OVERLAND
SUN FARMING

Volume 1

Main Report
and Appendices A and B

Hillston Sun Farm
Environmental Impact Statement

Prepared for OVERLAND Sun Farming Pty Ltd
June 2017

Volume 1

Main Report

Appendices A and B

Appendix A	Secretary's Environmental Assessment Requirements
Appendix B	Consultation material

Certification

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

EIS prepared by

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Proposed development

Hillston Sun Farm

Refer to Chapter 3 of this EIS for a description of the proposed development

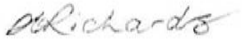
Land to be developed

The legal property description of the site is given below.

Deposited plan (DP)	Lot number
755189	22, 43, 61, 76, 77, 85, 100 and 101
626213	2

Certification

We certify that we have prepared this EIS in accordance with the Schedule 2 of the Environmental Planning and Assessment Regulation 2000 and Secretary's environmental assessment requirements issued for the Hillston Sun Farm on 14 October 2016. To the best of our knowledge, it contains all available information that is relevant to the environmental assessment of the development to which the statement relates. The information contained in this EIS is neither false nor misleading.



David Richards

30 June 2017

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30 June 2017

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30 June 2017

Hillston Sun Farm Environmental Impact Statement

Report J16135RP1 | Prepared for Overland Sun Farming | 30 June 2017

Prepared by	**David Richards**	**Kate Cox**	**Approved by**	**Duncan Peake**
Position	Environmental Scientist	Associate Environmental Scientist	**Position**	Director
Signature			**Signature**	
Date	30 June 2017	30 June 2017	**Date**	30 June 2017

Document Control

Version	Date	Prepared by	Reviewed by
V1	30 June 2017	D. Richards K. Cox	D. Peake

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Executive Summary

ES1 Project overview

OVERLAND Sun Farming Pty Ltd (OVERLAND) proposes to develop the Hillston Sun Farm, a large-scale solar photovoltaic (PV) generation facility and associated infrastructure in the Riverina region of south-western NSW (the project). The project will have an estimated nominal capacity in the order of 85 MWac (MW) and once operational will provide enough electricity to power up to 32,000 homes each year (AEMC 2016).

OVERLAND proposes to develop the project on a site within the Carrathool Shire local government area (LGA), approximately 3.5 kilometres (km) south of the township of Hillston. The site encompasses an area of approximately 393 hectares (ha), of which 293 ha will be developed. The site has been highly modified by past disturbances associated with land clearing, cropping, livestock grazing and weed invasion, and is currently used for broad acre cropping. The development footprint (293 ha) within the site boundary has been refined through the project design process to site project infrastructure to avoid environmental constraints as much as possible.

The project will connect to the Essential Energy 132 kV electricity distribution network that originates at the Hillston Substation. The site is in close proximity to the Hillston Substation, and there is a range of connection infrastructure in the vicinity. The development footprint has been designed to minimise the length of connection infrastructure required to connect the project infrastructure to the electricity grid. The site's proximity to the Hillston Substation means that the connection infrastructure will avoid major road and rail crossings.

The project is a State significant development (SSD) which requires development consent under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) from the Minister for Planning, or his delegate.

ES2 Project need

Under the guidance of the NSW Renewable Energy Action Plan (REAP), renewable energy is predicted to grow and make important contributions to the NSW economy. An important benefit of the project is its contribution to cleaner electricity generation in Australia and subsequent reductions in greenhouse gas emissions. The project is consistent with the objectives of the REAP. It will also contribute to achieving the Commonwealth Government's National Renewable Energy Target, which specifies targets for energy generated by renewable sources by 2020 (DoI-DRE 2016a).

The project will also contribute to continued growth in the total installed capacity of solar PV in both NSW and Australia. The NSW Department of Industry – Division of Resources and Energy (DoI-DRE) has identified potential for large-scale solar energy developments in the central, northern and western regions of NSW (NSW DoI-DRE 2016d). DoI-DRE (2016d) identifies ideal characteristics for large-scale solar energy as: low population densities; large, flat open spaces; and high average global solar exposure. The development footprint for the project is characterised by all of these features, which will allow the project to maximise the efficiency of electricity production, while minimising and avoiding disturbance of identified environmental constraints.

The project will also support two of the NSW Premier's priorities, namely creating jobs and building infrastructure (Department of Premier and Cabinet 2017).

The project will create employment opportunities within the local region, including an average of 100 full-time equivalents (FTEs) during construction and four up to five FTEs during the operational stage of the project.

ES3 Site selection

OVERLAND identified the site as a potential solar development in 2015; selecting land adjacent to the existing Hillston Substation to minimise environmental impacts and maximise the efficiency of existing easements and infrastructure. The site location, capacity of the project, design and layout of infrastructure and connection to the electricity grid has been selected through consideration of key factors including:

- availability of high solar radiation;
- proximity to, and capacity of the electricity grid. OVERLAND has been proactive in completing liaising with Essential Energy regarding the grid connection and capacity of the Hillston Substation, which has directly influenced the capacity of the project, and informed the project design and infrastructure layout;
- identification and avoidance of environmental constraints;
- availability of sufficient land area with suitable characteristics. The development footprint is predominantly cleared of native vegetation and requires limited site preparation and civil works. The proximity of the regional road network enables delivery of the infrastructure required for the project; and
- placement of infrastructure to minimise land use conflicts with the landholder and other projects.

ES4 Environmental assessment

ES4.1 Biodiversity

A biodiversity assessment report has been completed in accordance with the NSW *Biodiversity Offsets Policy for Major Projects* (OEH 2014a) and the *Framework for Biodiversity Assessment* (FBA) (OEH 2014b).

Measures to avoid and minimise impacts to vegetation were considered during the design and planning stage of the project, with the objective of significantly minimising impacts on native vegetation. The impact of the project will be limited to removal of 1.88 ha of native vegetation. Two scattered paddock trees will also be impacted, however these are not likely to provide key habitat for any listed threatened species.

Residual impacts to native vegetation will require retirement of 81 biodiversity credits. Impacts will be offset in accordance with a biodiversity offset strategy and processes outlined in the relevant government policies (OEH 2014a and OEH 2014b).

ES4.2 Aboriginal heritage

An Aboriginal cultural heritage assessment report (ACHAR) assessed the Aboriginal cultural heritage values of the site through field survey and consultation with registered Aboriginal parties identified during the consultation process. The field survey identified five previously unrecorded Aboriginal sites within the site boundary. There are no Aboriginal Heritage Information Management System (AHIMS) registered sites within the site boundary.

The project design has avoided impacts to five newly identified Aboriginal sites within the study area adopted as part of the ACHAR. No Aboriginal heritage sites will be impacted.

ES5 Historic heritage

A desktop assessment of the potential impact of the project on historic heritage was completed. The project will not impact any items of local, State, National or World heritage significance identified on the State Heritage Register, Carrathool Local Environmental Plan 2012 (Carrathool LEP) or Australian Heritage Database.

ES5.1 Land

The project has been developed to avoid and minimise land disturbance and overall impacts on agricultural land where possible. The land and soil capability (LSC) classes within the development footprint are mapped as approximately 279.1 ha of Class 5 land (severe limitations), and 13.4 ha of Class 4 land (moderate to severe limitations). The development footprint will be removed from agricultural production for the life of the project (in the order of 30 years).

Soil resources will be managed with consideration of the future viability of the site for agricultural production. Land management protocols and measures will be incorporated into an environmental management plan (EMP) that will be implemented to mitigate the potential impacts of the project on soil resources and land use.

The site is within the floodplain of the Lachlan River. Part of the site is within the flood planning area identified in the Flood Planning Land Map provided during consultation with Carrathool Shire Council (CSC). The majority of flood prone land subject to the 100 year average recurrence interval (ARI) within the site has been avoided by the project and is excluded from the development footprint.

ES6 Visual

A visual impact assessment was conducted from a number of representative viewpoints surrounding the site. Representative views close to private residential properties and road corridors (ie Kidman Way, The Springs Road and Lachlan Valley Way) nearest to the site were assessed.

The project design, development footprint and placement of infrastructure have minimised, and in some cases, avoided visual impacts. Due to the presence of vegetation and the low height of the dominant project infrastructure, the project's infrastructure will be shielded from view at the majority of the viewpoints assessed as part of the visual impact assessment. Of the viewpoints assessed, infrastructure may be visible from some locations on Kidman Way, The Springs Road, and from dwellings to the north and west of the site. The distance of the development footprint from these viewpoints ranges from 40 m to 3 km. Based on the presence of vegetation, combined with the low height of the project's infrastructure, visual impacts will be minimal from the majority of these viewpoints. Landscaping is proposed to minimise views from one sensitive receptor, R17.

Based on the findings of previous assessments prepared for PV solar energy facilities, glint and glare from the project's PV solar panels are not expected to significantly impact sensitive receptors, surrounding land uses, motorists or air traffic in the vicinity of the site.

ES7 Noise and vibration

A noise and vibration impact assessment for the project predicted that potential construction and operation noise levels will be below relevant criteria at all assessment locations (namely the eight sensitive receptors that were identified within a radius of approximately 2.4 km from the site boundary). Road traffic noise levels inclusive of project-related traffic are predicted to achieve the relevant noise goals at the nearest sensitive receptors to the site boundary.

Vibration associated with the proposed construction works is unlikely to generate impacts at the nearest vibration-sensitive receivers. Additional noise management and mitigation measures are not predicted to be required to achieve the relevant operational or construction noise criteria.

ES8 Traffic and transport

A traffic impact assessment predicted that the project will not adversely impact on the surrounding road network. Additional traffic generated by the project will not cause the future daily traffic volumes on Kidman Way or the Mid Western Highway, to exceed the relevant design standards that would necessitate road widening improvements.

Two new intersections are proposed for site access on Kidman Way serving the northern and southern parts of the site. The new intersection designs will be developed in consultation with NSW Roads and Maritime Services and in accordance with the intersection design standards defined by the Austroads *Guide to Road Design* (Austroads 2010). Right and left turn sealed shoulder widening is proposed for both the northbound and the southbound traffic approaches of both new intersections on Kidman Way.

Internal site roads and car parking will be constructed to serve the project's access and car parking needs during construction and operation.

ES9 Water

An assessment of the potential impacts of the project on flooding, groundwater and surface water resources was completed.

Flooding was a consideration in the site selection and project design process. Available flood mapping indicates part of the site is subject to inundation from a 100 year ARI event. The majority of the surface water flowpath has been excluded from the development footprint, with the exception of a connecting corridor between the northern and southern half of the development footprint. This corridor is within the mapped 100 year ARI. Infrastructure within this corridor would include internal electrical connection lines between the PV solar panels (above or below ground) and internal access roads. The project will be designed such that there would be no changes to the existing landform that would alter the flow of floodwater through this area. No solar PV panels would be constructed within the extent of the 100 year ARI.

The infrastructure to be established within the development footprint is unlikely to have a significant impact on local or regional flooding, as it will not require earthworks or changes to the general topography of the site that would result in a change to existing flow paths.

The project is not likely to impact groundwater during construction, operation and decommissioning due to the estimated depth to groundwater within the site boundary and the limited amount of subsurface disturbance activities required during the installation and decommissioning of project infrastructure. The project will not require access to groundwater resources and will not impact licensed water users within the vicinity of the site.

An erosion and sediment control plan will be prepared in consultation with CSC and will be implemented during the life of the project to minimise potential impacts to water resources.

ES10 Hazards

All project infrastructure will be designed in accordance with relevant industry standards. Once operational, the project infrastructure will be capable of generating electric and magnetic fields (EMFs). The degree of exposure to EMFs within the site boundary will vary depending on proximity to different components of the project infrastructure. Staff exposure during both the construction and operational stage of the project will be intermittent.

During the operational stage of the project, exposure to EMFs will be limited to exposure encountered during ongoing maintenance of the site and project infrastructure. The combination of low exposure rates and the intermittent exposure of staff to elements of the project infrastructure capable of generating EMFs indicate that adverse impacts from EMFs are unlikely as a result of the project.

Public access to the site will be restricted throughout the life of the project and surrounding landholders accessing the site will not be exposed to EMFs generated by the project infrastructure for extended periods of time.

Bushfire risks associated with the project have been assessed in accordance with *Planning for Bushfire Protection* (PBP) (RFS 2006). Measures to enable the project to comply with the objectives of PBP have been described within this EIS. Specifically, asset protection zones will be provided and managed to enable fire fighting vehicle access and to distance vulnerable structures from vegetation which represents a fire hazard. The risk of the project initiating a bushfire will be minimised through the implementation of appropriate management measures throughout the life of the project.

ES11 Air quality

Emissions to the atmosphere from the project during construction will be temporary in nature and will be restricted to dust caused by soil and surface disturbances and vehicle, plant and equipment exhaust emissions.

Ongoing maintenance of the site and project infrastructure will be required during operation. Maintenance activities will result in minor, localised vehicle emissions, and generation of dust from vehicles travelling along internal, unsealed access roads.

The implementation of the recommended mitigation measures will minimise air quality impacts during construction, operation or decommissioning.

ES12 Socio-economic

Based on the results of stakeholder engagement, there is a positive attitude and general community support for the project. The project will make important contributions to the production of renewable energy in NSW while creating employment opportunities, diversifying local revenue streams and generating direct and indirect benefits to the local economy throughout the life of the project.

Through the provision of additional economic stimulus, employment opportunities and investment in community infrastructure and services, the net community benefit of the project is considered to be positive. The implementation of the proposed management measures will mitigate potential adverse impacts from the project, such as impacts to the availability of local short-term accommodation during defined periods, such as during any of the region's major festivals and annual events.

ES13 Justification and conclusion

OVERLAND has leveraged off its experience leading benchmark renewable energy and infrastructure projects to implement a robust site selection and design process to minimise potential impacts from the project.

There is a sound justification for the project, founded on the following:

- The site is suitably located:
  - in a region with ideal climatic conditions for large-scale solar energy generation, with ideal physical conditions;
  - immediately adjacent to infrastructure with adequate capacity to receive the energy proposed to be generated; and
  - proximate to land uses compatible with large-scale solar energy generation at a capacity which matches the availability of the network.
- The project will not result in significant biophysical, social or economic impacts, and the project design has actively sought to avoid and minimise impacts, in particular to biodiversity, heritage, land use and visual amenity, through the siting and design of project infrastructure.
- The project will generate direct and indirect economic benefits, through the creation of employment opportunities and benefits to the local economy through income and expenditure during the life of the project.
- The production of renewable energy directly aligns with the objectives of the State's renewable energy targets and the objectives of the NSW Government's REAP, and will contribute to increased energy security through valuable contributions to a more diverse energy mix.

A suite of design, mitigation and management measures are proposed in this EIS to avoid, minimise and manage impacts of the project. The project will enable the orderly and logical use of natural, physical and human resources existing in the area and region. There will be economic investment and employment benefits for the local region and a realised opportunity for renewable energy generation, while minimising potential environmental and social impacts.

The overall benefits of the project are considered to be in the public interest.

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1 Introduction

1.1 Project overview

OVERLAND Sun Farming Pty Ltd (OVERLAND) proposes to develop the Hillston Sun Farm, a large-scale solar photovoltaic (PV) generation facility and associated infrastructure in the Riverina region of south-western NSW (Figure 1.1) (the project). OVERLAND proposes to develop the project on a site within the Carrathool Shire local government area (LGA), approximately 3.5 kilometres (km) south of the township of Hillston.

The project is a State significant development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). A development application (DA) for the project is required to be submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The NSW Minister for Planning, or the Minister's delegate, is the consent authority.

The project will have benefits including:

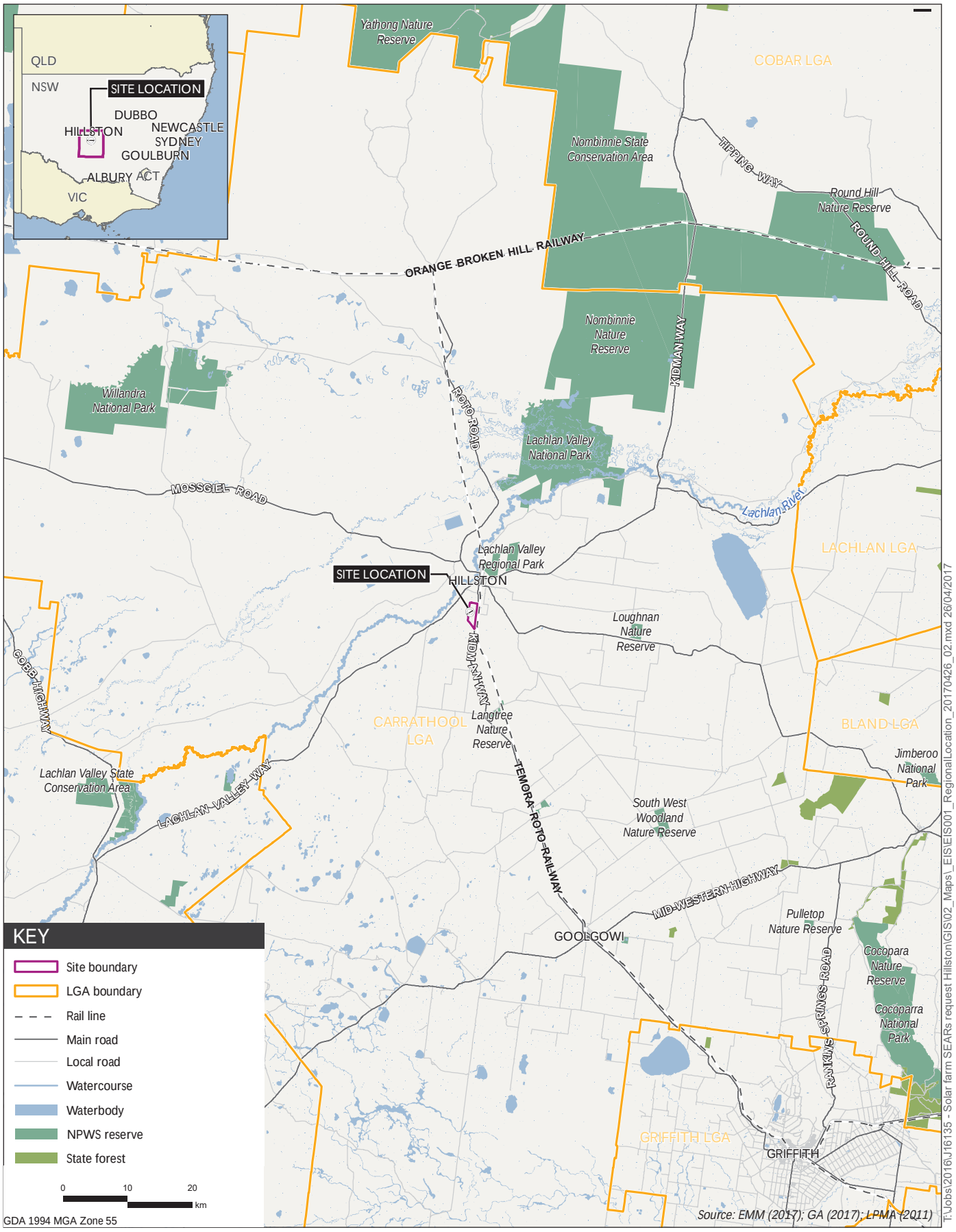
- production of renewable energy, directly contributing to the State's renewable energy targets and the objectives of the NSW Government's Renewable Energy Action Plan (REAP);
- creation of employment opportunities, including an average of 100 full-time equivalents (FTEs) during construction and up to five FTEs during the operational stage of the project;
- direct and indirect benefits to the local economy during the life of the project;
- diversification of local revenue streams; and
- increased energy security through valuable contributions to a more diverse energy mix.

The project is consistent with the objectives of the NSW Government's REAP and will contribute to achieving the Commonwealth Government's National Renewable Energy Target of 33,000 gigawatt hours (GWh) of energy generated by renewable sources by 2020 (DoI-DRE 2016a). Further discussion of the Commonwealth and NSW Government policy framework is provided as part of the strategic justification of the project in Section 1.3 and the conclusion and justification in Chapter 8.

1.2 The applicant

OVERLAND is the applicant for the project. OVERLAND is an Australian-owned and operated business engaged in the development of a portfolio of solar energy sun farms on land across regional Australia. Guided by direct experience in the development and commercial delivery of large-scale renewable projects, OVERLAND works closely with landowners, electricity supply companies, councils and governments to develop solar energy sun farms that bring both environmental and economic benefits to regional Australia consistent with the goals and objectives of both the Commonwealth and NSW governments.

OVERLAND's personnel have successfully led benchmark renewable energy and infrastructure projects from start to finish and have a sound record that traverses early stage site identification, working with landowners and communities, obtaining consents and licences from government to build and operate, securing energy and grid connection contracts, arranging financing and managing construction and ongoing operations and power generation.



Regional project location
Hillston Sun Farm
Environmental impact statement
Figure 1.1

This experience includes responsibility for the development, financing, construction and operation of over 320 megawatt (MW) of renewable energy generation projects including the delivery of approximately 50 MW of renewable energy generation in NSW. During 2016, OVERLAND led the development and financing of two 20 MW solar PV plants in Queensland and recently announced the construction of a further 320 MW of large-scale solar PV projects in north-western Victoria. OVERLAND continues to progress these projects and has worked with landholders and local governments to secure land and electrical grid connections, with construction due to commence in 2017.

1.3 Strategic justification

Under the guidance of the NSW REAP, renewable energy is predicted to grow and make important contributions to the NSW economy. In 2015, approximately 14% of the state's energy came from renewable sources (DoI-DRE 2016b). In the same year, more than 3% of the total electricity generated in NSW was from solar PV systems, which include both residential-scale PV solar (less than 10 kW capacity) and commercial-scale PV solar (greater than 10 kW capacity) systems (DoI-DRE 2016d).

Many of the state's large-scale renewable energy projects are in regional areas. At present, operational large-scale PV solar developments in NSW include: the Broken Hill Solar Plant, the Moree Solar Farm and the Nyngan Solar Plant, which produce a combined capacity of more than 200 MW (DoI-DRE 2016c). Such projects are recognised by the NSW Department of Planning and Environment – Division of Resources and Energy (DPE-DRE) as providing ongoing economic benefits through both the diversification of regional income streams and provision of employment opportunities in regional NSW (DoI-DRE 2016a).

The Clean Energy Council's *Clean Energy Australia Annual Report* (Clean Energy Council 2016) noted that at the end of 2015, there were 17 operational PV solar projects with a capacity greater than 1 MW in Australia, with the three largest PV solar projects located in NSW. In 2015, the cumulative installed capacity of solar PV in NSW was approximately 0.97 GW (Clean Energy Council 2016). When compared to 2014 statistics, this capacity reflects an increase of more than 23%. Similarly, the average size of solar PV systems in NSW continues to grow. However, substantial growth and continued investment in large-scale PV solar developments in NSW is required to achieve the State and Commonwealth Government's renewable energy targets. The Hillston Sun Farm will make important contributions to these targets and contribute to continued growth in the installed capacity of solar PV in NSW and Australia.

An important beneficial corollary of the project is its contribution to cleaner electricity generation in Australia and subsequent reductions in greenhouse gas emissions. On 10 November 2016, Australia ratified the Paris Agreement and the Doha Amendment to the Kyoto Protocol reinforcing its commitment to action on climate change and further reductions to greenhouse gas emissions. The Paris Agreement builds upon the United Nations Framework Convention on Climate Change and aims to strengthen the global response to the threat of climate change. Under the Paris Agreement, Australia has committed to reduce its emissions by 26–28% below 2005 levels by 2030 (DoEE 2016a). This emissions reduction target builds upon the country's 2020 target of reducing emissions by 5% below 2000 levels (DoEE 2016a). The target represents a 50–52% reduction in emissions per capita and a 64–65% reduction in the emissions intensity of the Australian economy between 2005 and 2030 (DoEE 2016a). In addition to the ratification of the Paris Agreement, the Commonwealth Government has demonstrated its ongoing commitment to greenhouse gas emission reductions through the implementation of a suite of national policies. These policies are already contributing to emissions reductions and encouraging both technological innovation and further expansions to the country's clean energy sector.

The project, in conjunction with similar large-scale investments in renewable energy, will also support two of the NSW Premier's priorities, namely creating jobs and building infrastructure (Department of Premier and Cabinet 2017).

As noted in Section 1.1, the project will create employment opportunities within the Carrathool Shire LGA, including an average of 100 FTEs during construction and up to five FTEs during the operational stage of the project. The project will have an estimated nominal capacity in the order of 85 MWac (MW) and once operational will provide enough electricity to power up to 32,000 homes each year (AEMC 2016). The electricity and associated environmental products generated from the project will be sold to one or more of a registered energy retailing organisation, large energy users (governmental or private) or to the National Electricity Market that is managed by the Australian Energy Market Operator (AEMO).

In addition, the project also aligns with the environmental sustainability strategy identified within Regional Development Australia's (RDA's) *Riverina Regional Plan 2013-2016.* The purpose of this strategy is to promote sustainable environmental practices to ensure the future of the Riverina region for generations to come (RDA 2013). One of the key actions of this strategy is to promote and support renewable and alternative energy sources, including solar (RDA 2013). The project will help realise this strategy and will contribute to cleaner electricity generation in the Riverina region and subsequent reductions in greenhouse gas emissions more broadly.

The DPE-DRE has identified potential for large-scale solar energy developments in the central, northern and western regions of NSW (DoI-DRE 2016d). Ideal characteristics for large-scale solar energy are identified by DPE-DRE (DoI-DRE 2016d) as: low population densities; large, flat open spaces; and high average global solar exposure. The Hillston Sun Farm is characterised by all of these features, which will allow the project to maximise the efficiency of electricity production, while minimising and avoiding disturbance of identified environmental constraints (refer to Section 3.2) such as remnant vegetation, as well as avoiding placement of dominant infrastructure (ie solar panels) in surface water flowpaths/flood planning areas. The site selection and design process are described in Chapter 3.

Throughout the site selection and design process and technical assessments supporting this EIS, OVERLAND has consulted with relevant government agencies, Carrathool Shire Council (CSC) and local landholders to communicate the aims and objectives of the project and the likely benefits that it will bring to the region.

OVERLAND has engaged with the NSW Renewable Energy Advocate and a number of NSW Government agencies regarding the Hillston Sun Farm and OVERLAND's ambitions to develop multiple solar farms in NSW. OVERLAND has had a continued dialogue with the NSW Department of Planning and Environment (DPE) with the objective of integrating appropriate standards and guidelines into the development, construction and operation of the project.

1.4 Purpose of report

This EIS accompanies a DA for the project under Part 4 of the EP&A Act and NSW Environmental Planning and Assessment Regulation 2000 (EP&A Regulation), and addresses the Secretary's environmental assessment requirements (SEARs) (Appendix A) and matters raised during consultation with stakeholders.

This EIS has been prepared by EMM Consulting Pty Limited (EMM) on behalf of OVERLAND.

1.5 Secretary's environmental assessment requirements

As required under Section 78A of the EP&A Act, this EIS has been prepared to address the SEARs for the project which were issued on 14 October 2016 (reference SSD 7955) (Appendix A). The SEARs and where they are addressed in this EIS are summarised in Table 1.1.

Table 1.1 Secretary's environmental assessment requirements

Assessment requirements	Reference in EIS
General requirements	
The Environmental Impact Statement (EIS) for the development must comply with the requirements in Schedule 2 of the Environmental Planning and Assessment Regulation 2000.	This EIS
• a full description of the development, including:	
- details of construction, operation and decommissioning;	Chapter 3
- a site plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of a separate approvals process); and	Figure 3.1
- a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development.	Figure 3.2
• a strategic justification of the development focusing on site selection and the suitability of the proposed site;	Section 1.3 Section 3.2
• an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including:	Chapter 6
– a description of the existing environment likely to be affected by the development;	
– an assessment of the likely impacts of all stages of the development (which is commensurate with the level of impact), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice;	
– a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below); and	
– a description of the measures that would be implemented to monitor and report on the environmental performance of the development;	
• a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS;	Chapter 7
• the reasons why the development should be approved having regard to the biophysical, economic and social costs and benefits of the development;	Chapter 8
• a signed report from a suitably qualified person that includes an accurate estimate of the capital investment value of the development; and	Provided separate to EIS
• the consent in writing of the owner of the land.	Provided separate to EIS
Biodiversity	
• an assessment of the likely biodiversity impacts of the development, having regard to the NSW Biodiversity Offsets Policy for Major Projects, and in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by the Department.	Section 6.2 Appendix C
Heritage	
• an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.	Section 6.3 Section 6.4 Appendix D
Land	
• an assessment of the impact of the development on agricultural land and flood prone land, paying particular attention to compatibility of the development with the existing land uses on the site and adjacent land (e.g. aerial spraying, dust generation, and risk of weed and pest infestation) during operation and after decommissioning, with reference to the zoning provisions applying to the land.	Section 6.5

Table 1.1 Secretary's environmental assessment requirements

Assessment requirements	Reference in EIS
Visual	
• an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain; and	Section 6.6 Appendix F
• a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners.	Section 6.6 Figure 6.7 Appendix F
Noise	
• an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG);	Section 6.7 Appendix G
• an assessment of sub-station noise impacts in accordance with the NSW Industrial Noise Policy (INP); and	Section 6.7 Appendix G
• a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria.	Not considered necessary given the outcomes of the noise and vibration impact assessment (refer to Section 6.7 and Appendix G)
Transport	
• an assessment of the site access route, site access point, rail safety issues and likely transport impacts of the development on the capacity, condition [safety and efficiency of the local and State road and rail network];	Section 6.8 Appendix H
• a description of the measures that would be implemented to mitigate any impacts during construction; and	Section 6.8
• a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required).	Section 6.8
Water	
• an assessment of the likely impacts of the development on surface water and groundwater resources (including watercourses, wetlands, riparian land and groundwater dependent ecosystems), related infrastructure, adjacent licensed water users, basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts;	Section 6.9
• details of water supply arrangements; and	
• a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004).	Section 6.9
Electromagnetic Interference	
• an assessment of the proposed transmission line and substation against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.	Section 6.10
Consultation	
• During the preparation of the EIS, consultation is required with relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups and affected landowners;	Chapter 5
• In particular, detailed consultation with affected landowners surrounding the development and Carrathool Shire Council must be undertaken; and	
• The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.	

1.6 Report structure

This EIS consists of the main EIS document and supporting appendices and is structured as follows:

- Chapter 1 – Introduction

Provides an introduction to the project, including an overview of the project, information about the applicant, the purpose of this EIS, and the SEARs.

- Chapter 2 – Site and surrounds

Provides a description of the site and surrounds, including the project location, the biophysical environment, socio-economic factors, and other surrounding developments.

- Chapter 3 – Project description

Provides a detailed outline of the project, including project details and objectives and alternatives considered during the site selection and project design process.

- Chapter 4 – Legislative framework

Provides information on the legislative framework and approval process for the project under relevant Commonwealth and NSW legislation and environmental planning instruments.

- Chapter 5 – Stakeholder consultation

Provides an overview of stakeholder consultation and engagement activities undertaken for the project and a summary of the consultation results.

- Chapter 6 – Impact assessment

Provides an assessment of the likely impacts of the project, including consideration of management measures to be implemented.

- Chapter 7 – Summary of mitigation and management

Provides a summary of the management and mitigation measures.

- Chapter 8 – Conclusion and justification

Provides a justification for the project, including discussion of the suitability of the site.

- Appendices

The appendices to the EIS which support the main document, including all copies of all technical assessments.

- Appendix A – SEARs;
- Appendix B – Consultation material;
- Appendix C – Biodiversity assessment report (BAR);
- Appendix D – Aboriginal cultural heritage assessment report (ACHAR);
- Appendix E – Desktop hydrological assessment;

- Appendix F – Visual impact assessment;
- Appendix G – Noise and vibration impact assessment; and
- Appendix H – Traffic impact assessment.

It should be noted that this main EIS document provides a summary of all the technical assessments prepared to support the EIS. The technical studies provide a full and comprehensive assessment of the project relating to their respective technical area.

2 Site and surrounds

2.1 Site description

The site is within the Carrathool Shire LGA in the Riverina region of south-western NSW, approximately 3.5 km south of the township of Hillston (see Figure 1.1). The site boundary encompasses an area of approximately 393 hectares (ha), with a corridor for connection infrastructure from the site to the Hillston Substation, on Lot 2 of Deposited Plan (DP) 626213 immediately north of the site. The legal property description of the site is given in Table 2.1.

Table 2.1 Legal description of the site and development footprint

DP	Lot number
755189	22, 43, 61, 76, 77, 85, 100 and 101
626213	2

The development footprint is defined as the land area within the site where project infrastructure will be constructed and operate for the project life, shown on Figure 2.1. The development footprint encompasses an area of 293 ha, which has been refined through the project design process to avoid environmental constraints (primarily remnant vegetation) and surface water flowpaths (see Section 3.2). The conceptual infrastructure layout within the development footprint is discussed further in Chapter 3.

The site is zoned RU1 Primary Production under the Carrathool Local Environmental Plan 2012 (Carrathool Local Environmental Plan (LEP)) (see Figure 2.2). It has been highly modified by past disturbances associated with land clearing, cropping, livestock grazing and weed invasion, and is currently used for broad acre cropping. The site is largely devoid of vegetation in the areas which have been subject to cropping.

The site is immediately to the south of Essential Energy's Hillston Substation (see Figure 2.1). It has direct access to Kidman Way, which provides access to the regional road network including the Cobb and Mid Western highways (see Figure 1.1). The site is also adjacent to the Temora–Roto railway line, which runs parallel to Kidman Way and is used for grain-related transport (Figure 2.1).

Photographs 2.1, 2.2 and 2.3 illustrate the general condition of the site.

2.2 Surrounding land uses

The site is part of the Lachlan River catchment. Land use within this catchment is dominated by extensive agricultural operations, with grazing occupying 75.5% of the total catchment area (Office of Water 2011). Dryland cropping and horticulture (15.1%), conservation (4.1%), forestry (1.6%) and irrigation (1.4%) are also prevalent across the catchment area (Office of Water 2011).

The majority of the land surrounding the site is zoned RU1 Primary Production under the Carrathool LEP (Figure 2.2). Land uses surrounding the site predominantly include dryland cropping (principally wheat) and irrigated horticulture (principally cotton). Agricultural production activities undertaken in the area are dominated by sheep and cattle grazing and cotton and rice production (CSC 2016).

The nearest sensitive receptors are dwellings. The nearest receptor, R1, is approximately 700 m north of the development footprint, with a further 20 receptors, within approximately 3 km (see Figure 2.1). The majority of these sensitive receptors are separated from the site by existing vegetation and surrounding road corridors.

Photograph 2.1 **View of the southern portion of the site at Kidman Way looking west towards remnant vegetation (which would not be impacted by the project)**

Photograph 2.2 **View of the site from southern boundary at Kidman Way looking north**

Photograph 2.3 **View of the northern portion of the site looking north towards the Hillston Substation**

Other prominent features in the surrounding landscape include the Hillston Cemetery and the Hillston Showground (Figure 2.1). There are some small parcels of Crown land near the site (Figure 2.3); however these will not be affected by the project.

2.3 Transport infrastructure

The site has good access to the regional road network from Kidman Way, which provides access to the Cobb and Mid Western highways (Figure 1.1). Kidman Way services the Murrumbidgee Irrigation Area and provides important transport connections for remote communities within the western Riverina region. Lachlan Valley Way and The Springs Road are also in close proximity of the site and at their closest points are located approximately 2 km west of the site's western boundary and 2.8 km east of the site's eastern boundary, respectively.

At the site, Kidman Way is a single carriageway with a sealed surface. It is a designated B-double route and is also part of NSW Roads and Maritime Services (RMS) Livestock Loading Scheme, which provides increased mass limits for livestock loads (RMS 2016). This designation permits the use of Kidman Way for heavy vehicle movements including 19 m, 23 m and 25 m B-double, B-triple and AB-triple vehicles. Current daily traffic estimates indicate that between 554-630 vehicles travel along Kidman Way per day, with the existing proportion of heavy vehicle traffic estimated to be approximately 22-26% of all vehicle movements.

The site is adjacent to the Temora–Roto railway line, which runs parallel to Kidman Way (Figure 2.1). This line is owned by Transport for NSW (TfNSW) and is part of NSW's freight transport network. At present, the line is used solely for grain-related transport, servicing one of GrainCorp's primary sites in southern NSW. A $3 million upgrade to the rail siding extension at Hillston was announced in 2016 to help service the region's major grain receival site (TfNSW 2016).

Other transport infrastructure includes the Hillston Airport, approximately 2.5 km north of the site (Figure 1.2).

2.4 Biophysical environment

2.4.1 Climate

The site is within the Riverina Interim Biogeographic Regionalisation for Australia (IBRA) bioregion. The climate of the Riverina IBRA bioregion is dominated by a persistently dry, semi-arid climate, characterised by hot summers and cool winters (Stern et al. 2000). Climate data for the site has been obtained from the Australian Bureau of Meteorology's (BoM) station in Hillston (station number 075032), approximately 3 km north of the site. Mean monthly minimum and maximum temperatures range between 16.4°C to 33.4°C in summer and 3.8°C to 17.1°C in winter (BoM 2016a). The area experiences a mean annual rainfall of 369.8 millimetres (mm) (BoM 2016a).

Climate data from the BoM indicates that the site's daily solar exposure ranges between 18-20 megajoules/m^2 (MJ/m^2), which equates to approximately 5-5.6 kWh/m^2 with an average of 8 to 9 hours of sunshine per day (BoM 2016b; BoM 2016c). Annual cloud cover statistics over a 53 year period indicate that the site receives an average of 98.8 cloudy days per annum (BoM 2016a). The Carrathool Shire LGA experiences a consistently high availability of solar radiation, and is therefore ideal for large scale solar development.

