of high scenic or recreational value, and*
 - (iv) *native plants and animals including threatened species, populations and ecological communities, and their habitats, and*
 - (v) *places and buildings of heritage significance,*
 - (b) to provide a choice of living opportunities and types of settlements,
 - (c) to facilitate development for a range of business enterprise and employment opportunities,
 - (d) to ensure that development is sensitive to both the economic and social needs of the community, including the provision of community facilities and land for public purposes.
- As shown in Figure 25, the proposed solar farm site is on land zoned RU1 - Primary Production.

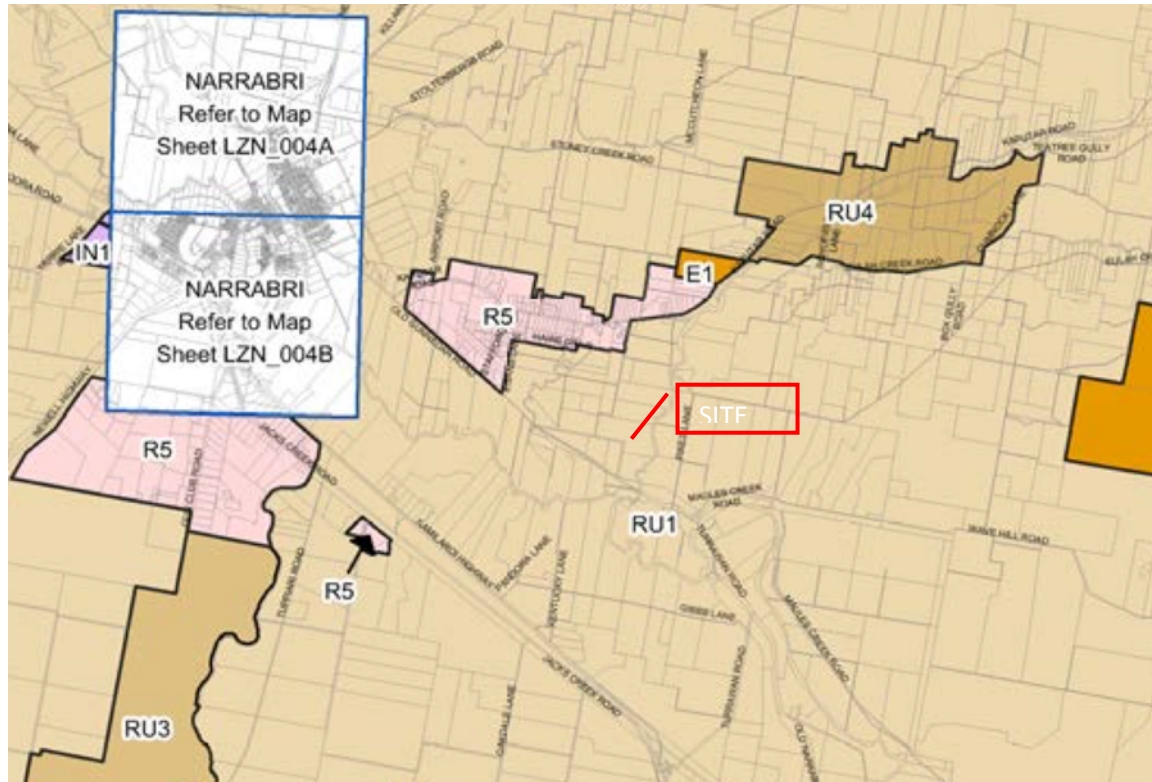


Figure 25: Zoning Map Extract (Narrabri LEP)

7.2.2 RUI – Primary Production

The Narrabri LEP states that the consent authority must have regard to the objectives for development in a zone when determining a development application. The objectives of this zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base
- To encourage diversity in primary industry enterprises and systems appropriate for the area
- To minimise the fragmentation and alienation of resource lands
- To minimise conflict between land uses within this zone and land uses within adjoining zones
- To allow for non-agricultural land uses that will not restrict the use of other land for agricultural purposes

The use is defined as a “high technology industry” under the Narrabri LEP. The definition of a “high technology industry” includes a range of elements including (g) Sustainable Energy Technologies.

Response:

Sustainable Energy Technologies are not included in with the permitted or permitted with consent lists under the zone and are therefore prohibited in terms of RU1 Zone. However, as noted above ISEPP (Division 4 Clause 34) allows the development for the purpose of a solar energy system (electricity generating works) on land in a prescribed zone with consent. RU1 Primary Production is one of the prescribed zones under Clause 33 of the ISEPP.

For the life of the project, the proposal would convert natural sunlight into electricity. While the activity would impact on land available for primary production, the PV Facility has been designed with the intent of reverting to agricultural use at the end of its life. As the lifespan of the PV Facility is approx. 35 years, the site is to be returned to its current agricultural state and use for primary production land.

As noted above, the Rural Zone land is really the only practical land for such a development based on the land area and land values required to make such a project viable. This is the case with all other large-scale solar farms developed in Australia to-date and typical of solar farms developed around the world. Finally, the project adds diversity to the kinds of economic activities that can occur in a rural area without a long-term net loss of rural land, which is considered to add to the long-term economic resilience of the area.

7.2.3 Subdivision

As detailed in section 4.2.3, the proposal involves the reconfiguration of lots for the solar farm area which will achieve the following outcomes:

Table 6: Proposed Lot Reconfiguration Summary

Reconfiguration	Outcome
Consolidate Lot 198 Deposited Plan 754949 Lot 197 Deposited Plan 754949 into one lot	Creation of Lot 1 with a total area of approx. 58 Ha
Consolidate part of Lot 83 Deposited Plan 754949 with Lot 6 Deposited Plan 5732 and part of Lot 1 Deposited Plan 1159855 into one lot.	- Creation of Lot 2 with a total area of approx. 132 Ha - Creation of Lot 3 with an area of approx. 16 ha (which could be consolidated into an adjoining lot) - The remaining area of the former road reserve (Lot 1 DP 1159855) could remain as an additional lot or could be consolidated into adjoining allotments.

As a result, Lot 1 and Lot 3 with an area of approximately 58 Ha and 16Ha that will not be consistent with the minimum lot size of 100 Ha for lots within a Rural Area (AD) set out under Section 4.1 of the Narrabri LEP and corresponding minimum lot size plan (LSZ 004). However, in this it is considered to be acceptable in this instance as the proposed Lot 1 is deemed to be consistent with Clause 4.2A Exceptions to minimum lot sizes for certain rural subdivisions of the Narrabri LEP as detailed below.

Clause 4.2A Exceptions to minimum lot sizes for certain rural subdivisions

This Clause is considered to be relevant with respect to proposal as it is creating a lot that is less than 100 Ha but deemed to meet the exception provisions. The relevant provisions are as follows:

- (1) The objective of this clause is to enable the subdivision of land in rural areas to create lots of an appropriate size to meet the needs of current permissible uses other than for the purpose of dwelling houses or dual occupancies.*
- (2) This clause applies to land in the following rural zones:*
 - (a) Zone RU1 Primary Production,*
 - (b) Zone RU4 Primary Production Small Lots.*
- (3) Land to which this clause applies may, with development consent, be subdivided to create a lot of a size that is less than the minimum size shown on the [Lot Size Map](#) in relation to that land, if the consent authority is satisfied that the use of the land after the subdivision will be the same use (other than a dwelling house or a dual occupancy) permitted under the existing development consent for the land.*
- (4) Development consent must not be granted for the subdivision of land to which this clause applies unless the consent authority is satisfied that:*
 - (a) the subdivision will not adversely affect the use of the surrounding land for agriculture, and*
 - (b) the subdivision is necessary for the ongoing operation of the permissible use, and*
 - (c) the subdivision will not cause a conflict between the use of the land subdivided and the use of the surrounding land in the locality, and*
 - (d) the subdivision is appropriate having regard to the natural and physical constraints affecting the land.*

Response:

The proposed reconfiguration and proposed solar farm will consolidate existing lots reducing the fragmentation of this rural land. The proposal reconfiguration/subdivision will not adversely affect the surrounding land use for agriculture as it will be setback from boundaries and not create any emissions to air, land or water that would affect these uses.

The subdivision will be necessary to simplify the lots for ownership and project financing given the land will be purchased for the project.

There are no natural or physical constraints that would render the reconfiguration impractical or mean the ongoing management and access to the site and surrounding land is adversely impacted.

The proposal will continue to be grazed and therefore serve a productive function albeit lower intensity and can be returned to full productive purposes if deemed strategically appropriate at the end of the projects life. On this basis, the proposed reconfiguration is considered to be consistent with the provision of Section 4.2A of the Narrabri LEP and justified on this basis.

The proposed subdivision will also be used as the instrument to create the easement for the proposed grid connection powerline and substation as required.

7.3 COMMONWEALTH LEGISLATION

7.3.1 Environmental Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is administered by the Commonwealth Department of the Environment and Energy (DoEE). Under the EPBC Act, if the Minister determines that an action is a 'controlled action' which would have or is likely to have a significant impact on a Matter of National Environmental Significance (MNES) or Commonwealth land, then the action may not be undertaken without prior approval of the Minister.

The EPBC Act identifies the following nine MNES:

- World Heritage properties
- National heritage places
- Ramsar wetlands of international significance
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- Water resources (in relation to coal seam gas development and large coal mining development).

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

Response:

A search of the Commonwealth Protected Matters Search Tool indicates that there are no World Heritage or National Heritage areas or items within the proposal site. Search results listed four Wetlands of International Importance that are either known to occur or have potential to occur within 10km, however these are not relevant to the site or proposal.

The proposed development is not likely to impact Commonwealth land. Section 9.3 discusses the results of searches in relation to threatened species, ecological communities and migratory species. Notwithstanding these results it is proposed to refer the application to the Department of Environment and Energy to obtain formal confirmation the project is not considered to be a controlled action.

7.3.2 Native Title Act 1993

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

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

Response:

Native Title is extinguished on private land. The subject land contains former road reserves that have been formally closed and disposed of to the land owner (Part of Lot 1 Deposited Plan 1159855). Native Title is extinguished through this process.

7.3.3 Renewable Energy (Electricity) Act 2000

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

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

Section 17 of the RE Act defines renewable energy sources eligible under the Commonwealth Government's RET including solar energy.

Certificates for the generation of electricity are issued using eligible renewable energy sources. This requires purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire.

In January 2011, renewable energy certificates were reclassified as either large-scale generation certificates or a small-scale technology certificates following changes to the RET scheme. The proposal is the subject of application to the Clean Energy Regulator under the RE Act.

Response:

The proposal is the subject of application to the Clean Energy Regulator under the RE Act. The site selection and design of the project have sought to ensure minimal environmental impacts occur from the development and therefore represents ecologically sustainable development.

7.4 PERMISSIBILITY AND APPROVALS SUMMARY

7.4.1 5.5.1 Permissibility

The ISEPP provides that development for the purpose of a solar energy system may be carried out by any person with consent on any land (other than on land in a prescribed residential zone if the system has the capacity to generate more than 100kW). A 'solar energy system' includes a photovoltaic electricity generating system. The Proposal would be located within a rural zone (RU1 Primary Production) and the construction, operation, upgrade and decommissioning of the PV Plant may be carried out with development consent.

The Proposal is classified as SSD under the S&RD SEPP and as such, the consent authority is the Minister for Planning. The development application is assessed and determined in accordance with those provisions in the EP&A Act relating to SSD.

7.5 APPROVALS AND LICENCES

The approvals and licence requirements for the Proposal are summarised in Table 7. Any additional licences or approvals that may be required would be obtained prior to the commencement of relevant activities.

Table 7: Approvals and Licences

Legal instrument	Approving authority	Approval or licence
Environmental Planning and Assessment Act 1979 Subdivision approval`	DP&E	Development consent
<i>Roads Act 1993</i> , Section 138 approval for works within a public road reserve	Narrabri Shire Council	Old Gunnedah Road
Electricity Supply Act 1995	Essential Energy	Connection to transmission network

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

8 CONSULTATION ACTIVITIES

This section outlines Canadian Solar’s approach to consultation and the activities that have been undertaken for this project.

8.1 CONSULTATION PLAN

The current landowners of the subject site support the project as confirmed by entering into an option to purchase the land. In addition, the Narrabri Shire Council has also expressed strong support for the project subject to the normal development approval requirements and processes being met. In addition, Canadian Solar has been in contact with the Department of Industry Northern Region (Tamworth) to brief them on the proposed project and better understand the regional context and had preliminary meetings with Department of Planning & Environment with regard to the approvals pathway.

Canadian Solar have submitted a preliminary enquiry to Essential Energy with regard to connecting the project to the power network. Essential Energy confirmed that there is “in principal” support to connect the project to the network at the suggested location, subject to further detailed studies.

Following this, Canadian Solar prepared and implemented a comprehensive stakeholder and community engagement plan, which can be found at Appendix G. Canadian Solar has extensive experience in successfully developing and executing such plans in association with a number their Australian projects including the two large-scale projects (Longreach and Oakey) that will soon be under construction in Queensland. Input in to the design of the plan will be in alignment with all requirements of the SEARs and input to the plan will be sought from key Council and State Government and other key stakeholder representatives to ensure all key parties are suitably considered and engaged. The approach to engagement used a range of channels including but not limited to the following:

- Face to face meetings
- Town Hall meeting/presentation
- Adverts in local newspapers
- Websites and social media.

The plan included liaison with but not be limited to the following Stakeholders:

- Narrabri Shire Council Mayor and Councillors
- Narrabri Shire Council Executive Group and Key Council Officers
- Department of Industry
- Department of Planning and Environment
- Office of Environment and Heritage
- Roads and Maritime Services
- Relevant Regional Authorities
- Residents nearby to the project site
- Narrabri Shire Community
- Narrabri Shire Business and Industry representatives
- Aboriginal Community Representatives
- NSW Rural Fire Service.
- Narrabri Airport Managers (Narrabri Shire Council) and Civil Aviation Safety Authority
- Distribution Network Authority (Essential Energy)
- Santos P/L

8.2 COMPLETED CONSULTATION

The engagement was undertaken between June and August 2017, utilising mixed communication strategies as detailed in the Community Engagement Strategy. Completed activities include:

Land owner engagement – Discussions, followed by Agreements have been entered in to.

Consultation with Council

A formal presentation provided to the Narrabri Council on 20th June 2017 ensured that all relevant members of council had the opportunity to understand the project and have any questions answered by the proponent. The Narrabri Shire Council has expressed strong support for the project subject to the normal development approval requirements and processes being met. Ongoing Consultation has been undertaken with Council including its Economic Development, Engineering and Planning Departments to ensure they understood the project and any issues addressed in the proposal.

Community Information Session

On Thursday the 27th of July 2017, Canadian Solar held both informal and formal community information sessions at the Narrabri RSL Club. A four-hour window between 2pm and 6pm enabled informal meet and greet between the proponents and any community members seeking information or questions answered. Following, a formal presentation and Q&A session was held after working hours. Responses from the community were overwhelmingly supportive, with many people commenting on their support of renewable energy and some individuals expressing interest in employment opportunities during the construction and operation phases. Unfortunately, this session did not attract a significant attendance.

Given the level of notice in the local paper which was available in both hard copy and online it is assumed that the project was not a significant point of interest.

Outreach

Outreach was conducted early in the development process and overall, the responses from the community have been overwhelmingly positive and supportive of the project. Only one resident raised a concern, the details of and mitigation responses to which are detailed in the full report at Appendix H. This resident was from the nearest dwelling to the site located to the south west.

The concern related about glare and potential adverse impacts on his property value. In order to mitigate this concern, the proponent has offered to move the access road further away from his block. Further, the planting of vegetation screening has been offered along the road and up eastern western boundaries to soften the appearance of the NSSF. The proponent will continue to work proactively and productively with the resident by keeping him informed about the construction schedule when trucks are entering and exiting on the access road. Canadian Solar is committed to keeping an active and clear channel of communication. Based on anecdotal evidence from other completed solar projects and the design and mitigation measures included in the project, its silent operation and limited activity on site during operation, it is not considered the project will have any adverse impacts on local land values.

In order to mitigate visual impact concerns among other members of the community, Canadian Solar will plant landscape screening (depth of 5m) along the boundaries. Accordingly, the proponent will first submit a landscape plan for endorsement by Narrabri Shire Council prior to commencing works.

Nearby residents home visits - On the 27th, 28th and 29th on July 2017, the appointed Canadian Solar Community Engagement Officer also visited neighbours whose properties adjoined the proposal site and residences (Sensitive receptors) with potential views of the site within a 2km radius of the site.

8.3 FUTURE CONSULTATION ACTIVITIES

As the project proceeds, the proponent will ensure the community is kept informed through sustained media coverage and outreach through mail outs. Continuous community engagement and consultation will be proactively driven by the same principles outlined in the Community and Stakeholder Engagement Strategy. Effective, ongoing liaison with the community and stakeholders will be sustained, particularly with the concerned neighbour as mentioned in the previous section. This will continue throughout EIS process and delivery of the project should it be supported.

9 ASSESSMENT OF THE LIKLEY ENVIRONMENTAL IMPACTS

9.1 SUMMARY

A detailed environmental risk analysis has been conducted to assist in identifying key environmental elements. This risk analysis includes consideration of both construction and operational phases of the project.

This section addresses the description of the existing environment likely to be affected by the development, the likely impacts of each stage of development taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice; and the mitigation measures that would be implemented to monitor and report on the environmental performance of the development.

An extract of the Site Plan showing site constraints is included at Figure 5 for reference and the full plan is annexed at Appendix B.

The environmental impact issues relevant to the project were considered with respect to the potential impacts of the project the existing conditions and context of the site and the policy context. In alignment with standard risk assessment process the risk of impact was determined by considering the likelihood and the consequences of impacts.

The risk rating is a factor of the *likelihood* of the impact occurring and the *consequence* of the impact. Depending on the combination of consequence and likelihood values, potential overall risk ratings range from low to extreme (refer Table 8). High to extreme risks (termed 'key risks') warrant a higher level of investigation in the EIS. Low to medium risks are addressed in less detail. Where uncertainty exists, a higher rating has been applied.

Table 9 summarises the results of the risk assessment applied to the proposal. Eleven environmental issues were investigated. The risk rating is unmitigated, based on a 'worst case scenario' prior to assessment and development of avoidance or mitigation measures. A mitigated risk rating has also been provided and takes into account the results of the assessment and development of avoidance or mitigation measures.

Table 8: Risk Rating Matrix

Probability	Consequences				
	Negligible	Minor	Moderate	Major	Catastrophic
Remote	Low	Low	Low	medium	medium
Unlikely	Low	Low	medium	high	high
Possible	Low	Medium	High	Very High	Very High
Likely	Medium	High	Very High	Very High	Extreme
Almost certain/inevitable	Medium	High	Very High	Extreme	Extreme

Table 9 below provides a summary of the risks assessment outcomes using the above risk matrix to assess each the key environmental risks identified for the project and also the assessed risk after proposed mitigation measures detailed below are applied.

