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Environmental Impact Statement

29-Jun-2018

Springdale Solar Farm

Environmental Impact Statement

Prepared for Renew estate.

Springdale Solar Farm

Client: Renew Estate Pty Ltd

ABN: 21 617 855 311

Prepared by

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Quality Information

Document Springdale Solar Farm

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Date 29-Jun-2018

Prepared by Dinesh Nadarajah, Matthew Filmer

Reviewed by Jamie McMahon, Richard Farmer

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
Draft	15-Dec-2017	For review	Jamie McMahon Project Manager	
Final	27-Apr-2018	For lodgement	Jamie McMahon Project Manager	
Final	29-Jun-2018	For lodgement (with updates to satisfy EPBC Act additional assessment)	Jamie McMahon Project Manager	

Certification

Submission of an environmental impact statement. Prepared under Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW).

Environmental impact statement prepared by:

Name	Jamie McMahon
Qualifications	Bachelor of Environmental Science (Honours I) Certified Environmental Practitioner – Impact Assessment Specialist (No. IA11004)
Address	AECOM Australia Pty Ltd Level 21, 420 George Street Sydney NSW 2000
Development application	SSD 8703
Applicant	Renew Estate Pty Ltd
Applicant address	101/39 East Esplanade Manly NSW 2095
Proposed development	Construction, operation and decommissioning of a photovoltaic solar farm with a capacity of up to 120 megawatts of direct current (MWdc) and 100 megawatts of export capacity (alternating current) (MWac), and associated infrastructure.
Land to be developed	Lot 1 DP198933, Lot 10 DP754908, Lot 15 DP754908, Lot 54 DP754908, Lot 97 DP754908, Lot 111 DP754908, Lot 161 DP754908, Lot 182 DP754908, Lot 189 DP754908, Lot 190 DP 754908, Lot 202 DP754908, Lot 209 DP754908.

I certify that I have overseen the preparation of this environmental impact statement in accordance with the Secretary's Environmental Assessment Requirements as issued on 26 September 2017 and supplemented on 2 May 2018, and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. The environmental impact statement contains all available information that is relevant to the environmental assessment of the infrastructure to which the statement relates. To the best of my knowledge, the information contained in the environmental impact statement is neither false nor misleading.

Signature

Name	Jamie McMahon
Date	29 June 2018

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Abbreviations

AACHIA	Aboriginal Archaeological and Cultural Heritage Impact Assessment
AC	Alternating current
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ATC	Air Traffic Control
BAM	Biodiversity Assessment Methodology
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BCC	Biodiversity Credit Calculator
BDAR	Biodiversity Development Assessment Report
BMP	Biodiversity Management Plan
BSAL	Biophysical Strategic Agricultural Land
CASA	Civil Aviation Safety Authority
dB	decibel
dB(A)	A measure of A-weighted sound levels in decibels
CEEC	Critically endangered ecological community
CEMP	Construction Environmental Management Plan
DC	Direct current
DCP	Development Control Plan
DEMP	Decommissioning Environmental Management Plan
DoEE	Department of Environment and Energy
DP&E	NSW Department of Planning and Environment
DPI	Department of Primary Industry
EEC	Endangered ecological community
EIS	Environmental Impact Statement
EMF	Electromagnetic fields
EMP	Environmental Management Plan
EMS	Environmental Management System
ESD	Ecologically Sustainable Development
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ESCP	Erosion and Sedimentation Control Plan
FAA	Federal Aviation Administration (USA)
FM Act	*Fisheries Management Act 1994*
GDE	Groundwater Dependant Ecosystem
GHG	Greenhouse Gas
GSM	Golden Sun Moth
GW	Gigawatts

GWh	Gigawatt hours
ha	Hectare/s
HV	High Voltage
IBRA	Interim Biogeographic Regionalisation for Australia
ICNG	Interim Construction Noise guideline
INP	Industrial Noise Policy
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
km	Kilometres
kV	Kilovolt
LALC	Local Aboriginal Land Council
LCZ	Landscape Character Zones
LEP	Local Environment Plan
LGA	Local Government Area
LLS	Local Land Services
LSC	Land and Soil Capability
LVIA	Landscape and Visual Impact Assessment
m	Metres
mm	Millimetres
MNES	Matters of National Environmental Significance (from the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*).
MW	Megawatt
MWac	Megawatt alternating current
MWdc	Megawatt direct current
MWp	Megawatt
NEM	National Electricity Market
NESA	National Energy Security Assessment
NHMRC	National Health and Medical Research Council
NML	Noise Management Level
NP&W Act	*National Parks and Wildlife Act 1974*
NPI	National Pollution Inventory
NSW	New South Wales
O&M	Operation and Maintenance
OEH	Office of Environment and Heritage (formerly DECCW, DECC, DEC)
OEMP	Operational Environmental Management Plan
PCS	Power Conversion Stations
PCT	Plant Community Type
PMST	Protected Matters Search Tool
POEO Act	*Protection of the Environment Operations Act 1997*
PV	Photovoltaic
RAP	Registered Aboriginal Parties
RBL	Rating Background Level
RE	Renew Estate Pty Ltd
RE Act	*Renewable Energy (Electricity) Act 2000*

RET	Renewable Energy Target
RHS	Radiation Health Series
RNP	Road Noise Policy
RPS	Radiation Protection Series
Roads Act	*Roads Act 1993*
Rural Lands SEPP	*State Environmental Planning Policy (Rural Lands) 2008*
SCADA	Supervisory control and data acquisition
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP 44	*State Environmental Planning Policy No.44 - Koala Habitat Protection*
SEPP 55	*State Environmental Planning Policy No 55 - Remediation of Land*
SEED	Sharing and Enabling Environmental Data
SSD	State Significant Development
SSF	Springdale Solar Farm
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
T	Tesla
TEC	Threatened Ecological Community
VDV	Vibration Dose Value
VIA	Visual Impact Assessment
WM Act	*Water Management Act 2000*

Executive summary

This EIS has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of Renew Estate Pty Ltd (Renew Estate) in support of State Significant Development Application SSD 8073, being the development of the Springdale Solar Farm (the project) in Sutton, New South Wales.

This Environmental Impact Statement (EIS) sets out the background environment and assesses the likely impacts associated with construction, operation and decommissioning of the project. The EIS has been prepared in accordance with the requirements of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act),*Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), and the Secretary's Environmental Assessment Requirements (SEARs) issued on 26 September 2017 and supplemented on 2 May 2018. Specifically this assessment seeks to fulfil the requirements of Section 4.15 of the EP&A Act and Schedule 2 of the EP&A Regulation while also satisfying the specific requirements of the SEARs with respect to environmental, social and economic factors relevant to the project.

Proposed project

The project includes solar generation equipment and associated infrastructure. The project has a capacity of up to 120 megawatts of direct current (MWdc) and 100 megawatts of export capacity (alternating current) (MWac). The project site (the Site) is generally greenfield and is located approximately 3.5 km north of the border with the ACT, and approximately 7 km north west of the Sutton village.

The project would include the following key components:

- Photovoltaic (PV) solar modules on a single-axis tracking system mounted on steel piles
- Approximately 22 containerised power conversion stations, containing electrical switchgear, inverters and transformers
- An electrical switchyard and substation that would be connected to the existing 132 kilovolt (kV) TransGrid transmission line that traverses the Site
- DC and AC cabling for electrical reticulation
- A control building including office, supervisory control and data acquisition (SCADA) systems, operation and maintenance (O&M) facilities, staff amenities, and associated carpark
- Two meteorological stations
- Internal all-weather access tracks
- Security fencing
- Landscaping
- Subject to the execution of a Voluntary Planning Agreement with Yass Valley Council (YVC) and agreement with YVC on the relevant works, construction of a new public road connection between Tallagandra Lane and Tintinhull Road (referred to in this EIS as Tintinhull Road re-alignment)
- Subject to the execution of a Voluntary Planning Agreement with YVC and agreement with YVC on the relevant works, subdivision of Lot 202 DP754908 to create a proposed new lot to be dedicated as a public road for the proposed Tintinhull Road re-alignment (as shown in Figure 11).
- Subdivision of Lot 209 DP754908 to create a new lot for the proposed substation (as shown in Figure 12).

The single-axis tracking system would orient the solar modules to follow the sun from east to west throughout the day. The tracking structures would be mounted on piles, which would be screw or pile driven depending on final geotechnical analysis.

The operational lifetime of the solar farm is approximately 30 years. Decommissioning at the end of the operational life of the solar farm would remove all above ground infrastructure and rehabilitate the Site to return it to its predevelopment condition.

Environmental Assessment

Biodiversity

A Biodiversity Development Assessment Report (BDAR) was prepared for the project. This was supported by fieldwork and assessed impacts relevant to both the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The project was referred to the Department of Environment and Energy (DoEE) on the basis of potentially significant impacts to Golden Sun Moth. The project was subsequently deemed to be a controlled action and supplementary assessment requirements were issued by DoEE. The assessment was updated in accordance with these requirements and is presents within the main body of this report.

The assessment identified the following TECs as being present within the Site:

- Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland (Endangered Ecological Community (EEC) under the BC Act and a Critically Endangered Ecological Community (CEEC) under the EPBC Act)
- Natural Temperate Grassland of the South Eastern Highlands (CEEC under the EPBC Act).

For both of these communities their representation within the Site was heavily degraded such that neither met the condition thresholds under the EPBC Act to warrant protection. Neither these or any other native vegetation communities within the Site were deemed to exceed the relevant vegetation integrity scores such that offsets were required under the BC Act.

Field surveys identified the presence or potential presence of several threatened species within the Site including Golden Sun Moth (GSM) (*Synemon plana)*, Superb parrot (*Polytelis swainsonii*), Dusky Woodswallow (*Artamus cyanopterus cyanopterus*), Scarlet Robin (*Petroica boodang*) and Varied Sittella (*Daphoenositta chrysoptera*), amongst a range of other bird species, many of which were assumed to be present based on habitat characteristics.

A range of avoidance and mitigation measures have been adopted as part of the project design, construction and operation to avoid, reduce or offset impacts upon threatened species. This includes avoidance of areas of higher quality GSM habitat as well as ongoing habitat management of these areas for the benefit of this species. Overall it has been calculated that 48 species credits would need to be obtained under the NSW Biodiversity Assessment Methodology (BAM) for the project to offset potential impacts. The project is not considered likely to result in any Serious and Irreversible Impacts to biodiversity (SAII).

Aboriginal heritage

A total of 15 Aboriginal archaeological sites, comprising 12 open artefact sites and three potential Aboriginal scarred trees were identified within the Site. All but one Aboriginal site was assessed as of low scientific significance with open artefact scatter site SSF-AS6-17 assigned moderate significance due to its research potential.

Consideration of the location of Aboriginal sites within the Site in relation to the location proposed project related impacts, as well as exclusion areas for environmental constraints, indicates that three open artefact sites comprising two artefact scatters and one isolated artefact site would be wholly impacted by the project. No potential scarred trees would be impacted.

Mitigation and management measures to address the impacts of the project on the known Aboriginal archaeological resource of the Site are provided in section 8.4. It is recommended that these measures be detailed in an Aboriginal Cultural Heritage Management Plan (ACHMP) for the Project, prepared in consultation with Registered Aboriginal Parties (RAPs), and to the satisfaction of the Office of Environment and Heritage (OEH) and the Department of Planning and Environment (DP&E).

Landscape and visual impacts

A total of fifteen visual receptor locations were identified to represent viewpoints for the assessment of potential impacts on views as a result of the Project. Of these, the significance of the visual impacts were assessed as high for one residence, high-moderate for two residences, moderate for three residences, moderate-low for two residences, low for three residences, and negligible for three residences. The visual impact to road users of Tallagandra Lane was assessed as moderate.

The Landscape and Visual Impact Assessment informed the development of a draft landscape plan which provides well integrated planted buffer areas of a minimum width of twenty metres along certain areas to minimise the extent of the solar array when viewed from surrounding receptor locations. Consultation on the draft landscape plan has occurred with the most affected receptors and would continue to occur during the finalisation of the plan.

Water

The existing runoff characteristics of the Site will be maintained throughout the operation of the solar farm. This would be achieved primarily through maintaining adequate grass cover beneath the solar arrays. During operation the runoff characteristics of the Site would be monitored. Should runoff regularly exceed that of the pre-development Site appropriate controls would be implemented. These may include the establishment of dams, vegetation, retention basins, infiltration trenches or swales.

Potential impacts to surface waters could occur during the construction phase as a result of exposure of soils during earthworks which may result in erosion and mobilisation of sediment into watercourses and contamination due to accidental spillages of chemicals used in the construction process. Potential construction impacts to surface water quality and quantity would be managed through the implementation of an Erosion and Sediment Control Plan (ESCP) and chemical storage and spill management procedures as part of a Construction Environmental Management Plan (CEMP).

While the proposal involves constructing solar arrays with impervious surfaces, these would not increase runoff from the Site during operation, as they would allow rainwater to drain to the ground underneath the arrays and follow similar flow paths to those currently present on the Site. By retaining good grass cover underneath the solar arrays, as the project intends to, the degree of surface water run-off would remain similar to current conditions. Changes in runoff characteristics as a result of increased imperviousness at the location of the access roads, control building, car parking and substation would be managed through the implementation of appropriate drainage features to promote attenuation and infiltration. Suitable scour protection/dissipation measures would also be provided at concentrated discharge points.

The only potential impacts to groundwater would be contamination due to spillages of chemicals used for construction or maintenance activities. This risk would be controlled through the implementation of procedures for chemical storage and use, and emergency spill management in accordance with the CEMP and Operation Environmental Management Plan (OEMP). Earthworks are unlikely to intercept the groundwater table.

The water demands during construction and operation would be satisfied by water imported (trucked in) to site and rainfall. Therefore the project would not impact on licensed water users or basic landholder rights.

A flood assessment was undertaken to evaluate the flood risk across the Site and provide input to the general layout of the project. The project infrastructure has been set outside areas with significant flood risk. No operational activities would occur within the riparian corridor with the exception of crossing the creeklines with underground utilities or on formed access roads which would be constructed in accordance with relevant regulations and guidelines.

Land

Given the benign nature of the project including low dust and vehicle emissions and noise, the operation of the project is expected to be compatible with the current adjacent land uses. During operation, no land use conflicts are likely with rural residential development, existing dwellings or surrounding grazing activities.

The estimated inherent soil fertility for the Site varies from moderately low to moderate from east to west. A search of Biophysical Strategic Agricultural Land (BSAL) areas returned no results within 30 km of the Site. The closest BSAL is located approximately 40 km to the east.

During operations, the project Site of 370 ha would be modified from the present land use for a period of approximately 30 years. Whilst current cattle grazing activities would be taken out of production, the grazing of sheep would occur underneath and between the solar arrays across the Site. The grazing of sheep would allow the agricultural land use to continue and would provide fire and weed management benefits through reducing and maintaining pasture growth. It is also noted that such grazing practices would provide beneficial outcomes for the maintenance of habitat for some native species and ecological communities.

The construction of the project has limited potential to result in increased levels of soil erosion, as most construction activities do not involve the removal of the surface layer and exposure of the erosion-prone B horizon within higher risk areas such as Back Creek and the other unnamed creek that runs through the Site. The proposed project is located in an area of lightly undulating terrain and predominantly cleared grazing land, and as such no major earthworks would be required.

As the development would result in only low level impacts upon the soil surface, the proposal is viewed as largely reversible upon decommissioning of the project.

Noise and vibration

Construction activities are predicted to comply with the recommended noise management levels at most receiver locations with the exception of four receivers, R1 360 Tallagrandra Lane, R2 156 Kiaora Lane, R3 141 Tallagandra Lane and R5, during certain construction stages. An exceedance of 11 dB(A) has been predicted during the site establishment stage at receivers R1, R2, R3 and R5. During the piling/foundations stage exceedance of up to 10 dB(A) have been predicted at R1 and R2. Exceedances of up to 4 dB(A) are predicted at R1 and R2 during the assembly stage. The construction noise model incorporated a number of conservative assumptions with actual noise levels likely to be lower in reality.

Road traffic noise levels were found to be significantly less that the road noise criteria.

The predicted operational noise levels comply with the most stringent (evening time) operational noise criteria at all locations. It is expected that the inverters (which are the dominant noise sources), would operate at a reduced load in the evening compared to during the day time and as such the noise emission levels would also be reduced.

The only significant vibration intensive works to be carried out during construction of project would be impact piling, during which the safe working distances for structural damage and human response would be complied with.

Non-Aboriginal heritage

There are no historic heritage values within the Site listed on UNESCO, Commonwealth, State or Local Government Lists, Registers or Schedules. The closest listed historic heritage item is Bywong Homestead, outbuildings and landscape, listed in the Yass Valley Local Environmental Plan, located 2.6 km east of the Site. In addition, no historic heritage items were identified during a field survey.

As no historic heritage values were identified within the Site or directly adjacent to it, no impacts to historic heritage items, places or values are anticipated, including views and vistas from the historic villages of Gundaroo and Sutton.

Traffic and transport

The construction phase of the project would require movements by a variety of heavy and light vehicles. This would include delivery vehicles carrying components, parts, equipment and machinery, as well as light vehicles carrying workers, small parts and equipment.

The majority of key construction materials would be likely delivered from the Sydney and Wollongong region via Federal Highway. The primary heavy vehicle route to Site turns off the Federal Highway at

Sutton Road. In the Sutton township, Sutton Road becomes Bywong Street. From Bywong Street, a left turn is proposed at Victoria Street, then a right at Camp Street before turning left to re-join Sutton Road for about 500 m and turning left onto East Tallagandra Lane. East Tallagandra Lane is about 5.5 km and joins Mulligans Flat road. A left turn at Mulligans Flat road is proposed before turning left after 300 m onto Tallagandra Lane.

The primary heavy vehicle route is considered suitable for construction traffic with the following works undertaken:

- Potential upgrade of the culvert on Tallagandra Lane, subject to further review prior to construction
- Potential temporary relocation of signage at turn locations
- Further review of transmission line heights to confirm there is sufficient clearance with heavy vehicles
- Minor road grading of Tallagandra Lane if required, to restore the driving surface to a suitable smoothness and shape. This would apply to the unsealed section of Tallagandra Lane that would be used for site access, extending from the northern-most site access point adjacent to the substation, to the point at which the road becomes sealed 150m south of the Site. Ongoing maintenance of the road surface would be undertaken as required throughout construction including grading and dust suppression.

Up to approximately 400 light vehicle and 75 heavy vehicle movements per day are anticipated during peak construction. Impacts from increased vehicle numbers on the road network would be manageable through careful project planning, including scheduling of movements. These protocols would be documented in a project-specific Traffic Management Plan developed in consultation with the local authorities and communicated to all key stakeholders, particularly the contractors and the local community.

The impacts of the project on traffic and transport during construction are considered manageable without the need for any significant upgrade or sealing of any roads. This is supported by the assessment set out in section 14.0 of this EIS. Despite this, however, Renew Estate has offered to enter into a Voluntary Planning Agreement with YVC to provide an additional public benefit of contributing funds to the upgrade of some currently unsealed sections of Tallagandra Lane. Renew Estate understands that YVC has no immediate plans to upgrade Tallagandra Lane due to other priority projects within the Local Government Area (LGA), however feedback provided to Renew Estate from the community during community consultation activities has identified that the state of Tallagandra Lane is an important issue for local residents. Renew Estate is continuing to work with YVC towards agreeing the terms of a Voluntary Planning Agreement that would allow for the provision of this public benefit (amongst other benefits). YVC has confirmed that, if such an agreement is able to be reached, that they would be the consent authority for these upgrade works. Accordingly, consent is not sought in this application for this component.

Traffic and transport impacts during operation would be negligible with approximately 10 additional light vehicle movements per day.

Hazards

Hazards considered in this EIS include bushfire, Electromagnetic fields (EMF) and hazards to aviation.

Bushfire

The Site does not lie on an area designated as bushfire prone land.
Further, the bushfire risk is considered low due to the mildly undulating terrain and lack of significant shrub or canopy vegetation within the vicinity of the Site.

Bushfire risks caused by construction activities are manageable through measures in the CEMP. During operation, bushfire risks would predominantly be associated with electrical component faults, maintenance works and possibly cigarette butts from vehicles travelling along Tallagandra Lane. There would be no smoking permitted within the Site at all times.

All electrical components would be designed to minimise potential for ignition and all maintenance works would be carried out by suitably qualified personnel. Ground cover beneath the panels would be maintained at an appropriate level through sheep grazing and cutting as required so as to minimise the build up fuel levels.

A 20,000L static water supply would be provided at the Site. Asset protection zones of 20 metres would be also be provided around perimeter of the solar fields and would include trafficable defendable space with ample ability for fire fighting vehicles to access and manoeuvre around.

A Bushfire Management Plan would be developed in consultation with RFS and implemented during both construction and operation and include various mitigation and management measures to reduce the ongoing risks of bushfire.

Electromagnetic Fields

The worst case magnetic fields in the vicinity of the solar farm were identified to be associated with the existing 330 kV and 132 kV transmission lines, which pass through the south-west corner of the Site.

All EMF sources associated with the project were determined to be below the recommended EMF limits.

Aviation (Glare)

The project is approximately 19 km from the nearest airstrip (Canberra Airport) and as such it is considered unlikely that the solar farm would create any significant glare issues for pilots on approach to or on departure, as per relevant US Federal Aviation Administration guidance (as recommended by the Civil Aviation Safety Authority).

Further to this, the alignment of the flightpaths into and out of Canberra airport is perpendicular to the orientation of PV solar panels on the single axis trackers. The PV solar panels would be aligned as much as possible to face directly into the sun and follow its path across the sky from east to west throughout the day. As approaching and departing aircraft would be traveling in a southern and northern direction respectively, the likelihood of an aircraft being in direct reflection from the sun would be reduced to the middle of the day. Arrivals and departures at Canberra Airport are concentrated to the morning and afternoon peak periods with relatively few movements between 11 am and 1 pm.

Solar PV plants with a large footprint have the potential to create heat islands producing rising convection currents that could potentially affect the operation of aircraft overflying the area. PV solar panels reduce albedo by making the surface darker and less reflective, leading to increased heat absorption. PV panels although having a low heat capacity can be up to 20°C warmer than the ambient temperature during the day causing the surrounding air mass to heat and rise.

The risk of a rising thermal plume affecting aviation approaching or departing Canberra Airport is considered low given the relatively small temperature differentials producing the thermal plume and the height of aircraft overflying the Site which are typically at least 900 m in altitude. Furthermore the widespread practice of siting large solar plants at airports suggests convection from solar panels is unlikely to be a significant safety issue for aviation activities.

Socio-economic

The socio-economic and environmental benefits of developing renewable energy sources and transitioning to a low carbon energy market are considered to be positive. The adoption of renewable energy sources would assist Australia to transition away from the historic carbon-intensive energy production industry which is linked to significant atmospheric pollution and climate change. The project would also contribute to a downward pressure on the historically-high energy prices currently affecting households and industries.

Potential negative impacts due to the operation of the proposed solar development would include a reduction of productivity of agricultural land and change in landscape character and visual amenity for visual receptors.

Whilst the project would not remove agricultural practices from the Site it is anticipated that the type and intensity of livestock on the Site would change. This change is not considered to be a significant impact in the context of agricultural activity across the wider Yass Valley.

Upon decommissioning, solar infrastructure would be removed and the Site would be returned to a condition near to its current state, which would be suitable for future agricultural activities such as grazing.

During construction of the project, it is considered that both positive and negative socio-economic impacts would be generated. The project promotes socio-economic wellbeing through offering opportunities for employment, training and up-skilling of the local and regional workforce throughout its construction and operation. Opportunities would be available to workers from a wide range of fields and expertise, including engineers, construction workers and labourers with further employment opportunities associated with supply chains and local goods and services.

Likely negative impacts during construction include increased traffic on local roads and hazards associated with heavy vehicles and plant, change in the visual amenity of the area, influx of workers which may put pressure on local community services, change in noise amenity of the immediate surrounding area and increased dust emissions. All of these impacts would be temporary with construction expected to take approximately 10 months.

A Community and Stakeholder Consultation Plan would be implemented during construction to manage potential impacts to community stakeholders.

Waste

Solid waste that would be generated during the construction phase includes biomass from site clearing, excess construction materials, packaging materials, office waste, food waste and sewage from temporary toilets. Noting that the Project design is a modular system which would be prefabricated and assembled on-site, the quantity of construction solid waste is expected to be low, temporary in nature and would be readily managed employing conventional procedures to ensure compliance with legislative requirements and best practices.

Waste bins/skips and a designated area within the laydown area would be provided for collection and temporary storage of waste. All waste would be collected, handled, stored, transported, recycled and/ or disposed in compliance with relevant regulations and guidelines. Solid waste would likely be collected and disposed at the Gundaroo landfill operated by YVC.

Waste generated during operation includes solid waste such as, office and food waste, maintenance waste consisting of replaced equipment, scrap materials and transformer oils from O&M operations and sewage from the toilets on-site.

The waste generated is minimal and can be managed using conventional waste collection, handling and disposal procedures in compliance with regulatory requirements.

Air Quality

During the construction phase, dust potentially would be generated from earthworks activities such as excavation and trenching as well as from vehicles movement on unsealed roads during dry weather. Due to the gentle undulation of the Site, there would be no major cut and fill works or stockpiling of earth. The existing vegetation would be retained as best practicable throughout the Site and the all-weather internal roads would be laid with gravel. As such, dust emissions would be limited and dust suppression measures would be implemented.

Air emissions would be generated from vehicles transporting workers to and from the Site, trucks delivering construction materials and construction machinery such as piling rigs, excavators, graders and diesel generators. The emissions would peak during the peak of construction but would be temporary in nature. Emissions are expected to be dispersed by prevailing winds and not significantly impact local air quality.

During operation, localised dust would potentially be generated from vehicles travelling on the internal roads for carrying out routine inspection works and maintenance activities. In order to minimise dust generation, all internal access roads would be constructed using a hardstand material. The impacts on local and regional air quality due to dust through the operational phase is expected to be negligible.

During operation, air emissions would be generated from the vehicles of the 5-10 workers travelling to the and from the Site each day, periodic operations and maintenance works, as well as occasional

unscheduled repair works. Minor application of pesticides may be required for weed control. The application regime would likely similar to current usage, if not reduced. The air emissions throughout the operation phase are considered negligible.

A key environmental benefit of project is the generation of electricity without the emissions of GHG that would otherwise be generated from conventional thermal power plants using fossil fuels. The reduction in GHG emissions would have a positive impact on climate change and facilitate transition to clean renewable energy in line with NSW government policies and Australia's Renewable Energy Target (RET).

Cumulative impacts

Cumulative impacts result from the aggregation and interaction of environmental impacts on the same receptor from multiple developments, and may occur concurrently or sequentially. For this project the assessment of cumulative impacts has considered any other approved or proposed developments in the area, including but not limited to the approved Collector Wind Farm, the proposed Gunning Solar Farm and existing Tallagandra Pit. The assessment found that no significant cumulative impacts are likely.

Conclusion

The positive impact of this renewable energy project coupled with the mitigation and management measures specified would, in effect, render this project socially acceptable, environmentally sound and economically viable. It is recommended that the project proceed, subject to implementation of the mitigation and management measures referred to herein, as well as a comprehensive environmental monitoring and auditing programme.

1.0 Introduction

1.1 Purpose and scope of assessment

This Environmental Impact Statement (EIS) has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of Renew Estate Pty Ltd (Renew Estate) in support of State Significant Development Application SSD 8073, being the development of the Springdale Solar Farm (SSF) (the project) in Sutton, New South Wales (NSW).

This EIS sets out the background environment and assesses the likely impacts associated with the development, including construction, operation and decommissioning of the project. The EIS has been prepared in accordance with the requirements of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), and the Secretary's Environmental Assessment Requirements (SEARs) issued on 26 September 2017 and supplemented on 2 May 2018 (both SEARs are included in Appendix A). Specifically, this assessment seeks to fulfil the requirements of Section 4.15 of the EP&A Act and Schedule 2 of the EP&A Regulation while also satisfying the specific requirements of the SEARs with respect to environmental, social and economic factors relevant to the development.

1.2 Project overview

Renew Estate propose to develop the SSF at Sutton, NSW, in the Yass Valley Local Government Area (LGA). The project site (the Site) is generally greenfield and is located approximately 3.5 km north of the border with the ACT, and approximately 7 km north west of the Sutton village. The solar farm includes solar generation equipment and associated electrical infrastructure and has a design life of approximately 30 years. The project has a capacity of up to 120 megawatts of direct current (MWdc) and 100 megawatts of export capacity (alternating current) (MWac).

The project would include the following key components:

- Photovoltaic (PV) solar modules on a single-axis tracking system mounted on steel piles
- Approximately 22 containerised power conversion stations, containing electrical switchgear, inverters and transformers
- An electrical switchyard and substation that would be connected to the existing 132 kilovolt (kV) TransGrid transmission line that traverses the Site
- DC and AC cabling for electrical reticulation
- A control building including office, supervisory control and data acquisition (SCADA) systems, operation and maintenance (O&M) facilities, staff amenities, and associated carpark
- Two meteorological stations
- Internal all-weather access tracks
- Security fencing
- Landscaping
- Subject to the execution of a Voluntary Planning Agreement with the Yass Valley Council (YVC) and agreement with YVC on the relevant works, construction of a new public road connection between Tallagandra Lane and Tintinhull Road (referred to in this EIS as Tintinhull Road re-alignment)
- Subject to the execution of a Voluntary Planning Agreement with the YVC and agreement with YVC on the relevant works, subdivision of Lot 202 DP754908 to create a proposed new lot to be dedicated as a public road for the proposed Tintinhull Road re-alignment (as shown in Figure 11).
- Subdivision of Lot 209 DP754908 to create a new lot for the proposed substation (as shown in Figure 12).

The single-axis tracking system would orient the solar modules to follow the sun from east to west throughout the day. The tracking structures would be mounted on piles, which would be screwed or pile driven depending on final geotechnical analysis.

The on-site switchyard and substation would lie adjacent to the existing 132kV TransGrid Easement. Final design would be carried out in collaboration with TransGrid and the Australian Energy Market Operator (AEMO). Civil and earthworks would be carried out to meet the transmission substation design guidelines.

The operational lifetime of the solar farm is approximately 30 years. Decommissioning at the end of the operational life of the solar farm would remove all above ground infrastructure and rehabilitate the Site to return it to its predevelopment condition.

Based on the initial design and the current solar engineering, procurement and construction market the estimated gross capital investment value of the project would be approximately $138,000,000.

1.3 Project location

The project is proposed to be located on existing farmland in Sutton, NSW, within the Yass Valley Council LGA, approximately 3.5 km northeast of the ACT border (Figure 1). Sutton Village is located approximately 8 km southeast of the Site. The Site is accessible via the partially sealed Tallagandra Lane from the east via Mulligans Flat Road. This site is also accessible via Murrumbateman Road and Tallagandra Lane from the north.

The Site is approximately 370 hectares in size, of which approximately 190 hectares would be occupied by the solar farm and associated infrastructure (the development envelope).

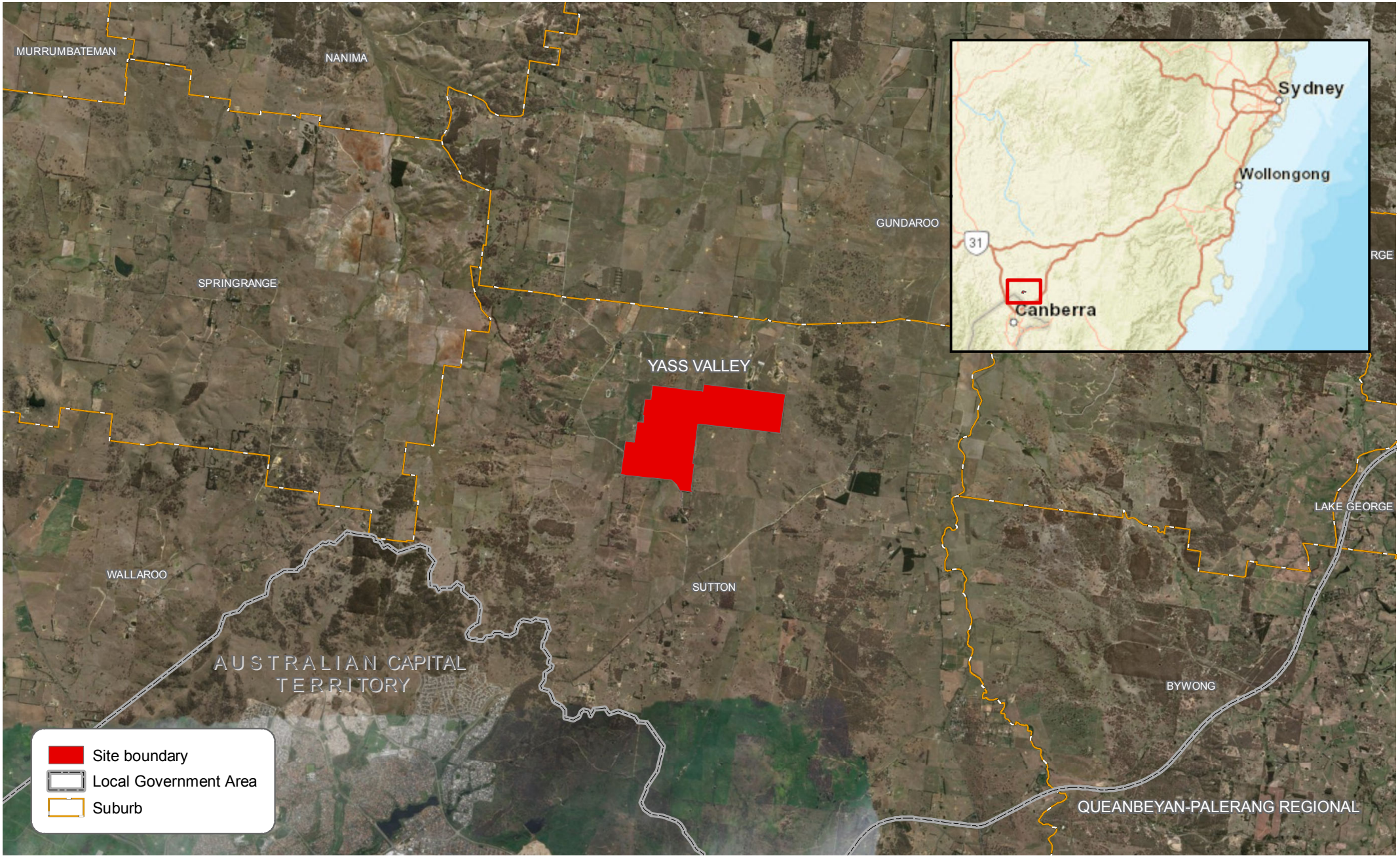
The Site is located on the following lots:

- Lot 1 DP198933
- Lot 10 DP754908
- Lot 15 DP754908
- Lot 54 DP754908
- Lot 97 DP754908
- Lot 111 DP754908
- Lot 161 DP754908
- Lot 182 DP754908
- Lot 189 DP754908
- Lot 190 DP 754908
- Lot 202 DP754908
- Lot 209 DP754908.

The landowner of these lots will lease the land to the project owner during the life of the project.

The Site also includes a number of paper roads, being unformed Crown roads located adjacent to the boundaries of several of the above lots. Further detail regarding these roads is set out in section 14.0.

Tallagandra Lane, which runs in a northwest-southeast direction, divides the lots in the southern portion of the Site. This public local road continues southeast of the Site to connect to Mulligans Flat Road.

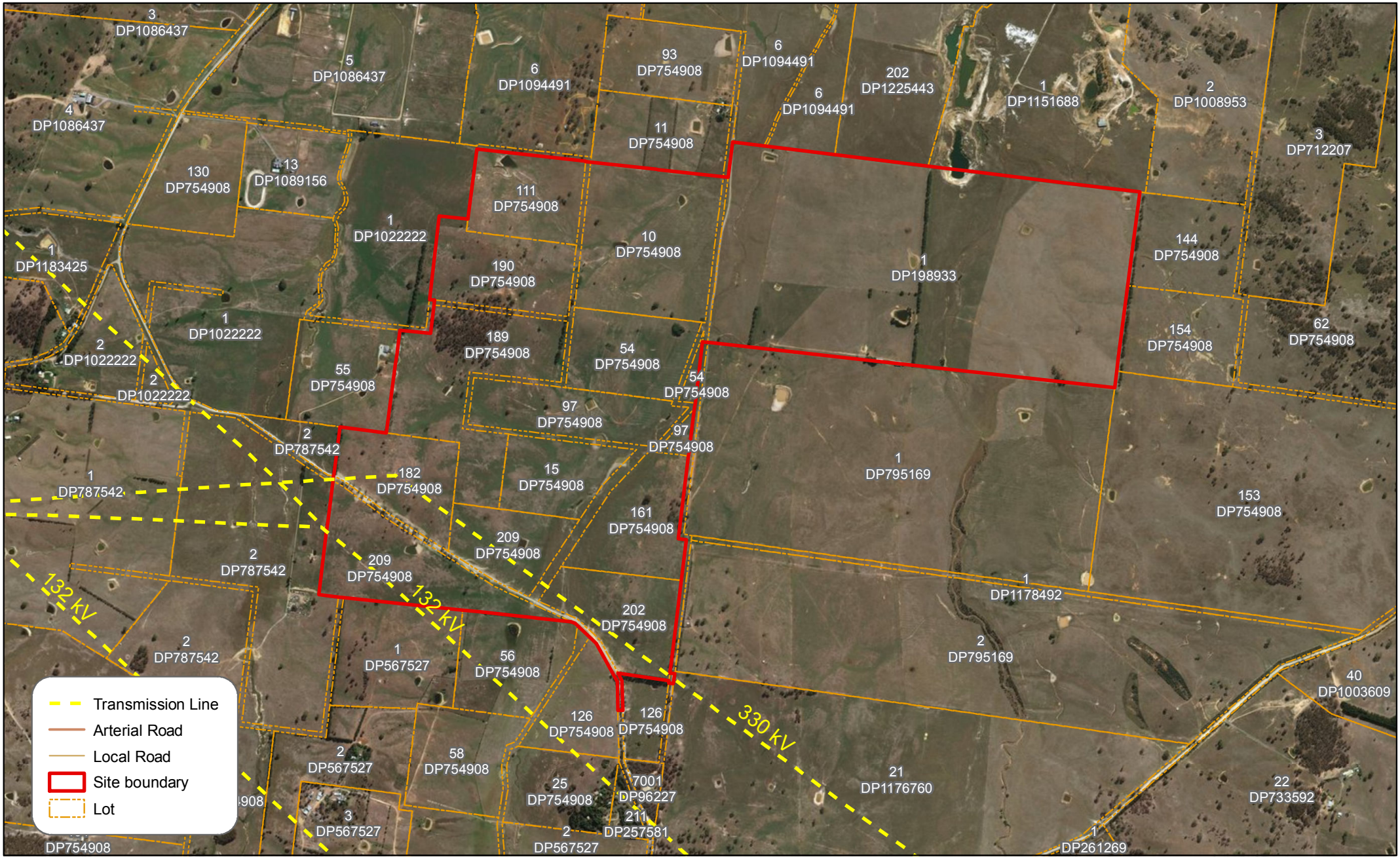


SPRINGDALE SOLAR FARM

SITE CONTEXT

DATE 19/04/2018
SCALE 1:100,000
PROJECT 60555008
DRAWN PH

Figure 1 Site context



SPRINGDALE SOLAR FARM

SITE LOCATION

AECOM Renew estate.

0 0.5 NORTH 1 2 km

DATE 19/04/2018
SCALE 1:20,000
PROJECT 60555008
DRAWN PH

Figure 2 Site location

1.4 Project features

The proposed project consists of the construction and commissioning of a Renewable Energy facility (Solar PV) and associated ancillary facilities. The project would involve the installation of approximately 350,000 individual PV modules, arranged on tracking structures referred to as trackers or tracker tables.

Tracker tables are grouped into power blocks, with consolidated DC cable runs back to the power conversion stations (PCS) in order to convert the incoming 1500 V DC power from the array to 33 kV AC power. It is anticipated that an estimated 5.5 MWp of modules would feed each PCS, resulting in approximately 22 of these PCSs across the Site.

Underground cabling would be installed to connect each of the PCS to the dedicated on-site HV substation. The HV substation would facilitate the voltage step up of generated electricity for connection to the 132 kV TransGrid transmission line.

A control building would be constructed along with associated parking facilities for an estimated 10 light vehicles. The control building would house the IT systems required for the management of the proposed solar facility including interface with the Site SCADA system and incoming weather data. The control building would also include staff amenities. A warehouse/workshop would be included as part of the control building to provide a maintenance base for the solar farm, including the storage of spare parts and safety equipment.

Security features to be constructed would include a perimeter security fence and CCTV security cameras with infrared sensors to provide 24/7 monitoring of the Site boundary. Sensor lights and/or surprise lighting may be installed in selected locations such as entrance roads to deter trespassers. The indicative height of the security fencing would be up to 2.2 metres, subject to final design which would seek to minimise the visual impact of the fencing while ensuring that it is appropriate for security and safety purposes.

Two weather stations would be installed at spatially distinct areas around the Site to monitor weather conditions and plant performance. Furthermore a number of anemometers would be installed around the Site perimeter to ensure that during extreme wind events that modules are aligned appropriately to reduce the risk of unnecessary damage. There is also the possibility of on-site short-term weather monitoring to inform dispatch capabilities.

One or two static water supply tanks filled by delivered water, with a combined capacity of 20,000 litres, would be located within four meters of hardstand areas/all-weather access roads for firefighting purposes. Separate water tanks, of approximately 50,000 litres, filled by rainwater or delivered water, would supply potable water for the staff amenities.

1.5 Project proponent

The proponent of the project is Renew Estate Pty Ltd (Renew Estate). Renew Estate is currently developing several medium to large scale renewable energy projects around Australia. The company maintains strong community values and is passionate about addressing the goals of all stakeholders and delivering appropriate and considerate uses of land, technology and investment. Renew Estate's goal is to embed sustainable energy into rural and urban lifestyles whilst enhancing energy security and affordability. Renew Estate develops utility scale solar farms that are flexibly designed to work with the existing and future natural and built environments.

Renew Estate comprises of a number of shareholders including Wirsol Energy (subsidiary of WIRCON Group). Wirsol Energy is Renew Estate's largest shareholder. The WIRCON Group is a globally operating group of companies that specialise in the development, construction and operation of PV systems (ground & rooftop mounted) and wind farms. WIRCON possesses significant know-how through its engineering of more than 850 MW of installed power worldwide using state-of-the-art technology.

Beast Solutions is also a shareholder of Renew Estate. The Beast Solutions team provides advisory, due diligence and design management support for property and renewable generation developments, low carbon precincts, smart grids and microgrids. Beast Solutions has played a key role in some of the most advanced and recognisable projects in the field.

1.6 Purpose of environmental impact assessment

The purpose of this EIS is to assess, and propose mitigation measures for, the environmental and social implications of proceeding with the development. This EIS has also been prepared to meet the SEARs for the proposed facility, issued by the NSW Department of Planning and Environment (DP&E) on 26 September 2017 and supplemented on 2 May 2018, as well as the recommendations of other consulted agencies and relevant stakeholders. The document has been prepared in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

In addition to describing the project, the EIS presents a comprehensive and focussed assessment of the associated planning and environmental issues to a level of detail commensurate with the scale of the development, the characteristics and previous use of the Site, and the legislative framework under which the development is to be assessed and determined. The matters dealt with in this EIS are presented in a manner that clearly addresses the specific requirements of the SEARs, as well as the requirements of other consulted government agencies and stakeholders. The SEARs with cross references to specific sections of this report is attached in Appendix A (Secretary's Environmental Assessment Requirements).

1.7 Format of assessment chapters

Throughout the EIS all relevant environmental and social factors have been assessed in the same manner for consistency. In each section the following have been addressed:

Method of assessment – this section explains the methodology undertaken for the specialist assessments, including reference to relevant legislation and assessment guidelines.

Existing environment – this section describes the key components and characteristics of the environment prior to the commencement of construction or operation of the project.

Impact assessment – this section identifies the main environmental issues relevant to the factor and assesses the impacts of the SSF project with regard to these issues. Where existing criteria, guidance, environmental or assessment methodologies exist, the determined significance of an impact would be guided by that information. Where no explicit guidance or information is available, qualitative judgement on the significance of an impact has been provided. The judgement as to whether an impact is significant would depend on the importance or sensitivity of the receptor (e.g. as defined by legislation, policy, standards or guidance) and the magnitude of the proposed impact (as decided by quantitative or qualitative means).

Mitigation and management measures – this section provides a description of the measures that would be implemented to avoid, minimise, mitigate, rehabilitate/remediate, monitor and/or offset the potential impacts of the SSF project. Where possible, the first priority has been to avoid the impact. In instances where this is not possible or feasible, impacts would be reduced at the source or at the receptor through a suite of mitigation and management measures. Finally, where avoidance or reduction cannot be achieved to a practicable or acceptable level, compensation or offsetting would be employed or recommended. Management and mitigation measures to be implemented through particular environmental management plans (EMPs) are also included where relevant.

2.0 Project need and alternatives

2.1 Project Objective

The objective of the project is to develop a viable, commercial-scale solar energy plant, which would deliver a low cost, low carbon, renewable energy source for the benefit of all energy users within the National Electricity Market (NEM).

The project aims to reduce the greenhouse gas (GHG) emissions arising from the NEM for the benefit of all Australian's and assist the NSW and Commonwealth governments to meet Australia's renewable energy targets and other national and international energy and climate change objectives.

Delivering economic benefits to the local region is another important objective for the project. This includes provide significant social and economic benefits to both the local community and surrounding region throughout the project construction and ongoing operation.

The development process purposes to engage meaningfully with the local community and government to help shape a project which is suitable for the region and would enhance opportunities for regional investment, economic development and employment and other social benefits during construction and operation. This process also aims to design, construct and operate the project in such a way that adverse local and regional environmental, social and heritage impacts are minimised as far as practicable while beneficial impacts are promoted and enhanced.

2.2 Strategic justification

There is an increasing global recognition of the mounting imperative to mitigate the environmental impacts associated with fossil fuel-based energy generation, specifically around CO_2 emissions. This has manifested into international, national and state-wide policy commitments from government and industry in support of the development of clean and renewable sources of energy. In addition to this the economic benefits of renewable energy projects are becoming increasingly strong and evident, particularly for new generation projects. Not only are renewables now the most economical source of new energy generation, these developments also present important economic opportunities for regional development and job creation.

Recent reports on energy security, such as the *Independent Review into the Future Security of the National Electricity Market* (Finkel, 2017), undertaken by the Australian Chief Scientist, concluded that new renewable energy generation is the source most likely to provide for Australia's future power demands beyond the life of our aging coal-fired power fleet. This new supply would be the driving force required to put downward pressure on the energy prices currently impacting household budgets and industry across the country.

The project sits within the context of numerous state and federal strategies regarding the development of renewable energy and the reduction in greenhouse gas emissions. These are outlined below.

2.2.1 NSW Renewable Energy Action Plan

The NSW Government's *Renewable Energy Action Plan* was released in 2013 (NSW Government, 2013) in support of the Australian Government's Renewable Energy Target (RET) and to guide renewable energy development in NSW. The Renewable Energy Action Plan comprises 24 actions surrounding the goals of:

- attracting renewable energy investment and projects;
- building community support for renewable energy; and
- attracting and grow expertise in renewables.

2.2.2 NSW Climate Change Policy Framework

The NSW Government has developed NSW Climate Change Policy Framework (OEH, 2016a) in support of Australia's COP21 commitments. The Framework outlines the NSW Government's long-term ambition to achieve net-zero emissions by 2050 and to make NSW more resilient to a changing climate.

The report highlights the new opportunities in 'advanced energy' sectors which would help the world adapt to climate change. The report outlines that the NSW Government would seek to support opportunities to grow these emerging industries in NSW.

2.2.3 Australian Renewable Energy Target

The large-scale RET is an Australian Government policy which commenced in 2001 with the aim of having at least 20% of Australia's electricity consumption derived from renewable sources by 2020. Following review in early 2015, the RET was confirmed as 33,000 gigawatt hours (GWh) of electricity by 2020. To meet the RET, significant new renewable energy capacity is needed.

The findings of the *Progress and status of the Renewable Energy Target* report (CEC 2016), undertaken by the Clean Energy Council, found that approximately half of the RET had been met to date, requiring approximately 6 gigawatts (GW) of capacity of new renewables projects by 2020.

To assist in achieving the RET and to emphasise the imperative to invest in clean energy technologies, the Government has committed funding of $1.5 billion to the Solar Flagships program. The program has been designed to accelerate the delivery of large scale solar power generation into the National Electricity Market.

2.2.4 COP21

At the COP21 climate talks in Paris in December 2015, the Australia Government committed a greenhouse gas emissions reduction target of 26-28% by 2030, when compared to 2005 levels. Despite ongoing political debate around renewable energy and reliability, there is a high probability that the committed 2030 targets would be met should the roll out of large and small scale renewable projects continue at their current pace.

2.2.5 Electricity supply

In Australia, approximately 87% of our electricity generation comes from fossil fuel-based generation, making our nation ranked as one of the highest levels of fossil fuel generation in the world (AEC, 2016). This unenviable position highlights the importance of ensuring an adequate supply of energy as our nation's fleet of coal-fired power stations approach the end of their operating lives, as well as providing an achievable pathway for decarbonising our economy to achieve our international climate commitments (section 2.2.4).

Energy security is defined as "the adequate, reliable and competitive supply of energy to support the functioning of the economy and social development" (DRET, 2011). A National Energy Security Assessment (NESA) carried out in 2011 (DRET, 2011) deemed Australia's energy security level to be 'moderate'. In order to maintain or enhance this level of security into the future significant new capacity would be needed over the medium to long term to compensate for the retirement of several emissions intensive coal-fired power plants and to help achieve emissions reduction targets.

The *State of the Energy Market* report produced by the Australian Energy Regulator (AER) in May 2017 (AER, 2017) identified an expected shortfall in generation capacity of over 1,000 MW in NSW during the summer upon the planned closure of the Liddell power station in 2022, as this plant reaches its end of life period. Liddell is the first of five coal-fired power stations in the NSW NEM region scheduled for retirement in the coming years. In total, over 8,000 MW of new generation capacity would be required to replace these coal assets upon their retirement.

The fragility of our nation's reliance on aging coal-fired power generation has been highlighted in recent months, with the failure of four coal units in a single week of December 2017. Reports of failures at the Eraring power station (a 700 MW unit) in NSW, Milmerran power station (a 420 MW unit) in QLD, Mt Piper power station (a 700 MW unit) in NSW and Loy Yang A Power Station (560 MW unit) in VIC, were identified over week-long of high temperatures and demands (Renew, 2017). Without the introduction of new supply, these aging assets would likely pose a continuing, and increasing, risk of energy security for our nation.

2.2.6 Reducing air pollution

According to the World Health Organization (WHO), air pollution remains one of the world's greatest threats to human life, with approximately 6.5 million deaths occurring each year due to air pollution - greater than the number from HIV/AIDS, tuberculosis and road injuries combined. Air pollution also results in major costs to the economy and damage to the environment (IEG, 2016). Recent studies have shown an increase in global deaths from fine particulate air pollution, of which coal is a major source, from approximately 3.5 million in 1990 to 4.2 million in 2015 (DEA, 2017).

In Australia, it has been estimated that more than 3,000 Australians die premature deaths each year from air pollution. A 2013 Commonwealth Senate Committee inquiry concluded that despite improvements in Australian air quality over the last two decades, air quality is still a significant problem in many parts of Australia, affecting some communities are much more affected than others, depending on how close they are to pollution sources (Envirojustice, 2016).

The proposed project would assist in reducing the levels of air pollution in Australian communities. The provision of pollution-free, renewable energy into the National Electricity Market would displace other sources of harmful, pollution intensive emissions, such as coal-fired generation.

2.2.7 Supporting regional development, employment and industry

At no point in history have the benefits of renewable energy been as apparent as they are today for industry in NSW. Significant increases in the cost of energy over recent years have been paralleled by significant reductions in the cost of renewable energy technologies, providing industry with the opportunity to secure substantial energy cost savings while improving their environmental footprint.

The need to address the record high power prices currently faced by NSW businesses cannot be understated. Power prices are now regularly identified as a major concern to industry groups, and growing threat to NSW industry and employment; for example, the recent Energy Shock report, Australian Industry Group (AIG, 2017). By establishing a source of low-cost power in the region, the project would assist in relieving the energy cost burden faced by NSW business and improve the competitive advantage of state industry. Direct industrial users in the region would also have the potential to benefit from the project through reduced loss factors on energy supply and transmission.

The project is expected to provide a strong contribution to regional development and employment, and ongoing economic benefits to the local region. The *Yass Valley Council Economic Development Strategy* (YVC, 2014) outlines the Council's plan to improve the economic wellbeing of the region through attracting employment-generating investment. The objective of the Council's strategy is to manage the transition from an economy based primarily on traditional agricultural practices to one which is diverse, robust and sustainable whilst maintaining a vibrant and skilled workforce. Infrastructure projects and services in particular were identified as having a substantial ability to positively affect the amount and type of economic activity that could be developed within the region.

2.2.8 Social and economic justification

The construction and ongoing operation of the project would provide significant social and economic benefits to both the local community and surrounding region.

On a social level, the project has received broad support from the local and regional community and Yass Valley Council. This has included broad support for Renew Estate's proposes community contributions scheme, which would be offered to support of local community initiatives (refer section 5.0).

The project promotes socio-economic wellbeing through offering opportunities for employment, training and up-skilling of the local and regional workforce throughout its construction and operation. Opportunities would be available to workers from a wide range of fields and expertise, including engineers, construction workers and labourers with further employment opportunities associated with supply chains and local goods and services. In a broader sense, the project would also contribute to a downward pressure on the historically-high energy prices currently affecting households and industries.

On an economic level, the project is consistent with both the NSW Government and Yass Valley Council's strategic objectives to promote economic stimulus to the region. Construction of the project would require a workforce of up to 200 people during the peak of this phase. During operation, following the initial two year defect liability period, there would be approximately five full time equivalent positions available. There would also be opportunity for the continuation of sheep grazing on the Site, maintaining a degree of the current agricultural value and employment. Upon the conclusion of the project's operational period, the plant would be decommissioned and the Site made available for agricultural purposes.

The project provides the opportunity for local community to be a part of the national and international action efforts to address climate change. The environmental benefits of transitioning to a low carbon future are significant and far-reaching, helping to maintain quality of life for the current community and that of future generations.

2.3 Project options and alternatives

2.3.1 Site selection

The site selection process involved the consideration of a number of alternative locations for the proposed solar farm. This included broad site exploration activities across the region as well as investigation of alternative site locations within the local area.

Managing environmental constraints and social aspects, improving infrastructure efficiency and matching localised energy demands were the major considerations in the evaluation of alternatives. The proposed Site was shown to be more suitable than alternatives considered and was selected on the following basis:

- The Site has a high-level of solar resource and ideal climatic conditions for a commercial-scale solar farm
- The Site is in close proximity to existing electrical infrastructure with sufficient connection capacity. Co-location to transmission lines offers a rare opportunity for direct grid connection without significant new overhead lines and easements, and any potential impacts and efficiency losses that may result
- Other network electrical efficiencies: alleviating transmission and distribution losses for generation at this connection point in the network due to high, and growing, energy demands in the region
- Availability of land of a suitable scale for a viable commercial-scale solar farm project
- Suitability of the land for solar farm construction and operation, including minimal shading, suitable topography, site accessibility, low flood risk and proximity to existing townships and access to a local labour force.

Consistent with the above, the *Yass Valley Council Economic Development Strategy* (YVC, 2014) notes that due to its location, topography and climate, the Yass Valley could potentially be a significant producer of renewable energy from solar or wind sources.

ACT government official modelling (ACT Population Projections: 2017 – 2020, ACT Government, 2016) shows the total Canberra population is projected to increase by 6% by June 2020. The fastest growth is projected in the northern suburbs of Gungahlin, Crace, Casey, Franklin and Bonner.

TransGrid already supplies over 440 MW of peak demand into the Canberra substation, and another 70 MW into Queanbeyan, with these numbers projected to increase according to TransGrid's Transmission Annual Planning Report 2017 (TAPR).

The project is located under TransGrid's 132 kV feeder 977, approximately 3.5 km north of the ACT and between the Canberra and Queanbeyan substations. The Site is uniquely located to contribute to the additional electrical demand in Canberra over the coming decades.

2.3.2 Technology

The project proposes to use solar PV electricity generating technology. This technology was selected for the project due to the following benefits:

- The technology is commercially proven, robust and has a low technical risk
- The technology has a low environmental impact in comparison to other power generation technologies
- The region has among the best solar resources in the world
- The technology has a rapid development potential in comparison to other power generation technologies.
- Ease of decommissioning at the end of project life, and ability to reinstate land to current agricultural purposes.

A number of PV module and mounting technologies have been considered for the proposed project. PV module technologies include the use of crystalline silicon and amorphous silicon thin film panels.

Both technologies have similar visual characteristics and a robust track record of deployment across the globe. The final module type would be selected during detailed design.

Panel mounting technologies considered include fixed-tilt, north-facing panel mounting systems and single-axis tracking systems. Single axis tracking systems are typically aligned north-south and track the sun east to west moving throughout the day following the movement of the sun.

