# ENVIRONMENTAL IMPACT STATEMENT

## Oxley Solar Farm

March 2021

**Project Number: 19-489**

# DOCUMENT VERIFICATION

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**W.** www.nghconsulting.com.au

**E.** ngh@nghconsulting.com.au

**BEGA - ACT & SOUTH EAST NSW**
Suite 11, 89-91 Auckland Street (PO Box 470) Bega NSW 2550 **T.** (02) 6492 8333

**BRISBANE**
Suite 4, Level 5, 87 Wickham Terrace
Spring Hill QLD 4000 **T.** (07) 3129 7633

**CANBERRA - NSW SE & ACT**
8/27 Yallourn Street (PO Box 62)
Fyshwick ACT 2609 **T.** (02) 6280 5053

**GOLD COAST**
PO Box 466
Tugun QLD 4224 **T.** (07) 3129 7633

**NEWCASTLE - HUNTER & NORTH COAST**
Unit 2, 54 Hudson Street
Hamilton NSW 2303 **T.** (02) 4929 2301

**SYDNEY REGION**
Unit 18, Level 3, 21 Mary Street
Surry Hills NSW 2010 **T.** (02) 8202 8333

**WAGGA WAGGA - RIVERINA & WESTERN NSW**
Suite 1, 39 Fitzmaurice Street (PO Box 5464)
Wagga Wagga NSW 2650 **T.** (02) 6971 9696

**BEGA • BRISBANE • CANBERRA • GOLD COAST • NEWCASTLE • SYDNEY • WAGGA WAGGA**
**W.** www.nghconsulting.com.au
ABN 31 124 444 622 ACN 124 444 622

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## CERTIFICATION

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

**EIS prepared by:** NGH Pty Ltd, Suite 11 89-91 Auckland Street, Bega NSW 2550.

**Applicant:** Oxley Solar Development Pty Ltd

**Proposed Development:**

The Oxley Solar Farm proposal includes the construction, operation and decommissioning of a photovoltaic solar farm that would produce 225 megawatts (MW) of electricity. Associated infrastructure would include a substation, battery storage and connection to an existing substation.

**Land to be developed:**

The Oxley Solar Farm proposal would be located on an approximately 895 hectare property comprising of Lot 5 DP253346, Lot 6 DP625427 and part of Lot 2 DP1206469 and Lot 7004 and 7003 DP1060201.

**Certification**

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

| | | |
|---|---|---|
| Name: | Jane Blomfield | Brooke Marshall |
| Qualification | BEnvSc (Land and Water), MEM | B.Nat.Res (Honours) |
| Signature: | JBlomfield | BMarshall. |
| Date: | 23/02/2021 | 23/02/2021 |

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **AADT** | Annual Average Daily Traffic |
| **ABARE** | Australian Bureau of Agricultural and Resource Economics |
| **ABRI** | Agricultural Business Research Institute |
| **ABS** | Australian Bureau of Statistics |
| **AC** | alternating current |
| **ACHA** | Aboriginal Cultural Heritage Assessment |
| **ACHCRP** | Aboriginal cultural heritage consultation requirements for proponents |
| **AEMO** | Australian Energy Market Operator |
| **AEMC** | Australian Energy Market Commission |
| **AEP** | *Annual Exceedance Probability* |
| **AER** | *Australian Energy Regulator* |
| **AS** | *Artefact scatter* |
| **AGO** | Australian Greenhouse Office |
| **AHD** | Australian Height Datum |
| **AHIMS** | Aboriginal Heritage Information Management System |
| **AHIP** | Aboriginal Heritage Impact Permit |
| **ARI** | Average Recurrent Interval |
| **APZ** | Asset Protection Zone |
| **ARENA** | Australian Renewable Energy Agency |
| **ARPANSA** | Australian Radiation Protection and Nuclear Safety Agency |
| **ASL** | Above sea level |
| **ASRIS** | Australian Soil Resource Information System |
| **AV** | Articulated Vehicle |
| **BAL** | Basic Left Turn |
| **BAM** | Biodiversity Assessment Methodology |
| **BAR** | Basic Right Turn |