Table 9: Risk Assessment Summary

Enviro Risk	Key Impacts	Prob	Conseq	Risk Rating	Mit Measures	Mit Risk
Biodiversity	Loss of flora and fauna t	Certain (tree removal)	Minor	High	Protect existing native veg and additional landscaping	Medium
Aboriginal Heritage	Loss of cultural heritage	Certain (1 tree removed)	Moderate	Very High	Mitigation measures as recommended by Specialist consultant report	High
Historic Heritage	Loss of historic fabric/values	Negligible	Moderate	Low	No mitigation considered necessary	Low
Land Impacts						
Productive Land Impacts	Loss of productive land	Unlikely	Moderate	Med	Conditions of approval to rehabilitate site and end of project life	Low
Biosecurity Risks (pest, disease and weeds)	Weed infestation during construction or operation	Unlikely	Moderate	Med	CEMP, OMP and DMP	Low
Compatibility with adjoining land uses	Amenity/operational impacts during construction/operation	Possible	Moderate	High	CEMP, OMP and DMP	Low
Flood and drainage	Flood exacerbation, impact of flood on the project	Possible	Moderate	High	Detailed civil and drainage plan to be approved, CEMP, OMP and DMP	Low
Visual Considerations						
Landscape	Adverse impact on identified local landscape values	Unlikely	Minor	Low	No mitigation considered necessary	Low
Visual Amenity impacts	Adverse impact on visual amenity of nearby dwellings and roads	Possible	Minor	Med	Increased setbacks and landscape screening	Low
Noise and vibration Considerations	Noise impacts from piling and traffic during construction	Possible	Moderate	High	Construction hours managed, CEMP,	Low

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Enviro Risk	Key Impacts	Prob	Conseq	Risk Rating	Mit Measures	Mit Risk
					OMP and DMP monitoring	
Traffic Management	Adverse impacts from increased traffic during construction	Remote	Moderate	High	New access point, Traffic Management Plan to be approved, CEMP, OMP and DMP	Low
Hazards						
Bush Fire	Grass fire risks threatening project and being started by project	Unlikely	Major	Medium	CEMP, OMP and DMP	Low
Electromagnetic Interference	Electromagnetic interference from power generation/connection	Remote	Moderate	Low	No mitigation considered necessary	Low
Socio Economic Impacts	Unsustainable demand on local services and facilities, amenity impacts	Unlikely	Moderate	Med	Ongoing engagement, temporary solutions if required	Low
Other Environmental Impacts						
Soil impacts	Contamination during construction and operation	Unlikely	Moderate	Medium	CEMP, OMP and DMP	Low
Water Use	Significant water use during construction or operation	Unlikely	Moderate	Medium	CEMP, OMP and DMP	Low
Ground Water	Contamination during construction and operation	Remote	Moderate	Low	No mitigation considered necessary	Low
Air Quality	Contamination during construction and operation	Remote	Moderate	Low	CEMP, OMP and DMP	Low
Waste	Adverse waste impacts	Unlikely	Moderate	Medium	CEMP, OMP and DMP Module recycling Licences	Low
Cumulative Impacts	Compounding impacts of project or with other projects	Certain (1 tree removed)	Moderate	Medium	Ongoing Engagement, Mitigation measures identified above	Low

The outcomes of the mitigated risks show only one medium risk which is associated with the removal of scattered native vegetation within the trees that cannot be avoided any further and one high risk associated with the removal of 1 aboriginal cultural heritage tree which also could not be avoided in this instance. All other risks are either categorised as low or mitigation measures can reduce the risk to low. On balance this considered to be demonstrate a highly suitable site and locality for the proposed project.

9.2 BIODIVERSITY

Issues

A Biodiversity Assessment was undertaken for the site by specialist consultants AREA Environmental Consultants and Communication. A full copy of the Biodiversity Assessment is included as Appendix E for reference. The outcomes from this report were used to inform the design and layout of the project. This report confirmed the need to ensure the large stand of remnant trees located in the centre of the site within what are former road reserves and an area surrounding a former farm dwelling should be protected from any impacts. In addition, another smaller stand of trees along the north-west boundary of the site is to be protected which was also identified in the preliminary environmental impact assessment as vegetation that may be sensitive and require protection.

The key findings of the Biodiversity Assessment Report (BAR) are as follows:

The Project is in a heavily modified agricultural landscape. Ninety per cent of native vegetation on site has been cleared for cropping or where present the native understorey is heavily affected by grazing. Fifty-seven paddock trees within the cropped area may be removed by the Proposal. Paddock trees are a common rural setting on agricultural properties in the immediate area and region. While patches of native vegetation in the Proposal will be avoided, the impact to paddock trees will affect habitat for the regions listed threatened fauna.

The BAR involved an assessment of the landscape values on the site and surrounding area, the vegetation communities present on the site and their condition, and the known or potential presence of threatened flora or fauna species and populations listed in NSW under the *Threatened Species Conservation Act 1995* (TSC Act) and / or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

There are no waterways within the proposal however some very shallow drainage depressions run through the site from the north east to the south west. Bullawa Creek, a Strahler third order drainage line, is the closest waterway, and is located next to but outside the eastern boundary of the Proposal. The most extensive patch of native vegetation is in the centre of the Proposal and less so in patches along the northern boundary. One Plant Community Type (PCT) was recorded in the Proposal based on sampled plot results and landscape features matched against the VIS classification database. The PCT recorded was Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion (PCT 101). Vegetation condition was assessed using the site attributes compared with benchmark values. The largest patch (16.56 ha) of PCT 101, located in the centre of the Proposal, fits the EPBC Act criteria and thresholds for Highest Quality A2 Class. This PCT is a component of an endangered ecological community with a preliminary listing under the EPBC Act.

The potential presence of threatened flora and fauna species as candidate species was considered in the assessment of impacts and targeted surveys. Candidate species are listed species that are identified by the OEH in the FBA as ecosystem credit species, which are predicted to occur based on their known presence in the Interim Biogeographic Regionalisation for Australia (IBRA) sub-region, the presence of associated PCTs, and the size and condition of the vegetation patches on the site. Species credit species are those that cannot be reliably predicted from the habitat surrogates and their presence is to be assessed through habitat assessment and targeted surveys. From consideration of the default list of species identified in the BioBanking Credit Calculator (BBCC) and the background review and assessment of likelihood, two flora species and 19 fauna species were identified as candidate species on the Proposal.

No threatened flora or fauna species were recorded from the targeted survey on the site. Several other threatened fauna species not recorded are also considered to have a moderate likelihood of temporarily using habitat in the Proposal, these include:

- Grey Falcon (TSC Act).
- Koala (TSC Act and EPBC Act).
- Regent Honeyeater (TSC Act and EPBC Act).
- Glossy Black-cockatoo (TSC Act).
- Brown Treecreeper (eastern subsp.) (TSC Act).
- Little Lorikeet (TSC Act).
- Superb Parrot (TSC Act and EPBC Act).
- Barking Owl (TSC Act).
- Masked Owl (TSC Act).
- Little Pied Bat (TSC Act).
- Yellow-bellied Sheath-tail-bat (TSC Act).

The Project would be unlikely to have a significant impact on any threatened species, populations or ecological communities listed under the TSC Act or the EPBC Act.

The site was selected using a dedicated site planning and selection process that compared multiple sites and decision criteria. These criteria included among other items, the intent to avoid impacts to remnant vegetation as much as possible, hence the selection of a site that is 90 per cent cleared of vegetation and those native vegetation remnants within this area would be avoided. Despite this site selection process, the Project would involve the loss up to 57 native paddock trees. The impacts of the Project are described in the BAR along with measures to further avoid and mitigate potential impacts to biodiversity.

With respect to impact on Koala Habitat the report noted “the proposal will not impact on an important movement corridor or affect the movements of the species.” On this basis, it is considered the proposal is considered to be consistent with objectives of SEPP44.”

This BAR has identified matters which are relevant to the assessment of impacts to threatened species, populations and ecological communities including direct and indirect impacts.

Direct impacts are limited to removal of 57 paddock trees which are also habitat for known and potential threatened species. The Biobanking Paddock Tree Calculator was used to assess this impact.

In addition to the removal of native vegetation to allow the project to proceed a number of additional risks exist that relate to construction. These additional risks include potential fauna mortality, weed invasion and impacts resulting from changes to surface hydrology. These risks are captured in the mitigation and management measures outlined below.

Critically, it is noted that there is adequate space to create a new access from Old Gunnedah Road, an access road between the north and south arrays and improvements to the access lane along the eastern boundary without the need to remove additional native vegetation and the provision of adequate setbacks to provide root protection zones for the trees to ensure the temporary use of this road during construction does not adversely impact on the viability of these zones. These setbacks will be included in the detailed design process for the project and the CEMP and also maintained as part of the operation of the project.

Mitigation and Management

Mitigation measures are required to further avoid and minimise impacts to biodiversity. These measures have been designed to address the potential impacts identified in the BAR being:

- Loss of vegetation and habitat for threatened species.
- Potential fauna mortality during construction.
- Edge effects and weed invasion long-term.
- Impacts on aquatic habitats including indirect changes to surface hydrology.

A list of recommended mitigation measures is provided in Table 10 below to address these impacts during the construction and operational stages of the project. These measures are to be outlined in the project construction environmental management plan (CEMP) or flora and fauna management plan to be prepared prior to construction.

Table 10: Recommended Biodiversity Impact Mitigation Measures

Item	Timing	Recommended mitigation measures
Site personnel induction	Pre-construction	Ensure all construction staff working on the project are aware of the ecological sensitivity of the native vegetation by educating staff at the induction phase on items such as: - Proposed site environmental procedures (vegetation management, sediment and erosion control, protective fencing, noxious weeds, hygiene protocols, ethical procedures for handling fauna displaced on the site). - What to do in case of environmental emergency (chemical spills, fire, injured fauna). - Key contacts in case of environmental emergency. - Potential impacts to threatened nocturnal fauna when travelling to or working at the Proposal during dusk to dawn hours (particularly during winter) and where possible to minimise light and noise impacts to fauna.
Site planning	Pre-construction	- Locate temporary infrastructure (plant sites and construction offices, access tracks etc.) in cleared areas away from vegetation to minimise vegetation removal and indirect effects. - Locate and upgrade any access tracks in a manner which minimises the removal of mature trees, hollow-bearing trees and dead trees.
Identification of clearing limits	Pre-construction	- Accurately and clearly mark out the limits of clearing (where appropriate) and the trees/vegetation to be retained outside of the construction footprint and / or used for post landscaping. - Regular inspections should be undertaken to ensure all retained vegetation/fauna habitat is clearly marked and that fencing is in place, where appropriate. - Only clear each stage of the project as required so that vegetation will be retained in the buffer area until future stages commence.
Protection of fauna during clearing of vegetation	Pre-construction and during clearing works	- Once final clearing areas have been marked, a suitably qualified fauna ecologist should undertake a pre-clearing inspection to identify and physically mark hollow-bearing trees and dead standing trees (stags), and any large bird nests within the clearing areas. The pre-clearing survey should also conduct a search for any koalas which may be present on the site. - A two-staged habitat removal procedure will be adopted to firstly remove non-habitat trees (i.e. trees with no hollows) 48 hours prior to removal of habitat trees. - An experienced and licensed wildlife carer and/or ecologist would inspect habitat once it is removed e.g. after a tree is felled). Animals that emerge would be captured, inspected for injury then relocated to pre-determined habitat identified for fauna release. Suitable release sites are recommended in bushland to the west of the site. - Any uninjured nocturnal fauna encountered should be held in a dark, quiet, warm, well ventilated box or carrier for release the following night. - Wildlife Information, Rescue and Education Services (WIRES) Narrabri (Ph: 1300 131 554) should be consulted if any injured fauna are encountered. - Any identified hollow bearing trees to be removed would need to be nudged and/or knocked before felling to allow any fauna to escape. - Remove habitat as carefully as possible to avoid injury to any fauna remaining in trees. Use equipment that would allow the habitat trees to be lowered to the ground with minimal impact (e.g. claw extension on an excavator).

Item	Timing	Recommended mitigation measures
		- Large logs encountered within the works should be retained and scattered throughout retained habitats adjacent to the site rather than mulched. This should be conducted using the most sensitive manner possible (i.e. not piled up in a heap at the edge of the property or pushed into the forest with a bulldozer). - Any dewatering of artificial farm dams if necessary has potential to impact on the breeding cycle of several frog species. As a precautionary measure dewatering of the structure should avoid the period late spring and summer to avoid the breeding period for most frog species. Dewatering of dams should be supervised by a suitably experienced aquatic ecologist. A suitable aquatic fauna release site (for eels, native fish, tadpoles and frogs) should be identified in proximity to the site prior to dewatering of dams.
Management of erosion and sediment control	Pre-and during construction	- Provide sediment and erosion controls to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways, vegetation and fauna habitat. - Clearly identify stockpile and storage locations and provide erosion and sediment controls around stockpiles.
Wetland areas	Pre-and during construction	- Minimise the area of disturbance in and near drainage lines or dams, clearly mark out work zones in these areas, where appropriate. - Ensure all work within proximity to aquatic habitats have adequate sediment and erosion control. - Further on-site investigations may be required to confirm any interaction with groundwater.
Weed management	Pre-and during construction	- Ensure that any machinery arriving on site be inspected for any foreign soil or plant matter/weed material and be washed down before entering the site. - Weeds should be controlled within the work area according to the requirements of the Noxious Weeds Act 1993. - All noxious weeds which are cleared as part of the project must be disposed of appropriately.
Impacts from introduction and spread of pathogen and diseases	Construction	All vehicles driving to and from site should follow a protocol to prevent the spread or introduction of Phytophthora, Myrtle Rust or Chytrid Fungus, namely vehicles should be clean, including the tyres and any equipment and disinfectant used.
Revegetation and landscaping	Operation	A Landscape Management Plan is to be developed as part of the CEMP which provides specific details for the re-establishment of native vegetation (shrubs and groundcovers) in areas to be identified in the approved environmental management plans. The Landscape Management Plan will need to consider a range of constraints and opportunities associated with the project including collection and propagation of local seed, salvage and reuse of topsoil and woody debris. The Landscape Management Plan should aim to revegetate buffer lands using the same species composition and structure as currently exists on the site and include a program for monitoring and maintenance of plantings.
Loss of hollow bearing paddock trees	Pre-and during construction	Include planting visual buffers with a species mix that included the paddock tree species, and where tree hollows are common, tree hollow salvage and erection in adjacent habitat areas (or nest boxes).
Monitor and review	All stages	A review of mitigation measures (including a checklist) should be developed to ensure that all measures proposed have been undertaken.

In addition, whilst The AREA Report notes the Project would be unlikely to have a significant impact on any threatened species, populations or ecological communities listed under the TSC Act or the EPBC Act the project is being referred under the EPBC Act to confirm it is not considered to be a controlled action.

Offsets

The direct loss of vegetation required for the project and the condition of this vegetation **does not** exceed the impact threshold identified in the FBA for offsetting, being impacts on PCTs that have a site value score ≥ 17 that are associated with threatened species habitat (all patches of remnant vegetation are avoided and impacts are limited to paddock trees). As such biodiversity offsets **are not** required.

A Biodiversity Offset Strategy (BOS) therefore has not been included but appropriate protection and management measures for the loss of 57 paddock trees habitat values are provided. These measures may include planting visual buffers with a species mix that included the paddock tree species, and where tree hollows are common, tree hollow salvage and erection in adjacent habitat areas (or nest boxes)

9.3 ABORIGINAL HERITAGE

An Aboriginal Heritage Assessment of the site and consultation with relevant key stakeholders has been undertaken by AREA Environmental Consultants. A copy of the detailed assessment is annexed at Appendix I. The assessment was undertaken by a suitably qualified professional in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (DECCW 2010).

A field survey took place on Tuesday 11 July and Wednesday 12 July 2017 as part of the assessment. It was attended by two representatives of the local Aboriginal community and two staff members from AREA. The results and recommendations of the assessment for Aboriginal and Historic heritage detailed below.

Results/Issues

Databases were searched to locate previous archaeological studies and Aboriginal sites in the Narrabri area and the results are summarised in Table 11 below.

Table 11: Summary of Cultural Heritage database search results

Database	Date of Search	Parameters	Results
AHIMS	04/07/17	10 km x 10 km centered on Study Area	Seven Aboriginal sites (plus one deleted). None within Study Area.
Narrabri LEP 2012	04/07/17	Schedule 5	No Aboriginal sites are listed on the LEP nearby to the Study Area.
Native Title Vision https://nntt.maps.arcgis.com/	04/07/17	NSW	Native Title claimants the Gomeroi People (Application number: NC2011/006)
Australian Heritage Database	04/07/17	Narrabri LGA	An indigenous place is listed at Bullawa Creek (Place File No. 1/02/193/0001). The details of this place are not available on the database.

A search of the AHIMS database revealed seven recorded Aboriginal sites are within 10 km of the Study Area. Four are stone artefact sites, one of which is also a quarry for stone suitable for tool making. Two of the sites are grinding grooves and one is an ochre quarry. None of the sites are within, or immediately next to the Study Area.

One Aboriginal site has been identified in the Australian Heritage Database nearby to the Study Area. This is simply listed as an 'Indigenous Site' at Bullawa Creek with no further details. It is unclear at what point(s) along Bullawa Creek that this listing refers to. Based on the results of the field survey it was concluded with confidence that this site does not occur within the Study Area.

No other sites or local historical information pertaining to the Aboriginal occupation of the Study Area or surrounds have been identified through a search of the databases, previous studies in the area or by contact with the local Aboriginal community.

Predictive Model

A predictive model of the Study Area is a requirement of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (NSW OEH 2011a). A predictive model combines the archaeological context for a study area with landscape information to propose likely site types, distributions and intactness within the area.

The regional archaeological context suggests that corridors alongside waterways were natural traveling routes for resource gathering and temporary encampments. The easternmost strip of the Study Area would be especially suitable for resource gathering given its proximity to Bullawa Creek. However, it may not have been suitable for encampments as it is a floodplain. Isolated activities such as hunting, butchering, other resource gathering such as bark extraction and one-off artefact retouching all likely took place in the Study Area.

The most common archaeological site types recorded in the Narrabri area are stone artefact scatters, isolated finds and culturally modified trees. These are possible within the Study Area, however large stone artefact scatters are unlikely to occur as they would be representative of longer-term or repeated encampments.

There are many more suitable areas for this activity, such as more elevated areas on the other side of Bullawa Creek. Culturally-modified trees are possible in the remnant vegetation zone and possible on paddock trees. Many are box trees which produce suitable bark to create carrying dishes (commonly known as coolamons), canoes and other items.

Other site types occur but within the landscape context of the Study Area they are not likely to exist. The cobbles of sandstone quartz are very coarse and crystalline in structure; meaning that they are unsuitable for either flaked or ground-edged tools. There are no outcroppings of bedrock or caves so grinding grooves and rock art are not possible. Hearths, ochre quarries and stone arrangements are not particularly common in the recorded archaeology of the area and would be almost unrecognisable in the ploughed paddocks.

Based on the discussion above, the following summary points can be made of the Study Area in terms of a predictive model of Aboriginal cultural heritage:

- Small of isolated stone artefact sites are possible in low densities, with likelihood increasing closer to Bullawa Creek.
- Culturally-modified trees are also possible within the remnant vegetation zones.
- Other site types are unlikely to occur within the Study Area.
- Any sites outside of the remnant vegetation zone are likely to be heavily disturbed.

The field survey took place on Tuesday 11 July and Wednesday 12 July 2017. It was attended by two representatives of the local Aboriginal community and two staff members from AREA. The local Aboriginal representatives were Mrs Alira Tufui and Mr David Trindall, both organised by Narrabri LALC, and the two AREA staff were Mr Nick Harrop (Principal Archaeologist) and Mr Phillip Cameron (Principal Consultant).

Ten Aboriginal sites were recorded during the survey which were all Aboriginal heritage trees. Ground surface visibility was generally very high and 90 per cent of the Study Area was found to be substantially disturbed. The location of this sites is depicted in Figure 26 below.