2.4.2 Topography and landform

The Riverina IBRA bioregion's upper catchment landscape is comprised of a series of overlapping, low gradient alluvial fans on the eastern half of the Murray Basin, while the lower tract of the Murray River is a floodplain with overflow lakes (OEH 2016). Elevation across the site is relatively uniform at approximately 117 to 120 m above sea level. Land around the site generally slopes from north-east to south-west.

2.4.3 Geology and soils

The site is in a landscape of Quaternary alluvial plains. The Riverina IBRA bioregion is characterised by river channels, floodplains, backplains, swamps, lakes and lunettes that date back to the Quaternary period. It covers the alluvial fans of the Lachlan River, Murrumbidgee River and the Murray River, west of the Great Dividing Range (OEH 2016).

The Lachlan Depression Plains soil landscape is prevalent within the site boundary (Biosis 2017). The Lachlan Depression Plains soil landscape is characterised by quaternary alluvial plains with numerous circular depressions consisting of grey and brown cracking and non-cracking clays on the plains and sands and red or brown texture-contrast soils on the higher ground (DECC 2002).

2.4.4 Water resources

The site is approximately 2.7 km east of the Lachlan River at its closest point (Figure 2.1) and is within the floodplain of the Lachlan River. The Lachlan catchment covers an area of 90,000 km^2 and supports a population of approximately 104,000 people, including the township of Hillston (Office of Water 2011). Within the catchment, the Lachlan River stretches over 1,400 km. At Hillston township, the river is characterised by a mean daily flow of 1,234 mega litres (ML) (Office of Water 2011).

The *Lachlan River Hillston Floodplain Management Plan Lake Brewster to Whealbah* (DNR 2005) includes the floodplains of the Lachlan River and Willandra Creek surrounding the township of Hillston, including the site. This floodplain supports successful irrigation and dryland farming industries and also has significant ecological values including a diverse and extensive network of wetlands (DNR 2005).

The Lachlan catchment supports a total of 471,000 ha of wetlands including nine wetlands listed as nationally significant in the *Directory of Important Wetlands in Australia* (DoEE 2016b). Of these wetlands, Merrowie Creek and Lake Brewster are the closest to the site, approximately 18 km north (upstream) and 40 km east (upstream) of the site, respectively.

Part of the site is identified as wetland within the Carrathool LEP, and is discussed further in Section 6.9.

The site is within the Lower Lachlan Alluvium groundwater management area which is characterised by an inland alluvial aquifer. Groundwater within the inland alluvial aquifer is of moderate to high quality (0-1,500 total dissolved solids (TDS) mg/L) (Office of Water 2011). It is suitable for domestic, stock and some irrigation purposes (Office of Water 2011).

2.4.5 Biodiversity

The site is within the Riverina IBRA bioregion and the Lachlan IBRA subregion. As noted by Morgan and Terrey (1992), vegetation within the Lachlan IBRA subregion is characterised by:

- black box and river red gum on channels;
- black box, lignum and cane grass in swamps;
- saltbush and bluebush with old man saltbush, cottonbush, myall and grasses on the plains; and
- white cypress pine on sandhills.

The site itself has been highly modified by previous and current land uses, including vegetation clearing, cropping, livestock grazing and weed invasion. This disturbance history has resulted in a mosaic of modified agricultural areas with remnant vegetation restricted to isolated patches within cropped paddocks, along roadsides or property boundaries or in road reserves adjacent to the site boundary (Biosis 2017).

2.5 Socio-economic factors

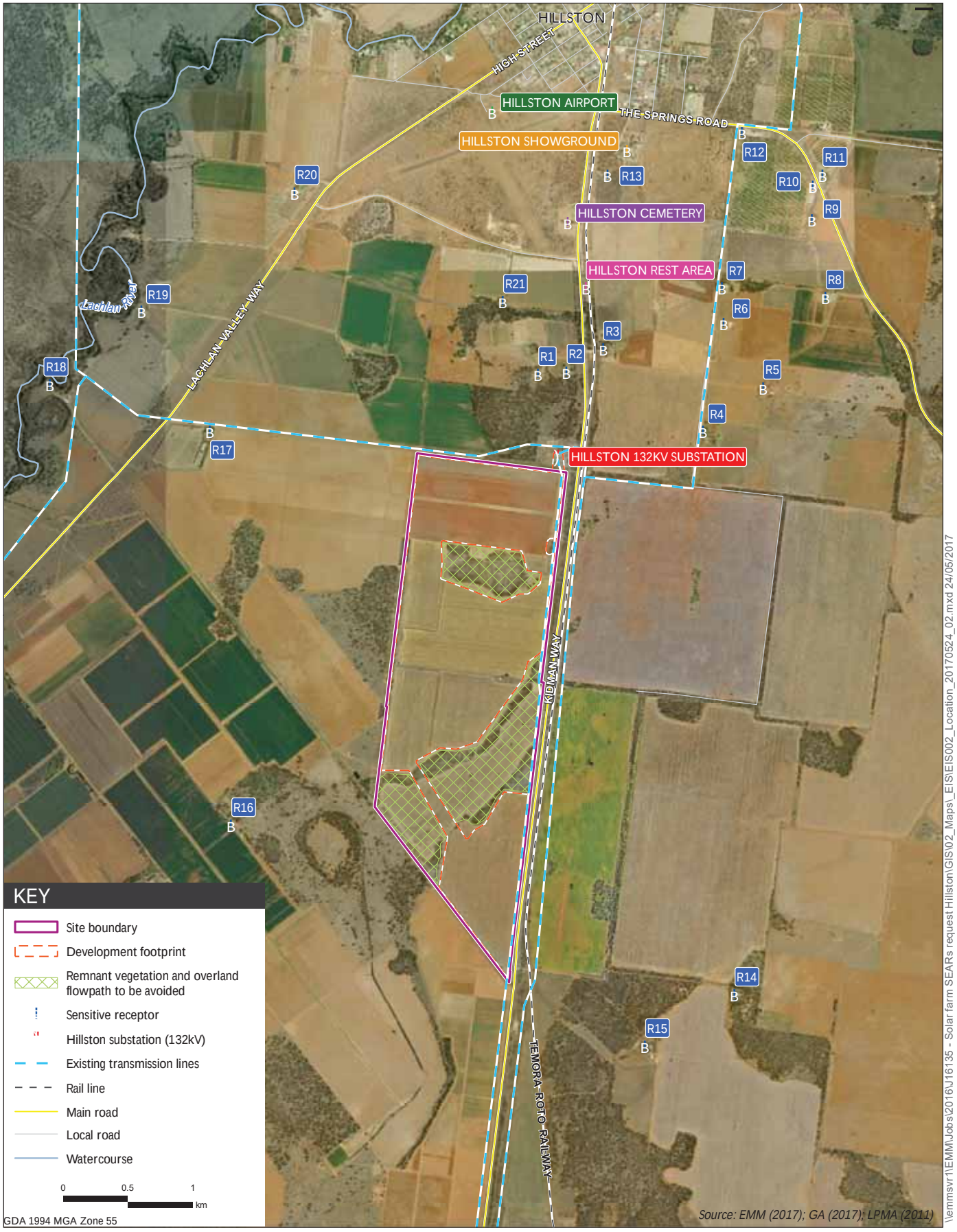
Hillston is the largest township in the Carrathool Shire LGA with a population of 1,430 and is the area's geographic and agricultural centre. Agriculture is the dominant industry of employment for Hillston's population, with school education and local government administration among the township's other major employers (ABS 2014). The town also hosts the majority of the area's largest social, cultural and recreational events, which make important to contributions to its agriculturally dependent economy.

The population of the Carrathool Shire LGA in 2011 was 2,587 compared to 2,819 in 2006, which reflects a decline of 232 people (or 8%) residing in the area (ABS 2007; ABS 2014). Similarly, the township of Hillston has also experienced a decline in population.

The local economy is dependent on agriculture with the geography, climate, and environment within the Carrathool Shire LGA favourable for a variety of agricultural and horticultural activities (CSC 2016). Sheep and cattle grazing and cotton and rice production dominate the agricultural production activities undertaken within the area (CSC 2016). Agriculture, forestry and fishing are the predominant employing industries in the Carrathool Shire LGA, accounting for more than 47% of the area's employment in 2011 (ABS 2014). In September 2016, the unemployment rate within the Carrathool Shire LGA was 2.7%, which was less than the NSW and Australian unemployment rates, which were 5.2% and 5.7%, respectively (DoE 2016).

2.6 Other local developments

A search of the NSW DPE's development assessment tracking system has indicated that there is a proposed poultry farm development, Goolgowi Poultry Farms (SSD 8036), approximately 55 km south of the site near Goolgowi (Figure 2.4). The proposal includes the development of five farms, each with a carrying capacity of 1.2 million birds, as well as associated activities at 375 McRaes Road, Goolgowi. SEARs for the proposed development were issued on 18 November 2016. Given the distance of the proposed poultry farm development to the site, an assessment of cumulative impacts is not warranted.



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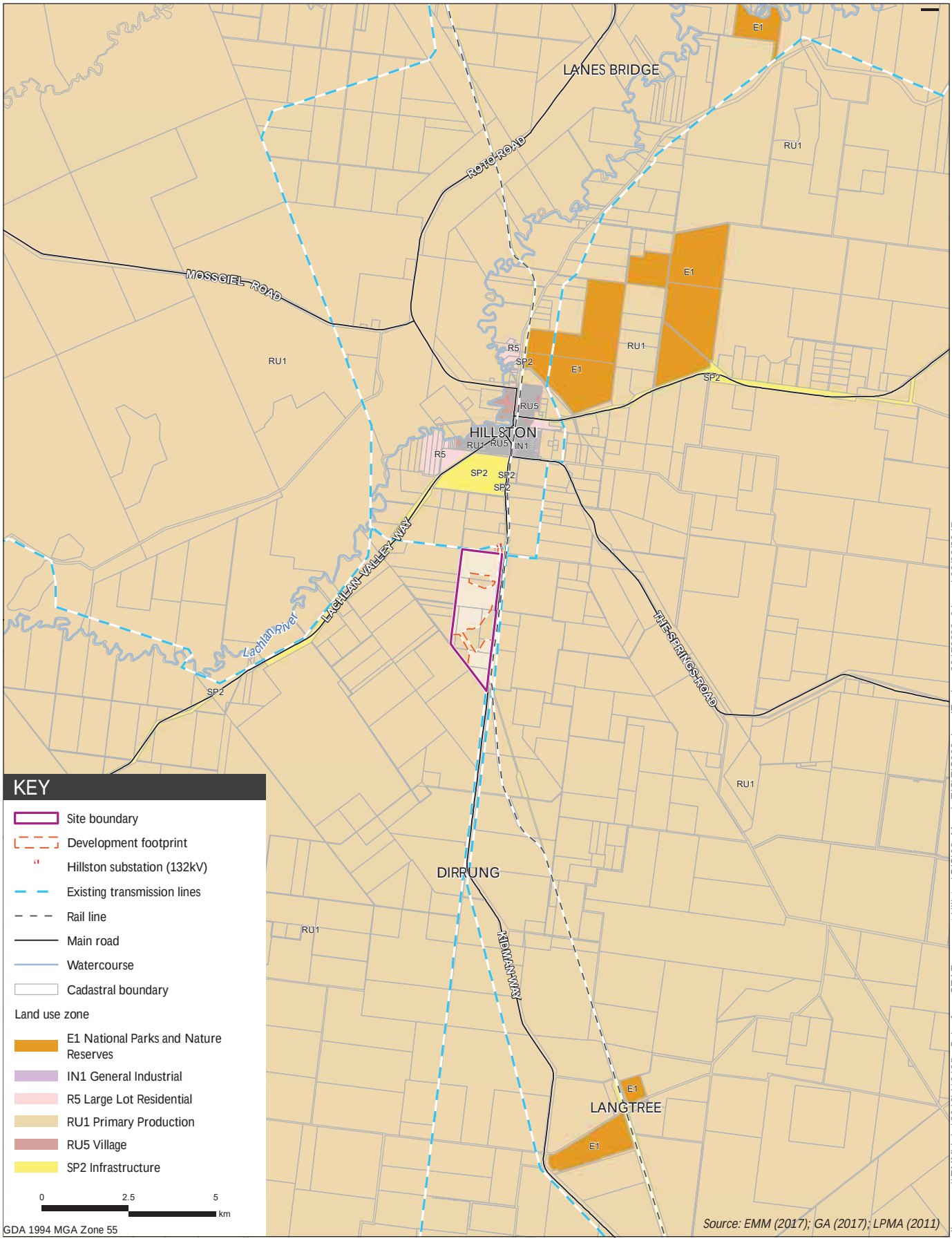
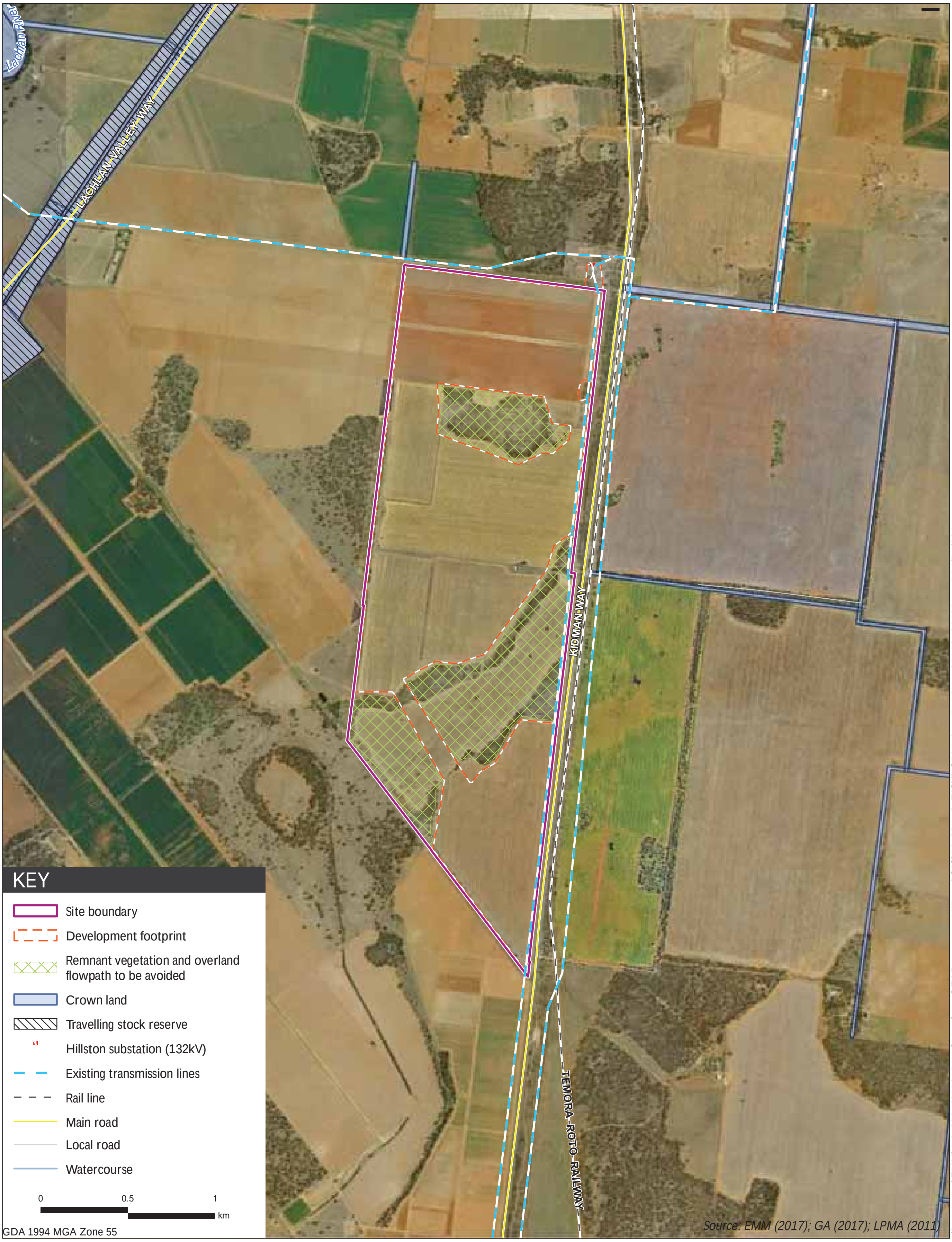
Location of the Hillston Sun Farm

Hillston Sun Farm
Environmental impact statement
Figure 2.1



Land use zoning
Hillston Sun Farm
Environmental impact statement
Figure 2.2



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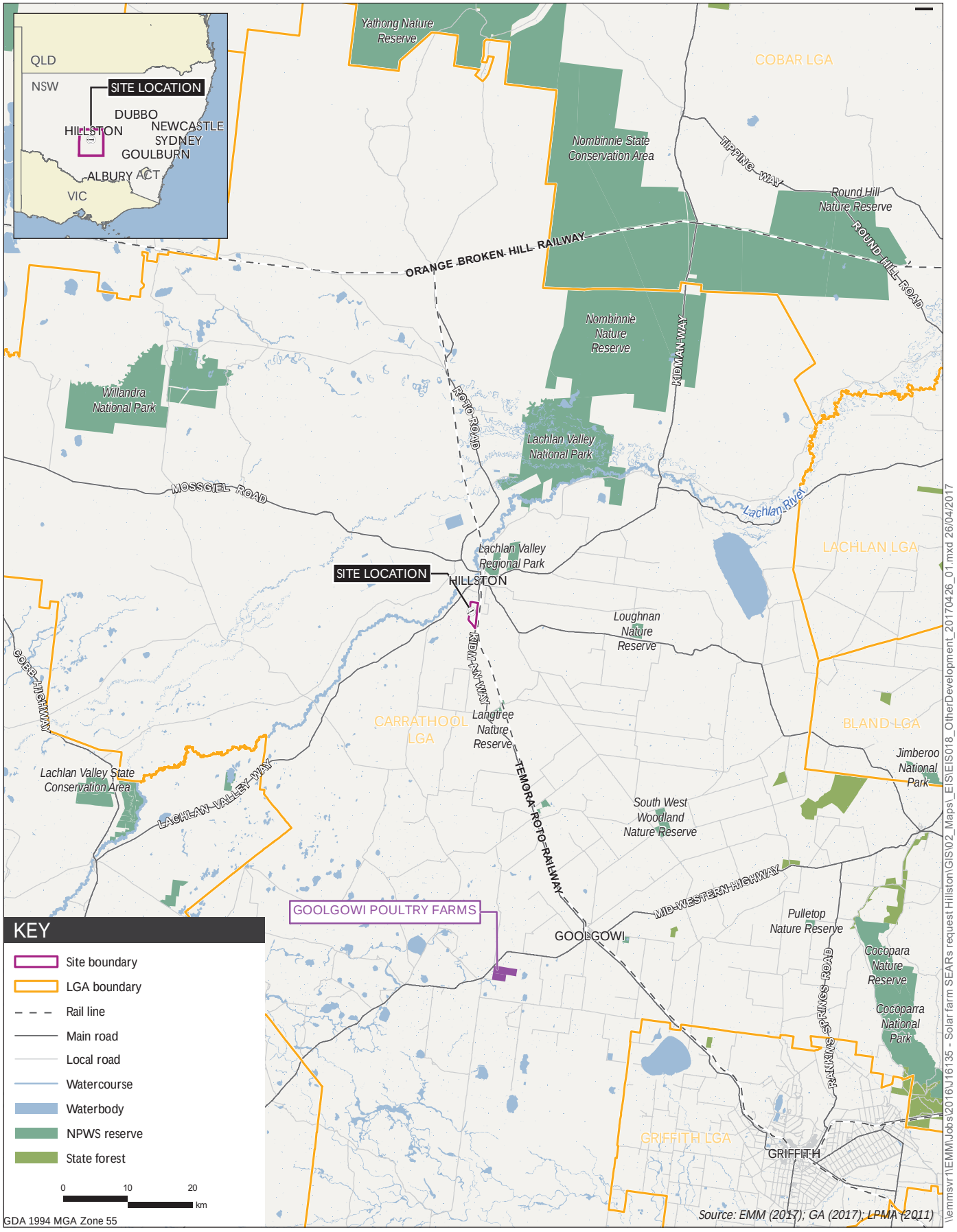
Crown land and other infrastructure features

Hillston Sun Farm

Environmental impact statement

Figure 2.3

EMM



Other local developments
Hillston Sun Farm
Environmental impact statement
Figure 2.4

3 Project description

3.1 Overview

The project includes the development, construction and operation of a solar PV electricity generation facility, which comprises the installation of PV solar panels and associated infrastructure on the site. The objectives of the Hillston Sun Farm are to:

- develop a large-scale PV solar development that avoids and minimises environmental, community and landholder impacts;
- contribute to the strategic objectives and targets of the NSW and Commonwealth governments for renewable energy generation;
- contribute to increased energy security through valuable contributions to a more diverse energy mix for NSW and Australia; and
- provide ongoing economic benefits for regional NSW through both the diversification of regional income streams and provision of employment opportunities during construction and throughout the operational stage of the project.

The project will connect to the Essential Energy 132 kV electricity distribution network that originates at the Hillston Substation (see Figure 2.1). The electricity and associated environmental products generated from the project will be sold to one or more of a registered energy retailing organisation, large energy users (governmental or private) or to the National Electricity Market that is operated by the AEMO.

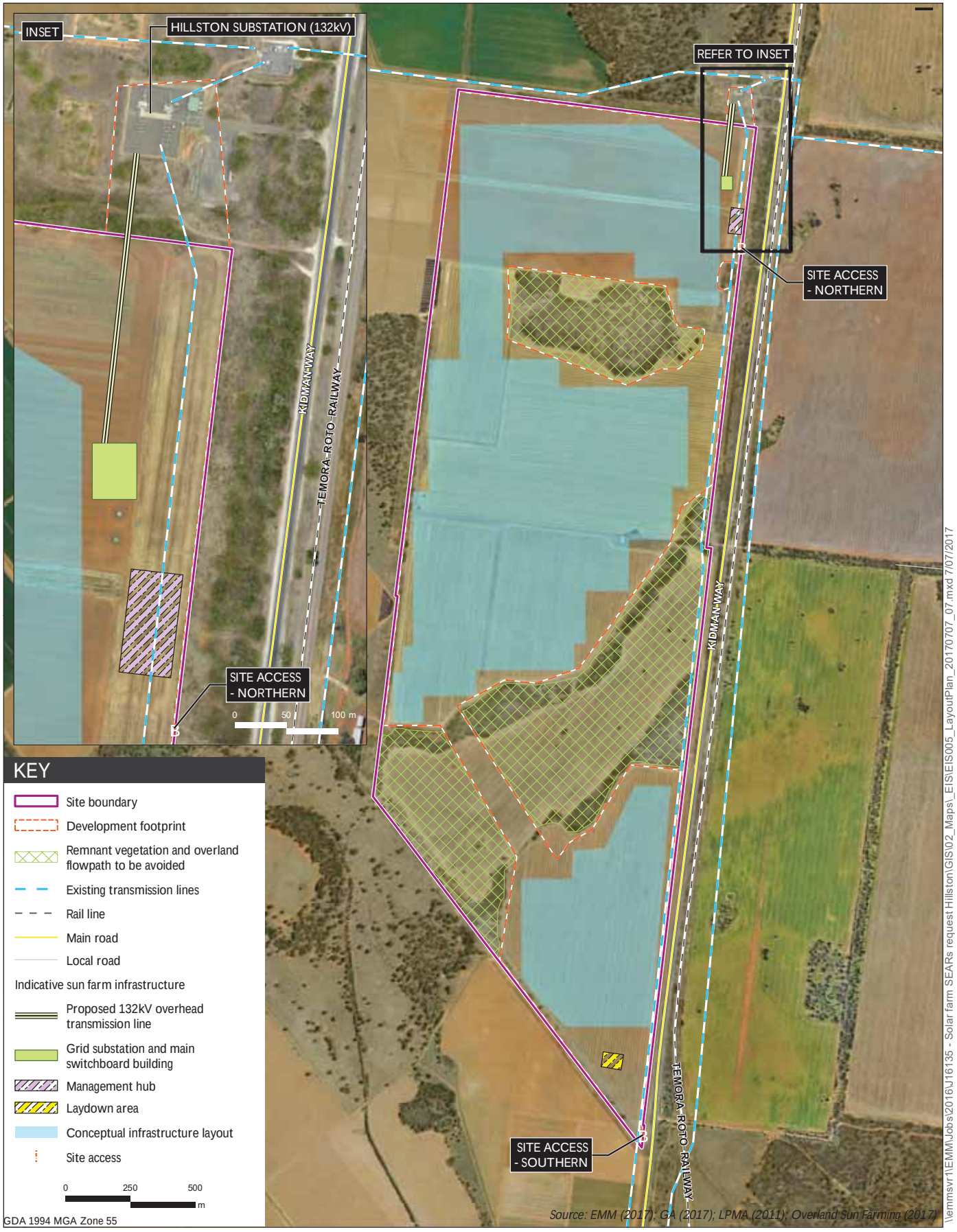
The project will have an estimated capacity in the order of 85 MW and once operational will generate enough electricity to power up to 32,000 homes each year.

The project comprises the following key components:

- a network of PV solar panel arrays;
- electrical collection systems, project switchyard and control room;
- a management hub, including demountable offices and amenities and equipment sheds;
- parking and internal access roads; and
- connection infrastructure to the Hillston Substation.

The project may include the installation of battery and energy storage devices within the development footprint, subject to further approval.

The conceptual infrastructure layout is illustrated in Figure 3.1. The infrastructure associated with the project will cover an area within the development footprint (Figure 2.1). During the preparation of the EIS, the development footprint within the site boundary has been refined on the basis of detailed technical studies including grid connection studies, environmental constraints identification and the design of project infrastructure with the objective of developing an efficient project that avoids and minimises environmental, community and landholder impacts. The site selection and design process is described below.



Infrastructure layout plan
Hillston Sun Farm
Environmental impact statement
Figure 3.1

3.2 Site selection and project design

OVERLAND has leveraged off its experience leading benchmark renewable energy and infrastructure projects to implement a robust site selection and design process to minimise potential environmental impacts. This experience includes the development and financing of two 20 MW solar PV plants in Queensland. In addition, OVERLAND have also recently announced the construction of a further 320 MW of large-scale solar PV developments in north-western Victoria.

The site location, capacity of the project, design and layout of infrastructure and connection to the electricity grid have been refined through an evaluation process both prior to and during preparation of the EIS. The evaluation process has considered a range of factors relating to a broader study area comprising land to both the east and west of Kidman Way (see Figure 3.2). Key factors include:

- Availability of solar radiation – the Riverina IBRA bioregion of NSW experiences a consistently high availability of solar radiation. As noted in Section 2.4.1, climate data from the BoM indicates that the site's daily solar exposure, average hours of sunshine per day and number of cloudy days per annum make it ideal for a large scale solar development (BoM 2016a; BoM 2016b; and BoM 2016c).
- Proximity to, and capacity of the electricity grid – the site is immediately adjacent to the Hillston Substation, owned and operated by Essential Energy (Figure 2.1). The site's proximity to the Hillston Substation is ideal, and has been an important element of site selection, minimising the length of overhead connection lines required to connect the project infrastructure to the electricity grid. The site's proximity to the Hillston Substation means that the connection infrastructure will avoid major road (ie Kidman Way) and rail crossings (Temora–Roto railway line) and also minimises impacts on vegetation and avoids impacts on roadside vegetation. OVERLAND has been proactive in investigating potential connection alignments and liaising with Essential Energy regarding the grid connection and capacity of the Hillston Substation, which has directly influenced the capacity of the project, and informed the project design and infrastructure layout.
- Availability of sufficient land area with suitable physical characteristics – the development footprint is predominantly cleared of native vegetation, would require minimal ground preparatory works and has good access to the regional road network and regional centres. The relatively flat terrain within the development footprint and predominantly cleared landscape mean that limited site preparation and civil works will be required, and impacts to biodiversity will be avoided. The proximity of the regional road network enables delivery of the infrastructure required for the project.
- Identification and avoidance of environmental constraints – OVERLAND has actively sought to identify and avoid environmental constraints as part of the project development, which has resulted in continual refinement of the site boundary and the development footprint, and infrastructure layout (Figure 3.1). This process has involved OVERLAND's team working with environmental specialists and landholders to:
    - complete site inspections, surveys and desktop review to map potential environmental and land use constraints;
    - assess the significance of potential constraints; and
    - identify opportunities to avoid constraints where required.

  Detailed technical environmental investigations have identified environmental and land use constraints which have informed the site selection process, development footprint and infrastructure layout. Identified site features are provided in Figure 3.2 with further detail presented in Table 3.1.

- Placement of infrastructure to minimise land use conflicts with landholders – the development footprint, and the placement of infrastructure including solar panels, inverters, electrical collection system, switchyard, easement and connection infrastructure have been identified through detailed consultation with the landholder, to minimise land use conflicts and enable agricultural production and land management practices to continue on surrounding land. As shown on discussed in Table 3.1, a number of identified site features within the study area have been avoided through careful consideration of the placement of infrastructure, and in particular the PV solar panel layout, for the project.

A summary of the key environmental constraints and site features considered during the site selection and project design process is provided in Table 3.1.

Table 3.1 Matters considered during the site selection and project design process

Aspect	Matters considered
Biodiversity	Remnant vegetation is present within the site boundary. Mapping of constraints early in the site selection and project design phase has enabled remnant vegetation to be avoided within and surrounding the development footprint and infrastructure layout, including: • avoidance of remnant vegetation within the site boundary; and • avoidance of mapped wetland areas identified within Carrathool LEP (Figure 6.11).
Heritage	Aboriginal and historic heritage sites. Mapping of potential constraints and their likely significance early in the site selection and project design stage has enabled the identification and avoidance of heritage items, including: • five Aboriginal heritage sites identified in the study area adopted as part of the ACHAR.
Land use	Engagement with the landholder has enabled consideration of a range of potential land uses over the life of the project, and consideration of the value of agricultural production on the land to the landholder, compared to utilising the land for solar power generation. The site is in close proximity to the Hillston Substation, and there is a range of connection infrastructure in the vicinity. The development footprint has been designed to minimise the length of connection infrastructure required to connect the project infrastructure to the electricity grid. The site's proximity to the Hillston Substation means that the connection infrastructure will avoid major road and rail crossings. The final site boundary and development footprint have been selected to avoid fragmenting the landholder's residual agricultural land.
Visual	Proximity to surrounding residences and passing motorists and potential impacts (if any) from glint and glare.
Noise	Potential noise impacts during construction and operation and proximity to surrounding residences.
Transport	Proximity to, and capacity of, the local and regional road network and ability to transport the necessary infrastructure to the site, and resource the workforce demand during construction.
Water	The Carrathool Shire Council Hillston Floodplain Risk Management Study (Cardno Willing 2005) and flood planning mapping provided by CSC identifies portions of the study area as being subject to flooding. The desktop hydrological assessment (Appendix E) states that the site would also be partially covered by a 100 year average recurrence interval (ARI) flood event. This has been a primary consideration in designing the development footprint and infrastructure layout described in this EIS. The study area to the east of Kidman Way was more significantly affected by the mapped flood extent, and this has been a consideration for its avoidance. The majority of the development footprint within the site has avoided the mapped 100 year ARI flood extent (Figures 3.2 and 6.11). Specifically, the onsite substation has been positioned to avoid the mapped 100 year ARI flood extent.
Electromagnetic interference	The Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (ICNIRP 1998) were considered in the placement of electrical infrastructure, including the inverters, electrical collection system and switchyard and easement and connection infrastructure.

In addition to the environmental aspects described above, the selection process has also been informed by the technical requirements of the PV solar panels (ie spacing requirements between panels and shading limitations) and the economic feasibility of the project.

3.3 Project alternatives

i 'Do nothing' option

The site is currently used for broad acre cropping. The 'do nothing' scenario would allow for the continued use of the site for agricultural production. There are no additional agricultural services dependent on agricultural production within the site boundary.

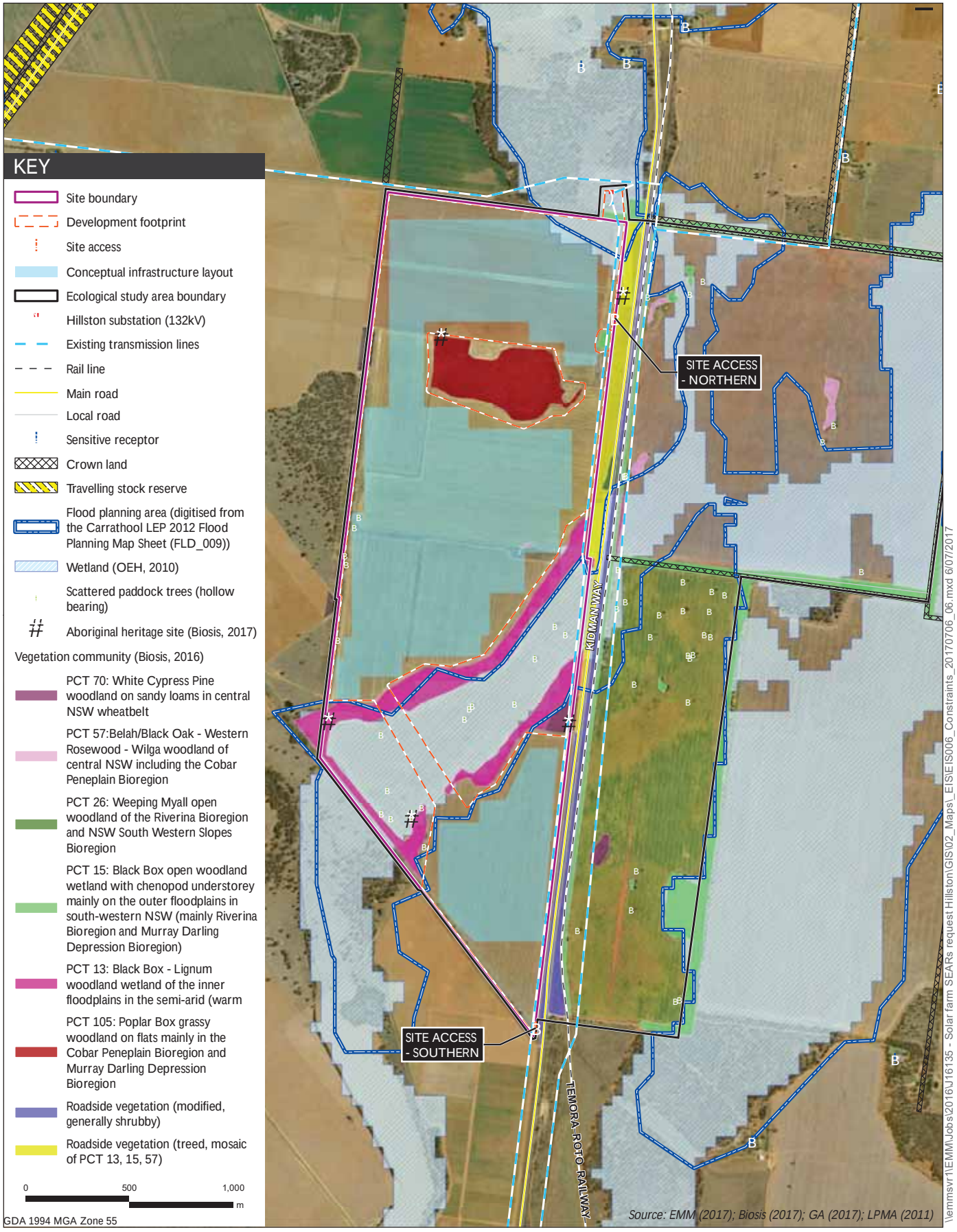
Although the 'do nothing' scenario would allow the site's continued use for agricultural production, it would also forego the benefits of the project listed in Section 1.1, namely:

- production of renewable energy on a site ideally located adjacent to the Hillston Substation with suitable physical characteristics;
- creation of employment opportunities;
- direct and indirect benefits to the local economy;
- diversification of local revenue streams; and
- increased energy security.

The 'do nothing' scenario would result in a lost opportunity for the development of a large-scale renewable energy project on an ideally located site (adjacent to the Hillston Substation) with limited significant environmental constraints. Further, the 'do nothing' scenario would also result in a lost opportunity for the landholder to diversify their revenue stream.

The 'do nothing' scenario would avoid the potential environmental impacts associated with the construction, operation and decommissioning of the project, which include construction noise, traffic and visual impacts, as well as impacts to biodiversity and heritage.

However, through the implementation of the management and mitigation measures described in Chapter 7, these potential impacts would not result in any significant impacts to the environment.



Site features
Hillston Sun Farm
Environmental impact statement
Figure 3.2

The project satisfies the principles of ecologically sustainable development (ESD) (refer to Section 8.3.7) and given its limited impact on the environment and considerable benefits, the 'do nothing' scenario is considered inappropriate.

ii Alternative solar technology

Under the guidance of the NSW REAP, renewable energy is predicted to grow and make important contributions to the NSW economy. As noted within the REAP, NSW has excellent renewable energy resources and is suitable for a number of different renewable energy technologies, including, hydroelectricity, wind, PV solar, solar thermal, bioenergy, geothermal and wave and tidal energy projects (NSW Government 2013).

As noted in Section 1.3, DPE-DRE has identified potential for large-scale solar energy developments in the central, northern and western regions of NSW (DoI-DRE 2016d). DPE-DRE (DoI-DRE 2016d) identifies ideal characteristics for large-scale solar energy as: low population densities; large, flat open spaces; and high average global solar exposure. The development footprint for the Hillston Sun Farm is characterised by all of these features, making it ideal for a large-scale solar energy development.