A single-axis tracking system has been selected for the project. While this option is generally considered to be more costly, it has the benefit of improving the yield per panel, therefore allowing a smaller development footprint for the project. Reducing the development footprint provides for increased flexibility in site design to avoid environmental constraints and reduce impacts.

Single axis tracking systems also enable the facility to generate electricity earlier in the morning and later into the evening, better aligning generation profile with periods of high demand in the network.

The proposed tracking structures would be mounted on piles, which would be screw or pile driven depending on final geotechnical analysis. This eliminates the need for concrete and foundations which significantly reduces the impact of construction, keeping ground disturbance to a minimum and allowing the design to follow the existing lie of the land.

2.3.3 Site layout options

The site layout has evolved a number of times throughout the development of the EIS to take into account constraints identified through specialist studies and outcomes of community engagement activities. Table 1 summarises the key layout iterations.

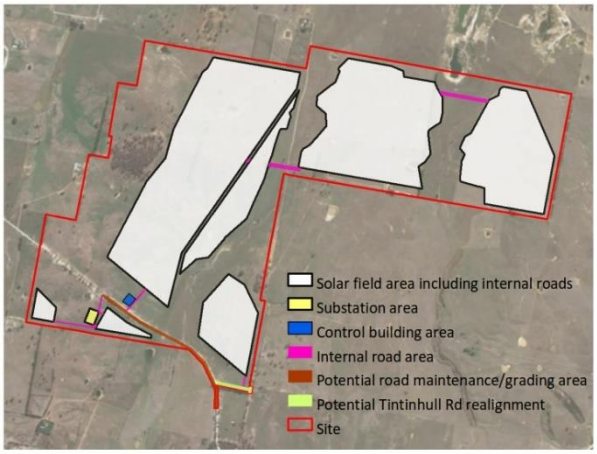
The specialist study outputs which informed the final layout have been incorporated into a constraints map (Figure 14). The environmental and social factors considered in the final layout include:

- Biodiversity, including threatened ecological communities and threatened species
- Flood risk
- Existing infrastructure such as roads, transmission lines and gas pipelines
- Existing dams, drainage lines and the riparian area of Back Creek
- Visual impacts, particularly to the nearest homesteads/dwellings
- Impacts upon Aboriginal heritage within the Site
- Noise impacts upon nearby residential receivers
- Accessibility of the Site for construction and operation utilising the existing road network.

The final layout of the project is a product of efforts by the developer and the EIS specialists to ‘design out’ and avoid potentially significant environmental impacts. This process has sought to arrive at a final project layout that is environmentally and socially acceptable whilst maintaining the project’s overall economic viability. All residual environmental impacts beyond scope of the project design process have been addressed through the proposed application of mitigation and management measures.

Table 1 Key layout iterations

	**August 2017 (initial layout)**
	- All available land developed except for the preliminary constraints identified including:
	  - woodland patches
	  - creeklines
	  - transmission line easements
	  - gas pipeline easement
	  - roads.

	**November 2017** - development envelope reduced around creeks to avoid unacceptable 1 in 100 year flood levels. - development envelope reduced in the west to mitigate visual impacts to residential receivers and to conserve moderate quality threatened species habitat.
	**January 2017 (final layout)** - development envelope further reduced and refined to avoid as much as practicable Aboriginal heritage sites and threatened species habitat. - Internal roads connecting solar fields and control building sited to avoid constraints. - Areas subject to potential road works identified, including potential Tintinhull Road re-alignment (refer section 3.2.12), and the extent of potential Tallagandra Lane road grading and culvert upgrade works (refer section 3.3.3).

2.3.4 The 'Do Nothing' option

The 'do-nothing' approach would not provide additional generating capacity in region. By doing nothing, the demand in the region would continue to increase without a corresponding increase in generation (supply), resulting in further rises in wholesale electricity prices. This would inevitably lead to increases in retail electricity prices, which are already under heavy scrutiny at all levels of government within Australia and throughout national media. A do-nothing approach would also not achieve many of the strategic targets and goals of Australian, NSW or ACT governments.

The project would generate approximately 100 MWac of renewable energy which would contribute to the general shift towards renewable energy generation, in line with the NSW government policies and the RET. If the project is not implemented, the increasing demand for electricity in NSW may be generated using conventional fossil fuel fired power stations which would accelerate resource depletion, increase local air pollution loads and contribute to climate change which runs counter to the objectives of the NSW government's Renewable Energy Action Plan.

The 'do-nothing' option would leave the Site in its current agricultural land use, which is largely dominated by livestock grazing. Noting that low intensity livestock grazing would be retained once the project was constructed, agricultural output would continue, albeit at a lower productivity level. The 'do-nothing' option would prevent the lease of the project land to the proponent, which provides an additional source of recurring income for the local landowner and represents a diversification of economic activities in the Yass Valley which is in line with current government economic strategy.

The SSF project would require approximately 200 workers during the peak construction period and approximately 5 permanent workers throughout the operation phase as well as periodic maintenance personnel. The 'do nothing' option would also deprive the local community from employment opportunities created during the construction and operation phase of the project.

The project would create business opportunities and provide a socio-economic boost to the local construction sector, suppliers of materials and services, retailers, eateries and hotels during the construction and operation phases. The 'do-nothing' option would also deprive Yass Valley Council and the local community from benefiting from a significant investment in a state-of-the-art renewable energy project and the associated spill over socio-economic benefits that it entails.

Thus, the 'do-nothing' option would result in a loss of opportunity for the NSW government, Yass Valley Council and the local community as this solar project, with its proved technology and demonstrated economic model would most likely be constructed at a different location within Australia.

3.0 Project description

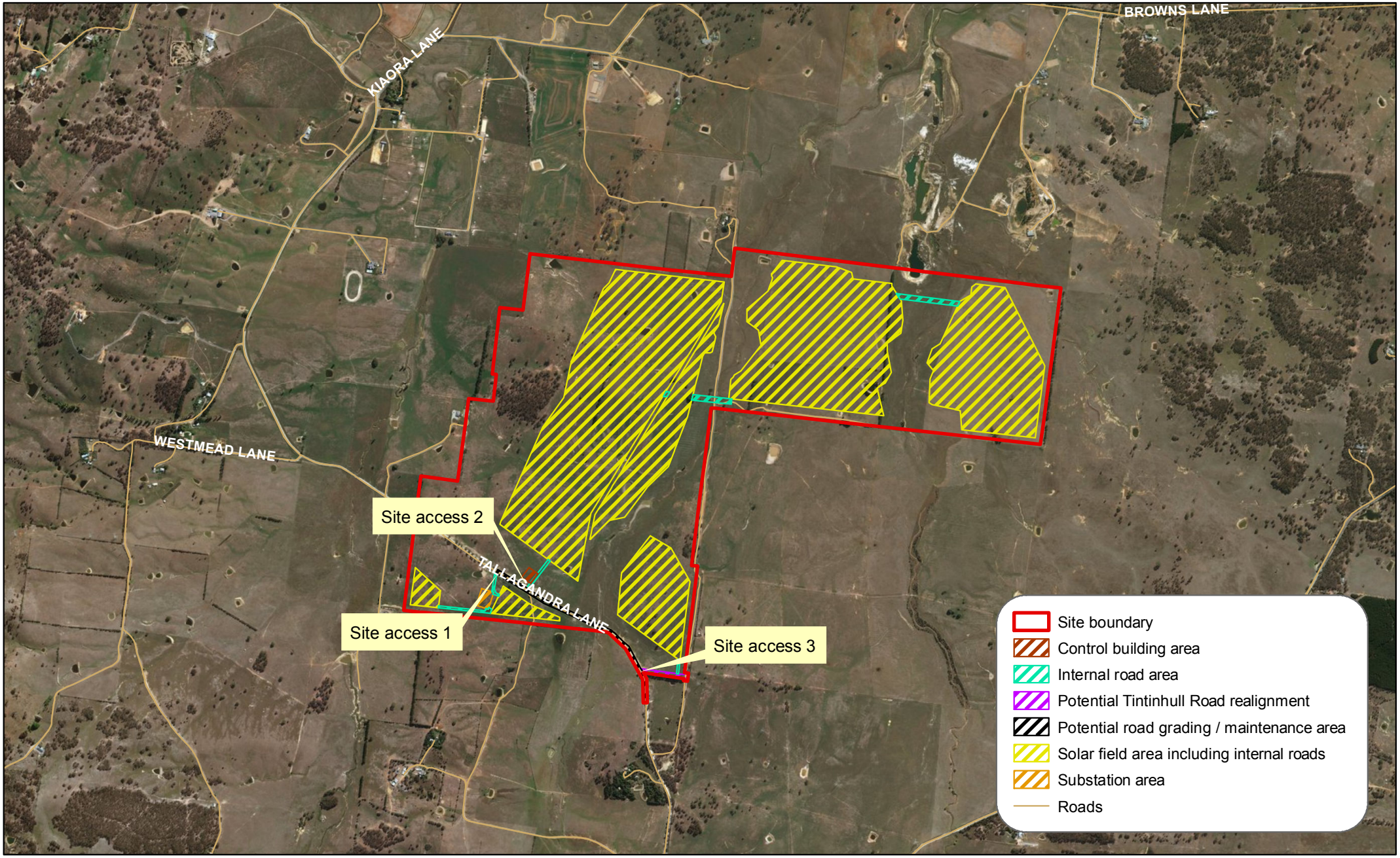
3.1 Site description

The Site location is described in section 1.3 and shown in Figure 1 and Figure 2. The proposed development envelope in which the solar farm infrastructure would be located is shown in Figure 3. Minor ancillary infrastructure, such as underground cabling and fencing, may however be placed outside the development envelope (but within the Site) and would be sited to avoid environmentally sensitive areas unless otherwise stated and assessed in this EIS.

The Site is greenfield comprising large paddocks used exclusively for grazing sheep and cattle. With the exception of a seven-hectare patch of woodland in the western portion of the Site (lots 189 and 190), the Site is largely cleared, with some scattered trees and rows of trees along fence lines. The topography is gently undulating with a few knolls and ridges. The Site contains a few dams and various tributaries that drain into Back Creek which flow towards the northeast and eventually discharges into the Yass River.

There are no residential dwellings or other major structures within the Site and the Site is fenced into paddocks with barbed wire and wooden fencing. There area surrounding the Site consists of similar cattle and sheep grazing areas with a few residential dwellings visible.

Two large existing overhead electricity transmission lines traverse the southern portion of the Site in a northwest-southeast direction. The transmission lines are both TransGrid owned and operated assets and are comprised of the Canberra to Capital Wind Farm 330 kV circuit and the Canberra to Queanbeyan 132 kV circuit. The project is proposing to connect to the 132 kV circuit (feeder 977) via an onsite substation under the transmission line. A buried gas pipeline also runs through the Site in a southwest-northeast direction.



AECOM Renew estate.

SPRINGDALE SOLAR FARM

SOLAR FARM LAYOUT

DATE 19/04/2018
SCALE 1:25,000
PROJECT 60555008
DRAWN PH

Figure 3 Springdale Solar Farm development envelope

3.1.1 Yass Valley

The Site is located with the YVC LGA and is zoned Primary Production (RU1) under the LEP.

The YVC LGA occupies around 4,000 km^2 of land in south-eastern NSW with Yass as its main town centre. Yass is approximately 40 km northwest of the Site, with Canberra being the Site's nearest major settlement approximately 22 km to the southwest. Sutton is the nearest village, approximately 7 km to the southeast. The Village includes a store, primary school and sporting facilities. The village of Sutton is supported by a local Community Association (Sutton and District Community Association). Other townships and villages within the LGA include Gundaroo, Murrumbateman, Binalong, Bookham, Bowning and Wee Jasper. It is estimated that around half of the Council's work force commutes to the ACT.

The YVC LGA has a population of approximately 16,000 as recorded in the 2016 Census, which has been steadily increasing over the past decade (ABS, 2016). The population density is 0.04 persons per hectare, reflecting its largely undeveloped, rural setting (ABS, 2016). The region was originally inhabited by the Ngunnawal people as early as 20,000 years ago (YVC, 2014a). The area's rich colonial history dates back to 1821 which is evident through historical architecture across the Yass Valley (YVC, 2014a).

The region is dominated by cool climate wineries east of the Murrumbidgee River and sheep and wool production in the north and west (YVC, 2017). In 2010/11 the total value of agricultural output in the LGA was $63 million which increased from $55 million in 2005/6. The largest commodity produced was livestock products, which accounted for 46.7% of the LGA's total agricultural output in value (ABS, 2011).

3.2 Key project components

3.2.1 Overview

The primary project components would consist of:

- PV solar modules on a single-axis tracking framing system mounted on steel piles
- Approximately 22 containerised power conversion stations, containing electrical switchgear, inverters and transformers
- An electrical switchyard and substation that would be connected to the existing 132 kV TransGrid transmission line that traverses the Site
- DC and AC cabling for electrical reticulation
- A control building including office, supervisory control and data acquisition (SCADA) systems, O&M facilities, staff amenities, and associated carpark
- Two meteorological stations
- Internal all-weather access tracks
- Security fencing
- Landscaping
- Subject to the execution of a Voluntary Planning Agreement with YVC and agreement with YVC on the relevant works, construction of a new public road connection between Tallagandra Lane and Tintinhull Road (referred to in this EIS as Tintinhull Road re-alignment)
- Subject to the execution of a Voluntary Planning Agreement with YVC and agreement with YVC on the relevant works, subdivision of Lot 202 DP754908 to create a proposed new lot to be dedicated as a public road for the proposed Tintinhull Road re-alignment (as shown in Figure 11).
- Subdivision of Lot 209 DP754908 to create a new lot for the proposed substation (as shown in Figure 12).

The single-axis tracking system would orient the solar modules to follow the sun from east to west each day. The tracking structures would be mounted on piles, which would be screwed or pile driven, depending on final geotechnical analysis.

The on-site switchyard and substation would lie adjacent to the existing 132 kV TransGrid easement. Final design would be in collaboration with TransGrid and the AEMO, however, there would likely be minor civil and earthworks required to meet the transmission substation design guidelines. This may include site levelling and the creation of an all-weather access track from Tallagandra Lane

The operational lifetime of the solar farm is approximately 30 years. Decommissioning at the end of the operational life of the solar farm would remove all above ground infrastructure and rehabilitate the Site to return it to its predevelopment condition.

The specification of the project's components has not yet been finalised as some components are still being evaluated prior to final selection. Thus the following sections describe the project components generally and provide typical indicative illustrative photographs from similar projects.

3.2.2 Key system metrics

Key system metrics of the project are outline in Table 2 below.

Table 2 Key system metrics

Component	Metric
Internal DC system voltage	1500 kV
Internal AC voltage	33 kV
Grid voltage at point of interconnection	132 kV
Number of Modules (approximately)	350,000
Number of trackers (approximately)	3,000
Number of power conversion stations (approximately)	22

The project would be designed to meet Australian/New Zealand Standards applicable to solar farms and electrical systems.

3.2.3 Photovoltaic modules and tracking system

PV solar panels would likely consist of polycrystalline silicon modules. The modules convert incident photons into electric current and generate direct current (DC) electricity. The PV solar panels would be mounted on a single axis tracking system to orient the solar modules to follow the sun from east to west each day. The tracking structures would be mounted on galvanised steel piles, which would be screw or pile driven into the ground depending on final geotechnical analysis (Figure 4). A typical example of the solar panels arrays is shown in Figure 5.

The modules would extend up to four metres above the natural ground level, depending on the tracking system manufacturer used.

Figure 4 Pile driven steel posts with tracker assemblies

Figure 5 A typical example of solar farm panel arrays

3.2.4 Power conversion stations

Solar modules and trackers would be arranged into power blocks of between 5.0 and 5.5MVA, each with a centralised power station, resulting in approximately 22 PCS throughout the extent of the project. Each PCS would be a containerised design, mounted on a concrete pad or piles, and would incorporate two inverters and a single MV transformer (Figure 6). Each PCS would also contain the tracker controller units, SCADA system along with other automation and monitoring components. All PCS would be interlinked via a buried 33kV circuit for reticulation to the solar farm substation and switchyard.

The environmental benefits of the containerised PCS coupled with the block design include:

- The modular design allows the solar farm to be designed to be fitted to the terrain and environmental constraints within the Site
- The PCS are of conventional container size which facilitate transportation and haulage during construction and demobilisation using trucks and conventional logistics equipment
- The containers provide secondary containment to cater for leakages
- The containers allow easy siting, dismantling, demobilisation and possible refurbishment and reuse or recycling
- The closed containers provide an effective safety enclosure that protects workers and operators during construction and operation when the system is energised
- The PCS would be painted colours that best blends with the landscape.

The power conversion stations have an indicative height of 3.5 m, and would have a total elevation of no more than four metres above the natural ground level, including foundations.

Figure 6 Example of SMA Medium Voltage PCS

3.2.5 Electrical switchyard and substation

The electrical switchyard and substation would contain the connection assets to enable the solar farm to connect to and export 100MWac into the NEM. The connection assets include the 132/33kV transformer, 132kV switchbays, 33kV switchgear and associated infrastructure to facilitate the safe and reliable operation of the network, in line with the project generator performance obligations.

The switchyard and substation infrastructure would include all provisions required for the safe and continuous operation of the facility, including redundant systems such as uninterruptable power supplies (UPS) and backup systems which may be provided by battery or auxiliary power supplies.

The transformer would be the largest single piece of plant on the Site and is likely an oil filled unit surrounded by appropriate aggregate bunding to contain the oil in the unlikely event of a leak.

The switchyard and substation are being designed with TransGrid, with an indicative footprint of 50 x 90 metres. The design would include all facilities as required for the safe and reasonable operation by TransGrid or solar farm employees such as a control room, workspaces and toilet(s).

The substation and switchyard would be connected adjacent to the existing TransGrid easement and transmission line (shown in Figure 7 below).

Figure 7 Existing 132kV TransGrid line 977 and infrastructure crossing the site

Figure 8 Transformers being installed at Wirsol's Whitsundays Solar Farm

Figure 9 Electrical switchgear being installed at Wirsol's Whitsundays Solar Farm

3.2.6 DC and AC cabling

DC cabling would run aboveground along the back of the tracker tables in cable trays or fixings flush against the modules. DC cabling from each string would run to a combiner box which would contain fuses/circuit breakers. The combiner box would then have a consolidated run of DC cabling back to the block power station. This cable run would most likely be underground. The final buried cable depth would be subject to detailed design; however, the likely buried depth is 800 mm.

The AC cabling would run between the PCS and the on-site substation. The internal AC voltage is likely to be 33 kV, however subject to final design the voltage may also be 11 kV or 22 kV. All AC cabling would be buried, with all junctions and turning points clearly marked with HV markers. Depth of cabling would be determined during detailed design, but is indicatively 1200 mm.

3.2.7 Control building

A control building with a footprint of approximately 450 m^2 would be constructed to contain both the site office and warehouse/workshop facilities. The control building would consist of a steel structure erected on a concrete base. The site office would contain:

- IT systems and primary interface with the Site SCADA system
- Staff amenities including bathrooms and kitchen
- One or two static water supply tanks filled by delivered water, with a combined capacity of 20,000 litres, located within four meters of the control building hard stand for firefighting purposes
- Separate water tanks, filled by rainwater or delivered water, would supply potable water for the staff amenities
- Septic system
- Warehouse/workshop facilities including:

- Operations and maintenance workshop facilities
- Solar farm spare parts
- Safety equipment and personal protective equipment
- Emergency survival blankets and firefighting equipment.

The control building would be powered by either a direct connection from the local distribution network or via the auxiliary supply of the high voltage (HV) transformer. Parking facilities would be provided adjacent to the control building for approximately 10 light vehicles. The parking area would be a hardstand area consisting of crushed stone or similar materials.

3.2.8 Meteorological stations

The solar farm would have two spatially distinct metrological stations on-site to monitor local climatic conditions and for performance monitoring. Data from the metrological stations and additional anemometers would be streamed to the solar farm SCADA system which would optimise system performance as well as move the trackers into stow position to avoid system damage in the event of adverse weather events.

3.2.9 Internal access tracks

Internal access tracks would be all-weather with an indicative width of four metres. Passing lanes and turning circles would be provided in line with requirements of the Bushfire Management Plan.

3.2.10 Security fencing

Security fencing would be installed around the perimeter of the solar farm to an indicative height of up to 2200 mm, subject to final design which would seek to minimise the visual impact of the fencing while ensuring that it is appropriate for security and safety purposes. A series of security cameras would be installed on the perimeter fencing and would be fitted with infrared sensors to provide 24/7 coverage of the Site boundary.

Permanent perimeter lighting would not be used, however motion and/or manually activated lighting may be installed in certain locations to deter intruders. All lighting would be closely directed, minimising the potential for light spill onto neighbours or other sensitive receivers. Occasional maintenance tasks may be scheduled overnight and would require limited lighting for safety, however such activities are expected to be minor and by nature of the rural area of the Site, a significant distance from most sensitive receivers.

3.2.11 Landscaping

The proposed draft landscape plan is provided as part of the Landscape and Visual Impact Assessment report in Appendix D. The aim of the plan is to minimise the visual impacts of the project on surrounding landowners.

The draft landscape plan provides well integrated planted buffer areas of a minimum width of twenty metres along certain areas to minimise the extent of the solar array when from surrounding receptor locations. The buffer areas contain random plantings of a variety of endemic tree and shrub species of differing growth habits at spacing's of four to five metres. The intention is to establish vegetation with characteristics of local plant communities to maintain a consistent landscape character. Consultation on the draft landscape plan has occurred with sensitive receptors and other stakeholders, as summarised in section 5.0.

3.2.12 Tintinhull Road re-alignment

Subject to the execution of a Voluntary Planning Agreement with YVC (including agreement on the relevant works), a new section of public road is proposed to be constructed between Tallagandra Lane and Tintinhull Road, across the southeast corner of the Site. This would provide an alternative access to Tintinhull Road from Tallagandra Lane which does not traverse Lot 7001 DP96227 (Figure 10).

Lot 7001 is a Crown land parcel, however if sold in the future to a private entity, the existing Tintinhull Road segment through this lot could be closed to the public. YVC made Renew Estate aware of this issue and suggested it could be resolved at the same time as the works for the project. Accordingly, Renew Estate has offered to YVC to enter into a Voluntary Planning Agreement to provide an

additional public benefit of constructing the proposed new public road. The Voluntary Planning Agreement is currently under negotiation with YVC, including in relation to the scope and nature of the relevant works.

The proposed new public road connection would be approximately 220 m in length and would be built in accordance with the 'Access' category of the rural road standards in Council's *Road Standards Policy* (YVC, 2013) (5.5 m minimum pavement width, 20 m road reserve, gravel finish). Renew Estate understands that this specification has been agreed in principle by YVC.

Subdivision is also proposed to allow the dedication of land to a public road, as described in the following section.

It should be noted that whilst works to facilitate the Tintinhull Road realignment form part of this SSD application (including subdivision of land and construction of the road), the execution of these works would be subject to reaching a Voluntary Planning Agreement with YVC

3.2.13 Subdivision

Subdivision for proposed new public road

Subject to the execution of a Voluntary Planning Agreement with the YVC and agreement on the relevant works, Lot 202 DP754908 would be subdivided to create a proposed new lot to be dedicated as a public road for the proposed Tintinhull Road re-alignment described in section 3.2.12 above. The Plan of Proposed Subdivision is shown in Figure 11.

As outlined above, please note that this subdivision will only be undertaken if a Voluntary Planning Agreement is able to be reached with YVC. Accordingly, consent is being sought under this SSD application to enable this subdivision to occur for the Tintinhull Road re-alignment only if, and once, a VPA has been signed with YVC.

Subdivision for proposed substation

In order to create a new lot for the proposed substation, Lot 209 DP754908 would also be subdivided to create three new lots. The Plan of Proposed Subdivision is shown in Figure 12.

The proposed substation lot will be owned by TransGrid. In order to facilitate access for TransGrid to the substation, a 10 metre right of way will be granted in favour of the new substation lot over the proposed residue lot of 20.5 ha. The right of way will run south from Tallagandra Lane to the proposed substation lot as shown in the Plan of Proposed Subdivision in Figure 12.

Permissibility of subdivisions

The areas of the proposed new lots are as follows:

Table 3: Existing and proposed lot sizes post-subdivison

Existing Lots	Proposed new lots	
Lot 202 DP754908 (16 ha)	1	15.5 ha
	2	0.5 ha
	1	20.5 ha
Lot 209 DP754908 (33.5 ha)	2	12 ha
	3	1 ha

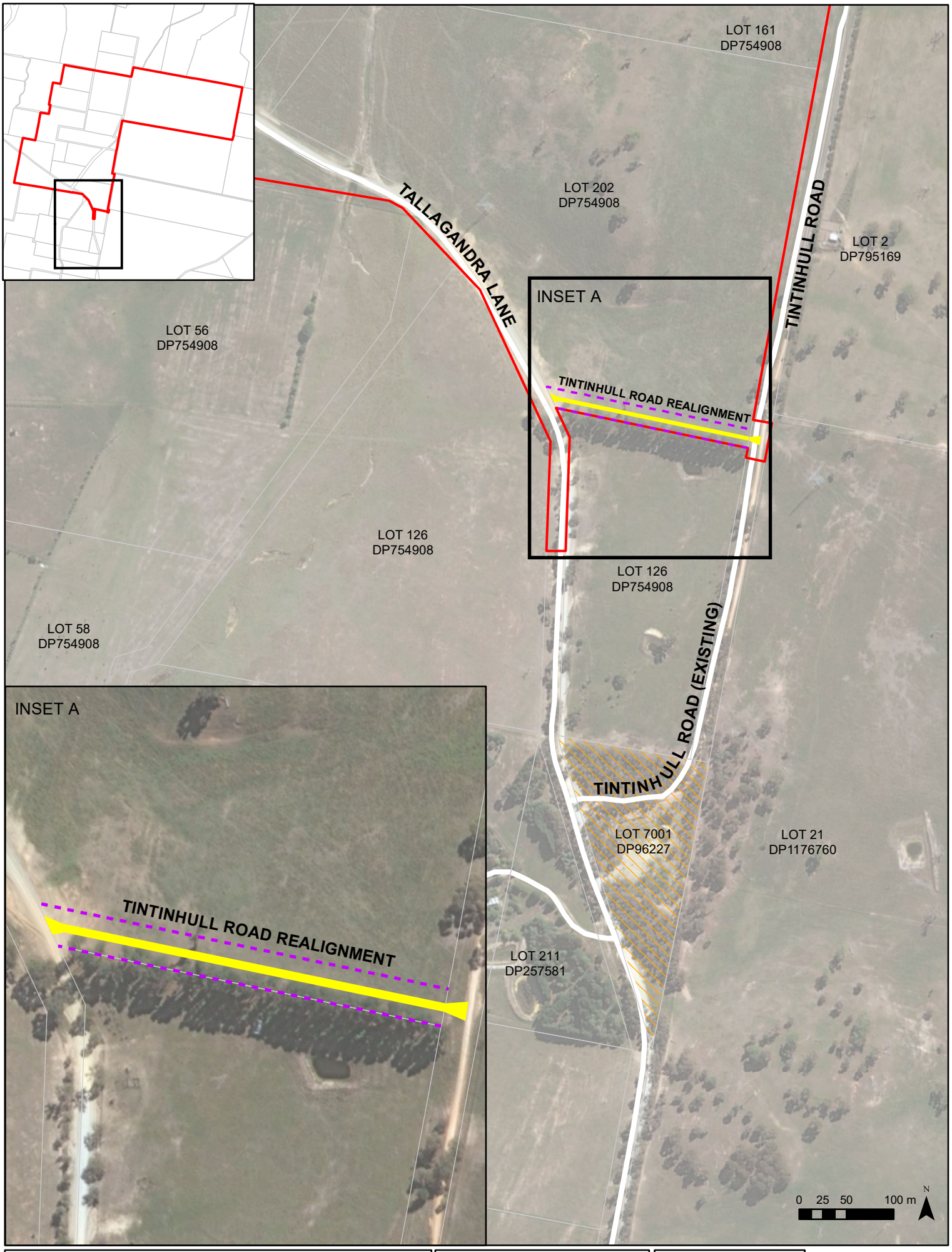
Note: Lot areas are approximate and will be confirmed through a cadastral survey.

Clause 2.6(1) of the LEP provides that: "*Land to which this Plan applies may be subdivided, but only with development consent*". Clause 4.1(3) states that: "*The size of any lot resulting from a subdivision of land to which this clause applies is not to be less than the minimum size shown on the Lot Size Map in relation to that land*". The minimum lot size which applies to the proposal site under the applicable Lot Size Map is 40 ha. Therefore, restrictions under the LEP with respect to lot size would ordinarily prohibit the proposed subdivision of the relevant lots in Table 3 (given the size of all proposed new lots is less than 40 ha).

However, section 4.38(3) of the EP&A Act allows for development consent to be granted for development which is partly prohibited in the context of State Significant Development:

> *Consent for State significant development*
>
> *……..*
>
> *(3) Development consent may be granted despite the development being partly prohibited by an environmental planning instrument.*

This means that consent may be granted to the proposed subdivision of Lot 202 DP754908 and Lot 209 DP754908 as part of this SSD application despite the provisions of the LEP set out above.



Springdale Solar Farm Proposal Site
Existing lot boundary
Crown lot
Proposed 20m wide strip of land to be dedicated as public road
Proposed 5.5m unsealed access road (indicative)

Project: Springdale Solar Farm	Scale: 1:5,000 @ A4
Drawing Title: Figure 10 Proposed Tintinhull Road Realignment	Drawn by: LL
	Date: Feb 2018 / Rev: A

Renew estate.

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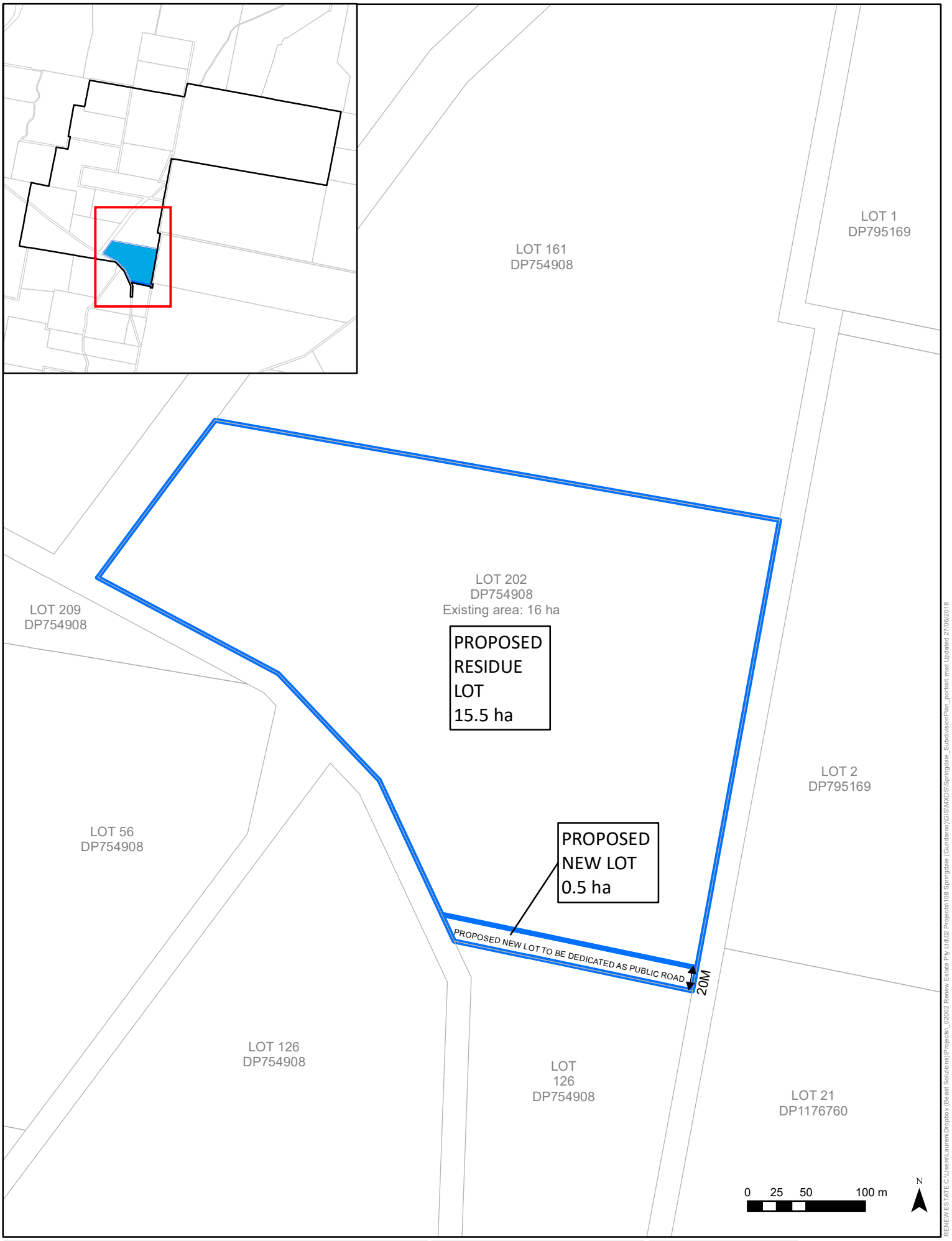


Existing lot

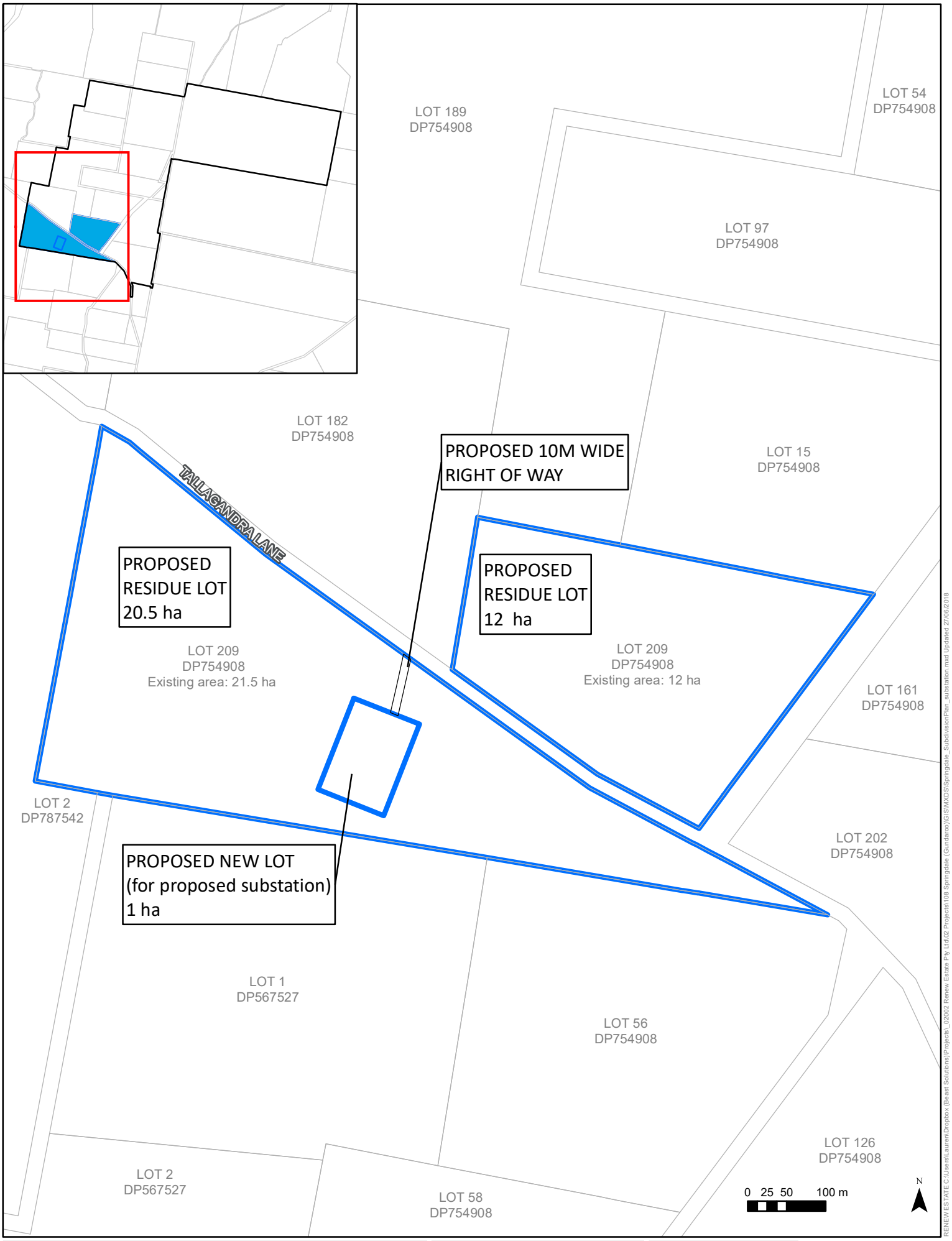
Proposed new/residue lot

Figure 11 Plan of proposed subdivision - for new road

Project: Springdale Solar Farm	Scale: 1:4,000 @ A4
Drawing Title:	Drawn by: LL
	Date: Feb 2018 / Rev: A

Renew estate.

BEAST SOLUTIONS



Proposed new/residue lot
Proposed Right of Way
Existing lot

Note: Areas have been rounded to nearest 0.5 hectare

Figure 12 Plan of proposed subdivison - for proposed substation

Project: Springdale Solar Farm	Scale: 1:6,000 @ A4
Drawing Title:	Drawn by: LL
	Date: Jun 2018 / Rev: A

Renew estate.

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3.3 Construction Activities

3.3.1 Pre-construction and site establishment activities

Preliminary works that would be undertaken prior to the commencement of full construction would include:

- Detailed civil and electrical design
- Procurement of solar farm equipment and materials
- Mobilisation of primary plant
- Establishment of internal access roads, hardstand and laydown areas
- Levelling and grading of land for solar trackers, where required
- Grading and culvert upgrade works on Tallagandra Lane as required
- Establishment of site fencing and other security features.
- Establishment of laydown areas and construction of the control building.

Prior to the preliminary works being carried out, the appointed consultant/contractor would prepare a Construction Environmental Management Plan (CEMP), taking into consideration the specific methodology adopted and the environmental management measures proposed in this EIS. The CEMP would be submitted to and approved by relevant regulatory authorities prior to commencement of works to ensure compliance to legislative and other regulatory requirements.

3.3.2 Construction programme

The construction programme sequence would likely be as follows:

- Stage 1: Site establishment activities as described in section 3.3.1
- Stage 2: Construction of solar farm and Tintinhull Road realignment (if agreed with YVC)
    - Piling supporting posts
    - Assembly of solar panels
    - Installation of monitoring equipment
    - Cable trenching, laying cables and connecting electrification reticulation
    - Installation of PCS
    - Construction of new public access road: Tintinhull Road realignment (if agreed with YVC)
- Stage 3: Construction of the substation and connection to the existing TransGrid power lines
- Stage 4: Testing and commissioning
- Stage 5: Demobilisation and rehabilitation works.

3.3.3 Construction works

Site Establishment

Site clearing

Some existing exotic vegetation on-site planted by the existing landowner as wind breaks may be removed to reduce shading and aid in site design. Some roadside vegetation may also be removed or trimmed along Tallagandra Lane to improve line of sight at the main access route on this road. Vegetation across the remainder of the Site would be retained where practicable, with the exception of selected paddock trees and some grassland areas that are required to be cleared during construction, in accordance with the biodiversity impact assessment. This would include footings for the physical infrastructure, as well as access roads, car parking, control building, electrical infrastructure and where grading and levelling works are required for the construction of the solar trackers.

Earthworks

The project is expected to require minimal bulk civil earthworks as the layout of the solar panels and tracking system would generally follow the existing topography of the Site. Grading or earthworks may be required for levelling some areas of land to accommodate the construction of tracking systems, as well as access tracks, and the footings of the substation and power conversion stations. Either pile driven posts or concrete foundations of suitable geotechnical design would be constructed to support the power stations, control building and transformer base that would be installed on-site. Drainage channels and structures would be implemented as necessary to direct overland/stormwater flows.

Temporary site access roads

Temporary access roads may be instated for construction. These roads would be designed for all-weather access and temporary drainage and would be approximately 4 m wide to allow effective movement of construction vehicles and plant. These roads would coincide with the location of the operational phase internal roads were practicable. Those that are not required as part of the operational phase internal road network would be removed and the ground made good following construction.

Hardstand/laydown areas

Temporary hardstand areas would be required for the temporary laydown and storage of construction materials. These areas may be graded and flattened and would require gravel or similar material to allow the movement of heavy construction materials and plant. These areas would be temporary and would be progressively rehabilitated throughout construction.

Top soil that is removed during the preparation of the hardstand areas would be stockpiled and later used in the remediation of these areas.

Hardstand areas would be located within the Site. The footprint of the hardstand areas would be minimised as much as practical and would avoid identified constraints. All hardstand areas would be rehabilitated by the end of the construction period.

Temporary site facilities

Temporary facilities such as parking, toilets and amenities would be provided during construction. These facilities would provide adequate water, shelter and safety from the elements for all site workers. Temporary accommodation for the workforce would not be installed on-site as the workforce would be accommodated in nearby towns.

Grading and culvert upgrade works on Tallagandra Lane

Heavy vehicle site access would be from the south via Tallagandra Lane, which becomes unsealed from approximately 150 m south of the Site. Due to the fluctuating condition of the unsealed section of Tallagandra Lane, minor road grading would be undertaken during site establishment if required to restore the driving surface to a suitable smoothness and shape. Ongoing maintenance of the road surface would be undertaken as required throughout construction including grading and dust suppression, as per the Traffic Management Plan (see section 14.0).

The traffic assessment in section 14.0 concludes that a culvert on Tallagandra Lane where the road crosses the unnamed creek through the Site, may need to be upgraded to accommodate heavy vehicles during construction. The need for this would be further assessed and confirmed prior to construction. If an upgrade is required this would be completed during the site establishment phase.

The impacts of the project on traffic and transport during construction are considered manageable without the need for any significant upgrade or sealing of any roads. This is supported by the assessment set out in section 14.0 of this EIS. Despite this, however, Renew Estate has offered to enter into a Voluntary Planning Agreement with YVC to provide an additional public benefit of contributing funds to the upgrade some current unsealed sections of Tallagandra Lane. Renew Estate understands that YVC has no immediate plans to upgrade Tallagandra Lane due to other priority projects within the LGA, however feedback provided to Renew Estate from the community during its community consultation activities has identified that the state of Tallagandra Lane is an important issue for local residents. Renew Estate is continuing to work with YVC towards agreeing the terms of a Voluntary Planning Agreement that would allow for the provision of this public benefit (amongst other

benefits). YVC has confirmed that, if such an agreement is able to be reached, that they would be the consent authority for these upgrade works. Accordingly, consent is not sought in this application for this component.

Security fencing and control building

Security fencing installation would likely involve casting concrete footings for posts and installing fencing mesh. Security fencing would be up to 2200 mm in height, subject to final design which would seek to minimise the visual impact of the fencing while ensuring that it is appropriate for security and safety purposes.

The control building would be constructed on concrete footings employing conventional construction methods. The control building would include a small car park with approximately 10 parking spaces provided.

Electrical switchyard and substation

The electrical switchyard and substation would consist of a three 132 kV circuit breaker switching station including line works to connect to 132 kV line 977, a 132/33 kV substation with switch bays, 132/33 kV transformer and 33 kV switchgear.

Construction works would consist of civil works including the substation bench, drainage and building works for the substation control room. The electrical works include installation of the primary plant, installation of the electrical interfaces, communications systems, secondary system interfaces including interface kiosks and metering.

The construction of the substation and switchyard is estimated to take 44 weeks including commissioning.

Solar field construction

The galvanized poles for the supporting framework would be piled or screwed into the ground, the formwork installed followed by mounting of the solar panels on the tracking frame. Meteorological monitoring equipment would be installed on poles with concrete footings.

All electrical cabling would be trenched to an appropriate depth. This would involve the excavation of trenches, placement of the cables and backfilling. Concrete footings would be constructed prior to installation of power stations, transformers and switchgear components.

Electrical works would involve installation of cables connecting to the TransGrid 132 kV transmission lines in compliance with TransGrid technical and safety procedures.

Tintinhull Road realignment

Subject to the execution of a Voluntary Planning Agreement with YVC (including agreement on the relevant works), a new section of public road is proposed to be constructed between Tallagandra Lane and Tintinhull Road, as described in section 3.2.12. The road would be constructed in accordance with the 'Access' category in the table of rural road standards in YVC's *Road Standards Policy* (YVC, 2013) (5.5 m minimum pavement width, 20 m road reserve, gravel finish). Renew Estate understands that this specification has been agreed in principle by YVC.

It should be noted that whilst works to facilitate the Tintinhull Road realignment form part of this SSD application (including subdivision of land and construction of the road), the execution of these works would be subject to reaching a Voluntary Planning Agreement with YVC

Demobilisation and rehabilitation

Upon completion of construction all temporary structures would be dismantled and all construction waste or excess materials would be removed from the Site and recycled or disposed at appropriate designated landfills. All temporary access roads and hardstand areas would be removed and rehabilitated back to their original condition as best as practicable. Ground cover (topsoil) suitable for grading would be reinstated on all exposed areas with these areas being reseeded with a local native seed mix.

3.3.4 Construction equipment

Construction would require the following plant and equipment:

- Heavy vehicles, utes and light vehicles
- Piling rigs
- Forklifts and assisted material handling equipment
- Manual tools, including compressed air and electric tools
- Machinery for earthworks/civil works such as excavators, compactors, rollers and graders
- Cable trenching and laying equipment
- Water trucks for dust suppression.

3.3.5 Materials

Construction materials would be sourced from local sources as much as practicable whilst solar panels and electrical equipment would be sourced from a combination of local and international suppliers. Materials would include:

- Gravel and road sub-base materials likely to be sourced from local quarries
- Concrete, cement, sand and steel for civil works likely to be sourced from local suppliers
- Galvanised fencing likely to be sourced from local suppliers within NSW
- Solar panels, power stations, trackers, switchgear, cables, SCADA systems and other electrical or control equipment would be sourced from specialist supplies and transported in from metropolitan areas or ports
- Water for temporary amenities, dust suppression and PV panel cleaning would be obtained from water delivered by trucks

3.3.6 Workforce

The average workforce during construction is expected to be approximately 50 full time equivalent positions, with up to 200 people during peak construction. Where practicable the workforce would be recruited from the local community and local sub-contractors would be used.

3.3.7 Construction hours

Construction hours are defined in as follows in the Interim Construction Noise guideline (ICNG) (DECC, 2009):

- Standard Hours: 7am to 6pm Monday to Friday and 8am to 1pm Saturday
- Out of Hours: before 7am and after 6pm Monday to Friday, before 8am and after 1pm Saturday, and all day on Sundays and public holidays.

Work is generally expected to be completed within standard hours. Out of hours work may be required, however would be limited to activities with low noise generation where practicable.

Nearby residents would be notified of certain noise-generating works outside of standard hours. This would involve justifying why works are required outside the standard hours and outlining the timing, duration and potentially expected noise levels.

3.4 Operation

3.4.1 Operation hours and days per year

The project would be in operation during daylight hours, 365 days a year. Operation and maintenance activities may occasionally extend beyond daylight hours for corrective and preventative maintenance activities. The solar farm is anticipated to be manned from 7am until 6pm, 365 days a year and would also be remotely monitored 24 hours a day, 365 days a year.

3.4.2 Operational workforce

The operational workforce would consist of approximately five long term full time equivalent positions with an additional up to five to ten full time positions during the initial defect liability period of operation,

an estimated two years. The workforce is likely to include a site manager, high voltage electrician and maintenance staff. Asset management staff and contractors would also be present from time to time.

3.4.3 Operation and maintenance activities

Operation and maintenance procedures and/or management plans would be developed and implemented for the project. For connection assets to be owned by TransGrid these would conform to the requirements of TransGrid's Environmental Management System (EMS). The operation of the SSF would be largely automatically controlled by the SCADA system with inputs from the meteorology stations and other equipment. Planned maintenance activities would likely include:

- Weekly and monthly inspections covering electrical, civil and environmental operational performance
- Annual cleaning of modules and meteorological stations
- Vegetation management in line with the Vegetation Management Plan. Sheep grazing may be retained within the project to maintain undergrowth as well as to retain long term agricultural productivity of the land. Grazing would reduce fuel use and emissions associated with grass cutting, as well as lowering bushfire threat and maintaining habitat for threatened species
- Preventative maintenance and other activities as defined in the operation and maintenance management plans
- Corrective maintenance activities would include testing and replacing of faulty plant components such as modules, fuses and other corrective actions within operation and maintenance scope
- Weed and pest control.

3.5 Decommissioning

The operational lifetime of the solar farm is approximately 30 years.

Decommissioning at the end of the operational life of the solar farm would remove all above ground infrastructure and rehabilitate the Site to return it to its current predevelopment condition with the aim of resuming agricultural activities, i.e. for cattle or sheep grazing. When the Site is decommissioned the following works would be carried out:

- The power stepping up station and switchyard would be disconnected from the main grid in accordance with the Operating Protocol, TransGrid and the Australian Electricity Market Operator
- All PV modules and electrical equipment would be disconnected, removed and recycled at a designated recycling facility
- Removal of all tracker posts and which would be recycled
- Possible repurposing of the control building for farm use. If not repurposed the control building would be demolished and recycled
- Rehabilitation of the top 300 mm with suitable top soil
- Removal or retention of perimeter fencing subject to agreement with the land owner
- Rehabilitation of the development envelope to its former pasture condition, i.e. replanting with suitable grass seed mixture
- Retention of the trees and vegetation along the riparian buffer strip of Back Creek as well as retention of vegetation planted for screening
- All ground disturbances would be made good and a final environmental audit would be conducted to verify compliance to applicable requirements.

In the event the life of the project is extended, the following would be carried out:

- Conducting an environmental audit of project performance
- Assessing the impact and obtaining the necessary regulatory approvals for project life extension

- Replacement, maintenance, repair or upgrading of PV and/or other electrical infrastructure
- Revision and implementation of the operation and maintenance management plan.

3.6 Access and traffic management

The Site is readily accessible via Tallagandra Lane, a public road which is also used by the local community and farmers. During the construction stage vehicles travelling to the Site would include:

- Trucks delivering materials and equipment (such as piling rigs, excavators, graders and rollers) to the Site as well as removing waste materials
- A heavy load truck and trailer convoy that would deliver the transformer (the largest piece of equipment), using existing roads and a formed access into the Site
- Workers would be accommodated at nearby towns and would commute daily by cars and 4x4 vehicles to and from the Site. This would peak when the maximum workforce of 200 personnel is reached.

A Traffic Management Plan would be prepared prior to commencement of construction to manage all construction related vehicle movement.

As discussed in section 3.3.3, minor road grading of Tallagandra Lane may be undertaken during site establishment if required to restore the driving surface to a suitable condition and shape. The requirement for this will depend on the road condition at the time of site establishment, which fluctuates due to rain events, vehicle use and the existing maintenance regime. Maintenance of the road surface would be undertaken as required throughout construction including grading and dust suppression. Further, a culvert on Tallagandra Lane where the road crosses the unnamed creek may need to be upgraded to accommodate heavy vehicles during construction. The need for this would be further assessed and confirmed prior to construction.

During operation approximately five full time equivalent staff would be present on-site. Repair and maintenance traffic is also expected to be infrequent and low level.

3.7 Project construction schedule

The construction period is expected to be approximately 10 months in duration, commencing in the fourth quarter of 2018. Commissioning will commence in the eighth or ninth month of construction.

4.0 Statutory context

4.1 Permissibility

The proposed development is located on land zoned RU1 Primary Production under the *Yass Valley Local Environment Plan 2013*. Electrical generation is not listed as permissible with consent in this zone, however the proposed development is permissible with consent on any land under clause 34(7) of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP). As outlined in clause 8 of the ISEPP, where there is an inconsistency between the ISEPP and any other environmental planning instrument, the ISEPP prevails to the extent of the inconsistency.

Therefore, the proposed development is permitted with consent within the RU1 zone. As Renew Estate are not a public authority for the purposes of the Act, the proposal must be assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

4.2 NSW legislation

4.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act*, Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and associated environmental planning instruments such as State Environmental Planning Policies (SEPPs) and LEPs provide the framework for the assessment of environmental impacts and approval of development in NSW.

The EP&A Act authorises the making of environmental planning instruments including *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) that covers the scope, power and content of plans. The EP&A Act also establishes the process for the assessment and approval of development which requires consent under Part 4.

Section 4.36 of the EP&A Act is relevant to this project and provides for a process where development can be declared as State Significant Development (SSD) either by a SEPP or Ministerial order published in the Gazette. Section 4.37 of the EP&A Act provides that the Minister for Planning is the consent authority for SSD. Part 4.1 of the EP&A Act sets out provisions which apply to the assessment and determination of SSD.

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

The SRD SEPP identifies development that is classified as SSD or State Significant Infrastructure (SSI). Clause 20 of Schedule 1 of the S&RD SEPP states that the following is SSD for the purposes of section 4.37 of the EP&A Act:

> *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.*

As the SSF would have a capital investment value greater than $30 million, the proposal is classified as ‘State Significant Development’ and is subject to assessment and determination under Part 4 of the EP&A Act. The Minister for Planning or their delegate is the consent authority for SSD projects.

4.2.3 State Environment Planning Policy (Infrastructure) 2007

The ISEPP aims to facilitate the effective delivery of infrastructure across the State. Clause 34(7) outlines that development for the purpose of a solar energy system may be carried out by any person with consent on any land. Clause 34(8) limits the capacity of solar energy systems in prescribed residential zones to no more than 100 kW. The Site is zoned RU1 under the *Yass Valley Council Local Environment Plan 2013* and as such is not a prescribed residential zone and is therefore not subject to Clause 34(8).

4.2.4 Other NSW Legislation

State Environmental Planning Policy (Rural Lands) 2008

The *State Environmental Planning Policy (Rural Lands) 2008* (Rural Lands SEPP) aims to facilitate the orderly and economic use and development of rural lands for rural and related purposes, to identify rural planning principles so as to assist in the proper management, development and protection of rural lands, reduce land use conflicts and identify State significant agricultural land to ensure its ongoing viability.

Clause 7 of the Rural Lands SEPP identifies the eight rural planning principles as follows:

a. the promotion and protection of opportunities for current and potential productive and sustainable economic activities in rural areas

b. recognition of the importance of rural lands and agriculture and the changing nature of agriculture and of trends, demands and issues in agriculture in the area, region or State

c. recognition of the significance of rural land uses to the State and rural communities, including the social and economic benefits of rural land use and development

d. in planning for rural lands, to balance the social, economic and environmental interests of the community

e. the identification and protection of natural resources, having regard to maintaining biodiversity, the protection of native vegetation, the importance of water resources and avoiding constrained land

f. the provision of opportunities for rural lifestyle, settlement and housing that contribute to the social and economic welfare of rural communities

g. the consideration of impacts on services and infrastructure and appropriate location when providing for rural housing

h. ensuring consistency with any applicable regional strategy of the Department of Planning or any applicable local strategy endorsed by the Director-General.

The project is considered to be an orderly use of the rural lands encompassed by the Site. Potential impacts to biodiversity, heritage, land use and water resources have been considered in project design and relevant mitigation and management measures have been provided. This include the continuation of low intensity livestock grazing within parts of the Site to maintain groundcover so as to reduce the potential for erosion and sedimentation. In addition, upon decommissioning the project would be readily returned to its original agricultural use. Thus, the project would not result in significant adverse impacts upon State significant agricultural land (none of which is currently specified in Schedule 2 of the SEPP). It is therefore considered that the development is consistent with the aims of the Rural Lands SEPP.

State Environmental Planning Policy No.33 - Hazardous and Offensive Development

State Environmental Planning Policy 33 – Hazardous and Offensive Development (SEPP 33) provides definitions for hazardous and offensive industry. A potentially hazardous industry is defined within SEPP 33 as:

> *a development for the purpose of any industry which, if the development were to operate without employing any measures to reduce or minimise its impact, would pose a significant risk to human health, life or property, or to the biophysical environment.*

This EIS investigates risks to human health and the biophysical environment, including risks that may affect existing and future land use. The project would be designed, constructed and operated to avoid significant risk to human health, life or property or to the biophysical environment. Therefore, it is considered that the proposal does not constitute a hazardous or offensive development nor is it potentially hazardous or potentially offensive development.

State Environmental Planning Policy No.44 - Koala Habitat Protection (SEPP 44)

State Environmental Planning Policy No.44 - Koala Habitat Protection (SEPP 44) aims protect suitable Core koala habitat is defined in the SEPP as:

'an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population'. Potential koala habitat is defined as 'areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component'.

SEPP44 is currently under review where the key changes relate to the definitions of koala habitat, list of tree species, list of applicable councils and the development assessment process.

The Site is located on approximately 370 hectares of land that is generally cleared of canopy vegetation and is currently used primarily for grazing. A seven-hectare stand of woodland is present within the Site, though this area would not be affected by the proposed solar farm. The biodiversity assessment (Chapter 7.0 and Appendix B) further addresses the potential for impact upon potential koala habitat within the Site and indicates that no core or potential habitat is present for this species.

State Environmental Planning Policy No. 55 - Remediation of Land

State Environmental Planning Policy No 55 - Remediation of Land (SEPP 55) aims to promote remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment.