| | |
|---|---|
| **BC Act** | *Biodiversity Conservation Act 2016* |
| **BCD** | Biodiversity Conservation Division (formally within Office of Environment and Heritage (OEH)) |
| **BDAR** | Biodiversity Development Assessment Report |
| **BFMC** | Bush Fire Management Committee |
| **BFSA** | Bush Fire Safety Authority |
| **BOM** | (Australian) Bureau of Meteorology |
| **BOS** | Balance of System |
| **BSAL** | Biophysical strategic agricultural land |
| **CCP** | Community Consultation Plan |
| **CCTV** | Closed-circuit television |
| **CEC** | Clean Energy Council |
| **CEEC** | Critically Endangered Ecological Community |
| **CEMP** | Construction environmental management plan |
| **CER** | Clean Energy Regulator |
| **CHMP** | Cultural Heritage Management Plan |
| **CIV** | Capital Investment Value |
| **CML** | Concessional Mass Limit |
| **CSIRO** | Commonwealth Scientific and Industrial Research Organisation |
| **DA** | Development Application |
| **dB(A)** | Decibels, a measure of A-weighted *(c.f.)* sound levels. |
| **DC** | direct current |
| **DECC** | Department of Climate Change (now DPIE) |
| **DECCW** | Department of Climate Change and Water (now DPIE) |
| **DEMP** | Decommissioning Environmental Management Plan |
| **DOP** | Department of Planning (now DPIE) |
| **DP** | deposited plan |
| **DPE** | Department of Planning and Environment |
| **DPIE** | Department of Planning, Industry and Environment (formally Department of Planning and Environment (DPE)) |

| | |
|---|---|
| **DPI** | Department of Primary Industries |
| **DAWE** | (Commonwealth) Department of Agriculture, Water and the Environment (Formally Department of Energy and Environment (DoEE)) |
| **EEC** | Endangered Ecological Community |
| **EES** | (NSW) Environment Energy and Science |
| **EIS** | Environmental Impact Statement |
| **ELF** | Extremely low frequency, in relation to Hz *(c.f.)* |
| **EMFs** | Electric and magnetic fields |
| **EMP** | Environmental Management Plan |
| **EMS** | Environmental Management Strategy |
| **EP&A Act** | *Environmental Planning and Assessment Act 1979* (NSW) |
| **EP&A Regulation** | *Environmental Planning and Assessment Regulation 2000* (NSW) |
| **EPA** | (NSW) Environment Protection Authority |
| **EPBC Act** | *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) |
| **EPC** | Engineering Procurement and Construction |
| **EPI** | environmental planning instruments |
| **ERP** | Emergency Response Plan |
| **ESB** | Energy Security Board |
| **ESD** | Ecologically sustainable development |
| **GDE** | Groundwater Dependent Ecosystems |
| **GHG** | Greenhouse gas |
| **GML** | General Mass Limit |
| **GRP** | gross regional product |
| **GWh** | Gigawatt hours |
| **ha** | hectares |
| **HBT** | Hollow Bearing Tree |
| **HML** | Higher Mass Limit |
| **Hz** | Hertz |
| **IBRA** | International Bioregions of Australia |

| | |
|---|---|
| **ICNG** | Interim Construction Noise Guideline |
| **ICNIRP** | International Commission on Non-Ionizing Radiation Protection |
| **IF** | Isolated find |
| **IPA** | Inner protection area |
| **ISEPP** | *State Environmental Planning Policy (Infrastructure) 2007* |
| **kl** | kilolitres |
| **km** | kilometres |
| **kV** | kilovolts |
| **kW** | kilowatts |
| **LALC** | Local Aboriginal Land Council |
| **LCA** | Life Cycle Assessment |
| **LEMC** | local emergency management committee |
| **LEP** | Local Environment Plan |
| **LGA** | Local Government Area |
| **LSC** | Land and Soil Capability |
| **LUCRA** | land use conflict risk assessment |
| **LVIA** | Landscape and Visual Impact Assessment |
| **m** | metres |
| **mm** | millimetres |
| **ML** | Megalitres |
| **MNES** | Matters of National Environmental Significance, under the EPBC Act (*c.f.*) |
| **MSDS** | Material and Safety Data Sheet |
| **MW** | Megawatt |
| **MWh** | Megawatt hours |
| **NARCliM** | NSW and ACT Regional Climate Modelling |
| **NEBFMC** | New England Bush Fire Management Committee |
| **NEG** | National Energy Guarantee |
| **NEM** | National Electricity Market |