OVERLAND's experience in the development of a portfolio of solar energy sun farms on land across regional Australia, supports the decision to develop the site into a large-scale solar PV energy development. Solar PV technology is considered to be more economically viable and also requires less supporting infrastructure than a similar scale solar thermal energy development.

iii Alternative site locations and configuration

Throughout the site selection and design process, OVERLAND considered a number of different site locations. There is an additional parcel of land suitable for the development of a large-scale solar energy development (due to its flat topography and availability of solar radiation) on the eastern side of Kidman Way, east of the Temora–Roto railway line (the study area, shown in Figure 3.2). This parcel of land was identified in the request for SEARs document submitted to DPE, however, it has since been excluded from the site boundary and project configuration as part of the project design process. This is due to the constraints identification process (see Table 3.1 and Figure 3.2) and refinement of the project's design. The primary constraint associated with the eastern portion of the study is the presence of mapped flood prone land across a substantial portion of this area.

As illustrated on Figure 3.2, the exclusion of the parcel of land on the eastern side of Kidman Way will avoid potential impacts from the project on a number of environmental features, including:

- mapped flood prone land;
- large areas identified as wetland within the Carrathool LEP;
- identified Aboriginal heritage sites;
- a significant number of scattered paddock trees (hollow bearing); and
- remnant native vegetation including areas of PCT 57, PCT 70 and PCT 15.

The position of the parcel of land to the east of Kidman Way would also mean construction of connection infrastructure to the Hillston Substation which would need to cross Kidman Way and the Temora–Roto railway line.

This would result in the disturbance of a greater area of remnant vegetation due to the increased length of transmission line required. It would also create a new electricity asset requiring management that would cross a major road, and be visible by motorists travelling along Kidman Way.

Construction of project infrastructure on this parcel of land may also result in temporary disruptions to services on the Temora–Roto railway line. Consequently, during the site selection and design process, OVERLAND has excluded this parcel of land from the site boundary.

As noted in Section 3.2, the site location, capacity of the project, design and layout of project infrastructure and connection to the electricity grid have been refined through an evaluation process both prior to and during preparation of the EIS. The development footprint and infrastructure layout within the site boundary have been refined on the basis of environmental constraints identification with the objective of developing an efficient project that avoids and minimises environmental impacts.

The site has also been selected to avoid and minimise land disturbance and overall impacts on agricultural production in the Carrathool Shire LGA where possible. The final site boundary and development footprint have been selected to avoid fragmenting the landholder's residual agricultural land. As noted in Section 6.5, access tracks to and from the site will remain accessible to the landholder to avoid any impacts to the operation and sustainability of agricultural production on land adjacent to the site boundary.

3.4 Project components

3.4.1 PV solar panels

The project involves the installation of PV solar panels, arranged in a series of rows positioned to maximise the use of the solar resource available at the site (refer to Photograph 3.1). PV solar panels will be constructed in a single axis tracking configuration, which will allow the PV solar panels to rotate from east to west during the day tracking the sun's movement. Panels will be fixed to and supported by ground-mounted framing (refer to Photograph 3.2). The average height of the PV solar panel rows will be approximately 1.2 m. During the early morning and late afternoon tracking periods, the maximum height of the PV solar panel rows will be approximately 2 m.

The typical dimensions of the PV solar panels are 1.7 m by 1 m, which provides a surface area of approximately 1.65 square metres (m^2) per PV solar panel. PV solar panels will be constructed of solar glass with an anti-reflective surface treatment.

Approximately 300,000 PV solar panels could be accommodated at the site, providing an estimated capacity in the order of 85 MW. The final number of PV solar panels within the development footprint will be dependent on detailed design, availability and commercial considerations at the time of construction.

Photograph 3.1 **Example of the proposed PV solar panel array layout**

Photograph 3.2 **Example of the steel frame structures used to support PV solar panels**

3.4.2 Electrical collection system and switchyard

The PV solar panels will be connected in series and the electricity generated by the project will be directed via underground electrical collection systems to the inverters (refer to Photograph 3.1).

It is estimated that 38, 2.5 MW inverters will be required; however, this will be dependent on the final detailed design. The inverters will connect to the main switchboard building and onsite substation, which will use the connection infrastructure to export electricity to the grid network. All electricity generated by the PV solar panels will pass through the Hillston Substation and then be transmitted into the grid network.

The on-site electrical collection systems will be placed underground in standard electrical conduit trenches of between 600-1,200 mm in depth. The electrical cabling necessary to connect the PV solar panels in series will be positioned in cable trays mounted underneath the panels.

3.4.3 Management hub

The project includes the development of a management hub, from which operation of the infrastructure will be managed. Structures will include a demountable office control building, including staff amenities, and equipment storage sheds. This will be the receival point for all equipment delivery during construction and all management activities during the project's operational period.

3.4.4 Access, parking and security

Access to the site will be from Kidman Way, utilising two existing cleared access tracks (Figure 3.1). Two new intersections will be constructed. The approximate locations of these intersections are presented in Figure 3.1 and further details on the intersection designs are discussed in Section 6.8 and Appendix H.

Internal unsealed access roads of approximately 4–6 m width will be constructed to accommodate construction and operational traffic movements throughout the site. The indicative location of the access roads is illustrated in the detailed infrastructure layout plan (Figure 3.1). Parking will be provided within the management hub (Figure 3.1).

The site will be fenced off by a chain mesh fence, which will be approximately 1.8–2.4 m high. Fencing will restrict public access to the site.

3.4.5 Connection infrastructure

An overhead transmission line to the Essential Energy Hillston Substation will be constructed to export electricity produced at the site to the electricity grid. The Hillston Substation is immediately adjacent to the site's northern boundary (being approximately 150 m from the existing infrastructure). Within the site boundary, transmission infrastructure will originate from the main switchboard building and onsite substation adjacent to the site's northern boundary (see Figure 3.1). The overhead transmission line will be approximately 300 m in length and will require the installation of up to four supporting poles (constructed of either concrete or steel), which will be up to 21 m high.

There is a paper road between the northern boundary of the site and the Hillston Substation. OVERLAND has consulted with CSC to discuss the potential impacts of the project on this paper road (refer to Section 5.3).

3.5 Construction

3.5.1 Site preparation

Due to the development footprint's relatively flat terrain and predominantly cleared landscape, limited site preparation and civil works will be required. Site establishment works and preparation for construction will include:

- the establishment of a temporary construction site compound in a fenced off area within the development footprint including:
  - a site office;
  - containers for storage; and
  - parking areas;
- construction of access tracks and boundary fencing;
- site survey to confirm infrastructure positioning and placement; and
- where necessary, additional geotechnical investigations to provide information specific to the selected tracking system, mountings, and foundation pile arrangement.

3.5.2 Construction stages

Upon completion of the site establishment and pre-construction activities described above, construction will typically be as follows:

- posts will be driven or screwed into the ground to provide support for the mounting framework required for the PV solar panels;
- foundations for the inverter blocks, switchyard and management hub structures will be prepared;
- underground cabling will be installed between the PV solar panels and the collection circuit (this cabling will carry power throughout the site, between the inverters and main switchboard building, which will be located in the management hub);
- PV solar panel frames will be assembled and mounted on top of the piles;
- PV solar panels, inverters, the onsite substation and switchgear units will be installed;
- transmission infrastructure will be constructed between the onsite substation and main switchboard building and the Hillston Substation;
- the management hub will be constructed;
- permanent fencing and security will be constructed; and
- the temporary construction site compound will be removed.

3.5.3 Construction plant and equipment

The plant and equipment required for the construction of the project will include:

- earthmoving machinery and equipment for site preparation;
- cable trenching and laying equipment;
- post-driving equipment;
- assisted material handling equipment (forklifts and cranes);
- machinery and equipment for connection infrastructure establishment; and
- water trucks for dust suppression.

3.5.4 Delivery of construction materials and infrastructure

Construction materials and infrastructure will likely be transported to the site via road. Consistent with the vehicle length allowances of the designated B-Double route for Kidman Way, heavy vehicles up to 19 m in length will require access to the site. Construction materials and infrastructure delivered to the site will include:

- PV solar panels;
- piles, mounting structures and frameworks;
- electrical equipment and infrastructure including cabling, inverters, switchgear, and the onsite substation (or transformer);
- construction and permanent buildings and associated infrastructure; and
- earthworks and lifting machinery and equipment.

Oversized vehicle movements may be required for the delivery of the 33 kV/132 kV onsite substation (or transformer) that will be located at the main switchboard building (Figure 3.1). The construction traffic and transportation of materials is further discussed in Section 6.8.

3.5.5 Construction duration and hours

Construction of the project will take approximately 12 months from the commencement of site establishment works. Construction activities will be undertaken during the standard daytime construction hours of:

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

In general, no construction activities will occur on Sundays or public holidays. Exceptions to these hours may be required on limited occasions. The local council, NSW Environment Protection Authority (EPA) and surrounding landholders will be notified of any exceptions prior to any works being undertaken.

3.5.6 Construction workforce

It is anticipated that the average construction workforce throughout the 12 month construction period will be approximately 100 people. During the peak construction period, a workforce of approximately 150 people will be required on site.

3.6 Operation

Following construction, the project will begin operating with the production of electricity for contribution to the grid network. The PV solar panels will operate during daylight hours, seven days per week, 365 days per year. The operational lifespan of the project may be in the order of 30 years, depending on the nature of solar PV technology and energy markets.

An operational workforce of between two and five FTEs will be required to maintain the project once construction has been completed and the operational stage of the project commences.

Throughout the operational stage of the project, ongoing maintenance of the site and project infrastructure will be required. This will include the following ongoing tasks:

- site maintenance including:
  - vegetation maintenance;
  - weed and pest management;
  - fence and access road management; and
  - landscaping;
- infrastructure maintenance including:
  - panel cleaning;
  - panel repair (if required); and
  - equipment, cabling, substation and communications system inspection and maintenance.

To ensure the optimal electricity production output from the project, the PV solar panels may need to be washed periodically to remove dirt, dust and other matter. Water for panel cleaning will be transported to the site via water trucks. Washing will not require any detergent or cleaning agents.

The operational workforce will also be responsible for ongoing security monitoring of the site and project infrastructure.

3.7 Decommissioning

Once the project reaches the end of its investment and operational life, the project infrastructure will be decommissioned and the site returned to its pre-existing land use, or other land use in consultation with the landholder, as far as practicable.

Decommissioning of the site will be carried out in accordance with the landholder's requirements and will typically involve the removal and recycling of the materials on site including:

- PV solar panels and mounting frames;
- metals from posts and cabling; and
- all other equipment including inverters and the onsite substation.

During decommissioning, all above ground facilities will be removed from the site.

Information about the management and mitigation measures that will be implemented during decommissioning is provided in Section 6.5.4 and Table 7.1.

3.8 Environmental management

An environmental management strategy will be implemented to provide the strategic framework for environmental management of the project. The strategy will:

- incorporate a project environmental management plan (EMP), all other required plans, protocols, management and mitigation measures proposed in this EIS;
- identify all relevant statutory approvals;
- establish roles, responsibility, authority and accountability of all key personnel involved in the environmental management of the project;
- establish procedures for consulting with the local community and relevant agencies about the operation and environmental performance of the development; and
- establish procedures for handling of complaints, disputes, non-compliances and emergency response.

Chapter 7 provides a consolidated summary of the management measures that will be implemented during the construction and operation of the project to manage, mitigate and/or monitor potential impacts identified within this EIS.

4 Regulatory framework

4.1 NSW Environmental Planning and Assessment Act 1979

4.1.1 Approval process

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

Section 89C(2) of the EP&A Act states that a:

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

The project is declared to be SSD by the provisions of the SRD SEPP (see Section 4.1.4.i for further details).

Under section 89D of the EP&A Act, the NSW Minister for Planning is the consent authority for SSD. However, pursuant to section 23 of the Act, the Minister may delegate the consent authority function to the Planning Assessment Commission (PAC), the Secretary or to any other public authority.

A DA for SSD must be accompanied by an EIS, prepared in accordance with the EP&A Regulation. Before preparing an EIS, an applicant must request SEARs which specify what must be addressed in an EIS. The SEARs for the project, issued on 14 October 2016, are included with this EIS in Appendix A.

The EIS will be placed on public exhibition for a minimum of 30 days by DPE and submissions will be sought from local and State government agencies and the community. Any submissions received by DPE will be reviewed and forwarded to the applicant to consider and respond to (via a response to submissions (RTS) report).

Following receipt of the RTS report, DPE will prepare its assessment report considering this EIS, all submissions received during the exhibition process and the RTS report. This report is forwarded to the consent authority for consideration before determining the DA.

The planning approval process for SSD (under Division 4.1 of Part 4 of the EP&A Act) can be seen in Figure 4.1.

4.1.2 Matters for consideration

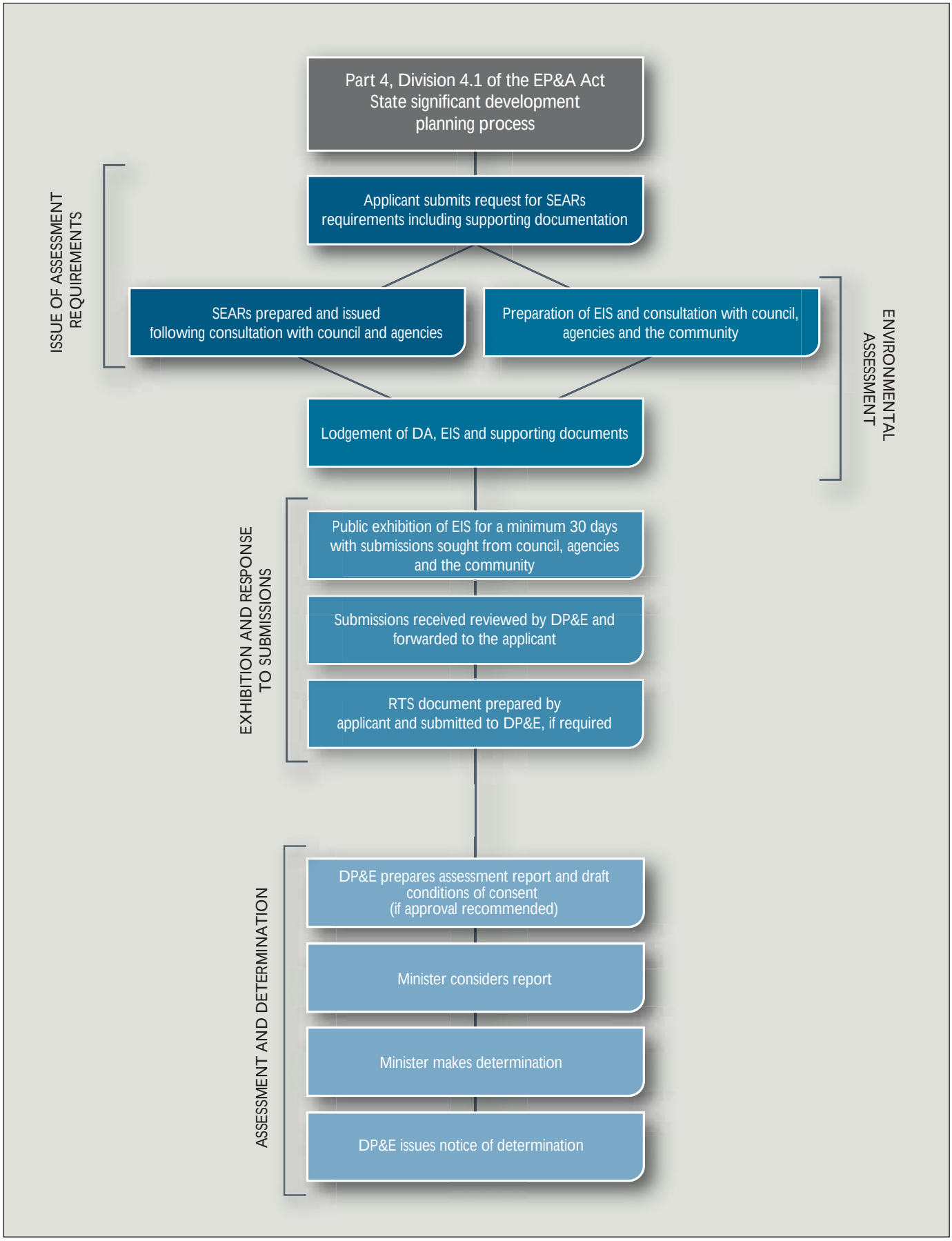
When assessing a DA for SSD, the consent authority is required to take into consideration the matters outlined in section 79C of the EP&A Act. These matters are addressed in Table 4.1.

Table 4.1 Matters for consideration – Section 79C of the EP&A Act

Provision	Consideration
Any environmental planning instrument	Relevant planning instruments are addressed in Section 4.1.4.
Any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority	There are no proposed instruments relevant to the project.

Table 4.1 Matters for consideration – Section 79C of the EP&A Act

Provision	Consideration
Any development control plan	Clause 11 of the SRD SEPP states that development control plans do not apply to SSD.
Any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F	There are no planning agreements relevant to the project.
The regulations (to the extent that they prescribe matters for the purposes of this paragraph)	The requirements of the EP&A Regulation are addressed in Section 4.1.5.
Any coastal zone management plan (within the meaning of the NSW *Coastal Protection Act 1979*)	The project is not within the coastal zone as defined under the *Coastal Protection Act 1979*.
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	This EIS comprehensively describes the likely impacts of the project based on the SEARs, including environmental impacts on both the natural and built environments, and social and economic impacts in the local area, region and State. It also describes commitments proposed by the applicant to mitigate and manage these impacts. These descriptions are based on technical studies prepared by specialists, which are appended to this EIS and summarised in Chapter 6. The technical studies were prepared using the most recent and accurate scientific data relevant to the project in consideration of current policies and legislation. In addition, the technical studies adopted conservative assumptions to enable the upper limit of likely impacts to be assessed.
The suitability of the site for the development	It is considered that the site of the project is suitable for a solar farm for a number of reasons which are detailed in Chapter 3.
Any submissions made in accordance with this Act or the regulations	This EIS will be placed on public exhibition for a minimum of 30 days by DPE and submissions will be sought from local and State government agencies and the community. Any submissions received by DPE will be reviewed and forwarded to the applicant to consider and respond to (via a RTS report). Following receipt of the RTS report, DPE will prepare its assessment report considering this EIS, all submissions received during the exhibition process and the RTS report.
The public interest	To assist the consent authority in determining whether the project is in the public interest, this EIS provides a justification for the project (refer to Section 1.3 and Chapter 8), taking into consideration its potential environmental impacts, and the suitability of the site. It also considers the project against the principles of ESD. The consent authority will also be required to consider all submissions received during the public exhibition of the EIS.



Planning approval process for SSD
Hillston Sun Farm
Environmental impact statement
Figure 4.1

4.1.3 Approvals not required or which cannot be refused

Under section 89J of the EP&A Act, the following authorisations are not required for SSD:

(a) the concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of that Act;

(b) a permit under Section 201, 205 or 219 of the *Fisheries Management Act 1994*;

(c) an approval under Part 4, or an excavation permit under Section 139, of the *Heritage Act 1977*;

(d) an Aboriginal heritage impact permit under Section 90 of the *National Parks and Wildlife Act 1974*;

(e) an authorisation referred to in Section 12 of the *Native Vegetation Act 2003* (or under any Act repealed by that Act) to clear native vegetation or State protected land;

(f) a bush fire safety authority under Section 100B of the *Rural Fires Act 1997*; and

(g) a water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the *Water Management Act 2000*.

Further, section 89K of the EP&A Act lists authorisations which cannot be refused and are to be substantially consistent with a development consent for SSD. Relevant to the project, consent under section 138 of the NSW *Roads Act 1993* (Roads Act) may be required for the site access intersections to connect the project to Kidman Way. Should the project obtain development consent, approval under the Roads Act cannot be refused and will be consistent with conditions of approval.

4.1.4 Environmental planning instruments

The following environmental planning instruments are relevant to the project:

- SRD SEPP;
- State Environmental Planning Policy (Infrastructure) 2007 (the Infrastructure SEPP);
- State Environmental Planning Policy No 33–Hazardous and Offensive Development (SEPP 33);
- State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55);
- State Environmental Planning Policy (Rural Lands) 2008 (rural lands SEPP);
- State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44); and
- Carrathool LEP.

The relevant provisions of the above instruments to the project are discussed in the following sections.

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

The SRD SEPP identifies development that is SSD. Clause 8 of the SRD SEPP states:

> (1) Development is declared to be State significant development for the purposes of the Act if:
>
> (a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and
>
> (b) the development is specified in Schedule 1 or 2.

Schedule 1 of the SRD SEPP defines the following as SSD:

> Electricity generating works and heat or co-generation
>
> 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.

The project is a development for the purpose of electricity generation using a solar energy source, and will have a capital investment value of more than $30 million.

Permissibility of the project is given under clause 34 (7) of the Infrastructure SEPP as detailed further below.

The project meets both the requirements of clause 8 of the SRD SEPP as it is not permissible without development consent and is development specified in Schedule 1. Therefore, the project is SSD for the purposes of the EP&A Act.

ii State Environmental Planning Policy (Infrastructure) 2007

The Infrastructure SEPP provides development controls for infrastructure and services. Clause 34 (7) of the SEPP provides provisions for development that is permitted with consent. It states:

> (7) Solar energy systems
>
> Except as provided by subclause (8), development for the purpose of a solar energy system may be carried out by any person with consent on any land.

Subclause (8) limits the use of photovoltaic electricity generating systems with a capacity to generate more than 100 kW in residential zones. The site is not within a residential zone and, therefore, is not affected by this subclause.

Therefore, the project is permissible with development consent.

iii State Environmental Planning Policy No 33—Hazardous and Offensive Development

Under SEPP 33 a preliminary hazard assessment (PHA) prepared in accordance with the current circulars or guidelines must be submitted for potentially hazardous or offensive development. The guideline *Applying SEPP 33* (DoP 2011) includes a checklist and a risk screening procedure to determine whether a development is potentially hazardous or offensive.

A review of *Applying SEPP 33* has identified that the project is not potentially hazardous, as it will not exceed the screening threshold for any of the hazardous material identified in *Applying SEPP 33*.

Further, the project will not pose a significant risk to or have a significant adverse impact on human health, life, property or the biophysical environment (see Chapter 6). The project is not a potentially hazardous or offensive industry and therefore, a PHA is not required.

iv State Environmental Planning Policy No 55 – Remediation of Land

SEPP 55 was enacted to provide a state wide planning approach to the remediation of contaminated land, and aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human and environmental health.

Clause 7 of 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* (Department of Urban Affairs and Planning 1998) identifies activities with the potential to cause contamination. These guidelines list 'agricultural/horticultural activities' as an activity which potentially causes contamination.

A search of the EPA's contaminated land record, public register and list of sites notified to the EPA under Section 60 of the NSW *Contaminated Land Management Act 1997* did not return any information on reported contamination or any regulatory notices issued for the site (EPA 2017a; EPA 2017b).

v State Environmental Planning Policy (Rural Lands) 2008

The rural lands SEPP aims to, among other objectives, 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 the proper management 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 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, for the reasons outlined in Section 3.2. Potential impacts to biodiversity, heritage, land use and water resources are considered in Chapter 6. The project will not impact State significant agricultural land.

On balance, the project is considered to be an acceptable use of rural lands, in consideration of the social, economic and environmental interests of the community.

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

SEPP 44 encourages the conservation and management of koala habitats, to ensure permanent free-living koala populations will be maintained over their present range. SEPP 44 requires the consent authority to consider if the land in the development application is 'potential koala habitat' or 'core koala habitat'.

An assessment of potential and core koala habitat has been undertaken for the project (refer to Appendix C). Bimble Box, a Koala feed tree species as defined in Schedule 1 of the SEPP, was identified within the development footprint. However, this feed tree species does not make up 15% of the total number of trees in the upper or lower strata of the tree component. Therefore, the vegetation within the development footprint would not be considered potential Koala habitat as defined under SEPP 44.

vii Carrathool Local Environmental Plan 2012

The site is zoned RU1 Primary Production pursuant to the Carrathool LEP. The objectives of the RU1 zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To facilitate farm adjustments.
- To enable agricultural support facilities to be carried out on land within the zone in manner which does not significantly reduce the agricultural and horticultural production potential of land in the locality.
- To encourage eco-tourist facilities and tourist and visitor accommodation that minimise any adverse effect on primary industry production and scenic amenity of the area.

The project will harness a natural resource, namely solar energy. Whilst the development of this project will impact the availability of land for other primary production, it will allow for and encourage diversity in the area's land use, and will provide economic stimulus and support to rural communities.

Development for the purpose of electricity generation works is prohibited in the RU1 zone under the Carrathool LEP; however, the project is permissible by virtue of clause 34(7) of the Infrastructure SEPP.

4.1.5 Environmental Planning and Assessment Regulation 2000

As previously stated, a DA for SSD must be accompanied by an EIS, prepared in accordance with the EP&A Regulation. Schedule 2 of the EP&A Regulation stipulates:

- requirements of the Director-General and approval bodies in relation to EISs (ie the SEARs); and
- general provisions relating to EISs.

The general provisions specify the form (clause 6) and the content (clause 7) of an EIS. The clause 6 and 7 requirements and where they are addressed in the EIS are set out in Table 4.2 below.

Table 4.2 Schedule 2 requirements for an EIS

Requirement	Where contained in the EIS
Name, address and professional qualifications of the person(s) who prepared the EIS	Certification page at the front of this EIS
Name and address of the responsible person (the applicant)	Certification page at the front of this EIS
Address of land	Table 2.1
Description of development	Chapter 3
Assessment of the environmental impact	Chapter 6
Declaration that the EIS has been prepared in accordance with this Schedule, contains all available information that is relevant to the environmental assessment of the development and that the information contained in the statement is neither false nor misleading	Certification page at the front of this EIS
Summary of the EIS	Executive summary
A statement of the objectives of the development	Section 3.1
An analysis of feasible alternatives, having regard to its objectives, including the consequences of not carrying out the development	Section 3.3
A full description of the development	Chapter 3
A general description of the environment likely to be affected by the development	Chapter 2
The likely impact on the environment of the development	Chapter 6
A full description of the measures proposed to mitigate any adverse effects of the development	Chapter 6 Chapter 7
A list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out	Table 4.3
A compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv) (a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment)	Chapter 7
The reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development	Section 1.3 Section 8.3.7

4.2 Other state legislation

4.2.1 Protection of the Environment Operations Act 1997

The NSW *Protection of the Environment Operations Act 1997* (POEO Act) is the principal NSW environmental protection legislation and is administered by the NSW Environment Protection Authority (EPA). Section 48 of the POEO Act requires an environment protection licence (EPL) to undertake scheduled activities at a premise. Scheduled activities are defined in Schedule 1 of the POEO Act and include the following premise-based activities that apply to the project:

> 17 Electricity generation
>
> (1) ...general electricity works, meaning the generation of electricity by means of electricity plant that, wherever situated, is based on, or uses, any energy source other than wind power or solar power.
>
> (2) Each activity referred to in Column 1 of the Table to this clause is declared to be a scheduled activity if it meets the criteria set out in Column 2 of that Table.

The project involves the generation of electricity from solar energy. Therefore, it is not a scheduled activity and an EPL is not required.

4.2.2 Water Management Act 2000

The NSW *Water Management Act 2000* (WM Act) regulates the use and interference with surface and groundwater in NSW where a water sharing plan has been implemented. A number of water sharing plans apply to the region in which the site is located.

The WM Act provides for basic landholder rights, which enable landholders to extract water from an aquifer underlying their properties for domestic and stock purposes without the need for a licence. A water use approval under Section 89 of the WM Act is not required for the project by virtue of Section 89J of the EP&A Act. Should water be extracted under these provisions for stock watering purposes, the relevant water supply work approvals would be sought under the WM Act.

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

As described in Chapter 3 and Section 6.9, the water demands of the project will be met via a combination of potable water trucked to the site, and extraction from either the Lower Lachlan Groundwater Source or the Lachlan Regulated River Water Source.

4.2.3 Rural Fires Act 1997

The NSW *Rural Fires Act 1997* (RF Act) aims to prevent, mitigate, and suppress bush and other fires in local government areas of the State. Section 63(2) of the RF Act requires the owners of land to prevent the ignition and spread of bushfires on their land. Under Section 89J of the EP&A Act, a bush fire safety authority under Section 100B of the RF Act is not required for SSD that is authorised by a development consent.

The NSW Rural Fire Service Bush Fire Prone Land online mapping tool indicates that the site is not bush fire prone. An assessment of bushfire hazards has been completed in Section 6.11.

4.2.4 NSW Roads Act 1993

The NSW *Roads Act 1993* (Roads Act) is administered by either RMS, local government or New South Wales Land and Property Information (NSW LPI). The RMS has jurisdiction over major roads, local government over minor roads and NSW LPI over Crown roads. The Roads Act sets out the rights of the public in regard to access to public roads.

Under section 138 or Part 9, Division 3 of the Roads Act, a person must not undertake any works that impact on a road, including connecting a road (whether public or private) to a classified road, without approval of the relevant authority, being either RMS or local council, depending upon classification of the road. The project will require improvements to two existing intersections on Kidman Way which will provide access to the site.

Under the provisions of the EP&A Act, an approval under section 138 or Part 9, Division 3 of the Roads Act cannot be refused if it is necessary for carrying out a SSD authorised by a development consent (see Section 4.1.3).

4.2.5 National Parks and Wildlife Act 1974

The NSW *National Parks and Wildlife Act 1974* (NPW Act) provides for nature conservation in NSW including the conservation of places, objects and features of significance to Aboriginal people and protection of native flora and fauna. A person must not harm or desecrate an Aboriginal object or place without an Aboriginal heritage impact under section 90 of the NPW Act. However, a section 90 permit is not required for SSD approvals by virtue of section 89J of the EP&A Act.

The project design has avoided impacts to Aboriginal heritage sites. The project will avoid harm to five Aboriginal heritage sites identified within the study area adopted as part of the ACHAR.

Further discussion of the potential impacts to Aboriginal heritage sites resulting from the project are detailed in Section 6.3 and Appendix D.

4.2.6 Threatened Species Conservation Act 1995

The NSW *Threatened Species Conservation Act 1995* (TSC Act) aims to conserve biological diversity in NSW through the protection of threatened flora and fauna species and endangered ecological communities (EECs).

Two TSC Act listed EECs have been mapped in the ecological study area (refer to Section 6.2 and Figure 6.1), but will be avoided by the development footprint. The project will not result in any impacts to these communities. The project will not result in removal of habitat for threatened species and populations.

Further discussion of the potential impacts of the project on threatened species and EECs listed under the TSC Act is provided in Section 6.2 and Appendix C.

4.2.7 Native Vegetation Act 2003

The NSW *Native Vegetation Act 2003* (NV Act) provides for the promotion, improvement and protection of native vegetation in NSW. Approval to clear native vegetation in NSW is required under the NV Act. Under section 89J of the EP&A Act, SSD is exempt from an authorisation to clear native vegetation under section 12 of the NV Act.

Consultation has been undertaken with NSW Local Land Services to confirm that there are no existing property vegetation plans (PVP) under the provisions of the NV Act that would be affected by the project.

Further discussion of the potential impacts of the project on native vegetation is provided in Section 6.2 and Appendix C.

4.2.8 Heritage Act 1977

The NSW *Heritage Act 1977* (Heritage Act) aims to protect and conserve the natural and cultural history of NSW, including scheduled heritage items, sites and relics. Approvals under Part 4 or an excavation permit under section 139 of the Heritage Act are not required for SSD by virtue of section 89J of the EP&A Act.

The project will not impact any items of local, State, National or World heritage significance identified on the SHR, Carrathool LEP or Australian Heritage Database.

Further discussion of the potential heritage impacts of the project are detailed in Section 6.4.

4.3 Commonwealth legislation

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) aims to protect matters of national environmental significance (MNES) including:

- world heritage properties;
- national heritage places;
- Ramsar wetlands of international importance;
- nationally threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- a water resource, in relation to coal seam gas development and large coal mining development.

A search of the Commonwealth Protected Matters Search Tool indicates that there are no World Heritage Properties or National Heritage Places within the vicinity of the site. The Commonwealth Protected Matters Search Tool and preliminary ecological investigations indicate that there is potential for listed threatened ecological communities (TECs), listed threatened species and listed migratory species to occur within the vicinity of the site.

If an action would, or is likely to, have a significant impact on any MNES, it is deemed to be a 'controlled action' and requires approval from the Commonwealth Environment Minister or the Minister's delegate. To determine whether a proposed action will or is likely to be a controlled action, a Referral or Proposed Action is submitted to the Commonwealth Department of the Environment and Energy (DoEE – formerly Department of the Environment).

4.4 Strategic policies

4.4.1 Riverina Murray Regional Plan

The Riverina Murray Regional Plan 2036 (RMRP) was prepared by the NSW DPE. The RMRP is a 20-year blueprint for the future of the Riverina Murray. The Riverina Murray Region consists of 19 LGAs including Carrathool.

The NSW Government's vision for the Riverina Murray is to create a diversified economy founded on Australia's food bowl, iconic waterways and a strong network of vibrant and connected communities. The RMRP provides the strategy necessary to deliver the vision for the region. To deliver the vision of the Riverina Murray the RMRP sets out the following goals:

- a growing and diverse economy;
- a healthy environment with pristine waterways;
- efficient transport and infrastructure networks; and
- strong, connected and healthy communities.

Solar generation is recognised in the strategy. Direction 11 of the strategy aims to promote the diversification of energy supplies through renewable energy generation. The strategy notes that there is significant potential for renewable energy industries, specifically, the plan notes that the Carrathool area is suitable for large-scale solar power generation.

Deficiencies in the energy network across the region, particularly in Carrathool are identified in the RMRP as a major barrier to business development and industry diversification or expansion.

The project is consistent with the aims and goals of the RMRP, as it would allow the region to realise the economic potential and benefits of utilising the areas suitability for solar power generation.

4.4.2 NSW Renewable Energy Action Plan

The REAP, prepared by the NSW Government in 2013 guides NSW's renewable energy development and supports the achievement of national renewable energy targets. The NSW Government's vision is for a secure, reliable, affordable and clean energy future for the state. The REAP positions NSW to increase the use of energy from renewable sources.

The REAP sets out a number of actions to achieve its vision, under the following three goals:

- Goal 1 – attract renewable energy investment;
- Goal 2 – Build community support; and
- Goal 3 – Attract and grow renewable energy expertise.

The project will assist in achieving the Government's goals of increasing renewable energy generation in NSW help to achieve renewable energy targets. Through creating new solar employment opportunities, the project will contribute to growing expertise in renewable energy technologies.

4.5 Summary of licences, approvals and permits

Table 4.3 contains a summary of the licences, approvals and permits that are likely to be required for the project.

Table 4.3 **Summary of required licenses approvals and permits**

Legislation	Authorisation	Consent or approval authority
EP&A Act	Development consent	Minister for Planning or delegate
	Construction certificate required prior to construction of certain structures	CSC or private certifier
	Occupation certificate required prior to use of certain buildings	CSC or private certifier
NSW Roads Act 1993	Section 138 permit for road and intersection improvements for site access road intersection with Kidman Way	RMS

5 Stakeholder consultation

5.1 Overview

During the project design development process and preparation of this EIS, consultation was undertaken with a range of stakeholders including various local and NSW Government agencies and the local community. This chapter describes the consultation undertaken for the project, including information on stakeholder identification, methods of communication, and outcomes of the consultation process.

5.2 Stakeholder identification

Three stakeholder groups were identified who may have a direct or direct interest in the project, and hence were included in the consultation for the project. These broad groups were:

1. Regulatory – local, State and Commonwealth government agencies.
2. Community – neighbouring landholders, the broader Hillston community, Aboriginal stakeholders.
3. Other stakeholders with local interests.

Table 5.1 provides a summary of the stakeholder and consultation objectives for the project.

Table 5.1 Stakeholders and consultation objectives

	Stakeholder	Consultation objectives
Regulatory	CSC	Introduce the project, including the project infrastructure layout and project timeline. Address matters raised by each of the listed agencies in correspondence provided with the SEARs, as well as any other matters that arise during consultation.
	DPE-DRE	
	Office of Environment and Heritage (OEH)	
	Roads and Maritime Services (RMS)	
	Local Land Services (LLS) Riverina	
	Department of Primary Industries (DPI) – Agriculture	
	NSW Environment Protection Agency (EPA)	
	NSW RFS	

Table 5.1 Stakeholders and consultation objectives

	Stakeholder	Consultation objectives
Community	Adjoining landholders	Introduce the project, including the project infrastructure layout and project timeline. Where relevant, request information about on site agricultural operations; aerial spraying; weed and pest management practices; and bushfire protection management measures implemented on adjoining land. Address any concerns about the project. Discuss the approval process. Present the findings of the visual impact assessment and discuss potential mitigation/management measures to address impacts (if required). Provide an opportunity for stakeholders to raise any concerns about the visual impact of the project.
	Hillston community	Introduce the project, including the project infrastructure layout and project timeline. Present information on the approval process. Inform the general public about the appropriate avenues for input into the project. Determine whether there are any concerns about the project to be addressed in the EIS.
	Aboriginal stakeholders	Introduce the project, including the project infrastructure layout and project timeline. Consultation regarding the Aboriginal cultural heritage values of the site.
Other stakeholders	Civil Aviation Safety Authority (CASA)	Introduce the project, including the project infrastructure layout and project timeline. Clarify whether there is potential for the Hillston Sun Farm to present a hazard to aviation.
	Essential Energy	Discuss the proposed connection infrastructure to the Hillston Substation.

5.3 Regulatory and industry stakeholders

The methods of engagement with regulatory and industry stakeholders, the purpose of engagement, and outcomes of the consultation, is provided in Table 5.2. Detailed records of consultation are provided in Appendix B.