Under clause 7, a consent authority must not consent to the carrying out of any development on land unless:

a. *it has considered whether the land is contaminated, and*

b. *if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or would be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and*

c. *if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land would be remediated before the land is used for that purpose.*

A review of the EPA Contaminated Land Register under section 58 of the *Contaminated Land Management Act 1997* (CLM Act) and the list of NSW contaminated sites notified to the NSW Environmental Protection Agency (EPA) under section 60 of CLM Act was conducted on 27 October 2017. This review did not return any registered contaminated land sites within or surrounding the Site. Further, previous and ongoing land uses within the site are not of a type that is likely to have resulted in substantial historical contamination risk.

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) establishes the State's environmental regulatory framework and includes licensing requirements for certain scheduled activities. The POEO Act is administered by the NSW Environmental Protection Agency (EPA).

Under Section 48 of the POEO Act certain activities, as defined in Schedule 1, require an Environmental Protection Licence (EPL). Clause 17 of schedule 1 of the POEO Act concerns electricity generation works, though solar energy generation does not fall within the definition of electricity generation under this schedule and therefore does not require an EPL.

Accordingly, an EPL is not required under the POEO Act for the proposal.

Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 (BC Act) commenced on 25 August 2017, repealing and replacing the *Threatened Species Conservation Act 1995,* the *Nature Conservation Trust Act 2001,* the *Native Vegetation Act 2003* and parts of the *National Parks and Wildlife Act 1974*. The BC Act contains provisions for the assessment of impacts on biodiversity values of a proposed development, providing measures to calculate biodiversity offsets for these impacts and establishing market-based conservation measures, including biodiversity credits.

A Biodiversity Development Assessment Report (BDAR) has been prepared for the project. This report describes the biodiversity values present within the Site and identifies potential impacts of the proposed solar farm on these values. This assessment has used the Biodiversity Credit Calculator

(BCC) as required under the NSW Biodiversity Assessment Methodology (BAM). Further details of this assessment are outlined in section 7.0 of this EIS.

Biosecurity Act 2015

The *Biosecurity Act 2015* manages the risk of biosecurity risks across the State in an integrated manner. The provisions of this Act relevant to the proposal include those around the management of weeds, particularly those previously regulated by the (now repealed) *Noxious Weeds Act 1993*.

The *Biosecurity Act 2015* includes a general biosecurity duty for all individuals who deal with plants known or likely to pose a biosecurity risk. This includes a duty to prevent, eliminate or minimise the risk posed by a prohibited matter (priority weed) as outlined in Schedule 2 of the Act so far as is reasonably practicable. Section 7.0 of this EIS considers weeds declared as priority weeds in the Yass Valley LGA that occur within the study area. A priority weed is one that should be prevented, managed, controlled or eradicated in the region.

Water Management Act 2000

The *Water Management Act 2000* (WM Act) aims to ensure that water resources are conserved and properly managed for sustainable use benefiting both the present and future generations. It is also intended to provide formal means for both the protection and enhancement of the environmental qualities of waterways and their in-stream uses as well as to provide for protection of catchment conditions.

Fresh water sources throughout NSW are managed via water sharing plans (WSPs) under the WM Act. Key rules within the WSPs specify when licence holders can access water and how water can be traded.

The Site is covered by the *Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2016* (Murrumbidgee Water Management Area), made under section 50 of the WM Act.

It is not anticipated modifications to existing entitlements or new entitlements would be required as a result of the proposed works. Water requirements would be satisfied by purchasing water during construction and operation and additionally from collected rain water during operation.

The WM Act specifies certain activities as controlled activities when carried out on waterfront land. This is defined as within 40 metres of the banks of a river, lake or estuary. Despite that fact that the proposed solar farm is proposed within 40 metres of Back Creek a controlled activity approval would not be required by virtue of Section 4.41 of the EP&A Act. This Section specifies certain approvals that are not required for SSD, including an activity approval (other than an aquifer interference approval) under section 91 of the WM Act. Despite this provision this section of the Act does not remove the requirement for obtaining an aquifer interference approval. The proposal would not interfere with any aquifers and as such an aquifer interference approval is not required.

National Parks and Wildlife Act 1974 (NP&W Act)

Under the *National Parks and Wildlife Act 1974* (NP&W Act), 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, 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.

A permit is required under section 90 of the NP&W Act before harming or desecrating an Aboriginal object, otherwise, such action is an offence under the NP&W Act. Despite this, under Section 4.41 of the EP&A Act, an Aboriginal Heritage Impact Permit is not required for SSD.

The closest NSW nature reserve is more than 6 km south of the Site (Goorooyarroo Nature Reserve). The potential impacts to native fauna and flora and Aboriginal heritage and are discussed in section 7.0 of this EIS.

Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to conserve heritage values across the State. 'Environmental heritage' is defined in the act as those places, buildings, works, relics, movable objects and precincts of State or local heritage importance. Heritage items are listed on the State Heritage

Register which is established under the Heritage Act. Items of local heritage significance are also found in LEPs, which contain provisions to ensure the protection of such items.

Under Section 4.41 of the EP&A Act, an approval under Part 4 or an excavation permit under section 139 of the Heritage Act is not required for SSD.

The potential impacts on heritage items and places are discussed in section 8.0.

Roads Act 1993

The *Roads Act 1993* (Roads Act) regulates the carrying out of various activities on public roads, and provides for the declaration of Roads and Maritime Services (RMS) and other public authorities including local Councils as roads authority for different types of roads (classified and unclassified).

Under section 138 of the Roads Act, the consent of the appropriate roads authority (Council or RMS) is required before a person can, for example, erect a structure or carry out a work in, on or over a public road, or dig up or disturb the surface of a public road.

If required, approval from the relevant roads authority would be sought under section 138 of the Roads Act.

The project's impacts relating to local and regional roads are outlined in section 14.0.

Proposed minor grading works along Tallagandra Lane and the proposed construction of a new public road as part of the Tintinhull Road realignment are described in Section 14.0. Approval for these works from YVC would be sought under section 138 of the Roads Act.

Crown Lands Act 1989

The Site includes a number of Crown roads located adjacent to the boundaries of a number of lots (Figure 13). Except for Tintinhull Road, all of these Crown roads inside the Site are unformed and most are subject to an enclosure permit. Renew Estate has commenced the application process to permanently close some of the unformed Crown roads and purchase the subject land from the Crown. Renew Estate would continue to consult with the Department of Industry, where required, in order to finalise the road closures for the purposes of the development.

Specifically, Renew Estate have requested the following Crown roads to be closed which are currently subject to enclosure permit 49446 (highlighted in red in Figure 13):

- west of lot 10 in DP 754908
- part south and east of lot 190 in DP 754908
- west and part south of lot 54 in DP 754908, and
- north, west and part south of lot 97 in DP 754908.

Renew Estate have requested the following Crown roads to be closed which are not subject to enclosure permit 49446 (highlighted in blue in Figure 13):

- through lot 54 in DP 754908, and
- part south of lot 97 in DP 754908.

In addition to the roads to be closed, Renew Estate has applied for a licence to cross the following sections of Crown road with access tracks. These access tracks would consist of compacted gravel and would be approximately 6 meters wide. In certain cases these roads would cover underground cables, which would be used for the distribution of electricity and electronic communication:

- Location 1: Between Lots 161 and 15, DP754908
- Location 2: Between Lot 1 DP198933 and Lot 54 DP754908 (across Tintinhull Road)

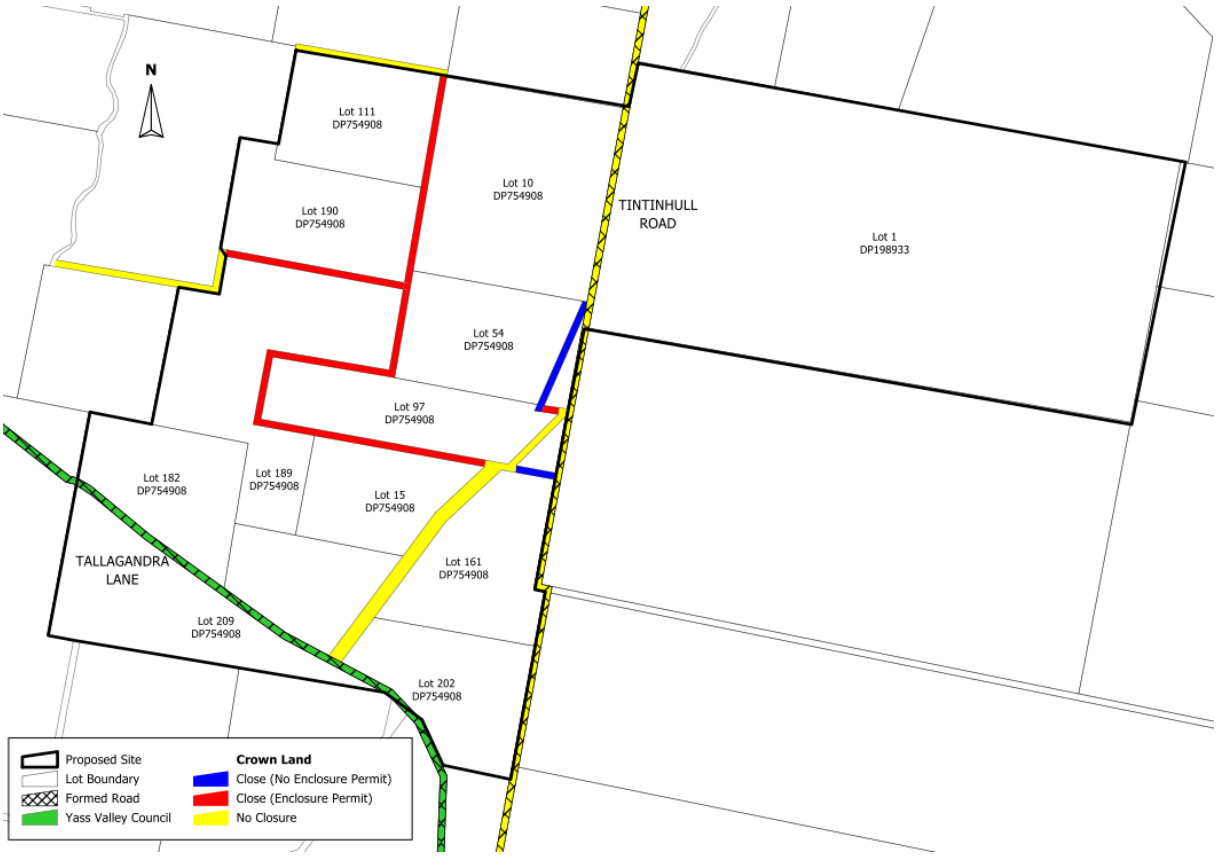


Figure 13 Unformed Crown roads subject to application for closure (blue and red)

Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) protects fishery resources within NSW. The objectives of the Act include the conservation of fish stocks and key fish habitats, and conservation and management of threatened species, populations and ecological communities of fish and marine vegetation.

Key Fish Habitat is defined to include all marine and estuarine habitats up to highest astronomical tide level and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank. Small headwater creeks and gullies (known as first and second order streams), that only flow for a short period after rain are generally excluded, as are farm dams constructed on such systems. Wholly artificial waterbodies such as irrigation channels, urban drains and ponds, salt and evaporation ponds are also excluded except where they are known to support populations of threatened fish or invertebrates.

The project is located within the Yass Valley LGA. Mapping for this LGA (DPI 2016) indicates that two waterways representing Key Fish Habitat run through the eastern part of the Site. However, as per Section 4.41 of the EP&A Act, permits under section 201, 205 or 219 of the FM Act are not required. Despite this any required crossing (road or underground cabling) would be undertaken according to best practice methods to minimise aquatic impacts.

4.3 Evaluation of the development

As per Section 4.40 of the EP&A Act, the evaluation criteria in section 4.15 is relevant to State Significant Development. This section outlines factors required to be considered by a consent authority as is relevant to the development proposal subject to the development application.

S 4.15(1)(a) - the provisions of (i) any EPI (Environmental Planning Instrument), (ii) any exhibited Draft EPI, (iii) any DCP (iiia) draft or finalised planning agreements (iv) the regulations (v) any applicable coastal zone management plan

(i) The EPIs and their provisions relevant to this proposal are outlined in section 4.2 of this report.

(ii) There are currently no draft EPIs under consultation relevant to the proposal

(iii) As per Clause 11 of the SRD SEPP, Development Controls Plans do not apply to State Significant Development

(iiia) No planning agreements have been entered into for this development proposal

(iv) Clause 92 of the EP&A Regulations require the following matters to be taken into consideration by a consent authority in determining a development application:

(a) in the case of a development application for the carrying out of development:

(i) in a local government area referred to in the Table to this clause, and

(ii) on land to which the Government Coastal Policy applies, the provisions of that Policy

Yass Valley Council is not listed on the relevant table to this clause.

(b) in the case of a development application for the demolition of a building, the provisions of AS 2601

The proposal does not include the demolition of any structures.

(c) in the case of a development application for the carrying out of development on land that is subject to a subdivision order made under Schedule 5 to the Act, the provisions of that order and of any development plan prepared for the land by a relevant authority under that Schedule

The proposal does not include development on land subject to a subdivision order.

(d) in the case of the following development, the Dark Sky Planning Guideline:

(i) any development on land within the local government area of Coonamble, City of Dubbo, Gilgandra or Warrumbungle Shire,

(ii) development of a class or description included in Schedule 4A to the Act, State significant development or designated development on land less than 200 kilometres from the Siding Spring Observatory.

The Dark Sky Planning Guideline does not apply to this proposal

S 4.15(1)(b) - the likely impacts of the development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality

The likely impacts of the proposed development are outlined in section 7.0 to section 19.0 of this EIS. This section demonstrates that, with the application of appropriate mitigation and management measures, the impacts of the project have been avoided or minimised as far as is reasonably practicable.

S 4.15 (1)(c) - the suitability of the site for the development

The suitability of the Site for the development of a solar farm is outlined in section 2.3.1 of this EIS. In summary this includes the high solar resource of the area, the proximity to electrical connections, electrical efficiencies, availability of land, minimal shading, suitable topography, low flood risk and proximity to local labour.

S 4.15 (1)(d) - submissions

The proposed development would be subject to public exhibition for a minimum of 28 days as per Clause 8 of Schedule 1 of the EP&A Act. The proponent would consider the submissions and provide a written response addressing each issue raised, including those form the community or other government stakeholders.

S 4.15 (1)(e) - the public interest

As outlined in section 2.0 of this EIS the project would be in the public interest on several levels. This includes:

- the provision of renewable energy, reducing the overall greenhouse gas intensity of the National Electricity Market and bolstering supply in the context of the impending closure of several coal fired electricity generators in NSW
- the provision of local employment and economic development in a regional area of NSW.
- The public interest would be further considered as part of feedback from various consultation activities (see section 5.0 of this EIS). Where practicable the project would be designed to further optimise public interest benefits.

4.4 Local government

4.4.1 Yass Valley Local Environmental Plan 2013

The *Yass Valley Council Local Environment Plan 2013* (LEP) governs land use within the Yass Valley Local Government Area. The LEP provides local environmental planning provisions for land in the Yass Valley area in accordance with the relevant standard environmental planning instrument under section 3.20 of the EP&A Act.

The project is located on land zoned ‘RU1 - Primary Production’ under the LEP. The LEP objectives of the RU1 zone include the following

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To maintain areas of high conservation value vegetation

- To protect and enhance the water quality of receiving watercourses and groundwater systems and to reduce land degradation.

Electricity generating works are not listed as permissible with or without consent under the LEP, but are permissible with consent under the ISEPP, which governs the permissibility of this project. As the development would cause minimal impact to the land resources, encourage diversity in the area's land use and would provide economic stimulus to support rural communities, it is considered that the proposed project is generally compatible with local land use objectives.

4.5 Commonwealth legislation

4.5.1 Environment Protection and Biodiversity Act 1993

The *Environment Protection and Biodiversity Conservation Act 1993* (EPBC Act) is administered by the Commonwealth Department of the Environment and Energy (DoEE) and provides a legal framework to protect and manage places defined as Matters of National Environmental Significance (MNES). Under the EPBC Act actions that have, or are likely to have, significant impacts on a MNES are deemed a 'controlled action' and require approval from the Minister for the Environment. The assessment of the significance of the impact is based on the criteria listed in the DoEE's *Significant Impact Guidelines 1.1* (DoEE 2013). The Minister would decide whether assessment and approval is required under the EPBC Act.

Nine MNES are listed under the EPBC Act:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development.

A search of matters protected by the EPBC Act was undertaken on 31 October 2017 using the EPBC Act Protected Matters Search Tool (PMST) (DoEE, 2017). A search radius of 5 km was applied. The results of the search are summarised in Table 4 and a copy of the PMST report is provided in Appendix B. Potential impacts to threatened species and ecological communities are further discussed in section 7.0.

Table 4 Results of the EPBC Act Protected Matters Search

Matters of National Environmental Significance	
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Significance (Ramsar)	4 (nearest is 600 – 700 km upstream)
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological Communities	2
Listed Threatened Species	28
Listed Migratory Species	13
Other Matters Protected by the EPBC Act	

Matters of National Environmental Significance	
Commonwealth Land	None
Commonwealth Heritage Places	None
Listed Marine Species	19
Whale and Other Cetaceans	None
Critical Habitats	None
Commonwealth reserves Terrestrial	None
Commonwealth reserves Marine	None

Detailed ecological assessments conducted as part of this EIS have identified impacts to MNES. As such a referral was submitted in March 2018 (referral number 2018/7183) to DoEE. DoEE subsequently determined that the project would be a controlled action and provided additional assessment requirements. Additional field and desktop assessment has been undertaken to address these requirements. This is reflected in the updated BDAR, detail of which is summarised in section 7.0 of this report (Biodiversity). This detail is expected to be satisfactory to be allow the Minister to undertake a final determination of the project as part of an accredited assessment process under the Bilateral Agreement between NSW and the Commonwealth.

4.5.2 Native Title Act 1993

The *Native Title Act 1993* (Native Title Act) provides a legislative framework for the recognition and protection of native title rights. Native title is the recognition that, in certain circumstances, Indigenous people continue to hold rights to their land and waters, which come from their traditional laws and customs.

The Native Title Act sets up processes to determine whether native title exists, how future activity impacting upon native title may be undertaken, and to provide compensation where native title is impaired or extinguished.

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.

Searches of the Schedule of Applications (unregistered claimant applications), Register of Native Title Claims, National Native Title Register, Register of Indigenous Land Use Agreements and Notified Indigenous Land Use Agreements were undertaken in November 2017, with no relevant listings identified for the Site.

4.5.3 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 renewal energy targets (RET). This includes solar energy. The RE Act establishes a scheme whereby accredited renewal energy generators are awarded certificates at a rate of one certificate per MW hour of renewable energy produced. These renewable energy certificates are then traded on the energy market where they can be purchased by large energy users such as energy retailers in order to meet stipulated RET. Under the RET scheme, solar farms are classified large-scale RETs.

The project would be the subject of application to get accredited by the Clean Energy Regulator under the RE Act to obtain Renewable Energy Certificates under the RET scheme.

4.6 Licenses and approvals

Table 5 contains a summary of the licences, approvals and permits that are likely to be required for the proposed project.

Table 5 Summary of licences and approvals required

Legislation	Licence or approval requirement	Consent or approval authority
Environment Protection and Biodiversity Conservation Act 1999	As the project was deemed a controlled action approval from the Commonwealth Minster for the Environment will be required.	Minister for the Environment and Energy
Environmental Planning and Assessment Act 1979	SSD applications require approval from the Minister for Planning. This EIS has been prepared in accordance with the requirements of the EP&A Act	Minister for Planning or delegate
Environmental Planning and Assessment Act 1979	Consent conditions to be placed upon the project, should it be approved.	Minister for Planning or delegate
Roads Act 1993, section 138	Any works to or on a public or classified road requires consent under this act from the roads authority.	Should the culvert on Tallagandra Lane require upgrading (refer section 3.3.3), YVC would be the approval authority for such works. YVC would also be the approval authority for the Tintinhull Road realignment works (proposed subject to execution of a Voluntary Planning Agreement with YVC).

5.0 Consultation

5.1 Overview

5.1.1 Renew Estate's engagement strategy

Renew Estate's mission statement is to deliver authentic, effective and comprehensive stakeholder and community consultation for its proposal and all its projects. Its board-approved strategy to drive and deliver its engagement program is set out in its Landowners, Government & Community Engagement Strategy ("Engagement Strategy").

Renew Estate's objectives in the Engagement Strategy are to:

- Deliver an honest, innovative, flexible and transparent engagement process with all landowners, government and community stakeholders relevant to a project, throughout the life cycle of the project
- Inform and consult with the communities that are local to each project so that they have a deep understanding of both the impact of, and the benefits from, each project
- Engage at all times in respectful and transparent communications that take community needs and preferences into account
- Ensure that the host community directly benefits from the project in a tangible and identifiable way
- Engage in a manner that ensures approval and broad social acceptance of its projects by the local community and all other stakeholders (a social licence)

These objectives are achieved by the following eight principles of community engagement:

- Mutual benefit - Creating shared outcomes of mutual benefit for the host community and landowners
- Relationship building - Building local networks and relationships based on trust
- Transparency - Being transparent at all times across all aspects of the project, processes and decisions
- Authenticity - Being authentic and engaging in active listening in all communications
- Mutual Respect - Using mutually respectful and dignified dialogue
- Appropriateness - Proposing projects that are appropriate for the local context
- Ongoing engagement - Delivering ongoing engagement throughout the project
- Responsiveness - Being responsive in a timely fashion to stakeholders' issues

Compliance with NSW DP&E Guidelines & SEARS

The Engagement Strategy was designed and delivered to ensure alignment with NSW DP&E Draft Community and Stakeholder Engagement Guidelines (June 2017). It also satisfies the requirements for consultation set out in the SEARS and supplementary SEARs (Appendix A).

5.1.2 Project engagement plan

Renew Estate has developed a Landowner, Government & Community Engagement Plan ("Engagement Plan") for the project that reflects Renew Estate's Engagement Strategy, the identified stakeholders (refer following section) and the Draft Community and Stakeholder Engagement Guidelines (DP&E, 2017). This plan sets out the methods of engagement, the stakeholders engaged, the timing of each activity and the outcomes of the consultation. The Engagement Plan is a live document and is updated progressively as engagement activities are undertaken and feedback provided. Forming part of the Engagement Plan is an Engagement Register which is a record of all significant meetings and telephone conversations with stakeholders and their contact details.

5.1.3 Stakeholder identification

Renew Estate identified a list of relevant stakeholders at the beginning of the project's planning phase. This list will continue to evolve throughout the various stages of the planning application and consent process. The current identified stakeholders are:

- Landowners and residents, including:
    - landowners or residents whose property adjoins the Site ("adjoining landowners"), and
    - other local landowners or residents who are likely to be directly affected by the proposal ("local landowners")
- Aboriginal people, Aboriginal organisations or their representatives with cultural or heritage connections with the Site
- Yass Valley Council
- NSW DP&E
- Commonwealth Department of Environment and Energy
- Other regulators via the DP&E
- Goulburn Chamber of Commerce
- Sutton Landcare
- NSW Rural Fire Service
- Sutton & District Community Association
- Gundaroo Community Association
- Local media
- Sutton Solar Action Group
- Local business owners in Sutton and Gundaroo
- Local political representatives including the Hon. Pru Goward, MP NSW for Goulburn and the Hon. Mike Kelly, Federal MP for Eden-Monaro.
- Relevant electricity authorities, including the Australian Energy Market Operator (AEMO) and TransGrid

5.2 Engagement activities undertaken during early project planning, EIS scoping and EIS preparation

Renew Estate is committed to frequent and transparent consultation from inception, throughout the life of the project. Accordingly, Renew Estate commenced its engagement activity early with telephone calls and face to face meetings with the adjoining neighbours, the local landowners and government agencies. Engagement activities have continued throughout the development of the EIS and will continue past lodgement of the EIS.

Table 6 summarises all of the engagement activities undertaken to date, from early planning phases, through to EIS scoping and completion of the EIS.

5.2.1 Project website

A project website (www.springdalesolarfarm.com.au) went live in October 2017 and is continuously updated with new project information. Information currently available on the website includes:

- a description of Renew Estate
- the project's location
- the proposed size of the project

- technical information about the solar panels and trackers
- the proposed operational lifetime of the project
- the proposed planning and construction timeline
- a link to the project's Preliminary Environmental Assessment and SEARs
- Renew Estate's community engagement ethos and vision
- an online Contractor Enquiry form for local businesses, contractors or service providers to express an interest in the project
- A telephone number and online form for the community to provide feedback
- links to project newsletters as they become available.

A link to this EIS will also be provided on the website during its public exhibition phase, as well as details on a community information drop-in session which will take place during the exhibition period.

5.2.2 Newsletters

Renew Estate provides project updates by way of regular newsletters.

The first newsletter (Appendix H1) provided key information about the project and a timeline. The second newsletter (Appendix H1) reported on the First Community Information Session, gave a more detailed planning timeline and answered questions that were raised by community members at the First Community Information Session. The third newsletter (Appendix H1) provided a timeline update, discussed shared benefits with the community and community investment opportunities, and answered more frequently asked questions.

These newsletters are distributed in two ways; digitally to stakeholders on the Engagement Register, and by hand when meetings are held. Links to the newsletters are also provided on the project website.

5.2.3 First community information session

In line with Renew Estate's strategy to engage with the community in a comprehensive and transparent way so as to embed a correct understanding of the impacts and benefits of the project, Renew Estate held the first of a planned series of Community Information Drop-In Sessions on 7 December 2017 in the Sutton Hall ("the First Community Information Session").

Notification and timing

The First Community Information Session was widely publicised by the use of a flyer (print and digital- Appendix H2) distributed in a number of ways including:

- A drop to all holders of a PO Box in Sutton and Gundaroo (~460 flyers)
- Letterbox drop to other Sutton dwellings
- Email notification to all those on the Engagement Register (including landowners, business owners, Sutton Landcare, the editor of the Gundaroo Gazette, Sutton & District Community Association and Gundaroo Community Association)
- Email notification to Yass Valley Council
- Notice in the Sutton Chatter (a printed local newsletter)
- Notification on the Sutton Chatter Facebook page
- Notice on the Sutton & District Community Association noticeboard.

On the morning of the First Community Information Session two large posters on stands were placed on display as a reminder to the community of the time and place of the session. The first was placed at the main road intersection in the Sutton village; the second on the corner of the road leading to the Town Hall.

As Renew Estate was aware that a large number of the Sutton community worked in Canberra and commuted to and from Sutton, the session was held in two parts so as to maximise the ability for people to be able to drop in. The session ran from 1–3 pm and again from 5-8pm.

Both sessions were well attended with an estimated 40-60 people attending in total. Those attended included the following:

- Adjoining and local landowners
- Sutton and Gundaroo business owners
- A member of Pru Goward's (Member for Goulburn) staff
- Yass Tribune
- Sutton Landcare
- Sutton & District Community Association members

Information provided

Display boards

A large volume of information was available at the First Community Information Session across 14 display boards as listed below:

- Indicative solar farm layout as of August 2018
- Indicative solar farm layout as of November 2018
- Likely heavy vehicle traffic routes during construction
- Construction timeline
- Site location maps
- Proposed Shared Value – Community Fund
- Ideas board for people to provide their feedback on how the Community Fund could be spent
- Proposed Shared Value – Opportunity for Community Investment
- Benefits to the Community - Increased demand for local services
- Benefits to the Community - Opportunity for relevant skills training, up-skilling and scholarships
- Benefits to the Community – Opportunity for local businesses to be involved in the project
- Landscaping
- Ideas board for people to provide their feedback on landscaping within the Site, such as species selections

Access to staff

There were seven staff present from Renew Estate and its partners for the community to speak with, comprising two Directors, two Senior Development Managers, a Senior Environmental Planner, the Director of Engagement & Culture and a Renewable Energy consultant.

Handouts and forms

A number of printed handouts were available which the community were encouraged to take away and/or fill out. These included:

- Survey form (for providing general feedback to Renew Estate) (Appendix H2)
- Local Service Opportunities form (for informing Renew Estate of local service providers) (Appendix H2)
- The two indicative layouts (August and November 2017 iterations)

- A snapshot of community benefits
- A general information sheet about solar farms (Appendix H2)
- Springdale Solar Farm Newsletter (issue #1) (Appendix H1)

Also, on display in the hall were:

- A time lapse video of a large scale solar farm being constructed.
- Several A0 size colour photo boards showing solar farms already built in the UK by Wirsol
- An actual solar panel similar to that panel that will be used by Renew Estate for the project.

Shared benefits for the community

Renew Estate has committed to share the benefits of the project with the community in a number of ways. The following proposed benefits were communicated at the First Community Information Session:

- A community fund: A fund of $100,000 is proposed to be paid for the benefit of the community. The community was invited to write down ideas on how this fund would be best used.
- Opportunity for community investment: The community was invited to express their interest in having a share in the financial return from the sale of renewable energy by completing the survey form available at the session or through providing feedback via the project website.
- Increased demand for local services: There will be an increased demand locally for services such as accommodation, catering, dining and drinking, automotive and electrical during the construction and operational stages of the solar farm. The community were invited to speak to a Renew Estate staff member about this and/or fill in the Local Service Opportunities form provided or the online Contractor Enquiry form.
- Opportunity for relevant skills training, up-skilling and scholarships: The community were invited to speak to a Renew Estate staff member about this.
- Maximised participation of local businesses in the construction and operation of the project: Renew Estate encouraged enquiries from any local businesses, contractors or service providers who were interested in learning about the scope of work and types of services that will be required during the construction and operational stages of a solar farm development. The community were invited to speak to a Renew Estate staff member about this and/or fill in the Local Service Opportunities form provided or the online Contractor Enquiry form.

Additional community benefits would include the sealing of Tallagandra Lane and Tintinhull Road re-alignment, which would only be undertaken if a Voluntary Planning Agreement is able to be reached with YVC, as discussed in section 3.2.12 and 14.2.1. These potential road works were not identified as benefits until after the First Community Information Session and therefore were not discussed at the session.

Further, Renew Estate has made a separate direct offer of two shared benefits options to landowners with dwellings within 1 km of the project or land adjacent to the project. Thirteen landowners have been identified for this offer, of which nine have dwellings. This offer (Appendix H3) illustrates Renew Estate's delivery of the first principle set out in its Engagement Strategy to create shared outcomes of mutual benefit to the host community. The offer was not on display at the First Community Information Session, as it has been shared at separate meetings with the relevant landowners.

Feedback from attendees

Survey forms

Of the survey forms handed in, 50% percent supported the project, 28% did not support it, 11% were undecided and 11% did not state their position.

Community Fund Ideas

Ideas provided by attendees on where the proposed Community Fund could be spent included:

- Primary school
- Help manage/improve Crown reserves/lands
- Sutton RFS
- Tavern [establishment of one]
- Landcare
- Protection of Crown reserve in Sutton (E2 zoned land), including establishment of a feral proof fence and control gates

Landscaping Ideas

Ideas provided by attendees regarding species selection for Site landscaping included:

- Allocasuarinas, for glossy black cockatoos
- Red box, yellow box, allocasuarinas
- Native grass species for regenerating soil
- Elms, hawthorns.

Concerns/queries raised

The following concerns/queries were raised at the First Community Information Session

- Why the Site location had been chosen for the project
- Visual impacts and the effect on the character of the local landscape
- Impact on land values in the area
- How the community would benefit
- Whether there would be an increased bushfire risk
- The use of good agricultural land
- Impact on traffic flow, safety, and conditions of the local roads
- Whether there are any plans to enlarge the solar farm or build a second phase in the future.

Table 7 sets out details as to where these issues are dealt with in this EIS.

Table 6: Summary of engagement during early planning, EIS scoping and EIS preparation

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
Regulators and industry stakeholders			
NSW DP&E	Meeting (August 2017)	Project briefing to introduce the project prior to applying for SEARs. Information shared included: • A description of Renew Estate and its partners • A map showing the project's proposed location • The rationale for the proposed size and site location	DP&E highlighted items they wanted to see in the PEA (application for SEARs) including environmental constraints, information on anticipated traffic generated, and evidence of a community consultation plan and early engagement activities.
	Telephone and email	• Receipt of SEARs • Provision of updates on EIS status	The SEARs were issued on 26 September 2017 and are addressed in this EIS (refer Appendix A).
	Telephone and email	• Ongoing liaison regarding administrative processes including the accredited EPBC Act assessment.	DP&E and Renew Estate remain informed about the project's planning status and processes.
Yass City Council	Meeting (July 2017)	Initial project briefing to YVC representatives. Information shared included: • A description of Renew Estate and its partners • The strategic justification for the project as well as proposed size and site location Anticipated project timeline	YVC gained an understanding of the proposed project and its potential benefits to the local area.
	Meeting (November 2017)	Progress update meeting	Council were updated on the progress of the EIS and project timeframes.

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
	Meeting (January 2018)	Meeting to provide YVC with an update on the progress and outcomes of community consultation. Access to the site was also discussed.	Tintinhull Road issue: YVC made Renew Estate aware of a pre-existing access issue regarding Tintinhull Road. Lot 7001 south of the site, is a Crown land parcel, however if sold in the future to a private entity, the existing Tintinhull Road segment through this lot could be closed to the public. This would block access to properties which rely on Tintinhull Road access. YVC suggested this issue could be resolved at the same time as the construction of the solar farm project. Refer section 3.3.3). Tallagandra Lane upgrade: YVC informed Renew Estate that there are no immediate plans to continue sealing Tallagandra Lane due to other priority projects in the Council area such as Mulligans Flat Road. YVC supported suggestions that a Voluntary Planning Agreement could be entered into for the contribution of funds to the upgrade of current unsealed sections of Tallagandra Lane. Refer section 14.2.1).
	Meeting (February 2018)	Meeting to discuss potential VPA terms including proposed road upgrade works and community fund. A general project update was also provided.	Both YVC and Renew Estate agreed to continue working through the development of a VPA.
Department of Environment and Energy (DoEE)	Meeting (January 2018)	Pre-referral meeting to discuss the potential impacts of the project on MNES protected under the EPBC Act, particularly the Golden Sun Moth, and the potential need for a referral to the DoEE.	The potential impacts to golden sun moth habitat were described to DoEE as well as how the project footprint had been modified to avoid impacts where practicable. The DoEE noted the modifications made to the design and the nature of impacts from a solar farm which are primarily shading, rather than habitat clearing. The DoEE advised Renew Estate to submit a referral to allow the DoEE to decide whether the project would be a Controlled Action.

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
	Teleconference (June 2018)	Following the DoEE's determination of the project as a Controlled Action and issue of supplementary SEARs, a teleconference was held to gain further understanding of DoEE's expectations and assessment requirements with regard to investigations already undertaken.	Renew Estate gained further understanding on DoEE's expectations and assessment requirements which are addressed in this EIS.
TransGrid	Ongoing meetings, telephone calls and emails	Detailed and ongoing collaboration with TransGrid on the technical aspects of the project.	Renew Estate has entered into a Connection Process Agreement with TransGrid for the scoping, design and interconnection of the project into the TransGrid transmission network. The project is currently in the finalisation of the Connection Agreement with TransGrid. Ongoing communication with TransGrid will be maintained throughout construction, commissioning and operation of the solar farm.
Australian Energy Market Operator (AEMO)	Ongoing meetings, telephone calls and emails	Ongoing collaboration with AEMO over project technical performance standards, operation and network security.	Renew Estate and AEMO are currently finalising the technical aspects of the projects connection and operation as outlined under the National Electricity Rules. The project is registered as an intending participant (generator) with AEMO

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
Rural Fire Service (RFS) NSW	Telephone (December 2017)	Initial project briefing. Information shared included: • A description of Renew Estate & its partners • A description of the project and proposed location • Proposed bushfire protection facilities	RFS representatives gained an understanding of the proposed project, including its location and design features. RFS representatives outlined the key firefighting facilities required for the project including static water supply volumes and other technical requirements. Renew Estate has undertaken to communicate with RFS on an ongoing basis, including annual inspections and independent access to the site and static water supplies.
Goulburn Chamber of Commerce (GCC)	Meeting (December 2017)	Information shared included: • status of the project • timing of development and construction • community benefits • opportunities for contractors.	GCC gained an understanding of the proposed project. The GCC was interested in discussing opportunities for training associated with the project and the potential for local companies to expand into piling and other areas of solar farm construction. The GCC asked to be updated as the project progresses.
Industry Capability Network (ICN)	Email, telephone and face to face meetings	Renew Estate has engaged with the ICN – a business network that connects companies to projects opportunities – to make them aware of the project. Information shared has included: • A description of Renew Estate and its partners • The project's proposed location and construction value • The types of opportunities available to surrounding NSW industry participants. • Renew Estate's community engagement ethos • The project website address	ICN gained an understanding of the proposed project. The ICN was interested in discussing the potential for local companies to participate in the various elements of solar farm construction and operation. Renew Estate and ICN agreed to continue discussions as the project progresses.

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
NSW Department of Industry	Email, telephone and face to face meetings	Renew Estate has engaged with the NSW Department of Industry to discuss opportunities for increasing NSW industry participation in the project and enhancing the strategic alignment with government policy objectives. Information shared has included: • A description of Renew Estate and its partners • The project's proposed location and construction value • The types of opportunities available to surrounding NSW industry participants. • The rationale for the proposed size & site location • The proposed timeline for the project • Renew Estate's community engagement ethos • The project website address	Industry representatives gained an understanding of Renew Estate and the proposed project, including its location and design features. Industry representatives outlined the organisations goal to deliver opportunities for NSW industry and provided additional context surrounding the Government's policy objectives Renew Estate has undertaken to continue communications with the NSW Department of Industry on a regular basis.
Adjoining and local landowners, and community organisations			
Adjoining and local landowners	Ongoing meetings, emails and telephone	Initial project briefing and ongoing face to face meetings, emails and telephone calls to identify and understand any concerns or land use conflicts, and to discuss mitigation measures for potential impacts. Information initially shared included: • A description of Renew Estate and its partners • Maps showing the project's proposed location • The rationale for the proposed size & site location • The proposed timeline for the project • Renew Estate's community engagement ethos	The adjoining and local landowners gained an understanding of the proposed project, including its location, proposed site and an overview of Renew Estate's development process, timeline and engagement plan. Several local landowners have formed a consolidated neighbour group and several face to face meetings were held with this group. Throughout various discussions with the adjoining and local landowners, both support for and concerns about the proposed project were raised. General concerns raised by the adjoining and local landowners included:

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
		• The project website address • Information sheet with key facts about solar farms Further consultation with adjoining and local landowners was undertaken: • First Community Information Session (refer section 5.2.3) • Site visits to relevant residents for the purposes of the Landscape and Visual Impact Assessment (refer Appendix D). • Presentation to a neighbour group on the outcomes of the EIS studies.	• Impact on the value on surrounding properties • Use of agricultural land • Impact on visual amenity • Construction traffic (road safety, road conditions, and traffic flow) • Construction and operational noise • Benefits to the community • Groundcover maintenance • Impact on wildlife • Glare from solar panels • Bushfire risk • Impact on health • Weed control • Flooding • Whether there are any plans to expand the solar farm or build a second phase in the future The concerns raised were noted by the Renew Estate team and passed onto AECOM for consideration in the EIS. Issues raised and how they are addressed is described in Table 7. The support for the proposed project were for the following reasons: • Benefit of renewable energy in reducing greenhouse gas emissions and climate change • Solar is good for the future of Australian energy • Reduced electricity costs • Potential improvements to the local roads • Benefits of employment and regional investment • A solar farm project may represent a lower visual/noise impact than other housing estate or industrial-type developments which might occur in its place.

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
Sutton Solar Action Group	Email	Following Renew Estate becoming aware of the Sutton Solar Action Group forming, Renew Estate reached out to the group via email in February 2018 to offer face-to-face meetings and sharing of information.	Renew Estate have not received a response to date from the initial email. We were advised of a change in the spokesperson by an email in March 2018 from the new spokesperson. Renew Estate will continue to reach out to the group.
Sutton & District Community Association	Meetings	Renew Estate has engaged with this association through its President who cascades information to its members. Renew Estate have met with the President twice and also provided project updates via email. Information shared to date has included: • A description of Renew Estate and its partners • Maps showing the project's proposed location • The rationale for the proposed size and site location • The proposed timeline for the project • Renew Estate's community engagement ethos • The project website address	The Sutton & District Community Association gained an understanding of the project.

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
Gundaroo Community Association	Face to face meeting	Renew Estate has engaged with this association through its President. Renew Estate have met with the President and have provided project newsletters and notification of the community session. Information shared to date has included: • A description of Renew Estate and its partners • Maps showing the project's proposed location • The rationale for the proposed size and site location • The proposed timeline for the project • Renew Estate's community engagement ethos • The project website address • The factsheet of the first community information session • Project newsletters	The Gundaroo Community Association gained an understanding of the project.
Local business in Sutton and Gundaroo	Email, telephone and face to face meetings	Renew Estate has reached out to many local business owners in Sutton and Gundaroo to make them aware of the project. Information shared has included: • A description of Renew Estate and its partners • Maps showing the project's proposed location • The rationale for the proposed size & site location • The proposed timeline for the project • Renew Estate's community engagement ethos • The project website address	Local businesses have gained an understanding of the project.

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
The Hon. Pru Goward, MP NSW for Goulburn	Meeting (December 2017)	General information was shared including the project size, proposed infrastructure, site selection process, status of the development, studies being undertaken and community benefits. Community concerns with the project were discussed in detail and Renew Estate outlined how these concerns were being addressed through expert studies and engagement with the community.	Pru Goward gained an understanding of the project. Renew Estate committed to keeping Ms Goward's office updated throughout the development of the project.
The Hon. Mike Kelly, Federal MP for Eden-Monaro	Telephone and email	Renew Estate spoke to one of Mike Kelly's staff to introduce the project and then emailed further information to include: • A description of Renew Estate and its partners • The proposed timeline for the project • Renew Estate's community engagement ethos • The project website address	Mike Kelly gained an understanding of the project.
	Meeting (April 2018)	Renew Estate spoke to Mike Kelly in person. General information was shared including the project size, proposed infrastructure, site selection process, status of the development, and community benefits. Community concerns with the project were discussed and Renew Estate outlined how these concerns were being addressed through expert studies and engagement with the community.	Mike Kelly gained additional understanding of the project and community shared benefits provided. Renew Estate committed to keeping Mr Kelly's office updated throughout the development of the project.
Sutton Landcare	Telephone	Initial project briefing with Landcare representatives. The Information shared included: • A description of Renew Estate & its partners • A description of the project and proposed location • Renew Estate's community engagement ethos	Landcare representatives gained an understanding of the proposed project, including its location and site features.

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
	Public meeting	Renew Estate attended a Landcare monthly meeting and presented on the proposed landscaping and planting selections for the project, opportunities for the project to assist Landcare objectives, as well as fielding general questions from Landcare on the project	Renew Estate received feedback on the proposed landscape plan. The project is currently investigating a number of opportunities and information provided during the meeting including additional planting information, suggestions for fencing design and opportunities to improve habitat for local flora and fauna. Renew Estate and Landcare are continuing to communicate in open dialogue on these matters. Landcare additionally invited Renew Estate to participate in the upcoming Climate Conversation Forum: *Join the Climate Conversation – Rural Communities Making a Difference* in May 2018.
Registered Aboriginal Parties (RAPs)	Letters, emails, local media, archaeological site survey.	Consultation with Aboriginal people, Aboriginal organisations or their representatives has been undertaken in accordance with *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010) as part of an Aboriginal Archaeological and Cultural Heritage Impact Assessment.	The RAPs contributed to the Aboriginal Archaeological and Cultural Heritage Assessment undertaken for the project by: • providing relevant information about the cultural significance and values of the Aboriginal objects and places within the Site. • influencing the design of the method to assess cultural and scientific significance of Aboriginal objects and places within the Site. • actively contributing to the development of cultural heritage management options and recommendations for Aboriginal objects and places within the Site. • commenting on draft assessment reports before they are submitted to OEH via DP&E. The detailed results of the Aboriginal heritage consultation process undertaken are provided in Appendix C.

Stakeholder	Method	Purpose/Information shared	Outcome/Comment
All stakeholders			
All	• Project website (refer section 5.2.1) • Newsletters and Factsheets (refer section 5.2.2) • First Community Information Session (refer section 5.2.3)		Outcomes of consultation are captured in Table 6 where relevant.

Table 7: Where issues raised have been addressed in this EIS

Issue raised	Where addressed in this EIS
Impact on the value of surrounding properties	The value of any property is influenced by a wide range of property attributes as well as the prevailing market conditions and the preferences of specific buyers. There is very little information on the impact of solar farms on property values however studies have been undertaken into properties surrounding wind farms. Wind farm projects have a longer history in Australia than solar farms and are considered to have greater visibility and noise emissions when operational. The NSW Department of Lands' analysis of property sales (2009) data found that wind farms did not negatively affect property values in most cases. In addition to that, a report commissioned by the Office of Environment and Heritage in 2016 (OEH, 2016b) commended that there were no conclusive findings relating to value impacts on properties located close to a find farm. The report noted that their findings from the review of case studies in NSW and Victoria did not identify any conclusive trends that would indicate that wind farms have negatively impacted on property values, and that their resale analysis indicated that all of the properties examined demonstrated capital growth that aligned with the broader property market of the time. Section 16.2.4 and Appendix H3 describe the proposed neighbour shared revenue scheme and rooftop solar PV and battery system offered to landowners within 1km of the project, which may provide a tangible and positive contribution to property value.
Location of project Site	Section 2.3.1
Use of agricultural land	Section 11.0
Impact on visual amenity	Section 9.0
Construction traffic (road safety, road conditions, and traffic flow)	Section 14.0
Construction and operational noise	Section 12.0
Benefits to the community	Section 5.2.3 and section 16.3
Bushfire risk	Section 15.1
Groundcover maintenance	Section 11.0
Impact on wildlife	Section 7.0
Condition of Site post-decommissioning	Section 11.0
Health	Section 15.2
Glare from solar panels	Section 9.0

Issue raised	Where addressed in this EIS
Whether there are any plans to expand the solar farm or build a second phase in the future	There are no plans to expand the project in the future.

5.3 Future engagement activities

Renew Estate will continue to regularly engage with the community and stakeholders throughout all stages of the project and continue to use a broad range of engagement methods. In order to ensure a broad saturation of project information and demonstrate presence in the community, Renew Estate also intends to continually inform local media regarding project updates, events and milestones.

5.3.1 Second community information session - during EIS exhibition

This EIS will be placed on public exhibition via the NSW Major Projects website for a minimum of 30 days. During this time the public will be able to view the EIS and associated specialist studies and make formal submissions on the proposal. Issues raised in submissions will be addressed by Renew Estate in a Response to Submission report.

During the EIS exhibition period, Renew Estate will host its second Community Information Drop-in Session (Second Community Information Session). Like with the first session, notice of this session will be widely and comprehensively publicised to ensure maximum attendance from the wider community and stakeholders. It will be open to everyone and will allow people to view information on the proposal, ask questions, and provide feedback.

Information shared at the Second Community Information Session will include general project information, community benefits and outcomes of the EIS studies.

5.3.2 Construction phase consultation

During construction of the project, a Community and Stakeholder Consultation Plan will be implemented to manage the concerns of stakeholders and any impacts on local landowners. The plan will include (but not be limited to) the following:

- Protocols to provide updated information regarding the project, including information regarding the project's program and proposed construction activities, potential impacts to nearby sensitive receivers and potential changes to local traffic conditions
- Methods to provide information regarding employment and business opportunities; and

A protocol for receiving and managing queries, complaints and grievances. Information on how local businesses, contractors or service providers can express an interest in the project will be continually disseminated by various methods throughout the pre-construction and construction phases.

5.3.3 Operation phase consultation

During operation of the project, a Community and Stakeholder Consultation Plan will be implemented to manage the concerns of stakeholders and any impacts on local landowners. The plan will include (but not be limited to) the following:

- protocols to keep the community and stakeholders updated about the operation of the project and its benefits
- protocols to inform relevant stakeholders of potential impacts of scheduled site activities outside of typical operation.
- protocols to allow the community to make complaints or identify any concerns with the project.
- protocols to keep the community and stakeholders updated about the operation of the project and its benefits

Information on how local workers, contractors or service providers can express an interest in the operation of the project will be displayed on the project website. Efforts will be made to engage with local schools, universities and community groups who may be interested in visiting the site or learning more about renewable energy.

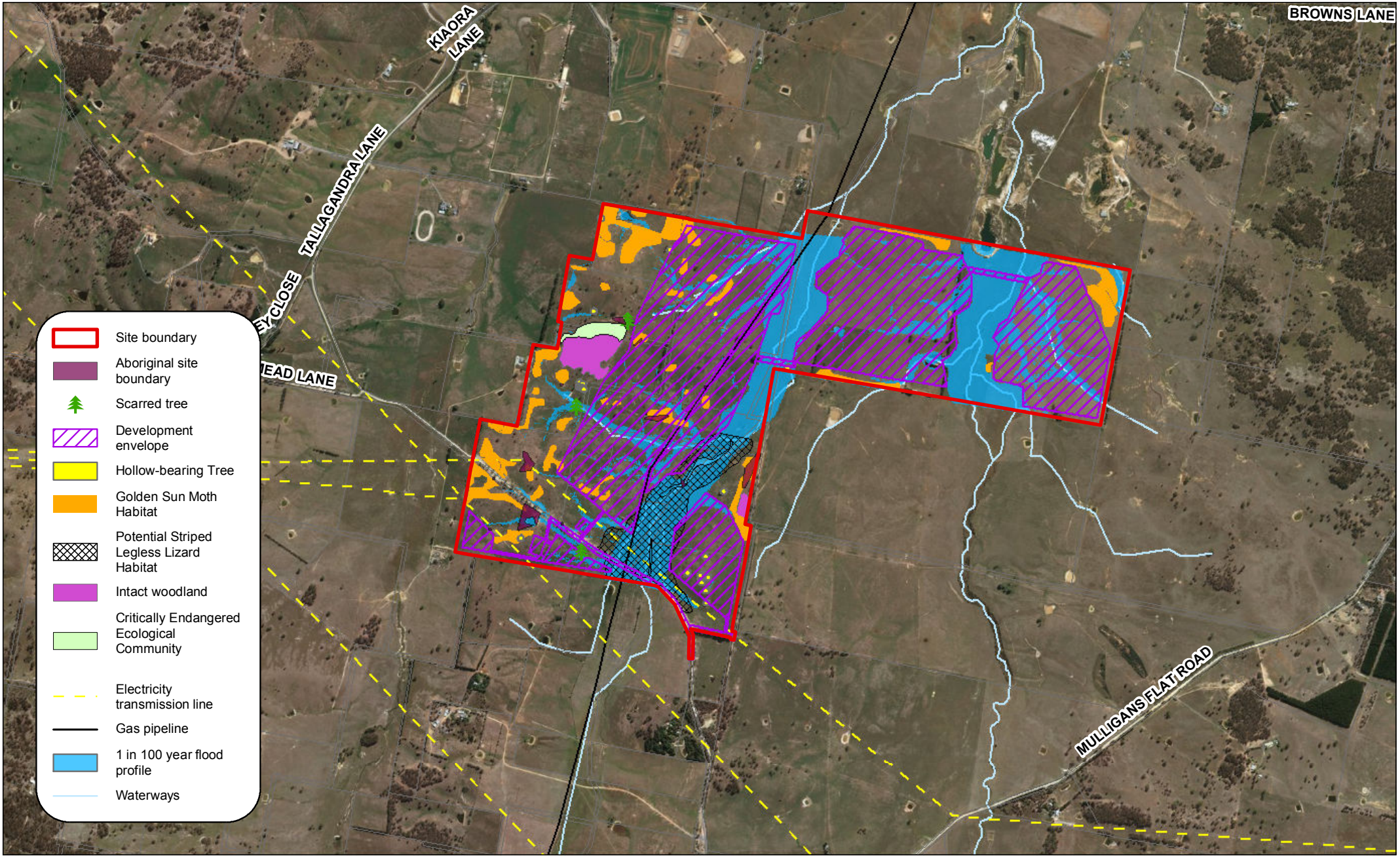
6.0 Constraints mapping

As part of the early development of the project a constraints map was developed. This was based on initial site inspections and desktop research. Over the course of the field surveys and other more detailed specialist investigations undertaken for the EIS (such as flood modelling) the constraints map was updated and the project layout refined accordingly. The final constraints map and site layout is shown in Figure 14 below.

Key environmental information that shaped the constraints map included:

- Biodiversity, including endangered ecological communities and threatened species as well areas of existing contiguous woodland vegetation
- Flood risk
- Existing infrastructure such as roads, transmission lines and a gas pipeline
- Existing drainage lines and their riparian areas
- Visual impacts upon adjacent residential dwellings
- Heritage sensitivities such as potential scar trees

The environmental constraints identified were considered when updating the design of the SSF layout effectively avoiding potentially significant environmental impacts. The impacts associated with this final layout are further assessed in subsequent section of this EIS.



AECOM

Renew estate.

NORTH

0 0.25 0.5 1 km

SPRINGDALE SOLAR FARM
SOLAR FARM CONSTRAINTS

DATE	29/06/2018
SCALE	1:25,000
PROJECT	60555008
DRAWN	PH

7.0 Biodiversity

A Biodiversity Development Assessment Report (BDAR) has been prepared for the project as per the requirements of the *Biodiversity Conservation Act 2016* (BC Act) (Appendix B). This report has been prepared according to the Biodiversity Assessment Methodology (BAM) (OEH 2017) to describe and assess the ecological values within the Site, and determine the nature of the project's impact upon threatened biodiversity listed under the BC Act. The BDAR has also assessed ecological values as listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

It should be noted that the project was referred to DoEE under the EPBC Act for potential significant impacts upon threatened species and ecological communities (referral number 2018/8173). The project was subsequently declared to be a 'controlled action' in May 2018. The assessment undertaken and presented below represents the additional level of assessment detail required by DoEE to satisfy their assessment of impacts upon MNES.

The full BDAR is presented in Appendix B with relevant aspects summarised within this section of the EIS.

7.1 Method of assessment

As per the requirements of the BAM the biodiversity assessment has been undertaken with focus upon three main elements of ecological value:

- Landscape
- Native vegetation communities and flora
- Fauna.

The methodology for the assessment of each of these elements is outlined below.

7.1.1 Landscape assessment

Landscape value is an assessment of a number of factors including:

- native vegetation cover
- rivers, streams and estuaries
- areas of geological significance
- habitat connectivity.

For each factor the current state of the landscape was assessed then compared with the state of the landscape if the project were to proceed.

7.1.2 Native vegetation and flora assessment

For both this and the fauna element an initial desktop assessment was undertaken. This includes searches of the NSW Wildlife Atlas and the Commonwealth Protected Matters Search Tool (PMST). Both of these searches were considered to a 10 km radius from the Site and were used to inform field surveys and for the preparation of a likelihood of occurrence assessment.

Native vegetation and flora surveys were undertaken by Niche Environment and Heritage between 24 and 27 October 2017 and 2 to 3 June 2018 using survey methods consistent with the NSW BAM to map and quantify the condition of Plant Community Types (PCTs) within the Site. This entailed 15 BAM plots, three 50 metre step-point transects and walking meander searches at observation points and around plot locations. At a minimum, the combined foot traverses complied with the recommended number and length of traverses per area of stratification unit (vegetation community) according to DEC survey guidelines 2004).

These surveys allowed comprehensive coverage of the study area to be achieved to confidently delineate native from exotic grassland areas. This was supplemented by data from Alison Rowell's GSM surveys assist with verification of cover of native and exotic areas within the Site.

7.1.3 Fauna assessment

Field survey for fauna values within the Site consisted of the following:

- Preliminary ecological constraints assessment (Alison Rowell), 13 July 2017
- Development-specific biodiversity assessment (Niche Environment and Heritage), 24-27 October 2017 and 2-3 June 2018
- Targeted Golden Sun Moth (GSM) survey (Alison Rowell), December 2017
- Striped Legless Lizard (SLL) habitat survey (Robert Speirs), 15 June 2018.

Methods and survey effort relating to the development-specific biodiversity assessment fauna are presented in Table 8 below.

Table 8 Fauna survey methods, timing and effort

Method	Target species	Timing	Effort
Diurnal bird survey and checks around hollow trees	Threatened birds (all)	24-27 October 2017	4 x 20 – 60 minute bird survey as well as opportunistic observations
Rock rolling and debris searches	Pink-tailed Worm-lizard and Striped Legless Lizard	24-27 October 2017	All available rocky outcrops and debris were searched. Estimated 6 person hours.
Active searches of tussock grasses (*Phalaris aquatica*)	Striped Legless Lizard	24-27 October 2017	Four person hours
Incidental and indirect observations	All species	24-27 October 2017	Over four days of survey

The methodology for the targeted GSM survey included:

- A targeted survey for GSM was conducted in accordance with *EPBC Act Policy Statement 3.12 – Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (*Synemon plana*)* (2009)
- Areas with a moderate component of native grasses identified and surveyed by walking meandering or parallel transects
- Flying male GSM were counted per 100 meters of transect. Where native grasses were rare or scattered among pasture grasses, flying GSM were searched for from a slowly moving vehicle, with pauses to search patches of native grasses
- A 100-metre step-point transect was surveyed in the best habitat in each area where the GSM was found. This measured the quality of the habitat by recording the density of food plants (Wallaby and Speargrasses), presence of bare ground and weeds etc. A ground search for pupal cases was undertaken at the same time, as these indicate the location of egg-laying and larval development and are important in identifying potential breeding habitat
- Some elements of the ecological surveys were conducted outside of the current Site. Surveys performed outside of the Site were conducted in contiguous areas within the same vegetation communities and available habitats as those within the Site to help inform GSM habitat distribution within the locality.