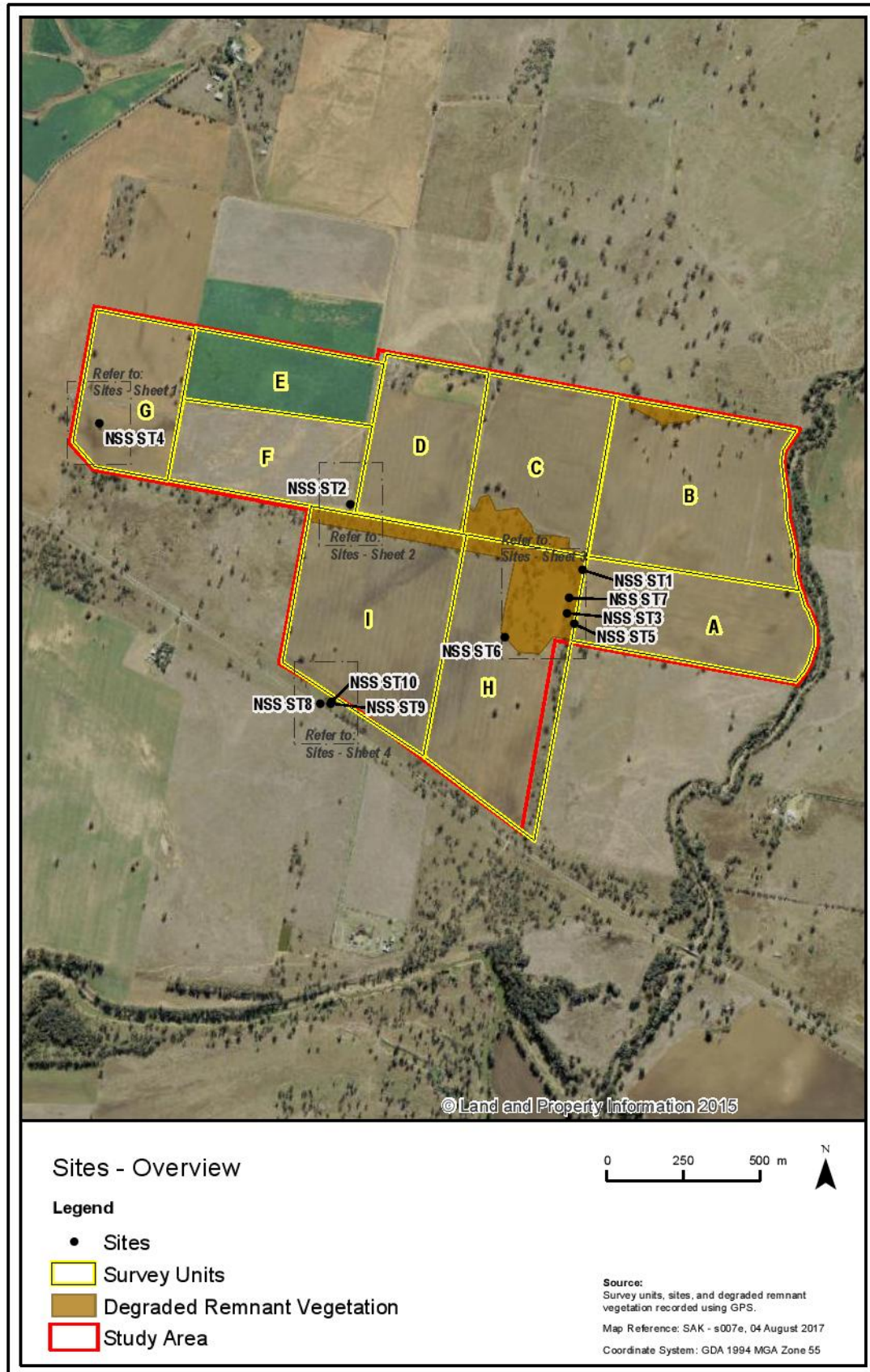


Figure 26: Location of Aboriginal Heritage Trees

Significance

Significance forms the basis for the management of Aboriginal cultural heritage. There are four main criteria for assessing the significance of Aboriginal cultural heritage sites listed in the OEH document *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (2011b).

These are Social or cultural significance, Aesthetic significance, Historic significance and Scientific significance.

Each criteria of significance is rated low, moderate or high. The following questions can be asked to help guide this rating (OEH 2011b; 10):

- **Research potential:** does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?
- **Representativeness:** how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?
- **Rarity:** is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- **Education potential:** does the subject area contain teaching sites or sites that might have teaching potential?

The significance of the Aboriginal cultural heritage sites are summarised in Table 12 below

Table 12: Summary of significance for sites recorded within the Study Area

Site	Social Significance	Aesthetic Significance	Historic Significance	Scientific Significance
Narrabri South Solar ST1	Moderate-High	Moderate	None	Low
Narrabri South Solar ST2	Moderate-High	Low-Moderate	None	Low
Narrabri South Solar ST3	High	Moderate	None	Low
Narrabri South Solar ST4	Moderate-High	Low-Moderate	None	Low
Narrabri South Solar ST5	High	Low-Moderate	None	Low
Narrabri South Solar ST6	Moderate-High	Low-Moderate	None	Low
Narrabri South Solar ST7	High	Moderate	None	Low
Narrabri South Solar ST8	Moderate-High	Low-Moderate	None	Low
Narrabri South Solar ST9	Moderate-High	Low-Moderate	None	Low
Narrabri South Solar ST10	Moderate-High	Low-Moderate	None	Low

Social or cultural significance

Social or cultural value refers to the spiritual, traditional, historical or contemporary associations and attachments the place or area has for Aboriginal people (OEH 2011b; 8). It relates to a contemporary connection that Aboriginal people have with events that have taken place in that location or general area.

Comment regarding the cultural significance of the scars was received for NSS-ST3, NSS-ST5 and NSS-ST7. These were regarded to be of particular significance by one RAP. It is the consultant's experience that culturally-modified trees are assigned a moderate to high level of cultural significance in NSW by traditional owners. Therefore, in the absence of other feedback, all trees have been preliminarily assigned to have moderate-high social significance except for NSS-ST3, NSS-ST5 and NSS-ST7, which are assigned high significance.

Aesthetic significance

This refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with the social values. It may consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use (Australian ICOMOS1988, as cited in OEH 2011b; 9).

The Study Area currently retains some resemblance to its appearance prior to the arrival of Europeans in the Narrabri area. Land clearance has had an impact, but there have been no major changes to the landscape. The remnant vegetation zones contain a moderate density of mature trees. Mount Kaputar and the tree-lines of Bullawa Creek and the Namoi River are within view throughout the Study Area.

Culturally-modified trees inherently have some aesthetic value. Mature trees have some level of aesthetic appeal and the scars provide a clear link to the Aboriginal use of the area. A regularly-shaped cultural scar can be appreciated by someone with limited knowledge of Aboriginal cultural heritage.

The aesthetic appeal of the Study Area and the scarred trees within it is not rare but it is representative of pre-European settlement. Some of the scars are more clearly representative of their function than others. Therefore the recorded sites within the Study Area have low-moderate or moderate aesthetic significance.

Historic significance

Historic value refers to the associations of a place with a historically important person, event, phase or activity in an Aboriginal community. Historic places do not always have physical evidence of their historical importance (OEH 2011b; 9).

There are no specific historical associations between the Study Area and the local Aboriginal community. Therefore, there is no historic significance of the Study Area and sites within it.

Scientific significance

This refers to the importance of a landscape, area, place or object because of its rarity, representativeness and the extent to which it may contribute to further understanding and information (Australian ICOMOS 1988, as cited in OEH 2011b; 9).

The distribution of the scarred trees conformed to the predictive model set out in Section 0. On this level, the recorded sites can be considered to be representative of this site type but not rare. There is little scope for the distribution of the scarred trees to contribute to the research or education of this site type in terms of distribution.

The scars are also representative of typical cultural scars and are not rare. All scars except for Narrabri South Solar ST7 appear to have been created by the procurement of bark for coolamons, with ST9 a likely canoe scar based on its size and proximity to the Namoi River. These are common types of cultural scars and there is little further research potential available by studying the examples within the Study Area. However, the scars do have some educational potential in that the trees are relatively accessible for the local community. There are other site types of this kind that can be used for this purpose though.

Based on the factors discussed above, the scientific significance of the sites within the Study Area is rated as low.

Under the design for the Proposal provided by Canadian Solar (May 2017), one scarred tree (Narrabri South Solar ST2) would be removed and the other nine would be retained. Should the Proposal remain unaltered, the cultural heritage values of the removed scarred tree will be greatly reduced.

Mitigation

The following recommendations are made for Aboriginal cultural heritage to be included in a Cultural Heritage Management Plan (CHMP):

1. *Should the consent for the removal of any culturally-modified trees be given, the following mitigation measures are recommended:*
 - *The Registered Aboriginal Parties should be consulted over the process of removal.*
 - *Any conditions that accompany the consent for the removal of the trees must be followed.*
 - *Detailed, quality archival photographs should be taken of the tree(s) and scars.*
 - *An Aboriginal Site Impact Recording form will need to be submitted for each site damaged or destroyed.*
 - *The CHMP should take into consideration the opinions of the Aboriginal community in the treatment of the removed tree(s), such as the display of the scarred portion of the trunk in a place that is accessible by the local Aboriginal community.*
2. *In order to avoid accidental impact, the following measures are recommended:*
 - *The locations of the culturally-modified trees should be provided to the relevant supervisors responsible for the construction and operation of the solar farm. They should be informed the trees are protected sites under the NPW Act and no harm is to come to them. The presence of the trees should be made clear to the workforce as part of an induction.*
 - *The scarred trees are encircled by temporary fencing with a curtilage of five metres from the trunk. The 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.*
 - *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 need to be formulated with the assistance of the local Aboriginal community and a heritage professional.*

3. Any CHMP developed for the management of cultural heritage will need to include an unexpected finds protocol that includes the obligations of a person who encounters an Aboriginal site. This protocol should form part of the induction for any workforce that is involved in the construction or operation of the solar farm.

The impacts Aboriginal Heritage impacts comprising the removal of one aboriginal cultural heritage tree from the site is considered to be acceptable in light of the significant benefits that will be delivered by the project and the mitigation measures proposed above.

9.4 HISTORIC HERITAGE

A Historic Heritage Assessment of the site was also undertaken by AREA Environmental Consultants at the same time as the Aboriginal Cultural Heritage Assessment. A copy of the detailed historic heritage assessment is included the AREA Cultural Heritage Report annexed at Appendix I.

Issues

A variety of heritage databases were searched to provide a local historical context for the Study Area (Table 12: Summary of significance for sites recorded within the Study AreaError! Reference source not found.). The State Heritage Inventory, the Australian Heritage Database and the Narrabri LEP 2012 all contained places of historic heritage within the search areas. These places were largely within the township of Narrabri and none were listed nearby to the Study Area.

Table 13: Summary of the results of the register search for the study area

Database	Date of Search	Parameters	Results
State Heritage Inventory	04/07/17	Narrabri LGA	43 places were listed in the Narrabri Area. The 'Bullawa Creek Area' was listed on the inventory.
Narrabri LEP 2012	04/07/17	Schedule 5	No places of historical heritage were listed within the Study Area. 21 places of historical significance were listed within the locality of Narrabri.
Australian Heritage Database	04/07/17	Narrabri LGA	No places of historical heritage were listed within the Study Area. Six places of historical significance were listed within the township of Narrabri.
The National Trust	04/07/17	Narrabri	No places of historical heritage were listed within or nearby to the Study Area.
Australia's National Heritage List	04/07/17	NSW	No places of historical heritage were listed within or nearby to the Study Area.
World Heritage List	04/07/17	Interactive Map	No places of historical heritage were listed within or nearby to the Study Area.

One result on the State Heritage Inventory was the 'Bullawa Creek Area'. There is little description of this place on the register. It is described as being 18 km to the north east of Narrabri. As the Study Area is 7 km to the south east of Narrabri and Bullawa Creek is not directly within the Study Area, this listing is not relevant to the Proposal.

An abandoned timber house and an array of items of farm infrastructure and machinery were recorded during the archaeological survey of the Study Area. None of these items have met a local or state level of significance. Additionally, it is assessed that no sub-surface remains of local or state historic heritage significance are likely to be within the Study Area.

Mitigation and management

The report prepared by AREA consulting made the following recommendations for Historic heritage are as follows:

1. *A discussion of historic heritage should be included in the CHMP.*

In addition to this recommendation it is proposed to include a protocol for unexpected Historic heritage finds in the Construction Environmental Management Plan (CEMP). This protocol should form part of the induction for any workforce that is involved in the construction or operation of the solar farm.

9.5 LAND IMPACTS

9.5.1 Productive Land Impacts

Issues

The land is currently used for agricultural production through a leasing arrangement by the landowner. The land is generally used for crop raising and some low intensity grazing. Construction of the solar farm on the site will prohibit the ability to continue any crop raising on the site at the current intensity for the duration that the solar farm is present on the site. It is noted that a number of solar farms are now using sheep grazing as part of their site maintenance regime and this could also be a solution for the Narrabri South Solar Farm. Whilst the land is used for agricultural production it has not been identified as representing Strategic Agricultural Land (SAL) in the new England North West Strategic Land Use Plan as shown in Figure 27 below.



Figure 27: Extract - New England NW Strategic Land Use Plan – Strategic Agricultural Land Map

As noted above, land zoned for rural purposes, is really the only practical land for such a development based on the land area and values and position required to make such a project viable. This is the case with all other large-scale solar farms developed in Australia to date and typical of solar farms developed around the world. The loss of the productive land for the period the solar farm is on the site needs to be balanced against the quality of the productive land and the siting requirements of these critical infrastructure projects.

Mitigation and Management

Whilst the subject land is productive agricultural land it is not identified as Strategic Agricultural Land and the site is located within a broader area that has become fragmented through nearby rural residential subdivision and lifestyle properties. Furthermore, the land does not form part of an area that is a large contiguous farming area under intensive agricultural production.

On this basis, the project will not result in a loss of high value productive land that is independently or forming part of a highly strategic contribution to agricultural production within the region.

Furthermore, the agricultural function of the land will not be completely lost as it is proposed to explore the viability of grazing sheep and or other small animals between the rows of panels. This will likely reduce Operation and Maintenance costs and if viable will be documented as a requirement in the Operations and Maintenance Plan.



Figure 28: Example of sheep grazing within a solar farm

In addition, this PV Facility has been designed with the intent of being decommissioned and reverting to agricultural use at the end of its life. Excluding the potential on-site substation, the project only requires very shallow or easily removable excavation for the steel piles and the underground cabling. Furthermore, the gravel from the internal roads will also be readily removable from site at the end of the projects life. On this basis, the barriers to remediating the site back to productive land are considered to be minimal. The footprint of the project has been designed to minimize the overarching size of the project whilst minimizing other environmental impacts such as impacts on existing remnant vegetation.

As the lifespan of the PV Facility is approximately 35 years, the site is to be returned to its former state as agriculturally productive land. As such, the project will not result in the permanent loss of the agricultural potential of the land.

It is proposed that a Decommissioning Plan be provided prior to the commencement of works. This Plan will outline the process for decommissioning the project and returning the land to a form that could be used for agricultural production

On this basis, the loss of the productive farm land is considered to be mitigated and outweighed by the benefits of allowing a solar farm on a site that has many other suitable features that will ensure it can be deployed on the site with limited environmental impacts and in a cost-effective fashion.

9.5.2 Biosecurity Risks (pest, disease and weeds)

Issues

During the construction of the project there will be a significant increase in traffic to the site. The key biosecurity risk arising out of this activity is the import of weeds into the region through tyres and undercarriages of the various vehicles attending the site during the construction period and to a much lesser extent during the operation and decommissioning periods. Other lesser risks across these periods will include contaminants from rubbish (packaging of solar PV modules removed during construction) or disposal hydrocarbon liquids.

The North West Regional Strategic Weed Management Plan 2017 – 2022 sets out the principals and system for weed management in the area and is underpinned by the New South Wales Biosecurity Strategy 2031 – 2021.

Mitigation and Management

The biosecurity risks will be mitigated through the appropriate inclusion of weed management and other rubbish and contamination management protocols included in the Construction Environmental Management Plan, Operations and Maintenance Plan and Decommissioning Plans to be developed for the project. These protocols will be informed by the above-mentioned Biosecurity and Weed Management Plans as relevant.

9.5.3 Compatibility with adjoining land uses

Issues, Mitigation and Management

Adjacent land uses will not be adversely impacted by the site. The land immediately abutting the site is other farm land that is used for low intensity agricultural production or grazing purposes. The single axis trackers move very slowly and silently and will not have any impacts on adjoining grazing animals as has been the experience in installations around the world. The construction environmental management plan will ensure the project does not have any adverse impacts on neighbouring properties during construction and the operation and maintenance plan will also ensure these interests are protected. The mitigation measures to ensure compatibility with landowners include:

- The solar facility will be setback a minimum of 10 metres from all boundaries
- Drainage designed to ensure the project does not have unintended consequences on neighbouring properties
- CEMP, OMP and DMP to ensure there are no emissions from the site that adversely affect use of the neighbouring properties
- Ongoing engagement with the adjoining landholders throughout the project.

9.5.4 Flood and drainage

Issues

Flood studies completed within the Narrabri LGA have not covered the subject land including the recent Narrabri Flood Study, Namoi River, Mulgate Creek and Longate Gully (Oct 2016) and the Draft Upper Namoi Valley FMP. The township of Narrabri is of high flood risk from the Namoi River which is subject to flooding where it extends to the south of the site.

An extract from Draft Upper Namoi Valley FMP in Figure 29 below indicated that the Namoi River does not present a high flood risk to the site. In addition, land contours on and surrounding the site indicate that the site falls outside of this flood prone area.

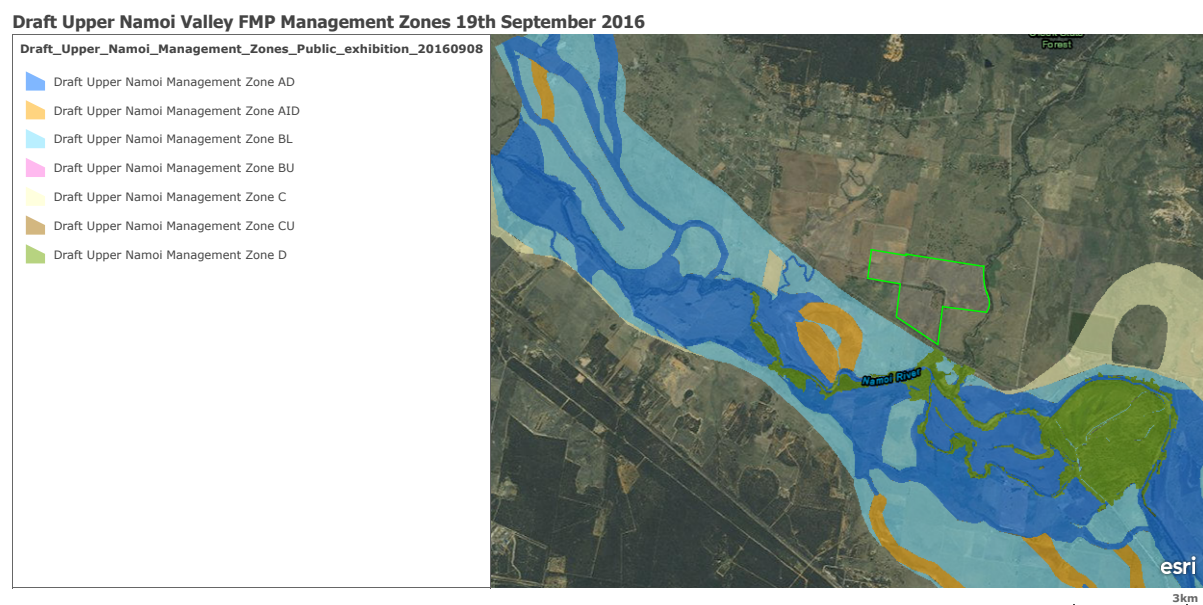


Figure 29: Extract from Draft Upper Namoi Valley FMP Management Zones

Whilst the risk of flood was considered to be relatively low it was considered prudent to commission Water & Environment Pty Ltd to prepare a flood study for the site which is attached at Appendix J for reference. This report describes the two key nearby waterways being the Namoi River to the south and Bullawa Creek to the east. The waterways are described as follows:

Namoi River

The main drainage feature around Narrabri is the Namoi River, which is a major tributary of the Murray Darling River system. The Namoi River has a catchment area of 25,400 km² to Narrabri. About 2.5 km upstream of the town centre, the Namoi River divides into two branches; Narrabri Creek and the Namoi River. Narrabri Creek carries the low flows through the town with the Namoi River channel carrying flood flows (and local catchment runoff) only. The two branches join up about 10 km downstream of the town.