| | |
|---|---|
| **NML** | Noise Management Level |
| **NPfI** | NSW Policy for Industry |
| **NPW Act** | *National Parks and Wildlife Act 1974* |
| **NSW** | New South Wales |
| **NRET** | National Renewable Energy Target |
| **O&M** | Office and Maintenance |
| **OEH** | (NSW) Office of Environment and Heritage (now Environment, Energy and Science) |
| **OEMP** | Operation Environmental Management Plan |
| **OSD** | Oxley Solar Development |
| **PBP** | Planning for Bushfire Protection |
| **PCT** | Plant Community Type |
| **PCU** | Power Conversion Unit |
| **PHA** | Preliminary Hazard Analysis |
| **PMF** | *Probably Maximum Flood Level* |
| **POEO Act** | *Protection of the Environment Operations Act 1997* (NSW) |
| **PV** | Photovoltaic |
| **RAPs** | Registered Aboriginal Parties |
| **RBL** | Rating Background Level - the level of background noise |
| **RE Act** | *Renewable Energy (Electricity) Act 2000* (Commonwealth) |
| **RET** | Renewable Energy Target |
| **REZ** | Renewable Energy Zone |
| **RFS** | (NSW) Rural Fire Service |
| **RNP** | *Road Noise Policy* |
| **Roads Act** | (NSW) *Roads Act 1993* |
| **SAII** | Serious and Irreversible Impacts |
| **SCIC** | Suppression through Cooling, Isolation, and Containment |
| **SEARs** | Secretary's Environmental Assessment Requirements |
| **SEIFA** | Socio Economic Indexes for Areas |

| | |
|---|---|
| **SEPP** | State Environmental Planning Policy (NSW) |
| **SHI** | State Heritage Inventory |
| **SLO** | Social licence to operate |
| **SOE** | State of the Environment |
| **sp/spp** | Species/multiple species |
| **SRD SEPP** | *State Environmental Planning Policy (State and Regional Development) 2011 (NSW)* |
| **SSD** | State Significant Development |
| **ST** | Scarred Tree |
| **SWMP** | Soil and Water Management Plan |
| **TEC** | Threatened Environmental Communities |
| **TfNSW** | Transport for New South Wales (formally Roads and Maritime Services (RMS)) |
| **TIA** | Traffic Impact Assessment |
| **TMP** | Traffic Management Plan |
| **UNE** | University of New England |
| **μT** | Microtesla, multiples of a unit of magnetic field |
| **VIA** | Visual Impact Assessment |
| **V** | Volts |
| **WAD** | Works Authorisation Deed |
| **WAL** | Water Allocation License |
| **WARR Act** | *Waste Avoidance and Resource Recovery Act 2001* |
| **WHO** | World Health Organisation |
| **WMP** | Waste Management Plan |

# EXECUTIVE SUMMARY

## INTRODUCTION

This Environmental Impact Statement (EIS) identifies and assesses the potential environmental and planning issues associated with the construction, operation and decommissioning of the proposed 225 Mega Watt (MW) Oxley Solar Farm. This EIS has been prepared by NGH on behalf of the proponent, Oxley Solar Development Pty Ltd (OSD).

This EIS has been prepared in accordance with Part 4 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) to support a Development Application (DA) to be lodged with the NSW Department of Planning, Industry and Environment (DPIE).

**The indicative infrastructure layout presented in this EIS has been developed iteratively, in tandem with the environmental assessment and in consultation with relevant government agencies, the community and other stakeholders. This process aims to avoid or minimise potential impacts wherever practicable and results in a proposal that responds appropriately to the site's constraints and the Large Scale Solar Energy Guideline for State Significant Development 2018.**

To inform the development of the most appropriate proposal, a Scoping Report (NGH 2019) was undertaken in the early planning stages of the proposal. The Scoping Report identified likely environmental constraints[1] at an early stage was used to assist develop the early solar farm layout and plan the detailed environmental assessment methodologies for the EIS. In response to the site's key constraints, and based on the results of the detailed assessments included in this EIS, the proposed Oxley Solar Farm has:

- Avoided higher biodiversity value land. Once the broader site was selected, the development footprint was refined iteratively, in tandem with the detailed biodiversity assessment. The layout has been developed to avoid higher quality areas of native vegetation onsite including:
  - 37.3 ha of Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion (PCT 567 woodland structure).
  - 29.2 ha of Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion (PCT 510 woodland structure).
  - 0.55 ha of EPBC listed Vegetation

- 36 no go zones to avoid identified Aboriginal Heritage items including stone artefacts, modified and cultural trees and archaeological deposits.
- Set back solar arrays further away from the Oxley Wild Rivers National Park and sensitive receivers, south and south west of the proposal site.
- Buffered waterways in accordance with their classification and the "Guidelines for Riparian Corridors on Waterfront Land", for 2nd order and above streams, to minimise impacts on hydrology and water quality. Excepting required crossings, these areas will be avoided. Rehabilitation of impacts required in these areas will be with reference to best practice guidelines.

## PROPOSAL OBJECTIVES, NEEDS AND BENEFITS

The objectives of the Oxley Solar Farm proposal are to:

- Develop a profitable, commercial scale solar electricity generation project.

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[1] Environmental constraints can be defined as factors which may affect the 'developability' of a site and include physical, ecological, social and planning factors.

- Include on-site energy storage to support the high voltage transmission network.
- Assist to mitigate the effects of climate change through the transition to renewable energy.
- Meet and exceed relevant environmental and regulatory requirements for the proposal, in collaboration with key stakeholders.
- Provide local and regional employment opportunities and other social benefits during the construction and operation of the facility.

The specific benefits of the development of the renewable energy source on the Oxley Solar Farm proposal site include:

- Assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets.
- Provide a clean and renewable energy source to assist in reducing greenhouse gas emissions.
- Generation of enough clean, renewable energy for about 81,000 average NSW homes.
- Displace approximately 400,000 metric tonnes of carbon dioxide, currently generated by non-renewable sources.

# PROPOSAL DESCRIPTION

The Oxley Solar Farm is located on the southern side of Waterfall Way (Grafton Road), approximately 14 kilometres (km) south-east of Armidale, in the New England region of NSW. This region has been identified as an optimal Renewable Energy Zone (REZ) in which to develop new electricity generation projects, supported by existing transmission network strength and capacity (AEMO, 2020). The New England North West is the second highest solar penetration region in NSW (DPIE, 2017).

The proposed Oxley Solar Farm involves the construction, operation and decommissioning of a ground-mounted PV solar array. Approximately 225MW (AC) of renewable energy would be generated and supplied directly to the national electricity grid. It would also assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets. The Oxley Solar Farm proposal site is outlined in the table below.

Table 1-1 Affected lots associated with the proposed Oxley Solar Farm.

| Referred to in the EIS | Proposed infrastructure | Lots and DP | Owner | Existing use | Ownership arrangements |
|---|---|---|---|---|---|
| **Proposal site and development footprint** | All proposed solar farm infrastructure including solar arrays, connection infrastructure, battery storage, internal roads and ancillary infrastructure. | Lot 5 DP253346 | Currently owned by one private landowner (involved landowner). | Agriculture. | OSD would purchase this land. |
| | | Lot 6 DP625427 | Currently owned by one private landowner (involved landowner). | Agriculture. | OSD would purchase this land. |
| | | Lot 2 DP1206469 | Currently owned by one private landowner (involved landowner). | Agriculture. | OSD would purchase part of this land. |

| Referred to in the EIS | Proposed infrastructure | Lots and DP | Owner | Existing use | Ownership arrangements |
|---|---|---|---|---|---|
| | | Lot 7003 and 7004 DP1060201 | Crown Land | Road easement<br>Travelling stock reserve | OSD would lease or purchase this land. |
| **Site access** | Up to 1km of access track between Waterfall Way (Grafton Road) south towards the solar farm and associated substation. | Lot 2 DP1206469 | Currently owned by one private landowner (involved landowner). | Agriculture | Easement would be established. |
| | | Lot 7003 and Lot 7004 DP1060201 | Crown Land | Road easement<br>Travelling stock reserve | Easement would be established. |

Of the 1,048 hectare (ha) proposal site, the development footprint would represent approximately 895ha which would be developed for the solar farm and associated infrastructure. Two existing TransGrid 132kV transmission lines run parallel to each other within the northern section of the proposal site and would be used to connect the solar farm to the national electricity grid. The primary access point during the construction and operational phases for light and heavy vehicles would be off Waterfall Way (Grafton Road), north of the site.