The methodology for the SLL habitat survey included:

- A review of regional records for SLL and modelling of pre-1750 vegetation was conducted for the Site and surrounds to assist with defining the known distribution of the species and predicting its likelihood of occurrence within the Site

- A full day of field survey was completed on 15 June 2018 to review the natural features of the Site and assess its potential to support SLL.

7.2 Existing environment

7.2.1 Landscape assessment

The results of the landscape assessment are outlined in Table 9 below.

Table 9 Landscape features and scoring under the NSW BAM

Parameter	Description
IBRA bioregion/subregion	The project is located in the Murrumbateman subregion which is within the South Eastern Highlands Interim Biogeographic Regionalisation for Australia (IBRA) bioregion.
Mitchell Landscapes	Mitchell Landscapes found within the Site include: • Dalton Hills • Yass Channels and Floodplain
Rivers, streams and estuaries and Strahler stream order	Murrumbateman: Back Creek is the largest water feature of the Site, which is a 3rd order watercourse that flows through the eastern portion of the Site. There is limited aquatic habitat associated with Back Creek and other watercourses within the Site. Numerous small, shallow ponds support permanent water and a few species of aquatic macrophytes. There are a number of farm dams which occur throughout the Site and higher within the catchment which impede natural hydrology. All water features of the Site have poor water quality due to frequent stock access, as evidenced by apparent high nutrient loads and high turbidity.
Wetlands within and adjacent to development	None – see comments above regarding farm dams.
Cleared areas	The majority of native vegetation within the Site and surrounding buffer area has been cleared and/or pasture improved. This has been factored into calculations of native vegetation.
Connectivity features	Extant vegetation within the Site is fragmented and isolated. There are no vegetated corridors throughout the Site.
Buffer area (percent native vegetation cover)	A 1,500m buffer was applied to the Site resulting in an overall buffer area of 2,531 ha. Existing vegetation mapping (OEH 2011) identified very limited areas of vegetation within the buffer area. ***Woody vegetation cover*** The native vegetation extent and cover of woody vegetation was determined via aerial photography interpretation based on canopy cover. For woody vegetation 6.1% of the buffer area was determined to support native woody vegetation with benchmark cover (155.6 ha). A further 2 % was determined to support 50% cover of the overstorey benchmark, bringing overall cover to 7.1%. ***Non-woody vegetation cover*** For non-woody vegetation, experience of the Site was drawn upon in addition to aerial photography interpretation to estimate cover of native grassland vegetation. Areas that were naturally grassland correspond with high fertility depressions, with heavy pasture improvement a feature of such areas. Consequently, little native grassland remains in such areas. It was conservatively estimated that 10 % of the buffer area contains native grassland. ***Total native vegetation cover*** Combining the estimated woody and non-woody vegetation cover resulted in 17.1% of the buffer area supporting native vegetation. This falls into the 10-

Parameter	Description
	30% category within the BAM Calculator.
Site context	Site based assessment.
Geological significance and soils	There are no karst, caves, crevices, cliffs or other areas of geological significance within the subject land. There are no high hazard soil areas.

7.2.2 Native vegetation and flora assessment

The results of the native vegetation community assessment are provided in Table 10.

Table 10 Vegetation mapping and alignment for vegetation types within the Site

Zone	Niche vegetation mapping	PCT – best fit	TEC Status (NSW/ Cwth)	Condition	Plots required (BAM)	Proposed development area (ha)
1	Brittle Gum Derived Grassland	351 – Brittle Gum – Broad-leaved Peppermint – Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	Not listed/ CEEC	Poor	1	0.82
2	Box Gum Derived Grassland	1330 – Yellow Box – Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	EEC/ CEEC	Poor	2	4.45
3	Natural Temperate Grassland	320 – Kangaroo Grass – Redleg Grass forb-rich temperate tussock grassland of the northern Monaro, ACT and upper Lachlan River regions of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	Not listed/ CEEC	Poor	1	0.11
4	Exotic pasture and trees	Cleared land	Not listed/ not listed	Poor	None (however several plots were conducted to test cover values and species richness)	188.36

As outlined in Table 10 the following Threatened Ecological Communities (TECs) were identified as being present within the Site:

- Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland (Endangered Ecological Community (EEC) under the BC Act and a Critically Endangered Ecological Community (CEEC) under the EPBC Act)
- Natural Temperate Grassland of the South Eastern Highlands (CEEC under the EPBC Act).

For both of these communities their representation within the Site was heavily degraded such that neither met the condition thresholds under the EPBC Act to warrant protection. Similarly neither community had sufficient vegetation integrity scores (i.e. plot score of <15) to require further assessment under the BAM.

During the plot surveys 54 flora species were recorded comprising 27 native species and 27 exotic species. Detail of these species and full floristic data recorded from plots performed throughout the identified vegetation zones is included within Appendix 2 of the BDAR (Appendix B of this report).

No threatened flora were detected during field survey and therefore it is considered unlikely that threatened flora would be impacted affected by the project. Vegetation was in poor condition throughout the Site due to consistent disturbance historically, which contributes to the low likelihood of occurrence for any threatened flora. Threatened flora with the potential to occur, as generated by the BAM Calculator, are presented in the BDAR. All of these species were assumed to be absent from the Site based on their non-detection during targeted searches.

Five high threat weeds were recorded during field surveys. The high threat weed species are sporadically distributed throughout the Site particularly where high levels of soil disturbance and nutrient enrichment have occurred. High threat weeds included *Paspalum dilatatum* (Dallas Grass), *Bromus diandrus* (Ripgut Brome), *Acetosella vulgaris* (Sheep's Sorrel) and *Nassella trichotoma* (Serrated Tussock). Of these, *Nassella trichotoma* (Serrated Tussock) is the only weed recorded that is also listed as a Priority Weed for the South East region.

7.2.3 Fauna assessment

The results of the fauna assessment are provided in Table 11.

Table 11 List of predicted and candidate threatened species for the proposed project

Common Name	Scientific Name	Status
Predicted threatened species (ecosystem credit species)		
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	Assumed present
Diamond Firetail	*Stagonopleura guttata*	Assumed present
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	Observed – assumed present in all vegetation types
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	Assumed present
Flame Robin	*Petroica phoenicea*	Assumed present
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Assumed present
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	Assumed present
Koala	*Phascolarctos cinereus*	Assumed present
Little Eagle	*Hieraaetus morphnoides*	Assumed present
Little Lorikeet	*Glossopsitta pusilla*	Assumed present
Painted Honeyeater	*Grantiella picta*	Assumed present
Powerful Owl	*Ninox strenua*	Assumed present

Common Name	Scientific Name	Status
Regent Honeyeater	*Anthochaera phrygia*	Assumed present
Scarlet Robin	*Petroica boodang*	Observed – assumed present in all vegetation types
Speckled Warbler	*Chthonicola sagittata*	Assumed present
Spotted Harrier	*Circus assimilis*	Assumed present
Spotted-tailed Quoll	*Dasyurus maculatus*	Assumed present
Superb Parrot (foraging habitat)	*Polytelis swainsonii*	Observed – assumed present in all vegetation types
Turquoise Parrot	*Neophema pulchella*	Assumed present
Varied Sittella	*Daphoenositta chrysoptera*	Observed – assumed present in all vegetation types
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Assumed present
White-fronted Chat	*Epthianura albifrons*	Assumed present
Candidate species (species credit species)		
Golden Sun Moth	*Synemon plana*	Observed
Squirrel Glider	*Petaurus norfolcensis*	No (no habitat present i.e. scattered trees are present but widely spaced in general and with no connectivity with larger patches. Note TBDC states: "*Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).*"
Superb Parrot (breeding)	*Polytelis swainsonii*	Observed breeding outside of development envelope. Possible breeding habitat within development envelope consisting of two trees (of preferred breeding species) to be removed.
Austral Toadflax	*Thesium australe*	No (surveyed)
Booroolong Frog	*Litoria booroolongensis*	No (no habitat present in the Site)
Eastern Bentwing-bat (breeding)	*Miniopterus schreibersii oceanensis*	No (no breeding habitat present in the Site)
Eastern Pygmy-possum	*Cercartetus nanus*	No (no habitat present in the Site)
Gang-gang Cockatoo	*Callocephalon fimbriatum*	No (surveyed)
Green and Golden Bell Frog	*Litoria aurea*	No (no habitat present in the Site)
Koala	*Phascolarctos cinereus*	No (no habitat present in development envelope – isolated paddock trees with no feed species as per SEPP 44)
Little Eagle	*Hieraaetus morphnoides*	No (surveyed)
Pink-tailed Legless Lizard	*Aprasia parapulchella*	No (surveyed)
Powerful Owl (breeding)	*Ninox strenua*	No (preferred breeding habitat absent – trees to be removed did not have sufficient sized hollows and paddock trees are not known to be

Common Name	Scientific Name	Status
		roost sites for Powerful Owl).
Regent Honeyeater	*Anthochaera phrygia*	No (surveyed)
Silky Swainson-pea	*Swainsona sericea*	No (surveyed)
Small Purple-pea	*Swainsona recta*	No (surveyed)
Southern Myotis	*Myotis macropus*	No (no breeding habitat or foraging habitat to be impacted)
Striped Legless Lizard	*Delma impar*	Assumed present, (expert report)
Tarengo Leek Orchid	*Prasophyllum petilum*	No (surveyed)
Wee Jasper Grevillea	*Grevillea iaspicula*	No (surveyed)
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	No (surveyed)
Yass Daisy	*Ammobium craspedioides*	No (surveyed)

Available fauna habitat within the Site is primarily influenced by the local topography and prevailing vegetation type and condition. Fauna habitat within the Site is relatively degraded with only some remnant pockets of native vegetation remaining. Large scattered paddock trees remain on the undulating slopes however, much of the Site consists of exotic pasture which provides little in the way of important habitat for native species. Habitat condition has been influenced within the Site via previous historic clearing of vegetation, grazing of livestock and ploughing, pasture improvement or the use of fertilisers.

The following broad and specific fauna habitat types and associated characteristics occur across the Site:

- Yellow Box – Blakely's Red Gum grassy woodland
- Brittle Gum – Broad-leaved Peppermint – Red Stringybark open forest
- Kangaroo Grass – Redleg Grass forb-rich temperate tussock grassland
- Cleared exotic pasture
- Outcropping rocky ridges
- Watercourses
- Hollows, tree stags and logs.

A total of 48 species were recorded during field surveys, comprising five mammal, 36 bird, four frog species and three reptiles. Threatened fauna recorded within the Site are outlined in Table 12.

Table 12 Threatened species recorded during field survey

Credit type	Common name	Scientific name	BC Act status	EPBC Act status
Ecosystem	*Petroica boodang*	Scarlet Robin	V	-
Ecosystem	Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-
Species	Golden Sun Moth	*Synemon plana*	E	CE
Species (breeding), Ecosystem (foraging)	Superb Parrot	*Polytelis swainsonii*	V	V

Credit type	Common name	Scientific name	BC Act status	EPBC Act status
Ecosystem	Varied Sittella	*Daphoenositta chrysoptera*	V	-
Species	*Delma impar*	Striped Legless Lizard	V	V

7.3 Impact assessment

The project would affect biodiversity, including threatened biodiversity through both direct and indirect impacts during construction and operation. The majority of impacts on biodiversity would occur during construction from clearing of native vegetation and removal of habitat for a limited range of flora and fauna. Direct impacts are proposed to be mitigated primarily through project design.

7.3.1 Avoidance of impacts

Renew Estate has aimed to avoid and minimise environmental impacts from the project during the design process. A Preliminary Environmental Assessment (PEA) for the project was conducted which included consideration of constraints such as threatened vegetation communities, threatened species habitat and other identified ecological constraints.

After further ecological survey (further described in Appendix B) the project was subject to substantial redesign with reference to specific project infrastructure. This redesign enabled the project to avoid substantial impacts to biodiversity with a particular emphasis on avoiding impacts upon the following features:

- Threatened ecological communities (i.e. Box Gum Woodland and derived native grassland) and other native vegetation
- The majority of GSM habitat
- Superb Parrot breeding and foraging habitat.

While avoidance measures initially focused on specific threatened species and their habitat these have also benefited all potentially occurring threatened species and general biodiversity values throughout the Site including vegetation communities more generally.

In addition to avoidance measures incorporated into design, planning for the proposed solar farm has avoided or minimised impacts on biodiversity through the following actions:

- Detailed survey for the GSM to confidently assess potential use of the Site by this species, including areas of higher density occupation or condition
- Avoidance of operational surface infrastructure in riparian areas, with the exception of road crossings
- Use of advanced high output panels to minimise the area of the farm whilst still achieving the required electricity generation capacity.

7.3.2 Direct impacts

The following residual direct impacts would result from the project:

- Clearing of native vegetation communities. The extent of clearing is conservatively estimated to be 5.38 ha
- Clearing of associated threatened species habitat including:
    - Hollow bearing trees and stags
    - Hollow logs
    - Native grassland.

The majority of vegetation likely to be affected by the project has been subject to historic clearing and other agricultural activities such as grazing and cropping and is therefore thinned, fragmented and dominated by exotic pasture.

Fourteen paddock trees containing hollows including *Eucalyptus mannifera* and *E. bridgesiana* trees would require removal.

During construction minor ancillary infrastructure, such as underground cabling and fencing, may be constructed outside the development envelope but within the Site. This may include trenching and rehabilitation of underground cabling through the potential SLL habitat area to the south of the Site. This impact would be highly localised and temporary as such is considered to be minor (refer Appendix B).

7.3.3 Indirect impacts

Indirect impacts would occur within and adjacent to the Site as a result of construction and operation of the solar farm. The main indirect impact from the solar farm would be shading of native derived grassland. Other potential indirect impacts include:

- Facilitation of weed spread via construction activities
- Migration of sediments to waterways from construction of roads and tracks or other infrastructure
- Possible impacts to GSM flying as a result of obstruction by the fixed solar arrays.

The above impacts would be mitigated via a Biodiversity Management Plan (BMP) with an incorporated GSM Management Subplan, and an Erosion and Sediment Control Subplan (ESCS).

7.3.4 Serious and irreversible impacts

Threatened species which have potential to experience Serious and Irreversible Impacts (SAII) as a result of the project are limited to GSM. This species has been listed in the *Guidance to assist a decision-maker to determine a serious and irreversible impact* OEH (2017b) as a candidate species for SAII. GSM is listed under Principle 3 of SAII criteria (species with a very limited geographic distribution). The project is unlikely to reduce the species geographic distribution for the following reasons:

- Comparatively large areas of GSM habitat are presently located around the areas of the Site which would be unaffected or improved as a result of the project. GSM habitat improvement throughout the retained areas of GSM habitat within the western third of the Site is likely due to management of these areas specifically for this species, as opposed to its present management to maximise grazing potential (which would continue to decrease habitat quality and extent for GSM). The improved management of GSM habitat would assist in improving and expanding GSM habitat and connecting habitat patches throughout the western third of the Site thus increasing long-term security
- The breeding cycle of the GSM would not be substantially disrupted given the above proposed habitat improvement measures, in combination with confinement of the development envelope to lower quality habitat areas. This would assist in maintaining the species' geographic distribution
- Fencing used within and around the Site would continue to allow GSM movement so that any impacts to male dispersion in seeking female breeding partners would be limited
- The extent of impact within the development envelope is unlikely to reduce the overall area of occupancy of the species on scales appropriate to measurements of a species area of occupancy. For example, 2 km x 2 km grid squares are the standard for area of occupancy measurements
- The surveys conducted have increased the known area of occupancy for the species (only one record was previously known at the Site compared to the 343 recorded as part of surveys in support of the project
- The project is unlikely to fragment any GSM population within the Site as as movement through the development envelope will still be possible. There is already a band of unsuitable habitat between eastern and western occurrences of GSM within the Site
- Due to access and timing restrictions, limited time was spent investigating areas outside of the Site, however a single patch of habitat adjacent to the Site (estimated at 12 ha) was found to contain active GSM. Moreover, similar habitat within the same landholding as the Site and

(estimated at 40 hectares) was identified as likely GSM habitat in equal or better condition to that of the Site

- Given the results of surveys undertaken for the project it is expected that large areas of occupied habitat for GSM exist throughout the locality generally. This is based on the known limited extent of previous surveys and consistent land management practices across much of the locality.

After considering the above factors, the project does not have the potential to cause Serious and Irreversible Impacts (SAII) to any TEC or threatened species.

7.3.5 Offset requirements

The results of the BAM calculator in terms of vegetation integrity scoring for vegetation zones and associated ecosystem offset credit requirements are shown in Table 13. No native vegetation communities identified within the development envelope generated ecosystem credit requirements as a result of vegetation integrity scores of <17 (or 15 for TECs).

Offsets required for species credit species are shown in Table 14. The Superb Parrot has not generated an offset requirement within the calculator, presumably due to the limited size of the impact on the species.

Table 13 Ecosystem credit requirements

Niche vegetation mapping	PCT – best fit	Cleared area (ha)	Vegetation Integrity Score	Required credits
Exotic pasture and trees	Cleared land	188.36	Not applicable	N/A
Box Gum Derived Grassland	1330 - Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	4.45	11.4	0
Brittle Gum Derived Grassland	351 - Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	0.82	5.2	0
Natural Temperate Grassland	320 - Kangaroo Grass - Redleg Grass forb-rich temperate tussock grassland of the northern Monaro, ACT and upper Lachlan River regions of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	0.11	1.5	0
TOTAL		**193.74**		**0**

Table 14 Species credit requirements

Niche vegetation mapping	PCT – best fit Cleared area (ha)	Required credits
Golden Sun Moth (*Synemon plana*)	4.52	38
Superb Parrot (*Polytelis swainsonii*)	0.25	1
Striped Legless Lizard (*Delma impar*)	2.01	9

7.4 Mitigation and management measures

The following mitigation measures are proposed to avoid, reduce or offset potential impacts upon biodiversity values arising from the construction, operation and future decommissioning of the SSF.

An indicative outline of the proposed GSM habitat conservation zone (See measure B3 below) is included in Figure 15.

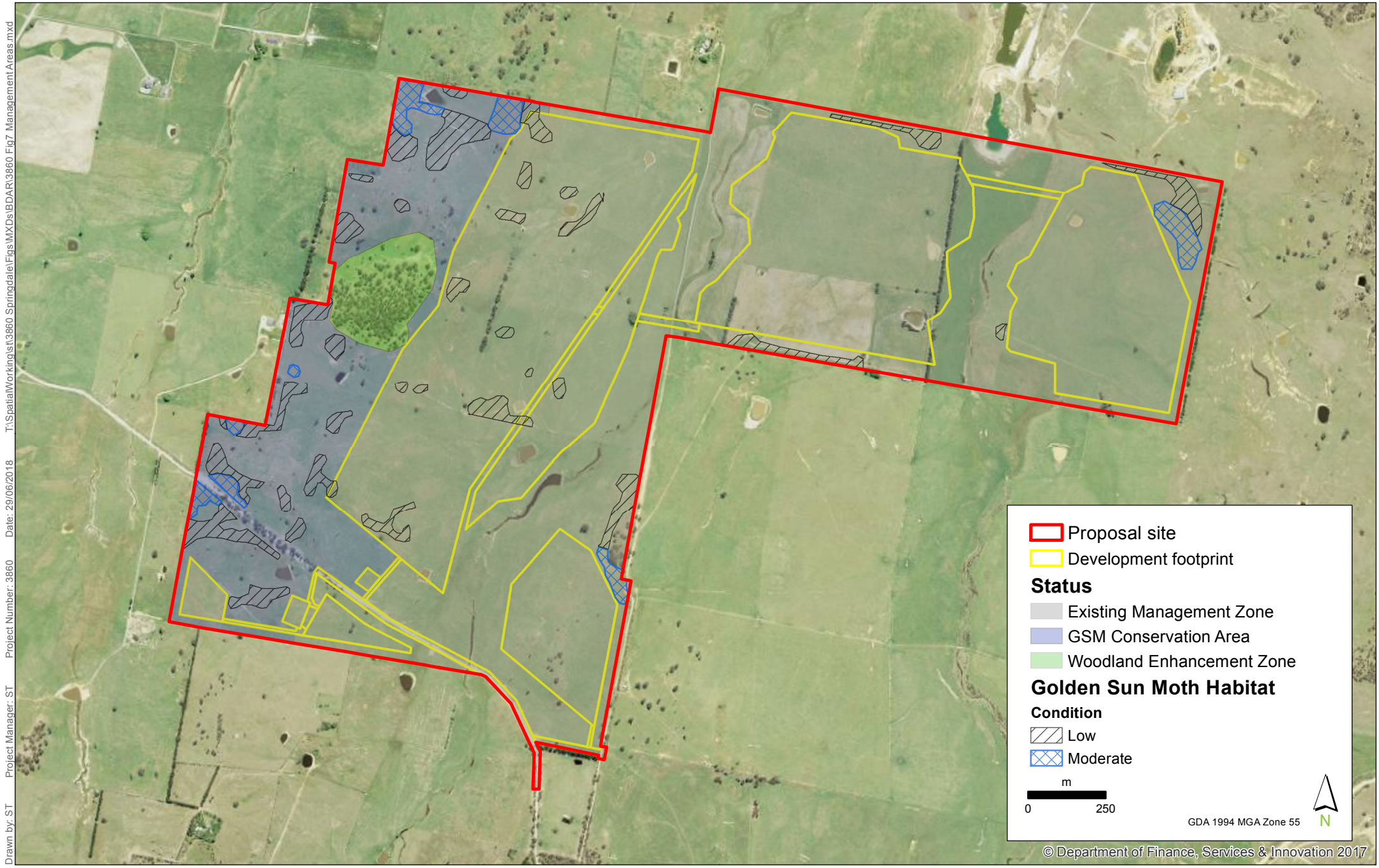


Figure 15 GSM management areas

niche Environment and Heritage

Table 15 Biodiversity mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
B1	Implementation of a Biodiversity Management Plan to include the following mitigation measures.	✓	✓	
B2	Establishment of fenced buffer areas (nominally a 50 m buffer) around retained GSM habitat outside of the development envelope, with fencing maintained throughout the construction phase of the project.	✓		
B3	Establishment of a GSM habitat conservation zone measuring approximately 60 hectares throughout the western portion of the Site (see Figure 15 for an indicative layout).	✓	✓	
B4	Management of GSM habitat within the GSM conservation area via implementation of a GSM Management Plan to maintain preferred ground cover conditions for the species via careful management of stocking rates and/or use of slashing	✓	✓	
B5	All Site fencing should be specified allow passage of adult GSM throughout the Site.		✓	
B6	Discontinuation of pasture improvement practices such as the use of fertilisers and sowing of pasture within the GSM conservation zone and throughout all solar fields	✓	✓	
B7	Stocking rates should be reduced within the Site after completion of construction.		✓	
B8	Rehabilitate disturbed areas with locally sourced Wallaby and Speargrasses in the GSM conservation area and in the development envelope.	✓	✓	
B9	Within the GSM conservation area, maintain tussock level between 3 and 15 cm with regulated grazing, with short height achieved by October before the GSM flying period, and lighter grazing from November to January if season is dry. Some areas may occasionally need slashing if grazing doesn't produce the desired conditions in GSM conservation zone.	✓	✓	
B10	Implementation of pest and weed prevention and management measures within the Site including the continued control of broad-leaved weeds in GSM conservation zone and in the development envelope.	✓	✓	
B11	Avoid creating unnecessary shading or barriers to GSM movement with landscaping or structures.	✓	✓	
B12	All landscaping should be sited so as to avoid or minimise occupation or shading of mapped GSM habitat.	✓	✓	
B13	Establishment and ongoing maintenance of a woodland enhancement zone for woodland areas in the west of the Site (see Figure 15).	✓	✓	
B14	Pre-clearing inspections for Superb Parrot would occur immediately prior to, and during the breeding season prior to, removal of hollow bearing trees to ensure the absence of roosting/breeding individuals.	✓	✓	
B15	If clearing is required during the Superb Parrot breeding season, any potential breeding trees will be surveyed for breeding parrots with individuals excluded from hollows and eggs/chicks removed prior to clearing. An appropriately qualified ecologist and wildlife carer will be	✓		

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	arranged to care for any chicks or eggs that are removed from trees			
B16	Any native vertebrate fauna present within hollow trees should be managed to minimise the risk of mortality or injury. Tree clearing would be undertaken in accordance with recognised best practice principles.	✓		
B17	Installation of nest boxes within or immediately adjacent to the Site specifically for Superb Parrots within preferred breeding trees that do not already contain hollows. The number of nest boxes should be at least twice that of the existing number of hollows appropriate for Superb Parrot breeding that are to be removed by the project as determined via a final survey of hollow trees prior to clearing. A nest box management subplan is to be included within the BMP which will outline commitments to manage the nest boxes throughout the life of the project.	✓	✓	
B18	Landscape planting should preference endemic tree and shrub species to compensate for loss of foraging habitat due to the removal of trees.		✓	
B19	Vehicles should remain on designated roads and tracks whenever practicable. Signposting and driver education during the induction process and in ongoing project discussions should be implemented.	✓	✓	
B20	Establishment and regular maintenance of erosion and sediment controls during construction and until disturbed areas are revegetated.	✓	✓	
B21	Appropriate on-site management and removal of all rubbish from the Site.	✓	✓	

8.0 Aboriginal heritage

A specialist Aboriginal Archaeological and Cultural Heritage Impact Assessment (AACHIA) was conducted to identify the Aboriginal cultural values associated with the Site and assess the potential impact of the project on identified Aboriginal cultural heritage values.

The complete report is attached in Appendix C with relevant aspects summarised within this section of the EIS.

8.1 Method of assessment

The AACHIA was conducted in accordance with the following NSW Office of Environment and Heritage (OEH) guidance:

- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a)
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b); and
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011)

The methodology of the Aboriginal heritage impact assessment included consultation, database and literature reviews, field surveys and an assessment of significance.

8.1.1 Consultation

Aboriginal community consultation was undertaken in accordance with OEH's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010a) (Consultation Requirements). The guidelines outline a four stage process, described below.

Stage 1 - Notification and registration

The following regulatory agencies were notified of the project:

- Office of Environment and Heritage
- Ngambri Local Aboriginal Land Council (Ngambri LALC)
- Office of the Registrar, *Aboriginal Land Rights Act 1983* (NSW)
- The National Native Title Tribunal (NNTT)
- Native Title Services Corporation Limited (NTSCORP Limited)
- Yass Valley Council
- South East Local Land Services (SE LLS).

Responses were received from four agencies providing details of groups who hold cultural knowledge of the area. A public notice was placed in the Bungendore Weekly on 18 October 2017 and letters were written inviting expressions of interest (EOI) from Aboriginal people who hold cultural knowledge of the area. These parties were requested to provide assistance in determining the significance of Aboriginal object(s) and/or places in the vicinity of the project. A total of seven organisations registered an interest in the assessment:

- Corroboree Aboriginal Corporation
- Didge Ngunawal Clan
- Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation
- Gulgunya Ngunawal Heritage Aboriginal Consultancy
- Muragadi Heritage Indigenous Corporation
- Murri Bidgee Mullangari Aboriginal Corporation
- Ngambri LALC.

Stage 2 - Presentation of information about project

Presentation of information about the Site and proposed development was provided to RAPs, together with EOI letter mailed on 23 October 2017. The information pack provided included information about the project, the Aboriginal cultural heritage assessment process, the project schedule, and the roles and responsibilities of the different parties involved in the project.

Stage 3 – Gathering information about cultural significance

All RAPs for the current assessment were provided with a draft of AECOM's proposed assessment methodology as part of the EOI package sent on 23 October 2017. Four responses were received from RAPs, all of which supported the draft methodology. No specific cultural heritage values relating to the Site were identified by RAP respondents.

A total of five RAPs participated in the fieldwork component of this AACHIA:

- Corroboree Aboriginal Corporation
- Didge Ngunawal Clan
- Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation
- Murri Bidgee Mullangari Aboriginal Corporation
- Ngambri LALC

RAP field representatives involved in the field inspection identified the following social or cultural values for the Site in conversation with AECOM archaeologists:

- Elevated rises and spurs adjacent to creeks would have been prime camping locations for Aboriginal people camping within and travelling through the Site
- Owing to generally poor visibility conditions, subsurface testing would be necessary to adequately characterise the Aboriginal archaeological record of the Site. Any subsurface investigation within the Site should utilise a landscape-based sampling strategy
- Quartz and silcrete are locally and regionally common rock types in terms of flaked stone tool technologies. Relative to quartz, which occurs in abundance across the Site, imported silcrete blanks appear to have more intensively worked
- Scarred tree SSF-ST1-17 representing a 'shield tree'.

Stage 4 - Review of draft assessment report

All RAPs were sent a draft of the AACHIA and the project's AAR for review and comment. The RAPs were provided with 28 days to provide comments. Following this period, RAPs who had not provided comments were contacted again. All RAP comments were accepted up to submission of the AACHIA.

8.1.2 Database and literature review

A search of the AHIMS database undertaken on 23 October 2017 for a 10 x 10 km area centred on the Site. A total of 14 Aboriginal archaeological sites were identified within the search area, all comprising open artefact sites. There were no sites within the Site, with the closest site, an open artefact site 'MFR OC3 (57-2-0697), located 1.5 km to the southwest (Refer to Figure 18 in Appendix C).

A comprehensive literature review was undertaken covering Aboriginal archaeology and the environmental factors within the local and regional context. Historical satellite imagery covering the Site was also obtained and analysed.

8.1.3 Field survey

A field team of two AECOM archaeologists (Geordie Oakes and Andrew McLaren) and five RAPs representatives completed the archaeological field survey of the Site over three days between 25 and 29 November 2017. All survey was conducted on foot, with a total of 11 transects executed across all parts of the Site covering flat, simple slope and crest landforms (Figure 16). For this assessment, the definition of '*two artefacts within 100 m of each other*' as a spatially discreet site has been adopted.

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Key

- Proposal Site
- Creeklines
- Roads & Tracks
- Transects

Data Sources:
1. Roads, Railway, Parks, Drainage, Localities: StreetPro Australia © 2014, Pitney Bowes Software
2. PhotoMap imagery under licence: Nearmap™ 2017

0 250 m

PROJECT ID	60555008
CREATED BY	G.Oakes
CREATED	24-01-2018
VERSION	1

Figure 16

Survey Coverage

Springdale Solar Farm
Aboriginal Archaeological and Cultural Heritage Impact Assessment

8.2 Existing environment

This section summarises the landscape and cultural context of the Site. The results of the field surveys and assessment of significance is also presented. Further details are provided in the full AACHIA in Appendix C.

8.2.1 Landscape context

Consideration of the landscape context of the Site is predicated on the now well-established proposition that the nature and distribution of Aboriginal archaeological materials are closely connected to the environments in which they occur. Environmental variables such as topography, hydrology, geology, soils and the composition of local floral and faunal communities will have played an important role in influencing how Aboriginal people moved within and utilised their respective Country. Amongst other things, these variables will have affected the availability of suitable campsites, drinking water, economic[1] plant and animal resources, and raw materials for the production of stone and organic implements. At the same time, an assessment of historical and contemporary land use activities, as well as geomorphic processes such as soil erosion and aggradation, is critical to understanding the formation and integrity of archaeological deposits, as well any assessment of Aboriginal archaeological sensitivity.

Key observations from a review of the existing environment of the Site are as follows:

- The topography of the Site is typical of that described by the Soil Landscapes of Canberra (Jenkins 2000) for the Canberra Lowlands and can be broadly characterised as flat to undulating
- Back Creek, an intermittent, northerly-flowing tributary of the Yass River, is the only named watercourse within the Site. Following Strahler (1952), the creek flows northward across the easternmost portion of the Site as a 3rd order stream (Plate 1 of Appendix C). An unnamed, north-north-easterly trending tributary of Back Creek, referred to throughout this report as the 'Central Tributary', traverses the western portion of the Site as a 3rd order stream (Plate 2 of Appendix C). Both watercourses are fed within the Site by a number of ephemeral 1st order steams, all unnamed
- At present, Back Creek and the Central Tributary can be classified as highly degraded, intermittent watercourses with semi-continuous incised channels and extensively eroded banks. However, field observations and available historical reference materials for the greater area suggest that the pre- and early post-European settlement morphology of these watercourses was likely that of a chain of ponds
- Reference to the 1:100,000 Geological Map Sheet for Canberra (9030) (Abel 1992) indicates that the surface geology of the Site is a mixture of Middle Silurian Canberra Formation groups Silurian mudstone (Sua) and Silurian dacitic ignimbrite (Sua4), as well as Early Ordovician sandstones (Oa) and Quaternary alluvium (Qal)
- Stone suitable for flaked stone artefact manufacture is available within the Site in the form of outcropping veins of milky quartz and associated gravel deposits (both colluvial and fluvial). These occur widely and abundantly across the Site, with several extensive deposits observed across the Site's slopes and crests. While other knappable rock types (e.g., mudstone, siltstone, hornfels and quartzite) are known to occur within the mapped geological formations of the Site, no exploitable deposits of these materials were identified during the field investigation component of the current assessment
- Prior to European settlement, the flora and fauna resources of the Site and environs will have been sufficient to facilitate intensive and/or repeated occupation by Aboriginal people
- Examination of historical aerial imagery for the Site indicates a range of historical land use activities and associated ground surface impacts. Major activities/impacts include native vegetation clearance, the construction of farm dams, erosion and ploughing. However, the majority of land within the Site retains moderate integrity.

[1] I.e., edible and/or otherwise useful (e.g., medicine, clothing)

8.2.2 Ethnohistoric context

The Site falls within the traditional country of Ngunawal-speaking peoples. According to Matthews (1904 cited in Flood 1996: 5), the boundaries of the Ngunawal language group were from "Goulburn to Yass and Burrowa, extending southerly to Lake George and Goodradigbee", and "from Queanbeyan to Yass, Boorroowa and Goulburn". Surrounding language groups comprised the Ngarigo and Walgalu to the south, Gandangara to the north, Wandandian and Walbanga to the east and Wiradjuri to the west.

Available documentation suggests that the Canberra region was significantly less densely populated than the coast and western riverine plains of southern New South Wales, with 70% of groups containing less than ten people (Flood 1980: 160). Flood (1980) speculated that the annual settlement and subsistence cycles of Aboriginal groups living in the region were based around the seasonal exploitation of animal and plant resources within three principal ecological zones: large rivers, montane valleys and 'high' Bogong moth localities.

8.2.3 Archaeological context

Available archaeological data indicate that Aboriginal people have occupied the Southern Tablelands and northernmost ranges and plateaus of the Australian Alps[2] for at least 21,000 years (Flood et al. 1987). Aboriginal archaeological investigations which were primarily development-impact based as well as research efforts has revealed a rich and diverse record of past Aboriginal occupation, with thousands of Aboriginal archaeological sites now registered on the AHIMS database and ACT Heritage Register. Key investigation themes of Aboriginal archaeology of the southeastern tablelands and highlands cover Open Artefact Sites: Distribution, Contents & Definition, Flaked Stone Artefact Technology, Chronology of Occupation and Rockshelter Sites: Distribution and Contents.

8.2.4 Archaeological predictions

A review of the existing archaeological and environmental context of the Site suggests that material evidence of past Aboriginal activity within the area is likely to be restricted to flaked stone artefacts in surface and subsurface contexts and scarred trees where mature trees remain. Accordingly, key predictions for the Site's Aboriginal archaeological record are as follows:

- The dominant raw material for flaked stone artefact production within the Site will be quartz, with silcrete the second most common material
- Flaked stone artefact assemblages will be dominated by flake and non-flake debitage items (sensu Andrefsky 2005), with formed objects (i.e., cores and retouched implements) comparatively poorly represented
- Flake debitage will dominate recorded site assemblages whilst retouched implements will be rare
- Knapping floors, if present, will exhibit evidence indicative of on-site backed artefact manufacture
- Tool types of demonstrated chronological significance will be restricted to backed artefacts and/or edge-ground hatchet heads
- Potential exists for the presence of modified or carved Aboriginal scarred trees where mature trees are present
- Subsurface artefact distribution across the Site will vary significantly in relation to proximity water.

8.2.5 Survey results

All landforms were investigated and a total survey coverage of approximately 150.1 ha, representing around 41.3% of the total Site, was achieved.

The key findings of the archaeological survey are as follows:

- A total of 145 individual stone artefacts were recorded.
- A total of 15 Aboriginal archaeological sites were recorded, comprising:

[2] Following Flood (1980), we refer here to the 'Namadgi Ranges', comprising the Tidbinbilla, Brindabella, Bimberi, Scabby and Booth Ranges, as well as the Bogong Mountains and Yarrangobilly Plateau to their west.

  - twelve open artefact sites comprising four isolated artefacts and eight artefact scatters, and
  - three potential Aboriginal scarred trees.

- All of these sites are new sites and will be registered on AHIMS.
- The majority of artefacts and sites are located at a distance greater than 300 m of a watercourse with a strong trend towards higher artefact counts on crests (86%), followed by simple slopes (10%) and flats (4%).

The Aboriginal archaeological site details are provided in Table 16 below and the corresponding locations shown on Figure 17.

Table 16 Aboriginal archaeological sites within the Site

AHIMS Site ID	Site name	AHIMS Centroid Coordinates (zone 55)		Site type
		MGAE	MGAN	
57-2-1055	SSF-IA1-17	700102	6112754	Isolated artefact
57-2-1056	SSF-IA2-17	699037	6112291	Isolated artefact
57-2-1045	SSF-IA3-17	699383	6112064	Isolated artefact
57-2-1046	SSF-IA4-17	699019	6112038	Isolated artefact
57-2-1047	SSF-AS1-17	699675	6113096	Artefact scatter
57-2-1049	SSF-AS2-17	699764	6112985	Artefact scatter
57-2-1052	SSF-AS3-17	699379	6112763	Artefact scatter
57-2-1051	SSF-AS4-17	699859	6112595	Artefact scatter
57-2-1050	SSF-AS5-17	700328	6112341	Artefact scatter
57-2-1053	SSF-AS6-17	699213	6112363	Artefact scatter
57-2-1054	SSF-AS7-17	699992	6112264	Artefact scatter
57-2-1048	SSF-AS8-17	699212	6112105	Artefact scatter
N/A	SSF-ST1-17	699500	6111920	Scarred tree
N/A	SSF-ST2-17	699474	6112653	Scarred tree
N/A	SSF-ST3-17	699735	6113087	Scarred tree

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Key

- Proposal Site
- Creeklines
- Roads & Tracks
- Aboriginal Site Boundaries
- Potential Scarred Trees

Data Sources:
1. Roads, Railway, Parks, Drainage, Localities: StreetPro Australia © 2014, Pitney Bowes Software
2. PhotoMap imagery under licence: Nearmap™ 2017

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VERSION	1

Figure 17

ABORIGINAL SITES

Springdale Solar Farm
Aboriginal Archaeological and Cultural Heritage Impact Assessment

8.2.6 Archaeological sensitivity: subsurface archaeological potential

Subsurface archaeological potential is addressed in the context of this assessment by the concept of 'archaeological sensitivity'. Archaeological sensitivity mapping was based on three key factors including the nature and extent of visible surface artefacts at the Site, a review of the findings of previous archaeological investigations in analogous landforms in the surrounding area, and on-site observations of post-depositional processes affecting artefact exposure and burial. Using these variables, the level of archaeological sensitivity has been graded into three categories: nil, low and high. These ratings have then been applied to the Site to determine levels of potential subsurface deposit (Refer to Figure 21 in Appendix C).

Areas of high archaeological sensitivity have been linked to crests and creekline flats. Approximately half of the Site has been assessed as being of low archaeological sensitivity, i.e. areas which have been associated with areas of slope.

8.2.7 Significance assessment

The assessment of cultural significance was conducted in accordance with *The Burra Charter*, which defines cultural significance as the "aesthetic, historic, scientific, social or spiritual value for past, present or future generations" of a site or place (ICOMOS 1999: 2). With respect to Aboriginal heritage, the overall significance assessment process consisted of the assessment of *scientific value(s)* by archaeologists and the assessment of *social (or cultural) value(s)* by Aboriginal people.

Scientific Value

An assessment of the scientific significance of the newly recorded sites uncovered in the AACHIA was conducted on the basis of the assessed research potential, rarity and representativeness on a local and regional scale. All the sites were assessed as having low significance with the exception of SSF-AS6-17 which was of moderate significance. A total of 96 artefacts including 71 angular shatter fragments, nine cores, eight flake shatter fragments, four complete flakes, two proximal flakes, one redirecting flake and one retouched flake were recorded at the Site.

Cultural Value

The assessment found that the Aboriginal heritage values of the Site rest principally with the Aboriginal archaeological sites identified within it. These sites attest to past Aboriginal use of the proposal site. RAPs for the assessment have identified the Site as forming part of a much larger and highly significant cultural landscape for Aboriginal people and have indicated that Aboriginal people will have moved across and utilised the proposal site as evidenced by the identified archaeological sites. During the archaeological survey RAP field representatives identified the following social or cultural values for the Site:

- Elevated rises and spurs adjacent to creeks would have been prime camping locations for Aboriginal people camping within and travelling through the Site;
- Owing to generally poor visibility conditions, subsurface testing will be necessary to adequately characterise the Aboriginal archaeological record of the proposal site. Any subsurface investigation within the Site should utilise a landscape-based sampling strategy;
- Quartz and silcrete are locally and regionally common rock types in terms of flaked stone tool technologies. Relative to quartz, which occurs in abundance across the Site, imported silcrete blanks appear to have more intensively worked; and

8.3 Scarred tree SSF-ST1-17 represents a 'shield tree'. Impact assessment

8.3.1 Construction

A total of 15 Aboriginal archaeological sites, comprising 12 open artefact sites and three potential Aboriginal scarred trees have been identified within the Site. Consideration of the location of sites within the Site in relation to the location proposed project related impacts, as well as exclusion areas for environmental constraints indicates that three open artefact sites comprising two artefact scatters and one isolated artefact site would be wholly impacted by the project. No potential scarred trees would be impacted. Table 17 presents a list of impacted sites.

Table 17 Impacted sites

Site name/AHIMS ID	AHIMS Centroid Coordinates (zone 55)		Site type	Impact
	MGAE	MGAN		
SSF-IA1-17	700102	6112754	Isolated artefact	Total
SSF-AS2-17	699764	6112985	Artefact scatter	Total
SSF-AS4-17	699859	6112595	Artefact scatter	Total

8.3.2 Operation

It is unlikely that the operation of the SSF project would affect Aboriginal archaeology. Provisions regarding the appropriate management action(s) for previously unrecorded Aboriginal archaeological evidence identified within the Site during operation would be incorporated into the Aboriginal Cultural Heritage Management Plan (refer section 8.4).

8.4 Mitigation and management measures

The AACHIA has identified Aboriginal heritage constraints across the Site including 12 open artefact sites (i.e., artefact scatters and isolated artefacts) and three potential Aboriginal scarred trees. The impact assessment has identified that three open artefact sites alongside areas of identified archaeological sensitivity would be impacted by the project. Mitigation and management measures to address the impacts of the project on the known and potential Aboriginal archaeological resource of the Site is provided below.

Table 18 Aboriginal heritage mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
AH1	Further avoid and/or minimise impacts to identified Aboriginal heritage sites at the detailed design stage as best practicable.	✓		
AH2	Preparation of a detailed Aboriginal Cultural Heritage Management Plan (ACHMP) for the Project in consultation with RAPs and to the satisfaction of OEH and DP&I. The ACHMP shall include a strategy for the management of known and potential Aboriginal heritage resource as well as identified cultural values. The ACHMP should contain procedures for consultation and involvement of RAPs in the management of Aboriginal cultural heritage values within the Site. In addition, the ACHMP should include details of proposed mitigation and management strategies of all Aboriginal sites, procedures for the identification and management of previously unrecorded sites, details of an appropriate long term management for any Aboriginal objects salvaged, details of an Aboriginal cultural heritage awareness program for all contractors and personnel associated with construction activities and compliance procedures. The key elements of the ACHMP are: • Archaeological salvage programme	✓		

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	• Conservation of non-impacted sites • Aboriginal cultural heritage awareness training • Management of any previously unrecorded archaeological evidence identified during operation • Management of potential human remains in the event of discovery during the life of the Project • AHIMS site cards • Aboriginal site database The above elements are detailed further in the following mitigation and management measures.			

AH3	Undertake a comprehensive archaeological salvage programme prior to ground disturbance which incorporates:
	• Surface collection of the three impacted open artefact sites (i.e., SSF-IA1-17, SSF-AS2-17, and SSF-AS4-17) of low scientific significance.
	• A landscape-based program of archaeological excavation across selected areas of low and high Aboriginal archaeological sensitivity within the Site, as determined through consultation with RAPs.
	• All archaeological salvage works should be undertaken by a combined field team of archaeologists and RAP field representatives. Post-salvage work for the surface collection and excavation components of the archaeological salvage program should, at minimum, include:
	  • The analysis and cataloguing of all recovered Aboriginal objects (e.g., stone artefacts, hearth stones) by a suitably qualified person or persons
	  • The submission, where deemed appropriate by a qualified archaeologist and/or geomorphologist, of excavated charcoal samples for conventional or Accelerator Mass Spectrometry (AMS) radiocarbon dating
	  • The submission, where deemed appropriate by a qualified geomorphologist, of excavated sediment samples for Optically Stimulated Luminescence (OSL) dating
	  • The submission, where deemed appropriate by a qualified archaeologist, of a selection of stone artefacts for functional use-wear/residue analysis; and
	  • The submission, where deemed appropriate by a qualified archaeologist, of a selection of non-artefactual rock samples to a qualified geologist for the purposes of raw
		✓		

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	material identification. • The ACHMP for the Project should include a detailed research design for the surface collection and excavation components of the salvage program. • All Aboriginal objects salvaged as part of the archaeological salvage program should be curated in an appropriate manner, as determined through consultation with RAPs, OEH and DP&I during preparation of the ACHMP. Temporary off-site storage of salvaged objects should be allowed for the purposes of analysis and recording. • Aboriginal Site Impact Recording (ASIR) forms for all salvaged sites should be submitted to OEH at the completion of the salvage program.			
AH4	All Aboriginal sites not impacted by the Project but within the Site should be conserved *in-situ* (i.e.:SSF-IA2-17, SSF-IA3-17, SSF-IA4-17, SSF-AS1-17, SSF-AS3-17, SSF-AS5-17, SSF-AS6-17, SSF-AS7-17, SF-AS8-18, SSF-ST1-17, SSF-ST2-17, SSF-ST3-17). Potential scarred tree sites should be protected via permanent stock-proof fencing and appropriate associated signage. Site fencing is to be erected after consultation with a qualified archaeologist and RAP representatives. All relevant staff and contractors are to be made aware of the nature and locations of all sites as well as Renew Estate's legal obligations with respect to them. Protected sites should be identified on all relevant site plans. Details for the care of protected sites should be incorporated into the ACHMP.	✓		
AH5	An Aboriginal cultural heritage awareness training package should be developed in consultation with RAPs for use throughout the life of the project, and completed prior to the commencement any ground disturbance works. The training programme shall cover: Maintaining a register of all persons who completed the training throughout the life of the Project. Training should be mandatory for all staff and contractors whose roles may reasonably bring them into contact with Aboriginal sites and/or involve consultation with local Aboriginal community members. Training should also be offered on a voluntary basis to all other staff and contractors. All standard site inductions should include an Aboriginal cultural heritage component. At a minimum, this should outline current protocols and responsibilities with respect to the management of Aboriginal cultural heritage within the Site, provide an overview of the diagnostic features of potential Aboriginal site types (e.g., scarred trees) and procedures for reporting the identification of Aboriginal archaeological sites.	✓	✓	✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
AH6	Provisions regarding the appropriate management action(s) for previously unrecorded Aboriginal archaeological evidence identified within the Site throughout the operational life of the Project should be incorporated into the ACHMP. Management action(s) should vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts.	✓	✓	✓
AH7	In the event that potential human skeletal remains are identified within the Site at any point during the life of the Project, the following standard procedure (New South Wales Police Force 2015; NSW Health 2008) should be followed: • All work in the vicinity of the remains should cease immediately • The location should be cordoned off and the NSW Police notified • If the Police suspect the remains are Aboriginal, they will contact the OEH and arrange for a forensic anthropologist or archaeological expert to examine the Site • Subsequent management actions would be dependent on the findings of the inspection undertaken under Point 3 • If the remains are identified as modern and human, the area would become a crime scene under the jurisdiction of the NSW Police • If the remains are identified as pre-contact or historic Aboriginal, OEH and all RAPs are to be formally notified in writing. Where impacts to exposed Aboriginal skeletal remains cannot be avoided an appropriate management mitigation strategy would be developed in consultation with OEH and RAPs • If the remains are identified as historic non-Aboriginal, the Site is to be secured and the NSW Heritage Division contacted, and • If the remains are identified as non-human, work can recommence immediately.	✓	✓	✓
AH8	AHIMS sites cards shall be completed and submitted to OEH: • for all newly recorded sites within the Site at the completion of the assessment. • in the event that a previously unidentified Aboriginal site is discovered within the Site at any point during the operational life of the Project, as promptly as possible. • in accordance to timing protocols the are included in the ACHMP.	✓	✓	

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
AH9	Establish a comprehensive Aboriginal site database for the Site upon commencement of the Project which would, at a minimum, contain the name, type, size (where applicable), MGA coordinates and status of all Aboriginal sites within and directly adjacent to the Site. The database should be regularly updated throughout the operational life of Project. Printed site lists and maps should be made available to RAPs upon request.	✓	✓	✓
AH10	Continued communication with the RAPs for the SSF project should be carried out. RAPs should be informed of any major changes the project design or extension, further investigations or finds.	✓	✓	

9.0 Landscape and visual impacts

A specialist Landscape and Visual Impact Assessment (LVIA) was undertaken to assess the potential landscape and visual impacts of the proposed project. The detailed LVIA is attached in Appendix D and summarised in the ensuing sections.

9.1 Method of assessment

The LVIA was conducted in accordance with industry standards with reference to techniques set out in the following guidelines:

- *The Guidelines for Landscape and Visual Impact Assessment, Third Edition (2013),* United Kingdom Landscape Institute and Institute for Environmental Management
- *Guideline for Landscape Character and Visual Impact Assessment (v.2),* Transport for NSW - RMS.

The LVIA was conducted based on the layout design drawings (Figure 3).

9.1.1 Desktop assessment and fieldwork

A desktop review of topographic maps and aerial photography was undertaken to identify potential receptor locations and to outline the visual character of the surrounding landscape including features such as landform, elevation, land cover and distribution of residential properties.

Fieldwork was undertaken to determine and confirm the potential extent and visibility of the project. Various view locations from which the project could be potentially visible were also confirmed.

9.1.2 Assessment of landscape character impacts

Assessment of landscape character deals with the impact of a visible change on the landscape and development on the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. The assessment comprises the combination of the following assessments:

- Sensitivity of the landscape to visual change, including susceptibility to change and value of the landscape
- Magnitude of landscape impact, including size or scale of change, geographical extent and duration and reversibility of the impact

The overall rating of landscape character impacts was determined by employing a matrix that rated overall significance as being Negligible, Low, Minor, Moderate - Low, Moderate, High-Moderate or High as set out in Table 19.

Table 19 Overall significance of landscape character/visual impacts

		Magnitude of effect			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High – moderate	Moderate	Negligible
	Moderate	High – moderate	Moderate	Moderate – low	Negligible
	Low	Moderate	Moderate – low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

9.1.3 Assessment of visual impacts

Assessment of visual impacts deals with the impact of changes to the landscapes perceived by individuals or groups of people. This identifies the change or loss of existing elements of the visual landscape and/or introduction of new elements to relevant users. The assessment considered:

- Receptor types, including nearby residential properties and road users
- Visual envelope mapping, which covers the likely visibility of the project from surrounding areas and indicates the 'worst case'
- Photomontages for the most affected receptors were developed to illustrate the likely visual changes from viewpoints of nominated receptor locations
- The sensitivity of the receptors, which included susceptibility of visual receptors to change, as well as the values attached to views
- The magnitude of visual impacts including the size or scale of change, geographical extent of impacts and the duration and reversibility of the impact.

An assessment of overall significance of visual impacts was then carried out employing the same matrix as that used in the assessment of landscape impacts (Table 19).

9.2 Existing environment

9.2.1 Landscape character zones

Three landscape character zones (LCZ) have been identified within the study area as shown in Figure 18 comprising:

- LCZ 1: Open rural landscape: characterised by a predominantly open rural landscape with large rural lot holdings, with a legible loose cadastral 'grid' layout
- LCZ 2: Elevated rural landscape: characterised by a steep and long ridge line that extends across the rural landscape, north from Nobby Hill
- LCZ 3: Enclosed rural landscape: comprises a gently undulating, enclosed rural landscape characterised by a low number of large rural holdings.

The key area of focus considered for this assessment was within a two kilometre offset from the project, beyond which the combined effects of intervening landform, built form and vegetation substantially limit impacts.

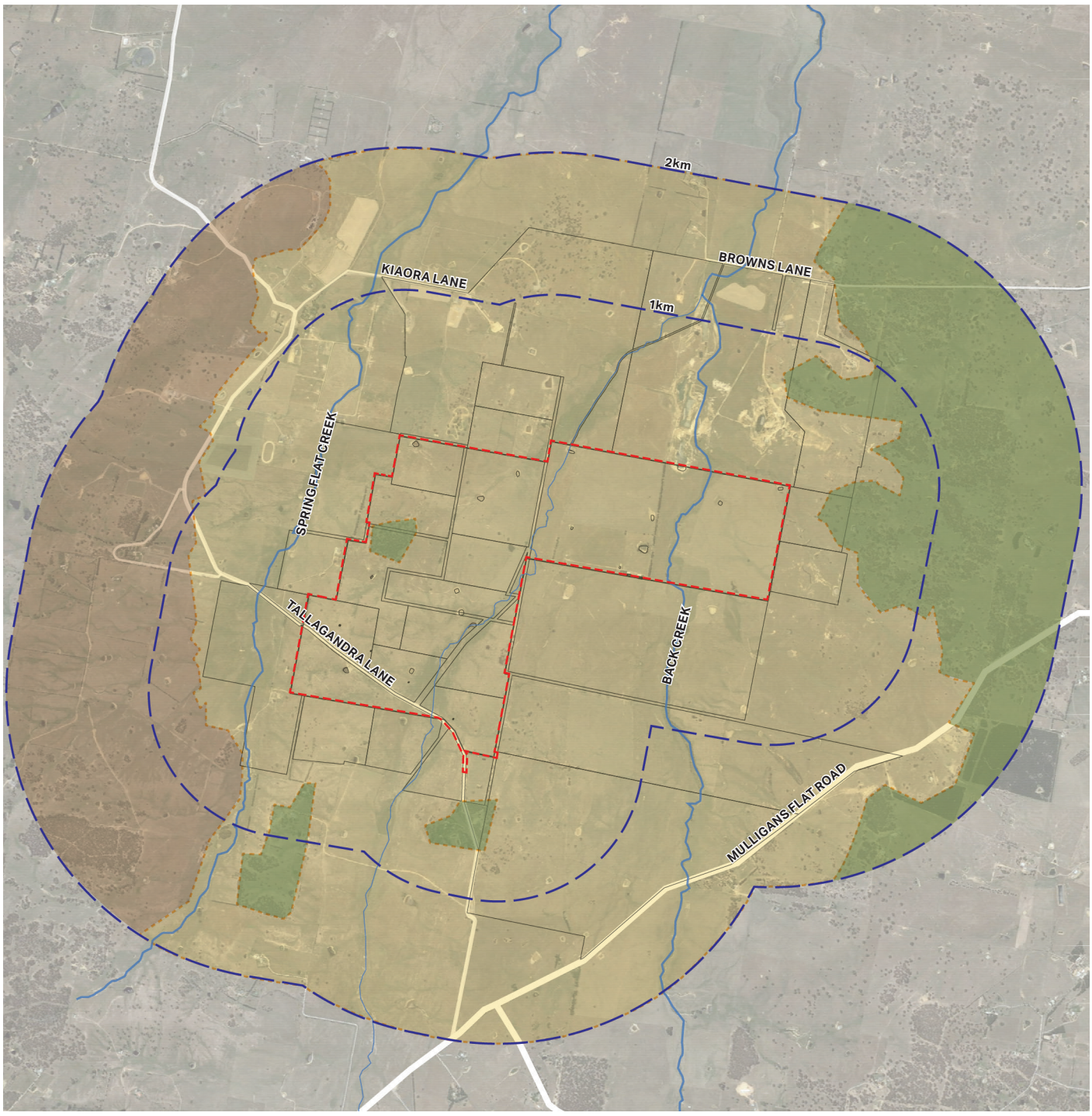


Figure 18 Landscape Character Zones

9.3 Impact assessment

9.3.1 Landscape character assessment

An assessment of landscape character impacts arising from the project of the identified landscape character zones has been undertaken to determine the significance of potential changes to the character of the landscape (Table 20 to Table 22).