Bullawa Creek

Bullawa Creek is located to the east of Narrabri (and abuts the eastern boundary of the site). The Bullawa Creek catchment commences within Mount Kaputar National Park and is characterised by steep slopes and dense bushland in the upper reaches.

Further downstream, the catchment drains through undulating agricultural land before reaching the Namoi River. The total catchment area to the proposed southern site is 263 km².

There are two distinct tributaries in the catchment; Bullawa Creek and Eulah Creek. Bullawa Creek is a well-defined channel that drains from east to west before meandering south towards Namoi River. Eulah Creek is a smaller tributary draining east to west from the National Park before meeting up with Bullawa Creek approximately 9 km north west of the Namoi River.

The land south of the Bullawa Creek and Eulah Creek confluence flattens out into floodplain however Bullawa Creek remains well defined.

Flood Study Outcomes

The Flood Study found that Bullawah Creek could potentially cause some minor flooding/overland flows during a 1%AEP event to a depth of between 0.2m and 0.4m. The output from the flood modelling for Bullawa Creek is shown in Figure 30 below. This is level of inundation is considered to represent a low flood risk to the project that can be readily mitigated through the detailed design for the project including drainage and runoff design and the detailed design of the solar plant and associated electrical infrastructure.

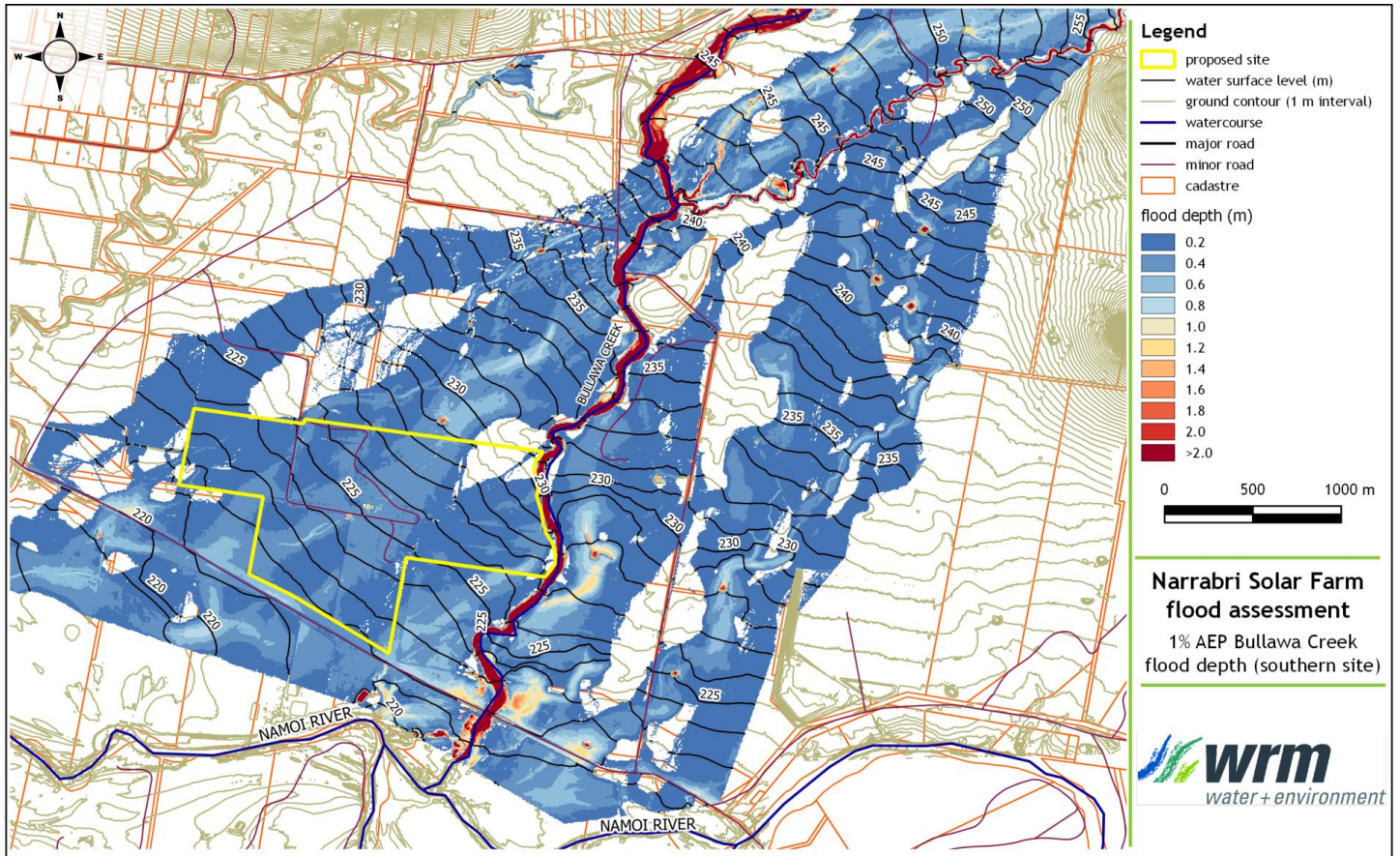


Figure 30: Extract from WRM Flood Study - Bullawa Creek Flood Depth and Levels, 1% AEP

This assessment found that the Namoi River could potentially cause some minor flooding/overland flows along the southern boundary of the solar site during a 1%AEP event to a depth of between 0.2m and 0.4 metres. The output from the flood modelling for Namoi River is shown in below:

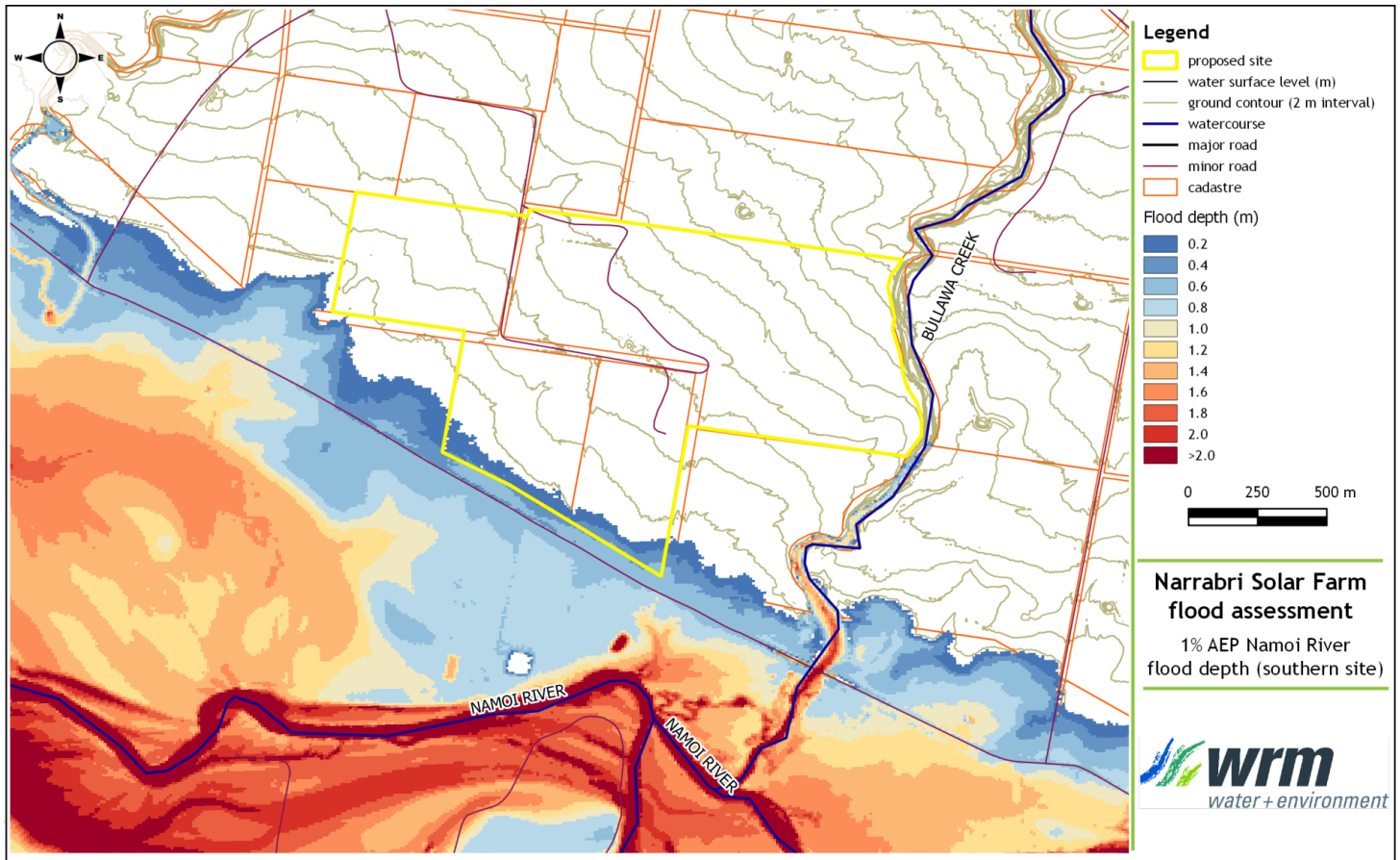


Figure 31 Extract from WRM Flood Study - Indicative Namoi River Flood Depth and Levels, 1% AEP

As noted above and shown on the Site Plan there are some very shallow drainage lines that run through the site from the north east to the south west generally following the fall of the land.

Mitigation and Management

The solar farm has been proposed to be setback from the projected 1%AEP flood lines from the Namoi River. This achieves a number of outcomes including avoiding any projected flood risk from the Namoi River, the major drainage feature around Narrabri and also provides visual impact mitigation benefits for the neighbours to the south of the property and traffic along Old Gunnedah Road.

As noted above, Bullawa Creek also presents a relatively low impact flood risk to the site. This risk will be addressed through a detailed drainage design and detailed engineering design for the project that ensures the flood risk is adequately managed and the management solution does not result in any adverse impacts on neighbouring properties or public property/roads whilst protecting the asset from this risk or result in any downstream effects. In the event there is a flood the design and layout of the project is such that the overland flows will be able to flow across the site or around the site depending on the final drainage design.

The low depth flood risk provides a range of options which includes consideration of elevating key electrical infrastructure components such as the substation and switching stations by approximately 600mm to avoid flood risk.

At this stage, it is anticipated the proposal will still use underground trenching for the underground trenching however an alternative approach is to use “cable trays” which are attached to the back of the panels and allow the cabling to be above ground without changing the visual appearance of the project. It is not expected that a 1%AEP flood depth of up to 600mm will result in any unreasonable blockages resulting from the build-up of debris against the proposed perimeter security fence.

Appropriate site management measures for construction and operation of the project coupled with the proposed setbacks of the project will ensure it does not cause changes to erosion, siltation and riparian vegetation.

In addition, with the correct mitigation measures in place the following is noted:

- The project will not affect existing flood Emergency Management and access procedures in place for the region.
- The project will not increase the risk to life from flood from existing conditions to the locality.

The mitigation measures in response to the risk are recommended as follows:

- Appropriate site management measures for construction, operation and decommissioning of the project coupled with the proposed setbacks of the project to ensure it does not cause changes to erosion, siltation and riparian vegetation.
- Provision of 55 metre setback from Bullawa Creek to the edge of the solar Field to minimise further minimise risk of any impacts on the abutting riparian edge or waterway.
- Adequate space between the rows of panels to ensure grass can be re-established on site to mitigate the risk of sediment runoff/erosion in the event the site is impacted by flood. The Operation and Maintenance Plan will ensure this ground cover is maintained throughout the life of the project.
- A further detailed flood modelling to ensure the detailed design and measures are directly correlated with the risk and ensure on-site and off-site risks are managed for the construction and operation of the site
- A detailed drainage plan and/or engineering design plan to Council and Construction Environmental Management Plan (CEMP) for endorsement prior to the commencement of works on the site to ensure the project responds appropriately to the flood risks set out in the Flood Studies completed for the site. The CEMP will include soil and water management measures mitigate risks associated with drainage and flood in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004);
- The Decommissioning Management Plan will include provisions to ensure the final topography of the site does not increase any flood impacts within the site or to adjoining properties.

It is considered the above measures will ensure all localized flooding and drainage management issues are addressed and the project does not result in any unreasonable flooding impacts on neighbouring properties or downstream and is also adequately protected from flood risk with respect to its construction and operation.

9.6 VISUAL CONSIDERATIONS

9.6.1 Landscape/Visual Amenity impact

This section provides an assessment of the visual impacts of the project considering physical elements of the built form, vegetation and topography as well as consideration of general issues such as travel paths and primary viewpoints.

Context

As noted above, the subject site comprises approximately 190Ha of land that forms part of an existing farm on Old Gunnedah Road Narrabri. Old Gunnedah Road extends southwest from the town centre and carries predominantly local traffic and some heavy vehicles.

The site is flat to very gently sloping (0.45%) and cleared farm land however there are two stands of remnant vegetation and several isolated paddock trees. The natural fall of the land runs from the north east to the south west with a fall of approximately 9 metres across a distance of approximately 2.1km.



Figure 32 Panorama of northern solar field area with Mount Kaputar range in the background.

There are stands of remnant vegetation on site and a number of isolated paddock trees. The stands of remnant vegetation are largely connected with old former road reserves where cropping hasn't taken place.

The site does not contain any waterways or significant drainage lines; however, it abuts the Bullawa Creek to the east. Bullawa Creek is a deeply carved waterway. There is existing access to the site from Old Gunnedah Road.

A 132kV power line passes along the southeast of the site however connection to the grid is proposed via an easement extending 520 metres from the southern boundary of the site to connect the 66kV powerlines which run east west to the south of Old Gunnedah Road.

The topography around the site is very gently sloping up towards the north and then increasingly climbs toward Kaputar Mountain and associated national park approx. 10km to the north of the site. Excluding views to the mountains, view lines are typically filtered by remnant vegetation excluding those up to the mountain.

Approximately 3km to the south west of the site and 8km to the south of the Narrabri Township is the Jacks Creek State Forest.

Approximately 5.75km to the north west of the site is the southern end of the Narrabri Airport. The Narrabri Airport is located on Airport Road (Shire Road 8), on the north side of Kaputar Road when travelling east towards Mt Kaputar National Park from Narrabri. The main sealed landing strip at the airport runs north/south.

The broader rural area, bordering the township to the west and northwest, can be broken down into six key types:

1. *Rural Farm land with farm dwellings and associated buildings and infrastructure to the north, south and east of the site. The land is used for either crop raising or grazing purposes.*
2. *A contiguous rural residential subdivision with dwellings on 1 – 2 acre allotments with varying built form and vegetation to the north and west of the site.*
3. *A large area of remnant vegetation to the north east of the site.*
4. *Waterways abutting the western boundary (Bullawa Creek) and approximately 2km to the south of the site (Namoi River).*
5. *A large mining camp located immediately to the east of the township which services the local coal mine and comprises approximately 100 independent single bedroom accommodation units.*
6. *The prominent Mount Kaputar National Park.*

There are two key visual impact areas that are considered relevant when considering the proposed solar. These are as follows:

- **Visual Amenity Impact** – *the impact of the project on sensitive receptors that are proximate to the site and will potentially see the project on a regular basis. This can include but is not limited to:*
 - *Reflectivity and glare*
 - *Proximity to sensitive receivers*
 - *Impact on outlook of sensitive receivers*
- **Landscape Visual Impact** – *the impact of the project on the existing form and character of the landscape and how that landscape is appreciated from public and private views This can include but is not limited to:*
 - *Reflectivity and Glare*
 - *Dominance and general impact in landscape*
 - *Impact on recognised sensitive landscape*

NSW Roads and Maritime Services “*Environmental Impact Assessment Guidance Note – Guidelines for Landscape Character and Visual Impact Assessment, 2013*” defines the level of impact to landscape character and viewpoints as being based on the combination of two criteria – ‘sensitivity’ and ‘magnitude of change’,

- **Sensitivity** - The sensitivity of a landscape character zone or view and its capacity to absorb change. In the case of visual impact this also relates to the type of viewer and number of viewers.
- **Magnitude** - The measurement of the scale, form and character of a development proposal when compared to the existing condition. In the case of visual assessment this also relates to how far the proposal is from the viewer.

Where there is high sensitivity and high magnitude there is high impact and where the opposite is the case there is low impact.

Issues - Visual Amenity

The immediately surrounding farmland comprises farm dwellings and further out is a rural residential subdivision. Given the flat topography of the site and the immediately surrounding area none of the dwellings within 2km of the site are located on elevated land with views out over the project. Beyond a distance of 2km the project will be visible by some in elevated positions as the land slopes (foothills) towards the Mount Kaputar mountain range. However, the project will simply appear as geometric shapes in the landscape, similar to agricultural shapes found in the existing landscape however the colour will be more akin to a water body, varying due to the receptor and depending on the sky colour and time of day. The impact will be more of a broader landscape impact than direct visual amenity impact. On this basis, the only sensitive receptors within 2km have been assessed from a visual amenity impact perspective.

Figure 33 below is an extract from the site context plan at Appendix B which shows the location of dwellings (sensitive receptors) that are proximate to the site. In addition, traffic traveling along Old Gunnedah Road is considered to be a public sensitive receptor.



Figure 33: Map of sensitive receptors within 2km of site

Of the nearby dwellings, the setbacks are summarised in the below table and also shown in *Table 14*. A number of the dwellings that are within 2000m of the site form part of the low density residential zone to the north-west.

Table 14: Summary of nearby dwellings

Distance	No. of Dwellings
500 metres	4
500 - 1000 metres	2(including site owners)
1000 - 1500 metres	3
1500 - 2000 metres	14

Visualisations

To further understand the visual impact of the project on the nearby sensitive receptors and the broader landscape visualisation specialist Orbit Solutions were engaged to prepare photomontages of the project to best reflect its appearance in the landscape when constructed. The photomontages confirm that the project will not be visually dominant from the nearest dwelling or indeed when standing directly in front of the site. In addition, the photomontages indicate the project will be almost imperceptible from nearby rural residential areas with a photomontage taken from the east side of Egans Lane where there will be clear views across the project. A “hero” photomontage was also prepared to understand what the visual impact would be when viewing the project from Old Gunnedah Road directly in front of the site. Extracts from the photo montages are provided in Figure 33 – 36 below and the full outcomes of the photomontages are provided at Appendix K for reference. In addition, a simulation was prepared by orbit to assist with the Stakeholder and Community engagement process and providing and understanding of what the constructed project would like from a range of angels (from ground level to an aerial view) and also the tracking action of the single axis trackers. An “still” from this simulation is also provided in Appendix K.



Figure 34: Visualisation from Old Gunnedah Road in front of nearest sensitive receiver (SR No.1 in Figure 32 above)



Figure 35: Visualisation from Old Gunnedah Road directly in front of site



Figure 36: Visualisation looking to the site from eastern edge of Egans Lane, 200 metres north of Old Gunnedah Road and 2km to the west of the site.