Table 5.2 **Consultation record and outcomes – regulators and industry stakeholders**

Stakeholder	Method of engagement	Date	Purpose	Outcome/comment
CSC	Presentation	07/07/2016	General project briefing	Presentation to CSC to identify OVERLAND's intentions to seek approval for a large-scale solar PV generation facility within the Carrathool Shire LGA.
	Letter	12/01/2017	General project briefing	Letter to provide an introduction to the project, contact details and request opportunity to meet if required, to discuss the project and relevant matters
	Information session	03/05/2017	General project briefing	Seven attendees registered attendance at the community information session for the project while a number of others attended without registering. The session was held at the Ex-Servicemen's and Citizens Club.
	Phone call and email correspondence	25/05/2017 26/05/2017	Impacts to the Hillston aerodrome	A phone conversation and email correspondence between OVERLAND and Rowan Johnson (Town Overseer, CSC) to discuss potential impacts of the project on flights to and from the Hillston aerodrome. Rowan confirmed that due to the distance between the aerodrome and the project, it is unlikely that the project will have an impact on aircraft landing at the aerodrome.
	Phone call and letter	22/06/2017 29/06/2017	Access to paper road	A phone conversation between OVERLAND and a representative from CSC to discuss the potential impacts of the project on the paper road between the northern boundary of the site and the Hillston Substation. A letter was provided by CSC, granting consent for vehicular access from Kidman Way across the paper roads to the site of the Hillston Sun Farm and to the Hillston Substation. The letter also grants consent for the erection of the overhead transmission line above the paper roads to connect the project to the Hillston Substation (refer to Appendix B).
	Phone calls and email correspondence	Ongoing	General update	Ongoing updates regarding the project status.
DPE-DRE	Letter	12/01/2017	General project briefing	Letter to provide an introduction to the project, contact details and request opportunity to meet if required, to discuss the project and relevant matters.
RMS	Letter	12/01/2017	General project briefing	Letter to provide an introduction to the project, contact details and request opportunity to meet if required, to discuss the project and relevant matters.
	Meeting	31/01/2017	Consider options available for site access	Provided an introduction to the project and discussed site access options for the project. Officer provided advice regarding the proposed site access locations off Kidman Way.
	Phone calls and email correspondence	02/02/2017 08/02/2017 03/04/2017 23/05/2017	Clarify requirements for site access options raised during meeting and site screening requirements and recommendations	RMS officer confirmed that if appropriate site distance lines were adhered to then there should not be any issues with access from Kidman Way.

Table 5.2 **Consultation record and outcomes – regulators and industry stakeholders**

Stakeholder	Method of engagement	Date	Purpose	Outcome/comment
OEH	Letter	12/01/2017	General project briefing	Letter to provide an introduction to the project, contact details and request opportunity to meet if required, to discuss the project and relevant matters.
	Phone calls and email correspondence	26/04/2017	General update	Phone call to update on project progress.
EPA	Letter and follow-up phone/email correspondence	12/01/2017	General project briefing	Letter to provide an introduction to the project, contact details and request opportunity to meet if required, to discuss the project and relevant matters. Follow-up phone correspondence with EPA officer confirmed that EPA did not have any specific matters to raise in relation to the project at this time, and the EPA did not see the need for a meeting at this time.
DPI	Letter	12/01/2017	General project briefing	Letter to provide an introduction to the project, contact details and request opportunity to meet if required, to discuss the project and relevant matters.
CASA	Phone call	10/02/2017	General project briefing	Confirmed that consultation is recommended.
	Phone call and email correspondence	11/05/2017 17/05/2017 24/05/2017	Potential impacts on air traffic and Hillston Airport	Email and phone call to provide an introduction to the project. The outcomes of discussions confirmed that: • Hillston Sun Farm is not runway aligned and is therefore unlikely to present a hazard to aircraft operations; • Hillston Airport is not certified or registered and CASA has no oversight of operations at this location; • CASA recommended that discussion with local users take place to gauge the potential impact on aircraft operations; and • there have not been any reports of glare or safety issues or concerns raised by pilots in relation to solar farm developments in Australia.
Essential Energy	Meetings, phone calls, email correspondence and letter	Ongoing	Grid connection	A letter was provided by Essential Energy to OVERLAND (dated 29 June 2017) acknowledging that a connection enquiry has been submitted and noting that OVERLAND have entered into a Connection Services Investigation Agreement with Essential Energy (refer to Appendix B).
RFS	Phone call	18/05/2017	General project briefing	Phone call to Deborah Dawson (Development Assessment and Planning Officer) to provide an introduction to the project. Deborah confirmed that there were no issues for the Hillston Sun Farm at this stage in the assessment process.

5.4 Community consultation

5.4.1 Adjoining landholders

The outcomes of consultation with adjoining landholders is summarised in Table 5.3. Copies of correspondence are provided in Appendix B.

Table 5.3 Consultation records and outcomes – adjoining landholders

Stakeholder	Method of engagement	Date	Purpose	Outcome/comment
Owner of residence R17 to the west of the site	Phone call	26/04/2017	General project briefing	Phone call to provide contact details and discuss project details.
	Meeting	03/05/2017	Assessment of visual impacts	Photographs taken from the residence at R17 to enable assessment of visual impacts.
	Phone call	05/05/2017	General update	General project discussion.
	Phone call	19/06/2017	General update	Discussion of visual impacts and landscaping to minimise views of the project infrastructure.

5.4.2 Community factsheet

A factsheet was distributed to the residents and businesses within Hillston township on 26 April 2017. The factsheet provided an introduction to the project, and included contact details for OVERLAND, and details of upcoming community sessions to be held in Hillston township on 3 May 2017. A copy of the factsheet is provided in Appendix B.

5.4.3 Hillston community information session

A community information session was held in Hillston at the Ex-Servicemen's and Citizens Club on 3 May, 2017. The session was advertised in the Riverine Grazier on 26 April 2017 and the details were included on the factsheet distributed to residents and businesses within Hillston township on 26 April 2017. The session provided an opportunity for the community to engage directly with representatives from OVERLAND and EMM about the project. Information boards were presented, which contained information about OVERLAND, solar farms and renewable energy generation, in general, as well as specific details about the project and the approval process. A copy of the information boards presented at the community information session is provided in Appendix B. A PV solar panel was also on display to provide attendees with an example of the primary project infrastructure.

The session was held over two hours with seven people registering their attendance. In addition, a number of other residents also attended the sessions but chose not to record their attendance. A brief presentation was given by an OVERLAND representative, which was followed by questions from attendees which were answered by OVERLAND and EMM representatives. A summary of the matters raised by attendees is given in Table 5.4.

Table 5.4 Matters raised at community information session

Matter	Comment
Local employment	Positive views about potential employment benefits for the local community. Questions related to how many local jobs would be generated by the project, as well how recruitment would be undertaken so that the local community had the opportunity to apply for jobs. OVERLAND indicated that local employment was desirable outcome and that it would endeavour to work with CSC to maximise employment opportunities for the local community where possible.
Economic benefits	Positive views about the benefits of the project for the local economy, and provide indirect benefits for other services operating within the town.
Electricity supply and cost	Questions were raised about the ability of the project to supply electricity locally, as well as whether the project would reduce electricity prices. The project would supply electricity directly to wholesalers through the National Electricity Market, and would not directly affect local electricity prices.
Visual impacts	Questions were raised about impacts on the visual amenity from surrounding residences. Visual impacts area assessed in Section 6.6 and Appendix F. Landscaping is proposed to minimise views from one sensitive receptor, R17.
Traffic impacts	Questions were raised about traffic impacts and site access, in particular the potential increase in the use of an unclassified access road running along the northern boundary of the site connecting Lachlan Valley Way and Kidman Way. Access to the site would be via Kidman Way. Two access locations have been identified in Figure 3.1 and assessed in Appendix H. Project-related traffic would not be permitted to use the unclassified road running along the northern boundary of the site to access Lachlan Valley Way.
Construction noise and air quality impacts	Questions were raised about impacts on noise and air quality during construction. Noise impacts are assessed in Section 6.7 and Appendix G and air quality impacts are addressed in Section 6.12.
Investment value of the project and government funding/contributions	Attendees queried the capital investment value of the project, and the value of any government incentives or funding for development of the project. The capital investment of the project is in excess of $150 million which would be privately funded. No government funding is currently available for the project.

5.4.4 Aboriginal stakeholders

Aboriginal stakeholders were identified and consulted in accordance with OEH's Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010) and the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005). A detailed description of consultation is presented in Appendix D, and discussed in Section 6.3.

6 Impact assessment

6.1 Introduction

A preliminary assessment of biophysical, social and economic matters was included as part of the request for SEARs submitted for the Hillston Sun Farm (September 2016). That assessment informed the SEARs which have identified the key matters for assessment in this chapter of the EIS, as follows:

- biodiversity;
- heritage;
- land;
- visual;
- noise;
- transport;
- water; and
- electromagnetic interference.

In addition to the key matters identified in the SEARs, consideration of impacts to the following has been included in this chapter:

- air quality;
- bushfires; and
- socio-economic.

Where relevant, technical reports have been prepared and appended (refer to Appendices C to H). A summary of mitigation and management measures is included in Chapter 7.

6.2 Biodiversity

6.2.1 Introduction

The SEARs require an assessment of the potential impacts of the Hillston Sun Farm project on biodiversity. The SEARs state that this EIS must include:

> an assessment of the likely biodiversity impacts of the development, having regard to the NSW Biodiversity Offsets Policy for Major Projects, and in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by the Department.

A BAR has been prepared by Biosis Pty Ltd for the project (Appendix C). This section of the EIS summarises the results of the BAR and addresses the SEARs requirements for biodiversity.

6.2.2 Existing environment

i Landscape

A broader ecological study area was adopted for the BAR which includes the development footprint plus the immediately surrounding land investigated during the field surveys (refer to Figure 6.1). The ecological study area consists of predominantly flat agricultural land with remnant native vegetation in isolated patches within cropped paddocks and along depressions, road and rail reserves. There are several mapped watercourses or drainage lines within the development footprint which are irrigation channels. One perennial watercourse dissects the development footprint (see Figure 6.1). All watercourses are mapped as Strahler order 1 tributaries of the Lachlan River.

The ecological study area occurs within the Riverina IBRA bioregion and the Lachlan IBRA subregion. The Lachlan Depression Plains Mitchell Landscape was used in this assessment as it covers the ecological study area and development footprint. The ecological study area is within the Lachlan catchment, in central NSW and west of the Great Dividing Range.

ii Native vegetation

The site is currently used for winter cereal and irrigated cropping activities. Native vegetation within the site boundary and broader ecological study area is composed of isolated patches of vegetation in an agricultural matrix or small sections of shelterbelts or roadside reserves.

Key ecological values identified within the development footprint include:

- 0.09 ha of the PCT 57 Belah/Black Oak – Western Rosewood – Wilga woodlands of central NSW including the Cobar Peneplain Bioregion (LA106).
- 1.29 ha of the PCT 13 Black Box – Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (LA108).
- 0.5 ha of the PCT 15 Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (LA110).
- Two scattered paddock trees.

Other ecological values identified within the broader ecological study area include:

- Stands of PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt (LA223), and PCT 105 Poplar Box grassy woodland on flats mainly in the Cobar Peneplain Bioregion and Murray Darling Depression Bioregion (LA177).
- Additional stands of PCT 13, 15 and 57 generally present as remnant vegetation around property boundaries, retained woodlots or along depressions.

- Native vegetation in adjacent Kidman Way road and railway reserves, including PCT 26, which represents Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions endangered ecological community (NSW Scientific Committee 2005), and small patches of Acacia melvillei shrubland in the Riverina and Murray-Darling Depression bioregions endangered ecological community (NSW Scientific Committee 2008). The Acacia melvillei shrubland is embedded in disturbed stands of PCTs 15 and 57 along the road and rail easements of the Kidman Way.
- Scattered paddock trees.

Two TSC Act listed EECs were mapped in the broader ecological study area, *Weeping Myall Acacia pendula woodland* and *Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions*. Weeping Myall Woodland is also an EEC under the EPBC Act. The development footprint has been designed to avoid these communities.

iii Threatened species

The ecological study area has an extensive history of use for agricultural purposes, and has recently been used for cropping. Areas of native vegetation are present within the development footprint and may provide habitat for large mammals or highly mobile avian species capable of disbursing across the fragmented landscape. Fauna habitat features in the ecological study area are limited to areas of remnant patch vegetation, as outlined above, scattered trees and mistletoe.

No permanent or semi-permanent wetlands are present within the development site.

The development footprint contains two scattered hollow bearing paddock trees, which contain small to large hollows. The development footprint contains limited habitat for woodland birds, although the broader ecological study area contains suitable habitat and populations of TSC Act listed woodland birds Major Mitchell's Cockatoo *Lophochroa leadbeateri* and Grey-crowned Babbler (eastern subspecies) *Pomatostomus temporalis temporalis*.

No threatened flora species were recorded within the development footprint during targeted surveys. Two TSC Act listed woodland birds, Major Mitchell's Cockatoo and Grey Crowned-babbler, were recorded close to the development footprint and within the ecological study area during surveys. White-browed Treecreeper and Black Falcon were not recorded in the development footprint during surveys. If these species were to occur, the small areas of woodland and two scattered trees within the development footprint are unlikely to significantly impact their persistence in the local landscape.

KEY

- Site boundary
- Development footprint
- Conceptual infrastructure layout
- Hillston substation (132kV)
- Rail line
- Main road
- Local road
- Waterway / canal / irrigation
- Ecological study area boundary
- Scattered paddock trees (hollow bearing)

Vegetation community (Biosis, 2016)

- PCT 70: White Cypress Pine woodland on sandy loams in central NSW wheatbelt
- PCT 57:Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion
- PCT 26: Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion
- PCT 15: Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- PCT 13: Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm
- PCT 105: Poplar Box grassy woodland on flats mainly in the Cobar Peneplain Bioregion and Murray Darling Depression Bioregion
- Roadside vegetation (modified, generally shrubby)
- Roadside vegetation (treed, mosaic of PCT 13, 15, 57)

0 250 500 m

GDA 1994 MGA Zone 55

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Plant community types at the site
Hillston Sun Farm
Environmental impact statement
Figure 6.1

EMM

6.2.3 Impact assessment

i Method

The BAR for the project was prepared in accordance with the NSW *Framework for Biodiversity Assessment* (FBA) (OEH 2014b). The extent of native vegetation within the development footprint was determined using Section 5 of the FBA. This included:

- review of regional vegetation mapping;
- site investigations involving mapping and assessment of vegetation condition;
- detailed mapping of vegetation communities using ArcGIS Collector application and aerial photo interpretation;
- identification and delineation of PCTs in the field; and
- confirmation of PCT identification using community profile descriptions (and diagnostic species tests) from the NSW Vegetation Information System (VIS): Classification Version 2.1.

Flora and fauna assessments of the ecological study area were undertaken from 22 to 23 August 2016 and targeted surveys from 9 to 10 November 2016. Flora survey methods included mapping of vegetation and condition assessment and targeted surveys. Targeted threatened flora surveys were undertaken in accordance with OEH (2016a) for the following threatened species:

- Lanky Buttons (Leptorhynchos orientalis);
- Menindee Nightshade (Solanum karsense);
- Mossgiel Daisy (Brachyscome papillose);
- Slender Darling Pea (Swainsona murrayana);
- Spike Rush (Eleocharis obicis);
- Winged Peppercress (Lepidium monoplocoides); and
- Nelia Shrublands.

Fauna assessment was habitat-based, seeking to identify the following fauna habitat features of the ecological study area:

- habitat trees including large hollow-bearing trees, availability of flowering shrubs and feed tree species;
- waterbody condition;
- quantity of ground litter and logs; and
- searches for indirect evidence.

ii Impacts on native vegetation

There is 1.88 ha of native vegetation within the development footprint that would be directly impacted. This vegetation occurs mostly as small, isolated patches with varying levels of disturbance. There is a patch of contiguous vegetation which bisects the development footprint, which connects to native vegetation south-west of the ecological study area.

Two TSC Act listed EECs were mapped in the ecological study area, *Weeping Myall Acacia pendula woodland* and *Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions. Weeping Myall Woodland* is also an EPBC Act listed EEC. The development footprint has been designed to avoid these communities. The project will not result in impacts to these communities.

Three PCTs were identified within the development footprint, described in Table 6.1 and shown in Figure 6.1.

Table 6.1 Plant community types in the development footprint

Plant community type	Vegetation formation	Vegetation class	Area
PCT 57: Belah/Black Oak – Western Rosewood – Wilga woodlands of central NSW including the Cobar Peneplain Bioregion (LA106)	Semi-arid Woodlands (Shrubby sub-formation)	Semi-arid Sand Plain Woodlands	0.09 ha
PCT 13: Black Box – Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (LA108)	Semi-arid Woodlands (Grassy sub-formation)	Inland Floodplain Woodlands	1.29 ha
PCT 15: Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (LA110)	Semi-arid Woodlands (Grassy sub-formation)	Inland Floodplain Woodlands	0.50 ha

iii Impacts on threatened species

a. Geographic habitat features

An assessment of the occurrence of geographic habitat features, in accordance with Section 6.3 of the FBA was undertaken, along with a determination of whether impacts to these habitat features will result from the project. The results of this assessment, along with the species determined by the FBA calculator as potentially occurring in these habitats are outlined in Table 6.2.

Table 6.2 Assessment of species and associated geographical habitat features within the development footprint

Scientific name	Common name	Habitat feature	Habitat present in development footprint
Hamirostra melanosternon	Black-breasted Buzzard	Land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts	No
Falco hypoleucos	Grey Falcon	Land containing within 100 m of riparian woodland on inland rivers containing mature living eucalypts or isolated paddock trees overhanging water or dry watercourses	No

Table 6.2 **Assessment of species and associated geographical habitat features within the development footprint**

Scientific name	Common name	Habitat feature	Habitat present in development footprint
Lepidium monoplocoides	Winged Peppercress	Land containing seasonally damp or waterlogged sites	Yes
Eleocharis obicis	Spike-Rush	Periodically waterlogged sites (including table drains and farm dams)	Yes
Solanum karsense	Menindee Nightshade	Periodically flooded depressions with heavy soils	Yes
Litoria raniformis	Southern Bell Frog	Land within 100 m of emergent aquatic or riparian vegetation	No
Botaurus poiciloptilus	Australasian Bittern	Land containing brackish or freshwater wetlands	No

b. Ecosystem credit species

A list of ecosystem credit species predicted to occur within the development footprint, based on the PCTs present and generated by the calculator associated with the FBA is provided in Table 6.3. The potential for these species to occur within the development footprint was assessed in accordance with Section 6.3 of the FBA. The presence of these species could not be discounted using the method outlined in Section 6.3 of the FBA (OEH 2014b). It was therefore assumed that these species may occur within the development footprint.

Table 6.3 **Ecosystem credit species assumed to occur within the development footprint**

Scientific name	Common name
Ardeotis australis	Australian Bustard
Rostratula australis	Australian Painted Snipe
Ninox connivens	Barking Owl
Grus rubicunda	Brolga
Burhinus grallarius	Bush Stone-curlew
Stagonopleura guttata	Diamond Firetail
Stictonetta naevosa	Freckled Duck
Pomatostomus temporalis subsp. temporalis	Grey-crowned Babbler (eastern subspecies)
Melanodryas cucullata subsp. cucullata	Hooded Robin (south-eastern form)
Hieraaetus morphnoides	Little Eagle
Chalinolobus picatus	Little Pied Bat
Anseranas semipalmata	Magpie Goose
Lophochroa leadbeateri	Major Mitchell's Cockatoo
Grantiella picta	Painted Honeyeater
Certhionyx variegatus	Pied Honeyeater
Chthonicola sagittata	Speckled Warbler
Circus assimilis	Spotted Harrier
Lophoictinia isura	Square-tailed Kite
Daphoenositta chrysoptera	Varied Sittella
Tiliqua occipitalis	Western Blue-tongued Lizard
Climacteris affinis - endangered population	White-browed Treecreeper Endangered Population
Saccolaimus flaviventris	Yellow-bellied Sheath tail-bat

No threatened flora species were identified within the development footprint despite targeted surveys being undertaken.

c. Species credit species

A list of species credit species predicted to occur within the development footprint, based on the PCTs present, along with an assessment of whether the development footprint provides suitable habitat and whether the species will be impacted by the development is provided in Table 6.4. The potential for a species to occur within the development footprint was assessed in accordance with Section 6.5 of the FBA.

Table 6.4 Species credit species and status within the ecological study area

Scientific name	Common name	Habitat present in development footprint	Recorded during field surveys	Impacted by development
Brachyscome papillosa	Mossgiel Daisy	Yes	No	No
Eleocharis obicis	Spike-Rush	Yes	No	No
Lepidium monoplocoides	Winged Peppercress	Yes	No	No
Leptorhynchos orientalis	Lanky Buttons	Yes	No	No
Solanum karsense	Menindee Nightshade	Yes	No	No
Swainsona murrayana	Slender Darling Pea	Yes	No	No

iv Summary of potential impacts

The following potential direct and indirect impacts of the project on biodiversity values were identified:

- direct impacts:
  - removal of 1.88 ha of native vegetation within the development footprint;
  - removal of two scattered paddock trees containing hollows; and
  - impacts to connectivity values due to removal of vegetation.
- indirect impacts:
  - decreased viability of retained vegetation due to edge effects and use of retained areas of native vegetation due to disturbance and degradation of habitat, including erosion and/or compaction of soils, as well as damage to seedlings and new growth;
  - further encroachment of invasive exotic weeds species, leading to loss of habitat and suppression of native seedling establishment resulting in changes to vegetation communities over time; and
  - temporary increased noise levels from construction equipment, leading to disturbance of fauna, especially during breeding seasons.

The PCTs identified within the development footprint, which are described in Table 6.1 and shown in Figure 6.1 do not represent any EECs or TECs listed under the TSC Act or EPBC Act.

6.2.4 Management and mitigation

The principal means to reduce impacts on biodiversity values has been to design the development footprint such that it will avoid and minimise removal of native vegetation and fauna habitat. These are described below.

i Avoidance of impacts

The project design process has considered all biodiversity values identified on the site. The project has been designed to avoid, where possible, direct impacts to the identified values.

As a result, removal of native vegetation is limited to paddock trees, small patches isolated within cropped paddocks or small corridors through previously disturbed areas. The development footprint has been reduced to the footprint shown in Figure 6.1, impacting a total of 1.88 ha of native vegetation.

ii Minimise impacts

Additional measures to avoid and minimise impacts will be outlined in an EMP and will include:

- installation of appropriate exclusion fencing around trees and vegetation to be retained in, or directly adjacent to, the development footprint;
- all material stockpiles, vehicle parking and machinery storage will be within cleared areas or areas proposed for clearing, and not in areas of retained native vegetation;
- a licensed wildlife salvage team will be on-site during vegetation removal to catch and relocate (if appropriate) any wildlife encountered in vegetation or hollow-bearing trees;
- where practical, all scattered hollow-bearing trees to be removed will be placed in areas of retained vegetation to provide additional fauna habitat;
- where reasonable and feasible, native vegetation cleared from the development footprint will be mulched for reuse on the site where possible;
- dust suppression measures will be implemented during construction;
- implementation of temporary stormwater controls during construction will be considered if necessary to ensure that runoff is consistent with existing conditions and to minimise potential impacts on areas of retained vegetation; and
- an erosion and sediment control plan in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004) will be prepared in consultation with CSC and will be implemented and monitored during the life of the project to minimise impacts.

iii Offsetting impacts

a. Impacts requiring offsets

Impacts on native vegetation requiring offsetting were assessed in accordance with Section 9.3.1 of the FBA. The project will result in removal of the following:

- 0.09 ha of the PCT 57 Belah/Black Oak – Western Rosewood – Wilga woodlands of central NSW including the Cobar Peneplain Bioregion (LA106);
- 1.29 ha of the PCT 13 Black Box – Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (LA108); and
- 0.5 ha of the PCT 15 Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (LA110).

The impacts on three PCTs will require offsetting. The remainder of the development footprint supports non-native vegetation and disturbed land. No further consideration of these areas is required. Impacts to native vegetation will require retirement of 81 biodiversity credits as shown in Table 6.5.

Table 6.5 Summary of ecosystem credits

Plant community type name	PCT code	Ecosystem credits retired
PCT 57 Belah/Black Oak – Western Rosewood – Wilga woodlands of central NSW including the Cobar Peneplain Bioregion	LA106	3
PCT 13 Black Box – Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone mainly Riverina Bioregion	LA108	48
PCT 15 Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW mainly Riverina Bioregion	LA110	30
	Total	81

Impacts on species and populations requiring offsets were assessed in accordance with Section 9.3.2 of the FBA. The project will not result in removal of habitat for threatened species and populations. No offsets for species or populations are required.

b. Biodiversity offset strategy

A total of 81 ecosystem credits are required to offset the impacts arising from the project. The proposed biodiversity offset strategy will follow Section 7 of the NSW *Biodiversity Offsets Policy for Major Projects* (OEH 2014a).

OVERLAND has elected to seek retirement of the credits by purchasing them on the open market, subject to availability.

In the first instance, every effort to obtain like-for-like offsets will be pursued. In the preparation of this Biodiversity Offset Strategy the BioBanking public register has been checked for the availability of credits of the same PCT as that being impacted or those listed in the credit profile report. There are no matching credits currently available on the public register.

In line with the recommendations outlined in Appendix A of OEH (2014a), an expression of interest for the required credits was placed on the OEH 'Credits Wanted Register' on 12 April 2017.

Should a period of six months lapse since the expression of interest was placed on the public register, with no positive outcome, and all other reasonable steps have been exhausted, then in accordance with the FBA a variation of the offset rules will be applied in which credits can be sought from a PCT in the same vegetation formation as the PCT to which the required ecosystem credits relate (OEH 2014b). PCT 57 is from the Semi-arid Woodlands (Shrubby sub-formation) vegetation formation and PCTs 13 and 15 are from the Semi-arid Woodlands (Grassy sub-formation). A review of the credit register shows that there are no credits listed under these vegetation formations (at 24 April 2017).

6.2.5 Conclusion

An assessment of biodiversity impacts has been completed in accordance with the NSW *Biodiversity Offsets Policy for Major Projects* (OEH 2014a) and FBA (OEH 2014b).

The assessment concluded that a total of 1.88 ha of native vegetation within the development footprint that would be directly impacted, comprising three PCTs. These PCTs do not represent any EEC listed under the TSC Act or EPBC Act, respectively. Two scattered paddock trees containing hollows would also be impacted.

Measures to avoid and minimise impacts to vegetation were considered during the design and planning stage of the project, with the objective of significantly minimising impacts on native vegetation. Additional recommendations to mitigate any minor residual impacts are provided in Section 6.2.4.

Residual impacts to native vegetation will require retirement of 81 biodiversity credits. These will be offset in accordance with the biodiversity offset strategy and processes outlined in the relevant government policies (OEH 2014a and OEH 2014b).

6.3 Aboriginal heritage

6.3.1 Introduction

The SEARs require an assessment of the potential impacts of the project on Aboriginal cultural heritage. The SEARs state that this EIS must include:

> an assessment of the likely Aboriginal and historic (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.

Biosis Pty Ltd has prepared an ACHAR for the project (Appendix D). This section of the EIS summarises the Biosis report and addresses the SEARs requirements for Aboriginal cultural heritage assessment. Historic heritage is addressed in Section 6.4.

6.3.2 Existing environment

i Landscape context

A 713 ha study area encompassing the site and development footprint was adopted for the ACHAR. The study area included surrounding private land and adjacent road reserves, and was part of a wider area investigated during project design and development.

The study area is in the Riverina bioregion in central-west NSW, within the landscape of the Murray Darling Basin. This landscape formed over 60 million years when the area was covered by an inland sea, and deposition of marine sands occurred, which are present in the current landscape. Subsequent draining of the sea led to periods of inundation by a giant fresh water lake and periods of deposition of clays and carbonates. The present landscape surface represents the final phase of deposition, the youngest of which is approximately 36,000 years old (Porteners 1993).

The Riverina bioregion is dominated by river channels, floodplains, backplains, swamps, lakes and lunettes that are all of Quaternary age. It covers the alluvial fans of the Lachlan River, Murrumbidgee River and the Murray River, west of the Great Dividing Range. The topography of the Riverina bioregion is comprised of a series of overlapping, low gradient alluvial fans on the eastern half of the Murray Basin.(NPWS 2003). The Lachlan Depression Plains soil landscape covers the entire study area, and is characterised by alluvial plains consisting of grey and brown cracking and non-cracking clays contrasting with red and brown texture contrast sands (DECC 2002).

The study area and surrounds supports natural and modified vegetation communities. Resources in the vicinity of the study area would have provided adequate sources of nutrition for subsistence activities; however, these resources would be largely tied to seasonal variations and the flow of the Lachlan River.

Aboriginal occupation of the region dates back to around 50,000 years ago (Hiscock 2008). The study area falls within an area identified by Tindale (1974) as being within the boundaries of the Wiradjuri linguistic group, one of the largest groups within Australia. Although the boundaries of this group vary between maps, the land occupied by the Wiradjuri encompasses an area roughly between Nyngan, Mudgee, Albury and Hay. The closest groups to the study area are identified as the Yitha (Yita Yita) group to the west and the Wongaibon to the north.

The Yitha group are identified around the junction of the Lachlan and the Murrumbidgee rivers, while the Nari are identified around the same area, on the south side of the Lachlan River. The Wiradjuri group is noted as being present along the Murrumbidgee and Lachlan rivers in the vicinity of Hillston (Martin 2006).

The first European to visit the Hillston area was John Oxley in 1817 during his first expedition along the Lachlan River (Oxley 1820). The area wasn't settled by Europeans until 1839 when William Hovel took up a pastoral run called "Bellingerambil" along the Lachlan River. The town of Hillston developed to serve these surrounding pastoral leases, and this was the primary industry of the area into the 1880s. Crops appear to have been grown less frequently and required the development of artificial irrigation channels (Hillston News 1882).

The study area appears to have been used for agricultural purposes since the early 20th century when it was divided into a number of smaller properties, it is likely the land was cleared for farming purposes by this time. Kidman Way was tarred in the 1970s, but had been functioning as a major thoroughfare for the region throughout the 20th century. Most recently, the study area has been subject to intensive use for large-scale wheat farming.

A search of the Aboriginal Heritage Information Management System (AHIMS) database was conducted on 26 July 2016 (Client service ID: 235837). The search identified 120 Aboriginal archaeological sites within a 10 km x 10 km search area, centred on the township of Hillston and encompassing the study area. The majority of AHIMS site types identified in the search area were modified trees. Burial, restricted and artefact site types were also identified in the search area. No registered AHIMS sites are within the study area.

6.3.3 Impact assessment

i Aboriginal community consultation

Aboriginal stakeholders were identified in accordance with OEH's Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010) and the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005). The guidelines outline a four stage process, described below.

a. Stage 1 – Notification and registration

Relevant bodies were notified of the project, including CSC, OEH, NSW Native Title Services Corporation Limited (NTSCORP Limited), Office of the Registrar, NSW *Aboriginal Land Rights Act 1983* of Aboriginal Owners, National Native Title Tribunal (NNTT), Southern Rivers Local Land Services and Griffith Local Aboriginal Land Council (GLALC).

A search conducted by the Office of the Registrar listed no Aboriginal Owners with land within the site boundary. A search conducted by NNTT listed one Registered Native Title Claim, two Native Title Determination Applications and no Registered Indigenous Land Use Agreements within the study area.

An advertisement was published in *The Hillston Spectator* on Wednesday 16 November 2016 inviting Aboriginal people who hold cultural knowledge to register their interest to provide assistance in determining the significance of Aboriginal object(s) and/or places in the vicinity of the project.

OEH provided a list of known Aboriginal stakeholders in the Hillston area. Aboriginal groups identified by OEH were sent a letter inviting them to register their interest in providing assistance to determine the significance of Aboriginal object(s) and/or places in the vicinity of the project.

In response to the letters and public notice, one group, GLALC, registered their interest in the consultation process.

b. Stage 2 – Presentation of project information

A project information pack was provided to the registered Aboriginal parties (RAPs) on 19 December 2016. The project information pack included information about the project, the Aboriginal cultural heritage assessment process, the project schedule, and the responsibilities and roles of the different parties involved in the project.

c. Stage 3 – Gathering information about cultural significance

On 19 December 2016, RAPs were provided with a copy of the project method outlining the proposed Aboriginal cultural heritage assessment process to be undertaken. RAPs were given 28 days to review and prepare feedback on the proposed methodology. No comments from RAPs were received regarding the methodology of the ACHAR.

As part of the site survey conducted on 29 January 2017, cultural information offered by the site representatives was recorded. Max Harris attended the site survey and during the survey spoke about sites known nearby which included scar trees and artefact scatters. Specific details and locations were not given.

d. Stage 4 – Review of draft Aboriginal cultural heritage assessment report

The draft ACHAR has been provided to RAPs for review and comment. RAPs have been provided with 28 days to provide comments on the ACHAR.

ii Site prediction modelling

A model was formulated to broadly predict the type and character of Aboriginal cultural heritage sites likely to exist throughout the study area and where they are more likely to be located. This model is based on:

- local and regional site distribution in relation to landform features identified within the study area;
- consideration of site type, raw material types and site densities likely to be present within the study area;
- findings of the ethnohistorical research on the potential for material traces to be present within the study area;
- potential Aboriginal use of natural resources present or once present within the study area; and
- consideration of the temporal and spatial relationships of sites within the study area and surrounding region.

The predictive model assessed the potential for certain Aboriginal heritage sites to be present within the site boundary as shown in Table 6.6.

Table 6.6 Aboriginal site prediction statements

Site type	Site description	Potential
Scarred trees	Trees with cultural modification	High
Earth mounds	Deposits of baked clay, charcoal, shell and bone which indicate multiple occurrences of occupation. Often contain human remains.	High
Hearths	Deposits of baked clay, charcoal, shell and bone which indicate a single use event.	High
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Moderate
Quarries	Raw stone material procurement sites.	Low
Potential archaeological deposits	Potential sub surface deposits of cultural material.	Moderate
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	High
Grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low
Burials	Aboriginal burial sites.	Moderate
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves. These features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Low
Aboriginal ceremony and dreaming sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Moderate
Post-contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post contact camp sites and buildings associated with post contact Aboriginal use.	Moderate

Table 6.6 Aboriginal site prediction statements

Site type	Site description	Potential
Aboriginal places	Aboriginal places may not contain any 'archaeological' indicators of a site, but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	Low

iii Aboriginal cultural heritage field survey

A field survey of the study area was undertaken on 29 January 2017. The archaeological survey was conducted by vehicle and on foot with a field team of three members. The survey effort targeted all landforms within the study area. Particular attention was given to stands of remnant vegetation with the potential to contain modified trees.

The survey followed the archaeological survey requirements of the code and industry best practice methodology. Any potential Aboriginal objects observed during the survey were documented and photographed. A total of seven transects were walked across the study area with the surveyors walking 2 m apart.

The overall effectiveness of the survey was limited due to poor ground surface visibility (20% to 50%) caused by wheat cropping across the majority of the site.

The survey effort identified five previously unrecorded Aboriginal sites within the study area: one artefact scatter, one isolated find and three modified trees. The Aboriginal sites identified are shown in Figure 6.2. The project design has avoided impacts to all newly identified sites.

All sites identified were located within the study area. Both the isolated find and the artefact scatter were located on areas of exposure created by ploughing and were considered to be in poor condition as a result. The intensive agricultural use of the study area throughout the 20th century has significantly disturbed the shallow soil profiles within the study area, displacing cultural material.

The three modified trees located within the study area all bore east-facing scars. Scar trees hold high significance to the local Aboriginal community. These black box trees were noticeably older than those surrounding them, the majority of which were considered too young to hold cultural modifications. The dominance of the modified trees site type in the Hillston area, the extensive clearing of the study area and the apparent subsequent regrowth of these areas of vegetation indicate the study area likely held more modified trees in the past prior to its initial clearance.

iv Significance assessment

An assessment of significance was completed for each of the newly identified Aboriginal sites within the study area. The significance assessment was carried out in accordance with the requirements of the *Burra Charter* (Australia ICOMOS 1999) and the *Guide to Investigating and Reporting on Aboriginal Heritage* (DECC 2006).

Of the five newly identified Aboriginal sites, three are assessed as being of moderate scientific significance, and two of low significance. The project design has avoided impacts to all Aboriginal heritage items identified within the study area. A summary of the potential archaeological impact of the project on known Aboriginal sites within the study area is provided in Table 6.7.

Table 6.7 Summary of potential Aboriginal cultural heritage archaeological impact

Site name	Within development footprint	Significance	Type of harm	Degree of harm	Consequence of harm
Hillston 1	No	Moderate	None	None	No loss of value
Hillston 2	No	Moderate	None	None	No loss of value
Hillston 3	No	Low	None	None	No loss of value
Hillston 4	No	Low	None	None	No loss of value
Hillston 5	No	Moderate	None	None	No loss of value

The assessment of significance for the five newly identified Aboriginal sites identified by the field survey are summarised below.

a. Statement of significance for Hillston 1

Hillston 1 is a modified box tree measuring 20 m across and 2.8 m in circumference bearing a large, east facing oval with no visible axe marks. The scar is in good condition and notable for its size, which suggests it was the result of the creation of a canoe. This site is of moderate scientific significance.

b. Statement of significance for Hillston 2

Hillston 2 is a modified box tree measuring 25 m across and 2.72 m in circumference with a large, east facing oval scar which bears steel axe marks at its centre. The scar is in good condition and is easily identifiable as being made by humans due to the presence of steel axe marks. The site is of moderate scientific significance.

c. Statement of significance for Hillston 3

Hillston 3 is an isolated find, a quartz flaked piece measuring 21 mm in length found exposed at the edge of a ploughed field. While quartz is an unusual raw material for the region, lithic fragments are common to the region and this site has been highly disturbed by ploughing. It has low scientific significance.

d. Statement of significance for Hillston 4

Hillston 4 is an artefact scatter consisting of three silcrete artefacts located in an area of exposure at the edge of a ploughed field. The assemblage is made up of one single platform core fragment and two distal flake fragments, all of which are common to the region and the site has been subject to extensive disturbance. The site is of low scientific significance.

e. Statement of significance for Hillston 5

Hillston 5 is a modified box tree measuring 20 m across and 3 m in circumference bearing a large, east facing oval scar with no visible axe marks. The scar is in good condition and notable for its size, which suggests it was the result of the creation of a canoe. This site is of moderate scientific significance.