Table 20 Landscape character effects assessment - LCZ 1

Landscape Character Zone 1 - Open rural landscape
Anticipated change to LCZ: the project would comprise a contrasting element across the open, low-lying rural landscape
Sensitivity to change: Moderate
Susceptibility to change: The LCZ is considered to have a moderate potential to accommodate the proposed change within the context of the open, low-lying landform, but mitigated by the potential to conserve isolated patches of endemic woodland and provision of new screen planting within the project, as a basis for future landscape integration that is reflected in the broader landscape, drawing upon existing landscape cover patterns.
Value of LCZ: LCZ 1 is considered to be of local value due to the visual amenity associated with the open, low lying rural landscape, with this LCZ present across large areas of the region.
Magnitude of change: Moderate
Size/scale: The scale of change in the landscape would be moderate, given the size and uncharacteristic form of the solar array within the open rural landscape setting, and other key structures including containerised power conversion stations, electrical switch-yard and substation and control building. However a substantial area of the project is expected to be reinstated with screening vegetation, with the aim of moving the landscape character from LCZ 1 to LCZ 3.
Geographical extent: The project comprises a major addition over a broadly localised area, within the context of extensive areas of LCZ 1 well beyond the Site.
Duration/reversibility: The project would comprise a long-term but potentially temporary (approximately 30 years) change to the character of the landscape.
Significance of landscape character effect: Moderate

Table 21 Landscape character effects assessment - LCZ 2

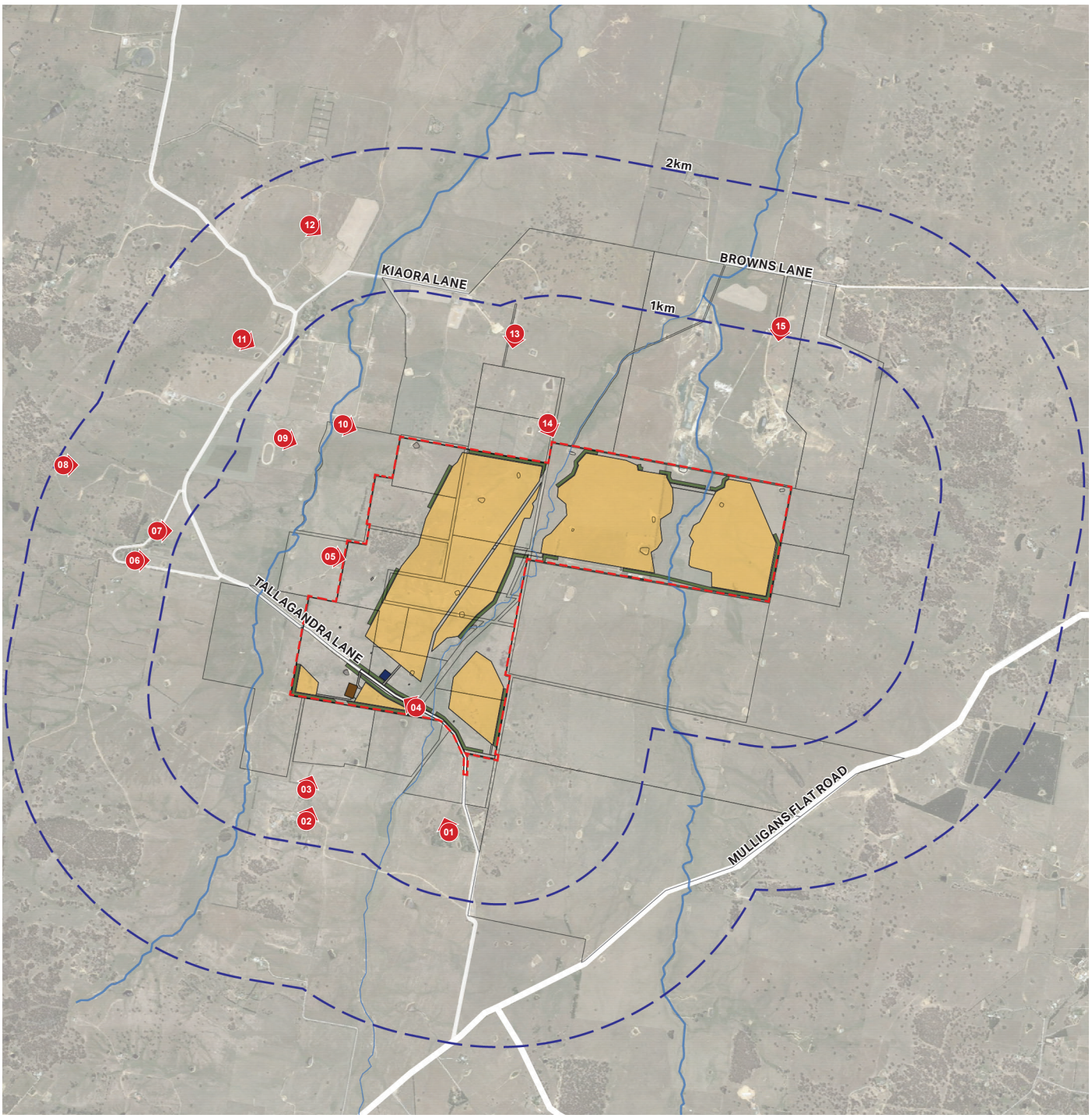
Landscape Character Zone 2 - Elevated rural landscape
Anticipated change to LCZ: The project would have some impacts on the character of the landscape, however these would be limited to the east orientated and elevated edges of the LCZ overlooking the project. The project would introduce new solar infrastructure elements within visual proximity of this LCZ.
Sensitivity to change: Low
Susceptibility to change: The ability of this LCZ to accommodate the proposed change without impacts on its landscape character is considered to be high given its substantial separation from the project.
Value of LCZ: LCZ 2 is considered to be of local value due to the visual amenity associated with its elevated position and outlook on the adjoining open, low-lying rural landscape, with this LCZ present across large parts of the region.
Magnitude of change: Low
Size/scale: The size of change is considered to be moderate within the context of the proximate form and scale of the project across the adjoining open, low-lying rural landscape LCZ 1.
Geographical extent: The impact of the project on this LCZ is locally high, but low within the context of the extent of this LCZ which extends well beyond the study area. The impact is only on the immediate setting the project.
Duration/reversibility: The project would comprise a long-term but temporary (approximately 30 years) change to the sections of this LCZ that are adjacent to the extent of works, subject to further application to operate at the end of the projected 30 year life of the project.
Significance of landscape character effect: Low

Table 22 Landscape character effects assessment - LCZ 3

Landscape Character Zone 3 - Open rural landscape
Anticipated change to LCZ: The project would comprise a contrasting element within visual proximity of the adjoining open, low-lying rural landscape (LCZ 1).
Sensitivity to change: Moderate
Susceptibility to change: The vegetation within LCZ 3 provides a complimentary setting to the landscape character of LCZ 1. The impacts arising from loss of vegetation on the existing character of LCZ 3 are largely isolated to the two retained patches of existing woodland within the project. The project will provide additional vegetation cover similar to that of LCZ 3, with the aim of extending the LCZ 3 character across much of the project.
Value of LCZ: LCZ 3 is considered to be of local value due to the contribution of tree planting within rural lots. In addition, the informal and naturalistic nature of endemic regrowth vegetation within the LCZ contributes to the broader landscape character.
Magnitude of change: Low
Size/scale: The scale of change in the landscape would be low within the context of the adjoining LCZ edges, and noting that a substantial area of the project is expected to be reinstated with screening vegetation which will reflect the character of this LCZ.
Geographical extent: The impact is on the immediate setting of the project only. Extensive areas of the LCZ occur across the regional landscape.
Duration/reversibility: The project would comprise a long-term but temporary (approximately 30 years) change to the character of the landscape.
Significance of landscape character effect: moderate-Low

9.3.2 Visual impact assessment

A total of fifteen visual receptor locations were identified to represent viewpoints for the assessment of potential impacts on views as a result of the project, as shown in Figure 19.



LEGEND

PROJECT SITE

VISUAL RECEPTOR LOCATION

SOLAR FIELD AREA INCLUDING INTERNAL ROADS

SCREEN PLANTING

SUBSTATION AREA

CONTROL BUILDING AREA

0 2,000m

Figure 19 Visual receptor locations

The visual receptor types considered were:

- **Residential receptors:** residents are interested in the outlook from their properties and have a sense of proprietary interest in their local environment. Residents typically have regular and prolonged viewing opportunities, so are considered likely to have a high level of sensitivity to the proposed change. All of the viewpoints assessed take into account any curtilage surrounding each residence which may be considered an extension to the dwelling for domestic or social activities
- **Road users:** road users may generally have only a passing interest in the quality of their surroundings as they are travelling through the landscape (especially on Tallagandra Lane because it is a local road and therefore it becomes a form of 'work' travel), and the project comprises only a small component of the landscape through which they are travelling. Additionally, drivers would be expected to have much of their attention focussed on road conditions and so are considered to have moderate to low sensitivity to change. Local road users may have a moderate level of sensitivity to change, given the potential for a sense of proprietary interest in their local environment.

Visual impact assessment

Construction

The key construction activities that may be visible from areas surrounding the project include:

- Civil/earthworks involved in the preparation of the Site
- Hardstand areas required for laydown and storage of construction materials
- Temporary site facilities such as parking, toilets and amenities
- Temporary site access tracks instated for construction vehicles
- Plant and equipment required for the construction of the project including:
    - Medium rigid trucks, utes and light vehicles
    - Piling machines
    - Forklifts and assisted material handling equipment
    - Water trucks for dust suppression.

The majority of construction activities which would result in physical changes to the landscape are generally temporary in nature.

While levelling and grading may be undertaken to achieve more consistent gradients, the areas of disturbance would be rehabilitated and the surrounding groundcover would be retained. Areas of earthworks would be subject to dust control measures that would aim to minimise any airborne dust that could affect local visibility.

The majority of construction activities would be unlikely to result in an unacceptable level of visual impact due to the relatively short duration (approximately eight months) and temporary nature of the works.

Operation

During operation, the significance of visual impacts as a result of the project for the 15 identified receptors is summarised in Table 23. A more detailed description of impacts is provided in Appendix D.

The likely visibility of the proposed elements of the Project during operation from surrounding areas has been broadly mapped to define a visual envelope (Figure 21). This provides an indication of where the Project is potentially visible from. This map indicates 'worst case' and is indicative only as it is

based on landform only and does not consider the impacts of intervening vegetation cover obstructing views.

Table 23 Operational visual impacts to identified receptors

Receptor	Anticipated change to view	Sensitivity to change	Magnitude of change	Significance of visual effect
V01 - Resident	Views north-west towards the project from the residential receptor and immediate property curtilage would be partially screened by existing vegetation.	Moderate	Low	Moderate-Low
V02 - Resident	Views north to north-east towards the project from the residential receptor and immediate property curtilage would be screened by existing vegetation cover and landform which falls away from the residence. Indirect views would extend toward the Project from a section of the driveway.	Low	Low	Low
V03 - Resident	Views north to the north-west towards the project from the residential receptor and immediate property curtilage would be partially screened by existing vegetation and cultural planting.	Low	Negligible	Negligible
V04 – Road User	Views north-west across Tallagandra Lane towards the project would comprise immediate views of the proposed screen planting, control building area and solar field areas north of Tallagandra Lane. To the south of Tallagandra Lane views would comprise screen planting, substation and solar field area in the background. A photomontage from this location is included in Figure 20.	Moderate	Moderate	Moderate
V05 - Resident	Views to the east towards the project would comprise distant views of the solar field areas and would be partially screened by the intervening landform.	High	Moderate	High-Moderate
V06 - Resident	Potential distant views east from this residential receptor toward the project are partially screened by vegetation within and surrounding the property boundary.	Low	Low	Low
V07 - Resident	Potential distant views east from this residential receptor toward the project are partially screened by vegetation within and surrounding the property boundary.	Low	Low	Low
V08 - Resident	The residential receptor would have an elevated view east overlooking the Project. Views would be on a landscape scale and as such have an appreciation of the extent of the project.	Moderate	Moderate	Moderate

Receptor	Anticipated change to view	Sensitivity to change	Magnitude of change	Significance of visual effect
V09 - Resident	This receptor does not currently have a direct view of the Project due to the presence of intervening vegetation, despite views from this receptor being theoretically possible on the basis of landform only (i.e ignoring existing vegetation). As such there would no change to the existing view from the receptor as a result of the project	Negligible	Negligible	Negligible
V10 - Resident	This receptor does not currently have a direct view of the Project due to the presence of intervening vegetation, despite views from this receptor being theoretically possible on the basis of landform only (i.e ignoring existing vegetation). As such there would no change to the existing view from the receptor as a result of the project	Negligible	Negligible	Negligible
V11 - Resident	The anticipated change from this elevated location overlooking the project would potentially have views on a landscape scale and as such have an appreciation of the extent of the project.	Moderate	Moderate	Moderate
V12 - Resident	The anticipated change from this elevated location overlooking the project would potentially have views on a landscape scale and as such have an appreciation of the extent of the Project.	Moderate	Moderate	Moderate
V13 - Resident	Views to the south towards the project would comprise distant views of the solar field areas and would be partially screened by the proposed screen planting.	High	Moderate	High-Moderate
V14 - Resident	Views to the south towards the project would comprise distant views of the solar field areas and would be partially screened by the proposed screen planting.	High	High	High
V15 - Resident	Views south from this residential receptor toward the project would potentially have views on a landscape scale and as such have an appreciation of the extent of the project.	Moderate	Low	Moderate-Low

Existing view

Figure 20 Photomontage for receptor location V04, Tallagandra Lane (public road)

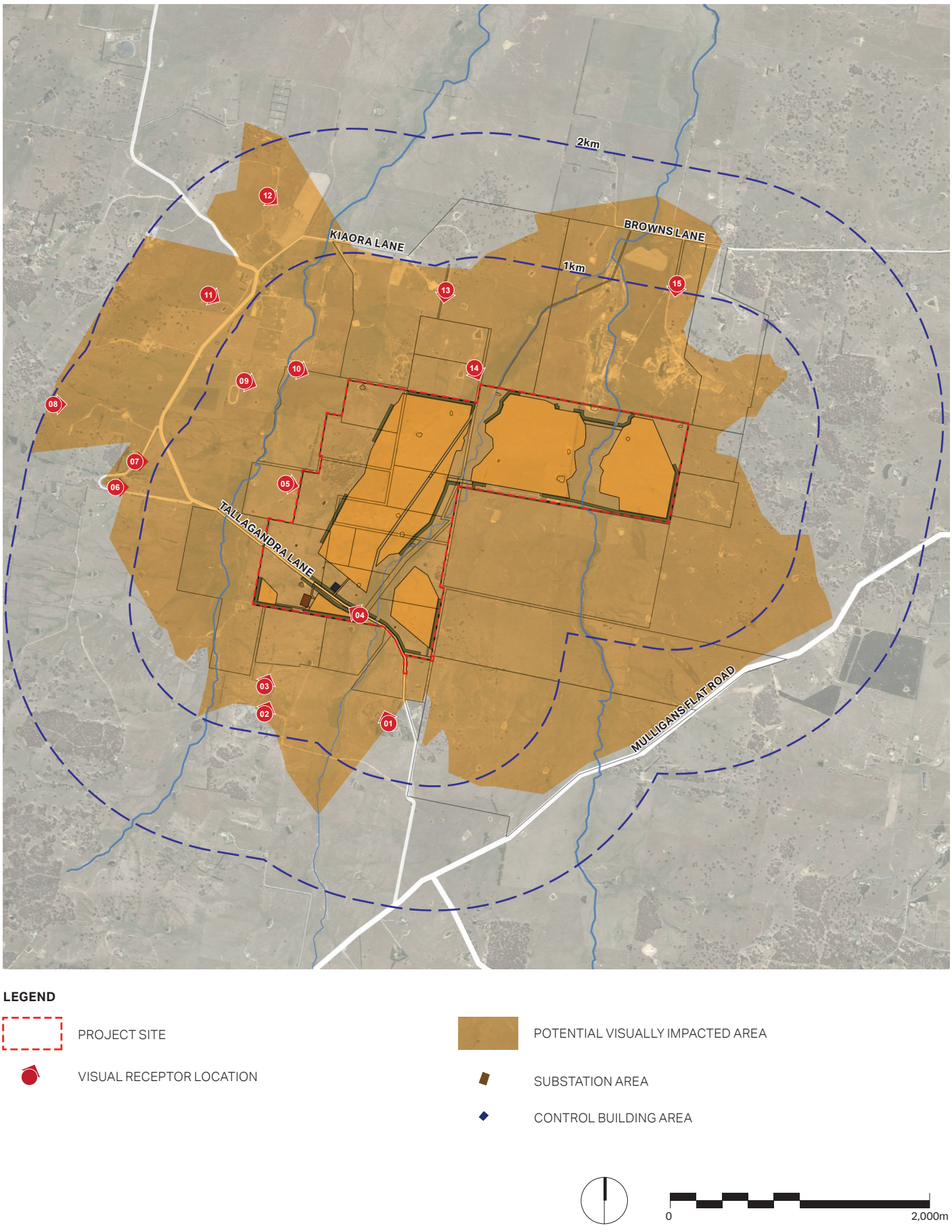


Figure 21 Visual envelope map

9.3.3 Night lighting

There will no night lighting except for sensor lighting for security associated with the operation and maintenance facilities and electrical switchyard and substation. It may be necessary to undertake maintenance on the solar panels and power conversion stations at night time when the solar farm is not generating electricity. In such cases, localised temporary lighting may be required to ensure safe conduct of the maintenance work.

A small number of localised light sources from residential dwellings are located in close proximity to the project, though these are unlikely to be visually prominent. Lights from vehicles travelling along local roads provide temporary and periodic sources of light.

The categories of potential view locations that would be affected by night lighting include residential receptors and road users. Irrespective of the total number of visible light sources associated with the project, lighting is more likely to be noticeable from exterior areas surrounding residences rather than from inside residential dwellings where at night time room lights tend to reflect and mirror internal views in windows, or curtains and blinds tend to be drawn.

Night time lighting associated with the project is unlikely to have a significant visual impact on road users travelling along the local roads; as no permanent lighting is proposed the duration of visibility would tend to be occasional and temporary.

9.3.4 Glint and glare

The results of the desktop glare hazard analysis identified that for the project, there is no glare hazard predicted to be generated as a result of the operation of the project.

The glare model developed for this study is considered a ‘worst case’ situation, whereby it is assumed that the solar arrays are installed across the entire Site and the entire area of the solar panel arrays are considered a potential glare source. In addition the model includes conservative assumptions including a high irradiance and the model does not consider any existing vegetation, buildings or topographical features that may exist between the solar panel arrays and the observation points.

Currently the Glare Gauge model does not account for the ‘backtracking’ operation which commonly occurs on single axis tracking systems. During the early morning and late afternoon when the backtracking procedure is operating the angle of incidence of the sun relative to the PV module may differ to that predicted in the modelling. Given the limited period of operation in backtracking mode and the lower direct normal irradiance (DNI) that occurs during backtracking operation the resulting potential for glare hazard is not expected to be significant during backtracking operation. Given there is no glare predicted at the modelled observation points, there are no recommended measures to mitigate glare from the project.

The risk of glint and glare on aircraft flightpaths to and from the Canberra Airport are discussed in section 15.3.

9.4 Mitigation and management measures

The draft landscape plan provides well integrated planted buffer areas of a minimum width of twenty metres along the project boundaries to minimise the extent of the solar array when seen from surrounding receptor locations. The buffer areas contain random plantings of a variety of endemic tree and shrub species of differing growth habits typically at spacings of two to five metres, and a groundlayer of grasses and low growing species at closer spacings. The intention is to reinstate screening vegetation with characteristics of local plant communities to maintain a consistent landscape character. Screen planting could not be placed in some locations due to conflicts with the location of GSM habitat.

Consultation regarding landscaping has occurred with the community other stakeholders, as summarised in section 5.0. Consultation would continue to occur during the finalisation of the landscape plan.

Table 24 Landscape and visual impact mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
V1	The following would be further considered as part of the detailed design of the project: • refinement in the design and layout which may assist in the mitigation of bulk and height of proposed structures • a review of materials and colour finishes for selected components in keeping with the surrounding landscape including the use of non-reflective finishes to structures.	✓		
V2	Finalise the draft Landscape Plan (Appendix A of the LVIA) in consultation with the most affected visual receptors and other stakeholders, and implement this plan during construction.	✓		
V3	The following would be implemented during construction as far as practicable: • minimise tree removal where possible • avoidance of temporary light spill beyond the construction site where temporary lighting is required • rehabilitation of disturbed areas • protection of endemic vegetation within the project where retained.	✓		✓
V4	The following would be implemented during operation as far as practicable: • ongoing maintenance and repair of constructed elements • long term maintenance of screen planting to maintain visual filtering and screening of external views where appropriate.		✓	

10.0 Water

10.1 Method of assessment

The existing surface water and groundwater conditions within the proposed Site were assessed through a review of available online searches and mapping. Watercourse ordering and riparian widths were assessed based on the Strahler System of ordering watercourses (DPI, 2012).

Flood modelling was undertaken to assess the existing flood behaviour across the Site to inform project planning and design. The flood assessment for the Site was undertaken using a two dimensional (2D) TUFLOW hydraulic model, with inputs from a hydrologic model using WBNM software. Full details of the flood assessment method and findings are provided in Appendix F (Flood Modelling Study).

A qualitative assessment of impacts to surface water resources (including flooding), groundwater resources, wetlands, riparian land, groundwater dependent ecosystems, key fish habitat, licensed water users and basic land holder rights was undertaken.

10.2 Existing environment

10.2.1 Watercourses

The Site contains a number of drainage/creek lines and farm dams as illustrated in Figure 22. The drainage lines generally flow in a southwest to northeast direction across the Site, and drain towards the Yass River, approximately 10 km downstream. As shown on Figure 22 Spring Flat Creek runs west of the Site and Back Creek runs through the eastern portion of the Site. Another unnamed creek runs through the Site from south of Tallagandra Lane through the western portion of the Site. Back Creek and the unnamed creek join approximately 1 km downstream (north-east) of the Site. Several smaller drainage lines cross the Site and drain towards these waterways.

10.2.2 Riparian land

A riparian corridor forms a transition zone between the terrestrial environment and a river, watercourse or aquatic environment, and performs a range of important environmental functions (e.g. provides bed and bank stability, protects water quality, provides habitat).

The NSW Office of Water recommends a vegetated riparian zone width based on watercourse order as classified under the Strahler System of ordering watercourses (DPI, 2012). The watercourse stream order and recommended riparian corridor widths for the watercourses within the Site are provided in Table 25. The existing riparian vegetation is relatively limited (refer to Figure 22) with only a few isolated trees and shrubs occurring within the recommended riparian zone.

Table 25 Riparian corridor widths (DPI 2012)

Watercourse within the Site	Watercourse type	Vegetated Riparian Zone (each side of watercourse)	Total riparian corridor
Unnamed waterway	1st order	10 metres	20 m + channel width
Back Creek	2nd order	20 metres	40 m + channel width

10.2.3 Wetlands

No Ramsar wetlands were identified within the Site or nearby surrounds, with the closest being the Ginini Flats Wetland Complex, approximately 63 kilometres south west. No Ramsar wetlands were located within 100 km downstream of the Site. No significant wetlands were identified within the Site.

Other than the farm dams located throughout the Site and the quarry lake situated on the northern boundary, no other known protected or non-significant wetlands are present within the Site.

10.2.4 Water quality

No known water quality monitoring data was available for the watercourses within the Site. The nearest known water quality monitoring is conducted on the Yass River, downstream and approximately 14 km north of the Site, by the Upper Murrumbidgee Waterwatch. The water quality was reported to be good for the 2015/16 and 2016/17 monitoring seasons (Upper Murrumbidgee Waterwatch, 2017). A summary of the water quality monitoring results for 2016/17 is provided in Table 26. The results indicate that the local tributaries of the Yass River, such as the watercourses within the Site, are likely to be of relatively good water quality, although affected to some extent by agricultural practices in the area.

Table 26 Yass River (YAS2) 2016/17 Monitoring Results (Upper Murrumbidgee Waterwatch, 2017)

Parameter	Rating	Rating thresholds
Overall Water Quality	Good	Not applicable
pH	Excellent	6.6 – 7.8
Turbidity	Fair	17 – 36
Total phosphorus	Excellent	<0.02
Nitrate	Excellent	<1.0
Electrical Conductivity	Degraded	>404
Dissolved Oxygen	Degraded	<78, >115

10.2.5 Flooding

A flood assessment has been undertaken to evaluate the flood risk across the Site, provide input to the general layout of the Site, and to develop mitigation measures where necessary. The flood assessment is described in detail in Appendix F (Flood Modelling Study).

Within the Site the floodplain of the unnamed creek is between 150 m to 250 m wide, with 1% Annual Exceedance Probability (AEP) flood depths of less than 0.5 m on the floodplain areas. The floodplain along Back Creek is slightly more extensive, being about 200 m to 350 m wide within the Site. The flood depths on the Back Creek floodplain are generally less than 1 m in the 1% AEP.

Velocities during a 1% AEP event are approximately 1 to 2 m/s in both creeks, but less than 1 m/s outside the main channels.

10.2.6 Groundwater resources

Based on the Canberra 1:250,000 Geological Series map, the Site is underlain by river and lake gravel and alluvium and sand drift (Cza), shale, siltstone, greywacke, limestone and volcanics (Slc), and calcerous shale, limestone, sandstone and volcanics (Smf). Reference to the DPI Water groundwater database indicates there are relatively few registered bores across the Site and the surrounds. Within the Site there are five registered bores and two just outside the Site boundary, as listed in Table 27 and Table 28 respectively. The distribution of bores is shown in Figure 22. The low number of water supply bores is attributed to a lack of consistent groundwater or aquifers within the underlying geology and sufficient surface water is obtained from local creeks, rivers and dams.

The available bore data indicates that the main use of groundwater in the area is for stock and domestic purposes, as typical in a rural agricultural environment. The groundwater standing water levels range from 5 - 13 metres below the ground surface (mbgs). The identified registered bores were drilled between 1951 and 2006. One of the most recent bores recorded a supply of 2 L/sec from shale and siltstone at 45 – 49 metres below the ground surface.

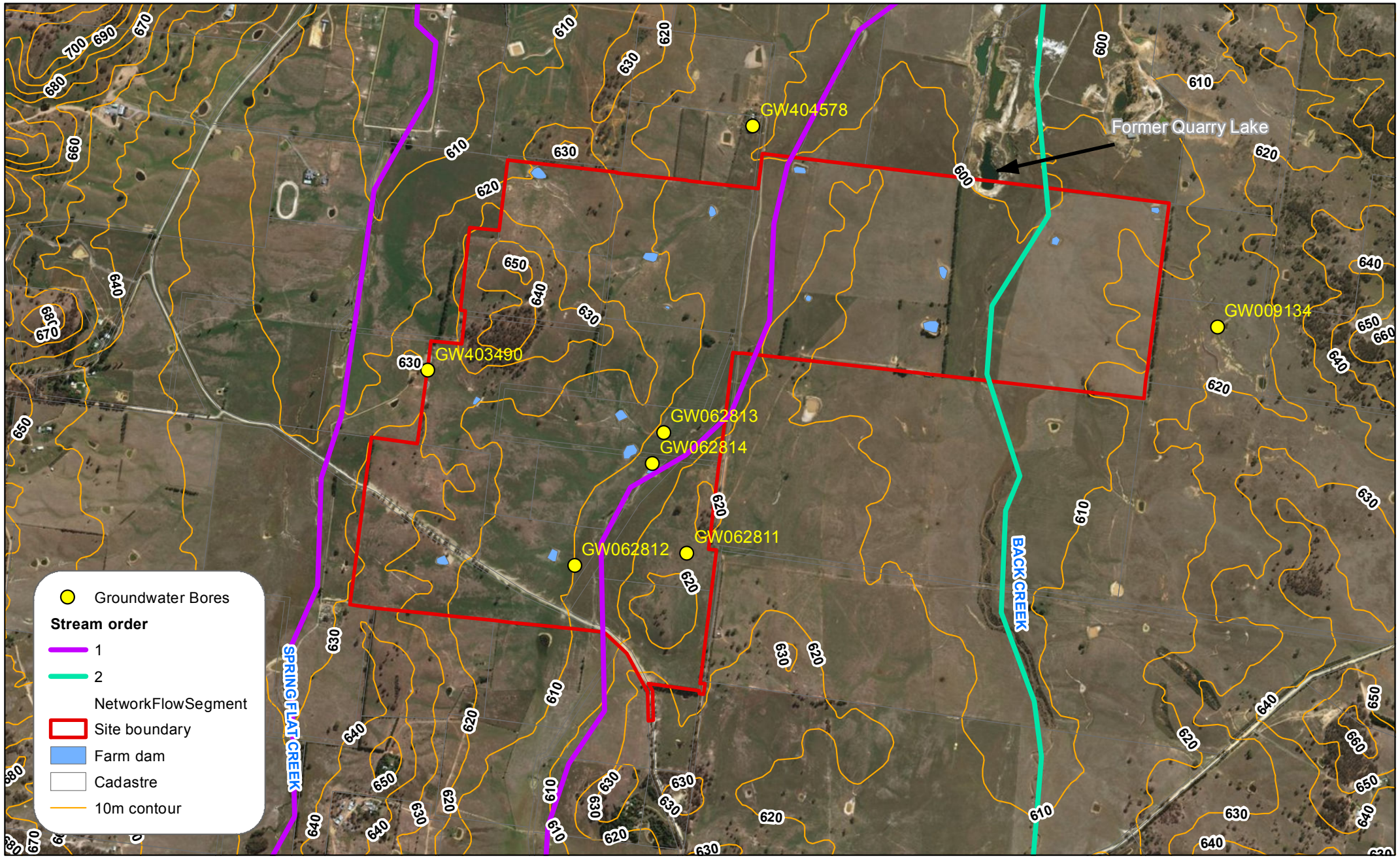
Upper Tertiary to Recent aged gravel and alluvium (Cza) can be a good source of good quality groundwater, however the depth of the bores present indicate that the deeper layers of Silurian aged shale and siltstone (Slc, Smf) are the predominant source of groundwater in this area. This is evidenced by bore GW403490, where a supply of groundwater was obtained from shale and siltstone. These units however, have only moderate prospects for containing groundwater. The Silurian aged calcerous and limestone components of the geological sequence may contain substantial groundwater within the dissolution of the calcium and creation of larger voids. However, within the limestone the voids are typically poorly connected reducing the available groundwater that can be pumped.

Table 27 Summary of available groundwater bore data within Site

Bore No.	Intended Purpose	Year Drilled	Total Depth	Yield	SWL	Salinity	Lithology
GW404578	stock, domestic	2006	46	N/A	5	N/A	Shale -> 0 - 46 mbgs
GW062813	stock, domestic	1982	N/A	N/A	N/A	N/A	N/A
GW062811	stock, domestic	1982	112	N/A	N/A	N/A	N/A
GW062812	stock, domestic	1982	113	N/A	N/A	N/A	N/A
GW062814	stock, domestic	1982	N/A	N/A	N/A	N/A	N/A

Table 28 Summary of available groundwater bore data within 500 m of the Site

Bore No.	Intended Purpose	Year Drilled	Total Depth	Yield	SWL	Salinity	Lithology
GW403490	stock, domestic	2006	54	2	13	N/A	Water bearing zones at 45-47 and 48-49 mbgs, screened at 42-54 mbgs Clay -> 0 - 2 mbgs Shale -> 2 - 48 mbgs Siltstone -> 45 - 54 mbgs
GW009134	N/A	1951	28	N/A	N/A	N/A	Clay -> 0 – 4.57 mbgs Quartz Decomposed -> 4.57 – 7.92 mbgs Sandstone gravel -> 7.92 – 12.80 mbgs Quartz Decomposed -> 12.80 - 15.24 mbgs Shell -> 15.24 – 28.04 mbgs



SPRINGDALE SOLAR FARM

SURFACE WATER & GROUNDWATER

DATE 21/03/2018
SCALE 1:20,023
PROJECT 60555008
DRAWN PH

Figure 22 Surface water and groundwater features

10.2.7 Groundwater dependant ecosystems

The Bureau of Meteorology Groundwater Dependent Ecosystems Atlas (BOM, 2017) indicates that there is a high potential for aquatic Groundwater Dependant Ecosystems (GDEs) in Back Creek situated within the Site and in Spring Flat Creek adjacent to the Site.

No high priority GDEs were identified within the Site based on a review of BOM (2017).

10.3 Impact assessment

10.3.1 Construction

Surface water

Potential impacts to surface waters during the construction phase could occur as a result of:

- Exposure of soils during earthworks which may result in erosion and mobilisation of sediment into watercourses. This could adversely impact water quality of the receiving watercourses through increased turbidity, lowered dissolved oxygen levels and increased nutrients.
- Contamination of surface waters due to accidental spillages of fuel, lubricants, herbicides, sewage and other chemicals used in the construction process

Earthworks would include site levelling and/or soil compaction for construction of the substation, control building, power conversion units, construction laydown areas, temporary site offices, access roads and solar trackers, driving or piling of solar panel mounting structures and trenching for underground electrical cable installation.

Potential construction impacts to surface water quality and quantity would be managed through:

- Implementation of an Erosion and Sediment Control Plan (ESCP), prepared in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) in order to manage potential impacts associated with erosion, mobilisation of sediment and other contaminants, changes in runoff characteristics and construction waste water
- Implementation of procedures for chemical storage, use and emergency spill management in accordance with the CEMP.
- Revegetation of areas where groundcover is cleared or disturbed below the panels, and in areas to be used only during construction (e.g. laydown and construction parking areas).

Further details of the proposed management measures are provided in section 10.4.

Impacts to receiving watercourses are considered to be negligible with the proposed management measures in place.

Flooding

During construction there is the potential for inundation of site compounds, construction equipment, stockpiles and storage areas if these are located close to or within the main floodplain areas. This could present a safety hazard to construction personnel, damage to equipment and could potentially lead to materials being washed into the creeks.

Flood impacts to surrounding properties would be negligible as the footprint of the temporary works compared to the wider floodplain area would be small.

Groundwater

There is a minor risk of contamination of groundwater due to accidental spillages of fuel, lubricants, herbicides, sewage and other chemicals. This risk would be controlled through the implementation of procedures for chemical storage and use, and emergency spill management in accordance with the CEMP.

Earthworks are unlikely to intercept the groundwater table, with standing water levels ranging from 5 to 13 metres below the ground surface.

No impacts to groundwater levels and flows are anticipated during the construction and decommissioning phase; therefore no impacts to GDEs are likely to occur.

Water required during construction and decommissioning would be primarily for dust suppression purposes, and other activities such as vehicle washing. It is estimated that approximately 2,000 KL of water would be required for these activities. Water supply during construction and decommissioning would not be sourced from groundwater and no existing bores would be affected by the works, therefore no groundwater quality or quantity impacts are anticipated to adjacent groundwater users.

Riparian land

Any disturbance of the riparian corridor during construction and decommissioning could potentially impact on its ability to provide its environmental functions.

Construction activities would predominantly be outside the designated riparian corridor. However, the construction of access tracks and potentially underground cabling would occur within the riparian corridor where they cross the creeklines. The design and construction of these works would be undertaken in accordance with the *Controlled Activities on Waterfront Land guidelines* (DPI 2012a) including:

- Guidelines for in-stream works on waterfront land (DPI, 2012b)
- Guidelines for outlet structures on waterfront land (DPI, 2012c)
- Guidelines for riparian corridors on waterfront land (DPI, 2012d).

Impacts to riparian land during construction are considered to be negligible with the proposed management measures in place.

Water supply

During construction, it is estimated that approximately two megalitres of water would likely be required for dust suppression, site amenities and vehicle washing. A static supply requirement of 20 kilolitres (kL) for fire protection would also be provided.

The water demands during construction would be satisfied by water imported (trucked in) to site. Therefore the project would not impact on adjacent licensed water users or basic landholder rights.

10.3.2 Operational

Surface water

The existing runoff characteristics of the Site would be maintained throughout the operation of the solar farm. This would be achieved primarily through maintaining adequate grass cover beneath the solar arrays. During operation the runoff characteristics of the Site would be monitored. Should runoff regularly exceed that of the pre-development Site appropriate controls would be implemented. These may include the establishment of dams, vegetation, retention basins, infiltration trenches or swales.

Potential impacts to surface waters during the operational phase include:

- Increases in imperviousness due to the access roads, control building, car parking and substation has the potential to minimally increase runoff volumes and flow rates which may result in increased land and watercourse erosion.
- Contamination of surface waters due to accidental spillages of fuel, lubricants, herbicides, sewage and other chemicals.

While the proposal involves constructing solar arrays with impervious surfaces, these would not increase runoff from the Site, as they would allow rainwater to drain to the ground underneath the arrays and follow similar flow paths to those currently present on the Site. The ground surface would absorb runoff similarly to current conditions on-site.

A 2013 study into the impact of solar farms on hydrology confirmed that a solar farm of the type proposed would not have a significant impact on the surface water run-off rate, or volume (Cook and McCuen 2013). This study found that underlying groundcover was the primary determinant of run-off rate. The study found that over bare ground (a smoother surface) the velocity and volume of run-off increases, whereas ground with good grass cover (a rougher surface) delays run-off and absorbs more water. Therefore, by retaining good grass cover underneath the solar arrays, as the project intends to, the degree of surface water run-off would remain similar to current conditions.

Rainfall runoff from solar panels is unlikely to cause soil erosion during operation. Each solar panel would have a length of up to four metres, and the maximum fall height from the panel to the ground would be about 1.22 metres to 2.0 metres. In addition, the panels would constantly change orientation throughout the day as they track the sun, with any runoff being distributed across an area around the front and rear of each panel, and not drained permanently to a single point on the ground. This would be further mitigated through the maintenance of grass cover below the panels which would act to resist erosion.

Changes in runoff characteristics as a result of increased imperviousness at the location of the access roads, control building, car parking and substation would be managed through the implementation of appropriate drainage features to promote attenuation and infiltration. Suitable scour protection/dissipation measures would also be provided at concentrated discharge points.

The minor risk of contamination due to accidental spillages would be controlled through the implementation of operational procedures for chemical storage and use, and emergency spill management. These procedures would be documented within an Operation Environment Management Plan (OEMP).

Further details of the proposed management measures are provided in section 10.4.

Impacts to receiving watercourses are considered to be negligible with the proposed management measures in place.

Flooding

During operation there is the potential for minor inundation of the solar fields and some ancillary infrastructure during a 1% AEP event.

The proposed location of the control building has been set outside 1% AEP flood depths of >0.25m, which is the maximum depth beyond which is deemed by Renew Estate as an unacceptable risk. The control building may be raised on a concrete slab to further reduce flood risk.

The proposed locations of the solar fields have been set outside 1% AEP flood depths of >0.4m, which is the maximum depth beyond which is deemed by the project owner as an unacceptable risk to the asset. Should flood levels exceed the lowest point of the solar panels, they can be stowed horizontally until flood levels subside.

The proposed location of the substation has been set outside the 1% AEP flood extent.

Flood impacts to surrounding properties would be negligible as the solar panels are raised above the floodplain with only the supports potentially presenting an obstruction to flows. As previously stated, the installation of impervious solar arrays would not increase runoff from the Site, as they would allow rainwater to drain to the ground underneath the arrays and follow similar flow paths to those currently present on the Site.

Where practicable, access roads would be built close to existing ground level similar to the construction of the existing Tallagandra Lane.

Groundwater

There is a minor risk of contamination of groundwater during operation due to accidental spillages of fuel, lubricants, herbicides, sewage and other chemicals. This minor risk would be controlled through the implementation of operational procedures for chemical storage and use, and emergency spill management.

No impacts to groundwater levels and flows are anticipated during the operational phase; therefore no impacts to GDEs are likely to occur.

Water supply during operation would not be sourced from groundwater and no existing bores would be impacted by the works, therefore no groundwater quality or quantity impacts are anticipated to adjacent groundwater users.

Riparian land

No operational activities would occur within the riparian corridor with the exception of crossing the creeklines on formed access roads which would be constructed in accordance with relevant regulations and guidelines. Therefore no significant impacts to riparian land are likely to occur.

Water supply

During operation, water would likely be required for cleaning of the solar arrays, landscaping/watering of plants and for staff amenities. Rainfall is generally sufficient to clean the solar arrays, and therefore the volume of water required for cleaning is dependent on annual rainfall.

Estimated operational water demands are provided in Table 29. The water demands during operation would be satisfied by water imported (trucked in) to site or rainwater.

Table 29 Operational Water Demands

Water Requirement	Water Demand (KL/year)	Supply arrangement
Panel Cleaning	500	Rainfall or imported truck supply
Plant establishment	900	Imported Truck Supply
Staff amenities	200	Water tanks filled by rainwater or imported truck supply

A static water supply (20 kL) for firefighting/bushfire management would also be provided.

As the water demands during operation would be satisfied by water imported (trucked in) to site and rainfall, the project would not affect adjacent licensed water users or basic landholder rights.

10.4 Mitigation and management measures

The following mitigation measures are proposed to control any potential impacts to surface water and groundwater arising from the construction, operation and future decommissioning of the SSF.

Table 30 Water mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
W1	Prepare and Erosion and Sediment Control Plan (ESCP) in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). This plan should be implemented in advance of site disturbance and be updated as required as work progresses. The ESCP would include, at minimum, the following provisions: • install erosion and sediment controls prior to and during construction • regularly inspect and maintain erosion and sediment controls, particularly following large rainfall/wind events • ensure vehicles, plant and equipment leave the Site in a clean condition to minimise mobilisation of sediment onto adjacent roads • soil handling and stockpiling procedures • identify exclusion zones to limit disturbance • stabilise and rehabilitate disturbed areas as soon as practicable • procedures for the testing, treatment and discharge of	✓		✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	construction waste water to be established and implemented where appropriate.			
W2	Prepare a CEMP that ensures: • All retained farm dams and associated drainage infrastructure to be maintained in a functional condition • Incidental spills would be intercepted by active spill management practices • Storage of hazardous materials such as oils, chemicals and refuelling activities would occur in bunded areas • All works within waterfront land (as defined in the WM Act) to be undertaken in accordance with the Controlled Activities on Waterfront Land guidelines (DPI 2012). • Procedures for the testing, treatment and discharge of construction waste water to be established and implemented where appropriate. • Groundcover to be re-established as soon as practicable on disturbed areas • Installation of any permanent scour protection measures required for the operational phase as soon as practicable • All construction staff to be engaged through toolbox talks or similar with appropriate training on water management practices • All water required for site activities during construction and operation to be imported to site. • Flood impacts would be managed by locating temporary site compounds, stockpiles and storage areas outside the 1% AEP flood extent where practicable.	✓		
W3	Prepare an O&M Plan for the operational phase that covers: • Standard operating procedures for chemical storage and use, and emergency spill management • Conducting toolbox talks or training on water management practices • Groundcover to be maintained between and under all solar panel arrays		✓	
W4	Potential operational flood impacts would be dealt with as part of the design including: • The substation would be located outside the 1% AEP flood extent. • The control building would be set outside 1% AEP flood depths of >0.25m, which is the maximum depth beyond which is deemed by Renew Estate as an unacceptable risk. • Solar arrays would be set outside 1% AEP flood depths of >0.4m, which is the maximum depth beyond which is deemed by Renew Estate as an unacceptable risk to the asset. • Access roads required within the 1% AEP flood extent would be constructed close to existing ground levels where practicable	✓		

11.0 Land

11.1 Method of assessment

The existing geology, soil conditions and soil types within the Site were determined and assessed through a review of available online databases and mapping. An assessment of the erosion potential for the Site using the available data was performed and inferences on the responsivity of soils in the area were derived. As part of the desktop assessment, information was extracted from the Sharing and Enabling Environmental Data (SEED) Portal (NSW Government, 2017), which included extracts from the following datasets:

- Australian Soil Classification (ASC) Soil Type Map of NSW
- Land and Soil Capability (LSC) Mapping for NSW
- Estimated inherent Soil Fertility
- NSW 1500k Surface Geology
- Hydrologic Groups of Soils in NSW

Information from these sources was collated and analysed in order to provide a characterisation of the Site.

11.2 Existing environment

11.2.1 Soils and landform

A search of the Australian Soil Classification (ASC) Soil Type Map of NSW reveals that the Site is largely dominated by the Kurosol soil type. Kurosols, also known as duplex soils, have a strong texture contrast between the surface and the B horizon. They generally have very low agricultural potential with high acidity (pH <5.5) and low chemical fertility. Kurosols commonly have low water holding capacity and are often saline. Other soils within the Site are classified as Alluvial Rudosols. Rudosols include young soils that have negligible pedologic organisation apart from minimal development of the A horizon.

A search of the OEH eSPADE viewer (OEH 2017b) identified four soil profiles recorded within the Site between 1993 and 1994:

1. Survey number 1000464, Profile number 248:
    - Soil type: Red sodosol (ASC), solodic soil (Great Soil Group (GSG)), Dr2.43 Principal Profile Form (PPF)
    - Surface condition firm, well drained, high erosion hazard and no salting evident
    - No erosion at profile site
2. Survey number 1000464, Profile number 346:
    - Soil type: Bleached Dystrophic Brown Chromosol (ASC), Yellow Podzolic Soil (GSG), Dy2.41 (PPF)
    - Surface condition hard set, moderately well drained, very high erosion hazard and no salting evident
    - Moderate gully erosion at profile site
3. Survey number 1000464, Profile number 247:
    - Soil type: Paralithic Leptic Tenosol (ASC), Lithosol (GSG), Um4.13 (PPF)
    - Surface condition firm, well drained, high erosion hazard and no salting evident
    - No erosion at profile site
4. Survey number 1000464, Profile number 246:

- Soil type: Yellow sodolsol (ASC), Solodic soil (GSG), Dy3.43 (PPF)
- Surface condition firm, imperfectly drained, high erosion hazard and no salting evident
- No erosion at profile site

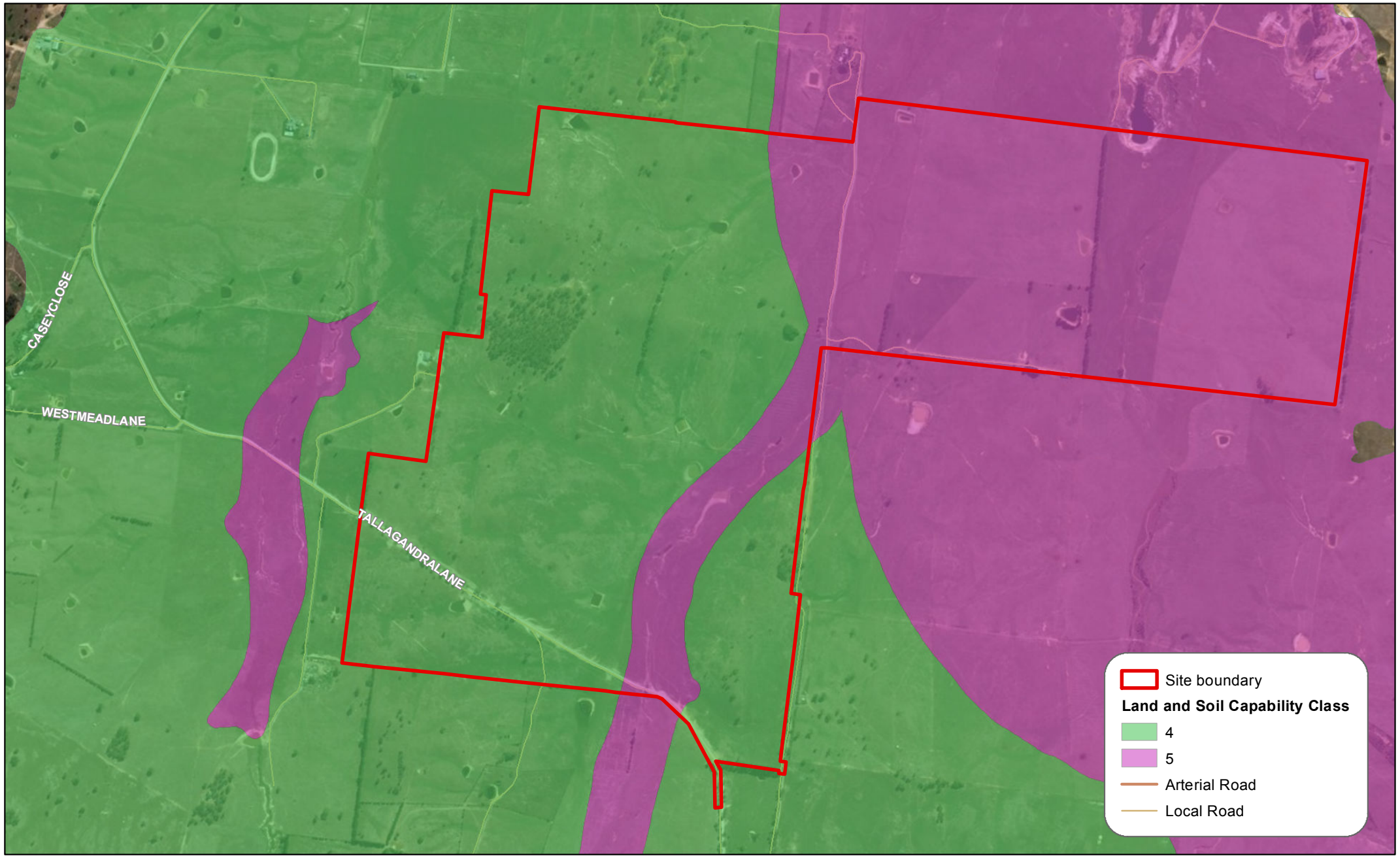
The Hydrologic Groups of Soils in NSW provides an estimate of Hydrologic Groups of soils in NSW according to a four class system. The Site has been rated as C under this classification representing soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. Class C soils have a slow rate of water transmission. While mapping of Flood Prone Land for the Site has not been completed, an assessment of potential flooding impacts area assessed in Chapter 10 (Water).

The Site consists of two main watercourses, Back Creek and another unnamed waterway. Areas in the immediate vicinity of these watercourses are categorised as Alluvial Rudosols. Rudosols have negligible pedologic organisation and are usually young soils where soil forming factors have had little time to modify parent rocks or sediments. They vary widely in terms of texture and depth and many are stratified and highly saline.

The OEH have established the land and soil capability (LSC) assessment scheme to both enhance the commitment to better soil and land management and to provide a comprehensive, current and accessible soil knowledge base to inform strategic land use and catchment planning. The LSC assessment scheme uses biophysical features of the land and soil, including landform position, slope gradient, drainage, climate, and soil type and soil characteristics, to derive detailed rating tables for a range of land and soil hazards. These hazards include water erosion, wind erosion, soil structure decline, soil acidification, salinity, waterlogging, shallow soils and mass movement. Each hazard is given a rating between 1 (best, highest capability land) and 8 (worst, lowest capability land). The final LSC class of the land is based on the most limiting hazard.

The western portion of the Site has been rated Class 4 under the LSC assessment scheme and is characterised as moderate capability land that has moderate to high limitations for high-impact land uses (Figure 23). LSC Class 4 lands restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can be managed through specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.

The eastern portion of the Site, along with the areas surrounding the watercourses on-site, have been rated as LSC Class 5 and is characterised as moderate-low capability land with high limitations for high-impact land uses (Figure 23). LSC Class 5 lands are generally restricted to grazing, some horticulture, forestry and nature conservation. The limitations need to be carefully managed to prevent long term degradation.



AECOM Renew estate.

NORTH

0 125 250 500 Meters

SPRINGDALE SOLAR FARM

SOILS

DATE 20/03/2018
SCALE 1:16,000
PROJECT 60555008
DRAWN PH

Figure 23 Land and soil capability classes within the Site

A search of the Biophysical Strategic Agricultural Land (BSAL) record for the Site returned no results within 30 km of the Site. The closest BSAL is located in the township of Tarago approximately 40 km to the east.

The estimated inherent soil fertility for the Site varies from moderately low to moderate from east to west. The areas surrounding traversing creeks are similarly rated as moderately low reflecting the generally poor quality Kurosol soils which dominate the area.

A search for acid sulfate soils on the OEH eSPADE viewer (OEH 2017b) within the larger area produced no results. There are no records of naturally occurring asbestos on or near the Site and despite the proximity to a number of small creeks and Lake George; no wetlands were mapped in the SEED viewer on or near the Site. No salinity assessments are known to have been performed in the Site ; however, the Kurosol soil type present within the Site is prone to salinity effects if not appropriately managed.

The Site lies on the fault line between the Canberra Block of the Gilgandra - Cowra - Yass Geological Zone and the Cullarin Block of the Molong - Wyangalla - Jerangle Geological Zone and within the Lachlan Orogen Geological Province (Structural Framework Map of New South Wales, Geological Survey of New South Wales, 1996). This fault line crosses the Site in roughly a north - south direction.

Rocks to the west of the fault line (Canberra Block), on the western portion of the Site are characterised by Silurian sedimentary rocks including sandstone and siltstone that have been metamorphosed to slate and quartz. To the east of the fault line (Cullarin Block), on the western portion of the Site, rocks are categorised as Ordovician sedimentary rocks dominated by interbedded quartz rich sandstone, siltstone and mudstone. They were deposited in turbidity currents along the continental slope and deeper ocean water. Deep water chert is also a common feature of this rock type, suggesting quiet, deep water conditions during deposition. Surrounding Spring Flat Creek, Back Creek and the remaining unnamed creek, Quaternary alluvial deposits dominate and consist of current and recent mud, silt, sand and gravel deposited by river systems.

Soil contamination

A search of the EPA's contaminated land public record of notice and list of sites notified to the EPA under Section 60 of the *Contaminated Land Management Act 1997* (CLM Act) returned 10 notices for two sites in the Yass Valley Council LGA, however none were reported in the vicinity of the Site.

Clause 7 of *State Environmental Planning Policy No 55 - Remediation of Land* (SEPP 55) requires that a consent authority take into consideration whether the land is contaminated. The contaminated land planning guidelines, *Managing Land Contamination Planning Guidelines: SEPP 55 – Remediation of Land* (DUAP 1998), identifies activities with the potential to cause contamination. These guidelines list "agricultural/horticultural activities" as an activity which potentially causes contamination. Agricultural/horticultural activities have occurred on and in the vicinity of the Site. Therefore, agriculturally derived contaminants could be present within the Site boundary. Based on the historic use of the area for grazing and low level cropping, as well as the nature of the proposed development, it is anticipated that any contamination within the Site would be low in quantity and would not pose a significant risk to the proposed development.

Erosion

As described in section 11.2.1, soils in the Site are dominated by Kurosols. Kurosols have a strong texture contrast between the surface and B horizon and are prone to erosion when the surface layers are removed.

The average gradient of the Site slopes gently from west to east with an approximately 50 m height differential from the highest point in the west to the lowest point at Back Creek. This elevation change occurs over approximately 2 km, giving an average gradient of 2.5%. It should be noted that the areas of highest gradient to the east correspond to the area of wooded vegetation to be retained and as such development would not occur in this area.

For the purposes of assessing the climate at the Site, climate data between 1939 and 2010 from the Bureau of Meteorology's Canberra Airport weather station have been used. The average annual rainfall over that period was 615.4 mm, relatively evenly spread out throughout the year. The average

annual 3:00pm wind speed is recorded as 17.3 km/h, predominantly from the north-west. Wind speeds are lowest in the autumn from March to May and highest in the spring from August to December.

Despite the topography of the Site being flat to undulating, the dominant soil type on the Site is prone to erosion if the soils are disturbed. While rainfall is relatively low throughout the year there is a risk of wind erosion during the late spring if topsoils are disturbed and winds speeds are consistently high.

The Natural Resources Land Map as part of the *Yass Valley Local Environment Plan 2013* does not identify any areas within the Site as having high soil erodibility.

11.2.2 Land use

The Site is located within the Yass Valley Council LGA and is zoned under the *Yass Valley Local Environment Plan 2013* as RU1 Primary Production. The objectives of this zone are stated as:

- 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 protect and enhance the biodiversity of Yass Valley
- To protect the geologically significant areas of Yass Valley
- To maintain the rural character of Yass Valley
- To encourage the use of rural land for agriculture and other forms of development that are associated with rural industry or that require an isolated or rural location
- To ensure that the location, type and intensity of development is appropriate, having regard to the characteristics of the land, the rural environment and the need to protect significant natural resources, including prime crop and pasture land
- To prevent the subdivision of land on the fringe of urban areas into small lots that may prejudice the proper layout of future urban areas.

The Site is generally greenfield, primarily comprising of large paddocks used exclusively for grazing sheep and cattle. With the exception of a seven hectare patch of woodland in the western portion of the Site (Lots 189 and 190), the Site is largely cleared, with some scattered trees and rows of planted trees along fence lines. The topography is gently undulating with a few knolls and ridges. The Site contains a small number of dams and drainage lines which flow towards the north-east as part of the Yass River Catchment.

Surrounding the Site land use is dominated by modified pasture grazing with small pockets of native vegetation grazing along with associated residential and farm infrastructure. An intensive animal husbandry is located to the north-west of the Site and is listed as horse studs in the NSW 2013 Land Use mapping study. There are no adjacent Traveling Stock Routes or NSW OEH estate or conservation areas within or near the Site.