Figure 37: Extract from simulation showing solar PV at ground level

Following site visits and analysis of the potential visual amenity impacts of the project it was determined that dwellings/sensitive receivers beyond 1km from the site boundary would only have only very moderately perceptible views of the project and it would not unreasonably impact on their visual amenity in terms of dominance or prominence within the landscape. The key basis for this conclusion was as follows:

- The topography of the land surrounding the site is very flat and project is relatively modest in scale in terms of height and generally uniform in height across a flat site. As such as distance between the receiver and the site increases the views of the project begin to blend in with the landscape. This is evident in visualisation of the project in Figure 33 above where at a distance of approximately 400m the project is already has a relatively modest visual impact. Beyond this distance the project is considered to represent a landscape amenity impact rather than visual amenity impact
- Views to the site from surrounding sensitive receivers are screened or filtered by existing vegetation that is located within the landscape, along road reserves, around dwellings and along the edge waterways (Bullawa Creek).
- Views to the site from surrounding sensitive receivers are screened or filtered other dwellings or farm buildings.
- Views to the project from sensitive receiver on land that is significantly elevated in comparison to the site are located 2.8km or more from the site (North of the site) which again is considered to be a landscape impact that is discussed separately below.

The sensitive receivers within 1km of the site comprise 4 dwellings that don't include the site owners dwelling and Old Gunnedah Road and are identified in Figure 38 below and the potential impacts assessed in Table 15 .

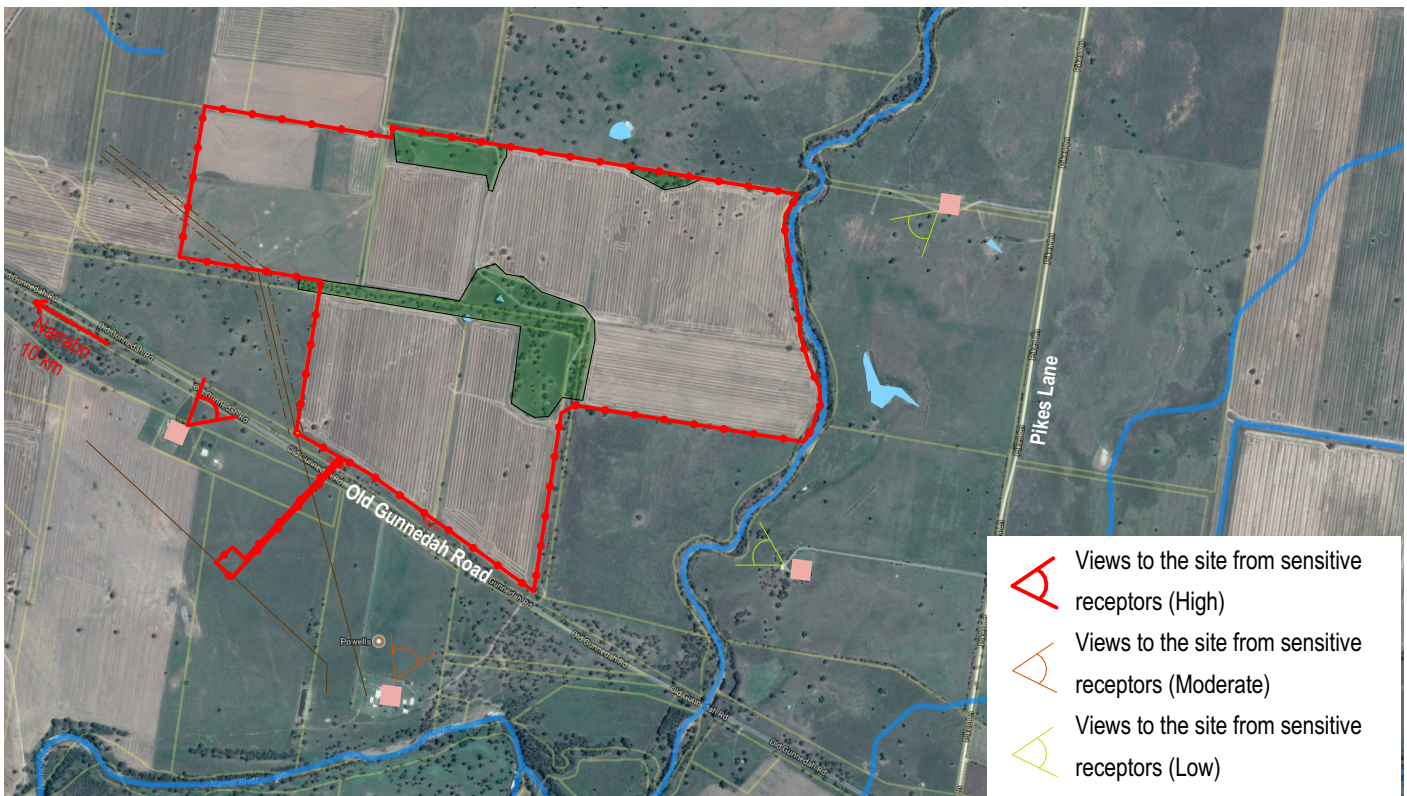


Figure 38: Dwellings within 1km of the project site

The nearest dwellings, position and views to the site within 1km of the site boundary are as follows:

Table 15: Nearby Dwellings and Impacts

No	Dwelling Position	Views to Site	Sensitivity
1	Approx. 350m from one of the south-western corners of the site (the site is irregular in shape).	This dwelling has significant vegetation screening within the property obscuring views to the site. The project will be visible when standing in front of the property in the road reserve however it is not considered it will not be a visually dominant feature. The substation will be visible but will be approximately 640m from the site and consistent with the infrastructure often found in rural areas.	High
2	Approx. 550 metres to south of the site.	This setback will diminish significance of views which is partly filtered by existing trees on between the dwelling and site.	Moderate
3	Approx. 450 metres from the south-eastern corner of the site.	This dwelling has significant vegetation screening surrounding it and views to the site are further screened by the layers of riparian vegetation along Bullawa Creek positioned between the two interfaces.	Low
4	Approx. 480 metres from the south-eastern corner of the site.	Views to the site from this dwelling is screened by the layers of riparian vegetation along Bullawa Creek positioned between the two interfaces.	Low

It is noted the Landowners dwelling Approx. 1km to the north-northwest of the site. This dwelling has significant vegetation screening surrounding it and views to the site are further screened by existing trees between the dwelling and the site.

As noted above the other sensitive receptors to the project will be traffic travelling along Old Gunnedah Road. Traffic approaching the project in either the east or west direction along Old Gunnedah Road will have direct views of the project. The visibility of the project will be similar or slightly higher than the dwellings to the south of the site however the sensitivity is deemed to be considerably lower. Issues relating to reflectivity and glare are addressed below and any implications for road safety are dealt with below.

Issues - Landscape

As noted above the site is located within a relatively low lying flat area within the landscape and does not have any immediately nearby elevated land with private or public views over the site or is positioned on elevated land where it will be a dominant feature within the landscape.

Approximately 10 km to the east and north of the site is Mount Kaputar and the associated National Park with Mount Kaputar clearly being the most dominant and regarded visual feature within the area. The topography starts to increase in elevation approximately 4.5 km to the north of the site and it is likely the project will be partly visible from these elevated dwellings however at views will be filtered and the project will not be a dominant feature. At these distances, the public and private views to the site will see the project forming patterns in the landscape with a different colour but references in shape and form to the rectangular/geometrical shapes typically evident in farming landscapes.

The colour will change to some degree depending on the level of cloud colour however the project will not be visual dominant or unreasonable intrusive to the visual landscape. Issues relating to reflectivity and glare are addressed below

Reflectivity and Glare

Glint and glare are visual phenomena resulting from the reflection of a light source off a surface resulting in concentrated lighting effect for a viewer. Glint and glare occur both in built environments and natural environments. The introduction of significant sources of glint and glare into an environment can result in annoyance for nearby residents, a decrease in visibility for automobile drivers, and a hazard for pilots of low-flying aircraft. Certain types of solar energy generation technologies can produce significant glint and glare, including thermal technologies that rely on mirrors to concentrate solar power. Photovoltaic technology, by contrast, generates very little glint and glare. A summary of the typical glare impacts is outlined below:

Photovoltaic panels are designed to absorb solar energy in order to produce electricity. The generation of photovoltaic electricity is predicated on absorbing as much light as possible while reflecting as little light as possible. As a consequence, the reflectance levels from photovoltaic systems are very low, and are decisively lower than the reflectance generated by common reflective surfaces of built environments, including office buildings, residential windows, and unpainted metal surfaces such as farm sheds. The reflectance from photovoltaic panels is lower, in fact, than certain features of natural environments, such as snow and bodies of smooth water.

Notwithstanding this there will be some instances of glint experienced from the site depending on the weather conditions, position of the sun and position of the receptor. This may be from the modules or some of the other reflective metal material that form part of the project. This will typically be a momentary experience for anyone moving past the project and less likely to be experienced to the north of the site due to the trajectory of the sun. This would be no worse and likely less impactful than the reflected light from a body of water such as a lake or metal farm buildings.

Numerous studies of glint and glare produced by solar photovoltaic systems have been performed in the last several years, all concluding that photovoltaic systems represent a low source of glint and glare and a less-than-significant environmental impact (e.g., Power Engineers 2010, AARDVARC Ltd. 2014). In addition, the The NSW Government Discussion Paper: *Planning for Renewable Energy Generation – Solar Energy* (April 2010) states: ‘*The potential for glare associated with non-concentrating PV systems which do not involve mirrors or lenses are relatively limited*’.

The increase in installation of photovoltaic systems at airports provides compelling evidence that photovoltaic systems result in a very low level of glint and glare (e.g. a small installation at the Narrabri Airport, Thunder Bay Airport Canada, Denver International Airport, Nellis Air Force Base, Indianapolis International Airport and San Jose International Airport).

Community Concerns received to date:

During our Community and Stakeholder Engagement Process, the only concerns raised about the project were from

Residents of the nearest neighbouring dwelling to the north who were concerned about glare but felt satisfied following a discussion on this matter

Residents of the nearest dwelling to the site located to the southwest of the site who were concerned about the impact on the rural character and property values of the area and appropriate mitigation to these concerns can be found below.

Mitigation and Management

The proposed development will not have an adverse impact on the landscape characteristics of the local area. It is modest in height and will not be a dominant feature within the landscape given its location on a large flat area. It is also noted that the site is not located on the crest of a hill or prominent landscape feature that would accentuate its visual prominence. The arrays of solar panels create a repetitive form, which in part references some of the visual elements of agricultural production, and views to and from distances of greater than 1km are typically filtered by existing vegetation. The minimal visual prominence of the project in the landscape is reflected in the photomontages completed by Orbit Solutions for the project shown above in Figures 33 – 36 and attached at Appendix K.

The project layout has been designed as to minimise and mitigate the visual impact and any glint or glare impacts on the two identified sensitive receivers to the south of Old Gunnedah Road and to public views from Old Gunnedah Road. The design changes and mitigation measures are as follows:

- Providing a 60m setback to the fence of the solar field the site boundary that abuts Old Gunnedah Road
- Providing a 55 metre setback between the edge of the solar field and Bullawa Creek
- Providing a further 10m setback from the fence for the solar field
- Proposing a 2.5m high landscape screen along the western and eastern boundary of the solar field in the southern portion of the site
- Provision of landscaping between the road and the fence with an unrestricted height.
- Ongoing engagement with key stakeholders including sensitive receivers, Narrabri Shire Council, Narrabri Airport and CASA

The proposed design and measures outlined will result in the development having little to no visual impact when viewed from Old Gunnedah Road. Most viewers will be in a vehicle travelling at 100km per hour, with the solar field setback approximately 150m from the road carriageway and behind landscaping and a security fence.

The proposed development not be visually dominant from the dwellings generally located to the south, due to the existing distance between the dwellings and the site boundary and the further setback of the proposed solar field, combined with proposed landscape screening measures and the proposed security fence. The proposed setback of 55 metres between the solar field and Bullawa Creek and the existing riparian vegetation along each of the creek banks will largely screen or filter views from the dwellings to the east. It is considered that the proposal will not result in an unreasonable visual impact on the surrounding properties or landscape.

Whilst the project is set some 7km (approx.) to the south east of the Narrabri Airport, Canadian Solar (Australia) Pty Ltd liaised with the Airport Managers/Operators (Narrabri Shire Council) who in turn liaised with the Civil Aviation Safety Authority (CASA) with respect to this matter to ensure all of their requirements are met. No objections or concerns were raised in relation to the project based on the information that was provided (Preliminary EIA and latest layout plans).

Notwithstanding this, it is noted that the project site is located to the east of the Narrabri airstrip, which is orientated northeast/southwest. As such, the project will not be in the direct sight lines of any planes entering or exiting the airport. Canadian Solar has had extensive experience in working with these key stakeholders and has a full appreciation of the documentation and processes required to ensure their confidence with a given solar project.

At ground level, any glint experienced from the project will be only be a momentary experience and equal to or less than that experienced when passing other reflect rural infrastructure such as large sheds or a water body. Critically it is proposed to provide landscaping to a height of 2 metres around the west and east boundaries and unlimited in height along the southern boundary of the southern solar field of the project. This landscaping will further mitigate the impacts of any incidental glint from the site.

Canadian Solar is not aware of any measureable examples or empirical evidence of solar farm projects having impacted on the valuation of surrounding properties/land. However, we are aware of examples where this concern has been raised by concerned stakeholders within Australia and internationally.

The proposed solar farms is modest in height and do not perceptibly move or create any noise and with proposed siting, design, landscaping and management, it not considered it will result in any other adverse impacts on surrounding properties in terms of visual impacts or operational impacts. There is potential for some impacts on amenity and traffic during construction however appropriate management protocols and procedures can ensure these impacts are adequately mitigated. ON this basis it is not considered the project will adversely impact on local land values.

9.7 NOISE AND VIBRATION CONSIDERATIONS

Issues

Land uses immediately surrounding the proposal area are generally comprised of farming land and farm dwellings excluding one rural dwelling on a small lot to the south west of the site (approx. 350 metres from between property boundaries). Noise generating equipment would include irrigation systems such as pumps as well as tractors, quad bikes and 4WD vehicles.

Specialist acoustic consultants, ttm, were engaged to carry out a construction and operational noise assessment for the project. A copy of their assessment is attached at Appendix L for reference.

The minimum assumed rating background noise level (RBL) in the Assessment is defined as shown in Table 16 and the Criteria for assessing acceptable noise levels are defined in Table 17 below.

Table 16: Background Noise Level

Time of day	Minimum assumed rating background noise level, in dB(A)
Day	35
Evening	30
Night	30

Table 17: Noise Criteria

Assessment period	Project Intrusiveness Noise Level $L_{eq,15min}$ dB(A)*	Project Amenity Noise Level L_{eq} dB(A)	Project Noise Trigger Level L_{eq} dB(A)
Day	40	45	40
Evening	35	40	35
Night	35	35	35
Note: - Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays) - Evening period is from 1800 to 2200 - Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays) * Based on minimum intrusive noise levels in Table 3.			

TTM predicted construction noise levels from the various phases of construction at the nearest noise sensitive receiver's (NSR's), using a worst-case scenario of all plant associated with the various stages of construction being used at the same time on the nearest boundary to the respective NSR. The identified noise sensitive receivers are shown in Figure 39 below.

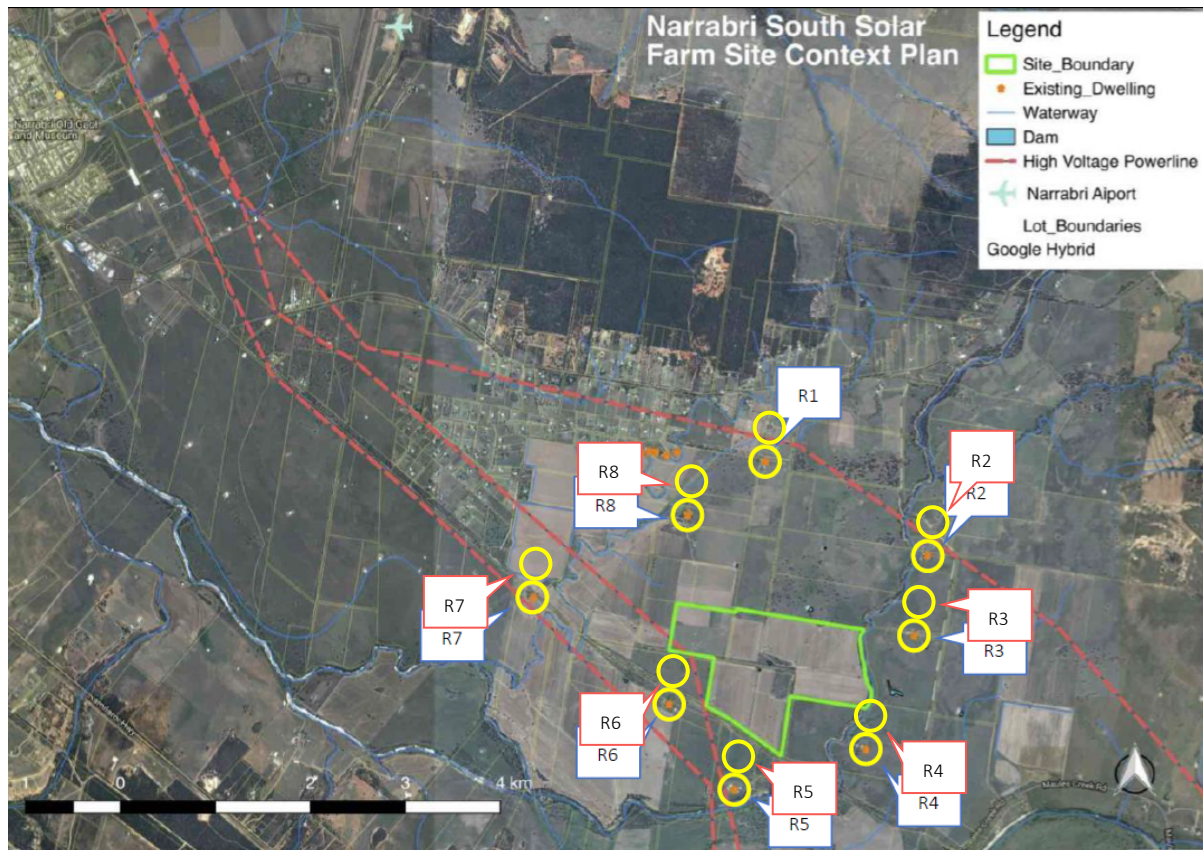


Figure 39: Noise Sensitive Reveivers

Predicted Noise Levels - Construction

The predicted noise levels for each noise significant construction phase are provided in Table 18, Table 19, and Table 20 below. Exceedances of the ICNG noise management level of 45 dB(A) Day-time are shown in bold and red.

Table 18: Predicted construction noise levels from site preparation

Construction Stage	Site Preparation							
NSR Reference	R1	R2	R3	R4	R5	R6	R7	R8
Predicted noise level dB(A) worst-case Met. Cat 6	35	41	50	50	50	53	35	41
Predicted noise level dB(A) neutral-case Met. Cat 4	30	36	46	46	46	49	30	36
ICNG noise management level (Day)	45	45	45	45	45	45	45	45
Meets Target worst-case Met. Cat 6 ✓/✗	✓	✓	✗	✗	✗	✗	✓	✓
Meets Target neutral-case Met. Cat 4 ✓/✗	✓	✓	✗	✗	✗	✗	✓	✓

Table 19: Predicted construction noise levels from Photovoltaic Panel System Installation

Construction Stage	Photovoltaic Panel System Installation							
NSR Reference	R1	R2	R3	R4	R5	R6	R7	R8
Predicted noise level dB(A) worst-case Met. Cat 6	38	44	54	54	54	57	38	44
Predicted noise level dB(A) neutral-case Met. Cat 4	33	39	49	49	49	52	33	39
ICNG noise management level (Day)	45	45	45	45	45	45	45	45
Meets Target worst-case Met. Cat 6 ✓/✗	✓	✓	✗	✗	✗	✗	✓	✓
Meets Target neutral-case Met. Cat 4 ✓/✗	✓	✓	✗	✗	✗	✗	✓	✓

Table 20: Predicted construction noise levels from Inverters, Transformers, and Electrical Collector System Installation

Construction Stage	Inverters, Transformers, and Electrical Collector System Installation							
NSR Reference	R1	R2	R3	R4	R5	R6	R7	R8
Predicted noise level dB(A) worst-case Met. Cat 6	36	42	51	51	51	54	36	42
Predicted noise level dB(A) neutral-case Met. Cat 4	31	37	46	46	46	49	31	37
ICNG noise management level (Day)	45	45	45	45	45	45	45	45
Meets Target worst-case Met. Cat 6 ✓/✗	✓	✓	✗	✗	✗	✗	✓	✓
Meets Target neutral-case Met. Cat 4 ✓/✗	✓	✓	✗	✗	✗	✗	✓	✓

The predicted construction noise levels in the tables above show that noise generated from the Photovoltaic Panel System Installation stage is predicted to be the noisiest at the NSR's.