6.3.4 Management and mitigation

The project design process has avoided impacts to all five newly identified Aboriginal heritage sites within the study area. Hillston 1, 2, 3, 4 and 5 are outside the development footprint and will not be impacted by the project.

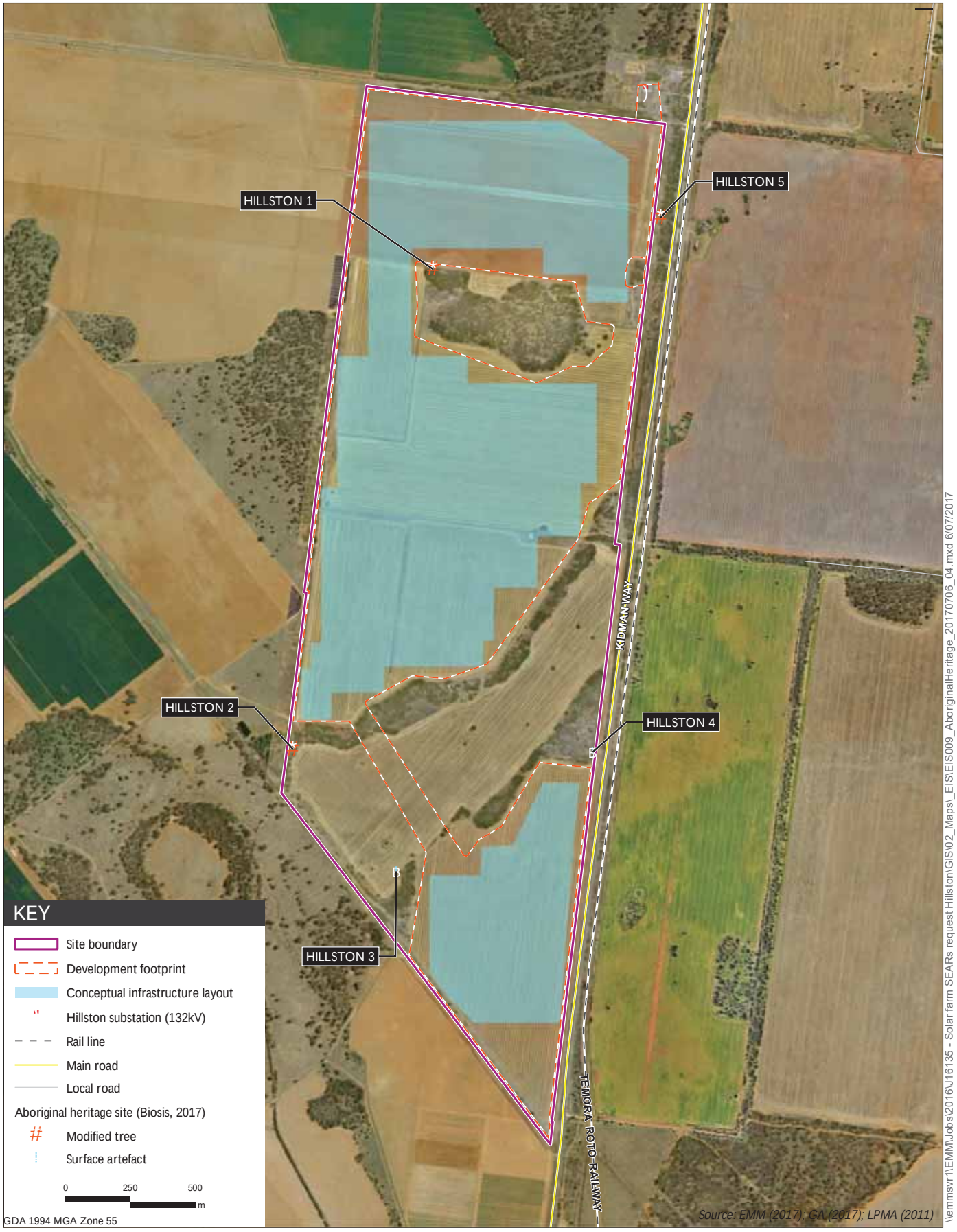
The following management and mitigation measures will be implemented:

- consultation with the RAPs will continue in regards to the management of Aboriginal cultural heritage sites within the site boundary throughout the life of the project in keeping with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010);
- should any unanticipated Aboriginal objects be encountered during works associated with this project, works will cease in the vicinity and the find will not be moved until assessed by a qualified archaeologist;
- should unanticipated relics be discovered during the course of the project, work in the vicinity will cease and an archaeologist will be contacted to make a preliminary assessment of the find. The Heritage Council will be notified if the find is assessed as a relic;
- if any suspected human remains are discovered during any activity the following will occur:
  - all work will immediately cease at that location and remains will not be further moved or disturbed;
  - the NSW Police and OEH's Environmental Line (131 555) will be notified of the details of the remains and their location as soon as practicable;
  - work will not recommence at that location unless authorised in writing by OEH; and
- if the human remains are likely to be Aboriginal in origin, the find will be reported to the RAPs and OEH. If the find is likely to be non-Aboriginal in origin and more than 100 years in age, the Heritage Council of NSW will be notified of the find under s.146 of the Heritage Act.

6.3.5 Conclusion

The project design has avoided impacts to all identified Aboriginal heritage sites in the site boundary. The project will avoid harm to all five newly identified Aboriginal heritage sites within the study area.

The implementation of the management and mitigation measures listed in Section 6.3.4 will reduce the impacts of the project on Aboriginal cultural heritage values.



Location of Aboriginal heritage sites
Hillston Sun Farm
Environmental impact statement
Figure 6.2

6.4 Historic heritage

6.4.1 Introduction

The SEARs require an assessment of the potential impacts of the Hillston Sun Farm project on historic heritage. The SEARs state that this EIS must include:

> an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.

EMM conducted a desktop assessment of the potential impact of the project on historic heritage. This section of the EIS summarises the results of this assessment and addresses the SEARs for historic heritage. Aboriginal cultural heritage is addressed in Section 6.3.

6.4.2 Existing environment

The Heritage Act provides for the protection and conservation of the natural and cultural history of NSW, including scheduled heritage items, sites and relics, and makes provisions for items of both local and state significance. The State Heritage Register (SHR) is enforced under the Heritage Act. The Carrathool LEP also makes provisions for heritage significance.

There are 20 items of local heritage significance listed within the Carrathool LEP. The closest item of local heritage significance to the site boundary is the Hillston Cemetery south of the township of Hillston, approximately 2 km north of the site (Figure 2.1).

A search of the SHR on the 3 April 2017 returned the following results for the Carrathool Shire LGA:

- one Aboriginal place listed under the NPW Act, Koomaringa, approximately 58 km south-east of the site;
- two items listed under the Heritage Act, the Carrathool Bridge over the Murrumbidgee River and Willandra Homestead, approximately 100 km south and 48 km north-west of the site, respectively; and
- 32 items listed by local government and state agencies, the closest of which is Hillston Official Residence 1 (also referred to as Hillston Police Station and Lockup Residence), approximately 3.3 km north of the site.

A search of the Australian Heritage Database on the 3 April 2017 identified 15 results within the Carrathool Shire LGA, nine of which were listed as registered sites in the Register of the National Estate. The Register of the National Estate was closed in 2007 and is no longer a statutory list; however it is still maintained on a non-statutory basis as a publicly available archive and educational resource. Nonetheless, the closest site to the site boundary is the Loughnan Nature Reserve, approximately 24 km east of the site. In addition, the Hillston Courthouse, which is in the township of Hillston approximately 3.3 km north of the site, was previously listed in the Register of the National Estate, but was removed prior to its closure in 2007.

6.4.3 Impact assessment

No items of heritage significance have been identified on or in close proximity to the site. The project will not impact any items of local, State, National or World heritage significance identified on the SHR, Carrathool LEP or Australian Heritage Database.

6.4.4 Management and mitigation

An unexpected finds protocol will be followed if unexpected historical archaeology is discovered during construction of the project.

If unexpected historical archaeology is discovered during construction, work in the immediate area will cease and an archaeologist will be contacted to make a preliminary assessment of the find. If it is determined to be a relic under the Heritage Act, further investigation may be required and the Heritage Council may need to be notified.

6.4.5 Conclusion

The project will not impact any items of local, State, National or World heritage significance, or the potential significance of any known items.

6.5 Land

6.5.1 Introduction

The SEARs require an assessment of the potential impacts of the Hillston Sun Farm project on land use. The SEARs state that this EIS must include:

> an assessment of the impact of the development on agricultural land and flood prone land, paying particular attention to compatibility of the development with the existing land uses on the site and adjacent land (e.g. aerial spraying, dust generation, and risk of weed and pest infestation) during operation and after decommissioning, with reference to the zoning provisions applying to the land.

A desktop assessment of the site was undertaken and relevant publicly available information about the site was reviewed and assessed. Consultation with the landholder, affected landholders surrounding the site boundary and members of the local community has also been undertaken (refer to Section 5.4). The impact of the project on flooding and water resources is addressed further in Section 6.9.

6.5.2 Existing environment

i Zoning

The site is zoned RU1 Primary Production under the Carrathool LEP (refer to Figure 2.2). The objectives of this zone are discussed in Section 4.1.4.

The project will alter the current land use of the site, being agriculture, to electricity generation. The project will harness a natural resource, namely solar energy. As noted in Section 4.1.4, whilst the project will impact the availability of land for other primary production, it will allow for and encourage diversity in the area's land use, and will provide economic stimulus and support to rural communities.

ii Geology, soils and land capability

The surface geology of the site is mapped as a combination of Cainozoic sedimentary and quaternary lacustrine deposits within DPE-DRE's Interactive Geological Map of NSW (DoI-DRE 2017a). Cainozoic sedimentary sediments are composed of unconsolidated mud, silt, sand and gravel of an uncertain age and origin and date back to up to 66 million years ago (DoI-DRE 2017a). Quaternary lacustrine deposits are up to 2.5 million years old and form when lakes are filled with sediment during wet periods (DoI-DRE 2017a). After water evaporates, mud, silt and sand deposits remain.

As noted in Section 2.4, the Lachlan Depression Plains soil landscape is prevalent within the site boundary. The Lachlan Depression Plains soil landscape is characterised by quaternary alluvial plains with numerous circular depressions consisting of grey and brown cracking and non-cracking clays on the plains and sands and red and brown texture-contrast soils on higher ground (DECC 2002).

Information was obtained from the Sharing and Enabling Environmental Data (SEED) Portal (NSW Government 2017). Relevant datasets from the SEED Portal are summarised in Table 6.8.

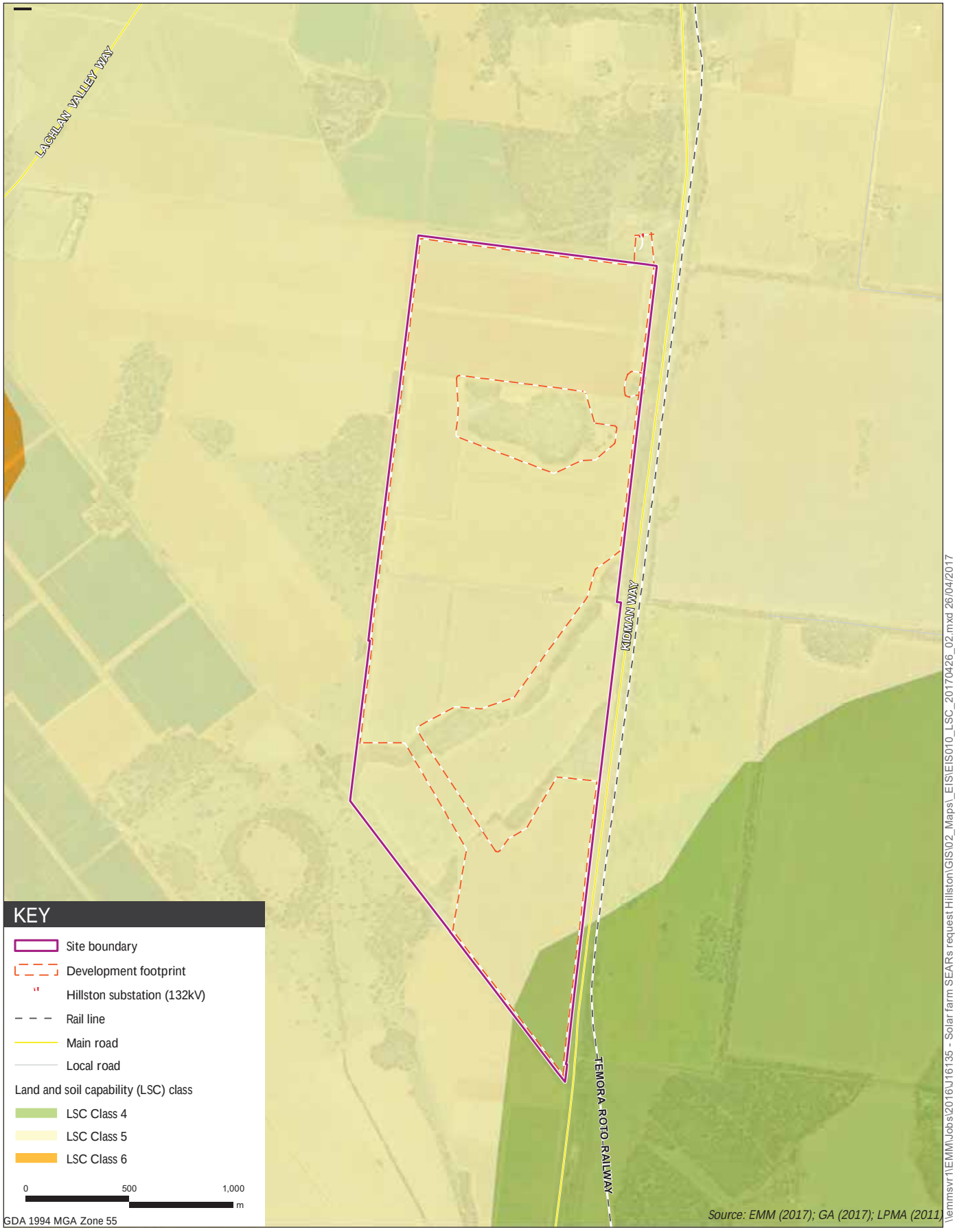
Table 6.8 Environmental data for the site from the SEED Portal

Dataset	Environmental data
Australian Soil Classification (ASC) Soil Type Map of NSW - provides soil types across NSW using the Australian Soils Classification at Order level	The site is mapped in its entirety as vertosols, which are clay soils that shrink and swell, and crack as the soil dries. Vertosols occur in the arid and semi-arid interior of Australia and are predominantly used for grazing, extensive dryland agriculture (where rainfall is adequate), and irrigated agriculture (CSIRO 2017).
Estimated Inherent Soil Fertility of NSW – uses available soils and natural resource mapping to describe soil fertility in NSW according to a five class system	The site is classified in its entirety as moderate inherent soil fertility.
NSW Strategic Regional Land Use Policy (SRLUP) - maps strategic agricultural land (SAL) capable of sustaining high levels of productivity or critical industry clusters, ie equine and viticulture clusters	The site is not mapped under the SRLUP. The site has not been mapped as biophysical SAL under State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.
Land and Soil Capability (LSC) mapping for NSW - uses eight key soil and landscape limitations to assess the capability of land according to an eight class system	The majority of land within the development footprint (approximately 279.1 ha) is mapped as LSC Class 5 land, which is classified as having severe limitations (refer to Figure 6.3). Land identified under this classification is recognised as having severe limitations and is incapable of sustaining high impact land uses except where resources allow for highly specialised land management practices to overcome limitations (OEH 2013). Lower impact land uses (eg grazing) can be managed by readily available practices (OEH 2013). Notwithstanding the limitations of LSC Class 5 land, the site is currently used for broad acre cropping. A small portion of land within the development footprint (approximately 13.4 ha) is mapped as LSC Class 4 land, which is classified as having moderate to severe limitations.

There are no known occurrences of acid sulphate soils within the site boundary.

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 NSW *Contaminated Land Management Act 1997* (CLM Act) did not return any information on reported contamination or any regulatory notices issued for the site (EPA 2017a; EPA 2017b). There is one contaminated site within the suburb of Hillston that has been notified to the EPA (EPA 2017a). This site is the location of the former BP Depot on Cowper Street approximately 3.2 km north of the site and does not require regulation under the CLM Act (EPA 2017a). A search of the contaminated land record of notices did not reveal any records for the Carrathool Shire LGA (EPA 2017b). Clause 7 of 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* (Department of Urban Affairs and Planning 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. However, as noted in Section 3.5, construction of the project will require limited site preparation and civil works and, subsequently, the level of surface disturbance will be minimal.



Land and soil capability
Hillston Sun Farm
Environmental impact statement
Figure 6.3

iii Agricultural land

The project is within the Carrathool Shire LGA, which covers an area of 1,893,250 ha in the Riverina IBRA bioregion of south-western NSW. The site is part of the Lachlan catchment. Land use within this catchment is dominated by extensive agricultural operations, with grazing occupying 75.5% of the total catchment area (Office of Water 2011). Dryland cropping and horticulture (15.1%), conservation (4.1%), forestry (1.6%) and irrigation (1.4%) are also prevalent across the catchment area (Office of Water 2011).

As noted in Section 2.1, the site is currently used for agriculture. Agriculture is the major land use and major employment industry within the Carrathool Shire LGA, accounting for approximately 87% of the total land area or approximately 1,650,381 ha and 47% of total employment (ABS 2014). The majority of agricultural production within the Carrathool Shire LGA is classified as either production from relatively natural environments (approximately 50%) or production from dryland agriculture and plantations (approximately 46%) (ABS 2014). This includes large areas used for grazing and cotton and rice production (CSC 2016). Production from irrigated agriculture and plantations occupies significantly less of the total land mass within the Carrathool Shire LGA (less than 4%) (ABS 2014).

The site boundary encompasses an area of approximately 393 ha, representing approximately 0.02% of the Carrathool Shire LGA, whilst the development footprint for the project is approximately 293 ha (approximately 0.01%).

One of the major threats to biosecurity within the Carrathool Shire LGA, and more generally within the greater LLS Riverina, is the presence of pest animals, including wild dogs, foxes, pigs, deer, plague locusts and other pests (LLS Riverina 2017). Pest animals can cause significant economic losses to agricultural production, pose a risk of exotic disease, threaten the survival of native species and contribute to environmental degradation (LLS Riverina 2017). In addition, LLS Riverina also emphasises the importance of weed management to prevent the spread of new and emerging weeds, which have potential to impact negatively on agricultural production within the region (LLS Riverina 2017).

iv Flooding and water resources

The site is within the floodplain of the Lachlan River. Part of the site is within the flood planning area identified in the Flood Planning Land Map provided during consultation with CSC (refer to Figure 6.11). This map identifies flood extent based on a 100 year ARI plus 0.5 m freeboard and, as noted in Section 3.2, indicates that there is a surface water flowpath running through the site. The impact of the project on flooding and water resources is addressed further in Section 6.9.

v Mining and minerals

There are no current titles, title applications or historical titles for minerals, petroleum or coal exploration for the site listed within DPE-DRE's online MinView database and mapping system (DoI-DRE 2017b). Mining and minerals have not been discussed further in this EIS.

vi Property vegetation plans

A PVP is a voluntary, legally binding agreement between a landholder and LLS. A public register of PVPs is maintained by the Land Property Management Authority under the NSW *Real Property Act 1900*. Consultation with LLS Riverina confirmed that there are no PVPs that will be affected by the project.

As noted in Section 5.3, consultation has been undertaken with LLS to confirm that there are no existing PVPs under the provisions of the NV Act that would be affected by the project. PVPs have not been discussed further in this EIS.

6.5.3 Impact assessment

i Introduction

The project will result in the direct disturbance of approximately 293 ha within the development footprint.

As noted in Section 3.5.1, due to the development footprint's relatively flat terrain and predominantly cleared landscape, limited site preparation and civil works will be required. Direct disturbance of the land within the development footprint will primarily be limited to:

- the establishment of a temporary construction site compound in a fenced off area within the development footprint;
- construction of access tracks and boundary fencing;
- posts will be driven or screwed into the ground to provide support for the mounting framework required for the PV solar panels;
- foundations for the inverter blocks will be prepared;
- underground cabling will be installed between the PV solar panels and the collection circuit;
- transmission infrastructure will be constructed between the onsite substation and main switchboard building and the Hillston Substation;
- the management hub will be constructed; and
- permanent fencing will be constructed.

The installation of approximately 300,000 PV solar panels may affect the capture and flow of runoff within the site, which could result in soil erosion if not appropriately managed.

The project will also result in an increase in vehicle movements to and from the site during construction. Subsequently, the project may result in increased levels of soil erosion.

ii Geology, soils and land capability

As noted above, the project may result in increased levels of soil erosion. The susceptibility of soils to erosive forces is dependent on their inherent properties, namely texture, structure and dispersibility (Charman 1978). As noted in Table 6.6, the site is mapped in its entirety as vertosols. Vertosols have high agricultural potential with high chemical fertility and water-holding capacity, however significant rainfall is required to make water available to plants (Australian Soil Club n.d.).

Within the NSW Soil and Land Information database, eSPADE, there are four soil technical reports available for sampling locations within a 5 km radius of the site boundary. These reports indicate that, at the time of sampling, evidence of erosion at these locations was variable and linked to the level of clearing and disturbance at each location. Within the soil technical reports for two of these locations, extensive clearing was recorded, which is similar to the land within the site boundary that encompasses the development footprint. At these locations, erosion and land degradation was noted as moderate and very high, respectively (Eldridge 1983; Davy 2005).

iii Agricultural production

The development footprint will be removed from potential agricultural production during the life of the project (in the order of 30 years). This is approximately 279.1 ha of LSC Class 5 and 13.4 ha of LSC Class 4 land. The project has been developed to avoid and minimise land disturbance and overall impacts on agricultural land where possible. In addition, the development footprint has been selected to avoid fragmenting the landholder's residual agricultural land.

Consultation with surrounding landholders and the local community has been undertaken to minimise the impacts of construction on agricultural operations adjacent to the site (refer to Section 5.4).

The project is unlikely to pose a risk to the safety of aircraft conducting aerial spraying operations in the vicinity of the development footprint due to the low height of the project infrastructure and the limited amount of reflectivity from PV solar panels. A number of different sources indicate that, in general, as little as 2% of the light received is reflected by PV solar panels (NSW DoI-DRE 2016a; Solar Trade Association 2016; FAA 2010). As noted by both the Federal Aviation Administration of the United States (FAA 2010) and Spaven Consulting (2011), this degree of reflectivity is less than the reflectivity produced by a wide variety of different surfaces, including surfaces within the immediate vicinity of the project's development footprint, such as bare soil and vegetation, and is similar to the reflectivity of smooth bodies of water.

iv Biosecurity

The project may lead to a reduction in biosecurity (ie reduced pest and weed control) due to the temporary significant increase in vehicle movements to and from the site during construction if not adequately managed. In addition, pest animals may also be encouraged by food sources from construction works and general disturbance.

One noxious weed, declared under the *Noxious Weeds Act 1993*, has been identified in the site boundary, namely African Boxthorn (*Lycium ferocissimum*). A potential indirect impact arising from the project has been identified in the BAR (Appendix C) as further encroachment of invasive exotic weeds species, such as African Boxthorn. There is potential that this will lead to loss of habitat and suppression of native seedling establishment resulting in changes to vegetation communities over time (refer to Appendix C).

v Flooding and water resources

The majority of flood prone land subject to the 100 year ARI within the site has been avoided by the project and is excluded from the development footprint. The impact of the project on flooding and water resources is addressed further in Section 6.9.

6.5.4 Management and mitigation

i Construction

The EMP will address land management and detail measures to minimise impacts to agricultural land with reference to DPI's publication *Infrastructure proposals on rural land* (Kovac and Briggs 2013). To address the potential impacts of the project on rural land, measures will be implemented during construction including:

- a site access protocol will be included as part of the EMP and will list the relevant landholder contact details and include measures to minimise adverse impacts, such as, driving carefully to minimise disturbance to livestock, crops and pastures;
- the timing of construction and the location/design of temporary access routes will be positioned to minimise impacts on neighbouring agricultural operations;
- access tracks to and from the site will remain accessible to the landholder to avoid any impacts to the operation and sustainability of neighbouring agricultural businesses;
- soil resources will be managed to ensure the future viability of the site for agricultural production, including:
  - optimisation and recovery of useable topsoil and subsoil;
  - establishment of effective soil amelioration procedures; and
  - separate storage of topsoil and subsoil to ensure that soil is replaced in the right order and to avoid unnecessary impacts on soil and existing vegetation structure.

An erosion and sediment control plan in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004) will be implemented and monitored during the life of the project to minimise impacts. This plan will include provisions to:

- install erosion and sediment controls (if required) prior to and during construction;
- regularly inspect erosion and sediment controls, particularly following large rainfall/wind events;
- minimise tracking of sediment from vehicles, plant and equipment on to Kidman Way;
- during excavation, separate topsoils and subsoils to ensure that they are replaced in their natural configuration;
- stockpile topsoil appropriately to minimise weed infestation and maintain soil organic matter, soil structure and microbial activity; and
- minimise the total area of disturbance from excavation and compaction.

The EMP will include weed management protocols, such as measures for the identification, management and ongoing monitoring of weeds on the site.

The EMP will include a spill response plan which will be implemented during construction and throughout the project's operational stage to avoid potential for contamination.

ii Operations

During the operational stage of the project, a number of land management and mitigation measures will be implemented to reduce the impact of the project on:

- land and soil capability within the site boundary;
- neighbouring agricultural operations;
- regional biosecurity;
- erosion; and
- surface water runoff.

In consultation with the landholder, land management will include consideration of the viability of sheep grazing as a means of vegetation maintenance throughout the life of the project. Sheep have been successfully employed to manage grassland in solar farm developments both within Australia and overseas (Sibson 2016; BRE 2014). Sheep are considered an appropriate means of managing grassland between and underneath PV solar panels with research suggesting that overall production levels can be maintained at levels sustained on open grassland under similar conditions (BRE 2014). As noted by BRE (2014), solar farm developments cause minimal ground disturbance with project infrastructure typically occupying approximately 5% of the total land area. Subsequently, approximately 95% of the total land area is still accessible for vegetation growth, which can be used to support agricultural activity over the life of a solar farm development.

To mitigate impacts to biosecurity, vehicle movements will be restricted to the formed access tracks. In addition, if implemented, sheep grazing within the site boundary will help maintain weed levels while maintaining a multi-purpose land use throughout the life of the project.

Consideration of ground cover beneath the PV solar panels will be included in the EMP to manage erosion, weed infestation and surface water runoff.

The area of impervious ground surface will not increase significantly; therefore there is not expected to be an increase in runoff generated from the site.

iii Decommissioning

As noted in Section 3.7, once the project reaches the end of its investment and operational life, the project infrastructure will be decommissioned and the site returned to its pre-existing land use, or other land use in consultation with the landholder, as far as practicable.

During decommissioning, all above ground facilities will be removed from the site. This will involve the removal and recycling of the materials on site including:

- PV solar panels and mounting frames;
- metals from posts and cabling; and
- all other equipment including inverters and the onsite substation.

During decommissioning and as agreed with the landholder, underground cables may be left *in situ* to avoid unnecessary ground disturbance. As noted in Table 6.6, the majority of land within the development footprint is recognised as having severe limitations under the LSC mapping for NSW and is suitable for lower impact land uses. At this depth, only deep-rooting trees, such as those associated with horticultural practices, would be likely to disturb the electrical conduit trenches and their respective cabling (Burges et al. 2008). Due to the limitations of the majority of the land within the development footprint, horticultural practices involving deep-rooting trees are unlikely to be a viable future land use; as such, it is unlikely that cables, if left in-situ, would impinge on any future agricultural production within the development footprint.

The access tracks within the site boundary may be retained if requested by the landholder at the time of decommissioning.

A site decommissioning plan will be prepared following the completion of project construction and commissioning and will feature rehabilitation objectives and strategies for returning the site to agricultural production. The plan will include:

- an outline of the methods used to remove infrastructure at the end of the project's operational life;
- disposal options for infrastructure once it has been removed; and
- a soils sampling plan to validate the health of the soil resource within the site boundary to inform restoration objectives to restore the land to its former LSC classification (if required).

The plan will also establish specific timelines for each of the activities outlined above.

6.5.5 Conclusion

The project has been developed to avoid and minimise land disturbance and overall impacts on agricultural land. Throughout the life of the project, soil resources will be managed with consideration of the future viability of the site for agricultural production. In addition, an EMP will be implemented to mitigate the potential impacts of the project on the land within the site boundary.

6.6 Visual

6.6.1 Introduction

The SEARs require an assessment of the potential visual impacts of the Hillston Sun Farm. The SEARs state that this EIS must include:

> an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners

EMM has prepared a visual impact assessment for the project (Appendix F). This section of the EIS summarises the visual impact assessment and addresses the SEARs requirements for potential visual impacts.

6.6.2 Existing environment

The site has been highly modified by previous and current land uses, including land clearing, cropping, livestock grazing and weed invasion. It is currently used for broad acre cropping. Photos illustrating the general condition of the site are provided in Chapter 2.

The Riverina IBRA bioregion's upper catchment landscape is comprised of a series of overlapping, low gradient alluvial fans on the eastern half of the Murray Basin, while the lower tract of the Murray River is a floodplain with overflow lakes (OEH 2016). Elevation across the site is relatively uniform at approximately 117 to 120 m above sea level. Land around the site generally slopes from north-east to south-west.

The site is in a semi-rural setting, with the wider region characterised by grazing properties, small-scale farm businesses, natural areas, forestry, scattered rural dwellings, villages and towns and major transport infrastructure such as the Cobb and Mid Western highways. The majority of the land surrounding the site is zoned RU1 Primary Production under the Carrathool LEP (Figure 2.2). Land uses surrounding the site predominantly include dryland cropping and irrigated horticulture. Agricultural production activities undertaken in the area are dominated by sheep and cattle grazing and cotton and rice production (CSC 2016).

The site's northern boundary is adjacent to Essential Energy's Hillston Substation (Figure 2.1). The site has direct access to Kidman Way, which provides access to the regional road network including the Cobb and Mid Western highways (Figure 1.1 and Figure 2.1). The site is also adjacent to the Temora–Roto railway line, which runs parallel to Kidman Way (Figure 2.1). Other prominent features in the surrounding landscape include the Hillston Rest Area, the Hillston Cemetery and the Hillston Showground (Figure 2.1).

No notable scenic or significant vistas within proximity of the site have been identified.

6.6.3 Impact assessment

i Project design

The site location, capacity of the project, design and layout of infrastructure and connection to the electricity grid have been refined through an evaluation process both prior to and during preparation of the visual impact assessment and this EIS.

Specifically, the parcels of land which comprise the development footprint and the placement of infrastructure including PV solar panels, inverters, electrical collection system and switchyard and easement and connection infrastructure have been identified through detailed consultation with the landholder, to minimise visual impacts and land use conflicts and enable agricultural production and land management practices to continue on surrounding land.

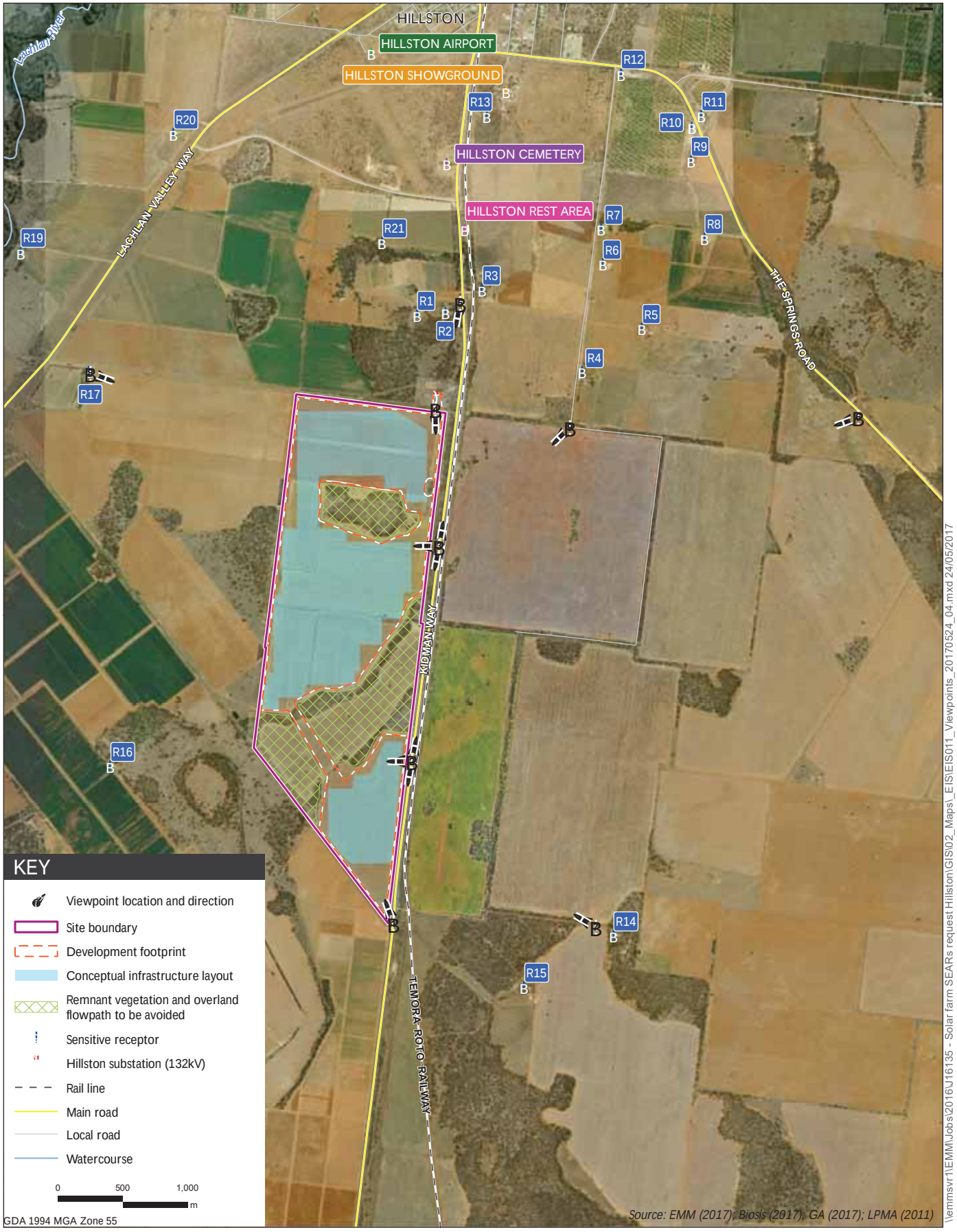
ii Viewpoint selection

A visual assessment was conducted from a number of representative viewpoints surrounding the site and development footprint. The viewpoints were selected to represent views close to sensitive receptors (ie dwellings), road corridors (ie Kidman Way, The Springs Road and Lachlan Valley Way) and infrastructure nearest to the site. The locations of the nine viewpoints are illustrated in Figure 6.4. The rationale for the selection of each of the viewpoints analysed are summarised in Table 6.9.

Table 6.9 Assessed viewpoints and sensitive receptors

Assessment location	Viewpoint type	Rationale for selection
Viewpoint 1 Viewpoint 2 Viewpoint 3	Motorist	Views are representative of those experienced by motorists travelling along Kidman Way. Daily traffic estimates indicate that between 554 and 630 vehicles travel along Kidman Way per day (refer to Section 6.8 and Appendix H). These viewpoints were selected on the basis that motorists travelling along this road corridor may experience limited views of project infrastructure.
Viewpoint 4	Electricity workers at Hillston Substation	The view from this location is representative of the view of the existing Hillston Substation, the 132 kV transmission line and associated infrastructure as seen from Essential Energy's access point.
Viewpoint 5 Viewpoint 7 Viewpoint 9	Dwellings	Views from Viewpoint 5 are representative of sensitive receptors (ie dwellings) to the north of the site, including those closest to the site (ie R1, R2 and R3 – refer to Figure 6.4). Views from Viewpoint 7 are representative of sensitive receptors (ie dwellings) to the south-east of the site (ie R14 and R15 – refer to Figure 6.4). Views from Viewpoint 9 are representative of sensitive receptors (ie dwellings) to the north-east of the site (ie R4, R5, R6, R7, R8, R9, R10, R11 and R12 – refer to Figure 6.4).
Viewpoint 6	Motorist	Views are representative of those experienced by motorists travelling along The Springs Road, east of the site. This viewpoint was selected on the basis that motorists travelling along this road corridor may experience limited views of project infrastructure.
Viewpoint 8	Dwellings Motorist	Views are representative of a sensitive receptor (ie dwelling) west of the site, R17, approximately 1.6 km from the site's western boundary (Figure 6.4). Views are also representative of sensitive receptors (ie dwellings) further west of the site (Figure 6.4): R18 – 2.8 km; and R19 – 2.4 km. Views are also considered representative of those experienced by motorists travelling along Lachlan Valley Way, west of the site. This viewpoint was selected on the basis that motorists travelling along this road corridor may experience limited views of project infrastructure.