Two existing TransGrid overhead electricity transmission lines traverse the Site in a northwest to southeast direction; the more northern of the two lines is the 330 kV Canberra to Capital Wind Farm circuit and is located within a 60 m wide easement. The more southern feeder is the Canberra to Queanbeyan circuit that the project would be connecting to. This line is located within a 40 m wide easement. A buried gas pipeline and associated easement also runs through the Site in a southwest to northeast direction. A third TransGrid transmission line runs in a northwest to southwest direction approximately 1 km south of the Site.

Agriculturally, the region is dominated by cool climate wineries east of the Murrumbidgee River and sheep and wool production to the north and west (YVC, 2014). In 2010/11 the total value of agricultural output in the LGA was $63 million which increased from $55 million in 2005/06. The largest commodity produced was livestock products, which accounted for 46.7% of the total agricultural output value of the LGA (ABS, 2011).

A search of NSW Mineral Occurrences indicated that there are no known mineral occurrences within the Site. A number of mineral occurrences were however observed in areas surrounding the Site and are summarised in Table 31.

Table 31 Mineral occurrences

Deposit Name	ID	Commodity Type	Approximate Distance to Proposed Site (m)	Operational Status
Tallagandra Pit	218246	Construction Materials (road base)	400	Operating intermittently
Hardwick Prospect	106725	Metallic Minerals (Cu, Ag, Pb)	200	Not operating
B62 Prospect	106730	Metallic Minerals (Pb, Cu)	600	Not operating
Sutton - Gundaroo Road Clay/Shale Pit	200908	Clays	300	Not operating
Sutton Clay/Shale	200828	Clays	250	Not operating
Deacon Prospect	106724	Metallic Minerals (Zn, Pb)	400	Not operating

A search of the DP&E's online MinView database and mapping system shows that there are no current mining or exploration licences over the Site. A number of historical exploration licences have existed with the most recent for gold exploration by Cgnm Resources Pty Ltd which expired in September 2015.

11.3 Impact assessment

11.3.1 Construction

The proposed project would result in varying levels of disturbance of approximately 190 ha within the Site during the construction phase.

Soils and landform

Soil contamination

The use of fuels and other chemicals on-site pose a risk of soil contamination in the event of a spill incident. Chemicals used on-site would include fuels, lubricants and (minimally) herbicides. Furthermore, contamination risks may occur due to sewage leakages from ablution facilities. Accidental spills or leaks of these substances can alter soil health, affecting its ability to support plant growth. When mobilised, such as in a rain event or flooding, these substances may spread via local drainage lines and potentially affect larger areas including the larger Yass River catchment. These risks are considered readily manageable through the use of appropriate mitigation and management measures including the use of spill-kits and suitably bunded fuel and chemical stores. Carrying out maintenance of construction vehicles and machinery off site at local maintenance workshops where possible would also minimise the risk of spills and leaks within the Site. Substances such as transformer oils would be transported to the Site just in time for use to minimise storage duration on-site.

Mitigation and management measures for the storage and management of fuels and chemicals, including preventing and managing spills and leaks would be incorporated into the CEMP for the project. The risk of soil contamination during construction would be low with the implementation of this plan.

Erosion

Construction activities would remove existing ground cover in certain locations and expose and disturb soils, potentially decreasing their stability and increasing their susceptibility to erosion. The susceptibility of soils to erosive forces is dependent on their properties, namely texture, structure and

dispersibility. As described in section 11.2.1, soils in the area are dominated by Kurosols which are prone to erosion once the surface layer has been removed.

The construction of the proposed project has limited potential to result in increased levels of soil erosion, as most construction activities do not involve the removal of the surface layer and exposure of the erosion-prone B horizon within higher risk areas such as Back Creek and the other unnamed creek that runs through the Site. The proposed project is located in an area of lightly undulating terrain and predominantly cleared grazing land, and as such no major earthworks would be required..

Other construction activities involving direct ground disturbance would primarily be limited to:

- Establishment of a temporary construction-site compound including temporary site offices, parking and laydown areas and ablution facilities
- Ground compaction and earthworks for the construction of internal roads, boundary fencing, laydown and parking areas
- Levelling and grading of ground for the solar trackers, where required
- Trenching up to an approximate depth of 900 mm for underground cable installation
- Construction of an electrical switchyard and substation adjacent to the existing 132 kV TransGrid transmission line
- Construction of the control building.

Soil compaction would occur where hardstand areas and internal access roads are created, reducing soil permeability. This would increase run off and the potential for concentrated flows, which may contribute to erosion. However due to the relatively small area of land that would be subject to soil compaction, and with limited topographic relief across the Site, any runoff containing sediment is considered to be readily manageable and unlikely to cause impacts to natural waterways.

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

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

Overall, the risk of erosion is considered low where appropriate erosion and sediment controls are implemented as part of the CEMP. Appropriate measures would be developed with consideration to the documents listed above, and outlined in an erosion and sediment control management sub-plan which would include provisions to:

- Install erosion and sediment controls prior to and during construction
- Regularly inspect erosion and sediment controls, particularly following large rainfall/strong wind events
- Minimise tracking of sediment from vehicles, plant and equipment onto Tallagandra Lane and onward onto the wider road network
- During excavation, separate storage of topsoil and subsoil to ensure that soil is replaced in their natural configuration
- Stockpile topsoil appropriately to minimise weed infestation and maintain organic soil matter, soil structure and microbial activity
- Minimise the total area of disturbance from excavation and compaction
- Establish effective soil amelioration procedures.

It has been established that specific soil testing would not be required for this environmental impact assessment as most construction activities do not involve the removal of the surface layer and

exposure of the erosion-prone B horizon within higher risk areas such as Back Creek and the other unnamed creek that runs through the Site. Furthermore any erosion impacts would be easily managed and mitigated through the measures outlined above and through the retention of vegetation. Notwithstanding this, a geotechnical study is currently being completed which includes an analysis of potential issues regarding slope stability and erosion at the Site. The erosion and sediment control sub-plan would be developed to respond to any potential soil erosion issues identified through the study.

Land use

During construction, agricultural activities would cease in areas within the Site required for access and construction activities. Fencing on-site would allow grazing within close proximity to the works areas.

As outlined in section 11.2.2, surrounding mineral extraction points have been generally decommissioned with the exception of Tallagandra Pit where construction materials are extracted only intermittently. Despite potential increases in traffic along Tallagandra Lane which runs alongside Tallagandra Pit, no extraction of minerals or activities under extraction licences would be directly affected by the construction of the proposal.

Land use conflicts during construction to surrounding grazing and farming activities are expected to be minor, and any impacts would be temporary (approximately ten months). Impacts would be generally restricted to increased traffic as construction workers travel to and from the Site. Surrounding agricultural operations on adjacent lands would not be affected as a result of the proposal including use of farm machinery, access to the road network or access to water. Mitigation and management measures strategies (refer to section 11.4 below) would ensure impacts on nearby agricultural activities continue to be managed appropriately.

The project would result in increased movements of vehicles and people to the Site during the construction phase. As a result, there is a risk of spreading weeds to and from the Site. Weeds can be dispersed easily via vehicles (e.g. on tyres and vehicle undercarriages) and on clothing of construction personnel. The spread of weeds would be controlled primarily through confining vehicle and machinery movements to formed access tracks where possible. A vehicle wash down procedure may also be implemented for vehicles entering and exiting the Site.

Construction of the project may result in the creation of certain conditions attracting pests to the Site. Domestic waste and food scraps left by workers could attract rodents to the Site while soil disturbance could result in areas of pooled water creating habitat for insect breeding. Pest habitat would be reduced as far as possible and would be outlined in the Biodiversity Management Plan.

The pest and weed management measures of the Biodiversity Management Plan would be prepared in accordance with requirements of the NSW Department of Primary Industries, and in consultation with the Yass Valley Council. Management measures would focus on preventing pests and weeds being introduced to site or tracked off site, early identification and ongoing monitoring of invasive pest and weed species, and a regular pest and weed maintenance program. Through the effective implementation of this management plan the risk of impacts from pest and/or weed species is expected to be low

11.3.2 Operation

Soils and landform

Once the project is constructed and commissioned, minimal operational impacts to soils are likely to occur. Biodiversity Guidance for Solar Developments (BRE, 2014) notes that solar farm developments cause minimal ground disturbance with project infrastructure typically occupying approximately 5% of total land area. As such, approximately 95% of the total land area is still accessible for vegetation growth (though with some shading), which can be used to support agricultural activity over the life of the project. Total land use available for agricultural activity during the operation of the project would be subject to the final detailed project design.

Land management measures would include sheep grazing as a means of vegetation maintenance throughout the life of the project. Sheep have successfully been employed to manage grassland in solar farm developments both within Australia and overseas. Sheep are considered an appropriate means of managing grassland between and underneath the PV solar panels with research suggesting

that overall production levels can be maintained at levels sustained on open grassland under similar conditions (BRE 2014).

To mitigate impacts from pest and weed infestation, vehicle movements would be restricted to the formed access tracks. Sheep grazing within the Site boundary would help maintain weed levels while maintaining a multi-purpose land use throughout the life of the project. Management of ground cover beneath the PV solar panels would be included in the BMP to manage erosion, pest and weed infestation and surface water runoff. A noxious weed protocol would be included in the BMP.

Soil contamination

During operation the substances stored on-site would be limited to herbicides for weed control and small amounts of hydrocarbon fuels and oils on-site. When used, herbicides would be applied by contractors in accordance to standard operating procedures, and would not be used within a five metre riparian buffer zone along Back Creek or the other unnamed waterway. The soil impacts of using herbicide would be consistent with the current use on-site though would take account of requirements for managing habitat for the Golden Sun Moth, as outlined in the Biodiversity Management Plan.

Fuels and oils would be appropriately bunded and stored to reduce the impact of any potential spill. Mitigation measures would be outlined in the OEMP to minimise the likelihood of adverse soil contamination due to chemical leaks and spills.

Erosion

The placement of solar panels would result in the removal of some existing trees and may potentially affect the growth of underlying vegetation. Grasses generally help slow the loss of the soil's A horizon. As such the project would seek to maintain this protective layer of vegetation wherever possible as a means of limiting soil erosion.

While the proposal involves constructing solar arrays with impervious surfaces, these would not increase runoff from the Site, as they would allow rainwater to drain to the ground underneath the arrays and follow similar flow paths to those currently present on the Site. The ground surface would absorb runoff similarly to current conditions on-site.

Rainfall runoff from solar panels is unlikely to cause soil erosion during operation. Each solar panel would have a length of up to four metres, and the maximum fall height from the panel to the ground would be about 1.22 metres to 2.0 metres. As such, the panels would be unlikely to concentrate runoff to a volume and velocity that would cause soil erosion when panel runoff contacts the ground. In addition, the panels would constantly change orientation, with runoff being distributed in the area around each panel, and not drained permanently to a single place on the ground. Furthermore, vegetation would be maintained below the panels to also reduce the potential for erosion.

The potential for wind erosion during regular plant operation would be low given the ability to stabilise soils exposed during construction through implementation of the management measures proposed.

The overall risk of erosion during operation is considered low given the benign nature of the proposal and practices listed above. Exposed soil would be limited and residual erosion risk would be managed in accordance with the OEMP for the Site.

Land use

Given the benign nature of the project including low dust and vehicle emissions and noise, and the location which is surrounded by large agricultural land holdings, the operation of the project is expected to be compatible with the current adjacent land uses. During operation, no land use conflicts are likely with rural residential development, existing dwellings or surrounding grazing activities. The development is unlikely to impact on aircraft conducting aerial spraying due to the low profile of the project infrastructure and the limited reflectivity of the PV solar panels. It has been documented that as little as 2% of the light received by a PV panel is reflected (DoI 2016, FAA 2010). This degree of reflectivity is much less than the reflectivity produced by a wide variety of surfaces, including bare soil, vegetation, and light coloured buildings. See section 9.3.4 and section 15.3 for further detail in this regard.

During the operation of the proposal, any future mineral exploration proposals would be restricted to outside of the Site boundary.

During operations, the project Site of 370 ha would be modified from the present land use for a period of approximately 30 years. Whilst current cattle grazing activities would be taken out of production, the grazing of sheep would occur underneath and between the solar arrays across the Site. The grazing of sheep would allow this agricultural land use (running livestock) to continue and would provide fire and weed management benefit through reducing and maintaining pasture growth. It is also noted that such grazing practices would provide beneficial outcomes for some native species and ecological communities, including golden sun moth and natural temperate grassland (refer section 7.0).

During operation, food scraps and other perishable waste in rubbish bins could potentially attract pest animals to the Site. As such, all rubbish bins containing food wastes would be covered and serviced on a regular basis. Wild rabbit, wild dog, feral pigs and red fox numbers would be controlled where necessary through targeted pest management during the operational phase of the project. Grazing pressure from sheep grazing and maintenance of ground cover across the Site would reduce cover for pest species.

As the development would result in a limited extent of impact upon the soil surface, the proposal is viewed as largely reversible upon decommissioning of the project. With the exception of concrete slabs for transformer infrastructure and the control building which would require excavation and soil compaction, impacts would be largely reversible. Upon decommissioning, above ground infrastructure including PV solar panels and their mountings would be removed. Some compaction on access roads would have occurred however, though the Site would have similar residual opportunities for land use as it currently possesses.

The expected impact on surrounding land uses during construction and operation is considered to be minimal given the temporary nature of the construction and generally benign nature of operation. The implementation of mitigation measures would however further reduce the level of impact upon surrounding land uses.

11.4 Mitigation and management measures

Table 32 Land mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
L1	• Preparation of a CEMP that incorporate the following measures: • A site access protocol that lists relevant landholder's contact details and includes measures to minimise adverse impacts, such as driving carefully to minimise disturbance to surrounding livestock, crops and pastures and minimising dust generation. • The timing of construction activities • An unexpected finds protocol for the event that any contamination is discovered during construction works. • The location of any temporary access roads to minimise the impacts to neighbouring agricultural activities and soils • Incorporation of pest and weed management measures in the Biodiversity Management Plan including measures for identification, management and ongoing monitoring of weeds on the Site. • A spill response plan to be implemented during both construction and operation to reduce the potential for contamination. The plan shall include: • Management of any potential contaminants on-site	✓		✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	• Mitigate and manage soil contamination by fuels, lubricants or other chemicals in accordance with EPA protocols • Prevent contaminants affecting waterways, dams and adjacent pasture.			

L2	• Preparation of an Erosion and Sediment Control Plan (ESCP) in accordance with the Managing Urban Stormwater: Soils & Construction (Landcom 2004) (Blue Book) that include provisions to:
	• Install erosion and sediment controls (if required) prior to and during construction
	• Regularly inspect erosion and sediment controls, particularity following large wind or rainfall events
	• Minimise tracking of sediment from vehicles, plant and equipment on to surrounding roads
	• During excavation, separate topsoils and subsoils to ensure they are replaced in their natural configuration.
	• Stockpile topsoil appropriately to minimise weed infestation and maintain soil organic matter, soil structure and microbial activity
	• Minimise the total area of disturbance from excavation and compaction
	• Groundcover to be re-established as soon as practicable on disturbed areas
	• Further soil management measures to ensure the future viability of the Site for agricultural production, including guidance on:
	  • Optimisation and recovery of useable subsoil and topsoil
	  • Establishment of effective soil amelioration procedures
	  • Separate storage of topsoil and subsoil to ensure that soil is replaced in the right order to avoid unnecessary impact on soil and the existing vegetation structure.
	• Where disturbance or stripping of soil is required, an ameliorant such as gypsum could be applied to manage soil sodicity and provide for effective rehabilitation outcomes.
		✓		✓

L3	Preparation and implementation of an OEMP to reduce the impact of the proposed project on: • Land and soil capability within the Site • Neighbouring agricultural operations • Regional biosecurity (pest and weed management) • Erosion The OEMP would cover: • Sheep grazing as a means of vegetation maintenance and weed control throughout the life of the project • Restricting vehicle movements to formed access tracks. • Maintaining ground cover beneath the PV solar panels to manage erosion, weed infestation and surface water runoff. • Procedures for waste materials to be removed from the site regularly and the site kept in a clean and orderly condition in order to deter potential pest animals. • A targeted pest management program (as necessary).		✓	

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
L4	Rehabilitation of the Site to its original condition as best practicable following decommissioning			✓

12.0 Noise and vibration

AECOM has conducted a specialist noise and vibration impact assessment for the construction and operation phases of the project in compliance with the SEARs. The complete report is attached in Appendix G (Noise and Vibration Impact Assessment) and is summarised in the following sections.

12.1 Method of assessment

12.1.1 Relevant guidelines

The noise and vibration assessment was undertaken in accordance with the following guidelines:

Construction

- Interim Construction Noise guideline, Department of Environment and Climate Change, NSW (ICNG, DECC 2009)
- Assessing Vibration: a technical guideline, Department of Environment and Conservation (AVTG, DEC 2006)
- NSW Road Noise Policy, Department of Climate Change, Environment and Water, NSW (RNP, DECCW 2011)
- Australian Standard Acoustics – Description and measurement of environmental noise – Part 2: Application to specific situations, AS 1055.2-1997.

Operation

- NSW Protection of the Environment Operations Act 1997 (PoEO 1997)
- NSW Industrial Noise Policy, NSW Environment Protection Authority, Sydney (INP, EPA 2000)
- Application notes - NSW Industrial Noise Policy, (EPA 2017a)
- NSW Noise Policy for Industry (EPA 2017b)
- NSW Road Noise Policy, Department of Climate Change, Environment and Water, NSW (RNP, DECCW 2011).

12.1.2 Scope of work

The noise and vibration impact assessment of the proposed construction works and operation of the Springdale Solar Farm includes the following:

General

- Identification of nearby noise and vibration sensitive receivers potentially affected by the construction and operation of the project
- Estimation of the background noise levels in accordance with Table 2.1 of the Noise Policy for Industry.

Construction noise and vibration

- Determination of the applicable construction noise management levels, in accordance with the EPA ICNG and the NSW RNP based on the estimated background noise levels for the study area
- Determination of the applicable vibration criteria, in accordance with the EPA's *Assessing Vibration: A technical guideline*
- Prediction of the likely noise impacts associated with three worst case construction scenarios. Assessment of predicted noise impacts against the derived noise management levels
- Identification of suitable and indicative construction noise management measures
- Review of vibration intensive construction works and recommendation of safe working distances and mitigation measures where required
- Assessment of road traffic noise arising from traffic generation as a result of construction activities.

Operational noise and vibration

- Determination of appropriate operational noise limits at nearby sensitive receivers in accordance with the NSW Noise Policy for Industry
- Review of sound power levels of proposed equipment
- Prediction of the likely noise impacts associated with the operation of the project
- Assessment of predicted noise impacts against the derived noise limits
- Identification of indicative noise control recommendations where required to meet the environmental noise limits.

12.2 Existing environment

Figure 24 shows noise sensitive receivers which could potentially be affected by the SSF. A total of 34 residential dwellings were identified as sensitive receivers with the closest receiver being approximately 50 m to the west.

AECOM

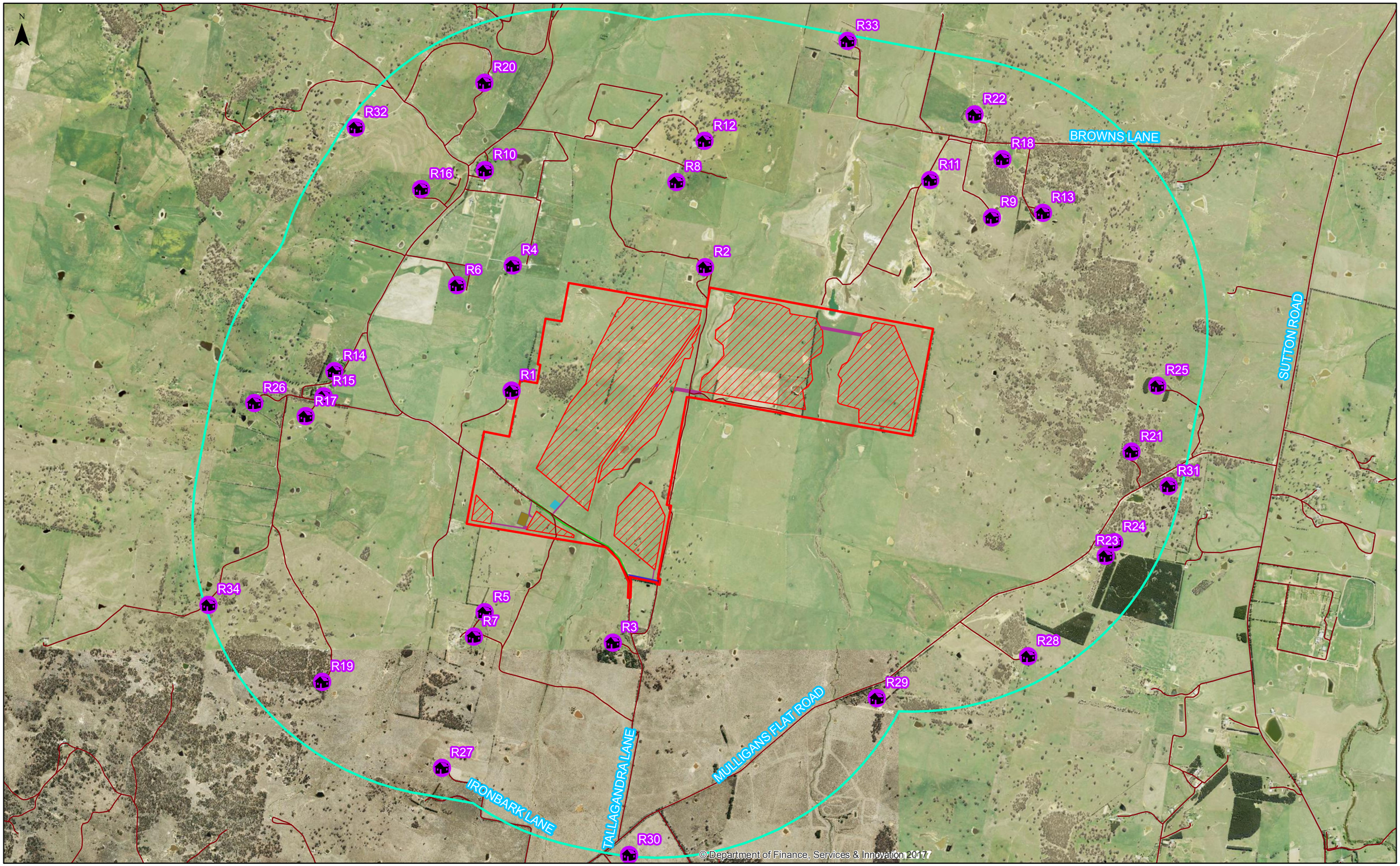


Figure 24 Springdale Solar Farm noise sensitive receivers

12.2.1 Estimated rating background levels

Minimum rating background levels (RBL) have been assumed for residential receivers in the area based on Table 2.1 of the Noise Policy for Industry.

The relevant RBLs are presented below in Table 33.

Table 33 Rating background levels

Time of day	Minimum assumed rating background noise level, dB(A)
Day 0700-1800	35
Evening 1800 – 2200	30
Night 2200 – 0700	30

The RBLs provided have been compared to background noise logging levels undertaken by AECOM at other remote rural areas in south west NSW and have been found to be generally representative.

12.3 Impact assessment

12.3.1 Construction noise criteria

The ICNG sets out the framework for the assessment and management of construction noise in NSW. The construction noise management levels (NMLs) for residential receivers in close proximity to the project are shown in Table 34.

Table 34 The ICNG noise management levels at residences

Time of day	NML, $L_{Aeq,15min}$, dB(A)[1]
Recommended standard hours • Monday to Friday: 7am to 6pm • Saturday: 8am to 1pm • No work on Sundays or public holidays	Noise affected • RBL + 10 dB
	Highly noise affected • 75 dB(A)
Outside recommended standard hours	Noise affected • RBL + 5 dB

Project specific construction noise management levels

Construction NMLs for the nearest noise sensitive residential receivers are shown in Table 35. The NMLs indicate levels "*above which there may be some community reaction to noise"* and do not represent strict criteria. The highly noise affected level of 75 dB(A) represents "*the point above which there may be a strong community reaction to noise".*

Table 35 Construction noise management levels – Residential receivers

Time of day	RBL, dB(A)	NML, dB(A)
Day - Standard hours	35	45
Day - Out of hours	35	40
Evening	30	35
Night	30	35

Sleep disturbance

Construction works are generally not proposed to be conducted at night-time; therefore a sleep disturbance assessment for the construction works is not required.

Construction road traffic noise criteria

The Road Noise Policy (RNP) was used for the assessment of noise arising from construction traffic on public roads. In accordance with the RNP, to assess noise impacts from construction traffic, an initial screening test should be undertaken by evaluating whether existing road traffic noise levels would increase by more than 2 dB(A). Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected. The road category specific criteria are presented in Table 36 below. The RNP does not require assessment of noise impact to commercial or industrial receivers.

Table 36 Road traffic noise assessment criteria

Road category	Type of land use	Assessment criteria, dB(A)	
		Day (7 am – 10 pm)	Night (10 pm – 7 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15\ hour)}$ 60 dB(A)	$L_{Aeq(9\ hour)}$ 55 dB(A)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1\ hour)}$ 55 dB(A)	$L_{Aeq(1\ hour)}$ 50 dB(A)

12.3.2 Operation noise criteria

The NSW Industrial Noise Policy (INP) provides guidance and recommendations on the assessment of noise impacts from industrial and commercial facilities.

The assessment procedure for industrial noise sources has two components that must be satisfied:

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

Intrusive noise impacts

The INP states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (L_{Aeq}), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is termed the Intrusiveness Criterion. The rating background level (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in Section 3.1 of the INP.

The project intrusive noise criteria are shown in Table 37.

Table 37 Recommended $L_{Aeq, 15\ minute}$ intrusive noise criteria levels from industrial noise sources

Receiver area	Time of day[1]	RBL ($L_{A90, 15\ minute}$)	Intrusive criterion RBL + 5 ($L_{Aeq, 15\ minute}$)
All nearby residential receivers	Day	35	40
	Evening	30	35
	Night	30	35

Notes:

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

Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level resulting from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1 of the INP. That is, the background noise level should not exceed the level appropriate for the particular locality and land use. This is termed the Amenity Criterion.

As noted in section 12.2.1 the residential receivers are considered to be rural. The relevant Amenity Criteria are shown in Table 38.

Table 38 Recommended L_{Aeq} noise levels from industrial noise sources

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

Project specific noise criteria

A summary of the environmental noise criteria for the project is presented in Table 39. Given the nature of the operation of a solar farm, generally only the day and evening time noise criteria are applicable. Equipment would not be in use during the night-time period. The evening period is therefore considered to represent the worst case operational noise scenario.

Table 39 Project specific noise levels

Receiver area	Period[1]	RBL ($L_{A90, 15\ minute}$)	Intrusive criterion ($L_{Aeq, 15\ minute}$)	Amenity criterion ($L_{Aeq, Period}$)	Project specific noise levels, (L_{Aeq})[2]
All nearby residential receivers	Day	35	40	50	40
	Evening	30	35	45	35
	Night	30	35	40	35

Notes:

1. Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays & Public Holidays. Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday & Public Holidays. Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays & Public Holidays.
2. Project specific noise levels determined as the lowest of the intrusive and amenity criteria.

Tonality and INP modifying factors

The INP provides additional guidance and criteria for assessing noise emissions from sources with "annoying characteristics" such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content. Penalties of up to a maximum of 10 dB(A) may be applied where the subject noise has such characteristics at the receiver.

Sleep disturbance criteria

As discussed in section 12.3.2 the solar farm would not operate during the night-time period, therefore a sleep disturbance assessment is not required.

Operation road traffic noise criteria

Access to the Site is via Tallagandra Lane which connects to a sub-arterial road, Mulligans Flat Road to the south. Tallagandra Lane becomes an unsealed road on approach towards the Site from the south.

In accordance with the RNP, to assess noise impacts from increases in operational traffic, an initial screening test should be undertaken by evaluating whether existing road traffic noise levels would increase by more than 2 dB(A). Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. Where the predicted noise level increase is greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected. The RNP does not require assessment of noise impact to commercial or industrial receivers.

12.3.3 Vibration criteria

Construction vibration objectives

Vibration from construction activities has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent. The potential impact of construction vibration was assessed for structural damage and human comfort at the nearest residential dwelling (R1).

Structural damage

The German Standard (DIN 4150) provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration. The recommended limits specified for residential and non-residential structures and are presented in Table 40.

Table 40 Structural damage safe limits (DIN 4150) for building vibration

Group	Type of structure	At foundation – Less than 10 Hz	At foundation - 10 Hz to 50 Hz	At foundation - 50 Hz to 100 Hz[1]	Vibration at the horizontal plane of the highest floor for all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s

Notes:

1. *At frequencies above 100 Hz, the values given in this column may be used as minimum values*

Human comfort

The assessment of intermittent vibration outlined in the NSW EPA guideline *Assessing Vibration: A Technical Guideline* is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods. Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in Table 41. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 41 Preferred and maximum vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime Preferred	Daytime Max	Night time Preferred	Night time Max
Residences	0.2	0.4	0.13	0.26

12.3.4 Construction noise and vibration assessment

Construction noise levels were modelled using SoundPLAN 7.3 software using the CONCAWE method. The model calculates total noise levels at assessment locations from the concurrent operation of multiple noise sources. The model has considered factors such as: topography, ground absorption and reflection, distance to receivers and construction noise sources. The noise model was created to represent 'reasonable' worst periods of construction works.

The following assumptions have been made in modelling all construction noise scenarios:

- For all construction scenarios all equipment would be operating at the same time, which is unlikely, and is a conservative assumption.

- Equipment is assumed to be operating at the closest point in the Site to each receiver, in order to present the worst case scenario for each receiver. In reality the equipment would only be closest point to each receiver for a limited period.
- Neutral atmospheric conditions i.e. relatively calm, no wind.

Predicted construction noise levels associated with the project are presented in Table 42.

Table 42 Predicted construction noise levels

Receiver	NML, dB(A)	Site establishment		Piling/foundations		Assembly	
		Predicted noise level, dB(A)	Exceedance, dB(A)	Predicted noise level, dB(A)	Exceedance, dB(A)	Predicted noise level, dB(A)	Exceedance, dB(A)
R1	45	53	8	52	7	46	1
R2	45	56	11	55	10	49	4
R3	45	53	8	45	-	39	-
R4	45	44	-	43	-	37	-
R5	45	46	1	44	-	38	-
R6	45	40	-	39	-	33	-
R7	45	40	-	38	-	32	-
R8	45	43	-	42	-	36	-
R9	45	40	-	39	-	33	-
R10	45	37	-	37	-	31	-
R11	45	40	-	39	-	33	-
R12	45	36	-	34	-	28	-
R13	45	37	-	36	-	30	-
R14	45	37	-	36	-	30	-
R15	45	38	-	37	-	31	-
R16	45	35	-	34	-	28	-
R17	45	37	-	36	-	30	-
R18	45	36	-	36	-	30	-
R19	45	35	-	35	-	29	-
R20	45	33	-	33	-	27	-
R21	45	35	-	34	-	28	-
R22	45	35	-	34	-	28	-
R23	45	34	-	34	-	28	-
R24	45	34	-	34	-	28	-
R25	45	21	-	20	-	14	-
R26	45	34	-	33	-	27	-
R27	45	34	-	33	-	27	-
R28	45	20	-	18	-	12	-

Receiver	NML, dB(A)	Site establishment		Piling/foundations		Assembly	
		Predicted noise level, dB(A)	Exceedance, dB(A)	Predicted noise level, dB(A)	Exceedance, dB(A)	Predicted noise level, dB(A)	Exceedance, dB(A)
R29	45	34	-	32	-	26	-
R30	45	33	-	31	-	25	-
R31	45	33	-	29	-	23	-
R32	45	27	-	27	-	21	-
R33	45	32	-	32	-	26	-
R34	45	32	-	32	-	26	-

The construction activities are predicted to comply with the recommended NMLs at most receiver locations with the exception of four receivers, R1 360 Tallagandra Lane, R2 156 Kiaora Lane, R3 141 Tallagandra Lane, Sutton and R5 during certain construction stages.

Exceedances of 11 dB(A) have been predicted during the site establishment stage at receivers R1, R2, R3 and R5. During the piling/foundations stage exceedances of up to 10 dB(A) have been predicted at R1 and R2. Exceedances of up to 4 dB(A) are predicted at R1 and R2 during the assembly stage.

Considering the relatively low sound power levels of the equipment proposed to be used during the underground cabling, commissioning and site rehabilitation and removal of temporary construction facilities stages, it is unlikely that exceedances of the NMLs would occur and therefore these stages have not been modelled.

It is noted that if bored piling is used in place of impact piling the overall noise level of the piling/foundation construction stage would be reduced by 6 dB(A) at the receivers.

During periods when more than one construction stage is occurring at once it unlikely that noise levels at one receiver would be increased significantly. This is because the equipment from any particular stage would not be operating in the same location as equipment from any other stage.

The construction noise levels at all the receivers for all the construction scenarios are predicted to be well below the 'highly noise affected' level of 75 dB(A).

As previously noted, the assessment is considered to be worst case and noise levels would be lower than presented in Table 42 for significant periods of time.

Construction traffic noise assessment

Construction activities have been conservatively estimated to generate the following levels of traffic during peak construction:

- 75 truck movements per day
- 400 light vehicle movements per day

Table 43 below presents the existing daytime hourly average traffic flows on Mulligans Flat Road and Tallagandra Lane, Sutton. Table 43 also presents the maximum additional hourly average construction traffic. It can be seen that the noise increases on both roads are likely to be more than 2 dB(A) during the peak construction periods. However, road traffic noise levels are significantly less than the RNP criteria presented in Table 36. Therefore no further consideration assessment is required, in accordance with the RNP.

Table 43 Existing traffic flows and additional traffic flows due to detour routes

Road	Existing average daytime hourly flow		Additional average daytime hourly flow		Relative noise increase, dB(A)	Distance to nearest residential receiver from road, m	Indicative $L_{Aeq,1hr}$ traffic noise level at nearest receiver, dB(A)
	Light	Heavy	Light	Heavy			
Mulligans Flat Road	44	4	40	7.5	3.7	60	51
Tallagandra Lane	9	3	40	7.5	6.2	130	46

Notes:

1. Assumes 88% of the daily 24 hour traffic volume occurs during the 15 hour day (7 am to 10 pm) and traffic is evenly spread throughout the day.
2. Based on traffic counts at Segment 7, West of Read Road during the period 27/05/2015 – 19/06/2015 for Mulligans Flat Road and on traffic counts at Segment 1,North of Mulligans Flat Road during the period 16/04/2015 – 8/05/2015 for Tallagandra Lane completed by Yass Valley Council.

Construction vibration assessment

The only significant vibration intensive works to be carried out during construction of SSF would be impact piling. The safe working distances for assessing vibration impacts was based on the British Standards *BS 6472 'Evaluation of human exposure to vibration in buildings'* (BSi 2008) and *BS 7385 'Evaluation and measurement for vibration in buildings'* (BSIand) are listed in Table 44.

Table 44 Recommended safe working distances for vibration intensive plant

Plant	Rating/Description	Safe Working Distance, metres	
		Cosmetic Damage	Human Response
Impact boring	30 kJ per blow	23 m	100 m
Pile boring	≤ 800 mm	2 m (nominal)	N/A

The safe working distances for structural damage and human response would be complied with when using piling rigs, therefore no further mitigation measures are required.

12.3.5 Operational noise assessment

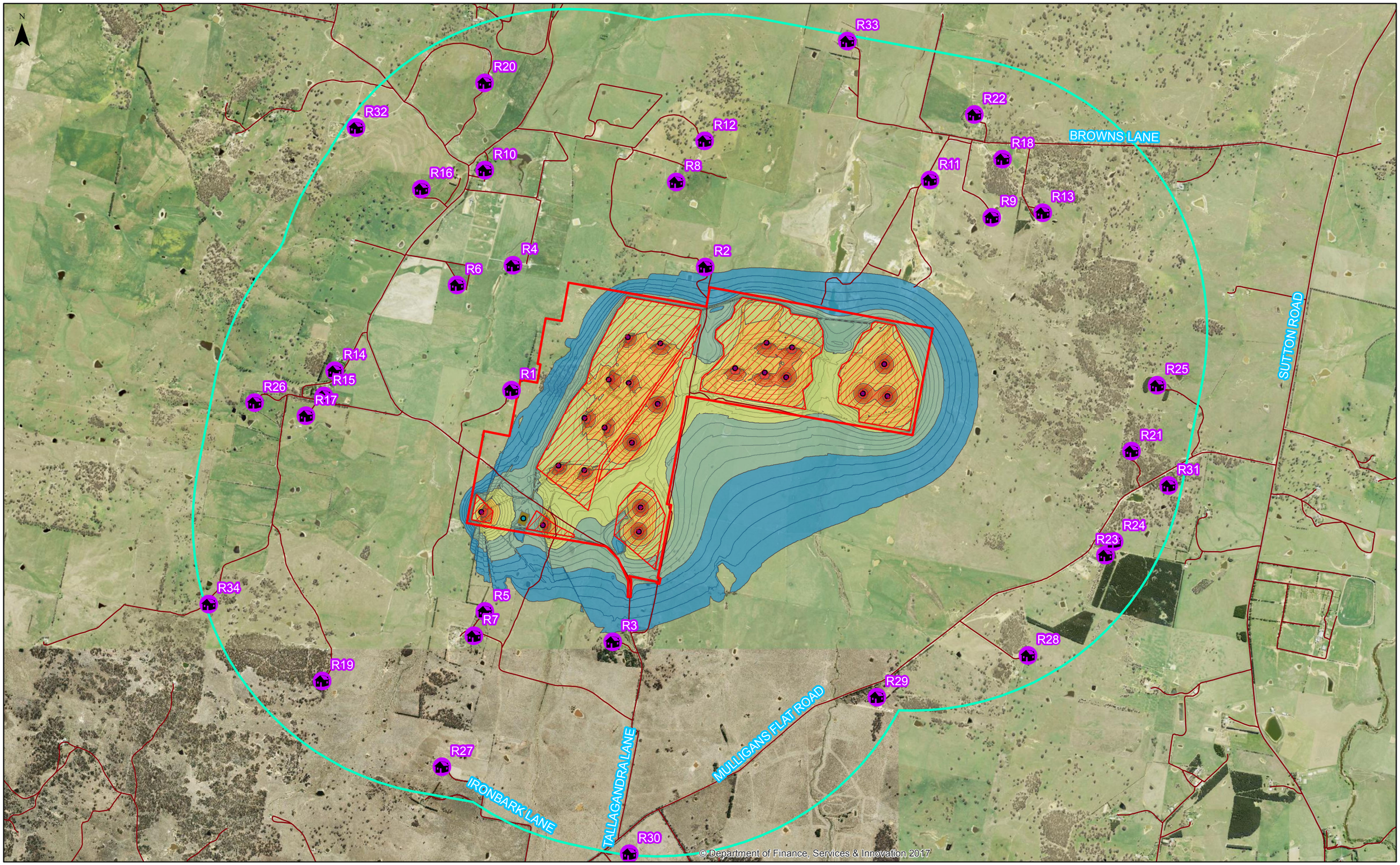
Predicted operational noise levels

Operational noise modelling was carried out using SoundPLAN 7.3 software using the CONCAWE method. The following assumptions have been made in modelling all operational noise scenarios:

- For all operational scenarios all equipment would be operating simultaneously
- Noise emissions from the Site have been modelled under neutral and adverse weather conditions.
- The location of the equipment is as shown in the site layout plan in provided in Appendix G.

Predicted noise levels at nearby noise sensitive receivers are presented in Table 45. These predicted levels include a +5 dB modifying factor correction applied to account for possible tonal characteristics of the inverters. The predicted noise levels are assessed against the more stringent evening time criterion. Indicative operational noise contours calculated under adverse weather conditions are shown in Figure 25.

AECOM



House
Roads
2km site buffer
Site boundary
Substation
Inverter (2x)
Solar field area
Substation area

Sound Pressure Level L_{Aeq}

36 - 40 | 41 - 45 | 46 - 50 | 51 - 55 | 56 - 60 | >= 60

Springdale Solar Farm

Operational Noise Contour Map with +5 dB(A) correction for tonality

0 250 500 1,000 m

Apr 2018

60555008

Fig. **D1**

Figure 25 Springdale Solar Farm indicative operational noise contours

Table 45 Summary of predicted operational noise levels (evening)

Receiver	Predicted L_{Aeq} noise levels, dB(A)	Operational noise criteria, L_{Aeq} dB(A	Exceedance, dB(A)
R1	32	35	-
R2	34	35	-
R3	34	35	-
R4	24	35	-
R5	32	35	-
R6	23	35	-
R7	26	35	-
R8	27	35	-
R9	28	35	-
R10	22	35	-
R11	28	35	-
R12	22	35	-
R13	25	35	-
R14	22	35	-
R15	22	35	-
R16	22	35	-
R17	21	35	-
R18	25	35	-
R19	21	35	-
R20	20	35	-
R21	25	35	-
R22	24	35	-
R23	25	35	-
R24	25	35	-
R25	11	35	-
R26	19	35	-
R27	24	35	-
R28	13	35	-
R29	27	35	-
R30	23	35	-
R31	19	35	-
R32	13	35	-
R33	22	35	-
R34	18	35	-

Notes:

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

The predicted operational noise levels comply with the most stringent (evening time) operational noise criteria at all locations. It is expected that the inverters (which are the dominant noise sources), would operate at a reduced load in the evening compared to during the day time and as such the noise emission levels would also be reduced.

Operational road traffic noise

The solar farm would initially have a workforce of approximately 5-10 full time positions during the initial defect liability period of operation (estimated two years) which would drop to approximately 3-5 full time positions in subsequent years. Periodic asset management staff and contractors are also expected to visit the Site. Minimal traffic movement generation is expected as a result of the operation of the solar farm. Therefore, the issue of impacts caused by operational traffic need not be considered any further.

12.4 Mitigation and management measures

The following mitigation and management measures are proposed:

Table 46 Noise mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
NV1	Prepare a Noise Management Plan that specifies: • Appropriate plant and equipment should be selected for each task to minimise the noise contributions • Turn off plant that is not being used where practicable • Ensure plant is regularly maintained, and repair or replace equipment that becomes more noisy • Noisier activities to be scheduled during less noise sensitive periods • Use non-tonal reversing alarms where practicable • Wherever feasible, turning circles should be created at the end points of vehicle work legs, which should allow trucks to turn and avoid the need for reversing • Emphasis should be placed during driver training and site induction sessions on the potential adverse impact of reversing alarms and the need to minimise their use.	✓		✓
NV2	Consider using bored piling for construction works where practicable	✓		
NV3	Incorporate barriers, attenuators, acoustic louvres and mufflers as best practicable.	✓		✓
NV4	Inverters to be selected with maximum sound power levels of less than 92 dB(A) with no tonal characteristics, if practicable. Inverters would be located as far as practicable from residential dwellings.	✓	✓	

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
NV5	Inverters identified as requiring noise mitigation in Appendix B of the Noise and Vibration Impact Assessment (Appendix G of this EIS) should utilise a 2 m high, three sided "horse-shoe" shaped noise walls unless an updated noise assessment with updated sound power levels is prepared which demonstrates that operational noise criteria at nearby sensitive receivers would not be exceeded. The noise walls should be orientated with the open side facing away from the nearest noise sensitive receivers.	✓	✓	

13.0 Non-Aboriginal heritage

A specialist assessment was undertaken in accordance with the *NSW Heritage Manual* (NSW Heritage Office & NSW Department of Urban Affairs and Planning, 1996) and with reference to the *Burra Charter* (ICOMOS, 2013). The complete report is attached in Appendix E (Historic Heritage Assessment) and is summarised below.

The following key tasks were undertaken as part of the assessment:

- Search of relevant historic heritage registers and lists including the:
    - World Heritage List
    - Register of the National Estate (non-statutory)
    - National Heritage List
    - Commonwealth Heritage List
    - NSW State Heritage Register
    - National Trust of Australia
    - Schedule 5 of *Yass Valley Local Environmental Plan 2013* (Yass LEP 2013)
- Background research of the Site to identify historic heritage items, including areas of archaeological sensitivity
- Targeted archaeological survey of land within the Site and report on its findings

A team of two AECOM archaeologists (Geordie Oakes and Andrew McLaren) completed the field survey of the Site over three days between 25 to 29 November 2017. All survey was conducted on foot, with full coverage of the Site achieved.

13.1 Existing environment

European exploration of Lake George region began as early as 1802, with settlements emerging in the region of Sutton and Gundaroo as early as 1825. The village of Sutton was established in 1867. The historic economic activities in the region included small scale gold mining, pastoral activities with grazing of cattle and sheep, cropping, orcharding and horse breeding.

Within the Site, land use from the early settlement period until today has focused on cattle/sheep grazing and limited cropping. Review of aerial photos from 1959 to 2011 indicated that extensive native vegetation clearance occurred prior to 1959 followed by progressive development of agriculture and infrastructure.

A search of historic heritage registers/lists confirmed there are no previously identified historic heritage items within or directly adjacent the Site.

The field survey identified within the Site a contemporary stockyard and sheep dip, remnants of an earlier stockyard dated to the 1950s, a burnt hayshed and a contemporary shearing shed and storage shed. No items of historic heritage significance were identified during the field survey.

The Site's cultural landscape contains aesthetic natural values, archaeological values associated with its occupation by Aboriginal people and historical values associated with its use as farm land from the early Nineteenth Century. An assessment of significance of these values finds that they do not meet significance criteria at a State or local level. As such, the Site's cultural landscape is not considered to have historic heritage significance.

13.2 Impact Assessment

No historic heritage values have been identified within the Site's or directly adjacent to it. As such, no impacts to historic heritage items, places or values are anticipated, including views and vistas from the historic villages of Gundaroo and Sutton.

13.3 Mitigation and management measures

The non-Aboriginal heritage assessment concluded that the project would not impact any historical heritage. Adopting the precautionary principle, the following mitigation and management measures are recommended.

Table 47 Non-Aboriginal heritage mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
HH1	In the event that unexpected historic finds are identified during construction, all works should immediately cease. The following procedure guides the management of unexpected and previously unidentified finds during the course of operations. Finds includes artefact scatters (glass, animal bone, ceramic, brick, metal, etc.), building foundations and earthworks of unknown origin. The procedures are: • All work in the area is to cease immediately • Alert the Project Manager to the find • If necessary, protect the area with fencing • Engage a suitably qualified archaeologist to undertake an assessment of the find/s • The assessment should be undertaken using the guidelines *Assessing Significance for Historical Archaeological Sites and 'Relics'* (NSW Heritage Branch, 2009) • On the advice of the archaeologist, if necessary, prepare an Impact Assessment and Research design and methodology to submit to the Heritage Branch • Undertake the archaeological mitigation in accordance with the prepared documents and the permit/exception issued by the Heritage Branch; and • Once the site has been mitigated to the satisfaction of the archaeologist and the Heritage Branch, works may resume in the area.	✓		
HH2	In the event of discovery of human remains the following procedure shall	✓		

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	be implemented: • All work in the vicinity of the remains should cease immediately • The location should be cordoned off and the NSW Police notified • If the Police suspect the remains are Aboriginal, they would contact the Office of Environment and Heritage and arrange for a forensic anthropologist or archaeological expert to examine the Site and implement mitigation measure AH7. • If the remains are identified as modern and human, the area would become a crime scene under the jurisdiction of the NSW Police • If the remains are identified as historic non-Aboriginal, the site is to be secured and the NSW Heritage Division contacted; and • If the remains are identified as non-human, work can recommence immediately.			

14.0 Traffic and transport

Traffic management and access requirements for the project have been reviewed as a part of this EIS. The traffic and transport assessment covered:

- Assessment of construction vehicles accessing the Site and the potential risks and impacts to local road users
- Accessibility requirements for the truck delivering the transformer which is the longest load-carrying vehicle, i.e. 37 m long and 5.2 m high, including the height of the transformer
- Assessment of road safety conditions within the surrounding road network
- Assessment of potential constraints for heavy vehicles travelling to the Site
- Assessment of the potential impact that heavy vehicles would have on the road network and the capability of the network to handle these vehicles
- Assessment of existing traffic volumes on and surrounding Tallagandra Lane
- Assessment of impacts of operational phase traffic.

14.1 Existing environment

The Site is located off Tallagandra Lane in Sutton, NSW and can be accessed from the Federal Highway via Sutton Road.

The Federal Highway links Canberra to the Hume Highway and also services the townships of Collector and Sutton. It is an approved route for High Mass Limit (HML) B-double vehicles of 25/26m. Access to Sutton Road from the Federal Highway is via an off-ramp that is also an approved route for HML B-double vehicles and should therefore pose no problems to heavy vehicles travelling to the Site.

The route description is as follows after leaving the Federal Highway:

- Sutton Road (arterial road, sealed)
- Into the Sutton township on Bywong Street (arterial road, sealed)

- Victoria Street (arterial road, sealed)
- Camp Street (arterial road, sealed)
- Leaving the Sutton township on Sutton Road (arterial road, sealed)
- East Tallagandra Lane (sub-arterial Road, sealed)
- Mulligans Flat Road (sub-arterial Road, sealed)
- Tallagandra Lane (local road, sealed for approximately 1.8 km before becoming unsealed approximately 150 m south of the Site).

In general, private properties surrounding and in the vicinity of the Site are rural in nature, with some comprising a dwelling. It is understood that the vast majority or transport to and from these properties is by private vehicle, with the exception of school bus services that are known to use Tallagandra Lane.

The Yass Valley Council as part of its Asset Management Program conducts traffic counts around the Yass Valley Local Government Area on a fortnightly basis and this data have been used to provide an analysis of existing traffic volumes for Tallagandra Lane and surrounding roads. A summary of the relevant traffic volume data can be found in Table 48 below.

Table 48 Traffic volumes and heavy vehicle percentages for roads nearby to the Site

Road Name	Count Site Location	Date of count	Average Daily Traffic (ADT)	Heavy Vehicle Percentage (%)
Bywong Street	On Sutton Road In-line with 66 Bywong Street	03/01/2008 - 23/01/2008	2028	10.00%
East Tallagandra Lane	Segment 1 near Sutton road Intersection	16/04/2015 - 08/05/2015	434	14.80%
East Tallagandra Lane	Segment 6 near Mulligans Flat Road	16/04/2015 - 08/05/2015	405	10.30%
Sutton Road	Segment 25 North of East Tallagandra Lane Intersection	12/05/2010 - 19/05/2010	2075	5.70%
Sutton Road	Segment 24 North of Camp Street Intersection	13/05/2010 - 19/05/2010	2197	9.00%
Sutton Road	Segment 23 200m South of Majura Lane and Guise Street	17/08/2013 - 11/09/2013	3022	10.07%
Sutton Road	South of Victoria Street and Bywong Street Intersection	30/07/2015 - 13/08/2015	2963	7.00%
Sutton Road	North of Mulligans Flat Road Intersection	05/05/2016 - 25/05/2016	2510	14.9%
Sutton Road	South of Tallagandra Lane	05/05/2016 - 25/05/2016	2917	10.55%
Sutton Road	50m West from Sutton Road and Bywong Street Intersection	05/05/2016 - 25/05/2016	3133	12.40%
Tallagandra Lane	South of Casey Close	03/03/2009 - 10/03/2009	147	15.50%

It can be seen that the chosen route has a moderate number of heavy vehicles with the percentage ranging from 5.7% to 15.5%. This indicates that a reasonable number of heavy vehicles currently use the existing road network in this area. Heavy vehicles volumes appear to be relatively well-dispersed across the local network and there does not appear to be any one road that would be considered to be carrying too many heavy vehicles or that could be expected to become notably congested or have

capacity issues due to the addition of construction traffic. In particular Tallagandra Lane is known to have a low amount of existing traffic overall (light and heavy vehicles) and the additional construction traffic during the relatively short construction period is expected to be easily accommodated.

14.2 Impact assessment

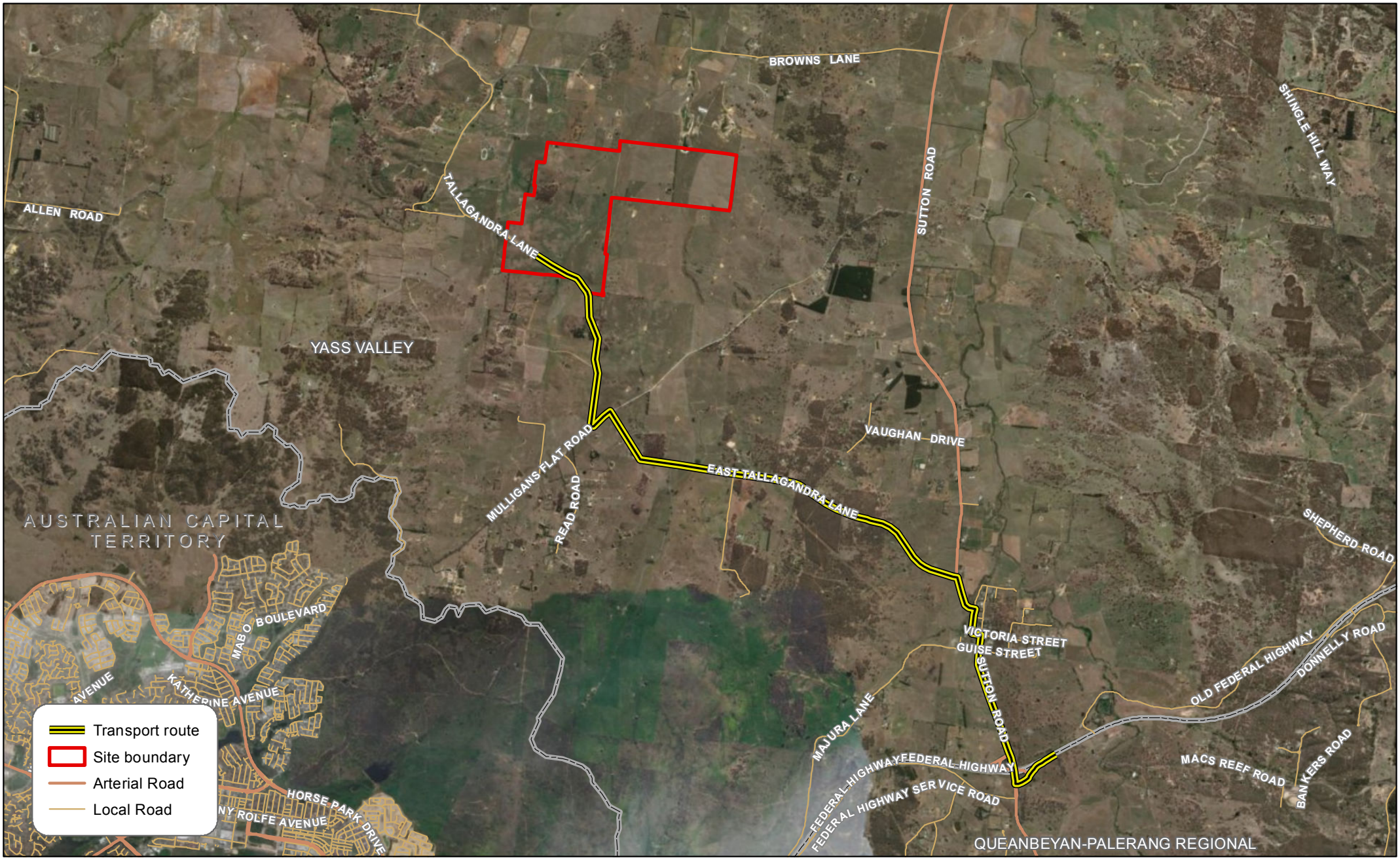
14.2.1 Construction

The construction phase of the project would require movements by a variety of heavy and light vehicles. This would include delivery vehicles carrying components, parts, equipment and machinery, as well as light vehicles carrying workers, small parts and equipment.

The specific impacts upon the local road network and traffic are further outlined in the following sections.

Primary heavy vehicle route

The proposed route to be used to transport the transformer from the Federal Highway is shown in Figure 26. The same route is expected to be used for the transport of the majority of key construction materials, most of which would likely be delivered from the Sydney and Wollongong region.



AECOM Renew estate.

NORTH

0 1 2 4 km

SPRINGDALE SOLAR FARM

LAST 14KM TRANSPORTER ROUTE

DATE 21/03/2018
SCALE 1:70,000
PROJECT 60555008
DRAWN PH

Figure 26 Last 14 km of proposed primary heavy vehicle traffic route

The identified route turns off the Federal Highway at Sutton Road. In the Sutton township, Sutton Road becomes Bywong Street. From Bywong Street, a left turn is proposed at Victoria Street, then a right at Camp Street before turning left to re-join Sutton Road for about 500 m and turning left onto East Tallagandra Lane. East Tallagandra Lane is about 5.5 km and joins Mulligans Flat road. A left turn at Mulligans Flat road is proposed before turning left after 300 m onto Tallagandra Lane. For the link from Tallagandra Lane to the final transformer location, a compacted all-weather track would need to be constructed.

An assessment of potential constraints has been undertaken along the route identifying:

- Road grades
- Possible overhead clearance obstructions
- Bridges and culverts
- Road widths and turning radii
- Road surface

The potential heavy vehicle constraints are described in Table 49 and shown in Figure 28. The transformer transportation vehicle has been used as the design vehicle as it represents the largest vehicle and if it is appropriate then all other vehicles are expected to have no issues with site access.