NSR R6 is the closest receiver at approximately 400m from the nearest boundary of the site. The ICNG noise management level of 45 dB(A) is exceeded by up to 12 dB under the worst-case meteorological category (Met. Cat 6). However, it should be noted that the prediction method has assumed that all plant is operating at the same time (adjusted for the percentage daily use), and in the same location. This is an unlikely scenario in practice, and even if it did occur, it would be only for a short duration before the work moves on to another area of the site further away.

The same applies to other exceedances at other less sensitive NSR's further from the nearest site boundary.

The exceedances of the ICNG noise management level are considered to be minor and given that the worst-case scenario has been predicted, exceedances may not actually occur.

The predicted noise levels are significantly below the ICNG highly noise affected limit of 75 dB(A).

The conclusion of the construction noise assessment is that the potential noise impact is considered to be minor, particularly given the size of the site and that the construction activities will move along swiftly towards and away from NSR's. This means that any impact, if it occurs will be of short duration.

Therefore, additional noise management beyond good practice was not considered necessary.

Predicted Noise Levels - Operation

Noise generated from the operation of the solar farm was also been assessed and found to be insignificant.

Mitigation and management

There is potential for noise impacts on the three dwellings within 500 metres of the site during the construction process. Appropriate management and mitigation measures will need to be implemented during the construction phase to protect the amenity of these sensitive receptors. This will be implemented through the Construction Environmental Management Plan that will be required as part of any permit. This CEMP will consider the range of measures to minimise noise exceedances outlined in Section 6.6 of the ttm Construction and Operational Noise Assessment.

Appropriate noise monitoring will be undertaken during stages of the construction to ensure that there are no unreasonable noise impacts to nearby residents and that noise levels comply with the regulations.

Ongoing noise assessments will be undertaken in accordance with the Interim Construction Noise Guideline (Department of Environment Climate Change and Water 2009) by a suitably qualified person and all mitigation measures implemented accordingly.

9.8 TRAFFIC MANAGEMENT

Issues

The solar energy facility will be operated remotely with only a small number of operations and maintenance staff (approx. 4 staff members) accessing the site to maintain it on a regular basis. There will also be a small number of deliveries to the site, likely to not exceed 5 deliveries per quarter. As such, during operation, the project will have negligible traffic impacts on the local road network.

The main traffic impacts will occur during the construction phase. During the 6 - 9months construction phase there will be a temporary significant increase in traffic to the site, which will include, civil works machinery, heavy vehicles, light vehicles and commuter vehicles visiting the site with high frequency for approximately 6 - 9 months. A similar traffic impact is anticipated for the decommissioning phase however it is expected that an updated traffic impact assessment and traffic management plan would be completed at this time to ensure mitigation measures remain relevant.

For all phases of the project, construction works would be undertaken during normal construction hours only. That is, works would be undertaken between:

- 6am and 6 pm Monday to Friday
- 7am to 5 pm Saturday.

The site is serviced by Old Gunnedah Road which is a constructed local council road with clear bi-directional carriageways and a speed limit of 100kmh.



Figure 40 Photo Looking East - Old Gunnedah Road (110km/hr)

Old Gunnedah Road connects to the Narrabri township at the western end and the Kamilaroi Highway at the eastern end via Turrawan Road. Old Gunnedah Road is also an RMS approved 25/26m B-Double Route, however through access must be via Narrabri to the northwest. The key issues will be ensuring construction traffic accesses the site in accordance with relevant safety standards and the heavy vehicles can obtain access to the site on approved roads.

Existing Traffic Volumes

A recent traffic count was undertaken on Old Gunnedah Road. The counter was located on the eastern side of Hair Drive. The counters were in place for 4 weeks between 11th July and 16th August. This period included 1 week of school holidays and the remaining time was regular traffic usage. This period did not include an agricultural harvest period. The data collected by these counters is provided at Appendix M for reference.

This counter revealed the following key local traffic characteristics:

- The highest user of Old Gunnedah Road during this period was passenger vehicles (Approx. 60%).
- The next highest user was two axle truck (delivery) or bus vehicles – approx. 26%.
- During this period 83% of all trips occurred between 7am and 7pm.
- Some heavy vehicles use the road (2%). Notably this period did not include a time of peak agricultural activity where this number would be significantly higher.
- Peak hourly usage generally aligns with the work commute times and or school drop off times.
- There are no capacity concerns with Old Gunnedah Road.

Adopted Solar Farm Delivery Timeframes

The project has a construction window of approximately 6 - 9 months where no delays or delivery issues are encountered. The following are indicative timeframes (optimal) for each week of the main phases of the project:

Table 21: Project Stage Delivery Time Frames

Stage	Weeks
Site Mobilisation	1 – 3
Site Set-up / Access Roads	1 – 8
PV Plant Delivery and Erection	4 – 26
Substation Component Delivery and Erection	12 – 27
Miscellaneous Works	10 – 12

External Solar Farm Construction Traffic Generation

A Traffic and Transport Assessment was prepared for the project by Impact. Impact estimated the following traffic will be generated by the project based on their experience with other solar projects that have been delivered and the scale of the proposed Narrabri South Solar Farm. A copy of the Impact assessment is provided at Appendix N for reference. Extracts of their traffic generation estimates are provided below for reference.

External traffic generated by the site will be split across three broad categories:

- > General traffic generated by staff travelling to / from the site (i.e. utes, vans and private cars)
- > Over Dimensional (OD) used for the delivery of the large substation components; and
- > Other heavy vehicles (HV) which are used for the delivery of the solar panel components and construction materials such as aggregate.

Table 22 below summarises the likely traffic mix and the various activities that are anticipated for the construction phase.

Narrabri South Solar Farm Total External Vehicle Movements

This section summarises the total external vehicle movements expected during construction.

Table 22 Total Heavy Vehicle Movements

Operation	Purpose	tonnes / load	total tonnage	Delivery Vehicle	Total
General					
Construction Operations	Water delivery	15	na	Truck Tanker	180
	Fuel delivery	15	na	Truck Tanker	54
	Skip delivery	3	na	SM Flat Bed	41
	Portaloo Pumpout	3	na	SM Flat Bed	68
Solar Farm Construction					
Site Mobilisation	Miscellaneous Establishment Deliveries	5	na	L Low Loader	10
	Earthworks equipment delivery	30	na	H Low Loader	10
Site Set-up / Access Roads	Imported material for site office and laydown areas	30	4,000	Truck and Dog	133
	Imported material for site roads base fill	30	18,500	Truck and Dog	400
	Imported material for site roads capping / pavement	30	0	Truck and Dog	0
PV Plan	PV Modules	30	-	B-Double	75
	Tracker Systems and Mounting Posts	30	-	B-Double	75
	Cabling	30	-	B-Double	13
	Inverter Stations	30		L Low Loader	6
Substation	Primary Transformer	40	40	OD H - Low Loader	1
	Modular Substation	30	30	OD L - Low Loader	1
	Switch Board	15	na	L Low Loader	1
	Cabling	15	na	L Low Loader	1
	Miscellaneous Building Materials	15	na	L Low Loader	3
	Switchgear Components	30	na	Semi-Trailer	3
Misc Small Vehicles	Workers and Visitors	na	na	Vans, cars	
	Misc small tools etc.	na	na	Light goods van	
	Total estimated OD Traffic (one-way)				2
	Total estimated HV Traffic (one-way)				1,073
	Total estimated traffic for project (one-way delivery)				3,003

The total daily movements for the project are expected to peak in the second and third month of construction and then declining until the commissioning phase in the final weeks.

Table 23 Daily Vehicle Movements

Phase	Total Staff movements	OD Movements	HV Movements	Total
Weeks 1-3	27.5	0	29	35
Weeks 3-4	34	0	29	63
Weeks 4-8	46	1	29	76
Weeks 8-10	46	0	3	23
Weeks 10-12	34	0	3	37
Weeks 12-26	20	0	3	23
Weeks 26-27	10	0	0	2

*Assumes a 6-day working week during construction activities

**A total of three OD deliveries are expected to occur across three separate days during this period

Staff numbers for each construction stage were advised by Canadian Solar. It is advised that approximately 40 staff will be shuttled to and from the site by means of three, mini-bus type vehicles, with the remainder conservatively assumed to access the site via private vehicle with an average occupancy of 1.5 persons per vehicle.

As detailed above, the Solar Farm is expected to generate in the order of 76 additional traffic movements per day during the peak construction period (Weeks 4 – 8). During peak construction, 22% of the total daily traffic or 40 vehicle movements are expected to be heavy vehicle traffic.

This level of traffic can be expected to be absorbed with minimal negative impact on the surrounding road network, particularly given the short period of time for peak construction (four weeks), and the split of heavy vehicles between two separate access roads.

As noted previously, PV and Substation delivery is not expected to occur until November (at which point in time the first two stages will be complete) as such, the traffic volumes for weeks 3-8 (as nominated above) are considered very conservative with respect to traffic generation, and in reality, are expected to be lower than those nominated above.

Both Councils Engineering Department and the Local Roads and Maritime Services were consulted regarding the project during the stakeholder engagement period. It was advised through this process that the road coming off the Kamilaroi Highway is called Turrawan Road (SR61). This then turns into Old Gunnedah Road once you cross the Tarriaro Bridge (a single lane concrete bridge).

Heavy vehicle access at the intersection of the Kamilaroi Highway and Turrawan Road is restricted to 19m articulated vehicles only. This is due to the turning movement and sight distance restrictions at this intersection for both B-Doubles and Road Trains. B-Doubles, will need to travel into Narrabri and then south along Old Gunnedah Road (Road). Road trains are not permitted to travel along this section of road due to the turning movement restrictions through the local town streets).

As such the Heavy Vehicle route used to access the site will be as follows:

Table 24: Proposed Heavy Vehicle Routes

Heavy Vehicle Type	Heavy Vehicle Route
19m articulated vehicles or smaller	Kamilaroi Hwy > Turrawan Rd > Old Gunnedah Rd
19m articulated vehicles or larger	Newell Highway > Narrabri Town > Old Gunnedah Road

Access

A single access point for the site has been nominated for the project. This access point has excellent visibility from a distance of greater than 500 metres when approached in both directions. The main access point has been proposed in a location where a large single access point can be provided without requiring any tree removal.

The Impact Traffic and Transport Assessment report notes the following with respect to access from the site from Old Gunnedah Road:

Reference has been made to AustRoads Road Design Guidelines Part 4A: Unsignalised and Signalised Intersections. This document provides guidance on warrants for various turn treatments.

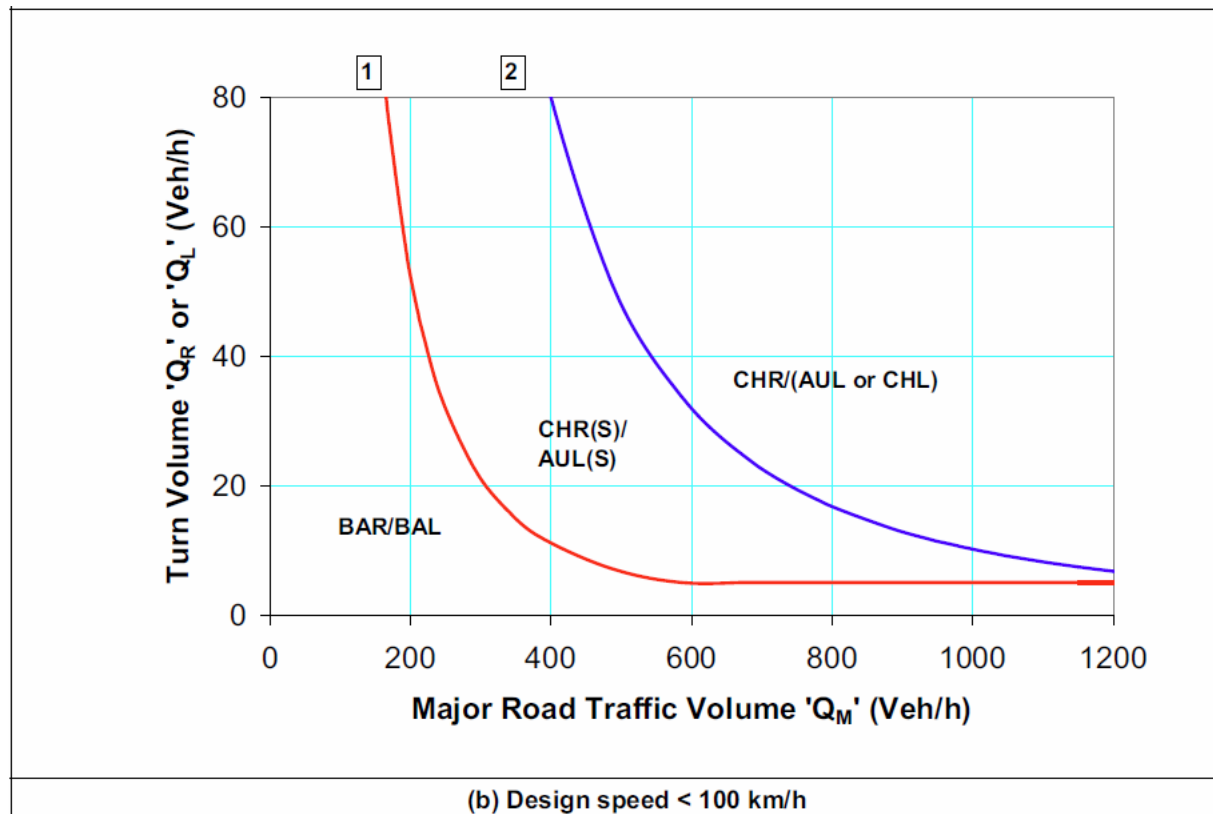


Figure 41: Solar Farm Access Layout

The warrants provide guidance on where a full-length deceleration lane must be used and where a shorter lane, designated AUL(S) and CHR(S), may be acceptable based on traffic volume.

The warrants apply to turning movements from the major road only, with the applicable traffic flows being the peak hour flows.

We are advised that traffic volume counts for Old Gunnedah Road were undertaken by Council for 5 weeks during July and August 2017. These counts indicate that there are approximately 1,200 daily vehicle movements along Old Gunnedah Road. It is a 'rule of thumb' that peak hour traffic flows are approximately 10% of daily traffic volumes. Accordingly, about 120 vehicle movements are recorded during the peak hours.

Whilst this time is outside peak harvesting periods, it does provide an indicator as to the potential volumes along Old Gunnedah Road for the purposes of this assessment.

The proposal is projected to generate in the order of 76 daily vehicle movements during the peak construction period. It is conservatively assumed that 50% of these movements will occur during peak hour and from the same direction, equating to approximately 38 peak hour vehicle movements.

Consideration of these volumes against the warrants reveals that Basic Turn Treatments are triggered, in the form of:

- Basic left-turn treatment (BAL)
- Basic right-turn treatment (BAR)

We do not expect the increase in traffic volumes associated with peak harvesting season to change the warranted turn treatment.

Old Gunnedah Road is constructed with mountable gravel shoulders, which allow vehicles to pass vehicles waiting to turn if required. Given the construction period is relatively short (6 - 9 months only), it is considered appropriate to utilise the shoulders for passing where required in place of more formalised BAL and BAR treatments during this time.

Mitigation and Management

The existing main access road, Old Gunnedah Road, is a well-constructed road, not heavily trafficked and is an approved restricted access vehicle road that has excellent site lines and capacity to create a suitable new entry to site that will allow access for heavy vehicles.

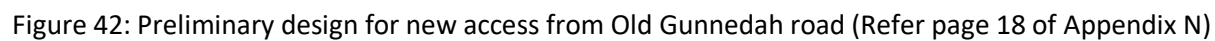
The Traffic and Transport Assessment Report prepared by Impact recommends a detailed Traffic Management Plan (TMP) be prepared prior to commencement of the project to confirm any mitigation and management works required at that time.

This TMP could be implemented as a condition of any approval issued for the Solar Farm and developed in consultation with Narrabri Shire Council, The Roads and Maritime Services, Canadian Solar (Australia) and any other relevant stakeholders to provide more accurate indication of traffic impacts and generally identify responsibilities for road maintenance and upgrades throughout the construction period.

This TMP should include:

- Confirmation of the Solar Farm construction timeframe and work stages;
- Confirmation of expected traffic volumes generated by the wind farm for all work stages;
- Identification of all HV and OD vehicle haulage routes for all work stages;
- A mechanism to review identified haulage route road conditions prior to the commencement of works;
- Mechanisms/agreements (if deemed necessary) to maintain haulage route roads and road infrastructure, including local public roads used by site traffic, during construction works and to reinstate roads to at least pre-construction conditions;
- Qualify any requirement for specific work stage construction traffic management plans; and
- Qualify and identify any relevant mechanisms for OD vehicle permits and traffic management requirements.
- An updated Traffic Impact Assessment and Traffic Management Plan to be prepared prior to decommissioning the project.

In addition, the Impact Report provides a preliminary design for the proposed new access from Old Gunnedah Road shown below.



Canadian Solar will develop and implement a tailored temporary traffic management plan for the construction period and submit it to Department of Planning and Environment, NSW Roads and Maritime Services and Narrabri Shire Council for approval prior to the commencement of works on the site. It is expected that Council will impose a condition on any development approval given that it requires the submission of such a plan for endorsement prior to the commencement of works. This plan will be referred to the afore mentioned authorities for comment and feedback to ensure the plan adequately protects traffic and rail safety requirements.

The Traffic Management Plan would be developed in consultation with Council and RMS and integrate preliminary feedback with response to B-Double access to the site. It may also be necessary to deploy temporary speed limit signs to ensure adequate safety levels and achieved at the entry/exit to the site particularly during in the peak construction activity periods.

During the Construction phase, sufficient area will be set aside for on-site for informal carparking to accommodate the anticipated number of employee vehicles of up to 60 vehicles on any given day although a number of employees are expected to be transported to the site via bus.

During the operations phase, no formalised carparking spaces (i.e. the use of concrete/bitumen and line markings) have been identified due to the lack of permanent staff employed at the PV Facility. Maintenance staff will be employed off-site and will only be on-site for inspection, maintenance and cleaning tasks. Accordingly, as the PV Facility will not generate traffic beyond that necessary for ongoing maintenance, traffic generation is not considered significant and a formalised car parking arrangement is not considered necessary.

Ongoing consultation with all key stakeholders throughout the detailed design and construction phase of the project to ensure the traffic management approaches and solutions meet their expectations.

9.9 HAZARDS

9.9.1 Bush Fire

Issues

The subject land is largely cleared agricultural land with a small number of remnant vegetation stands and isolated paddock trees across the site. The site does not have any specific Bush Fire controls applied to it under the LEP and the site is not mapped as Bushfire Prone Land under the NSW Rural Fire Service Mapping Tool. In addition, Construction and Operational Management Plans for the project will include detailed fire safety standards and protocols. The Proposal will not increase the risk of bushfires in the area.