To determine potential visibility of project infrastructure, a viewshed analysis was also completed. The results of the viewshed analysis are presented in Figure 6.5 and Figure 6.6. The viewshed analysis simulates the effects of existing vegetation (based on aerial imagery and ground-truthing) and topography on screening views. The results of the viewshed analysis indicate that the project infrastructure may be visible from viewpoints 1, 2, 3, 6, 7, 8 and 9.



Viewpoint locations
Hillston Sun Farm
Environmental impact statement
Figure 6.4

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Viewshed analysis within the development footprint from viewpoints 1, 2, 3 and 6

Hillston Sun Farm

Environmental impact statement

Figure 6.5

KEY

Source: EMM (2017); GA (2016); LPMA (2011)

- Site boundary
- Development footprint
- Conceptual infrastructure layout
- Hillston substation (132kV)
- Rail line
- Main road
- Local road
- Modelled visible areas within the development footprint from viewpoint
- Viewpoint location and direction

0 1 2 km

GDA 1994 MGA Zone 55

Viewshed analysis within the development footprint from viewpoints 7, 8 and 9

Hillston Sun Farm

Environmental impact statement

Figure 6.6

EMM

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iii Construction impacts

During construction, views of the development footprint will change with the installation of project infrastructure, which will add new features to the visual landscape. Views of the site during construction will be predominantly from motorists travelling along Kidman Way. It is anticipated that the focus of these motorists will be in line with their direction of travel along Kidman Way.

Any changes to the visual landscape during construction are not considered significant due to the low visual sensitivity of passing motorists and the temporary nature of construction activities.

iv Operation impacts

A summary of the results of the assessment of visual impacts for each of the nine viewpoints is provided in Table 6.10.

Table 6.10 Summary of results of visual impacts at each viewpoint

Viewpoint	Distance to site	Project infrastructure visible based on viewshed analysis	Magnitude of change	Visual sensitivity	Evaluation of significance	Significant impact?	Additional mitigation proposed?
Viewpoint 1	40 m	Yes	Moderate	Low	Slight/moderate	No	No
Viewpoint 2	40 m	Yes	Moderate	Low	Slight/moderate	No	No
Viewpoint 3	40 m	Yes	Low	Low	Slight	No	No
Viewpoint 4	150 m	No	Low	Low	Slight	No	No
Viewpoint 5	850 m	No	Negligible	Moderate	Slight	No	No
Viewpoint 6	3 km	Yes	Negligible	Low	Negligible	No	No
Viewpoint 7	1.7 km	Yes	Negligible	Moderate	Slight	No	No
Viewpoint 8	1.6 km	Yes	Moderate	Moderate	Moderate	No	Yes
Viewpoint 9	1 km	Yes	Negligible	Moderate	Slight	No	No

Due to existing mature vegetation in the landscape and the relatively low height of the dominant project infrastructure, namely the PV solar panels, the project's infrastructure will be relatively shielded from view at a number of the viewpoints assessed as part of the visual impact assessment, with the exception of views of the site from parts of Kidman Way and Viewpoint 8.

As part of the visual impact assessment, Viewpoint 1, Viewpoint 2 and Viewpoint 8 were selected for preparation of photomontages. Photomontages enable potential visual changes from a viewpoint to be illustrated on a photograph, with the objective of simulating the visual extent of project infrastructure, once constructed. Viewpoint 1 and Viewpoint 2 were selected as they are representative of viewers on Kidman Way, and project infrastructure is predicted to be visible from this road based on the results of the viewshed analysis (Figure 6.5). Viewpoint 8 was selected as it is representative of the view from a sensitive receptor (ie the dwelling R17) west of the site, as well as viewers on Lachlan Valley Way. Based on the results of the viewshed analysis, project infrastructure is predicted to be visible from this viewpoint (Figure 6.6).

The existing views from Viewpoint 1, Viewpoint 2 and Viewpoint 8 and the photomontages for these viewpoints are provided in Section 5.3 of the visual impact assessment (refer to Appendix F). The photomontages conservatively assume the height of the PV solar panels (ie the dominant project infrastructure) will be 2.1 m (refer to Section 3.4.1).

With the exception of receptor R17 at Viewpoint 8, all nearby sensitive receptors are shielded from views of the project infrastructure to some degree by vegetation immediately surrounding each of the dwellings and/or remnant vegetation between the site boundary and these dwellings.

v Reflectivity and glare

A number of different sources indicate that, in general, as little as 2% of the light received is reflected by PV solar panels (NSW DoI-DRE 2016a; Solar Trade Association 2016; FAA 2010).

The potential impacts of reflectivity on sensitive receptors, primarily motorists travelling along Kidman Way, the Springs Road and Lachlan Valley Way, are glint and glare. Glint refers to shorter period and more intense levels of exposure, while glare refers to sustained or continuous periods of exposure to excessive brightness, but at a reduced level of intensity (Morelli 2014). The amount of glint and glare produced by a PV solar panel is variable and dependent on the angle of the panels, with lower angles producing less glint and glare (Morelli 2014). As described in Chapter 3, the project's PV solar panels will be constructed in a single axis tracking configuration. This configuration will allow the PV solar panels to rotate from east to west during the day tracking the sun's movement. Consequently, the degree of glint and glare experienced by sensitive receptors will be variable depending on the time of day and viewing location.

The Hillston Airport is approximately 2.7 km north of the site (Figure 2.1) with the runway positioned in an approximate east-west orientation. Due to the distance between the Hillston Airport and the site, it is unlikely that aircraft using this facility will pass directly over the site during the critical phases of flight, namely approach and landing (Spaven Consulting 2011). OVERLAND consulted with CASA during the preparation of the visual impact assessment to discuss the potential impact of the project on flights to and from the Hillston Airport. As part of this consultation, CASA acknowledged that "*modern solar panels are designed to absorb and not reflect light. CASA's experience to date is that despite the large number of solar farms being developed around Australia – some on airports themselves – there have been no pilot reports of glare or of any safety issues or concerns related to these solar farms*". CASA did not consider the project to be a hazard to aviation (see Section 5.3). In addition, consultation with CSC's Town Overseer confirmed that it is unlikely the project will have any impact on aircraft landing at the Hillston Airport (see Section 5.3).

The potential for low angled reflected sunlight to cause a distraction to drivers travelling along Kidman Way was considered as part of the traffic impact assessment for the project (refer to Section 6.8 and Appendix H). There is sufficient vegetative screening provided by existing roadside vegetation between the site boundary and Kidman Way along the northern portion of the site. In these areas, roadside vegetation is generally between 50-60 m deep. Along the southern portion of the site, the existing roadside vegetation is sparser and direct views of the site are possible. Notwithstanding, due to the anti-reflective properties of the PV solar panels, they are not expected to cause a distraction to motorists on Kidman Way due to glint and glare.

It is also noted that there are other local examples of PV solar panels close to major roads in and near Hillston. These include a panel array at the intersection of the Mid Western Highway and Kidman Way near Goolgowi, and on Lachlan Valley Way near Boundary Road, Hillston, shown in Photographs 6.1 and 6.2. While these are minor in scale compared to the project, they provide an indication of the type of infrastructure that will be visible for the project at similar distances from major roads.

Photograph 6.1 **PV solar panels at the intersection of the Mid Western Highway and Kidman Way near Goolgowi**

Photograph 6.2 **PV solar panels on Lachlan Valley Way near Boundary Road, Hillston**

Based on the findings of previous assessments prepared for PV solar energy facilities, glint and glare from the project's PV solar panels are not expected to significantly impact the following:

- sensitive receptors within the vicinity of the site;
- people engaged in agricultural activities in the surrounding landscape;
- motorists travelling along the major road corridors of Kidman Way, Lachlan Valley Way or The Springs Road;
- motorists travelling along a number of minor unsealed rural property access roads and farm tracks; and
- aircraft arriving at or departing from the Hillston Airport.

While significant impacts are not expected from sensitive receptors, consultation with the property owner of receptor R17 (the only dwelling from which direct views of the project are likely) has determined that consideration of landscaping to minimise views of project infrastructure where possible, is required. Landscaping is discussed in Section 6.6.4.

6.6.4 Management and mitigation

The project infrastructure is described in detail in Chapter 3. Development of the project design has included general measures to reduce the degree of contrast between the project and the surrounding rural landscape, having regard to the form, scale, height, colour and texture of materials incorporated as part of the project's infrastructure, described in the following sections. All of these amendments have reduced the overall visual impacts. The visual impact assessment (Appendix F) has led to further refinement of the project to reduce visual impacts through consultation with surrounding landholders (refer to Section 5.3).

i Landscaping

A conceptual landscaping plan is shown in Figure 6.7 which presents landscaping options either adjacent to the fenceline at receptor R17 (option A), or along the western boundary of the northern portion of the site (option B). Either of these options would reduce the visibility of project infrastructure from R17 (ie Viewpoint 8). The final location and extent of landscaping will be determined during detailed design and following subsequent discussions with the project landowner and the property owner of R17 as part of preparation of the EMP. Landscaping would involve planting of native shrub species between 1-3 m in height. A suggested species list is provided in Table 6.11.

Table 6.11 Suggested native shrub species for landscaping

Scientific name	Common name	Height	Suggested planting spacing
Acacia oswaldii	Miljee	2-5 m	2-3 m apart
Apophyllum anomalum	Warrior Bush	2-3 m	2-3 m apart
Chenopodium nitrariaceum	Nitre Goosefoot	1-2 m	2-3 m apart
Dodonaea viscosa subsp. *angustissima*	Narrow-leaf Hop-bush	1-2 m	2-3 m apart
Eremophila longifolia	Emubush	1-2 m	2-3 m apart
Maireana aphylla	Cotton Bush	1 m	1-2 m apart
Maireana microphylla	Small-leaf Bluebush	1 m	1-2 m apart
Olearia pimeleoides	Pimelia Daisy-bush	1-2 m	2-3 m apart
Pittosporum angustifolium	Butterbush	2-3 m	2-3 m apart
Senna artemisioides	Desert Cassia	2 m	2-3 m apart

ii Colour of materials

Suitable colours will be chosen for project infrastructure to minimise visual impacts. Buildings and materials for site amenities will be made from colourbond or similar. These buildings and materials will be designed to be consistent with the local farming landscape and will be similar to existing farm buildings located in the surrounding area.

iii Night lighting

Localised night lighting may be required during general maintenance activities conducted during the operation stage of the project. If required, lighting will be motion-activated and will be linked with security cameras, which will be positioned in strategic locations around the perimeter of the site. The use of motion-activated lighting will minimise impacts on surrounding areas. All night lighting will comply with *Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting*.

iv Reflectivity and glare

The specifications of PV solar panels being considered for the project feature anti-reflective surface treatment to minimise reflectivity and glare.

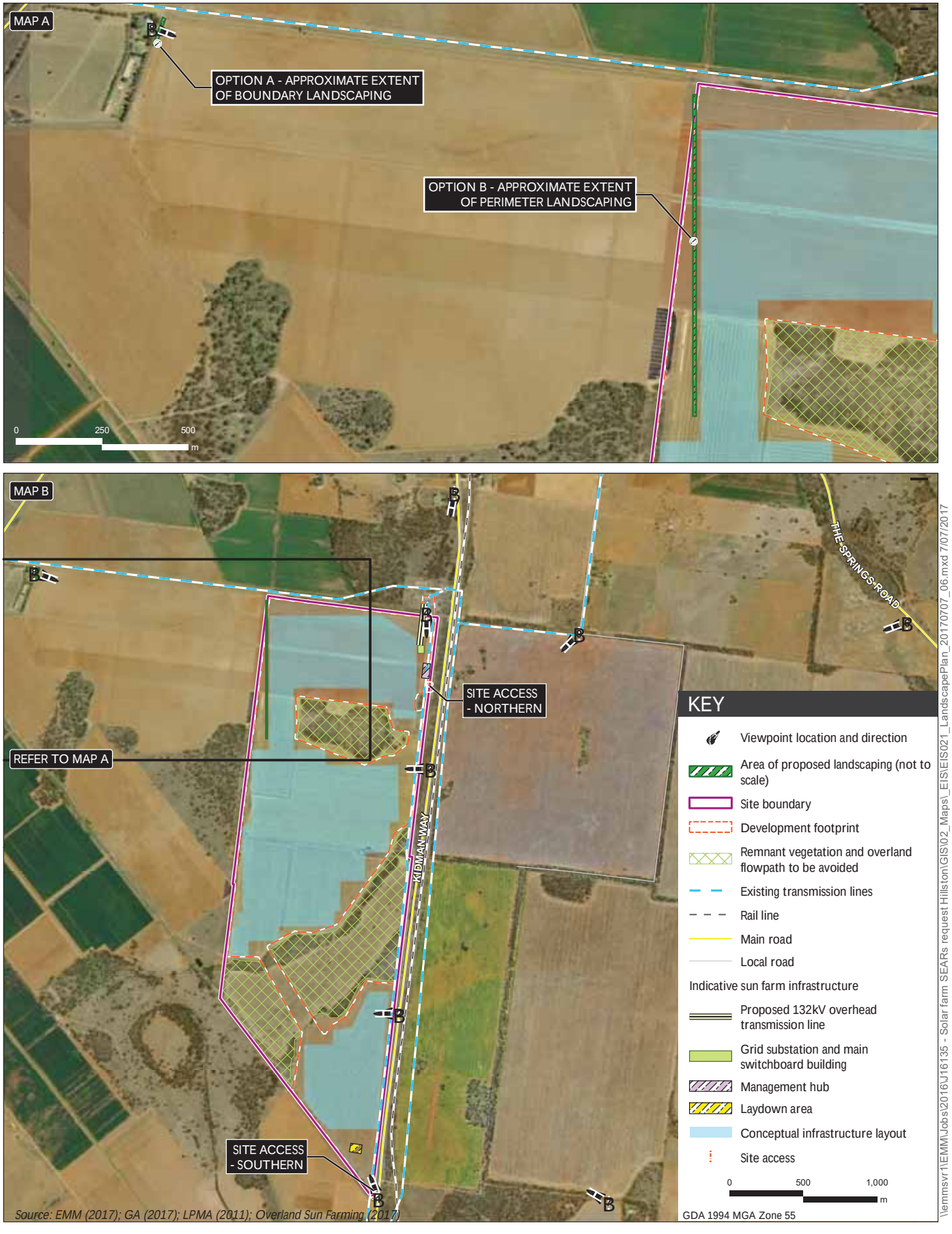
6.6.5 Conclusion

The project will not have significant adverse visual impacts on the locality.

Nine viewpoints have been assessed to demonstrate the visual impacts of the project. Due to existing mature vegetation and the relatively low height of the dominant project infrastructure, namely the PV solar panels, the project's infrastructure will be relatively shielded from view at the majority of the viewpoints assessed as part of the visual impact assessment, with the exception of views of the site from parts of Kidman Way and Viewpoint 8.

The project design, development footprint and placement of infrastructure have progressively evolved to minimise or avoid visual impacts. Nonetheless, the development of the project will result in some changes to the landscape. Visual impacts will occur during the construction and operational stages of the project. The visual landscape will be altered from its current state for the duration of the operational stage of the project.

The visual assessment determined that, of the viewpoints assessed, infrastructure may be visible to varying degrees from seven viewpoints; viewpoints 1, 2, 3, 6, 7, 8 and 9. The distance of the development footprint from these viewpoints ranges from 40 m to 3 km. Based on the presence of vegetation, combined with the relatively low height of the project's infrastructure, visual impacts will be minimal from the majority of these viewpoints. Landscaping is proposed to minimise the impact on views from Viewpoint 8.



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Conceptual landscaping plan
Hillston Sun Farm
Environmental impact statement
Figure 6.7

EMM

6.7 Noise and vibration

The SEARs require an assessment of the potential impacts of the Hillston Sun Farm project on noise. The SEARs state that this EIS must include:

> an assessment of the construction noise impacts of the development in accordance with the *Interim Construction Noise Guideline* (ICNG) and sub-station noise impacts in accordance with the *NSW Industrial Noise Policy* (INP), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria.

EMM has prepared a noise and vibration impact assessment for the project (Appendix G). This section of the EIS summarises the assessment and addresses the SEARs requirements for potential noise impacts.

6.7.1 Existing environment

i Ambient noise

Land uses are primarily agricultural as described in Chapter 2. Given the area and surrounding agricultural land uses, existing ambient noise levels at assessment locations are expected to be low (30 dB or below). Therefore the INP minimum rating background noise level (RBL) of 30 dB has been adopted to represent background noise levels.

The nearest sensitive receptor, R1, is approximately 700 m from the site (refer to Figure 2.1). Eight representative sensitive receptors were selected for the purposes of the noise assessment, and are referred to as assessment locations (AL1-8), shown in Figure 6.8.

ii Meteorology

Noise propagation over distance can be significantly affected by the prevailing weather conditions. Of most interest are source to receiver winds as these conditions can enhance received noise levels.

Meteorological data from the nearest BoM Automatic Weather Station (AWS) were analysed, and identified that there were no feature winds during the day, evening or night periods. Accordingly, only calm meteorological conditions were adopted for the construction noise modelling.

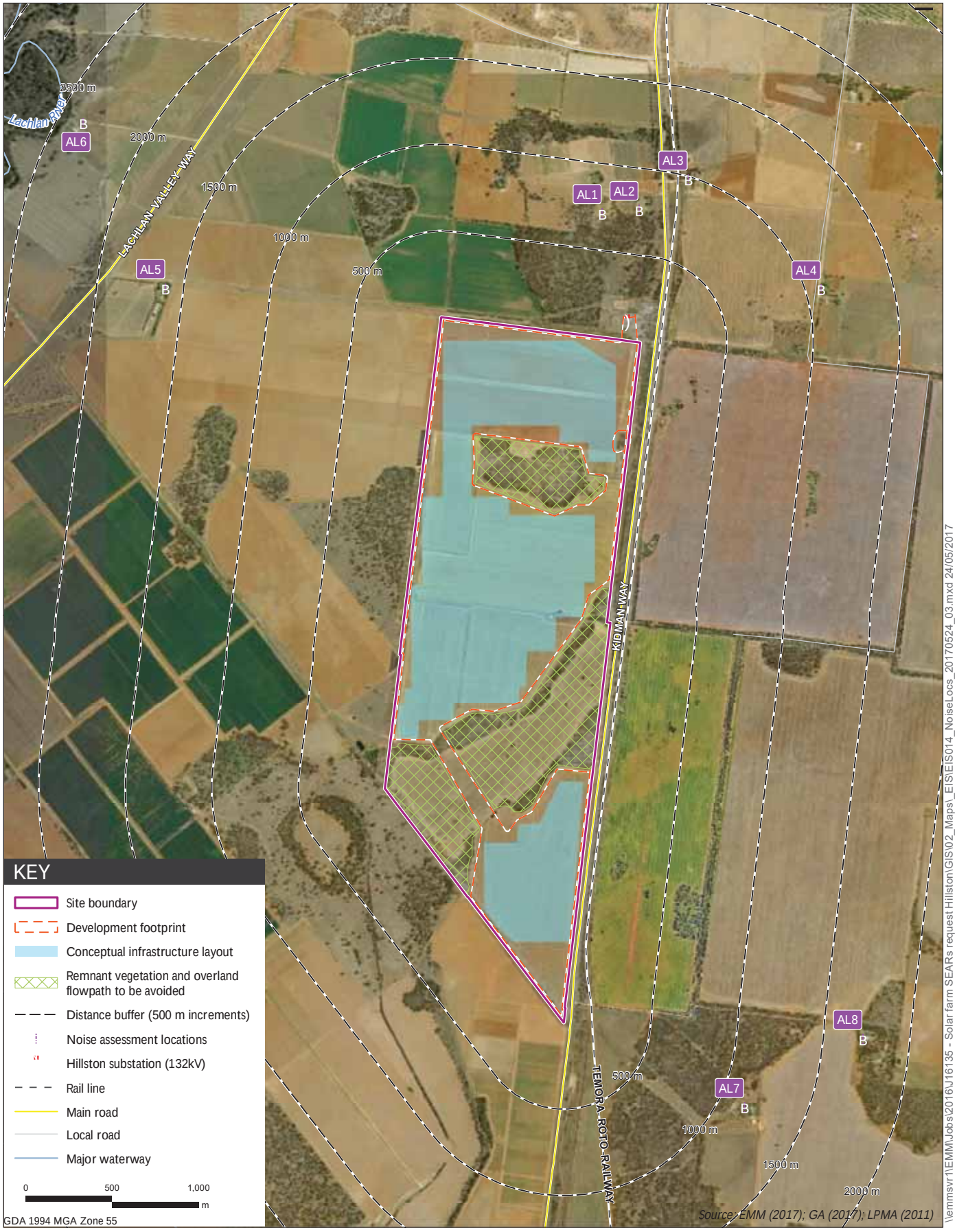
6.7.2 Impact assessment

i Noise criteria

a. Construction noise criteria

The NSW EPA's *Interim Construction Noise Guideline* (ICNG) (DECC 2009) sets out noise management levels (NMLs) for residential and other noise-sensitive receivers and how they are to be applied.

The construction NMLs for the project have been based on the adopted INP minimum RBL of 30 dB in accordance with the ICNG (DECC 2009). The policy suggests restrictions to the hours of construction that apply to activities that generate noise at residences above the 'highly affected' NML. The NMLs are shown in Table 6.12.



Noise assessment locations
Hillston Sun Farm
Environmental impact statement
Figure 6.8

EMM

Table 6.12 Construction noise management levels

Assessment locations	Period	Adopted RBL, dB(A)	NML, LAeq(15-min) (RBL + 10 dB)
AL1-AL8	Standard hours	30	40 75 (highly affected)

b. Road traffic noise criteria

The principal guidance for assessing the impact of road traffic noise on receivers is the NSW EPA's *Road Noise Policy* (RNP) (DECCW 2011).

It is anticipated that road trucks will deliver all equipment and material (eg posts, frames, cables, PV solar panels, inverters etc) to the site. The site will be accessed from the eastern boundary via Kidman Way, with most vehicles originating from the south, and some from the north of the access road (along Kidman Way). The sections of Kidman Way leading to the project are classified as an arterial road. Table 6.13 presents the road noise assessment criteria for this road category and are reproduced from Table 3 of the RNP (DECCW 2011).

Table 6.13 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria, dB(A)	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	$L_{eq(15\text{-}hr)}$ 60 (external)	$L_{eq(9\text{-}hr)}$ 55 (external)

The RNP states that where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB.

Consideration must be given to any significant increase in total traffic noise at residences where existing road traffic noise level is low (eg 30 dB(A)) or below the relevant assessment criteria. Residences likely to experience an increase in total traffic noise level above the criteria presented in Table 6.14 should be considered for mitigation.

Table 6.14 Relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase, dB	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/sub-arterial roads and transit ways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $L_{Aeq(15\text{-}hr)}$+12 dB (external)	Existing traffic $L_{Aeq(9\text{-}hr)}$+ 12 dB (external)

ii Construction noise assessment

Construction noise levels were modelled using Brüel and Kjær Predictor software. 'Predictor' calculates total noise levels at assessment locations from the concurrent operation of multiple noise sources. The model has considered factors such as location, distance, ground effects, atmospheric absorption, topography, and applicable meteorological conditions. Predicted noise levels over a typical worst case 15-minute scenario were modelled and assessed for comparison against the relevant NMLs. The construction noise impact assessment has adopted sound power levels from the EMM noise database for plant and equipment items used on similar projects. Plant and equipment items, sound power levels and quantities adopted in the noise modelling are provided in Appendix G.

As noted in Section 3.5, the construction of the project will comprise the installation of PV solar panels and associated infrastructure. Site preparation will be the first action to be completed as part of the construction works. As discussed in Section 3.5, minimum earthworks are expected to occur during site preparation works due to the relatively flat terrain and predominantly cleared landscape within the development footprint.

As noted in Section 3.5, upon completion of the site establishment and pre-construction activities described above, construction will typically be as follows:

- posts will be driven or screwed into the ground to provide support for the mounting framework required for the PV solar panels;
- foundations for the inverter blocks, switchyard and management hub structures will be prepared;
- underground cabling will be installed between the PV solar panels and the collection circuit (this cabling will carry power throughout the site, between the inverters and main switchboard building, which will be located in the management hub);
- PV solar panel frames will be assembled and mounted on top of the piles;
- PV solar panels, inverters, the onsite substation and switchgear units will be installed;
- transmission infrastructure will be constructed between the onsite substation and main switchboard building and the Hillston Substation;
- the management hub will be constructed;
- permanent fencing and security will be constructed; and
- the temporary construction site compound will be removed.

Modelling results indicate site preparation works will have the most potential for noise impacts. Construction of the project will take approximately 12 months from the commencement of site establishment works.

Predicted construction noise levels for the site preparation works during standard construction hours are presented in Table 6.15. Construction noise levels are predicted to satisfy the recommended NMLs at all locations. Therefore, noise levels during all construction activities are expected to satisfy the NMLs at all locations.

Table 6.15 Predicted noise levels during construction (site preparation)

Assessment locations (receptor ID)	Land use	Predicted construction noise level $L_{Aeq\ (15\text{-}min)}$, dB	Construction noise management level $L_{Aeq\ (15\text{-}min)}$, dB
AL1 (R1)	Residential	40	40
AL2 (R2)	Residential	39	40
AL3 (R3)	Residential	36	40
AL4 (R4)	Residential	35	40
AL5 (R17)	Residential	32	40
AL6 (R19)	Residential	<30	40
AL7 (R15)	Residential	35	40
AL8 (R14)	Residential	31	40

Notes: 1. Standard hours only: Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm and no construction work on Sundays or public holidays.

iii Road traffic noise assessment

The proposed construction works will generate traffic movements associated with the construction workforce as well as the delivery of all construction materials by road trucks. Construction of the project will take approximately 12 months from the commencement of site establishment works. Daily average (and peak) traffic movements during construction are summarised in Table 6.16. Site generated traffic movements would be travelling via Kidman Way.

Table 6.16 Average daily traffic movements during construction

Construction scenario	Daily workforce movements[1] (light vehicles)	Daily heavy vehicles movements[1]	Total daily movements	Peak hourly workforce movements (light vehicles)	Peak hourly heavy vehicle movements	Total peak hourly movements
Average	60 (30)	32 (16)	92	16	8	24
Peak	90 (45)	56 (28)	146	24	12	36

Notes: 1.It has been assumed that one daily vehicle trip (to and from site) equates to two vehicle movements.

Existing traffic data for Kidman Way was obtained from the RMS online database. Road traffic noise levels during construction works are predicted to be below the relevant criteria at the affected residential dwellings on roads north and south of the site, as shown in Table 6.17.

Table 6.17 Predicted road traffic noise during construction

Road/area	Distance to road (m)	Speed (km/h)	Existing traffic noise level, $L_{Aeq,period}$, dB	Site generated traffic noise level, $L_{Aeq,period}$, dB[1]	Future traffic noise level, $L_{Aeq,period}$, dB	Criteria, $L_{Aeq,period}$, dB
Hillston	≥7	50	69	50	69	60
Kidman Way - north of site access road	≥120	100	56	41	56	60
Kidman Way - south of site access road	≥15	100	67	56	67	60
	≥10	60	71	55	71	60

Notes: 1. Based on the peak hourly workforce movements and construction delivery movements during the peak construction scenario.

The nearest residential facades that could potentially be affected by an increase in road traffic noise are:

- in Hillston town, the nearest residential facades are set back approximately 7 m or greater from the road in a 50 km/h speed zone;
- on Kidman Way, south of the Hillston township and north of the project, the nearest residential facades are set back approximately 120 m or greater from the road in a 100 km/h speed zone; and
- on other parts of the route and further away south from the project (towards Griffith), the nearest residential facades are set back approximately 10 m and 15 m (or greater) from the road in a 60 km/h and 100 km/h speed zones respectively.

These distances have been adopted for the road traffic noise assessment. Road traffic noise results are based on the peak hourly workforce movements and construction delivery movements during peak construction scenario and hence this assessment of road traffic noise is therefore considered to be conservative.

iv Operational noise impacts

Noise impacts during operation of the project were assessed at each of the assessment locations. Potential impacts from operational noise are predicted to satisfy the minimum INP criterion of 35 dB during worst case assessable meteorological conditions. Therefore, no impact is anticipated during the operational stage of the project.

v Vibration assessment

The majority of vibration generating activities associated with the proposed construction works includes the use of a roller and a piling drill rig. As a guide, safe working distances for typical items of vibration intensive plant are listed in Table 6.18. The safe working distances are quoted for both 'Cosmetic Damage' (refer British Standard BS 7385) and 'Human Comfort' (refer British Standard BS 6472-1).

Table 6.18 Recommended safe working distances for vibration intensive plant

Plant item[1]	Rating/description	Safe working distance	
		Cosmetic damage (BS 7385)	Human response (BS 6472)
Vibratory Roller	<50 kN (typically 1–2 tonnes)	5 m	15 to 20 m
	<100 kN (typically 2–4 tonnes)	6 m	20 m
	<200 kN (typically 4–6 tonnes)	12 m	40 m
	<300 kN (typically 7–13 tonnes)	15 m	100 m
	>300 kN (typically 13–18 tonnes)	20 m	100 m
	>300 kN (>18 tonnes)	25 m	100 m
Small hydraulic hammer	(300 kg - 5 to 12 tonne excavator)	2 m	7 m
Medium hydraulic hammer	(900 kg - 12 to 18 tonne excavator)	7 m	23 m
Large hydraulic hammer	(1,600 kg - 18 to 34 tonne excavator)	22 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	20 m
Pile boring	≤800 mm	2 m (nominal)	N/A
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

Source: Transport Infrastructure Development Corporation Construction's Construction Noise Strategy (Rail Projects), November 2007.

Notes: 1. Plant items shown are indicative to illustrate safe working distances, not all plant items will be used.

The nearest residence, R1, is approximately 700 m from the development footprint to the north. Given these distances are well outside the safe working distance for cosmetic damage and human comfort, it is anticipated that impacts are unlikely throughout the approximate 12-month duration of the construction stage of the project.

6.7.3 Management and mitigation

The noise and vibration impact assessment predicts that impacts are not likely to be significant during construction or operation of the project, nor would the project result in adverse impacts from road traffic noise or vibration during construction. Therefore based on the results of the noise and vibration impact assessment, no specific mitigation or management measures are required.

6.7.4 Conclusion

Given the significant separation distance between the site and the nearest assessment locations, the potential construction and operation noise levels are predicted to be below relevant criteria throughout the approximate 12-month duration of the construction stage of the project. Further, road traffic noise levels inclusive of project-related traffic are predicted to achieve the relevant noise goals at the nearest residences for the duration of the construction and operational stages of the project. Vibration associated with the proposed construction works is highly unlikely to generate impacts at the nearest vibration-sensitive receivers for the duration of the construction stage of the project. Additional noise management and mitigation measures are not predicted to be required to achieve the relevant operational or construction noise goals.

6.8 Traffic and transport

6.8.1 Introduction

The SEARs require an assessment of the potential impacts of the Hillston Sun Farm project on traffic and transport. The SEARs state that this EIS must include:

> an assessment of the site access route, site access point, rail safety issues and likely transport impacts of the development on the capacity, condition, a description of the measures that would be implemented to mitigate any impacts during construction and a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required).

EMM has prepared a traffic impact assessment for the project (Appendix H). This section of the EIS summarises the assessment and addresses the SEARs requirements for potential traffic and transport impacts.

6.8.2 Existing environment

i Road network

The three main transport routes that would primarily be used by the project are Kidman Way, Mid Western Highway and Lachlan Valley Way. The existing road network is shown in Figure 6.9.

Kidman Way is a state funded main road, which connects in a north south direction through the major part of western NSW, from Bourke and Cobar in the north, via Hillston, to Griffith in the south. The Mid Western Highway is a federally funded highway. It is the main route connecting from the east to the south west of NSW. It diverges from the Great Western Highway at Bathurst and connects to the Sturt Highway at Hay. Lachlan Valley Way connects from the east to the south west of NSW via Hillston and combines with the Kidman Way as the main street route through the centre of Hillston.

A heavy vehicle bypass route is signposted for trucks travelling north or south through Hillston via either the Kidman Way or Lachlan Valley Way. The bypass route follows the industrial area around the eastern side of the town, so that large trucks do not generally drive through the town centre of Hillston.

The speed limit on Kidman Way is generally 100 km/hr near the site frontage, which commences approximately 3.5 km south of Hillston. Lower speed limits (50 km/hr on most sections) apply to the Kidman Way route through the town centre of Hillston including the heavy vehicle bypass route.

ii Traffic volumes

Baseline daily traffic volumes for the affected roads (project access routes) have been determined primarily using published RMS daily traffic surveys, for the years between 2006 and 2012. To establish a baseline year 2017 daily traffic volume, +1% annual (linear) traffic growth has been added to the most recent annual survey. Traffic volumes are presented in Table 6.19.

Table 6.19 Historic and projected daily vehicle volumes

Road	Historic daily traffic volumes			2017 projected daily traffic volume	Average proportion of heavy vehicles
	2006	2010	2012		
High Street (Kidman Way) at Hillston	2,409	N/A	N/A	2,674	N/A
Kidman Way, north of the site (near Hillston)	568	N/A	N/A	630	22%
Kidman Way, 20 km south of Hillston	441	518	N/A	554	26%
Kidman Way, south of Goolgowi	826	801	N/A	857	15%
Mid Western Highway, east of Goolgowi	334	378	N/A	404	44%
Mid Western Highway, west of Goolgowi	417	426	385	404	35%

Notes: + 1% annual (linear) traffic growth is used, which gives a growth factor x 1.05 from the 2012 volumes, x 1.07 from the 2010 volume or x 1.11 from the 2006 volumes.

Road width design standards for low volume (generally rural) roads are defined by the Austroads *Guide to Road Design* (Austroads 2010) and are based on daily traffic volumes. The current design standards applicable to the major roads are presented in Table 6.20.

Table 6.20 Daily traffic volumes and corresponding design standards

Daily traffic volume	Austroads (2010) design standards	Applicable roads	Meets design standard
150–500	Austroads requires a 6-7 m wide seal (7 m wide if more than 15% heavy vehicles)	Mid Western Highway east and west of Goolgowi	Yes
500–1,000	Austroads requires a 7-8 m wide seal	Kidman Way (all rural sections) between Hillston and Griffith	Yes
1,000–3,000	Austroads requires a minimum 9 m wide seal	Kidman Way, urban sections through the town of Hillston	Yes

The major roads which would be used for the project access have acceptable road cross sections which meet the Austroads (2010) road design standard for the daily traffic volumes using each route. In most cases there is also a reasonable margin of spare traffic capacity to accommodate significant daily traffic increases, without requiring any increase to the design standard of the route.

iii Safety

Traffic safety conditions in the vicinity of the proposed site access intersections on the Kidman Way south of Hillston are considered to be acceptable, with excellent intersection visibility in both directions along the major road.

The accident history for the five year period 2011-2015 from the TfNSW interactive accident history database indicates a total of nine recorded traffic accidents for an approximately 50 km section of Kidman Way (between Hillston and Goolgowi) over the period. This represents a relatively low number of accidents for the route. Of the nine recorded accidents, three (33%) resulted in fatalities. This is a high proportion of fatal accidents in comparison to either the LGA or NSW State averages.

The majority of the road pavement along the Kidman Way between Hillston and Goolgowi has a sealed width of between 7-8 m and the road centre line and edge lines are generally clearly marked along the entire route. The route design meets the relevant Austroads (2010) road design standard for the current daily traffic volumes and there would appear to be no inherent traffic safety deficiencies for the route. Driver behaviour and the delays in persons receiving medical treatment after road accidents due to the remoteness of the location are probably significant contributory factors in the above average proportion of fatal traffic accidents which have occurred since 2011 on this section of the Kidman Way.

Along the frontage of the site, which extends from approximately 3.5-7 km south of the township of Hillston, there were no recorded traffic accidents during the five year period 2011-2015.

6.8.3 Impact assessment

i Traffic generation and distribution

The following generated daily traffic movements and corresponding vehicle types have been calculated for the average construction, peak construction and operations stage activities for the project (Table 6.21). As noted in Chapter 3, the construction of the project will take approximately 12 months from the commencement of site establishment works. The operational lifespan of the project may be in the order of 30 years, depending on the nature of solar PV technology and energy markets.

Table 6.21 Additional daily and hourly traffic volumes generated by the project

Project stage	Average construction (daily traffic)	Average construction (peak hourly traffic)	Peak construction (daily traffic)	Peak construction (peak hourly traffic)	Project operations (daily traffic)	Project operations (peak hourly traffic)
Workforce (car) traffic movements	60	16	90	24	8	2
Delivery (truck) traffic movements	32	8	56	12	4	1
Total site traffic movements	**92**	**24**	**146**	**36**	**12**	**3**

The proposed transport routes for car and heavy vehicle traffic were considered. Approximately 40% of the project generated car traffic is expected to travel to and from the Hillston area via the Kidman Way north of the site. Around 20% of the project generated truck traffic would also travel to and from the north from locations in the local Hillston area and other routes north and east of Hillston.

The major proportions of the project generated car and truck traffic (60% and 80% respectively) are expected to travel to and from the south via the Kidman Way to Griffith or the Mid Western Highway and other routes east and west of Goolgowi. The project car traffic would mainly be travelling to and from the direction of Griffith which is the major population centre in the region. Significant proportions of the project truck traffic would be expected to travel further, likely from the Melbourne area.

ii Capacity

The effective current daily traffic capacities for the various roads were considered, according to the current Austroads (2010) Road Design Guide standards, and are given in Table 6.20 above. To assess the impact of the project on the existing design capacity of these roads, a comparison of the existing volumes and additional daily traffic volumes generated during the project during construction and operation were calculated for the affected travel routes (Kidman Way and Mid Western Highway).