Table 49 Potential heavy vehicle constraints

Classification	Description
Road Gradient	Small sections exceeding 7% gradient are found in two sections of East Tallagandra Lane. On average these hills gradients do not exceed 5% slope. The gradient profile from the Federal highway to the Site is shown in Figure 27.
Transmission Lines	There are a total of 12 locations where transmission lines cross the road and may prove a hazard while transporting the transformer (refer Figure 28). The height of the transmission lines vary. The majority of the transmission lines are within Sutton and the single connections to properties are the lowest points, specifically at the Sutton Village Centre on the corner of Victoria Street and Camp Street.
Bridge	There is one bridge across the Federal Highway (refer Figure 28). The bridge and underpass are marked as B double routes and should be able to accommodate the transformer.
Culverts	There are three locations where culverts exist. Of these, only one is considered to be of high risk which is the culvert on Tallagandra Lane where it crosses the unnamed creek which traverses the Site (refer Figure 28). A more extensive review would be undertaken prior to delivery of the transformer.
Road surface	All roads of the primary heavy vehicle route are sealed except for the section of Tallagandra Lane which becomes unsealed from 150 m south of the Site. The condition of the unsealed section of Tallagandra Lane fluctuates, as it is affected by rain events, vehicle use, and the existing maintenance regime.

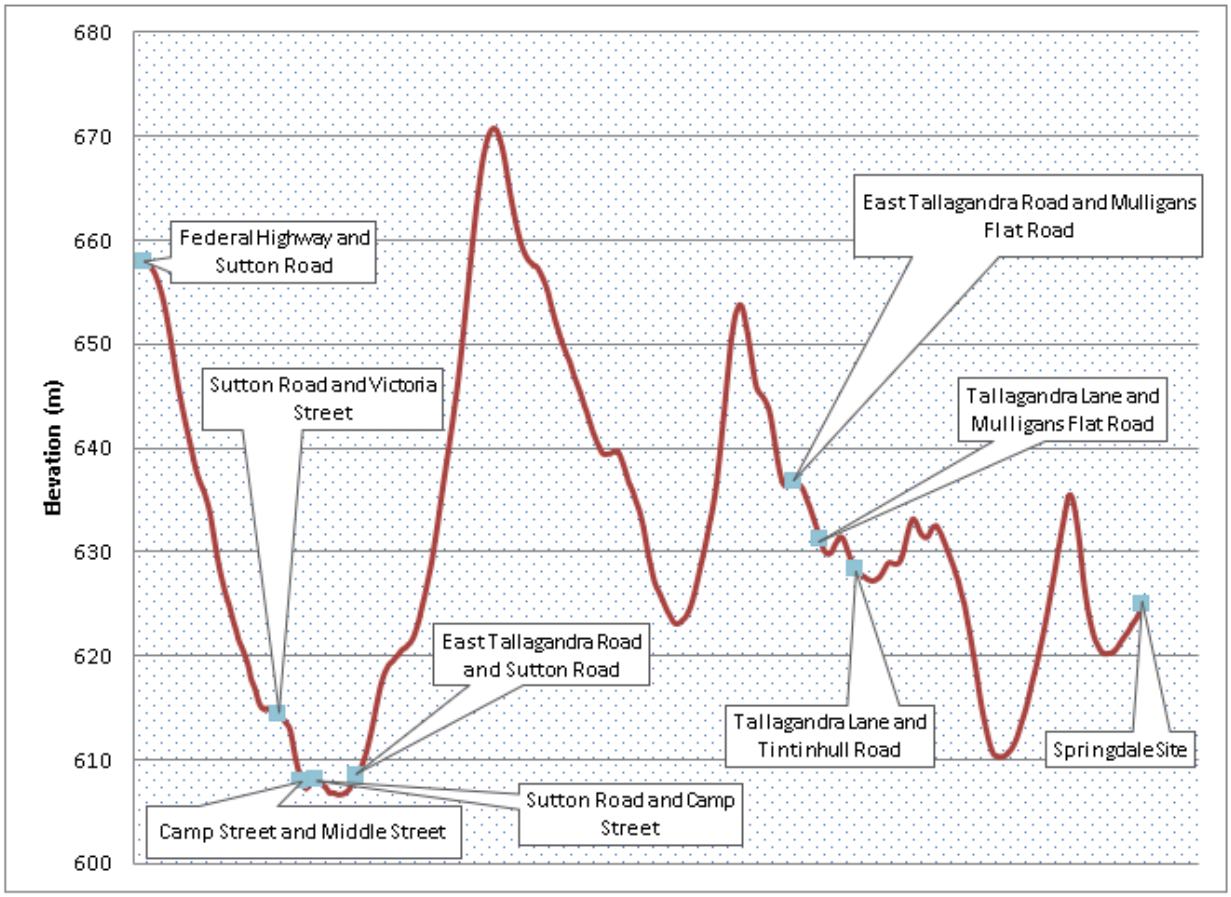
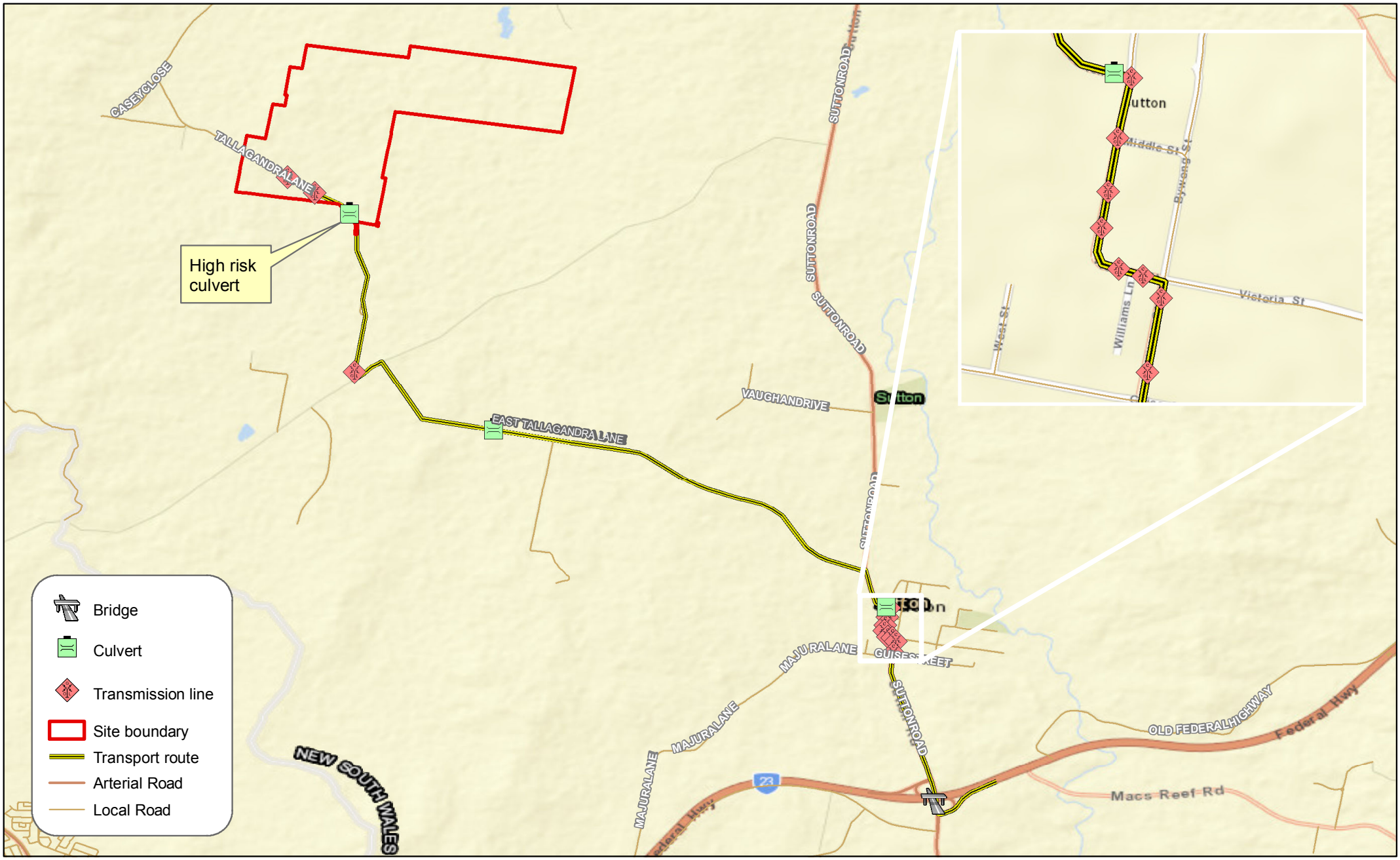


Figure 27 Elevation profile along the primary heavy vehicle traffic route

The locations where the heavy vehicles would be expected to undertake turns are shown in Figure 28 and outlined in Table 50. The turning radius of the transformer transportation vehicle is shown in Figure 29.



SPRINGDALE SOLAR FARM

HEAVY VEHICLE CONSTRAINTS

NORTH

0 1 2 4 km

DATE	28/03/2018
SCALE	1:60,000
PROJECT	60555008
DRAWN	PH

Figure 28 Heavy vehicle constraints along the route between the Federal Highway and the Site

Table 50 provides a review of heavy vehicle turn locations and their constraints along the route outlined in Figure 28.

Table 50 Review of heavy vehicle turn locations and constraints

Intersection	Description
Off ramp of Federal Highway onto Sutton Road	Give way signs in middle of intersection may need to be removed during transport.
Bywong Street and Victoria Street	Street signage on corner may need to be removed during transport as it might be necessary to use the verge slightly.
East Tallagandra Lane and Mulligans Flat Road	Verge may need to be used here however there are no obstacles or roadside gradients preventing its use.
Mulligans Flat Road onto Tallagandra Lane	Intersection satisfies the necessary dimensions but only barely satisfies the outside turning radius. No obvious obstacles such as posts exist so the verge may be used however it should be noted that the condition of the verge should be checked to ensure that its condition is suitable for this use.
On-site movements	On-site the transporter is expected to have to turn around, however due to the Site's relatively flat nature it is not expected that there would be any concern when undertaking this movement.

*Note: *All assessments are based on an inside turning radius of 9.45 m and an outside turning radius of 17.75 m.*

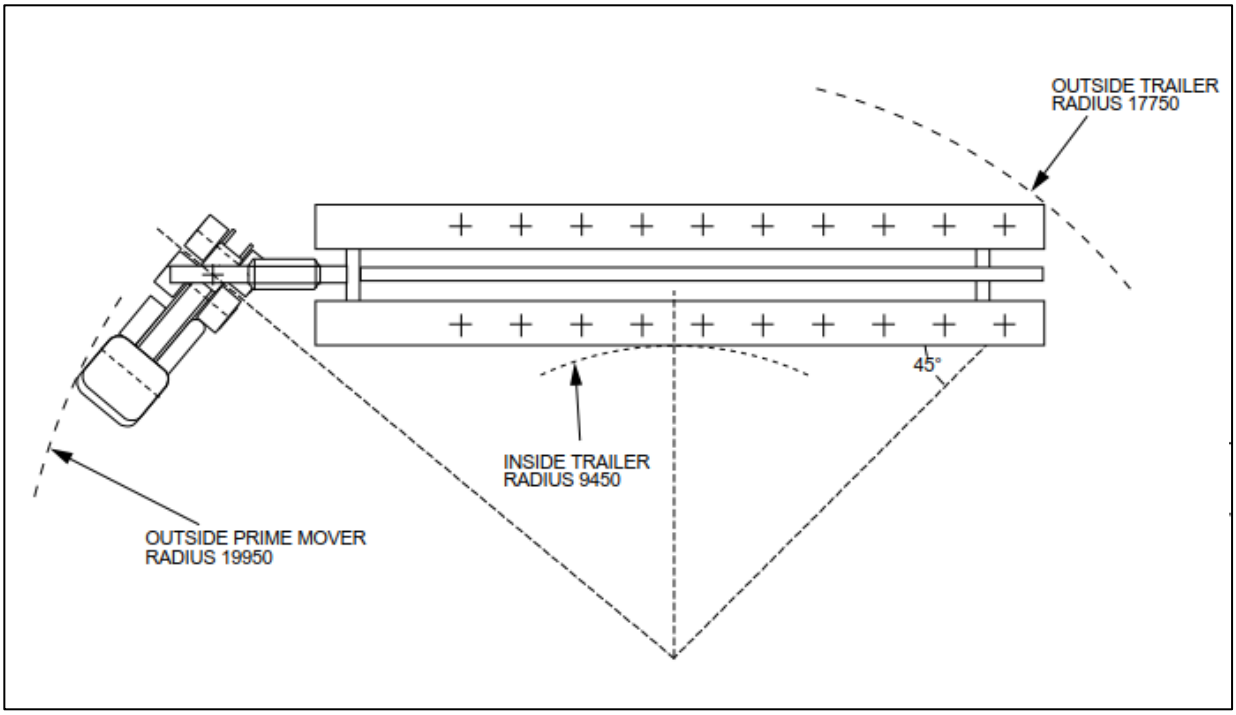


Figure 29 Diagram of transformer transportation vehicle's turning circle

In summary, the primary heavy vehicle route is considered suitable for construction traffic with the following enabling works being undertaken:

- Potential upgrade of the culvert on Tallagandra Lane, subject to further review prior to construction
- Potential temporary relocation of signage at turn locations

- Further review of transmission line heights to confirm there is sufficient clearance with heavy vehicles
- Minor road grading of Tallagandra Lane if required, to restore the driving surface to a suitable smoothness and shape. This would apply to the unsealed section of Tallagandra Lane that would be used for site access, extending from the northern-most site access point adjacent to the substation, to the point at which the road becomes sealed 150 m south of the Site. The requirement for road grading will depend on the road condition at the time of site establishment, which fluctuates due to rain events, vehicle use and the existing maintenance regime. Ongoing maintenance of the road surface would be undertaken as required throughout construction including grading and dust suppression.

While reasonable effort has been undertaken to identify all likely constraints, the contractor would undertake a risk assessment for suitability prior to installing the transformer or any major equipment on-site.

Temporary site access roads

Temporary access roads may be instated for construction. These roads would be designed for all-weather access and temporary drainage and would be approximately 4 m wide to allow effective movement of construction vehicles and plant. These roads would coincide with the location of the operational phase internal roads were practicable. Those that are not required as part of the operational phase internal road network would be removed and the ground made good following construction.

Traffic generation

Traffic and transport impacts for the project are mostly related to the additional traffic on the external road network due to the following:

- Construction personnel accessing the Site
- Construction of access points off Tallagandra Lane to the SSF
- Delivery of site compound materials, temporary buildings and compound set-up
- Delivery of construction materials including PV modules, posts, mounting frames, cabling, inverter substations and fencing
- Delivery of other materials, e.g. gravel, jute mesh etc.
- Delivery of construction plant and equipment
- Dust suppression activities involving use of a water cart.

The requirement for the above traffic movements has been considered in the context of the likely amount/number of plant, equipment and personnel required to be brought to and/or from the Site in order to construct the solar farm. The number and type of vehicle movements is expected to be as follows:

- Light vehicles:
    - up to approximately 400 light vehicle movements per day during peak construction (~5 month period).
- Heavy vehicles:
    - up to approximately 75 heavy vehicle movements per day during the peak delivery period (~2 month period)
    - up to approximately 16 oversized vehicle[3] movements in total throughout construction

[3] Oversize vehicles is as per Class 1 Heavy Vehicles under the Heavy Vehicle National Law. Oversized vehicle movements are indicative only, based on similar sized solar farm projects, and will be further detailed in a Traffic Management Plan following detailed design.

It should be noted that a single vehicle arriving and departing the Site is considered as two separate vehicle movements.

Based on the current project schedule, the construction period is due to last approximately 10 months, which includes a five month peak construction period and within this a two month peak delivery period.

Within the two month peak delivery period, up to approximately 75 heavy vehicle movements per day are anticipated. Reviewing these additional 75 heavy vehicles and 400 light vehicle movements per day with respect to the existing traffic volumes, it is not expected that these additional vehicles would affect the Level of Service experienced on local roads such as Tallagandra Lane.

Generally, increased vehicle numbers on the local public road network during the project's construction period could potentially result in impacts to:

- Traffic efficiency, including:
    - Very minor potential for disruption to four school bus services that travel on Tallagandra Lane each day
    - Minor delays to trip times as a result of movements of project-related vehicles through Sutton and along the major transport routes
    - Delays due to temporary road or lane closures. It should be noted that no road closures are currently planned during construction, operation or decommissioning of the project. If a temporary road or lane closure is necessary, alternative access arrangements would be made in accordance with approved temporary traffic controls and in consultation with Yass Valley Council and/or RMS.
- Safety, due to increased conflicts with other vehicles, cyclists, pedestrians, stock, wildlife and increased levels of dust. It is noted that many of the local roads have generally low traffic volumes and congestion, and/or high signposted speeds (80 km/h or greater). As such there is the potential for crashes to occur for a variety of reasons (fatigue, speed etc). To minimise the safety risk associated with additional project-related traffic all drivers would be under strict instruction to obey all speed limits, traffic controls and other road rules. Where project vehicles are required to traverse unsealed roads vehicles would stay on hard pack parts of the road whenever safe to do so in an effort to reduce dust generation.
- Local amenity, due to associated noise and dust generation. These impacts would be managed through the use of standard working hours where practicable and strict instructions to all project drivers to obey all speed limits, traffic controls and other road rules. Dust suppression measures would also be implemented.
- Damage to road pavement on local roads. In selecting the proposed routes for the delivery of materials Renew Estate have considered the nature of existing road surfaces, as well as the potential impact of project vehicles. The selected route generally travels along large regional, sealed arterial roads which are designed to handle such vehicles. Ongoing maintenance of the unsealed section of Tallagandra Lane would be undertaken as required throughout construction.

Whilst the majority of roads in the local area are generally low traffic, the above issues would be manageable through careful project planning, including scheduling of movements. These protocols would be documented in a project-specific Traffic Management Plan. This Plan would be developed in consultation with the local authorities and communicated to all key stakeholders, particularly the contractors and the local community.

As supported by this traffic and transport assessment, the impacts of the project during construction are considered manageable without the need for any significant upgrade or sealing of any roads. Despite this, however, Renew Estate has offered to enter into a Voluntary Planning Agreement with YVC to provide an additional public benefit of contributing funds to the upgrade of some currently unsealed sections of Tallagandra Lane. Renew Estate understands that YVC has no immediate plans to upgrade Tallagandra Lane due to other priority projects within the LGA, however feedback provided to Renew Estate from the community during its community consultation activities has identified that the state of Tallagandra Lane is an important issue for local residents. Renew Estate is continuing to work with YVC towards agreeing the terms of a Voluntary Planning Agreement that would allow the provision of this public benefit (amongst other benefits). YVC has confirmed that, if such an agreement

is able to be reached, that they would be the consent authority for these upgrade works. Accordingly, consent is not sought in this application for this component.

14.2.2 Operation

During the defect liability (DFL) period of two years, it is assumed that approximately 10 personnel would enter and depart the Site each day. This accounts for approximately 20 light vehicle movements. Post-DFL period, it is expected that approximately five personnel would enter and depart the Site each day. This equates to 10 light vehicle movements per day, assuming no car-pooling. In addition, delivery vehicles may enter the property occasionally to replace equipment or deliver supplies. Security personnel could also be required to access the Site occasionally.

It is expected that the volume of staff accessing the Site would have a very minimal increase in traffic flow on local roads based on their existing low traffic volumes and uncongested nature. There would be no permanent obstruction to any existing private or public access. No mitigation measures relevant to road safety have been proposed as the impact from operational traffic would be minor to negligible.

Internal access roads

Various internal roads would be required throughout the Site to allow for the movement of operations and maintenance staff and equipment. These access roads would be hard-stand and all-weather. In locations where these roads are required to cross existing ephemeral gullies within the Site, it is likely that low-level causeways, comprised of concrete, would be constructed. All roads would be approximately 4 m in width.

It is expected that internal site movements utilising these access roads would be minimal on the basis that the solar farm requires only intermittent monitoring and maintenance. The movement of vehicles within the Site is not expected to be of such a volume that impacts upon local amenity from noise or dust generation are expected.

Tintinhull Road re-alignment

Subject to the execution of a Voluntary Planning Agreement with YVC (including agreement on the relevant works), a new section of public road is proposed to be constructed between Tallagandra Lane and Tintinhull Road, across the southeast corner of the site. This would provide an alternative access to Tintinhull Road from Tallagandra Lane which does not traverse Lot 7001 DP96227 (Figure 10).

Lot 7001 is a Crown land parcel, however if sold in the future to a private entity, the existing Tintinhull Road segment through this lot could be closed to the public. YVC made Renew Estate aware of this issue and suggested it could be resolved at the same time as the works for the project. Accordingly, Renew Estate has offered to YVC to enter into a Voluntary Planning Agreement to provide an additional public benefit of constructing the proposed new public road. The Voluntary Planning Agreement is currently under negotiation with YVC, including in relation to the scope and nature of the relevant works (refer section 5.0).

The proposed new public road connection would be approximately 220 m in length and would be built to in accordance with the 'Access' category of the rural road standards in Council's *Road Standards Policy* (YVC, 2013) (5.5 m minimum pavement width, 20 m road reserve, gravel finish). Renew Estate understands that this specification has been agreed in principle by YVC.

It should be noted that whilst works to facilitate the Tintinhull Road realignment form part of this SSD application (including subdivision of land and construction of the road), the execution of these works would be subject to reaching a Voluntary Planning Agreement with YVC.

14.2.3 Decommissioning

It is anticipated that traffic generated during decommissioning and associated impacts would be similar to that of the construction phase. Mitigation measures would be included in a Decommissioning Environmental Management Plan (DEMP) to manage traffic impacts during this phase.

14.3 Mitigation and management measures

The following mitigation and management measures are proposed:

Table 51 Traffic and transport mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
T1	Preparation of a Traffic Management Plan in consultation with the YVC, RMS and other authorities prior to construction that covers: • Programmes for monitoring road traffic conditions, to repair damage exacerbated by construction traffic • The designated routes of construction traffic to the Site • Carpooling. Shuttle bus arrangements to minimise vehicle numbers throughout construction and decommissioning • Consideration for cumulative impacts with any nearby developments • Scheduling delivery of major components where possible to minimise safety risks to other road users including avoiding major deliveries during school pick-up and drop-off times • Temporary traffic controls such as signage, speed restrictions and traffic safety flagmen as necessary to ensure safety of all road users and the public. • Procedure for monitoring traffic impacts and adapting controls to minimise impacts traffic risks.	✓		✓
T2	Implementation of a communication and consultation strategy with stakeholders including RMS, emergency services, local stakeholders (landholders and business owners) regarding changes to roads uses during construction and decommissioning. RMS and YVC should also be consulted on the access route, particularly regarding the delivery of the transformer to the Site.	✓		✓
T3	Implementation of a complaints management system as part of the CEMP to ensure any community concerns regarding traffic are addressed effectively and promptly.	✓	✓	✓

15.0 Hazards

An environmental hazard is defined as a substance, state or event which has the potential to threaten the surrounding natural environment or adversely affect human health. Hazards may consist of any single or combination of toxic chemicals, biological, or physical agents in the environment resulting from human activities or natural processes. Hazards relevant to the proposal and the proposed Site include risks associated with bushfires, electromagnetic fields, flooding and aviation activities.

Risks of flooding and electromagnetic interference are specifically addressed in the relevant sections 10.0 and 14.0 respectively.

15.1 Bushfire

Bushfire can present a significant threat to human life, property, infrastructure and ecology. Bushfire risk can be considered in terms of environmental factors that increase the risk of fire including fuel quantity and type, topography and weather patterns. Specific activities or infrastructure components may exacerbate combustion of ignition risk, leading to an increased risk of fire.

15.1.1 Existing environment

The Site is on mildly undulating terrain that slopes gently from west to east with an average gradient of 2.5%. The Site consists of mainly improved pasture and native grasses interspersed with scattered paddock trees and planted windbreaks (radiata pine). An approximately seven hectare patch of woodland is located approximately 90 metres from the western boundary inside the Site. No other areas of significant shrub or canopy vegetation exist within 500 metres of the Site. As such, the residual bushfire risk is considered low and this is reflected in the Yass Valley Council bushfire prone land map 2014, in that no areas on or in the vicinity of the Site have been categorised as bushfire prone land. The nearest bushfire prone area is located more than 800 metres to the north-east.

The bushfire danger period for the Site and Yass Valley generally is typically between 1 October and 31 March, subject to local climate variability. Dry and hot summer conditions coupled with high wind speeds pose a risk of grass fires during this period. Sources of ignition and risk factors include operation of farm machinery in dry grass, storage of hay, fuel and flammable farm chemicals, lightning and cigarette butts thrown from vehicles travelling along Tallagandra Lane.

Access to the Site is from Tallagandra Lane, connecting to the greater road network and the Canberra area via Mulligans Flat Road and to the Federal Highway via Sutton Road. Tallagandra Lane has been recently sealed from Mulligans Flat Road in the south to a point approximately 150 m south of the Site, beyond which Tallagandra Lane is unsealed. There are other unsealed roads to the north and west of the Site which would still allow for emergency access.

In terms of receivers and assets at risk from bushfire, 33 homestead/residences are located within two kilometres of the Site. Additionally, associated agricultural assets including farm sheds, silos, watering points and equipment are common in the local area.

15.1.2 Impact assessment

The proposed Site does not lie on an area designated as bushfire prone land under the Yass Valley Council LGA Bush Fire Prone Land Map (6 June 2014). Therefore, a Bush Fire Assessment is not required under the assessment methodology specified in *Planning for Bushfire Protection* (PBP) (RFS 2006). Notwithstanding, a qualitative assessment has been undertaken to determine controls to mitigate residual risk that may be present.

Construction

Bushfire risks associated with the proposed development occur during both construction and operation. During construction the activities that could increase the risk of bushfire include:

- using plant and machinery over land containing combustible material
- hot works including welding, grinding, soldering, etc.
- storage and handling of fuels and flammable chemicals
- electrical faults during testing and commissioning works.

Considering the mildly undulating terrain and low degree of vegetation present the risk of bushfire within the Site and surrounds is considered to be low. The risk outlined above would be manageable during construction through measures in the CEMP.

Operation

During operation, bushfire risks would predominantly be associated with electrical component faults, maintenance works and possibly cigarette butts from vehicles travelling along Tallagandra Lane. There would be no smoking permitted within the Site at all times.

All electrical components would be designed to minimise potential for ignition and all maintenance works would be carried out by suitably qualified personnel. Ground cover beneath the panels would be maintained at a low level through sheep grazing and cutting as required so as to minimise the build up of fuel levels.

During operation there would be up to 10 permanent staff present on-site. These staff would be expected to spend the majority of their time in or near the control building, which is sited next to Tallagandra Lane and is readily accessible in the event that evacuation is required.

Static water supplies for firefighting/bushfire management would be provided at the Site as follows:

- 1 x 20,000 L or 2 X 10,000 L potable water and static water supply tank(s) located within four metres of the control building hard stand or a suitable all-weather access track
- tank(s) to be constructed of steel or concrete
- fittings would be compliant with Rural Fire Service truck requirements.

Static water supplies would be filled through water delivery by trucks.

Asset protection zones of 20 metres would be provided around perimeter of the solar fields. The asset protection zone would include trafficable defendable space with ample ability for fire fighting vehicles to access and manoeuvre around.

A Bushfire Management Plan would be developed in consultation with RFS and implemented during both construction and operation and include various mitigation and management measures to reduce the ongoing risks of bushfire.

The nearest fire services to the Site located within 16 km include the Sutton Volunteer Fire Brigade, Wallaroo Volunteer Rural Fire Brigade, Charnwood Fire Station and Gungahlin Fire Station (ACT RFS). The RFS would be consulted on an ongoing basis during the construction and operation of the solar farm, particularly during development of the Bushfire Management Plan and with regard to maintaining site accessibility for RFS vehicles and conducting fire safety inspections.

Bushfire risk at the Site is considered to be highly manageable employing the mitigation and management measures proposed. Developing the Bushfire Management Plan at the beginning of the construction phase and conducting training would facilitate bushfire prevention and effective response if necessary.

The bushfire risk during decommissioning would be similar to the construction stage and would be highly manageable by employing the same mitigation and management measures.

15.1.3 Mitigation and management measures

The following mitigation and management measures would be implemented to minimise bushfire risk and impacts:

Table 52 Bushfire mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
BF1	A Bushfire Management Plan would be developed covering all phases of the development. This plan would outline relevant protocols, practices and other measures to minimise the risk of bushfire and to outline appropriate emergency actions should one occur.	✓	✓	✓
BF2	All electrical equipment would be designed in accordance to applicable ANZ engineering design standards, industry codes and best practice standards. Installation, operation and maintenance work shall be carried out by competent persons.	✓		
BF3	Buildings would be designed to comply with the national Construction Code (formerly the Building Code of Australia).	✓		
BF4	Safety management processes/ system covering: • Induction training to all personnel and contractors on fire risk, do's and don't's, prevention and emergency response • Safety hazards including bushfire and control measures	✓	✓	✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	• Preparation and implementation of job specific SWMS • Emergency preparedness and response • Policies and procedures to control hot works, prohibition of smoking on-site, fuel storage, use of flammable materials and use of machinery and vehicles.			
BF5	Implement a Hot Work Permit system that would ensure: • hot works are restricted to the maintenance workshop as best practicable • stringent control of all hot works (cutting, grinding, welding, etc.), by prescribing pre-requisites and implementing specific control measures • fire extinguishers would be made available during all hot works. • effective implementation by all parties including contractors throughout the life of the project.	✓	✓	✓
BF6	Designating a site safety management representative on-site who would: • be responsible for implementation of safety requirements, mitigation and management measures and emergency response procedures related to bushfires • consult with the local RFS regarding bushfire management requirements • be the point of contact onsite to assist RFS and emergency services if there is a fire on-site.	✓	✓	✓
BF7	Effective communication to ensure fire incidents are communicated quickly including: • use of mobile phones, with emergency communication contacts on a speed dial • use of two way radio • Fire Danger Warning signs located at the entrance to the Site • Signs clearly showing locations of onsite SWMS and fire access tracks	✓	✓	✓
BF8	Slashing of vegetation prior to construction activities and to maintain fuel loads.	✓	✓	
BF9	Grazing by sheep stocked at suitable levels so as to maintain a low level of vegetation whilst minimising erosion throughout the lifespan of the project.	✓	✓	
BF10	The NSW RFS be provided with a contact for the SSF project, during construction and operation.	✓	✓	✓
BF11	Maintain access and egress roads to the Site free from being blocked by parked vehicles or other items so as to be readily accessible by emergency services at all times and prevent entrapment of personnel in the event of a bushfire.	✓	✓	✓
BF12	Training for personnel covering fire prevention, using fire extinguishers and emergency response procedures/ drills.	✓	✓	✓

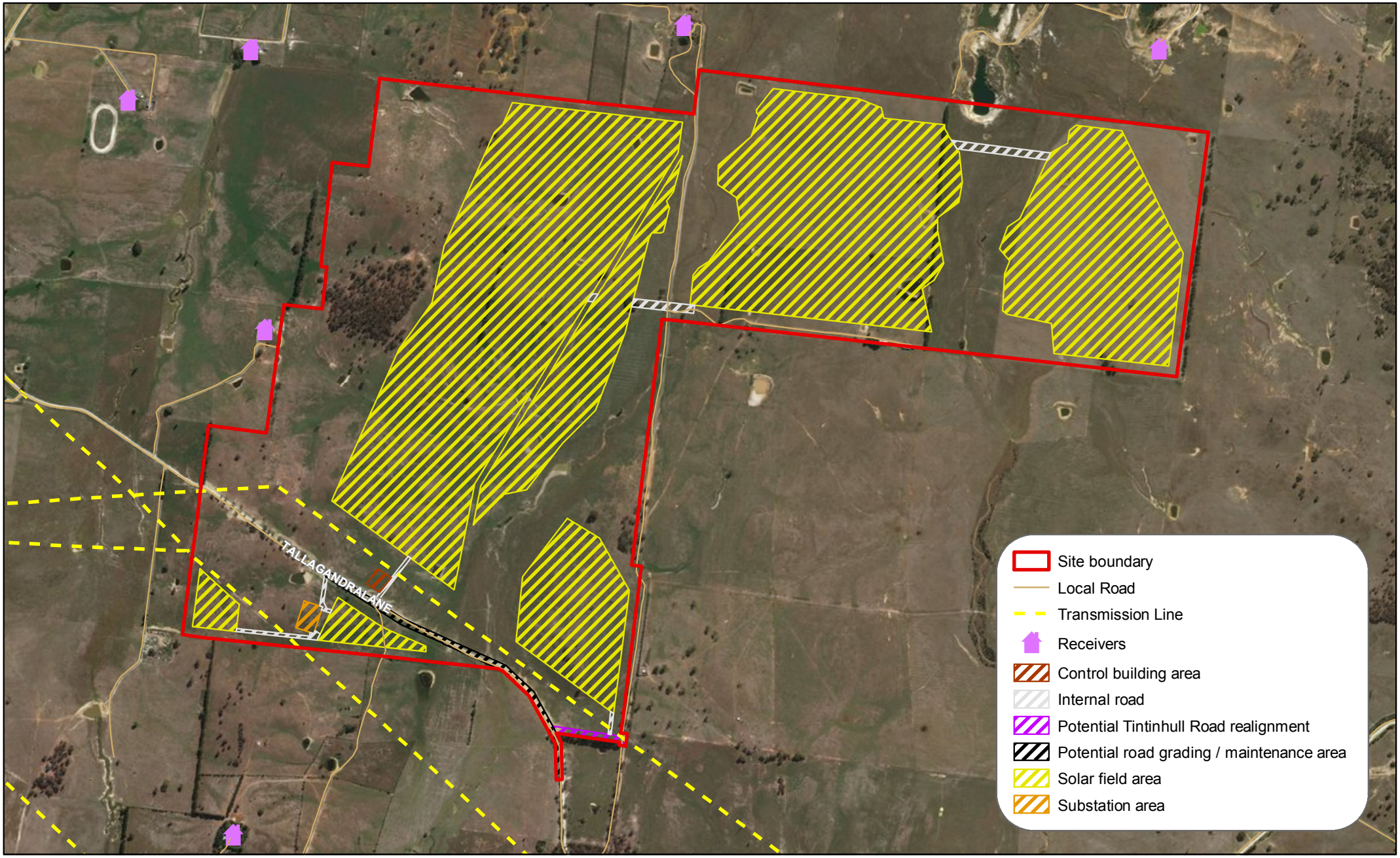
No	Mitigation and Management Measures	Construction	Operation	Decommissioning
BF13	Seek 'mutual assistance' agreement with local property owners to use dams as water sources in the event of an emergency.	✓	✓	✓
BF14	Suitable and adequate emergency response equipment shall be provided and maintained on-site during the construction of the project. This would include fire extinguishers and 20,000 litre static water supply that would be installed at the early part of the construction phase and maintained throughout the life of the project. Equipment lists shall be detailed in the SWMS, Bushfire Management Plan and hot work permits.	✓	✓	✓

15.2 Electromagnetic fields

Electromagnetic fields (EMF) are produced wherever electricity or electrical equipment is in use. The electric field component is proportional to the operating voltage and the magnetic field component is proportional to the electrical current (i.e. moving charge). Electric fields are readily shielded by any earthed conductive objects (trees, fencing, etc.), whereas it is difficult to effectively shield external low frequency magnetic fields.

15.2.1 Existing environment

An overview of the proposed solar farm layout in relation to surrounding infrastructure is provided in Figure 30. Existing TransGrid 330 kV and 132 kV transmission line easements pass through the south-western corner of the Site. The two closest residences have also been identified, with a minimum separation in the order of 300 m to the future PV panels and ~500 m to the 330 kV transmission line.



SPRINGDALE SOLAR FARM

EMF

AECOM Renew estate.

NORTH

0 125 250 500 Metres

DATE 27/03/2018
SCALE 1:16,000
PROJECT 60555008
DRAWN PH

Figure 30 Solar farm layout and surrounds

15.2.2 Impact assessment

The proposed solar farm PV panels generate a DC voltage (i.e. operate at zero hertz frequency) and are grouped into a number of strings prior to being inverted to a 33 kV AC 50 Hz circuit. The 33 kV circuits route back to the proposed site substation, where a 33/132kV step-up transformer is used to connect into the existing TransGrid 132 kV transmission line.

Standards/guidelines

The Energy Networks Association EMF Management Handbook recognises the International 50 Hz magnetic field limits published in the Institute of Electrical and Electronics Engineers (IEEE) Standard C95.6:2002 and International Commission on Non-Ionizing Radiation Protection's (ICNIRP) 2010 'Guidelines for limiting exposure to time varying electric and magnetic fields (1 Hz to 100 kHz)'. However, the IEEE levels are much higher than ICNIRP's and the IEEE limits have therefore been discarded.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has taken over responsibility of the Radiation Health Series (RHS) and Radiation Protection Series (RPS) of documents that were previously published by National Health and Medical Research Council (NHMRC). The legacy NHMRC RHS No. 30 'Interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields (1989)' has since been withdrawn and the ICNIRP limits are considered by ARPANSA to be best practice. ARPANSA has also developed a draft RPS 'Exposure Limits for Electric & Magnetic Fields – 0 Hz to 3 kHz (2006)'; however this is yet to be formally published.

The recommended ICNIRP magnetic field limits are provided in Table 53, alongside a summary the latest updates in Australian publications that plan to develop formal standards in this area. The separate electric field limits are provided in Table 54.

Table 53 External Magnetic Field Exposure Limits

Publication	Power System	Reference Levels (1)	
		General Public	Occupational
ICNIRP (2009)	DC (0 Hz)	$4x10^5$ µT ($4x10^6$ mG)	$2x10^6$ µT ($2x10^7$ mG)
ICNIRP (2010)	50 Hz	200 µT (2,000 mG)	1,000 µT (10,000 mG)
ARPANSA (2010 Presentation Update) (2)		300 µT (3,000 mG)	1,500 µT (15,000 mG)
ARPANSA (2006 Draft RPS)		100 µT (1,000 mG)	500 µT (5,000 mG)
NHMRC (1989 RHS No. 30, Withdrawn)			

Table 53 notes:

1. The International System of Units (SI) for magnetic field strength is Tesla (T) and another commonly used unit is Gauss (G), where 1µT = 10mG.
2. ARPANSA 2010 Presentation '*The Precautionary Approach for ELF Fields – ARPANSA Update*'.

Table 54 External Electric Field Exposure Limits

Publication	Power System	Reference Levels	
		General Public	Occupational
ICNIRP (2010)	~DC (1Hz)	5kV/m	20kV/m
ICNIRP (2010)	50Hz	5kV/m	10kV/m
ARPANSA (2006 Draft RPS)			
NHMRC (1989 RHS No. 30, Withdrawn)			

Site Specific Assessment – Magnetic Fields

The solar farm's DC magnetic field levels would be negligible in comparison to the very high limits presented in Table 53 and as such there are not any likely to be any compliance issues due to the PV array DC cabling.

The solar farm 33 kV AC underground circuits are understood to be three-core cables, which is an optimal arrangement from a magnetic field perspective. This is because the phase conductors would be closely coupled and each at 120 degree phase difference, which would maximise cancellation of the magnetic field. Operating at 33 kV, rather than a lower voltage such as 11 kV or 22 kV, also means that these circuits would supply a lower comparable current which also assists in reducing the magnetic field from the solar farm AC power system.

Previous EMF studies for the detailed designs of similar solar farms indicate that the maximum 50 Hz magnetic field would occur in the immediate vicinity of the Inverters and the utility connection substation, where personnel may be exposed to magnetic fields in the range of 100-500 mG, when operating at full capacity. These levels are less than the recommended short term occupational exposure limits for personnel. Once the separation distance to the solar farm boundary fence is taken to consideration, the maximum magnetic field level that may be exposed to the public (directly adjacent to the fence) would be <10 mG. The proposed solar farm electrical installation is therefore considered to be compliant in regards to magnetic field levels exposed to personnel and the public.

The worst case magnetic fields in the vicinity of the solar farm are identified to be associated with the existing 330 kV and 132 kV transmission lines, which pass through the south-west corner of the Site. These transmission lines have a much larger spacing between phase conductors and therefore have a much higher magnetic field associated.

The existing TransGrid 330 kV transmission line is at a ~500 m minimum separation distance to the nearest residence, which is closer than both the proposed 33/132 kV substation location and the 132 kV transmission line that the solar farm would connect into. Desktop calculations using CDEGS software have been undertaken that estimate a magnetic field level of <10 mG at a distance of 500 m from the dual transmission line easement. On this basis it is confirmed that the recommended levels would not be exceeded at any nearby residences.

Site Specific Assessment – Electric Fields

The DC voltage of the solar arrays is 1.5 kV DC and this therefore complies with the recommended electric field levels (in excess of 5 kV/m) by default.

The solar farm 33 kV AC cabling and switchgear would both be enclosed by surrounding earthed screens/metalwork. As a result, the external electric fields from the 33 kV system would be negligible and well below the recommended levels.

The solar farm 132 kV switchgear is assumed to be an outdoor busbar arrangement as a worst case from an electric field perspective. The 33/132 kV Substation is estimated to have a minimum ~50 m separation to the property boundary and the electric field level at this separation would be designed to be <5 kV/m, which would therefore be compliant in regards to general public exposure.

15.2.3 Mitigation and management measures

Table 55 Electromagnetic frequencies mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
E1	All electrical equipment would be designed in accordance to ANZ engineering design specification, industry codes and best practice standards. Installation, operation and maintenance work shall be carried out by competent persons.	✓		
E2	All relevant TransGrid and other procedures in relation to high voltage installation and operation would be adhered to throughout the life of the project. Public access to the Site would be restricted throughout the life of the project and all power stations, the substation and switchyard would be kept locked.	✓	✓	

15.3 Aviation

15.3.1 Existing environment

The closest public airfield to the Site is Canberra Airport approximately 19 km south of the Site. Aircraft in the flight pattern around the airport join the final approach at approximately 3000 to 4000 feet between 15 and 25 kilometres from the airport and fly towards the runway in a straight line. There is no minimum altitude for aircraft in the process of landing and aircraft would generally descend on a glide slope of three degrees.

Departing aircraft would generally maintain a straight line away from the runway for around 15 km before turning to their heading. There is no regulated minimum altitude for an aircraft in the process of taking off and altitude would depend on a variety of operational factors.

15.3.2 Impact assessment

Glint and glare

Glint is defined as a quick reflection that occurs when the sun is reflected on a smooth surface while glare is a longer sustained reflection. Both glint and glare present an operational hazard to aviation as the result of PV solar developments. Glint and glare have been further assessed as part of the visual assessment in Chapter 9.0.

The nature of flight patterns around Canberra Airport and the location of the Site within a direct alignment of the main 17/35 runway results in a significant percentage of air traffic overflying the Site during both approach and departure. Data from July to September 2017 shows that 7% of arrivals overflew the Site on approach to runway 17, while over the same period 47% of departures flew in the direction of the Site on departure from runway 35 (Airservices Australia, 2017).

The potential for glint or glare associated with PV solar systems which do not involve solar concentrating through the use of mirrors or lenses, are relatively limited. The nature of PV solar panels requires them to absorb as much solar energy as possible in order to maximise electricity generation. PV solar panels reflect only around 2% of received light comparable to forest cover. The Department of Planning (DoP 2010) discussion paper for renewable energy generation confirms that solar panels do not produce noticeable glare compared to existing roofs or building surfaces.

Other infrastructure associated with the project such as buildings and support posts are not considered to pose a significant ongoing glint and glare hazard due to their small size and low surface area.

The US Federal Aviation Administration (FAA) *Technical Guidance for Evaluating Selected Solar Technologies on Airports* (FAA, 2010) cites several cases of operating solar facilities within the area of large airports including Denver International, Fresno Yosemite International and Albuquerque International Sunport. The US Department of Energy's National Renewable Energy Laboratory (NREL) found that with proper planning, solar can be successfully installed at airports with minimal or no impacts (Kandt and Romero, 2014).

The Civil Aviation Safety Regulations require that air traffic control towers are protected from glare. Through consultation with Air Services Australia (ASA) and the Civil Aviation Safety Authority (CASA), AECOM has been advised that there are no rules or regulations guiding the assessment of such glare. CASA therefore recommends that proponents of solar PV systems within or near airports use the above guidance from the FAA in making their assessments.

The FAA recommends that any proposed solar farms that are below the direct approach paths to an airport (aligned with a runway) and within a distance of around 5 nautical miles (approximately 10 km) from a runway end should be referred for assessment.

The FAA requires the use of Solar Glare Hazard Assessment Tool (SGHAT, currently marketed as GlareGauge) to demonstrate the impact of glare caused by PV systems proposed for installation on airports in the US. CASA would typically not object to a solar farm if the glare analysis indicates that air traffic control (ATC) towers experience no glare and runway approaches experience at most "low potential for after-image" glare.

Given the proposed Springdale Solar Farm is approximately 19 km from the nearest airstrip (Canberra Airport) it is considered unlikely that the solar farm would create any significant glare issues for pilots on approach to or on departure.

Further to this, the alignment of the flightpaths into and out of Canberra airport is perpendicular to the orientation of PV solar panels on the single axis trackers. The PV solar panels would be aligned as much as possible to face directly into the sun and follow its path across the sky from east to west throughout the day. As approaching and departing aircraft would be traveling in a southern and northern direction respectively, the likelihood of an aircraft being in direct reflection from the sun would be reduced to the middle of the day. Arrivals and departures at Canberra Airport are concentrated to the morning and afternoon peak periods with relatively few movements between 11 am and 1 pm.

Convection currents

Solar PV plants with a large footprint have the potential to create heat islands producing rising convection currents that could potentially affect the operation of aircraft overflying the area. PV solar panels reduce albedo by making the surface darker and less reflective, leading to increased heat absorption. PV panels although having a low heat capacity can be up to 20°C warmer than the ambient temperature during the day causing the surrounding air mass to heat and rise.

The risk of a rising thermal plume affecting aviation approaching or departing Canberra Airport is considered low given the relatively small temperature differentials producing the thermal plume and the height of aircraft overflying the Site which are typically at least 900 m in altitude. Furthermore the widespread practice of siting large solar plants at airports suggests convection from solar panels is unlikely to be a significant safety issue for aviation activities.

16.0 Socio-economic

Socio-economic impact assessments aim to provide an understanding of the community context within which the project would be undertaken, considering local community perceptions, while recognising the diversity of stakeholder interests and values. Socio-economic impacts can be positive, such as an increase in employment and local retail trade; however they can also be negative, such as creating strains on the existing infrastructure. A socio-economic assessment has been undertaken using publicly available demographic profiles and census data for the Yass Valley LGA.

16.1 Existing environment

The proposed project would have a total development envelope of approximately 190 hectares and lies within the south eastern corner of the Yass Valley LGA. The Site lies approximately 38 km to the

South East from the township of Yass which is the largest township within the Yass Valley LGA, with a population of 6,506 (ABS 2016). The total population at the 2016 Census of the Yass Valley LGA was measured as 16,142 and this compares to 15,020 recorded in the 2011 Census indicating the region is in a state of growth (ABS 2016; ABS 2011). The State Suburb of Sutton had a population of 1,660 at the 2016 Census, staying relatively constant from the 1,670 recorded during the 2011 Census.

In the Yass Valley LGA, the median age is 42, four years older than the national median of 38 (ABS 2016). In 2016, children aged between 0 and 14 years made up 21.1% of the local population and people aged 65 years and over made up 16.2% of the population.

Labour force within the Yass Valley LGA was 8,318 people and unemployment was recorded as 2.9%, well below the national average of 6.9% (ABS 2016). The top industries of employment in 2016 included Central Government Administration (7.8%), Sheep Farming (Specialised) (3.0%) and Defence (2.7%).

The total value of agriculture within the Yass Valley LGA in the 2010/2011 agricultural census was approximately $63 million representing 0.53% of agricultural output in NSW, with meat production and wool the largest agricultural commodities in the area.

A total of 584 people are employed in various agricultural industries and services within the Yass Valley LGA representing 3.9% of the total 2011 Census population.

The Site is approximately 5 km from the outermost urban areas of Canberra and across the NSW/ACT border. No urban development has occurred on the NSW side of this border. The area surrounding the Site consists of cattle and sheep grazing land, with a few of rural residential dwellings visible from the Site.

16.2 Impact assessment

16.2.1 General

The socio-economic and environmental benefits of developing renewable energy sources and transitioning to a low carbon energy market are considered to be positive. As detailed in Chapter 2.0, the adoption of renewable energy sources would assist Australia to transition away from the historic carbon-intensive energy production industry which is linked to significant atmospheric pollution and climate change. While some climate change is now inevitable due to the long lag times associated with climate processes, a reduction in carbon emissions would contribute to reduced air pollution and slow or limit the effects of future climate change, benefiting both current and future generations.

The project promotes socio-economic wellbeing through offering opportunities for employment, training and up-skilling of the local and regional workforce throughout its construction and operation. Opportunities would be available to workers from a wide range of fields and expertise, including engineers, construction workers and labourers with further employment opportunities associated with supply chains and local goods and services. In a broader sense, the project would also contribute to a downward pressure on the historically-high energy prices currently affecting households and industries.

The project is expected to provide a strong contribution to regional development and employment, and ongoing economic benefits to the local region. The *Yass Valley Council Economic Development Strategy* (YVC, 2014) outlines the Council's plan to improve the economic wellbeing of the region through attracting employment-generating investment. The objective of the Council's strategy is to manage the transition from an economy based primarily on traditional agricultural practices to one which is diverse, robust and sustainable whilst maintaining a vibrant and skilled workforce. Infrastructure projects and services in particular were identified as having a substantial ability to positively affect the amount and type of economic activity that could be developed within the region.

16.2.2 Construction

During construction of the proposed project, it is considered that both positive and negative socio-economic impacts would be generated. Positive impacts as a result of the project would include:

- Generation of employment, with up to 200 staff employed during peak construction. Where possible, these staff would be drawn from the local area

- Opportunities for training and up-skilling of the local and regional workforce to further contribute to the delivery of renewable energy projects across Australia
- Significant contribution to local and regional economies through increased demand for accommodation, goods and services from travelling contractors.

Likely negative impacts include:

- Increased traffic on local roads and hazards associated with heavy vehicles and plant (see section 13.2)
- Change in the visual amenity of the area (see Chapter 9.0)
- Change in noise amenity of the immediate surrounding area (see section 12.0)
- Increased dust emissions (see section 13.6)
- Influx of construction workers may put pressure on local community services.

Although there is not a large availability of accommodation within Sutton, there is ample accommodation in neighbouring NSW townships and across the ACT border in Canberra. It is possible that in conjunction with other major projects or community events within the local area or within the Canberra area, that a shortage of accommodation may occur at times during construction. By sourcing as many workers as practicable from the local area, the effects on accommodation supply would be mitigated as far as possible.

Traffic impacts as a result of the construction of the proposed development are discussed in section 14.0. It is anticipated that impacts due to construction would generally be minimal and manageable with appropriate mitigation measures. Up to an estimated 400 light vehicles movements per day would occur during the peak construction phase with movements concentrated during the start and end of each working day. The surrounding road network is considered to be typical of a rural area, predominantly characterised by light vehicle movements. The increase in traffic caused by the proposed project would not negatively affect the Level Of Service experienced by local road users.

During peak construction, up to approximately 75 heavy vehicle movements per day would be required. The majority of these vehicles would be delivery trucks approaching from the Sydney/Wollongong area via the Federal Highway, heading through the township of Sutton on Sutton Road, Bywong Street and Camp Street before re-joining Sutton Road and turning onto East Tallagandra Lane on the north side of town and then onto Tallagandra Lane. There is the potential for minor disruptions to local residents as heavy vehicles traverse the turns within the Sutton town centre.

A Traffic Management Plan would be prepared to manage heavy vehicle movements associated with the project, minimise impacts on local roads and ensure public safety (refer to section 13.2.3). Further consultation would occur with the community to identify and mitigate potential concerns.

Impacts to visual amenity as during construction are discussed in Chapter 9.0. Visual amenity impacts during construction would be associated with the increased presence of construction vehicles and workforce within the local area. These impacts would be temporary and short term for the duration of the works, and are not deemed to be significant.

A Community and Stakeholder Consultation Plan would be implemented during construction to manage potential impacts to community stakeholders.

16.2.3 Operation

Positive impacts due to the operation of the proposed solar development would include:

- Generation of permanent employment for operation of the project
- Ongoing benefits to local businesses for the supply of equipment, materials and services required for the ongoing operation of the Site

Ongoing supply of low-cost energy to the region, reducing energy price pressures on industry and households and reducing loss factors in the region. This would contribute to security of supply. There would be up to 10 permanent operational staff posted at the facility at any one time to monitor and manage site activities and systems. This would reduce after the two year defect liability period to five

personnel for the remainder of the operational phase. It is anticipated that workers for the operational phase of the project would be sourced from the local community where possible.

Local businesses would be utilised where possible for equipment and supplies required for the ongoing running of the project. This would have an ongoing positive impact for the local economy.

Potential negative impacts due to the operation of the proposed solar development would include:

- Reduction of productivity of agricultural land
- Change in landscape character and visual amenity of the Site (see Chapter 9.0).

The area of the Yass Valley LGA has a total area of 399,837 hectares (ABS, 2011), most of which is rural and agricultural lands. Whilst the project would not remove agricultural practices from the Site it is anticipated that the type and intensity of livestock on the property would change. This change in the nature of agricultural activity on the property is not considered to be a significant impact in the context of agricultural activity across the wider Yass Valley. The total area subject to change of use would be in the order of 0.09% of total land area of the Yass Valley LGA. It is not anticipated that the operation of the proposed project would result in a significant adverse impact to the economic output of agricultural activities within the wider Yass Valley LGA.

Upon decommissioning, solar infrastructure would be removed and the Site would be returned to a condition near to its current state, which would be suitable for future agricultural activities such as grazing.

As outlined in section 16.1, the agricultural industry employs 3.9% of the population within the Yass Valley area, with 3% involved directly in sheep farming. The largest sector for employment within the area remains Central Government Administration, which would not be affected by the project.

As the proposed area would be used for the grazing of sheep between the PV panels, albeit at a lower density, the requirement remains for personnel to tend and manage the livestock. The continuation of this activity would ensure the Site remains in use for agriculture and would ensure that it continues to generate local income.

The placement of solar panels within the Site would result in a change to the landscape character of the Site, and hence the potential for impacts on the visual amenity of receivers with views of the Site. Chapter 9.0 assesses views to the project from several view points, including surrounding rural residential dwellings and local roads. The assessment concluded that no landscape character zones would be subject to high impacts and moderate impacts would occur only for open rural landscapes, comprising a contrasting element across open, low lying areas. The assessment found that the project would result in in moderate or high impacts upon three of the fifteen nearby receptors, with the remainder being subject to negligible or low impacts.

To mitigate visual amenity impacts upon affected receivers it is proposed to provide screening planting at strategic locations as part of a Landscaping Plan for the Site. This plan would be subject to further consultation with affected residents prior to implementation. On this basis it is expected that the socioeconomic impact of changes to visual amenity would be minor to moderate initially and would decrease over time as vegetation matures.

16.2.4 Shared benefits with the community

Renew Estate has proposed to share the benefits of the project with the community in the following ways:

- A fund of $100,000 is proposed to be paid for the benefit of the community. Where this fund would be spent is yet to be determined, however the community was invited to submit ideas on how this fund would be best used during the First Community Session (refer section 5.2.3)
- Opportunity for community investment: During the First Community Session the community was invited to express their interest in having a share in the financial return from the sale of renewable energy. Renew Estate will continue to seek expressions of interest in this opportunity during future engagement activities

- Increased demand for local services: There will be an increased demand locally for services such as accommodation, catering, dining and drinking, automotive and electrical during the construction and operational stages of the project
- Opportunity for relevant skills training, up-skilling and scholarships: The details of this are yet to be determined, however Renew Estate will continue to seek expressions of interest in this opportunity during future engagement activities
- Maximised participation of local businesses in the construction and operation of the project: Renew Estate are encouraging enquiries from any local businesses, contractors or service providers who are interested in learning about the types of services that will be required during the construction and operational stages of the project. Information on businesses who would like to participate in the project is being collected through the Contractor Enquiry form on the project website and during information sessions
- Potential sealing of part of Tallagandra Lane and the re-alignment of Tintinhull Road, which would only be undertaken if a Voluntary Planning Agreement is able to be reached with YVC including agreement on the relevant works with YVC, as discussed in section 3.2.12 and 14.2.1
- Neighbour shared benefits for landowners within 1 km of the project comprising one of the following two options for each neighbour:
    - Neighbour shared revenue scheme whereby the neighbour will receive income from a number of modules allocated to them.
    - An up-front a rooftop solar PV and battery system.

  Further details regarding the proposed neighbour shared benefits are provided in Appendix H3.

16.3 Mitigation and management measures

The following mitigation and management measures focus on maximising the benefits of the project and prevent potential negative impacts.