The indicative site layout presented in this EIS assumes the maximum development impact[2] and includes the following key infrastructure:

- Approximately 715,000 PV solar panels mounted on either fixed or tracking systems, both of which are considered feasible:
  - Fixed-tilted structures in a north orientation; or
  - East-west horizontal tracking systems.
- Approximately 45 Power Conversion Units (PCU) composed of two inverters, a transformer and associated control equipment to convert DC energy generated by the solar panels to 33kV AC energy.
- An onsite 132kV substation containing up to two transformers and associated switchgear to facilitate connection to the national electricity grid via the existing 132kV transmission lines onsite.
- Steel mounting frames with driven or screwed pile foundations.
- Underground power cabling to connect solar panels, combiner boxes and PCUs.
- Underground auxiliary cabling for power supplies, data services and communications.

[2] Proposing a 'maximum development footprint' and assessing this allows flexibility required in the final design stages, post project approval. This minimises the need for further assessment at that time but should be noted as generally overestimating the impacts of the proposal at this time.

- Buildings to accommodate a site office, indoor 33kV switchgear, protection and control facilities, maintenance facilities and staff amenities.
- About 1km of access track off Waterfall Way (Grafton Road) to the site which would require construction to the proposed onsite substation.
- Internal access tracks for construction and maintenance activities.
- An energy storage facility with a capacity of up to 50MWh (i.e. 50 MW power output for one hour) and comprising of lithium ion batteries with inverters.
- Perimeter security fencing up to 2.3m high.
- Native vegetation planting to provide visual screening onsite and for specific receivers.

The construction phase of the proposal would take about 12 – 18 months. The peak construction period would be a shorter period of about 6 months. Approximately 300 workers would be required during construction.

The solar farm is anticipated to be operational for about 30 years. Around five fulltime equivalent operations and maintenance staff and service contractors would operate the facility.

At the end of the project's life, when the solar farm is no longer considered viable, the site will be returned to existing or better land capability. All above ground infrastructure, with the possible exception of the onsite substation, would be removed. Any cabling more than 500mm underground may also be left in place (as this would not impact future agricultural activities following rehabilitation of the site). Similarly access tracks may be left in place, depending on the future use of the site.

## COMMUNITY AND STAKEHOLDER CONSULTATION

OSD has undertaken comprehensive consultation with affected landowners, the local community and other relevant stakeholders in developing the proposal. A Community Consultation Plan (CCP) is in place for the Oxley Solar Farm. It identifies ways to inform the community about Oxley Solar Farm and facilitate engagement within the community. It commences prior to lodgement of the Scoping Report (NGH 2019) and would be updated to continue through the assessment, construction and operational phases of the project, pending project approval.

OSD has informed and engaged with relevant local, State and Commonwealth Government authorities, infrastructure and service providers, community groups and affected landowners on the proposal.

In accordance with the CCP (NGH, 2019), OSD and community engagement consultancy, OPF Consulting (OPF ) offered a range of community engagement methods including.

- Face to face meetings with OSD and OPF community liaison team members.
- Videoconference meetings with OSD and OPF representatives.
- Telephone calls with OSD and OPF community liaison team members.
- Emails and calls to key stakeholders and special interest groups – e.g. Armidale City Council, Sustainable Living Armidale, National Parks Association and Armidale Local Aboriginal Land Council.
- Three advertisements placed in the print and digital version of the Armidale Express in the two weeks leading up to the information session.
- A media release published on the Armidale Express website and across local radio stations promoted the information session.
- A newsletter distributed to letterboxes within 5km of the proposal site.
- Attendance at an information session (together with NGH) open to stakeholders over 7 hours in Armidale on August 6, 2020.
- A dedicated community email and phone number for stakeholders to contact OSD with questions, concerns or feedback.

- A dedicated community webpage for the Oxley Solar Farm which promoted all engagement activities and how this relates to the planning process detailed the proposed methods for communication. The website also provides details about OSD, details of the project, contact details and opportunity to be provided updates about the project by joining the project mailing list. The website can be found at:
    - https://www.oxleysolarfarm.com.au/

Approximately 133 occurrences of contact or feedback opportunities has been undertaken with or by stakeholders to date including calls, emails and feedback forms. The results of community consultation have informed this EIS. Specific concerns and comments raised during the process have been addressed throughout this report. Consultation with the community will be ongoing throughout the life the proposal.