The predicted traffic volumes for peak and average construction periods are summarised in Table 6.22.

Table 6.22 Future daily traffic assessment for average and peak construction traffic

Route	Projected baseline traffic volume (year 2017)	Future total daily traffic (including project)		Design standard – daily vehicles
		Average	Peak	
High Street (Kidman Way) at Hillston	2,674	2,698	2,710	Not Applicable
Kidman Way, north of the site (near Hillston)	630	662	678	500–1,000
Kidman Way, 20 km south of Hillston	554	614	652	500–1,000
Kidman Way, south of Goolgowi	857	889	909	500–1,000
Mid Western Highway, east of Goolgowi	404	418	425	150–500
Mid Western Highway, west of Goolgowi	404	418	429	150–500

The predicted traffic volume impacts during operation are summarised in Table 6.23.

Table 6.23 Future daily traffic assessment for project operations traffic

Route	Projected baseline traffic volume (year 2017)	Peak traffic from the project	Future total traffic	Percent traffic increase	Traffic volume design standard
High Street (Kidman Way) at Hillston	2,674	3	2,679	0.1%	Not Applicable
Kidman Way, north of the site (near Hillston)	630	4	634	0.6%	500–1,000
Kidman Way, 20 km south of Hillston	554	8	562	1.4%	500–1,000
Kidman Way, south of Goolgowi	857	4	861	0.5%	500–1,000
Mid Western Highway, east of Goolgowi	404	2	406	0.5%	150–500
Mid Western Highway, west of Goolgowi	404	2	406	0.5%	150–500

The predicted increases to traffic volume on each of the affected routes are predicted to be within the relevant Austroads traffic volume thresholds during average and peak construction, and operational stages of the project. The traffic volumes generated by the project are therefore anticipated to have minimal effects on the future traffic operations, level of service and traffic safety.

iii Site access and parking

Vehicular access to the site will occur via two proposed intersections on Kidman Way, serving the northern and southern parts of the site (see Figure 6.9). Each access will involve construction of a site access road from Kidman Way; asphalt surfacing for approximately 50 m of the new site access road; and improved intersection visibility and gravel shoulder widening design corresponding to Austroads type BAR/BAL intersection standard on the Kidman Way on the approaches to and departures from the intersections.

Site access intersection requirements have been discussed with RMS and agreed in principle. The RMS and Carrathool Shire Council will be consulted further in relation to the detailed design requirements for each access road intersection prior to construction.

The predicted maximum project daily traffic usage on each site access road (up to 80% of the future total predicted site traffic) during each stage of the project construction and operations will be approximately:

- 74 daily vehicle trips, during average construction;
- 116 daily vehicle trips, during peak construction; and
- a maximum of 10 daily vehicle trips during operation.

For these daily traffic volumes, a single lane width, unsealed rural road is acceptable. However, sealing of the initial length of approximately 50 m of each site access road, with a minimum sealed width of 6.5 m, is proposed to facilitate the turning trips by large vehicles to and from the Kidman Way and to minimise the potential tracking of dirt and debris onto public roads by the site construction vehicles.

Parking for the project construction and operations workforces will be provided on-site in gravel surfaced parking areas with appropriate dimensions to accommodate the number and size of vehicles.

iv Intersections

The existing peak hourly volumes of northbound or southbound through traffic using the Kidman Way at the locations of the two proposed site access intersections are not anticipated to increase significantly as a result of the project. These traffic volumes will remain at approximately 60 vehicle movements per hour (two-way traffic) for the approximate 12-month duration of the construction stage of the project.

The need for additional turning lanes at the two proposed site access intersections has been assessed by reference to the 100 km/hr Austroads intersection design warrant chart and the Austroads intersection road design guide extracts.

At each of the two proposed site access intersections, it has been assumed that 80% of the future project construction traffic could potentially use each intersection, during the respective peak construction periods for the work on the northern and southern parts of the site. From the forecast future project traffic volumes for each stage of construction and the corresponding project operations, the maximum peak hourly turning traffic volumes which could be using either site access intersection, using the 80% site traffic ratio, are summarised in Table 6.24 for the morning and afternoon peak hour traffic periods.

Table 6.24 Future forecast turning traffic volumes using either site access from Kidman Way

Stage	Peak hour	Hourly traffic entering the site		Hourly traffic leaving the site	
Site activity	Time of day	From the north	From the south	To the north	To the south
Average construction	Morning peak hour	5	10	1	4
	Afternoon peak hour	1	4	5	10
Peak construction	Morning peak hour	9	13	3	5
	Afternoon peak hour	3	5	9	13
Operation	Morning peak hour	1	1	0	1
	Afternoon peak hour	0	1	1	1

The findings of this intersection traffic assessment, using the forecast major road and minor road traffic volumes for each leg of the intersection, show that only the minimum (Type BAR/BAL) intersection left or right turn safety treatment is satisfactory to accommodate the predicted levels of traffic accessing the site at the two proposed site access road intersections.

v Glare and distraction

The potential impacts of reflectivity on motorists travelling along Kidman Way are glint and glare. Glint refers to shorter period and more intense levels of exposure, while glare refers to sustained or continuous periods of exposure to excessive brightness, but at a reduced level of intensity (Morelli 2014). The amount of glint and glare produced by a PV solar panel is variable and is dependent on the angle of the panels, with lower angles producing less glint and glare (Morelli 2014).

The potential for low angled reflected sunlight to cause a distraction to drivers travelling either northbound or southbound along the Kidman Way was considered. PV solar panels will be constructed of solar glass with an anti-reflective surface treatment. Furthermore, there would a perimeter security fence between the PV solar panel infrastructure and the Kidman Way. No further mitigation measures are considered to be warranted.

An assessment of visual impacts is provided in Section 6.6 and Appendix F. This includes a photomontage, which illustrates the maximum potential visible extent of project infrastructure from Kidman Way.

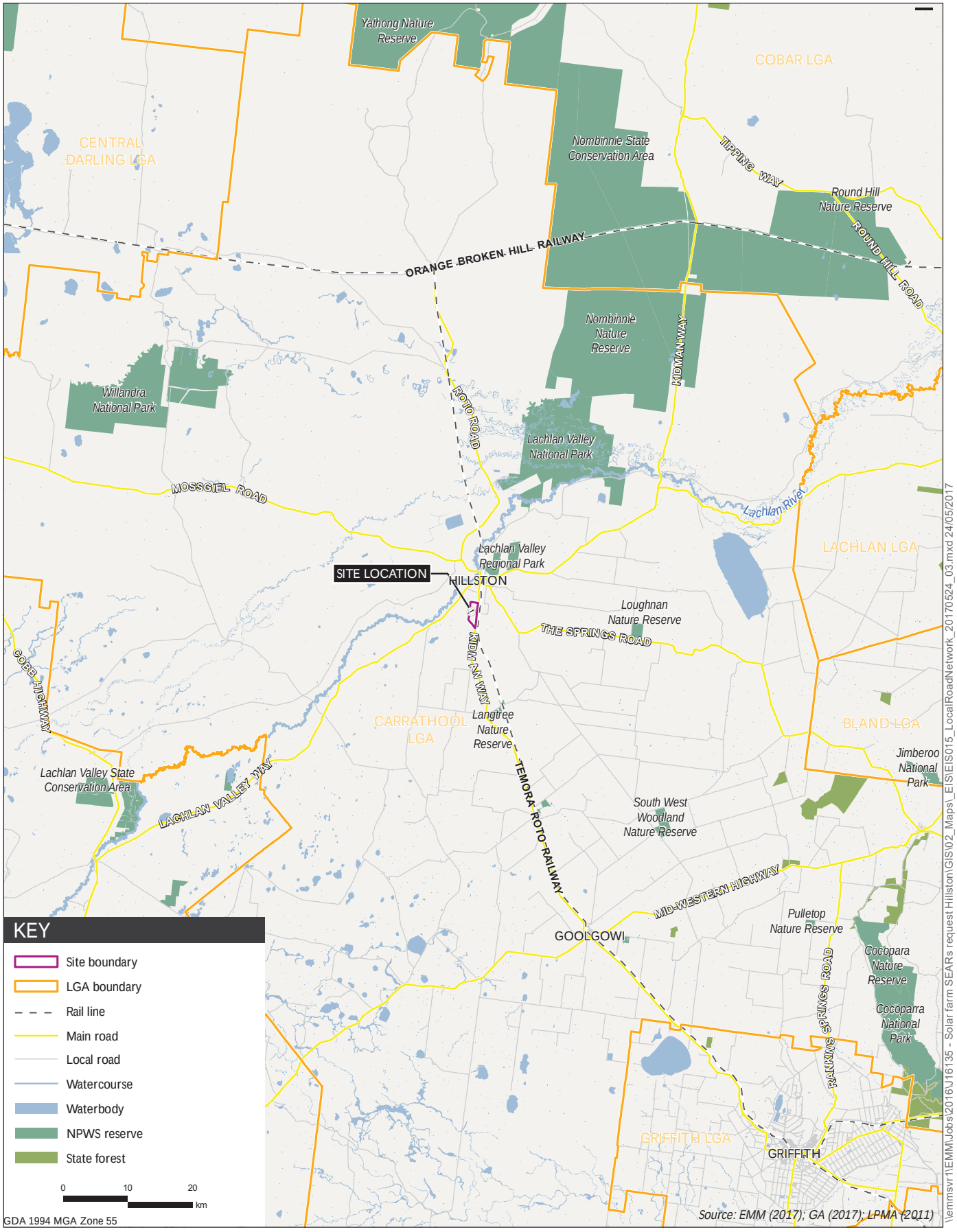
6.8.4 Management and mitigation

The traffic impact assessment predicts that impacts during construction and operation will not have a significant impact on the road network, including capacity of the major traffic routes and intersections, or road safety.

The proposed intersection treatments for the site access road intersections with Kidman Way would be incorporated into an EMP adopting relevant Austroads and RMS guidelines. Details of the relevant standard designs (Austroads 2010) for intersection construction are included in Appendix H. The EMP will also include temporary traffic control arrangements during the peak stages of construction traffic activity and on days when deliveries by oversize vehicles may be required.

6.8.5 Conclusion

The project will not adversely impact on the surrounding road network. Additional traffic generated by the project will not cause the future daily traffic volumes on either Kidman Way or Mid Western Highway, to exceed the relevant design levels that would necessitate road widening improvements.

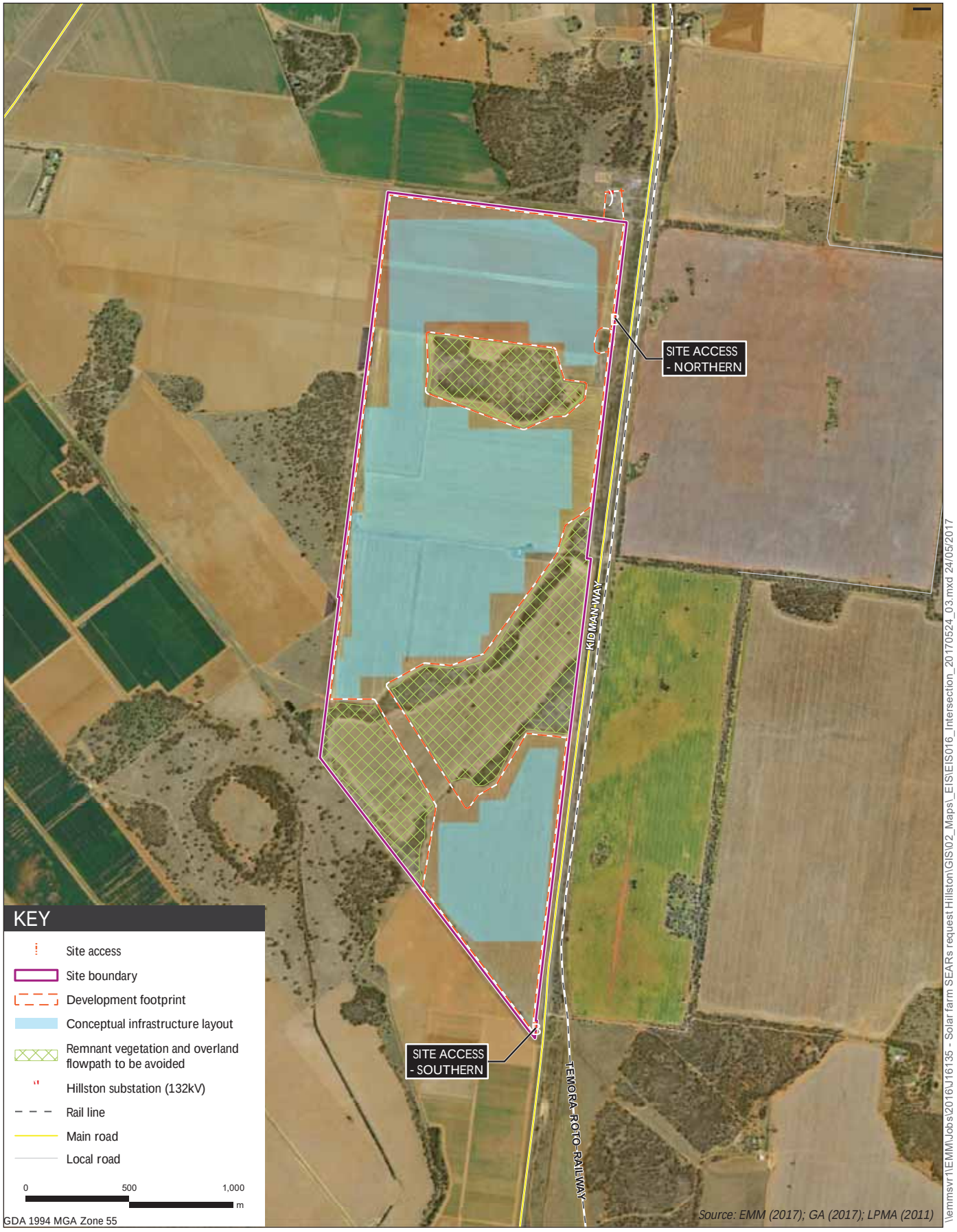


Local road network

Hillston Sun Farm

Environmental impact statement

Figure 6.9



Proposed intersection locations
Hillston Sun Farm
Environmental impact statement
Figure 6.10

6.9 Water

6.9.1 Introduction

The SEARs require an assessment of the potential impacts of the Hillston Sun Farm project on water. The SEARs state that this EIS must include:

> an assessment of the likely impacts of the development on surface water and groundwater resources (including watercourses, wetlands, riparian land, groundwater dependent ecosystems), related infrastructure, adjacent licensed water users, basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts; details of water supply arrangements; and a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004).

A desktop assessment of the site was undertaken and relevant publicly available information about the site was reviewed and assessed. Consultation with the landholder, affected landholders surrounding the site boundary and members of the local community has also been undertaken (refer to Section 5.4).

6.9.2 Existing environment

i Surface water resources and flooding

The site is within the floodplain of the Lachlan River. A description of the broader surface water resources within the Lachlan catchment relevant to the site is provided in Section 2.4.4.

There are several mapped watercourses or drainage lines within the development footprint which are irrigation channels. One perennial watercourse dissects the development footprint (see Figure 6.11). All watercourses are mapped as Strahler order 1 tributaries of the Lachlan River.

Part of the site is identified as wetland within the Carrathool LEP (Figure 6.11). The majority of the mapped wetland extent has been excluded from the development footprint.

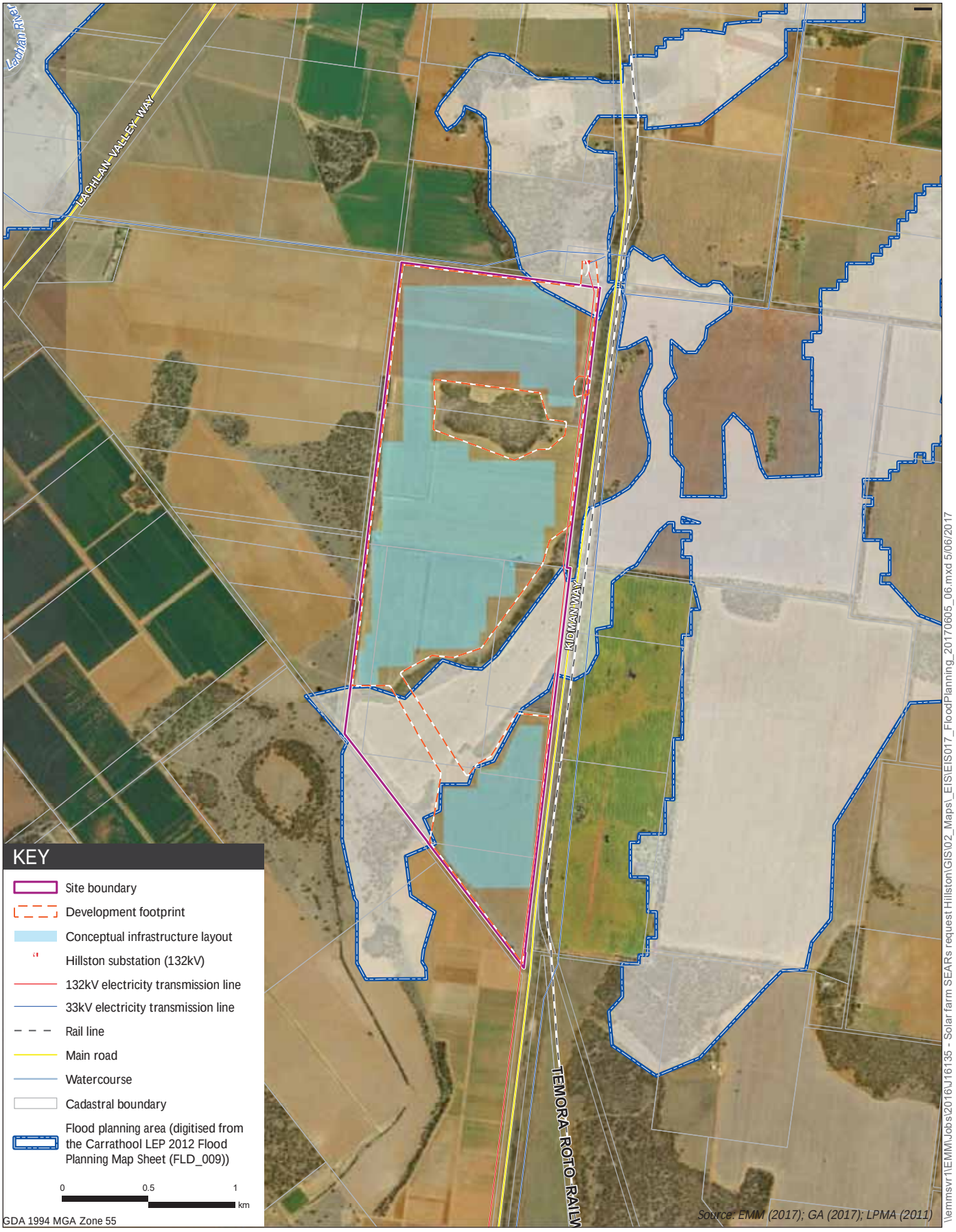
Part of the site is identified within the Flood Planning Land Map provided by CSC (refer to Figure 6.11) which identifies the flood extent for a 100 year ARI plus 0.5 m freeboard.

ii Groundwater resources

The site is within the Lower Lachlan Alluvium groundwater management area which is characterised by an inland alluvial aquifer. Groundwater within the inland alluvial aquifer is of moderate to high quality (0-1,500 total dissolved solid (TDS) mg/L) (Office of Water 2011). It is suitable for domestic, stock and some irrigation purposes (Office of Water 2011).

To protect vulnerable groundwater resources from depletion and contamination as a result of development, the Carrathool LEP identifies areas with the Carrathool Shire LGA as groundwater vulnerable. The site is not identified as groundwater vulnerable within the Carrathool LEP.

There is a private groundwater bore recorded on the DPI Water database within the site boundary (GW027954) authorised for stock watering purposes and has a water bearing zone at depths of 32.634.7 m below ground level.



Flood planning area
Hillston Sun Farm
Environmental impact statement
Figure 6.11

The *Atlas of Groundwater Dependent Ecosystems* (BoM 2017) does not identify any groundwater dependent ecosystems (GDEs) in the site boundary. Parts of the site, namely the surface water flowpath and the large patch of remnant vegetation in the north of the site (the majority of which have been excluded from the development footprint), are identified within the *Atlas of Groundwater Dependent Ecosystems* as having low potential for groundwater interaction (BoM 2017).

6.9.3 Impact assessment

i Surface water resources and flooding

At its closest point, the site is approximately 2.7 km east of the Lachlan River. At this distance, the project will have negligible impacts on this surface water resource. The majority of the part of the site identified as wetland within the Carrathool LEP has been excluded from the development footprint and impacts to this area will be negligible.

Flooding was a consideration in the site selection and project design process described in Section 3.2. As described in Section 6.9.2, 100 year ARI flood mapping indicates part of the site is subject to inundation from a 100 year ARI event (Figure 6.11). The majority of the surface water flowpath has been excluded from the development footprint, with the exception of a connecting corridor between the northern and southern half of the development footprint. This corridor is within the mapped 100 year ARI. Infrastructure within this corridor would include internal electrical connection lines between the PV solar panels (above or below ground) and internal access roads. The project will be designed such that there will be no changes to the landform that would alter the flow of floodwater through this area. No solar PV panels will be constructed within the extent of the 100 year ARI. As the proposed infrastructure is above the 100 year ARI flood level, the probability of any infrastructure being inundated by flooding is assessed to be less than 1% in any given year.

The infrastructure to be established within the development footprint is unlikely to have a significant impact on local or regional flooding, as it will not require earthworks or changes to the general topography of the site that would result in a change to existing flow paths.

ii Groundwater resources

The project is not likely to impact groundwater during construction, operation and decommissioning due to the estimated depth to groundwater within the site boundary and the limited amount of subsurface disturbance activities required during the installation and decommissioning of project infrastructure.

Access to the private groundwater bore within the site boundary, ie GW027954, will be restricted throughout the life of the project. The project will not require access to groundwater resources within the vicinity of the site (ie GW027954).

iii Water licensing

Basic landholder rights enable landholders to extract water from an aquifer underlying their properties for domestic and stock purposes without the need for a licence under the WM Act. Should water be required for stock watering purposes, the relevant water supply work approvals would be sought under the WM Act.

The WM Act also contains provisions relating to harvestable rights. Harvestable rights allow landholders to collect a proportion of the runoff on their property and store it in one or more farm dams up to a certain size. Any runoff harvested from the site would be within the volume permitted under harvestable rights.

iv Water supply arrangements

The water needs of the project during construction are expected to be in the order of 50 ML for the 12 month duration of construction. Water demands will be met via a combination of potable water trucked to the site, and extraction from either the Lower Lachlan Groundwater Source or the Lachlan Regulated River Water Source.

Water will be purchased from existing licensed users, from either the Lower Lachlan Groundwater Source or the Lachlan Regulated River Water Source. There is an active trading market for both of these water sources, with the volume of water traded permanently in the 2016-17 water year being 7,521 ML for the Lachlan Regulated River Water Source and 2,923 ML for the Lower Lachlan Groundwater Source.

The total volume of general security licences available on the Lachlan Regulated River is 592,801 ML, and for high security is 27,680 ML. For the Lower Lachlan Groundwater Source, the long term average annual extraction limit is 108,000 ML/yr, which is equivalent to 100% of the estimated long term average annual recharge.

In the Lachlan Regulated River Water Source, for the 2016-17 water year, there was 349,063 ML of general security water made available (with a total usage of 103,681 ML), and 27,597 ML of high security water made available (with a total usage of 70,144 ML, which may include carryover from previous years).

In the Lower Lachlan Groundwater Source, for the 2016-17 water year, there was 105,678 ML of groundwater made available for aquifer access licences (with a total usage of 53,402 ML).

Based on the availability of water within this water source, and the active trading market, it is anticipated that the balance of the required volume would be able to be purchased readily from the water trading market.

6.9.4 Management and mitigation

i Flooding

Project infrastructure will be positioned to minimise the potential obstruction of the surface water flowpath and stormwater runoff to minimise the possibility of surface water flooding within the development footprint.

ii Erosion and sediment control

An erosion and sediment control plan in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004) will be prepared in consultation with CSC and will be implemented and monitored during the life of the project to minimise impacts. This plan will include provisions to:

- install erosion and sediment controls (if required) prior to and during construction;
- regularly inspect erosion and sediment controls, particularly following large rainfall/wind events;
- minimise tracking of sediment from vehicles, plant and equipment on to Kidman Way;
- during excavation, separate topsoils and subsoils to ensure that they are replaced in their natural configuration;
- stockpile topsoil appropriately to minimise weed infestation and maintain soil organic matter, soil structure and microbial activity; and
- minimise the total area of disturbance from excavation and compaction.

6.9.5 Conclusion

The project is unlikely to have a significant impact on local or regional flooding, surface water and groundwater resources, provided the management and mitigation measures are implemented.

Water supply arrangements for the project will be the subject of further consultation with the landholder, surrounding landholders, CSC and relevant agencies.

6.10 Electromagnetic interference

6.10.1 Background

Electric and magnetic fields (EMFs) exist wherever electricity is generated, transmitted, distributed or used and are strongest closest to their source (ARPANSA 2015). Electric fields are produced by voltage, while magnetic fields are produced by current (ARPANSA 2016). In Australia, EMFs associated with the use of electricity are generated at a frequency of 50 hertz (Hz) (ARPANSA 2016). This frequency falls within the extremely low frequency (ELF) range of 0–3,000 Hz, as defined by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) (2015). Subsequently, power lines, substations, transformers and other electrical sources all emit ELF EMFs (ARPANSA 2015).

The units commonly used to express the strength of a magnetic field include the Tesla (T) or microtesla (μT) and the Gauss (G) or milligauss (mG), where 1 mG is equal to 0.1 μT. The typical values of magnetic fields measured near significant electrical infrastructure in Australia, including distribution lines, substations and transmission lines are provided in Table 6.25. It should be noted that distribution lines operate at significantly lower voltage than transmission lines (ARPANSA 2016).

Table 6.25 Typical values of magnetic fields measured near powerlines and substations

Source	Location of measurement	Range of measurements (mG)*
Distribution line	Directly underneath	2–30
Distribution line	10 m away	0.5–10
Substation	At substation fence	1–8
Transmission line	Directly underneath	10–200
Transmission line	At edge of easement	2–50

Notes: ** Levels of magnetic fields may vary from the range of measurements shown.*

Source: *ARPANSA (2016).*

Extensive research has been conducted to determine whether exposure to ELF EMFs produces adverse health consequences (WHO 2007). As noted by the World Health Organisation (WHO 2007), the health effects related to short-term, high-level exposure to EMFs have been established and form the basis of two international exposure limit guidelines, namely, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (1998), *Guidelines for limiting exposure to time varying electric, magnetic and electromagnetic fields (up to 300 GHz)*, and the Institute of Electrical and Electronics Engineers (IEEE) Standards Coordinating Committee (2002), *Standard for safety levels with respect to human exposure to electromagnetic fields, 0–3kHz.*

As noted by ARPANSA (2015), the majority of research indicates that ELF EMFs exposure levels normally encountered in the environment, including in the vicinity of power lines, does not pose a risk to human health. Further, there is no established evidence that exposure to magnetic fields from power lines, substations, transformers or other electrical sources causes any health effects (ARPANSA 2015). Nonetheless, the ICNIRP guidelines (1998) define reference levels for occupational and general public exposure to prevent potential adverse health effects from exposure to EMFs. These reference levels are shown in Table 6.26. The ranges of measurements listed within Table 6.26 are well below the exposure limits of 2,000 mG or 200 μT defined by international guidelines (ARPANSA 2016).

Table 6.26 ICNIRP reference levels for occupational and general public exposure

Exposure characteristics	Electric field strength (kilo volts per metre - kV/m)	Magnetic flux density (μT)
Occupational	10	1,000
General public	5	200

Source: ICNIRP (1998).

A study by Chang and Jennings (1994) investigated the level of EMFs generated at two utility-scale PV solar developments in the United States. Specifically, the study compared the magnetic fields generated by these developments with published data on more prevalent magnetic field sources. The study concluded that magnetic fields, considered by Chang and Jennings (1994) to be of greatest public concern, generated by PV solar panel arrays were significantly less than for common household applications. For example, magnetic field measurements taken from the back of a PV solar panel were recorded as significantly less than those recorded from within close proximity of a hair dryer, microwave and television, respectively. Therefore, Chang and Jennings (1994) concluded that EMFs generated by PV solar panel arrays should not generate concern.

Other infrastructure installed as part of the PV solar developments assessed by Chang and Jennings (1994), such as transformers, exhibited more significant magnetic fields. However, these sources were found to be localised and could not be detected at the perimeters of each of the developments assessed (Chang and Jennings 1994). Further, it was noted that concerns about EMFs generated by transformers would also apply to a number of other electricity generation and storage technologies (Chang and Jennings 1994).

6.10.2 Impact assessment

Staff involved in the construction and decommissioning stages of the project will be exposed to EMFs during works on the connection infrastructure, which as described in Section 3.4.5 will connect the project to the Hillston Substation, immediately adjacent to the site's northern boundary. Staff exposure levels will be below the recommendations for general public and occupational exposure throughout the construction and decommissioning of the connection infrastructure.

As noted in Chapter 3, construction of the project includes the installation of electrical infrastructure within the site boundary including cabling, inverters, switchgear and the onsite substation, as well as, connection infrastructure to connect the project to the Hillston Substation and the installation of a large number of PV solar panels. As this infrastructure will be involved in the generation, transmission and distribution of electricity, EMFs will be produced. The EMFs produced will be strongest closest to their respective sources.

Once operational, the project infrastructure will generate EMFs. The degree of exposure to EMFs within the site boundary will vary depending on proximity to different components of the project infrastructure. Staff exposure during the operational stage of the project will be intermittent and limited to exposure encountered during ongoing maintenance of the site and project infrastructure. The combination of low exposure rates and the intermittent exposure of staff to elements of the project infrastructure capable of generating EMFs indicate that adverse impacts from EMFs are unlikely as a result of the project.

As noted in Chapter 3, public access to the site will be restricted throughout the life of the project. Surrounding landholders accessing the site or persons accessing the adjacent Hillston Substation will not be exposed to EMFs generated by the project infrastructure for extended periods of time.

The closest sensitive receptor R1, is approximately 700 m north of the development footprint and will not be exposed to a higher level of EMFs due to the construction and operation of the project.

The onsite substation will be located within the development footprint, close to the site's northern boundary (refer to Figure 3.1). At this location, the onsite substation will be offset from Kidman Way by approximately 150 m and will be approximately 800 m from the closest sensitive receptor.

6.10.3 Management and mitigation

As noted in Chapter 3, all project infrastructure will be designed in accordance with relevant industry standards. All relevant procedures in relation to a high voltage installation will be adhered to throughout the life of the project. Further, public access to the site will be restricted throughout the life of the project.

6.11 Bushfire

6.11.1 Introduction

Bushfire risks associated with the project have been assessed in accordance with *Planning for Bushfire Protection* (PBP) (RFS 2006). Appendix 4.1 of PBP sets out submission requirements for DAs on bushfire prone land. Section 2.5 of PBP requires proponents of major projects, for example SSDs, to consult PBP when undertaking environmental assessments.

Section 63(2) of the RF Act requires the owners of land to prevent the ignition and spread of bushfires on their land. The recommended measures in this section, and any measures in a subsequent bushfire management plan for the project, will ensure that the risk of bushfire ignition and spread will be as low as practically possible.

6.11.2 Existing environment

This section determines if the project will be on bushfire prone land and describes vegetation and land slopes within 100 m of the infrastructure area, as required by Appendix 4 of the PBP.

i Bushfire prone land

There are areas of vegetation surrounding the site; for the purposes of this assessment, it is assumed that they qualify as 'vegetation category 2' bushfire prone land under *Guide for bush fire prone land mapping* (RFS 2014) due to the following:

- comprise semi-arid woodland/shrubland (see below); and
- comprise a combined area of vegetation greater than 2.5 ha.

ii Native vegetation

PBP uses broad scale native vegetation classifications and maps compiled between 2001 and 2004 (the Keith formations) (Keith 2004) to classify vegetation according to bushfire hazard (the PBP classifications). The Keith formation and PBP classification of native vegetation within 100 m of the infrastructure area are (Figure 6.12 and Figure 6.13) woodland and semi-arid woodland.

iii Slope

Slopes are classified according to PBP, and are combined with vegetation in an area to determine appropriate asset protection zones (APZs) (discussed below). The slope under bushfire hazard vegetation over a distance of 100 m from the infrastructure area was determined using a digital terrain model (1 m height resolution). The slopes were classified according to PBP as follows:

i) all up-slope vegetation (considered 0°);

ii) >0 to 5° down-slope vegetation;

iii) >5 to 10° down-slope vegetation;

iv) >10 to 15° down-slope vegetation; and

v) >15 to 18° down-slope vegetation.

Slopes under bushfire hazard vegetation within 100 m of the infrastructure area are predominantly class i.

6.11.3 Impact assessment

The locations and dimensions of APZs needed to achieve necessary bushfire protection have been calculated in accordance with PBP.

An APZ is the distance that buildings are set back from vegetation that represents a bushfire hazard (see Appendix 2 of the PBP). APZs are divided into an 'inner protection area' (IPA) located next to the development in question and an 'outer protection area' where there is adjacent forest vegetation. Only an IPA is required where there is adjacent woodland vegetation.

APZs are determined by referring to Table A2.5 in PBP, which compares fire hazard vegetation formations, slope classes near subject boundaries and fire weather at a site. The fire weather or 'fire danger index' (FDI) for Carrathool Shire is 80 (Table A2.3 in PBP). The resulting APZs for the project are 10 m and are shown on Figure 6.12 and 6.13. The APZs will be IPAs as surrounding vegetation is woodland.

If a fire is ignited within the development footprint, this could spread to the surrounding area. The risk of this occurring will be reduced by adoption of measures that would be outlined in a bushfire management plan, and are discussed in Section 6.11.4.

6.11.4 Management and mitigation

A bushfire management plan will be prepared and implemented for the project, and will contain the measures detailed below.

The APZs will be maintained as follows:

- canopy cover will be kept at less than 15% of total surface area and at least 2 m from the roof line of a building;
- around buildings, garden beds and shrubs will not be located under trees and sited at least 10 m from any exposed windows or doors;
- lower limbs of trees up to 2 m above the ground will be removed; and
- understorey vegetation will be mowed annually before the fire season (usually September) to reduce fuel loads provided by shrubs and long grasses.

Water, gas and electricity services will be will be incorporated into the detailed project design as follows:

- located and installed in a manner that reduces the potential for them to contribute to fire hazard;
- water for fire fighting will be supplied by truck and stored in an on-site water tank;
- fire hydrants at buildings will be installed, spaced, sized and pressured in accordance with *Australian Standard 2419.1-2005 Fire hydrant installations – System design, installation and commissioning*. If required water pressures of the standard cannot be met, engineering principles will be used to determine the locations, sizing and number of hydrants;
- electricity and gas services will be located so they do not contribute to the risk of fire to a building;
- overhead electrical transmission lines will be installed and managed in accordance with *Ausgrid 2010 NS179 Vegetation Safety Clearances*;
- *AS/NZS 1596:2008 The storage and handling of LP gas* will be followed for bottled gas installation and maintenance (if required), including the use of metal piping;
- there will be minimum 10 m distance between fixed gas cylinders (if required) and flammable materials and shielding will be placed on the hazard side of the cylinders; and
- release valves on gas cylinders close to buildings will be directed away from the building and be a minimum of 2 m from combustible material. Metal connections will be used.

The site will be accessed via existing access roads from Kidman Way which can accommodate passing vehicles and support vehicles that weigh over 15 t. A minimum vertical clearance of 4 m will be provided to any overhead obstructions including branches.

The risk of igniting a fire within the development footprint will be reduced by adoption of the following measures:

- refuelling will be undertaken in designated refuelling bays (there will not be any vegetation in these areas), especially when the fire danger rating is very high or above;
- fire extinguishers will be maintained in buildings, vehicles and refuelling areas;
- there will be no smoking within the development footprint;
- spill response kits will be available should there be a spill of flammable substances;
- a UHF/VHF communication system will be established, enabling rapid response to emergencies;
- risk reduction, such as slashing, will be undertaken where appropriate, such as along fencelines; and
- the RFS will be contacted if there is a fire.

Section A4.1 of PBP requires an assessment of whether specific buildings are capable of complying with the bushfire construction levels described in *Australian Standard 3959 – 2009 Construction of buildings in bushfire prone areas* (AS 3959 – 2009). The specific buildings are classified by the *Building Code of Australia* (BCA) as class 1, 2, 3 and 4 buildings; and some class 9 and 10 buildings (Australian Building Codes Board 2013). Project related structures do not correlate to these BCA classes and, therefore, do not have bushfire construction levels specified in AS 3959 – 2009. Notwithstanding, PBP requires that such buildings comply with the general bushfire construction requirements in section 3 of AS 3959 – 2009. The structures will be constructed to comply with these requirements.

6.11.5 Conclusion

This section describes measures to enable the project to comply with the objectives of PBP. Specifically, APZs will be provided and managed to enable fire fighting vehicle access and to distance vulnerable structures from vegetation which represents a fire hazard. The risk of the project initiating a bushfire will be minimised through the implementation of appropriate management measures.