Table 56 Socio-economic mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
S1	The project would aim to give preference to local workers and suppliers of construction materials and equipment where practicable.	✓	✓	
S2	Community consultation would be undertaken in accordance to the Community and Stakeholder Consultation Plan which shall include communication with local communities and stakeholders: • to provide updated information regarding the project, including information regarding the project's program and proposed construction activities, potential impacts to nearby sensitive receivers and potential changes to local traffic conditions • provide information regarding employment and business opportunities; and • as a channel to receive queries, complaints and grievances.	✓	✓	✓

17.0 Waste

17.1 Existing environment

The *Protection of the Environment Operations (POEO) Act 1979* and the *POEO (Waste) Regulations 2005* specify the legal requirements for waste management covering transportation and disposal. The *Waste Avoidance and Resource Recovery Act 2001* sets out the hierarchy of resource management options which should be considered. The hierarchy of prioritisation for resource conservation are:

- Avoidance of unnecessary resource use
- Resource recovery, covering reuse, reprocessing, recycling and energy recovery
- Disposal as a final resort.

Renew Estate has considered the hierarchy early in project development and selected most practicable options for resource optimisation and waste management in compliance with their sustainability policy.

YVC provide a weekly residential kerbside waste collection service and a fortnightly kerbside recycling collection service in Yass, Browning, Minalong and Murrumbateman. YVC operate a "Revolve" facility at Yass Transfer Station for recycling of bulky goods in good condition, a tip at Gundaroo, and transfer stations at Yass, Murrumbateman, Brookhan, Browning, Wee Jasper and Binalog. YVC would perform business waste collection as requested on application for a nominal fee.

YVC currently require all properties not connected to a reticulated sewage system to have an on-site sewage management system (OSSMS) located on the property. Installation of an OSSMS requires approval under the *Local Government Act* 1993 and operation of an OSSMS requires approval under the *Local Government (General) Regulation* 2005.

The Site is characterised by agricultural production and grazing activities. Current responsibility for the management of waste generated by these activities lies with the landholder.

17.2 Impact assessment

17.2.1 Construction

Solid waste that would be generated during the construction phase includes:

- Biomass from site clearing
- Excess construction materials such as cables and fencing
- Excess aggregate, sand and asphalt
- Packaging materials including wooden pallets, crates, plastic and cardboard
- Office waste and food waste
- Sewage from temporary toilets (transferred by a licensed contractor/ council to the Yass Valley Council treatment facility).

The quantity of construction waste would increase in tandem with the construction schedule and typically be stored on-site until final site clearing. Noting that the project design is a modular system which would be prefabricated and assembled on-site, the quantity of construction solid waste is expected to be low, temporary in nature and would be readily managed employing conventional procedures to ensure compliance with legislative requirements and best practices.

A final environmental audit would be carried out to ensure all waste is properly cleared and disposed.

Although the Site is mainly cleared land, the felling of some trees would generate biomass waste. Indiscriminate disposal of biomass may block drainage channels, increase bushfire risk and harbour pests. The chipping of biomass from site clearing for use in landscaping as well as erosion control within the Site would be undertaken if practicable.

Most of the waste generated during the construction phase would be classified as general solid waste (non-putrescible). Ancillary facilities within the Site compound may produce quantities of general solid waste (non-putrescible) however portable toilet facilities on-site would produce a small quantity of sanitary wastes classified as liquid waste and would be taken off site by the waste contractor.

Waste bins/skips and a designated area within the laydown area would be provided for collection and temporary storage of waste. All waste would be collected, handled, stored, transported, recycled and/ or disposed in compliance with relevant regulations and guidelines. Solid waste would likely be collected and disposed at the Gundaroo landfill operated by YVC.

In summary, the generation of waste during construction is expected to be minimal and would not place undue pressure on local landfill or treatment facilities.

17.2.2 Operation

A notable advantage of solar farms compared to thermal power generation plants is the minimal generation of waste throughout the operation phase. Waste generated during this stage includes:

- Solid waste such as, office and food waste
- Maintenance waste consisting of replaced equipment, packaging materials, scrap materials and transformer oils from operation and maintenance activities
- Sewage from the toilets on-site.

The waste generated is minimal and can be managed using conventional waste collection, handling and disposal procedures in compliance with regulatory requirements.

Typical waste would be faulty equipment and packaging materials. Such waste is anticipated to be minimal as the main components have been designed for a 30 year lifespan.

The likelihood of equipment needing replacement due to damage is low as the project layout has considered flood and bushfire risk, and the tracking system automatically stows the panels into a horizontal position during storm events.

Replacement of transformer oils would be carried out in accordance with the OEMP which would detail handling, collection, storage, transportation and disposal measures in compliance with regulatory requirements. Maintenance of site vehicles would be carried out at garages in nearby towns and not within the Site.

In summary, the generation of waste during operation is expected to be minimal and would not place undue pressure on local landfill or treatment facilities.

17.2.3 Decommissioning

Decommissioning would be carried out to return the Site generally to its predevelopment condition. Waste items generated would include:

- Metals from dismantled solar panel framework, posts, fencing, buildings and other scrap materials
- Solar panels, electrical cables and wiring
- Electrical and monitoring equipment such as transformers, switchgears, meteorological stations and office computer equipment
- Demolition waste from building demolition and removal of transformer, power stations and building foundations as necessary

All equipment would be demolished, dismantled and removed from the Site, with only some below ground infrastructure to remain. Where practicable equipment shall be refurbished, reused and recycled.

During decommissioning, electrical equipment and components would be refurbished and reused as best practicable. All metal, cables and plastics scrap generated would be reused and recycled. All other demolition debris and waste shall be cleared and the Site made good. If agreed by the landowner, the control building and the perimeter fencing could be retained and repurposed.

17.3 Mitigation and management measures

The following mitigation and management measures would be implemented to avoid, recover and dispose waste through the life cycle of the project:

Table 57 Waste mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
W1	A Waste Management Plan which identifies all waste streams and specifies management measures covering collection, handling, transportation, recycling and disposal would be incorporated in the CEMP. An environmental audit shall be carried out at the completion of the construction stage to verify all waste has been properly disposed prior to the final payment being released to the contractor(s).	✓		✓
W2	A waste management policy/ procedure/ plan shall be developed and implemented to ensure compliance to waste management legislative requirements, guidelines and best management practices throughout the operation and decommissioning phases. All waste shall be collected, properly stored and recycled or disposed at facilities licensed by the local council.		✓	

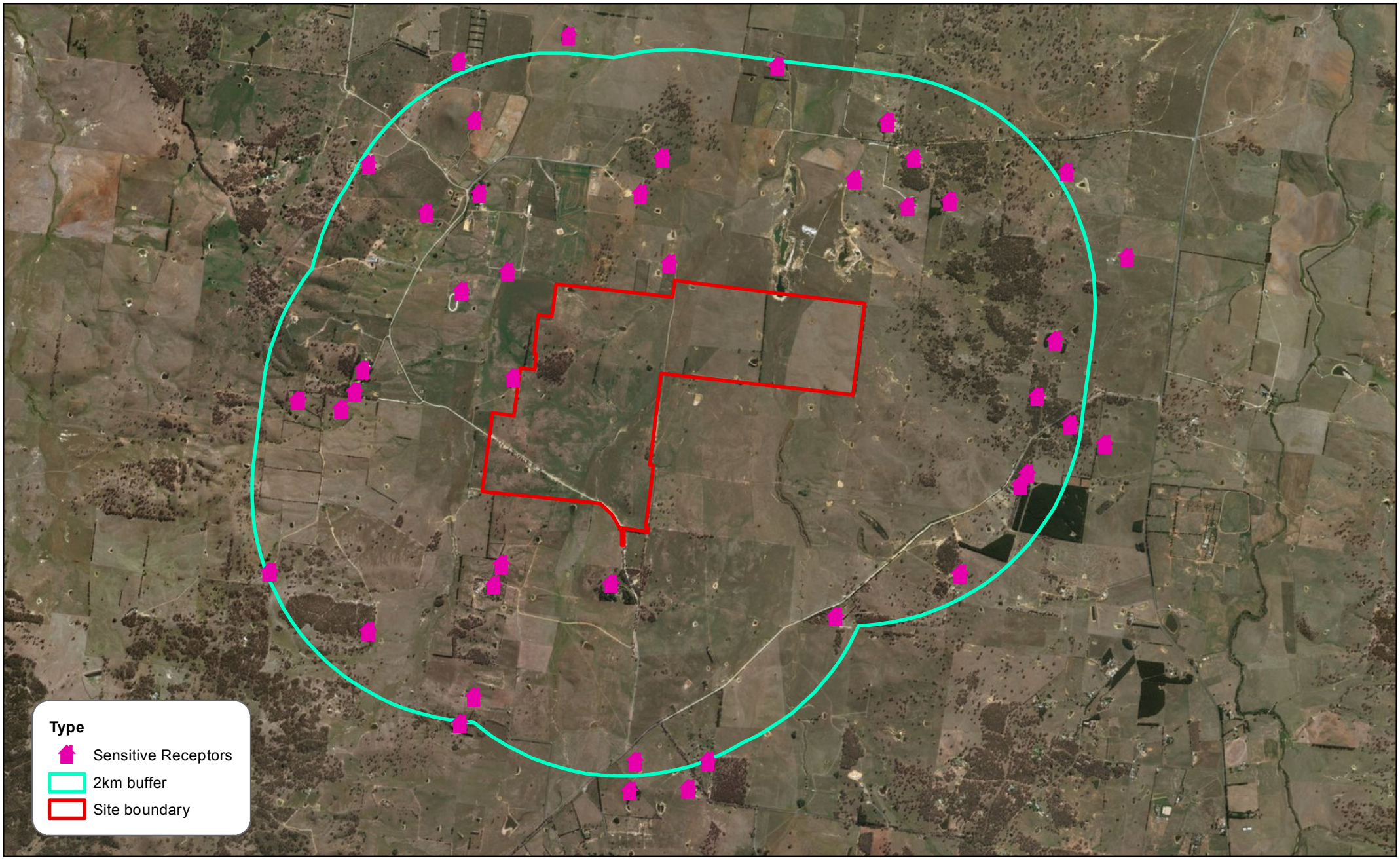
18.0 Air quality

18.1 Existing environment

The air quality within Yass Valley is generally considered to be good. This is due to the area being predominantly agricultural, a dispersed population and absence of major air polluting industries. There is only one facility registered on the National Pollution Inventory (NPI) within the Yass Valley, Boral Hall Quarry (No. 1291) which is located approximately 5 km west of the Site. Existing air pollution sources would be predominantly from agricultural activities and vehicle emissions along local roads.

The project is located in a rural agricultural setting within the Yass Valley where the nearest receptors are the residential dwellings. A total of 34 residential receptors have been identified within a 2 km radius of the Site (refer to Figure 31). The nearest residential dwelling is located approximately 150 m to the north of the Site and the nearest town, Sutton, is located approximately 7 km to the southeast. Excessive dust and air emissions if uncontrolled could potentially adversely affect local residential dwellings in the vicinity, though it should be noted that all unsealed roads in the area already generate dust emissions each time a vehicle travels along them.

For the purposes of assessing the climate and prevailing wind direction at the Site, climate data between 1939 and 2010 from the Bureau of Meteorology's Canberra Airport weather station have been used. The average annual rainfall over that period was 615.4 mm, relatively evenly spread out throughout the year. The average annual 3:00pm wind speed is recorded as 17.3 km/h, predominantly from the North West. Wind speeds are lowest in the autumn from March to May and highest in the spring from August to December.



AECOM Renew estate.

NORTH

0 0.5 1 2 km

SPRINGDALE SOLAR FARM

AIR QUALITY RECEPTORS

DATE 21/03/2018
SCALE 1:43,000
PROJECT 60555008
DRAWN PH

Figure 31 Air quality receptors

18.2 Impact assessment

18.2.1 Construction

During the construction phase, dust would potentially be generated by earthworks activities such as levelling and grading, excavation and trenching, as well as from vehicles movement on unsealed roads during dry weather.. The framework for the solar panels would be attached onto posts that would be driven or screwed into the ground. The main earthworks would be for construction of the internal roads, levelling and grading for the construction of the solar trackers, trenching for cable installation, and levelling the ground for the power conversion stations, substation and the control building. Due to the relatively flat terrain of the Site, there would be no major cut and fill works or significant stockpiling of earth. The existing vegetation would be retained as best practicable throughout the Site. The all-weather internal roads would be laid with gravel.

Air emissions would be generated from vehicles transporting workers to and from the Site, trucks delivering construction materials and construction machinery such as piling rigs, excavators, graders and diesel generators. The emissions would peak during the peak of construction but would be temporary in nature. Emissions are expected to be dispersed by prevailing winds and not significantly impact local air quality.

The construction phase would span for a period of approximately ten months with the earthworks being completed within approximately six months. Taking into consideration the temporary nature of the works and the distance of the nearest residence at 150 m, air quality impacts during the construction phase are not considered to be significant and would be manageable through the CEMP.

18.2.2 Operation

During operation, localised dust would potentially be generated from vehicles travelling on the internal roads for carrying out routine inspection works and maintenance activities. In order to minimise dust generation, all internal access roads would be constructed using a hardstand material. The impacts on local and regional air quality due to dust through the operational phase is expected to be negligible.

During operation, air emissions would be generated from the vehicles of the five to ten workers travelling to the and from the Site each day, periodic operation and maintenance activities, as well as occasional unscheduled repair works. Minor application of pesticides may be required for weed control. The application regime would likely similar to current usage, if not reduced. The air emissions throughout the operation phase are considered negligible.

A key environmental benefit of project is the generation of electricity without the emissions of GHG that would otherwise be generated from conventional thermal power plants using fossil fuels. The reduction in GHG emissions would have a positive impact on climate change and facilitate transition to clean renewable energy in line with NSW government policies and the RET.

18.2.3 Decommissioning

During decommissioning the air quality impacts that would occur would be similar to that during construction. Noting that the decommissioning works would be for a shorter duration, the associated impacts to air quality are not expected to be significant and are can be mitigated employing similar measures as those implemented during construction.

18.3 Mitigation and management measures

Table 58 Air quality mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
A1	The CEMP and DEMP shall include procedures to minimise and mitigate dust generation. The measures shall include: • Use water trucks for dust suppression throughout the construction and decommissioning phases particularly in the vicinity of adjacent residential dwellings. • All disturbed areas shall be re-vegetated as soon as practicable to minimise exposed areas • Vehicle speed limits shall be controlled to minimise dust from vehicle movement	✓		✓
A2	The CEMP and DEMP shall include procedures and best management practices to minimise emissions from vehicles and site machinery used at the project site. This shall include carrying out inspections and maintenance of all vehicles, plant and equipment to ensure they are operating efficiently.	✓		✓

19.0 Cumulative impacts

19.1 Introduction

Cumulative impacts result from the aggregation and interaction of environmental impacts on the same receptor from multiple developments, and may occur concurrently or sequentially. For this project the assessment cumulative impacts has considered any other approved or proposed developments in the area, including but not limited to the approved Collector Wind Farm, the proposed Gunning Solar Farm and existing Tallagandra Pit.

Collector Wind Farm is a 228 MW development located over 800 ha approximately 28 km to the north-east of the Site.

Gunning Solar Farm is proposed to be 316 MW and would be positioned over a site of 500 ha approximately 27 km to the north of the Site.

Tallagandra Pit is a small quarry located immediately to the south of the Site. The quarry is used only intermittently for road base materials.

Based on the impact assessments undertaken in sections 7.0 to 18.0, the key potential cumulative impacts relevant for the SSF project are discussed in the following sections.

19.2 Cumulative impact assessment

19.2.1 Biodiversity

The biodiversity impact assessment for the project addressed potential impacts upon native vegetation generally as well as threatened species and ecological communities. This assessment found that the project would not result in any serious or irreversible impacts. Impacts upon threatened ecological communities were found to not require any offsets. Impacts upon threatened species were found to require the retirement of 48 credits for species credit species.

In developing the project Renew Estate has sought to avoid impacts upon threatened species habitat wherever practicable. This has, for example, included the redesign of the layout of panels and supporting infrastructure away from areas of primary habitat for Golden Sun Moth. Residual land within the boundaries of the Site but outside the development envelope would benefit from the lowered pressure of existing land management activities, potentially leading to enhanced quality and quantity of habitat for this species within the Site.

Mitigation measures would be implemented throughout the Site during construction and operation via a Biodiversity Management Plan.

With regard to mitigation of cumulative impacts on biodiversity, the offsetting mechanism with the Biobanking assessment methodology specifically provides a systematic quantifiable framework of effectively replacing and conserving suitable habitat for impacted endangered communities and species. For the project, 48 credits were recommended to be retired.

The retention of a riparian buffer zone along Back Creek and the unnamed waterway coupled with the Landscaping Plan which includes planting native vegetation for screening, would support local wildlife and have a positive impact on local wildlife populations.

Further to this, there are no known proposed developments within the vicinity of the project that would combine with the project cumulatively in terms of large scale changes to habitat or existing vegetation generally.

19.2.2 Aboriginal heritage

Two avenues for assessing the cumulative impact of the project on Aboriginal heritage can be pursued:

1. A comparison, using the results of AHIMS searches, of the identified Aboriginal archaeological resource of the Site with that of the surrounding region, defined here as an arbitrary 20 x 20 km (400 km^2) area roughly centred on the Site; and
2. The use of existing environmental data sources (e.g., digital land use data and topographic maps) to identify the potential open artefact resource of the study region as a whole.

Known resource

Alongside sites identified within the Site, existing open artefact sites in the study region offer opportunities for future research, conservation and education. Accordingly, it is necessary to quantify the impacts of the proposed development on this joint resource.

As indicated in section 8.3, three open artefact sites would be completely impacted by the proposed development. AHIMS data obtained from OEH on 22 November 2017 indicate that these sites represent 3.8% of the valid extant open artefact resource of the study region, with searches of the AHIMS database returning 79 'Valid' open artefact sites for this search region. While acknowledging the limitations of the AHIMS database with respect to the validity of listed site statuses, on the basis of these data, it seems reasonable to conclude that the loss of these sites would not constitute a significant impact to the known open artefact resource of the region. Consideration of the character of these sites, which have been assessed as being of low scientific significance, provides further support to this assessment as does the observation that the majority of land within this region has not been physically inspected for Aboriginal sites.

Potential resource

AHIMS results only represent a fraction of the likely archaeological resource present within a region, as these results are only representative of land that has been subject to archaeological investigations. Accordingly, an assessment of the *potential* Aboriginal heritage resource of an approximate 20 x 20 km study region centred on the Site is also a useful guide. For the present analysis, land use data (dated 2017) obtained from the Land Assessment Unit at OEH was utilised (Table 59).

As a starting point, it is necessary to quantify the amount of land within the study region that has the *potential* to retain to open artefact sites. A basic assumption here is that grossly disturbed terrain is unlikely to retain such sites whereas non-grossly disturbed terrain does, both in surface and subsurface contexts. Analysis of available digital land use data for the study region is summarised in Table 59. This analysis indicates that grossly modified or disturbed terrain (e.g., urban and industrial

areas) accounts for approximately 27.5% of land within the region. Outside of grossly disturbed areas, fully to semi-cleared grazing land is particularly well represented, accounting for approximately 68.2% of land within the region and tree and shrub cover c.3.1%. Horticultural land is comparatively poorly represented at 0.2%. Areas specifically reserved for conservation meanwhile, account for approximately 0.7% of land within the region.

Table 59 Land use analysis for study region (20 x 20 km)

Existing Land Use	Hectares	%	Archaeological Potential?
Conservation Area	273.1	0.7	Yes
Cropping	103.9	0.3	Yes
Grazing	27,260.8	68.2	Yes
Horticulture	63.2	0.2	Yes
Intensive Animal Production	199.2	0.5	No
Mining & Quarrying	50	0.1	No
Other	6,650	16.6	No
River & Drainage System	228	0.6	No
Special Category	270	0.7	No
Transport & Other Corridors	998.4	2.5	No
Tree and Shrub Cover	1,244.3	3.1	Yes
Urban	2,655.7	6.5	No
Total	**39,996.6**	**100**	

Source: NSW Landuse Data 2013 for Sydney region obtained from OEH.

Viewed from an Aboriginal archaeological perspective, the results of the land use analysis presented in Table 59 suggest that approximately 72.5% of the study region (*c*.28,945 ha) can reasonably be considered to comprise a *potential open artefact resource*. As indicated, land upon which open artefact deposits are unlikely to survive accounts for just over 27.5% of land within the region. This figure increases to 95.5% if agricultural and grazing land is included. However, as indicated by the results of numerous Aboriginal archaeological investigations, both within and outside of the study region, cropped and grazed areas can and frequently do retain significant surface and subsurface stone artefact records. It can, therefore, be concluded that around 72.5% of land within the study region has the potential to retain open artefact deposits in surface and subsurface contexts. While acknowledging the fact that the nature and distribution of such deposits would vary markedly in relation to environmental variables such as landform and the availability of potable water, analysis of available land use data does help to quantify the extent of the region's potential Aboriginal open artefact resource. Moreover, it provides a basis from which assess the cumulative impact of the proposed development on this resource.

In order to quantify the impact of the proposed development on the potential open artefact resource of the study region it is necessary to compare the amount of impacted land within the Site that could be considered a potential open artefact resource (i.e., 190 ha) with that available in the search area (i.e., 28,945 ha). On this basis, it can be stated that the project would result in an approximate 0.7% decline in the region's potential open artefact resource (assuming total impact of the Site). As such, it can be concluded that the impact of the project on the potential Aboriginal archaeological resource of the region would be low.

With regards to the existence, outside of the Site, of environmental contexts that have the potential to contain sites comparable to those identified within it, an examination of relevant topographic maps for the study region indicates that many such contexts exist including unmodified sections of Back Creek, Spring Flat Creek and Yass River. On the basis of this evidence, it can be confidently concluded that land outside of the current Site but within the wider region contains a significant, as yet unidentified, open artefact site resource.

19.2.3 Landscape and visual impacts

Noting that there are no other solar or wind farms or large scale developments visible from the Site, there are no cumulative visual impacts. The mitigation and management measures proposed in section 9.4 which include planting screening trees at strategic locations as part of the Landscaping Plan would minimise visual impacts to adjacent residents.

19.2.4 Water

This EIS has considered the impact of the construction and operation of the project upon local and regional water resources, including surface water, flooding, groundwater, riparian land and water supply. For each of these factors the assessment indicated that the residual impact of the project would be negligible to minor providing the proposed mitigation and management measures are implemented. This, combined with the absence of other large scale developments in the vicinity of the project indicates that the potential for adverse cumulative impacts would be negligible.

19.2.5 Land

This EIS has considered the impact of the construction and operation of the project upon soils, landform, contamination and erosion potential. For each of these factors the assessment indicated that the residual impact of the project would be negligible to minor providing the proposed mitigation and management measures are implemented. This, combined with the absence of other large scale developments in the vicinity of the project indicates that the potential for adverse cumulative impacts would be negligible.

19.2.6 Noise and vibration

During construction, noise would be predominantly generated from site establishment, piling works and solar array assembly, construction stages, on-site of which are all temporary in nature. Noting that the Site is at a rural agricultural area and that there are no other known large scale developments or development proposals in the surrounding area, cumulative noise impacts are not assessed to be an issue of concern during the construction phase.

The predicted noise levels from the operation of the project comply with the most stringent operational noise criteria at all residential receivers. This, coupled with the lack of other large scale developments in the surrounding area indicates that there would not any cumulative operational noise impacts associated with the project.

19.2.7 Non-Aboriginal heritage

No historic heritage values have been identified within the Site or directly adjacent to it. As such, no impacts to historic heritage items, places or values are anticipated, including views and vistas from the historic villages of Gundaroo and Sutton. As such there would be no cumulative impacts upon non-Aboriginal heritage.

19.2.8 Traffic and transport

During the peak of the construction phase, the increase in traffic due to delivery of materials, machinery and equipment as well as workers commuting to and from the worksite would add around 400 light vehicle movements per day and up to 75 heavy vehicle movements per day to local roads, particularly Tallagandra Lane.

This traffic volume and associated impacts upon the local road network and users, are temporary in nature. This would include minor impacts upon nearby towns such as Sutton through which a portion of the construction traffic would travel. With the implementation of a Traffic Management Plan for the project, residual impacts are considered to be minor and given the lack of large-scale developments in this locality the potential for cumulative impacts during construction are considered to be negligible.

During operation the volume of light and heavy vehicles would be substantially lower – in the order of 20 light vehicle movements per day and only occasional heavy vehicle movements. The potential for cumulative impacts during this phase of the project is considered to be negligible.

19.2.9 Hazards

Bushfire

The bushfire risk presented by the project has been assessed to be low and highly manageable throughout construction and operation. Presuming the proposed mitigation measures are implemented the overall potential for the project to contribute to cumulative bushfire risk alongside other large nearby proposals and activities (such as Tallagandra Pit, Collector Wind Farm and the Gunning Solar Farm) is considered to be very low.

Electromagnetic fields

The electromagnetic field assessment indicates that the magnetic fields generated by the solar farm itself would be compliant for members of the public adjacent to the boundary fence. The electrical elements of the solar farm would also be compliant for members of the public at the nearest boundary fence. On this basis there would be no exceedance for any adjacent residential property.

When considered alongside other proposed power generation projects such as the Collector Wind Farm and the Gunning Solar Farm it is deemed that there would be no potential for cumulative EMF impacts to occur.

Aviation

The aviation assessment presented in section 15.3 of this EIS indicates that the glint and glare impact of the solar farm upon local aviation (primarily related to movements into and out of Canberra airport, 19 km to the south) would not be significant. When considered alongside other projects such as the Collector Wind Farm and the Gunning Solar Farm the potential for cumulative impact to aviation is deemed to be negligible.

19.2.10 Socio-economics

During construction the project would result in both positive and negative impacts upon the socioeconomic environment of the area. Given the lack of large scale development proposals in the vicinity of the project, and the general abundance of suppliers, accommodation and workers nearby in the ACT, it is not expected that the project would result in significant adverse socio-economic impacts.

Once operation the project would also result in a reduction in agricultural productivity and changes to visual amenity. These impacts are considered to be minor overall. In the context of the lack of other large scale developments in the nearby area cumulative impacts are considered to be negligible.

19.2.11 Waste

During construction the project is likely to generate waste from excess construction materials, removal of vegetation, aggregates for roads, packaging materials, office waste and sewage. All such waste would be collected, handled, stored, transported, recycled and/ or disposed in compliance with relevant requirements and guidelines. Solid waste would be collected and likely disposed at the Gundaroo landfill operated by YVC.

During operation waste would generally be restricted to office and food waste, waste from maintenance activities and sewage.

There are no other large-scale developments within the region that are expected to place pressure upon the ability of surrounding landfills or other treatment facilities to accept or process waste generate by the project. On this basis the potential for cumulative impacts with respect to waste are expected to be negligible.

19.2.12 Air quality

Construction the project would generate impacts upon air quality through emissions from project vehicles and equipment, as well as dust generated from construction activities and movement of vehicles. These impacts are not considered to be significant.

During operation air quality impacts would be associated with the movement of project vehicles (emissions and dust) and potentially minor applications of pesticides. These impacts are not considered to be significant.

During operation the project would generate electricity without the need to burn fossil fuels. This would result in an overall positive cumulative impact for air quality in the local area and across NSW generally.

In the absence of other large development proposals in the area it is considered that the overall potential for adverse cumulative impacts to arise from the project are negligible.

19.2.13 Renewal energy targets

The SSF project would add 100 MW of renewable energy to the energy mix in NSW. This would reduce dependence on fossil fuels and form part of renewable energy initiatives in NSW which contribute towards NSW policy objectives and the RET.

20.0 Summary of management and mitigation measures

Table 60 Combined mitigation measures

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	Biodiversity			
B1	Implementation of a Biodiversity Management Plan to include the following mitigation measures.	✓	✓	
B2	Establishment of fenced buffer areas (nominally a 50 m buffer) around retained GSM habitat outside of the development envelope, with fencing maintained throughout the construction phase of the project.	✓		
B3	Establishment of a GSM habitat conservation zone measuring approximately 60 hectares throughout the western portion of the Site (see Figure 15 for an indicative layout).	✓	✓	
B4	Management of GSM habitat within the GSM conservation area via implementation of a GSM Management Plan to maintain preferred ground cover conditions for the species via careful management of stocking rates and/or use of slashing.	✓	✓	
B5	All Site fencing should be specified allow passage of adult GSM throughout the Site.		✓	
B6	Discontinuation of pasture improvement practices such as the use of fertilisers and sowing of pasture within the GSM conservation zone and throughout all solar fields.	✓	✓	
B7	Stocking rates should be reduced within the Site after completion of construction.		✓	
B8	Rehabilitate disturbed areas with locally sourced Wallaby and Speargrasses in the GSM conservation area and in the development envelope.	✓	✓	
B9	Within the GSM conservation area, maintain tussock level between 3 and 15 cm with regulated grazing, with short height achieved by October before the GSM flying period, and lighter grazing from November to January if season is dry. Some areas may occasionally need slashing if grazing doesn't produce the desired conditions in GSM conservation zone.	✓	✓	
B10	Implementation of pest and weed prevention and management measures within the Site including the continued control of broad-leaved weeds in GSM conservation zone and in the development envelope.	✓	✓	
B11	Avoid creating unnecessary shading or barriers to GSM movement with landscaping or structures.	✓	✓	
B12	All landscaping should be sited so as to avoid or minimise occupation or shading of mapped GSM habitat.	✓	✓	

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
B13	Establishment and ongoing maintenance of a woodland enhancement zone for woodland areas in the west of the Site (see Figure 15).	✓	✓	
B14	Pre-clearing inspections for Superb Parrot would occur immediately prior to, and during the breeding season prior to, removal of hollow bearing trees to ensure the absence of roosting/breeding individuals.	✓	✓	
B15	If clearing is required during the Superb Parrot breeding season, any potential breeding trees will be surveyed for breeding parrots with individuals excluded from hollows and eggs/chicks removed prior to clearing. An appropriately qualified ecologist and wildlife carer will be arranged to care for any chicks or eggs that are removed from trees	✓		
B16	Any native vertebrate fauna present within hollow trees should be managed to minimise the risk of mortality or injury. Tree clearing would be undertaken in accordance with recognised best practice principles.	✓		
B17	Installation of nest boxes within or immediately adjacent to the Site specifically for Superb Parrots within preferred breeding trees that do not already contain hollows. The number of nest boxes should be at least twice that of the existing number of hollows appropriate for Superb Parrot breeding that are to be removed by the project as determined via a final survey of hollow trees prior to clearing. A nest box management subplan is to be included within the BMP which will outline commitments to manage the nest boxes throughout the life of the project.	✓	✓	
B18	Landscape planting should preference endemic tree and shrub species to compensate for loss of foraging habitat due to the removal of trees.		✓	
B19	Vehicles should remain on designated roads and tracks whenever practicable. Signposting and driver education during the induction process and in ongoing project discussions should be implemented.	✓	✓	
B20	Establishment and regular maintenance of erosion and sediment controls during construction and until disturbed areas are vegetated.	✓	✓	
B21	Appropriate on-site management and removal of all rubbish from the Site.	✓	✓	
	Aboriginal heritage			
AH1	Further avoid and/or minimise impacts to identified Aboriginal heritage sites at the detailed design stage as best practicable.	✓		
AH2	Preparation of a detailed Aboriginal Cultural Heritage Management Plan (ACHMP) for the project in consultation with RAPs and to the satisfaction of OEH and DP&I. The ACHMP shall include a strategy for the management of known and potential Aboriginal heritage resource as well as identified cultural values. The ACHMP should contain procedures for consultation and involvement of RAPs in the management of Aboriginal cultural heritage	✓		

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	values within the Site. In addition, the ACHMP would include details of proposed mitigation and management strategies of all Aboriginal sites, procedures for the identification and management of previously unrecorded sites, details of an appropriate long term management for any Aboriginal objects salvaged, details of an Aboriginal cultural heritage awareness program for all contractors and personnel associated with construction activities and compliance procedures. The key elements of the ACHMP are: • Archaeological salvage programme • Conservation of non-impacted sites • Aboriginal cultural heritage awareness training • Management of any previously unrecorded archaeological evidence identified during operation • Management of potential human remains in the event of discovery during the life of the project • AHIMS site cards • Aboriginal site database The above elements are detailed further in the following mitigation and management measures.			
AH3	Undertake a comprehensive archaeological salvage programme prior to ground disturbance which incorporates: • Surface collection of the three impacted open artefact sites (i.e., SSF-IA1-17, SSF-AS2-17, and SSF-AS4-17) of low scientific significance. • A landscape-based program of archaeological excavation across selected areas of low and high Aboriginal archaeological sensitivity within the Site, as determined through consultation with RAPs. All archaeological salvage works should be undertaken by a combined field team of archaeologists and RAP field representatives. Post-salvage work for the surface collection and excavation components of the archaeological salvage program should, at minimum, include: • The analysis and cataloguing of all recovered Aboriginal objects (e.g., stone artefacts, hearth stones) by a suitably qualified person or persons • The submission, where deemed appropriate by a qualified archaeologist and/or geomorphologist, of excavated charcoal samples for conventional or Accelerator Mass Spectrometry (AMS) radiocarbon dating • The submission, where deemed appropriate by a qualified geomorphologist, of excavated sediment samples for Optically	✓		

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	Stimulated Luminescence (OSL) dating • The submission, where deemed appropriate by a qualified archaeologist, of a selection of stone artefacts for functional use-wear/residue analysis; and • The submission, where deemed appropriate by a qualified archaeologist, of a selection of non-artefactual rock samples to a qualified geologist for the purposes of raw material identification. The ACHMP for the project should include a detailed research design for the surface collection and excavation components of the salvage program. All Aboriginal objects salvaged as part of the archaeological salvage program should be curated in an appropriate manner, as determined through consultation with RAPs, OEH and DP&I during preparation of the ACHMP. Temporary off-site storage of salvaged objects should be allowed for the purposes of analysis and recording. Aboriginal Site Impact Recording (ASIR) forms for all salvaged sites should be submitted to OEH at the completion of the salvage program.			
AH4	All Aboriginal sites not impacted by the project but within the Site should be conserved *in-situ* (i.e.:SSF-IA2-17, SSF-IA3-17, SSF-IA4-17, SSF-AS1-17, SSF-AS3-17, SSF-AS5-17, SSF-AS6-17, SSF-AS7-17, SF-AS8-18, SSF-ST1-17, SSF-ST2-17, SSF-ST3-17). Potential scarred tree sites should be protected via permanent stock-proof fencing and appropriate associated signage. Site fencing is to be erected after consultation with a qualified archaeologist and RAP representatives. All relevant staff and contractors are to be made aware of the nature and locations of all sites as well as Renew Estate's legal obligations with respect to them. Protected sites would need to be identified on all relevant site plans. Details for the care of protected sites should be incorporated into the ACHMP.	✓		
AH5	An Aboriginal cultural heritage awareness training package should be developed in consultation with RAPs for use throughout the life of the project, and completed prior to the commencement any ground disturbance works. The training programme shall cover: • Maintaining a register of all persons who completed the training throughout the life of the project. • Training should be mandatory for all staff and contractors whose roles may reasonably bring them into contact with Aboriginal sites and/or involve consultation with local Aboriginal community members. Training should also be offered on a voluntary basis to all other staff and contractors. All standard site inductions should include an Aboriginal cultural heritage component. At a minimum, this should outline current protocols and responsibilities with respect to the management of Aboriginal cultural heritage within the Site, provide an overview of the	✓	✓	✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	diagnostic features of potential Aboriginal site types (e.g., scarred trees) and procedures for reporting the identification of Aboriginal archaeological sites.			
AH6	Provisions regarding the appropriate management action(s) for previously unrecorded Aboriginal archaeological evidence identified within the Site throughout the operational life of the project should be incorporated into the ACHMP. Management action(s) should vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts.	✓	✓	✓
AH7	In the event that potential human skeletal remains are identified within the Site at any point during the life of the project, the following standard procedure (New South Wales Police Force 2015; NSW Health 2008) should be followed. • All work in the vicinity of the remains should cease immediately; • The location should be cordoned off and the NSW Police notified. • If the Police suspect the remains are Aboriginal, they would contact the OEH and arrange for a forensic anthropologist or archaeological expert to examine the Site. Subsequent management actions would be dependent on the findings of the inspection undertaken under Point 3. • If the remains are identified as modern and human, the area would become a crime scene under the jurisdiction of the NSW Police; • If the remains are identified as pre-contact or historic Aboriginal, OEH and all RAPs are to be formally notified in writing. Where impacts to exposed Aboriginal skeletal remains cannot be avoided an appropriate management mitigation strategy would be developed in consultation with OEH and RAPs; • If the remains are identified as historic non-Aboriginal, the Site is to be secured and the NSW Heritage Division contacted; and • If the remains are identified as non-human, work can recommence immediately.	✓	✓	✓
AH8	AHIMS sites cards shall be completed and submitted to OEH: • for all newly recorded sites within the Site at the completion of the assessment. • in the event that a previously unidentified Aboriginal site is discovered within the Site at any point during the operational life of the project, as promptly as possible. in accordance to timing protocols the are included in the ACHMP.	✓	✓	
AH9	Establish a comprehensive Aboriginal site database for the Site upon commencement of the project which would, at a minimum, contain the	✓	✓	✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	name, type, size (where applicable), MGA coordinates and status of all Aboriginal sites within and directly adjacent to the Site. The database should be regularly updated throughout the operational life of project. Printed site lists and maps should be made available to RAPs upon request.			
AH10	Continued communication with the RAPs for the SSF project should be carried out. RAPs should be informed of any major changes the project design or extension, further investigations or finds.	✓	✓	
	Landscape and visual			
V1	The following would be further considered as part of the detailed design of the project: • refinement in the design and layout which may assist in the mitigation of bulk and height of proposed structures • a review of materials and colour finishes for selected components in keeping with the surrounding landscape including the use of non-reflective finishes to structures.	✓		
V2	Finalise the draft Landscape Plan (Appendix A of the LVIA) in consultation with the most affected visual receptors and other stakeholders, and implement this plan during construction.	✓		
V3	The following would be implemented during construction as far as practicable: • minimise tree removal where possible • avoidance of temporary light spill beyond the construction site where temporary lighting is required • rehabilitation of disturbed areas • protection of endemic vegetation within the project where retained.	✓		✓
V4	The following would be implemented during operation as far as practicable: • ongoing maintenance and repair of constructed elements long term maintenance of screen planting to maintain visual filtering and screening of external views where appropriate.		✓	
	Water			
W1	Prepare and Erosion and Sediment Control Plan (ESCP) in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). This plan would be implemented in advance of site disturbance and be updated as required as work progresses. The ESCP would include, at minimum, the following provisions: • install erosion and sediment controls prior to and during	✓		✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	construction • regularly inspect and maintain erosion and sediment controls, particularly following large rainfall/wind events • ensure vehicles, plant and equipment leave the Site in a clean condition to minimise mobilisation of sediment onto adjacent roads • soil handling and stockpiling procedures • identify exclusion zones to limit disturbance • stabilise and rehabilitate disturbed areas as soon as practicable • procedures for the testing, treatment and discharge of construction waste water to be established and implemented where appropriate.			
W2	Prepare a CEMP that ensures: • All retained farm dams and associated drainage infrastructure to be maintained in a functional condition • Incidental spills would be intercepted by active spill management practices • Storage of hazardous materials such as oils, chemicals and refuelling activities would occur in bunded areas • All works within waterfront land (as defined in the WM Act) to be undertaken in accordance with the Controlled Activities on Waterfront Land guidelines (DPI 2012). • Procedures for the testing, treatment and discharge of construction waste water to be established and implemented where appropriate. • Groundcover to be re-established as soon as practicable on disturbed areas • Installation of any permanent scour protection measures required for the operational phase as soon as practicable • All construction staff to be engaged through toolbox talks or similar with appropriate training on water management practices • All water required for site activities during construction and operation to be imported to site. • Flood impacts would be managed by locating temporary site compounds, stockpiles and storage areas outside the 1% AEP flood extent where practicable.	✓		
W3	Prepare an O&M Plan for the operational phase that covers: • Standard operating procedures for chemical storage and use, and		✓	

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	emergency spill management • Conducting toolbox talks or training on water management practices • Groundcover to be maintained between and under all solar panel arrays			
W4	Potential operational flood impacts would be dealt with as part of the design including: • The substation would be located outside the 1% AEP flood extent • The control building would be set outside 1% AEP flood depths of >0.25m, which is the maximum depth beyond which is deemed by Renew Estate as an unacceptable risk • Solar arrays would be set outside 1% AEP flood depths of >0.4m, which is the maximum depth beyond which is deemed by Renew Estate as an unacceptable risk to the asset • Access roads required within the 1% AEP flood extent would be constructed close to existing ground levels where practicable	✓		
	Land			
L1	Preparation of a CEMP that incorporate the following measures: • A site access protocol that lists relevant landholder's contact details and includes measures to minimise adverse impacts, such as driving carefully to minimise disturbance to surrounding livestock, crops and pastures and minimising dust generation. • The timing of construction activities • An unexpected finds protocol for the event that any contamination is discovered during construction works. • The location of any temporary access roads to minimise the impacts to neighbouring agricultural activities and soils • Incorporation of pest and weed management measures in the Biodiversity Management Plan including measures for identification, management and ongoing monitoring of weeds on the Site. • A spill response plan to be implemented during both construction and operation to reduce the potential for contamination. The plan shall include: - Management of any potential contaminants on-site - Mitigate and manage soil contamination by fuels, lubricants or other chemicals in accordance with EPA protocols - Prevent contaminants affecting waterways, dams and adjacent pasture.	✓		✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
L2	Preparation of an Erosion and Sediment Control Plan (ESCP) in accordance with the *Managing Urban Stormwater: Soils & Construction* (Landcom 2004) (Blue Book) that include provisions to: • Install erosion and sediment controls (if required) prior to and during construction • Regularly inspect erosion and sediment controls, particularity following large wind or rainfall events • Minimise tracking of sediment from vehicles, plant and equipment on to surrounding roads • During excavation, separate topsoils and subsoils to ensure they are replaced in their natural configuration. • Stockpile topsoil appropriately to minimise weed infestation and maintain soil organic matter, soil structure and microbial activity • Minimise the total area of disturbance from excavation and compaction • Groundcover to be re-established as soon as practicable on disturbed areas • Further soil management measures to ensure the future viability of the Site for agricultural production, including guidance on: - Optimisation and recovery of useable subsoil and topsoil - Establishment of effective soil amelioration procedures - Separate storage of topsoil and subsoil to ensure that soil is replaced in the right order to avoid unnecessary impact on soil and the existing vegetation structure. - Where disturbance or stripping of soil is required, an ameliorant such as gypsum could be applied to manage soil sodicity and provide for effective rehabilitation outcomes.	✓		✓
L3	Preparation and implementation of an OEMP to reduce the impact of the proposed project on: • Land and soil capability within the Site • Neighbouring agricultural operations • Regional biosecurity (pest and weed management) • Erosion The OEMP would cover: • Sheep grazing as a means of vegetation maintenance and weed control throughout the life of the project • Restricting vehicle movements to formed access tracks. • Retaining ground cover beneath the PV solar panels to manage		✓	

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	erosion, weed infestation and surface water runoff. • Procedures for waste materials to be removed from the Site regularly and the Site kept in a clean and orderly condition in order to deter potential pest animals. • A targeted pest management program (as necessary).			
L4	Rehabilitation of the Site to its original condition as best practicable following decommissioning			✓
	Noise and vibration			
NV1	Prepare a Noise Management Plan that specifies: • Appropriate plant and equipment should be selected for each task to minimise the noise contributions • Turn off plant that is not being used where practicable • Ensure plant is regularly maintained, and repair or replace equipment that becomes more noisy • Noisier activities to be scheduled during less noise sensitive periods • Use non-tonal reversing alarms where practicable • Wherever feasible, turning circles should be created at the end points of vehicle work legs, which should allow trucks to turn and avoid the need for reversing Emphasis should be placed during driver training and site induction sessions on the potential adverse impact of reversing alarms and the need to minimise their use.	✓		✓
NV2	Consider using bored piling for construction works where practicable	✓		
NV3	Incorporate barriers, attenuators, acoustic louvres and mufflers as best practicable.	✓		✓
NV4	Inverters to be selected with maximum sound power levels of less than 92 dB(A) with no tonal characteristics, if practicable. Inverters would be located as far as practicable from residential dwellings.	✓	✓	
NV5	Inverters identified as requiring noise mitigation in Appendix B of the Noise and Vibration Impact Assessment (Appendix G of this EIS) should utilise a 2 m high, three sided “horse-shoe” shaped noise walls. The noise walls should be orientated with the open side facing away from the nearest noise sensitive receivers.	✓	✓	
	Non-Aboriginal Heritage			
HH1	In the event that unexpected historic finds are identified during construction, all works should immediately cease. The following procedure guides the management of unexpected and previously unidentified finds during the course of operations. Finds includes artefact scatters (glass, animal bone, ceramic, brick, metal, etc.),	✓		

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	building foundations and earthworks of unknown origin. The procedures are: • All work in the area is to cease immediately • Alert the Project Manager to the find • If necessary, protect the area with fencing • Engage a suitably qualified archaeologist to undertake an assessment of the find/s • The assessment should be undertaken using the guidelines *Assessing Significance for Historical Archaeological Sites and 'Relics'* (NSW Heritage Branch, 2009) • On the advice of the archaeologist, if necessary, prepare an Impact Assessment and Research design and methodology to submit to the Heritage Branch • Undertake the archaeological mitigation in accordance with the prepared documents and the permit/exception issued by the Heritage Branch; and Once the Site has been mitigated to the satisfaction of the archaeologist and the Heritage Branch, works may resume in the area.			
HH2	In the event of discovery of human remains the following procedure shall be implemented: • All work in the vicinity of the remains should cease immediately • The location should be cordoned off and the NSW Police notified • If the Police suspect the remains are Aboriginal, they would contact the Office of Environment and Heritage and arrange for a forensic anthropologist or archaeological expert to examine the Site and implement mitigation measure AH7. • If the remains are identified as modern and human, the area would become a crime scene under the jurisdiction of the NSW Police • If the remains are identified as historic non-Aboriginal, the Site is to be secured and the NSW Heritage Division contacted; and If the remains are identified as non-human, work can recommence immediately.	✓		

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	Traffic and transport			
T1	Preparation of a Traffic Management Plan in consultation with the YVC, RMS and other authorities prior to construction that covers: • Programmes for monitoring road traffic conditions, to repair damage exacerbated by construction traffic • The designated routes of construction traffic to the Site • Carpooling. Shuttle bus arrangements to minimise vehicle numbers throughout construction and decommissioning • Consideration for cumulative impacts with any nearby developments • Scheduling delivery of major components where possible to minimise safety risks to other road users including avoiding major deliveries during school pick-up and drop-off times • Temporary traffic controls such as signage, speed restrictions and traffic safety flagmen as necessary to ensure safety of all road users and the public. Procedure for monitoring traffic impacts and adapting controls to minimise impacts traffic risks.	✓		✓
T2	Implementation of a communication and consultation strategy with stakeholders including RMS, emergency services, local stakeholders (landholders and business owners) regarding changes to roads uses during construction and decommissioning. RMS and YVC should also be consulted on the access route, particularly regarding the delivery of the transformer to the Site.	✓		✓
T3	Implementation of a complaints management system as part of the CEMP to ensure any community concerns regarding traffic are addressed effectively and promptly.	✓	✓	✓
	Bushfire			
BF1	A Bushfire Management Plan would be developed covering all phases of the development. This plan would outline relevant protocols, practices and other measures to minimise the risk of bushfire and to outline appropriate emergency actions should one occur.	✓	✓	✓
BF2	All electrical equipment would be designed in accordance to applicable ANZ engineering design standards, industry codes and best practice standards. Installation, operation and maintenance work shall be carried out by competent persons.	✓		
BF3	Buildings would be designed to comply with the national Construction Code (formerly the Building Code of Australia).	✓		
BF4	Safety management processes/ system covering: • Induction training to all personnel and contractors on fire risk, do's and don't's, prevention and emergency response	✓	✓	✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	• Safety hazards including bushfire and control measures • Preparation and implementation of job specific SWMS • Emergency preparedness and response • Policies and procedures to control hot works, prohibition of smoking on-site, fuel storage, use of flammable materials and use of machinery and vehicles.			
BF5	Implement a Hot Work Permit system that would ensure: • hot works are restricted to the maintenance workshop as best practicable • stringent control of all hot works (cutting, grinding, welding, etc.), by prescribing pre-requisites and implementing specific control measures • fire extinguishers would be made available during all hot works. • effective implementation by all parties including contractors throughout the life of the project.	✓	✓	✓
BF6	Designating a site safety management representative on-site who would: • be responsible for implementation of safety requirements, mitigation and management measures and emergency response procedures related to bushfires • consult with the local RFS regarding bushfire management requirements • be the point of contact onsite to assist RFS and emergency services if there is a fire on-site.	✓	✓	✓
BF7	Effective communication to ensure fire incidents are communicated quickly including: • use of mobile phones, with emergency communication contacts on a speed dial • use of two way radio • Fire Danger Warning signs located at the entrance to the Site • Signs clearly showing locations of onsite SWMS and fire access tracks	✓	✓	✓
BF8	Slashing of vegetation prior to construction activities and to maintain fuel loads.	✓	✓	
BF9	Grazing by sheep stocked at suitable levels so as to maintain a low level of vegetation whilst minimising erosion throughout the lifespan of the project.	✓	✓	
BF10	The NSW RFS be provided with a contact for the SSF project, during	✓	✓	✓

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
	construction and operation.			
BF11	Maintain access and egress roads to the Site free from being blocked by parked vehicles or other items so as to be readily accessible by emergency services at all times and prevent entrapment of personnel in the event of a bushfire.	✓	✓	✓
BF12	Training for personnel covering fire prevention, using fire extinguishers and emergency response procedures/ drills.	✓	✓	✓
BF13	Seek 'mutual assistance' agreement with local property owners to use dams as water sources in the event of an emergency.	✓	✓	✓
BF14	Suitable and adequate emergency response equipment shall be provided and maintained on-site during the construction of the project. This would include fire extinguishers and 20,000 litre static water supply that would be installed at the early part of the construction phase and maintained throughout the life of the project. Equipment lists shall be detailed in the SWMS, Bushfire Management Plan and hot work permits.	✓	✓	✓
	Electromagnetic fields			
E1	All electrical equipment would be designed in accordance to ANZ engineering design specification, industry codes and best practice standards. Installation, operation and maintenance work shall be carried out by competent persons.	✓		
E2	All relevant TransGrid and other procedures in relation to high voltage installation and operation would be adhered to throughout the life of the project. Public access to the Site would be restricted throughout the life of the project and all power stations, the substation and switchyard would be kept locked.	✓	✓	
	Socio-economics			
S1	The project would aim to give preference to local workers and suppliers of construction materials and equipment where practicable.	✓	✓	

No	Mitigation and Management Measures	Construction	Operation	Decommissioning
S2	Community consultation would be undertaken in accordance to the Community and Stakeholder Consultation Plan which shall include communication with local communities and stakeholders: • to provide updated information regarding the project, including information regarding the project's program and proposed construction activities, potential impacts to nearby sensitive receivers and potential changes to local traffic conditions • provide information regarding employment and business opportunities; and • as a channel to receive queries, complaints and grievances.	✓	✓	✓
	Waste			
W1	A Waste Management Plan which identifies all waste streams and specifies management measures covering collection, handling, transportation, recycling and disposal would be incorporated in the CEMP. An environmental audit shall be carried out at the completion of the construction stage to verify all waste has been properly disposed prior to the final payment being released to the contractor(s).	✓		✓
W2	A waste management policy/ procedure/ plan shall be developed and implemented to ensure compliance to waste management legislative requirements, guidelines and best management practices throughout the operation and decommissioning phases. All waste shall be collected, properly stored and recycled or disposed at facilities licensed by the local council.		✓	
	Air Quality			
A1	The CEMP and DEMP shall include procedures to minimise and mitigate dust generation. The measures shall include: • Use water trucks for dust suppression throughout the construction and decommissioning phases particularly in the vicinity of adjacent residential dwellings. • All disturbed areas shall be re-vegetated as soon as practicable to minimise exposed areas • Vehicle speed limits shall be controlled to minimise dust from vehicle movement	✓		✓
A2	The CEMP and DEMP shall include procedures and best management practices to minimise emissions from vehicles and site machinery used at the project site. This shall include carrying out inspections and maintenance of all vehicles, plant and equipment to ensure they are operating efficiently.	✓		✓

21.0 Project justification and conclusion

This chapter outlines the justification for the proposed project given the likely impacts along with the environment and community along with the relevant legislative requirements.

21.1 Ecologically sustainable development

An objective of the EP&A Act is Ecologically Sustainable Development (ESD). Section 7 (1(f)) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) requires proponents to include in the EIS the reasons justifying the development including the principles of ESD. Section 7(4) of Schedule 2 of the EP&A Regulation defines the principles of ESD as follows:

a. *The **precautionary principle**, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*
    i. *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
    ii. *an assessment of the risk-weighted consequences of various options,*
b. ***inter-generational equity**, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*
c. ***conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
d. ***improved valuation, pricing and incentive mechanisms**, namely, that environmental factors should be included in the valuation of assets and services, such as:*
    i. *polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*
    ii. *the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,*
    iii. *environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

21.1.1 Precautionary principle

he Precautionary Principle states that if there are threats of serious of irreversible environmental damage the lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

This EIS has been prepared by experts in their respective fields and has identified and assessed the potential environmental impacts. Where there has been any uncertainty in the prediction of impacts through the EIS process, a conservative approach was adopted to ensure the worst case scenario was predicted in the assessment of impacts. In response, appropriate mitigation and management measures have been developed to minimise potential environmental impact. Taking these measures into account, it is considered that there would be no threat of serious or irreversible damage to the environment as a result of the project.

21.1.2 Intergenerational equity

Intergenerational Equity is centred on the concept that the present generation should ensure the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. There is a moral obligation to ensure the current progress benefiting current and future generations is not offset by environmental degradation.

This EIS has assessed the type and extent of potential impacts caused by this project. The project incorporates a range of design, mitigation and management measures to minimise potential impacts on the environment. These measures aim to maintain the environmental conditions within and surrounding the project such that detrimental impacts do not affect the future health, diversity and productivity of the environment.

21.1.3 Conservation of biological diversity and ecological integrity

Biological diversity refers to the diversity of genes, species, populations, communities and ecosystems along with the linkages between them. Maintaining biological diversity is critical in safeguarding life support functions and can be considered a minimum requirement in maintaining ecological integrity.

A detailed ecological assessment has been undertaken by qualified specialists to identify the extent of biological diversity on the Site and surrounding area. The detailed assessment identified the presence of Golden Sun Moth habitat, a threatened species. A large proportion of good quality habitat identified within the Site would be retained and a site-specific Biodiversity Management Plan would be developed to safeguard this as well as the other threatened species identified as using or potentially using the Site.

Through the proposed management and mitigation measures it is concluded that the project would not have a significant adverse impact on the biological diversity or ongoing ecological integrity of the locality.

21.1.4 Improved valuation, pricing and incentive mechanisms

The principle of improved valuation, pricing and incentive mechanisms, deems that environmental resources should be included in the valuation of assets and services. In the past, environmental resources have been assumed as free or undervalued, leading to their exploited use and subsequent degradation.

The project incorporates a range of design, mitigation and management measures to minimise potential impacts on the environment. The costs associated with these measures are incorporated into the capital investment and operating costs of the project. Furthermore, the commitment to offset impacts to threatened species and their habitat under the Bio-banking legislative framework procedures, places an appropriate monetary value on environmental protection and the maintenance of biodiversity.

21.2 Project need/justification

The SSF would add 100 MW of renewal energy into the energy mix of NSW and contribute towards NSW achieving its objectives under the Renewable Energy Action Plan and the RET and transitioning towards a sustainable future. The SSF project would generate electricity with minimal water use, air pollution and waste generation throughout the 30 year lifespan of the project. This increase in renewable energy would reduce the NEM's dependence upon fossil fuels, mitigate the climate change, facilitate NSW achieving its target of producing 23.5% of energy from renewable resources and support Australia's commitments to comply with the COP21 convention on Climate Change.

The SSF would provide socio-economic benefits by generating jobs, providing opportunities for developing skills in an emerging technology and supporting local business and service providers.

The SSF project is considered compatible with the current land use, which upon decommissioning can be readily reverted to productive agricultural use. The SSF design has been customised to suit the lie of the land, would utilise existing road infrastructure and connect to the TransGrid 132 kV power lines that currently traverse the Site, thereby minimising the need for additional off-site infrastructure development.

See section 2.0 for further project justification.

21.3 Conclusion

This EIS has been prepared in accordance with the EP&A Act, EP&A Regulation and the SEARs. The preparation of the EIS was commenced early in the project design stage allowing identified environmental constraints to be considered in the design of the project layout. The project has been

design to minimise impacts on biodiversity values, Aboriginal heritage sites, and visual amenity, as well as reduce flood risk.

Project specific mitigation and management measures have been recommended to respond to the impacts identified. Issues raised during stakeholder and community engagement have been addressed and considered in the project design.

Renew Estate would continue to implement its Engagement Plan to facilitate and maintain good communication with the local community and other stakeholders throughout the life of the project. It is Renew Estate's intention that project serve as a benchmark for future renewable energy development projects in NSW.

The positive impact of this renewable energy project coupled with the mitigation and management measures specified would, in effect, render this project socially acceptable, environmentally sound and economically viable. It is recommended that the project proceed, subject to implementation of the mitigation and management measures referred to herein, as well as a comprehensive environmental monitoring and auditing program.

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