## KEY ENVIRONMENTAL ISSUES

In addition to addressing the project – specific Secretary's Environmental Assessment Requirements (SEARs), a risk assessment was carried out to identify key construction, operation and decommissioning environmental risks of the proposal. This was undertaken to guide the depth of investigation that would be undertaken in the EIS and the level of specialist involvement. The risk assessment identified five environmental aspects as key risks:

1. Biodiversity
2. Visual amenity and landscape character
3. Hydrology and flooding
4. Aboriginal heritage
5. Agriculture and land use

### Biodiversity

The development site occurs within the Armidale plateau IBRA subregion and the dominant Mitchell Landscape within the development site is Moonbi – Walcha. No wetlands of international importance and no Ramsar wetlands would be impacted by the proposal. The proposal site itself is largely cleared of native overstorey and provides little connectivity at a local level. The exception to this is the Gara River corridor which is intended to be avoided where possible by the development. Oxley Wild Rivers National Park is also listed as an area of geological significance in the New England region of NSW and is part of the Gondwana Rainforests of Australia World Heritage Area. No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the development site.

Approximately 517.2 ha of land within the subject land has been determined to meet the definition of Category 1- exempt land. Approximately 456ha of Category 1 – exempt land falls within the development site. There is evidence to suggest that large areas of the development site have been under regular rotational cropping or pasture improvement prior to 1990. This is supported by recent and historical imagery, as well as 2017 Land Use Mapping data.

Three Plant Community Types (PCTs) were identified within the development site, these are:

- PCT 84: River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
- PCT 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

The latter two PCTs are considered NSW listed White Box-Yellow Box- Blakely's Red Gum Woodland (Box-gum Woodland Threatened ecological community). 86.7 ha of Box Gum Woodland TEC (around 70% of this would be impacted by panel shading rather than direct removal). This includes the removal of 20 hollow bearing trees.

Once commissioned, the majority of the development footprint (around 70%) will consist of solar panels. The impacts of shading and diversion of rainfall runoff from the panels themselves is largely unknown. For the purpose of the BDAR report, the entire development footprint is assumed to be removed however, as the indicative layout shows, substantial peripheral areas are likely to be unimpacted and it is likely that a number of perennial native species will persist underneath the solar arrays. Certainly, only a minor proportion of the seed bank will be impacted, given the limited excavation proposed.

In this assessment an assumption has been made that all vegetation within the development footprint would be removed. This is a 'worst case' conservative approach. There is currently limited ability to vary this assumption without specific scientific data to justify a lesser impact; such as the results of ground cover monitoring beneath the solar array. Therefore, the costs associated with purchasing and retiring ecosystem and species credits or the need for offset areas is currently an 'over estimated result' of the impacts of this solar farm undertaken to address current uncertainty.

After consideration of avoidance measures, mitigation measures have been outlined to reduce the impacts to biodiversity. Key mitigation strategies centre on:

- Timing and management of clearing to reduce impacts
- Relocation of habitat features, installation of nest boxes and indigenous plantings to enhance adjacent habitat
- Management of indirect impacts such as light spill, dust and erosion
- A management plan in construction and operation, to monitor the effectiveness and adapt controls as required.

The residual impacts are set out below and will be offset in accordance with the NSW Biodiversity Offsets scheme, and will be achieved by either;

(a) Retiring credits under the Biodiversity Offsets Scheme, or

(b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

(c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

(d) Table 1-2 Offset requirement

| PCT name | Ecosystem credits required |
|---|---|
| **PCT 84 River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion** | 7 |
| **PCT 510 Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion** | 193 |
| **PCT 567 Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion** | 1020 |
| **Species credit species** | **Species credits required** |
| **Tusked Frog *Adelotus brevis*** | 12 |
| **Glandular Frog *Litoria subglandulosa*** | 12 |

| | |
|---|---|
| **Southern Myotis *macropus*** | 220 |
| **Hawkweed *Picris evae*** | 186 |
| **Austral toadflax *Thesium australe*** | 910 |

## Visual amenity and landscape character

Visual impact assessments are used to characterise the value and sensitivity of a landscape to change. Moir Landscapes completed a Visual Impact Assessment (VIA) of the proposal in the following stages:

- Landscape character assessment, which involves an overview of the existing landscape character and identification of key landscape features of the site and surrounds.
- Assessment of visual impacts using computer modelling and viewpoints analysis.
- Development of mitigation measures where warranted.