The proposal has been assessed against the NSW Rural Fire Services Planning Guideline for Council to Bushfire Prone Area Land Mapping has introduced a new Category 3 into the Bush Fire Prone Land System. Category 3 includes grasslands. The subject site has not been included in this Category. Notwithstanding this an assessment of the project against the NSW Rural Fire Services Planning for Bush Fire Protection was undertaken

9.9.2 Existing Environment

Vegetation within the site is largely cleared of native vegetation excluding several remnant patches and crops. The site is isolated from heavily vegetated areas to the north and north-east of the site and to the south. Native riparian vegetation abuts the eastern boundary of the site. The topography of the site and the surrounding land is flat and only very gently undulating excluding the Bullawa Creek waterway to the east of the site.

A search of the NSW Rural Fire Service (RFS) bush fire prone land mapping tool on the 17 January 2018 identified that the Proposal is not be located on Bushfire Prone land. The RFS head office was also contacted and confirmed this was the case. RFS fire records indicate that grass fires and bush fires have occurred in the general Narrabri area in the last 30 years. It was noted there was only one instance of a fire at the site which was at harvest time

The main sources of ignition in the district are:

- Lightning
- Crop harvesting equipment

Water resources on the Subject Land include the farm dam in the north-east and water bores. There are no natural watercourses within the site but the site abuts Bullawa Creek to the east and is within 2km of the Namoi River to the south.

Bushfire impacts associated with the proposal relate to the risk of the solar farm causing a bushfire or the risks of bushfire affecting the solar farm. Potential ignition sources associated with construction and decommissioning of the Proposal would include:

- Site preparation activities involving the use of other petrol-powered tools, and slashing machinery which could cause sparks
- Operating a petrol, LPG or diesel-powered motor vehicle (or other plant and equipment) over land containing combustible material
- Storage of fuels and dangerous goods
- Smoking from site personnel
- Electrical faults during testing
- Existing ignition sources such as lighting and cropping equipment.

Most of the activities are regularly undertaken on the site under current operations. The main sources of ignition in the existing environment (lightning and crop harvesting equipment) will remain however as the cropping area will be reduced the ignition risk from crop harvesting equipment will decrease and lightning protection including lightning arrestors will be installed at the solar farm.

The risks of bushfire within the site are limited by the following factors:

- The site is not located on bushfire prone land
- The site is on flat land with no significant slope
- The majority of the site is cleared so there is a limited amount of fuel for the fire
- The vegetated clusters within the Subject Land are not contiguous with larger vegetated areas
- The solar array, which would occupy the majority of the site, would be largely constructed of glass, silicon, steel and aluminium which all have very low flammability
- All electrical components would be designed and managed to minimise potential for ignition in accordance with applicable Australian standards.
- Water storage will be provided on site with a capacity that is determined as suitable in consultation with the Rural Fire Service.

No bush fire impacts in addition to those mentioned for construction are anticipated during the decommissioning phase.

During operation, crops and pasture surrounding the site are the main fuel for bushfires. Activities associated with operation of the Proposal and existing activities in the area that may cause or increase the risk of bush fire include:

- Storage of fuels and dangerous goods within the maintenance storage container
- Powerline failure or contact with vegetation within clearances
- Electrical infrastructure such as inverters, transformer and electrical cabling as they represent ignition risks
- Substation overheating
- Operating a petrol, LPG or diesel-powered motor vehicle (or other plant and equipment) over land containing combustible material.
- Existing ignition sources such as lightning and cropping equipment.

The PV solar panels are designed to be to minimise reflection and do not concentrate light and therefore do not present an ignition risk.

Ignitions from other electrical equipment is theoretically possible from electrical faults such as arc faults, short circuits, ground faults, overheating and reverse currents. It is conceivable that arcs or melted components resulting from a fault could ignite grass fuels under or surrounding installations and start a bushfire. Appropriate mitigation measures for these risks are detailed below

Potential hazards to fire fighters

The Rural Fire Service is the primary response agency for fighting grass and structural fires within the Site. As such, the fire-fighters likely to respond to a bushfire in this area would be volunteers and/or individual property owners; the latter are mostly equipped with one or more of their own small fire units.

Any fire-fighters from the RFS or neighbouring farms attending bushfires in this area may not be equipped with appropriate breathing apparatus and are unlikely to be trained in structural fire-fighting.

The 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
- Conduction of electrical current through water is also a risk when operational personnel spray the high-powered engine hose at the inverter or the components of the solar PV system
- Inhalation of potentially toxic fumes and smoke from any plastic components such as cables or other decomposed products of the panels, although the majority of the site, would be largely constructed of glass, silicon, steel and aluminium.

Each string of solar panels will be fitted with an isolation switch allowing for the isolation and the turning off parts or all of the solar farm. This can be done remotely from Photon's control centre. When the string is turned off then the solar panels will be isolated and disconnected from the grid. This will mitigate risks to fire fighters by reducing their risk of electrocution.

Firefighting water supplies

Given the safety concerns for fire-fighters, fire-fighting equipment for fire-fighters will not be located on site because the equipment could not be utilised safely and effectively. One tank outside the APZ with a capacity of 20,000L will be located near the substation.

Mitigation and Management

The following mitigation measures have been proposed in response to the above risks and in consultation with the RFS Coffs Harbour Customer Service Centre.

- All electrical components would be designed and managed to minimise potential for ignition in accordance with the relevant Australian Standards.
- Maximise use of construction components using materials such as glass, silicon, steel and aluminium rather than plastic
- Develop an Emergency Response Plan (ERP) and Fire Management Plan (FMP) in consultation with the NSW RFS District Fire Control Centre prior to construction and operation. Development of an updated plans for decommissioning
- Maximise use of construction components using materials such as glass, silicon, steel and aluminium rather than plastic
- A trafficable asset protection zone (APZ) with a minimum width of 15 metres will be provided around the entire perimeter of the site
- A minimum 20 metre Asset Protection Zone is provided between the edge of the solar array and the riparian vegetation along the eastern boundary abutting Bullawa Creek and around the east, west and southern boundaries of the southern field where the vegetation screen is proposed.
- The design would consider that the trafficable APZ and the internal access tracks must be trafficable by Category 1 fire appliances.

- Construction between 1 December and 31 March would be undertaken in accordance with the following:
 - All plant, vehicles and earth moving machinery will be cleaned of any accumulated flammable material (e.g. soil and vegetation)
 - A suitable fire appliance (e.g. fire extinguisher) is present on site with at least two personnel trained in bushfire fighting
 - On days when Very High fire danger or worse is forecast for Narrabri, the “fires near me” app is to be checked hourly for the occurrence of any fires likely to threaten the site
 - All operations involving machinery will cease while the GFDI is or forecast to be 35 or greater
- Installation of electrical equipment such as, junction boxes, inverters, transformer and electrical cabling, is to be in accordance with AS 3000:2007 Electrical installations and undertaken by qualified professionals.
- All waste will be managed within the site include packaging waste shall be managed and removed from the site so as not to increase the potential fuel source for a fire
- Install a water supply tank with a capacity of 20,000L outside the APZ and in location that is to the satisfaction of the RFS
- Fit PV arrays with an earthing and lightning protection system connected to the main earth link.
- Vegetation fuel levels internal to the APZ and throughout the solar farm will be maintained by grazing, slashing or mowing
- The solar farm will be monitored via off-site control centres to monitor to ensure systems are working correctly, investigate any alarms and monitor panel performance
- Site familiarisation sessions and emergency response review will be undertaken with the local RFS team prior to construction and decommissioning and on an agreed regular basis during operation.
- Vegetation planted for landscape screening purposes must be determined in consultation with the RFS and the APZ increased if deemed necessary.

Ongoing stakeholder engagement throughout the project to ensure the community, key stakeholders and local service providers are aware of the timing of the key project milestones and understand the potential impacts of these milestones.

It is considered this approach will ensure the proposal does not present an increased bushfire risk for the local area.

9.9.3 Electromagnetic Interference

Issues

EMF exposure limits are governed by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). The strength of the magnetic field is expressed in units of Tesla (T) or microtesla (μT) or Gauss (G) or milligauss (mG), where $1 \text{ mG} = 0.1 \mu\text{T}$.

The recommended magnetic field exposure limit for members of the public are:

- Public (24-hour exposure) is 0.1 millitesla (1,000 milligauss (mG))
- Occupational exposure (whole working day) is 0.5 millitesla (5,000 mG)

The strength of electromagnetic fields produced by photovoltaic systems do not approach levels considered harmful to human health established by the International Commission on Non-Ionizing Radiation Protection. Moreover, the small electromagnetic fields produced by photovoltaic systems rapidly diminish with distance and would be indistinguishable from normal background levels within several metres. Research by the Australian Radiation Protection and Nuclear Safety Agency found that:

“The conversion of solar to electric power involves a series of [inverters](#) and transformers that may result in high ELF MF level in close proximity. The highest ELF MF levels measured were directly adjacent to transformers and inverters, which were close to but still below the general public limit set by the International Commission on Non-Ionizing Radiation Protection ([ICNIRP, 2010 \(PDF 641 kb\)](#)). However, at 30 centimetres from the transformer surface, the ELF MF level dropped to 5 times lower than the ICNIRP’s general public limit”
(www.arpansa.gov.au/RadiationProtection/EMR/literature/June15.cfm).

Mitigation and Management

The project will be designed to comply with all relevant standards and the project is setback from any nearby sensitive receptors.

9.10 SOCIO ECONOMIC IMPACTS

Issues/Context

Narrabri Shire is home to approximately 14,000 people covering an area of over 13,000 square kilometres. Most of the population is centred around Narrabri and the outlying towns of Wee Waa and Boggabri.

Narrabri is at the centre of a major cotton-growing industry. Other agricultural industries in the area include wheat, beef and lamb. Nearby attractions are Mount Kaputar National Park, the Australia Telescope Compact Array at the Paul Wild Observatory (administered by the CSIRO) and a number of agricultural centres. Just to the south of town is the Pilliga Forest, the largest remnant temperate forest in Eastern Australia.

This will be where the Narrabri Coal Seam Gas Project is going to be located and west along from Narrabri to Yarrie Lake, which will be surrounded by 450 gas well pads with 850 gas wells over the next 20 years if the project goes ahead. Narrabri also has The Crossing Theatre, a 1,000-seat auditorium and cinema complex.

Regional airline Fly Corporate operates a regular scheduled air service to and from Brisbane and more recently Sydney improving the accessibility of Narrabri. Narrabri is an important centre for rail freight, with considerable infrastructure improvements since the mid-1990s

Narrabri has a labour force of over 7,000 people. Agriculture, Forestry & Fishing is the largest industry in terms of business numbers in Narrabri Shire, accounting for 44.0% of the total number of businesses, followed by the Construction (10.4%), Transport, Postal & Warehousing (6.9%) and Rental, Hiring & Real Estate Services (6.5%) sectors.

Major projects that are currently or proposed to impact on Narrabri include

1. The existing Whitehaven Coal Mine,
2. The proposed Inland Rail route traversing through the area,
3. The proposed Narrabri Gas Project (Coal Seam Gas)
4. Other mooted solar farms in the area

Impacts, Mitigation and Management

The proposal will change the nature of the commercial operation on the site from cropping and low intensity grazing to renewable energy generation.

This is considered to be a justifiable on the following grounds:

- The site is not deemed high value strategic agricultural land which must be protected for this purpose.
- The surrounding area has seen a fragmentation of some of the productive land but is not part of a large area where intensive agriculture is occurring.
- Conversion of this land to a solar farm activity will not inhibit the ability for crop raising and grazing to continue on the neighbouring properties.
- The solar farm will allow continued grazing of the land between the rows for sheep which means it is not being completely removed from productive purposes in the region.
- At the end of the life of the project the use and development can be reversed and the land can be returned to agricultural land by removing the infrastructure from the site and will not leave any lasting adverse impacts on the soil or productive capacity of the land. In fact, reducing the production to grazing only during this period may improve soil qualities for future production.

The project is not considered to be in conflict with other major projects proposed in the area for the following reasons:

- The project is not within the alignment of the Inland Corridor and discussion with Santos have indicated the project is not considered to be in conflict with the Narrabri Gas Project
- The project is currently set away from the Whitehaven Coal project and current services within the town such as the medium-term accommodation villa are underutilised.

The proposal will modify the visual character of the area by changing the land from productive purposes to a solar farm. However, this change to the character is not considered to be ultimately detrimental for the following reasons:

- The locality is not identified as a place of high visual character sensitivity in comparison to the national park to the north east of the site.
- The site is not located on elevated or visually prominent land that would make it a dominant feature in the broader landscape.
- The proposal is located in an area that has very few dwellings and mitigation measures have been put in place to ensure the visual impacts are reduced or softened through setbacks and landscape screening.
- Infrastructure is generally modest in scale and therefore, through its construction, will not be a dominant feature in the landscape. The scale will be further diminished through its significant setbacks from private and public viewing points and existing and proposed vegetation screening the site.
- A solar farm design has basic visual parallels with crop raising activities due to its repetitive linear lines that run north/south and geometric shapes formed by the blocks and fields of panels.

The project will also result in potential impacts on amenity from traffic, noise and air quality during construction and operation. These potential impacts are assessed in detail in sections of this report, Section 9.9, 9.8 and 9.12 including relevant mitigation measures to reduce and manage these impacts.

The project will bring additional pressure to the local accommodation services in the region. It is considered this will not result in any unreasonable impacts for the following reasons:

Narrabri is very well serviced with existing accommodation and restaurants and food services including the following:

- | | |
|---|-------------------------|
| • 11 Motels | • 3 hotels serving food |
| • 2 Hotels | • 6 Cafes |
| • 3 Caravan Parks/camping grounds | • 5 Take way food shops |
| • 2 temporary accommodation villages with approximately 700 rooms | • 3 supermarkets |
| • 7 restaurants | |

As noted earlier in the report Canadian Solar and its partners will seek to maximise the use of local labour and services in the delivery of this project which will in part off set the increased impact on local services. Canadian Solar has made contact one of the village accommodation service providers who have advised there will not no problems accommodating part of the workforce over the next 1 – 2 years as the facilities are currently underutilised and are likely to remain so for the foreseeable future even taking into account projects such as the Narrabri Gas Project going ahead. This short-term village accommodation also provides on-site catering and creation facilities if required which provides additional scope to mitigate the impacts of the project on local services. The experience to date with delivery of our solar farms in Queensland has been that the local service providers and very happy to support the needs of any additional labour force to the area as its provides a welcomed boost to their respective businesses.

In addition, in the highly unlikely event that the accommodation be fully occupied due to a ramping up of accommodation during the construction phase then a temporary accommodation camp will be established for the project. This has been successfully achieved at other solar projects being delivered across Australia and there are a number of existing providers setup to provide these services as a result of the sustained (but more recently softer demand from the mining industry) across Australia.

The project will deliver a number of positive socio-economic impacts including the following:

- The direct and induced economic benefits of the project of the project Increased employment during construction – there is the potential for local employment to be generated during the construction phase where suitable local contractors and labour hire are available. This outcome has been successfully achieved at a number of other solar farms being delivered across Australia. Local service providers have provided the following services:
 - Fencing services
 - Significant Civil works
 - Temporary Site Buildings
 - Labour force for panel installation
 - Security services
 - Machinery Hire
- Ongoing employment for operation – the proposal will provide approximately 6 ongoing full time local jobs as part of its operations and maintenance requirements. Whilst this is not ultimately a significant number of jobs, the ongoing permanent nature means they are considered to be high value jobs for the local community and will add to the local employment opportunity diversity.
- The New South Wales Government considers this region of the State to be highly strategic for the development of renewable energy projects due to the intersection of renewable energy resources, electricity network capacity and capacity of the community to support the delivery and operation of these projects. For these same reasons the locality is experiencing strong interest from project developers looking to delivery wind and solar energy projects. These projects will support the transition of New South Wales away from fossil fuel based power which is necessary to ensure the State and the Nation meets its obligations under the Paris Agreement and to ensure it maximises the significant socio-economic opportunity presented by this transition which will occur over the coming years and decades and will ultimately include electrification of transport.

- The project will provide an opportunity for the local community to build skills and capacity associated with the construction and operation of solar projects that can be transferred to the significant number of additional projects that are mooted for the region and across Australia.

9.11 OTHER ENVIRONMENTAL IMPACTS

Other potential environmental impacts of the project are summarised below:

Table 25: Other Environmental Impacts

Environmental Consideration	Potential Impact	Comments
Soil Impacts	There are potential impacts on soil and surface water during the construction and operation such as sediment runoff/erosion, pollution and construction waste.	Construction Environmental Management Plan and Operations Management Plan will ensure there is no adverse soil impacts. On completion of construction, the site will be remediated, including exposed surfaces, as well as the removal of debris and vegetation to ensure no unreasonable impacts on soil and water.
Water Use	Raw water supply for construction and decommissioning (mainly for dust suppression of earthworks and access roads) will be sourced from the existing on-site water bore via water tankers. An ongoing water supply will be required for ongoing cleaning of the solar farm panels throughout its operating which is expected to occur 2 – 4 times per year depending on weather.	The amount of water required for this purpose will vary according to weather conditions during construction, however it is expected to be up to 2 ML in total. This volume is well within the supply capacity of the water bore and will have negligible impact to nearby surface water users. A static water supply (20,000L) for fire protection will be established on site during construction with appropriate fittings for access by local brigade appliances. This facility will remain throughout the duration of the Project. Water supply for fire protection will also be sourced and imported to site similar to that for dust suppression on an as-required basis (expected to be extremely infrequent). It is anticipated that 200 kilolitres (kL) of water would be used during operations each year for cleaning, maintenance, and staff amenities. Water would be trucked in during periods when there is insufficient rainfall to fill onsite water tanks. As noted above the CEMP, OMP and DMP will include erosion mitigation measures. These measures will be compliant with Managing Urban Stormwater: Soils & Construction (Landcom 2004);

Environmental Consideration	Potential Impact	Comments
Air Quality	Dust impacts could occur during construction and operation of the project arising from earth works and vehicle movements.	Dust mitigation measures will be established for the construction and operational management plans.
Groundwater	Ground water could be impacted through excavation during construction.	The depth to ground water is beyond the depth of any disturbance that will occur as part of the project.
Waste	Rubbish waste generated from the project and waste water management for the operations and maintenance building.	The CEMP, OMP and DMP will include measures that waste generated from the project is disposed of in a responsible manner that minimises environmental impacts. As noted above Canadian Solar Australia has pledged to a recycling program with Reclaim PV Recycling for old and damaged solar panels. This much needed initiative commenced in 2015 and is on the forefront of tackling the PV waste management challenge facing the solar industry in the country. There is adequate space in the frontage of the project for an on-site waste water treatment field and soils are considered to be suitable. Onsite testing to be carried out on the waste water generated onsite to see if it is within discharge limits and appropriate permitting obtained if possible. If the waste water is not within discharge limits the wastewater collected in the tanks would be pumped out and taken to an offsite licensed facility on a regular basis. A licensed contractor will be appointed for wastewater management during construction of the project.

9.12 CUMULATIVE IMPACTS

Adverse cumulative impacts occur when a proposed development exacerbates the negative impacts of other activities occurring nearby.

Issues

There are a number of solar farms in NSW, but none in immediate proximity to this project. The nearest are the Moree Solar Farm located approximately 100km north of the subject site. There is another proposal in the Narrabri Shire by Overland Sun Farming for a large scale solar facility near Wee Waa located approximately 40km west. It is understood there are solar farms being mooted to the north west and north of Narrabri however there has not been any formal submissions relating to these projects to date, they are not proximate to the Narrabri South Solar Farm site and unlikely to be delivered at the same time.

The possible cumulative impacts of these projects will be during the construction phase, where there will be increased traffic and some dust and possible noise impacts. The generation of traffic and dust from the project will need to be managed to ensure that this combined with any traffic and dust generation from cropping facilities does not become excessive.

There is existing power infrastructure on the site being the 132 Kilovolt (kV) Powerline and easement owned by TransGrid which transects the south west corner of the site and the 66 Kilovolt Powerline and easement owned by Essential Energy, located to the south of the site, which combined with the proposed solar field may result in a cumulative visual impact.