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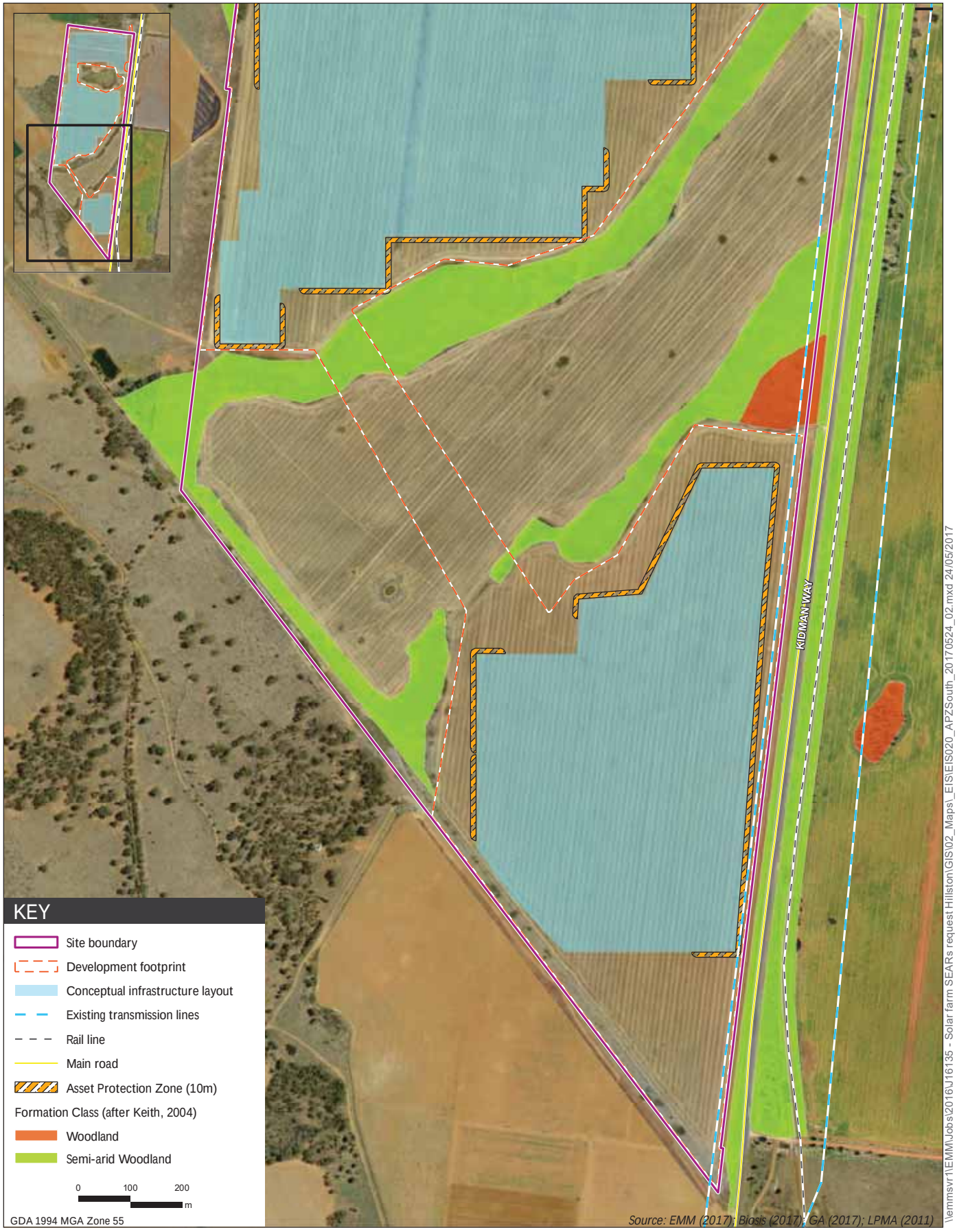
Note: Slope has been assessed as predominantly Class 1 (0° or upslope) within 140m of the site, with minor areas of class 2 (>0° to 5° downslope)

EMM

Asset protection zones - north
Hillston Sun Farm
Environmental impact statement
Figure 6.12



Note: Slope has been assessed as predominantly Class 1 (0° or upslope) within 140m of the site, with minor areas of class 2 (>0° to 5° downslope)

EMM

Asset protection zones - south
Hillston Sun Farm
Environmental impact statement
Figure 6.13

6.12 Air quality

6.12.1 Existing environment

The site is in a rural setting, with the nearest concentration of sensitive receptors in Hillston township, approximately 3.5 km to the north. The area surrounding the site is sparsely populated.

The Carrathool Shire LGA is heavily dependent on agricultural activities, which are likely to have a significant influence on local and regional air quality. Consequently, existing sources of air pollution within the area are limited and are primarily comprised of dust and vehicle and machinery exhaust emissions associated with transportation and agricultural activities. Bushfires are also a source of seasonal dust generation (OEH 2017).

There are two facilities within the Carrathool Shire LGA that are required to report their emissions as part of the National Pollutant Inventory (NPI) (DoEE 2017). The closest facility to the site boundary that is listed within the NPI is the Lowes Petroleum Hillston Depot operated by OCWEN Energy Pty Ltd, approximately 3 km north of the site. The main activities at this facility are petroleum product storage and wholesaling. The second facility listed within the NPI is the JBS Prime City Feedlot operated by JBS Australia Pty Ltd, approximately 65 km south-east of the site. This facility is a beef cattle feedlot. Within the NPI, the most commonly reported emissions for these facilities are noted as: ammonia (total); benzene; cumene (1-methylethylbenzene); cyclohexane; and ethylbenzene (DoEE 2017).

Twenty one rural dwellings have been identified within an approximate 3 km radius of the site, identified as sensitive receptors R1-R21 (Figure 2.1) (excluding dwellings in the built-up area of Hillston township, the southern extent of which commences approximately 2.8 km north of the site). The nearest sensitive receptor,R1, is approximately 700 m north of the development footprint.

6.12.2 Impact assessment

i Construction

Emissions to the atmosphere from the project during construction will be temporary, and restricted to dust caused by land disturbance, and vehicle, plant and equipment exhaust emissions. Construction of the project will take approximately 12 months from the commencement of site establishment works.

Due to the relatively flat terrain and predominantly cleared landscape of the development footprint, limited site preparation and civil works will be required. During site establishment and construction, surface disturbance works will be limited to:

- construction of access tracks and boundary fencing;
- installation of piles to provide support for the mounting framework required for the PV solar panels;
- preparation of foundations for the inverter blocks;
- installation of underground cabling between the PV solar panels and the collection circuit;
- construction of transmission infrastructure between the project switchyard and the Hillston Substation; and
- erection of permanent fencing and security.

Exhaust emissions will also be generated by the plant and equipment required for the construction of the project, which includes:

- vehicles travelling to and from the site;
- earthmoving machinery and equipment for site preparation;
- cable trenching and laying equipment;
- post-driving equipment;
- assisted material handling equipment (forklifts and cranes);
- machinery and equipment for connection infrastructure establishment; and
- water trucks for dust suppression.

During decommissioning, no additional air quality impacts to those described above are anticipated. Total vehicle movements to and from the site during decommissioning will be similar to those experienced during construction. However, it is anticipated that the length of the decommissioning stage will be shorter than the construction stage and therefore emissions to the atmosphere will also be experienced over a shorter period of time.

ii Operation

Ongoing maintenance of the site and project infrastructure will be required during operation. The infrastructure maintenance activities listed in Section 3.6 will result in minor, localised vehicle emissions and generation of dust from vehicles travelling along the internal, unsealed access roads (Figure 3.1). Provided the recommended mitigation measures are implemented, predicted impacts will be adequately managed.

6.12.3 Management and mitigation

The project will not generate significant air quality impacts during construction, operation or decommissioning provided the following mitigation measures are implemented:

- use of a water truck(s) during construction for dust suppression along internal, unsealed access roads and disturbed areas;
- vehicle movements will be minimised where possible;
- all vehicles, plant and equipment will be cleaned and washed regularly;
- all vehicles, plant and equipment will be switched off when not in continuous use;
- all vehicles, plant and equipment will be regularly inspected and maintained to ensure that they are operating efficiently;
- regular maintenance of unsealed access roads will be undertaken to minimise wheel generated dust;
- a 50 m section from the site access roads to the intersections with Kidman Way will be sealed to prevent the transport of soil and dust to the surrounding road network; and
- dust suppression requirements during construction will take into consideration weather and the likelihood of extended dry periods which could exacerbate impacts.

6.12.4 Conclusion

The implementation of the recommended mitigation measures will ensure that the project will not generate significant air quality impacts during construction, operation or decommissioning.

6.13 Socio-economic

6.13.1 Existing environment

Hillston is the largest township in the Carrathool Shire LGA with a population of 1,430 and is the area's geographic and agricultural centre. The population of the Carrathool Shire LGA in 2011 was 2,587 compared to 2,819 in 2006, which reflects a decline of 232 people (or 8%) residing in the area (ABS 2007; ABS 2014). Similarly, the township of Hillston has also experienced a decline in population.

Agriculture is the dominant industry of employment for Hillston's population, with school education and local government administration among the township's other major employers reflecting the township's role as a service centre within the Carrathool Shire LGA (ABS 2014). Hillston township and the greater Carrathool Shire LGA are among the Riverina region's leading producers of a diverse range of primary commodities due to the availability of high quality water, rich and fertile soils, and a warm climate (RDA 2014). Though traditionally reliant on cropping and grazing, innovations in irrigation have allowed Carrathool Shire LGA to expand into additional avenues of agricultural production, including citrus, cotton, viticulture and rice, among others. The most common occupations in Hillston township include managers, labourers, machinery operators and drivers, clerical and administrative workers, and technicians and traders workers (ABS 2014). In September 2016, the unemployment rate within the Carrathool Shire LGA was 2.7%, which was less than the NSW and Australian unemployment rates, which were 5.2% and 5.7%, respectively (DoE 2016).

Hillston township also hosts the majority of the area's largest social, cultural and recreational events, including the Hillston Outback Triathlon, Hillston Races and the Hillston Show. Each of these events makes important contributions to its agriculturally dependent economy. In addition, tourists are attracted to the natural beauty of the Carrathool Shire LGA and its proximity to the Australian outback (CSC 2012).

Within the township of Hillston, there are a number of short-term accommodation options available for tourists and visitors, including motels, motor inns, and onsite cabins (within the Hillston Caravan Park). A review of available accommodation conducted in April 2017 indicated that there are at least 75 rooms available within the township of Hillston. Additional short-term accommodation options are also available in Griffith (approximately 100 km south-east of Hillston), with at least 340 rooms available. A limited number of short-term accommodation options are also available in the village of Goolgowi (approximately 55 km south-east of Hillston), with at least 20 rooms available.

6.13.2 Impact assessment

Based on the results of stakeholder engagement (refer to Section 5.4), there is a positive attitude and broad community support for the Hillston Sun Farm.

The project will make important contributions to the production of renewable energy in NSW while creating employment opportunities, diversifying local revenue streams and generating direct and indirect benefits to the local economy during the life of the project.

i Direct and indirect economic benefits

The project will diversify and strengthen the region's economic base and benefit local businesses through direct expenditure and employment, as well as indirect benefits such as employee expenditure locally and use of local services.

The project will provide economic benefits to the township of Hillston and the Carrathool Shire LGA, as well as the neighbouring City of Griffith LGA. The project will also provide additional economic stimulus, employment opportunities and investment in community infrastructure and services, which may act to counter population decline. The project will also provide increased demand for community and retail services within the township of Hillston.

One of the economic development opportunities identified within both CSC's *Economic Development Strategy* (CSC 2012) and Regional Development Australia's (RDA's) *Riverina Regional Plan 2013-2016* (RDA 2013) is renewable energy. As noted within both the *Economic Development Strategy* (CSC 2012) and the *Riverina Regional Plan 2013-2016* (RDA 2013), there are opportunities to attract investment in renewable energy generation within the Riverina region of NSW and, more specifically, within the Carrathool Shire LGA (CSC 2012; RDA 2013). Within the *Economic Development Strategy*, CSC acknowledges that they should investigate the potential benefits that renewable energy projects would bring to the region (CSC 2012). As noted above, the project will have positive flow-on effects, driving economic growth, employment, prosperity and diversity within the township of Hillston and, more generally, within the wider Carrathool Shire LGA and Riverina region.

The project also aligns with the long-term vision of CSC, namely, "to protect and promote quality of life in harmony with economic development and environmental sustainability" (CSC 2014). For example, through provision of additional employment opportunities, the project will help build the strength and resilience of Carrathool Shire LGA's economy. In addition, the project will lead to improvements to Carrathool Shire LGA's energy infrastructure and contribute to expansions to the Riverina region's clean energy sector thereby promoting future environmental sustainability.

ii Workforce

During construction an average of 100 FTEs will be required for a 12 month period, which will create demand for short and medium term accommodation options. The workforce will be sourced from both the local and wider region, and is expected to comprise of a combination of people residing locally, and those who would travel from other regional or metropolitan areas and reside temporarily in short and medium term accommodation (eg motels, rental accommodation) during construction. For the purposes of this assessment, it has been assumed that the workforce will be distributed between the Carrathool Shire LGA and City of Griffith LGA, which borders Carrathool Shire LGA to the south, as shown in Table 6.27. Given the proximity and larger population of Griffith, approximately 100 km south-east of the site (refer to Figure 1.1), it is assumed that a proportion of the workforce will be from the resident population within the City of Griffith LGA, or will temporarily reside in Griffith and commute to and from the site.

Table 6.27 Construction workforce location of residence (temporary and resident) during construction

Local government area	Population (2014, estimated number of persons)	Proportion of workforce (%)	Residing construction workforce (temporary and resident)	
			Average	Peak
Carrathool Shire	2,795	40	40	60
City of Griffith	25,811	60	60	90

Notes: 1. Population estimates based on ABS national regional profile data last updated in 2016.

As described above, some of the workforce is likely to travel from other regional or metropolitan areas and reside in the area temporarily. This will create demand for short and medium term accommodation. As described in Section 6.13.1, there are in excess of 75 rooms available in Hillston township. The temporary influx of workers during the project's construction may place pressure on local short-term accommodation and other services within the township of Hillston. If not managed, this could have adverse flow-on effects on local tourism. For example, the project may restrict the availability of supply of short-term accommodation to other users during peak demand periods such as weekends coinciding with any of the region's major festivals and annual events. However, given some of the workforce are expected to comprise some of the resident population, the temporary demand for accommodation in Carrathool Shire LGA or City of Griffith LGA (see Table 6.24) is not likely to place significant strain on the existing temporary accommodation for the majority of the duration of construction.

As noted in Section 3.7, the project will also create employment opportunities during operation and decommissioning. Up to five FTEs will be required during the operational stage of the project. It is not yet known how many employment opportunities will be available during decommissioning; however it is expected that less staff will be required on site than during construction. The duration of decommissioning will also determine the extent of direct and indirect economic benefits made available for local businesses and industries during the final stage of the project.

Due to the relatively small volume of potential new residents to the Carrathool Shire LGA as a result of the project, it is not anticipated that this will impact the availability of housing for existing or other new residents.

iii Amenity

There may be some temporary increases in traffic travelling along local roads during the peak of construction. As noted in Section 6.8, the predicted additional daily traffic generated at the peak stage of project construction will be approximately 146 daily vehicle movements, reducing to approximately 92 daily vehicle movements during the earlier and later (average) stages of project construction and approximately 12 daily vehicle trips during the operational stage of the project. Further discussion of the potential impacts of the project on traffic is provided in Section 6.8.

The potential impacts of the project on air quality (Section 6.12), noise (Section 6.7), land (Section 6.5) and the visual landscape (Section 6.6) have been discussed in more detail in relevant sections of the EIS.

6.13.3 Management and mitigation

The project is anticipated to have social and economic benefits for the region. The proposed management and mitigation measures focus on maximising the potential benefits of the project and, where possible, resolving potential conflicts before they are encountered.

The proposed management and mitigation measures that will be implemented for the project include:

- a preference for local employment wherever possible;
- a preference for use of local businesses such as motels, motor inns, restaurants and service providers wherever possible;
- consideration of demand on local short-term accommodation demand and potential conflicts with the region's major festivals and annual events; and
- provision of information to the community about the timing of project construction period and need for employees and services from local business and services.

6.13.4 Conclusion

Through the provision of additional economic stimulus, employment opportunities and investment in community infrastructure and services, the net community benefit of the project is considered to be positive. The implementation of the proposed management measures will mitigate potential adverse impacts from the project, such as impacts to the availability of local short-term accommodation during defined periods, such as during any of the region's major festivals and annual events.

7 Summary of mitigation and management

A summary of the management and mitigation measures for the project, including those documented in this EIS and appended technical reports is presented in Table 7.1. These management and mitigation measures will be incorporated into the environmental management strategy and relevant management plans and protocols.

Table 7.1 Summary of management and mitigation measures

Key issue	Management and mitigation measures
Biodiversity	• disturbance will be restricted to the development footprint identified impacting a total of 1.88 ha of native vegetation; • installation of appropriate exclusion fencing around trees and vegetation to be retained in, or directly adjacent to, the development footprint; • all material stockpiles, vehicle parking and machinery storage will be within cleared areas or areas proposed for clearing, and not in areas of retained native vegetation; • a licensed wildlife salvage team will be on-site during vegetation removal to catch and relocate (if appropriate) any wildlife encountered in vegetation or hollow-bearing trees; • where practical, all scattered hollow-bearing trees to be removed will be placed in areas of retained vegetation to provide additional fauna habitat; • where reasonable and feasible, native vegetation cleared from the development footprint will be mulched for reuse on the site; • dust suppression measures will be implemented during construction; • implementation of temporary stormwater controls during construction will be considered if necessary to ensure that runoff is consistent with existing conditions and to minimise potential impacts on areas of retained vegetation; • an erosion and sediment control plan in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004) will be prepared in consultation with CSC and will be implemented and monitored during the life of the project to minimise impacts; and • impacts to native vegetation will require retirement of 81 biodiversity credits.
Aboriginal heritage	• consultation with the RAPs will continue in regards to the management of Aboriginal cultural heritage sites within the site boundary throughout the life of the project in keeping with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010); • should any unanticipated Aboriginal objects be encountered during works associated with this project, works will cease in the vicinity and the find will not be moved until assessed by a qualified archaeologist; • should unanticipated relics be discovered during the course of the project, work in the vicinity will cease and an archaeologist will be contacted to make a preliminary assessment of the find. The Heritage Council will be notified if the find is assessed as a relic; • if any suspected human remains are discovered during any activity the following will occur: - all work will immediately cease at that location and remains will not be further moved or disturbed; - the NSW Police and OEH's Environmental Line (131 555) will be notified of the details of the remains and their location as soon as practicable; - work will not recommence at that location unless authorised in writing by OEH; and - if the human remains are likely to be Aboriginal in origin, the find will be reported to the RAPs and OEH. If the find is likely to be non-Aboriginal in origin and more than 100 years in age, the Heritage Council of NSW will be notified of the find under s.146 of the Heritage Act.
Historic heritage	• an unexpected finds protocol will be followed if unexpected historical archaeology is discovered during construction of the project; and • if unexpected historical archaeology is discovered during construction, work in the immediate area will cease and an archaeologist will be contacted to make a preliminary assessment of the find. If it is determined to be a relic under the Heritage Act, further investigation may be required and the Heritage Council may need to be notified.

Table 7.1 Summary of management and mitigation measures

Key issue	Management and mitigation measures
Land	• a site access protocol will be included as part of the EMP and will list the relevant landholder contact details and include measures to minimise adverse impacts, such as, driving carefully to minimise disturbance to livestock, crops and pastures; • the timing of construction and the location/design of temporary access routes (Figure 3.1) will be positioned to minimise impacts on neighbouring agricultural operations; • access tracks to and from the site will remain accessible to the landholder to avoid any impacts to the operation and sustainability of neighbouring agricultural businesses; • soil resources will be managed to ensure the future viability of the site for agricultural production, including: - optimisation and recovery of useable topsoil and subsoil; - establishment of effective soil amelioration procedures; and - separate storage of topsoil and subsoil to ensure that soil is replaced in the right order and to avoid unnecessary impacts on soil and existing vegetation structure. • an erosion and sediment control plan in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004) will be prepared in consultation with CSC and will be implemented and monitored during the life of the project to minimise impacts; • the EMP will include weed management protocols and will include measures for the identification, management and ongoing monitoring of weeds on the site; • the EMP will include a spill response plan which will be implemented during construction and throughout the project's operational stage to avoid potential for contamination; • vehicle movements will be restricted to the formed access tracks; • during decommissioning, all above ground facilities will be removed from the site; • during decommissioning and as agreed with the landholder, underground electrical collection systems will be left in situ in order to avoid unnecessary ground disturbance; and • a site decommissioning plan will be prepared following the completion of project construction and commissioning and will feature rehabilitation objectives and strategies for returning the site to agricultural production.
Visual	• implementation of the landscaping plan in Figure 6.7; • suitable colours will be chosen for project infrastructure to minimise visual impacts; • buildings and materials will be designed to be consistent with the local farming landscape and will be similar to existing farm buildings located in the surrounding area; • all night lighting will be motion activated and comply with Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting; and • the panel designs considered for the project will feature anti-reflective surface treatment.
Noise and vibration	No mitigation measures proposed.
Traffic and transport	• two new intersections are proposed for site access (refer to Figure 3.1 and Figure 6.9); • OVERLAND will be required to lodge a Section 138 Certificate (Work on Public Lands) for RMS approval prior to road work for the construction of the site access intersections; and • an EMP will be prepared for the construction of the proposed site access intersections.
Water	• project infrastructure will be positioned to minimise the potential obstruction of the surface water flows and stormwater runoff to minimise the possibility of surface water flooding within the development footprint; • an erosion and sediment control plan in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004) will be prepared in consultation with CSC and will be implemented and monitored during the life of the project to minimise impacts. This plan will include provisions to: - install erosion and sediment controls (if required) prior to and during construction; - regularly inspect erosion and sediment controls, particularly following large rainfall/wind events; - minimise tracking of sediment from vehicles, plant and equipment on to Kidman Way; - during excavation, separate topsoils and subsoils to ensure that they are replaced in their natural configuration; - stockpile topsoil appropriately to minimise weed infestation and maintain soil organic matter, soil structure and microbial activity; and - minimise the total area of disturbance from excavation and compaction.

Table 7.1 Summary of management and mitigation measures

Key issue	Management and mitigation measures
Electromagnetic interference	• all project infrastructure will be designed in accordance with relevant industry standards; and • all relevant procedures in relation to a high voltage installation will be adhered to throughout the life of the project.
Bushfire	• a bushfire management plan will be prepared and implemented for the project; • APZs will be maintained as follows: - canopy cover will be kept at less than 15% of total surface area and at least 2 m from the roof line of a building; - around buildings, garden beds and shrubs will not be located under trees and sited at least 10 m from any exposed windows or doors; - lower limbs of trees up to 2 m above the ground will be removed; and - understorey vegetation will be mowed annually before the fire season (usually September) to reduce fuel loads provided by shrubs and long grasses. • Water, gas and electricity services will be will be incorporated into the detailed project design as follows: - located and installed in a manner that reduces the potential for them to contribute to fire hazard; - water for fire fighting will be supplied by truck and stored in an on-site water tank; - fire hydrants at buildings will be installed, spaced, sized and pressured in accordance with Australian Standard 2419.1-2005 Fire hydrant installations – System design, installation and commissioning. If required water pressures of the standard cannot be met, engineering principles will be used to determine the locations, sizing and number of hydrants; - electricity and gas services will be located so they do not contribute to the risk of fire to a building; - overhead electrical transmission lines will be installed and managed in accordance with Ausgrid 2010 NS179 Vegetation Safety Clearances; - AS/NZS 1596:2008 The storage and handling of LP gas will be followed for bottled gas installation and maintenance (if required), including the use of metal piping; - there will be minimum 10 m distance between fixed gas cylinders (if required) and flammable materials and shielding will be placed on the hazard side of the cylinders; and - release valves on gas cylinders close to buildings will be directed away from the building and be a minimum of 2 m from combustible material. Metal connections will be used. • the site will be accessed via existing access roads from Kidman Way which can accommodate passing vehicles and support vehicles that weigh over 15 t. A minimum vertical clearance of 4 m will be provided to any overhead obstructions including branches; • the risk of igniting a fire within the development footprint will be reduced by adoption of the following measures: - refuelling will be undertaken in designated refuelling bays (there will not be any vegetation in these areas), especially when the fire danger rating is very high or above; - fire extinguishers will be maintained in buildings, vehicles and refuelling areas; - there will be no smoking within the development footprint; - spill response kits will be available should there be a spill of flammable substances; - a UHF/VHF communication system will be established, enabling rapid response to emergencies; - risk reduction, such as slashing, will be undertaken where appropriate, such as along fencelines; and - the RFS will be contacted if there is a fire.
Air quality	• use of a water truck(s) during construction for dust suppression along internal, unsealed access roads and disturbed areas; • vehicle movements will be minimised where possible; • all vehicles, plant and equipment will be cleaned and washed regularly; • all vehicles, plant and equipment will be switched off when not in continuous use; • all vehicles, plant and equipment will be regularly inspected and maintained to ensure that they are operating efficiently; • regular maintenance of unsealed access roads will be undertaken to minimise wheel generated dust; • a 50 m section from the site access roads to the intersections of Kidman Way will be sealed to prevent the transport of soil and dust to the surrounding road network; and • dust suppression requirements during construction will take into consideration weather and the likelihood of extended dry periods which could exacerbate impacts.

Table 7.1 Summary of management and mitigation measures

Key issue	Management and mitigation measures
Soicio-economic	• a preference for local employment wherever possible; • a preference for use of local businesses such as motels, motor inns, restaurants and service providers wherever possible; • consideration of demand on local short-term accommodation demand and potential conflicts with the region's major festivals and annual events; and • provision of information to the community about the timing of project construction period and need for employees and services from local business and services.

8 Conclusion and justification

8.1 Introduction

The SEARs require the EIS to address the reasons why the development should be approved having regard to the biophysical, economic and social costs and benefits of the development. This justification is summarised below with reference to the outcomes of the impacts of the project presented in Chapter 6. The strategic justification for the project is presented in Section 1.3, and an analysis of site suitability is presented in Section 3.2.

This chapter also considers the other relevant requirements under Schedule 2 of the EP&A Regulation not already addressed in the EIS, specifically the objects of the EP&A Act.

8.2 Biophysical, social and economic justification

8.2.1 Biophysical

The biophysical aspects of the project are assessed in Chapter 6. Biophysical impacts of the project include:

- Biodiversity – removal of 1.88 ha of native vegetation within the development footprint, none of which is listed as TEC or EEC, and other indirect biodiversity impacts (including impacts to viability of retained vegetation, encroachment of weeds and temporary noise impacts). The project has been designed to avoid and minimise impacts to biodiversity. To compensate for unavoidable disturbance of native vegetation, biodiversity offsets are proposed.
- Aboriginal cultural heritage – the project has been designed to avoid harm to all five Aboriginal heritage sites identified within the study area adopted as part of the ACHAR.
- Land – change of land use for 293 ha of the site, the majority of which is currently used for agricultural purposes, and which would be removed from agricultural production for the life of the project (in the order of 30 years). Land management practises will avoid or minimise impacts with adjoining land uses, and ensure that the site is not precluded from being returned to a productive agricultural use at the end of operation.

Impacts to all other aspects were predicted to meet relevant criteria and/or be negligible as a result of the project. Through the site selection and project design process, described in Section 3.2, the project has avoided and minimised impacts to the biophysical environment as far as practicable.

8.2.2 Economic

Economic impacts of the project are detailed in Section 6.13. The project is justified economically due to the economic benefits and stimulus it would provide to the local region.

Construction of the project will require an average workforce of 100 people, with up to 150 people during the peak of construction. In the order of five full time equivalent people will be employed during the operational stage of the project.

The project is consistent with the strategic objectives of the NSW Government in terms of renewable energy generation, and will provide economic stimulus to the local region.

8.2.3 Social

The project is justified on social grounds for three principal reasons; it is broadly supported by the local and regional community (refer to Section 5.3), it will contribute to the local and regional economies (refer to Section 6.13), and provide indirect benefits through the use of services and facilities both locally and regionally.

8.3 Objects of the EP&A Act

The project's consistency with the relevant objects of the EP&A Act is considered below. However, the overall conclusion is that the project is consistent with the objects of the EP&A Act either wholly or in the majority.

8.3.1 Proper management, development and conservation of resources

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

Resources within the project site include land that is being used for agricultural production (albeit with a majority of the development footprint being LSC Class 5 with severe limitations), and land which has biodiversity and cultural heritage values. This constitutes the 'natural resources', which must be properly managed, developed or conserved.

As stated previously, the development footprint will be removed from agricultural use, however land management practises will avoid or minimise impacts with adjoining land uses, and ensure that land is not precluded from being returned to a productive agricultural use at the end of the operational stage of the project.

The biodiversity values and cultural resources in the project site will be mitigated or offset.

For the reasons given above the project will maintain 'social and economic welfare' and achieve 'a better environment'.

8.3.2 Orderly development

(a) to encourage:..

...(ii) the promotion and co-ordination of the orderly and economic use and development of land,

The project provides an opportunity for orderly and economic use and development of land with benefits to the local region. The project's planning and design process, including site selection (see Section 3.2) has taken into account all potential impacts and incorporates measures to avoid, minimise or compensate for these impacts. Thus, it will be an orderly development.

8.3.3 Communication and utility services

(a) to encourage:

...(iii) the protection, provision and co-ordination of communication and utility services,

The Hillston Substation is immediately adjacent to the site's northern boundary (being approximately 150 m from the existing infrastructure). The existing utility services within the Hillston Substation and surrounds (including the 132 kV transmission line and 33 kV electricity infrastructure) will not be affected. This represents an orderly and coordinated approach to utility connections. The project will not affect any other communication and utility services.

8.3.4 Land for public purposes

(a) to encourage:

...(iv) the provision of land for public purposes,

The project will not affect the provision of land for public purposes, as it is currently freehold and privately owned. The project is considered to have an overall benefit for the public associated with renewable energy generation, therefore it is considered to be consistent with this objective.

8.3.5 Community services and facilities

(a) to encourage:

...(v) the provision and co-ordination of community services and facilities, and

The project is likely to utilise existing community services and facilities. The greatest impact would occur during construction when the workforce requirements are at their peak; the socio-economic assessment provided in Section 6.13 indicates that there is current capacity for this demand. It may also help support services and facilities affected with recent measured population decline.

8.3.6 Protection of the environment

(a) to encourage:

...(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

The project has sought to minimise impacts on native vegetation due to the project as far as practicable, while establishing offsets would enhance biodiversity values in the medium to short term.

8.3.7 Ecologically sustainable development

(a) to encourage:

...(vii) ecologically sustainable development, and

The principles of ESD, for the purposes of the EP&A Act, are provided in clause 7(4) of Schedule 2 of the EP&A Regulation. It states:

The principles of ecologically sustainable development are as follows:

(a) the precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options,

(b) inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

(c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

(d) improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

The four principles of ESD and the project's compatibility with each are considered below.

In addition, the Commonwealth's National Strategy for Ecologically Sustainable Development defines ESD as 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.

Conservation of ecological resources will be achieved through avoiding valuable areas (as far as practicable), while establishing offsets would enhance biodiversity.

i Precautionary principle

This means that if there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. This EIS, prepared by experts in their respective fields, has identified and assessed the potential environmental impacts, and appropriate mitigation and management measures have been developed in response. Taking these measures into account, it is considered that there will be no threat of serious or irreversible damage to the environment as a result of the project.

ii Inter-generational equity

Inter-generational equity is the concept that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations, while intra-generational equity is applied within the same generation.

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.

iii Conservation of biological diversity and maintenance of ecological integrity

Through design, the project has actively sought to minimise impacts to biodiversity, and through the provision of biodiversity offsets, will increase the area of land conserved for biodiversity protection. Therefore, the project will conserve biological diversity and maintain ecological integrity.

iv Improved valuation and pricing of environmental resources

One of the common broad underlying goals or concepts of ESD is economic efficiency, including improved valuation and pricing of environmental resources.

In the past, it was assumed that some environmental resources were free or underpriced, leading to their wasteful use and consequent degradation. Consideration of economic efficiency, with improved valuation of environmental resources, aims to overcome the underpricing of natural resources and has the effect of integrating economic and environment considerations in decision making, as required by ESD.

As previously stated, 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.

Having considered all aspects of ESD, the conclusion is that the project is consistent with the objects of the EP&A Act, and with its specific components.

8.3.8 Increased public involvement

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

Community consultation has been completed during the preparation of the EIS, and OVERLAND has actively sought to involve the community in the planning and assessment process (refer to Chapter 5). The engagement activities undertaken included a community information session, phone calls, meetings and informal discussions, thus providing opportunity for public involvement and participation in environmental planning and assessment.

8.4 Conclusion

There is a sound justification for the project, founded on the following:

- The site is suitably located:
  - in a region with ideal climatic conditions for large-scale solar energy generation, with ideal physical conditions;
  - immediately adjacent to infrastructure with adequate capacity to receive the energy proposed to be generated; and
  - proximate to land uses compatible with large-scale solar energy generation at a capacity which matches the availability of the network.
- The project will not result in significant biophysical, social or economic impacts, and the project design has actively sought to avoid and minimise impacts, in particular to biodiversity, heritage, land use and visual amenity, through the siting and design of project infrastructure.
- The project will generate direct and indirect economic benefits, through the creation of employment opportunities and benefits to the local economy through income and expenditure during the life of the project.
- The production of renewable energy directly aligns with the objectives of the State's renewable energy targets and the objectives of the NSW Government's REAP, and will contribute to increased energy security through valuable contributions to a more diverse energy mix.

A suite of design, mitigation and management measures are proposed in this EIS to avoid, minimise and manage impacts of the project. The project will enable the orderly and logical use of natural, physical and human resources existing in the area and region. There will be economic investment and employment benefits for the local region and a realised opportunity for renewable energy generation, while minimising potential environmental and social impacts.

The overall benefits of the project are considered to be in the public interest.

Abbreviations

ACHAR	Aboriginal cultural heritage assessment report
AEMO	Australian Energy Market Operator
AHIMS	Aboriginal Heritage Information Management System
APZ	asset protection zone
ARI	average recurrence interval
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASC	Australian Soil Classification
AWS	Automatic Weather Station
BAR	biodiversity assessment report
BCA	Building Code of Australia
BoM	Bureau of Meteorology
Carrathool LEP	Carrathool Local Environmental Plan 2012
CASA	Civil Aviation Safety Authority
CSC	Carrathool Shire Council
DA	development application
DoE	Commonwealth Department of Employment
DoEE	Commonwealth Department of the Environment and Energy
DoI-DRE	NSW Department of Industry - Division of Resources and Energy
DPE	NSW Department of Planning and Environment
DPE-DRE	NSW Department of Planning and Environment – Division of Resources and Energy
DPI	NSW Department of Primary Industries
EEC	endangered ecological community
EIS	environmental impact statement
ELF	extremely low frequency
EMM	EMM Consulting Pty Limited
EMP	environmental management plan
EMFs	electric and magnetic fields

EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EP&A Regulation	NSW Environmental Planning and Assessment Regulation 2000
EPA	NSW Environment Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPL	environment protection licence
ESD	ecologically sustainable development
FBA	Framework for Biodiversity Assessment
FDI	fire danger index
G	gauss
GDEs	groundwater dependent ecosystems
GLALC	Griffith Local Aboriginal Land Council
GWh	gigawatt hours
ha	hectare
Heritage Act	NSW *Heritage Act 1977*
Hz	hertz
IBRA	Interim Biogeographic Regionalisation for Australia
ICNG	Interim Construction Noise Guideline
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICOMOS	Australia International Council on Monuments and Sites
IEEE	Institute of Electrical and Electronic Engineers
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007
INP	Industrial Noise Policy
IPA	inner protection area
km	kilometre
kW	kilowatt
LGA	local government area
LLS	Local Land Services
LLS Riverina	Local Land Services – Riverina Region
LSC	Land and Soil Capability

m^2	square metres
mG	milligauss
mm	millimetres
MNES	matters of national environmental significance
MRC	Murray River Council
MW	megawatt
NMLs	noise management levels
NNTT	National Native Title Tribunal
NPI	National Pollution Inventory
NPW Act	NSW *National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NSW LPI	NSW Land and Property Information
NTSCORP Limited	NSW Native Title Services Corporation Limited
NV Act	NSW *Native Vegetation Act 2003*
OEH	NSW Office of Environment and Heritage
OVERLAND	OVERLAND Sun Farming Pty Limited
PAC	Planning Assessment Commission
PBP	Planning for Bushfire Protection
PCT	plant community type
PHA	preliminary hazard assessment
POEO Act	NSW *Protection of the Environment Operations Act 1997*
PV	photovoltaic
PVP	property vegetation plan
RAPs	registered Aboriginal parties
RBL	rating background noise level
RDA	Regional Development Australia
REAP	Renewable Energy Action Plan
RF Act	NSW *Rural Fires Act 1997*

RMRP	Riverina Murray Regional Plan 2036
RMS	NSW Roads and Maritime Services
RNP	Road Noise Policy
RTS	response to submissions
Rural Lands SEPP	State Environmental Planning Policy (Rural Lands) 2008
SEARs	Secretary's environmental assessment requirements
SEED	Sharing and Enabling Environmental Data
SEPP 33	State Environmental Planning Policy No 33 - Hazardous and Offensive Development
SEPP 55	State Environmental Planning Policy No 55 - Remediation of Land
SHR	State Heritage Register
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2011
SRLUP	NSW Strategic Regional Land Use Policy
SSD	State significant development
T	tesla
TDS	total dissolved solids
TEC	threatened ecological community
TfNSW	Transport for NSW
TSC Act	NSW *Threatened Species Conservation Act 1995*
VIS	Vegetation Information System
WM Act	NSW *Water Management Act 2000*
µT	microtesla

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