The Narrabri township is considered to be endowed with more than adequate facilities and services to support the simultaneous delivery of a number of large projects within the region as noted in Section 9.10 (Socioeconomic impacts).

Mitigation and Management

A visual impact assessment of the project is included in Section 9.7 of this report. As outlined, the layout has been designed as to minimise the visual impact of the solar farm by:

- Providing a 60m setback to the fence of the solar field the site boundary that abuts Old Gunnedah Road
- Providing a 55m setback from Bullawa Creek to the edge of the solar field
- Providing a further 10m setback from the fence for the solar field in this southern portion of the site
- Proposing a 2.5m high screen along the western boundary of the solar field in the southern portion of the site
- The solar trackers will be up to approx. 3m in height above ground level
- Providing landscaping between the road and the fence.

The proposed design and measures outlined will result in the development having little to no visual impact when viewed from Old Gunnedah Road. Most viewers will be in a vehicle travelling at 100km per hour, with the solar field setback approximately 150m from the road carriageway and behind landscaping and a fence. The solar field will be barely visible in this circumstance.

The proposed development not be visually dominant from the dwellings generally located to the south, due to the distance between the dwellings and the proposed solar field, combined with the fencing and landscaping measures that are proposed. The existing creek vegetation and bank will mask views from the dwelling to the east.

It is considered that the proposal will not result in an unreasonable visual impact on the surrounding properties or landscape.

It is considered the development of appropriate management plans, including but not limited to a Traffic Management Plan, CEMP, OMP and DMP, in consultation with the community and key stakeholders will ensure there are no unreasonable cumulative impacts during the construction, operation and decommissioning of the proposed solar farm.

9.13 SUMMARY OF ENVIRONMENTAL MEASURES

This section provides for a consolidated summary of all proposed environmental management and monitoring measures. Overall, impact has been avoided where possible through the current design, however the following additional management and monitoring measures are detailed below:

Table 26: Summary of Environmental Measures

Item	Timing	Mitigation Measure
Biodiversity		
Site personnel induction	Pre-construction	Ensure all construction staff working on the project are aware of the ecological sensitivity of the native vegetation by educating staff at the induction phase on items such as: - Proposed site environmental procedures (vegetation management, sediment and erosion control, protective fencing, noxious weeds, hygiene protocols, ethical procedures for handling fauna displaced on the site). - What to do in case of environmental emergency (chemical spills, fire, injured fauna). - Key contacts in case of environmental emergency. - Potential impacts to threatened nocturnal fauna when travelling to or working at the Proposal during dusk to dawn hours (particularly during winter) and where possible to minimise light and noise impacts to fauna.
Site planning	Pre-construction	- Locate temporary infrastructure (plant sites and construction offices, access tracks etc.) in cleared areas away from vegetation to minimise vegetation removal and indirect effects. - Locate and upgrade any access tracks in a manner which minimises the removal of mature trees, hollow-bearing trees and dead trees.
Identification of clearing limits	Pre-construction	- Accurately and clearly mark out the limits of clearing (where appropriate) and the trees/vegetation to be retained outside of the construction footprint and / or used for post landscaping. - Regular inspections should be undertaken to ensure all retained vegetation/fauna habitat is clearly marked and that fencing is in place, where appropriate. - Only clear each stage of the project as required so that vegetation will be retained in the buffer area until future stages commence.
Protection of fauna during clearing of vegetation	Pre-construction and during clearing works	- Once final clearing areas have been marked, a suitably qualified fauna ecologist should undertake a pre-clearing inspection to identify and physically mark hollow-bearing trees and dead standing trees (stags), and any large bird nests within the clearing areas. The pre-clearing survey should also conduct a search for any koalas which may be present on the site. - A two-staged habitat removal procedure will be adopted to firstly remove non-habitat trees (i.e. trees with no hollows) 48 hours prior to removal of habitat trees. - An experienced and licensed wildlife carer and/or ecologist would inspect habitat once it is removed e.g. after a tree is felled). Animals that emerge would be captured, inspected for

Item	Timing	Mitigation Measure
		injury then relocated to pre- determined habitat identified for fauna release. Suitable release sites are recommended in bushland to the west of the site. - Any uninjured nocturnal fauna encountered should be held in a dark, quiet, warm, well ventilated box or carrier for release the following night. - Wildlife Information, Rescue and Education Services (WIRES) Narrabri (Ph: 1300 131 554) should be consulted if any injured fauna are encountered. - Any identified hollow bearing trees to be removed would need to be nudged and/or knocked before felling to allow any fauna to escape. - Remove habitat as carefully as possible to avoid injury to any fauna remaining in trees. Use equipment that would allow the habitat trees to be lowered to the ground with minimal impact (e.g. claw extension on an excavator). - Large logs encountered within the works should be retained and scattered throughout retained habitats adjacent to the site rather than mulched. This should be conducted using the most sensitive manner possible (i.e. not piled up in a heap at the edge of the property or pushed into the forest with a bulldozer). - Any dewatering of artificial farm dams if necessary has potential to impact on the breeding cycle of several frog species. As a precautionary measure dewatering of the structure should avoid the period late spring and summer to avoid the breeding period for most frog species. Dewatering of dams should be supervised by a suitably experienced aquatic ecologist. A suitable aquatic fauna release site (for eels, native fish, tadpoles and frogs) should be identified in proximity to the site prior to dewatering of dams.
Management of erosion and sediment control	Pre-and during construction	- Provide sediment and erosion controls to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways, vegetation and fauna habitat. - Clearly identify stockpile and storage locations and provide erosion and sediment controls around stockpiles.
Wetland areas	Pre-and during construction	- Minimise the area of disturbance in and near drainage lines or dams, clearly mark out work zones in these areas, where appropriate. - Ensure all work within proximity to aquatic habitats have adequate sediment and erosion control. - Further on-site investigations may be required to confirm any interaction with groundwater.
Weed management	Pre-and during construction	- Ensure that any machinery arriving on site be inspected for any foreign soil or plant matter/weed material and be washed down before entering the site. - Weeds should be controlled within the work area according to the requirements of the Noxious Weeds Act 1993. - All noxious weeds which are cleared as part of the project must be disposed of appropriately.

Item	Timing	Mitigation Measure
Impacts from introduction and spread of pathogen and diseases	Construction	All vehicles driving to and from site should follow a protocol to prevent the spread or introduction of Phytophthora, Myrtle Rust or Chytrid Fungus, namely vehicles should be clean, including the tyres and any equipment and disinfectant used.
Revegetation and landscaping	Operation	A Landscape Management Plan is to be developed as part of the CEMP which provides specific details for the re-establishment of native vegetation (shrubs and groundcovers) in areas to be identified in the approved environmental management plans. The Landscape Management Plan will need to consider a range of constraints and opportunities associated with the project including collection and propagation of local seed, salvage and reuse of topsoil and woody debris. The Landscape Management Plan should aim to revegetate buffer lands using the same species composition and structure as currently exists on the site and include a program for monitoring and maintenance of plantings.
Loss of hollow bearing paddock trees	Pre-and during construction	Include planting visual buffers with a species mix that included the paddock tree species, and where tree hollows are common, tree hollow salvage and erection in adjacent habitat areas (or nest boxes).
Monitor and review	All stages	A review of mitigation measures (including a checklist) should be developed to ensure that all measures proposed have been undertaken.
Referral	Pre-construction	The project will be referred under the EPBC Act to confirm it is not a controlled action.
Aboriginal Heritage		
Cultural Heritage Management Plan (CHMP):	Pre-construction	- Should the consent for the removal of any culturally-modified trees be given, the following mitigation measures are recommended: - The Registered Aboriginal Parties should be consulted over the process of removal. - Any conditions that accompany the consent for the removal of the trees must be followed. - Detailed, quality archival photographs should be taken of the tree(s) and scars. - An Aboriginal Site Impact Recording form will need to be submitted for each site damaged or destroyed. - The CHMP should take into consideration the opinions of the Aboriginal community in the treatment of the removed tree(s), such as the display of the scarred portion of the trunk in a place that is accessible by the local Aboriginal community. - In order to avoid accidental impact, the following measures are recommended:

Item	Timing	Mitigation Measure
		- The locations of the culturally-modified trees should be provided to the relevant supervisors responsible for the construction and operation of the solar farm. They should be informed the trees are protected sites under the NPW Act and no harm is to come to them. The presence of the trees should be made clear to the workforce as part of an induction. - The scarred trees are encircled by temporary fencing with a curtilage of five metres from the trunk. The 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. - 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 need to be formulated with the assistance of the local Aboriginal community and a heritage professional. - Any CHMP developed for the management of cultural heritage will need to include an unexpected finds protocol that includes the obligations of a person who encounters an Aboriginal site. This protocol should form part of the induction for any workforce that is involved in the construction or operation of the solar farm.
Ongoing protection of areas of sensitivity	Post-construction	It is recommended that the Operations and Maintenance Plan and the Decommissioning Plan include a section detailing the ongoing need to protect areas of Cultural Heritage Sensitivity during maintenance works.
Historic Heritage		
Cultural Heritage Management Plan (CHMP):	Pre-construction	- Discussion of historic heritage to be included in the CHMP. - Protocol for unexpected Historic heritage finds in the Construction Environmental Management Plan (CEMP)
Land Impacts		
Productive Land Impacts	Operation	- The proponent will investigate the viability of using sheep grazing as the preferred method for maintaining grass on the site. - A decommissioning Plan will be prepared for the site which outlines the process for decommissioning the project and returning the land to a form that could be used for agricultural production
Productive Land Impacts	Decommissioning	The site is to be returned to its former state as agriculturally productive land. As such, the project will not result in the permanent loss of the agricultural potential of the land.
Biosecurity – weed and pest management	All stages	Appropriate weed, pest and waste measures to be included in the Construction Environmental Management Plan, Operations and Maintenance Plan and Decommissioning Plans

Item	Timing	Mitigation Measure
Compatibility with adjoining land uses	Pre-construction	- The solar facility will be setback a minimum of 10 metres from all boundaries - Drainage designed to ensure the project does not have unintended consequences on neighbouring properties - CEMP, OMP and DP to ensure there are no emissions from the site that adversely affect use of the neighbouring properties - Ongoing engagement with the adjoining landholders throughout the project.
Flood and Drainage	All stages	- Appropriate site management measures for construction, operation and decommissioning of the project coupled with the proposed setbacks of the project to ensure it does not cause changes to erosion, siltation and riparian vegetation. - Provision of 55 metre setback from Bullawa Creek to the edge of the solar field to minimise further minimise risk of any impacts on the abutting riparian edge or waterway. - Adequate space between the rows of panels to ensure grass can be re-established on site to mitigate the risk of sediment runoff/erosion in the event the site is impacted by food. The Operation and Maintenance Plan will ensure this ground cover is maintained throughout the life of the project. - A further detailed flood modelling to ensure the detailed design and measures are directly correlated with the risk and ensure on-site and off-site risks are managed for the construction and operation of the site - A detailed drainage plan and/or engineering design plan to Council and Construction Environmental Management Plan (CEMP) for endorsement prior to the commencement of works on the site to ensure the project responds appropriately to the flood risks set out in the Flood Studies completed for the site. The CEMP will include soil and water management measures mitigate risks associated with drainage and flood. - The Decommissioning Management Plan will include provisions to ensure the final topography of the site does not increase any flood impacts within the site or to adjoining properties.
Visual Impacts		
Impacts on visually amenity of nearby sensitive receives and public road users	Pre-construction, construction and operation	60m setback to the fence of the solar field the site boundary that abuts Old Gunnedah Road 55m setback from the eastern edge of the solar field and Bullawa Creek 10m setback from the fence for the solar field in this southern portion of the site

Item	Timing	Mitigation Measure
		2.5m high landscape screen along the western and eastern boundary and unlimited height landscape screen along the southern boundary of the southern solar field. - Ongoing engagement with key stakeholders including sensitive receivers, Narrabri Shire Council, Narrabri Airport and CASA
Noise Impacts		
Noise impacts on nearby sensitive receivers	Construction and decommissioning	- Management and mitigation measures will need to be implemented through the construction environmental management plan and decommissioning plans to protect the amenity of these sensitive receptors. - Appropriate noise monitoring will be undertaken during stages of the construction to ensure that there are no unreasonable noise impacts to nearby residents and that noise levels comply with the regulations. - Noise assessments will be undertaken in accordance with the Interim Construction Noise Guideline (Department of Environment Climate Change and Water 2009) by a suitably qualified person and all mitigation measures implemented accordingly.
Traffic Impacts		
Hours of operation	During construction and operation	- For all phases of the project, construction works would be undertaken during normal construction hours only. That is, works would be undertaken between: 6am and 6 pm Monday to Friday 7am to 5 pm Saturday.
New Access	Construction	Construction a new access point to allow access to the site for all vehicles that will be accessing the site during all stages of the project. Access point to be generally in accordance with preliminary design and to the satisfaction of relevant authorities.
Traffic Management Plan	All stages	- A detailed Traffic Management Plan (TMP) be prepared prior to commencement of the project for approval by the relevant authorities and will include: - Confirmation of the Solar Farm construction timeframe and work stages; - Confirmation of expected traffic volumes generated by the wind farm for all work stages - Identification of all HV and OD vehicle haulage routes for all work stages;

Item	Timing	Mitigation Measure
		• A mechanism to review identified haulage route road conditions prior to the commencement of works; • Mechanisms/agreements (if deemed necessary) to maintain haulage route roads and road infrastructure, including local public roads used by site traffic, during construction works and to reinstate roads to at least pre-construction conditions; • Qualify any requirement for specific work stage construction traffic management plans; and • Qualify and identify any relevant mechanisms for OD vehicle permits and traffic management requirements. • An updated Traffic Impact Assessment and Traffic Management Plan to be prepared prior to decommissioning the project. Please note that this is not an exhaustive list, and that the final TMP requirements will be as per those outlined in any approval.
Parking	All stages	• During the construction operation and decommissioning of the project sufficient all-weather parking areas will be provided for staff working on the project.
Stakeholder Engagement and Consultation	All stages	• Ongoing consultation with all key stakeholders to ensure the traffic management approaches and solutions meet their expectations.
Hazards		
Bush Fire risks – ongoing engagement	All stages	• All electrical components would be designed and managed to minimise potential for ignition in accordance with the relevant Australian Standards. • Maximise use of construction components using materials such as glass, silicon, steel and aluminium rather than plastic • Develop an Emergency Response Plan (ERP) and Fire Management Plan (FMP) in consultation with the NSW RFS District Fire Control Centre prior to construction and operation. Development of an updated plans for decommissioning • Maximise use of construction components using materials such as glass, silicon, steel and aluminium rather than plastic • A trafficable asset protection zone (APZ) with a minimum width of 15 metres will be provided around the entire perimeter of the site • A minimum 20 metre Asset Protection Zone is provided between the edge of the solar array and the riparian vegetation along the eastern boundary abutting Bullawa Creek and around the east, west and southern boundaries of the southern solar field where the vegetation screen is proposed.

Item	Timing	Mitigation Measure
		- The design would consider that the trafficable APZ and the internal access tracks must be trafficable by Category 1 fire appliances. - Construction between 1 December and 31 March would be undertaken in accordance with the following: - All plant, vehicles and earth moving machinery will be cleaned of any accumulated flammable material (e.g. soil and vegetation) - A suitable fire appliance (e.g. fire extinguisher) is present on site with at least two personnel trained in bushfire fighting - On days when Very High fire danger or worse is forecast for Narrabri, the “fires near me” app is to be checked hourly for the occurrence of any fires likely to threaten the site - All operations involving machinery will cease while the GFDI is or forecast to be 35 or greater - Installation of electrical equipment such as, junction boxes, inverters, transformer and electrical cabling is to be in accordance with AS 3000:2007 Electrical installations and be undertaken by suitably qualified professionals. - All waste will be managed within the site include packaging waste shall be managed and removed from the site so as not to increase the potential fuel source for a fire - Install a water supply tank with a capacity of 20,000L outside the APZ and in location that is to the satisfaction of the RFS - Fit PV arrays with an earthing and lightning protection system connected to the main earth link. - Vegetation fuel levels internal to the APZ and throughout the solar farm will be maintained by grazing, slashing or mowing - The solar farm will be monitored via off-site control centres to monitor to ensure systems are working correctly, investigate any alarms and monitor panel performance - Site familiarisation sessions and emergency response review will be undertaken with the local RFS team prior to construction and decommissioning and on an agreed regular basis during operation. - Vegetation planted for landscape screening purposes must be determined in consultation with the RFS and the APZ increased if deemed necessary.
Electromagnetic Interference	All stages	The project will be designed to comply with all relevant standards and the project is setback from any nearby sensitive receptors.

Item	Timing	Mitigation Measure
Stakeholder Engagement and Consultation	All stages	Ongoing stakeholder engagement throughout the project to ensure the community, key stakeholders and local service providers are aware of the timing of the key project milestones and understand the potential impacts of these milestones.
Socio-economic impacts		
Socio Economic impacts on locality and area	All	All relevant measures are covered above and below in this table.
Other Environmental Impacts		
Soil Impacts	All	Construction Environmental Management Plan, Operation Management Plan and Decommissioning Plan to include measures to ensure the project does not have any adverse soil impacts through contamination, unnecessary disturbance or erosion.
Water Use	All	- Access to water negotiated prior to the commencement of works - Construction Environmental Management Plan, Operation Management Plan and Decommissioning Plan to include measures to ensure water use is
Groundwater	All	Construction Environmental Management Plan, Operation Management Plan and Decommissioning Plan to include measures to ensure the project does not have any adverse ground water impacts through contamination.
Air Quality	All	Dust mitigation measures will be established for the construction and operational management plans.
Waste	All	- Construction Environmental Management Plan, Operation Management Plan and Decommissioning Plan to include measures to minimise environmental impacts of waste generated the project through waste control and recycling measures. - Damaged or end of life panels to be recycled through Canadian Solar's module recycling program. - Onsite testing to be carried out on the waste water generated onsite to see if it is within discharge limits and appropriate permitting obtained if possible. - If the waste water is not within discharge limits the wastewater collected in the tanks would be pumped out and taken to an offsite licensed facility on a regular basis. - A licensed contractor will be appointed for wastewater management during construction of the project.

10 CONCLUSION

Using a multi-criteria process, this site was selected as it is proximate to critical infrastructure, highly modified land with limited site constraints, and with a limited number of nearby sensitive interfaces. The proposal has been designed to avoid, minimize and then mitigate any environmental impacts, including avoiding significant stands of vegetation on site, avoiding all impacts on cultural heritage excluding one aboriginal cultural heritage tree, and proposing vegetation screening to reduce any visual impacts on the limited number of sensitive receptors to the site. The proposal will have impacts on the amenity of nearby residents for a short period during construction through noise and traffic however potential impacts will be managed and mitigated through appropriate management plans and measures. All other environmental impacts can be readily managed and mitigated through the measures set out in in this Assessment and summarised in Section 9.13.

Community and stakeholder consultation undertaken to date, including town hall meetings and one on one discussions with all nearby landholders has only revealed one concerned resident and the design was modified to mitigate the potential impacts raised by this resident.

It is considered the project is proposed in a highly suitable and strategic location with limited environmental and community impacts and will make a valuable contribution to the goals of the New South Wales Renewable Energy Action Plan.

Appendix A – Narrabri South Solar Farm SEARs

Appendix B - Context and Site Plans

Appendix C - Proposed Layout Plan

Appendix D - Capital Improved Value

Appendix E - Biodiversity Assessment

Appendix F - Exploration Licences

Appendix G - Engagement Outcomes Report

Appendix H – Stakeholder Engagement Plan

Appendix I - Cultural Heritage Assessment

Appendix J - Flood Study

Appendix K - Visualisations

Appendix L - Noise Assessment Report

Appendix M – Traffic Counts

Appendix N - Traffic and Transport Assessment