Fifteen representative viewpoints were assessed, taken from publicly accessible roads surrounding the site to represent local view points and residences including: residents of Castledoyle, along Gara Road, Silverton Road and Waterfall Way (Grafton Road) in addition to directly adjacent neighbours. The viewpoints which have been included represent the areas from where the development would appear most prominent, either based on the extent of the view or the number of people likely to be affected. The viewpoints were evaluated based on their land use, effect of the development on the viewpoint and overall visual impact.

Overall, the proposed development will result in the modification of the existing visual landscape locally. However, due to the relatively small vertical scale of infrastructure proposed, the existing landscape features, including vegetation and topography, are able to provide screening, limiting views from a distance. The highest visual effect is likely to be from areas within close proximity to the site. Key results include:

- There are a total of 30 residences within 2km of the proposal site. Of these dwellings the proposal will be screened by either topography, vegetation or both from fifteen (15) dwellings and visible in varying degrees from fifteen (15) dwellings. Therefore for the fifteen dwellings with views, mitigation measures have been recommended to reduce any potential visual impacts of the proposal. Given mitigation, none would be considered to be highly impacted by the proposal.
- Any views toward the proposal from Castledoyle Road, Milne Road and Anderson Road would be relatively distant and a combination of roadside vegetation, undulating topography and general road direction would limit the opportunities to view the proposal.
- Limited views are afforded from the Therelfall Walking Track due to topography and vegetation.
- Blue Hole Picnic Area is located at the entry to Oxley Wild Rivers National Park and there is potential for views of the proposal from this location. Screen planting at the southern portion of the proposal site has been recommended to reduce the potential visibility.

Based on the consultation with the specific landowners to date, and the findings of the visual impact assessment, visual screening and the development of a draft Landscaping Plan is required

Landscaping and screening for the proposal would include:

- A wide band of native plantings of trees up to 5-10m in height for the southern boundary of the proposal site to address potential visual impacts from the Oxley Wild Rivers National Park. These can be positioned in three (3) rows (or approximately 6 - 9m wide) between the property boundary and security fence. The tree canopy should not intrude into the zone that exists between the edge of the security fence and the solar panels
- Screen planting along the proposal site eastern boundary, adjacent to Silverton Road to assist in screening views from residences to the east and reducing the visual impact from Silverton Road.

- Screen planting on the western boundary of the site to reduce the potential visual impact from residences to the west.

## Hydrology and flooding

A Hydrological and Hydraulic Analysis Report was prepared by Footprint NSW Pty Ltd to assess the impact of the proposed permanent infrastructure on hydrology and flooding.

According to the Armidale - Dumaresq Council Flood Plan, the area is almost entirely contained within the Macleay River Basin. The Armidale Regional Council area is located in the New England Tablelands and Gorge sections of the upper Macleay River Valley. The primary tributaries are the Gara River, Commissioners Waters, Salisbury Waters and the Chandler River and its main tributaries.

The proposal site is traversed by two major watercourses in the Gara River, which traverses the proposal area in a north-south direction, and Commissioners Waters, which traverses the proposal area in a west-east direction. These two watercourses meet on the western boundary in the southern portion of the proposal site before entering the Gara Gorge within the Oxley Wild Rivers National Park which abuts the southern boundary of the proposal site. The proposal site also contains numerous other minor un-named tributaries of the above creeks, most of which are first or second order watercourses. Except for the two primary watercourses all other watercourses within the proposal site would be described as ephemeral and would only contain flowing water during and shortly after rainfall events.

There is not predicted to be a significant impact on flood behaviour within the floodplain as a result of the proposed solar farm, with flood levels, depths, velocities and hazards remaining relatively unchanged. Importantly, the modelling undertaken specific to this proposal demonstrates that changes in peak flood levels are limited to within the proposal site and are therefore not anticipated to adversely affect adjoining properties.

The mitigation measures presented within this EIS are considered sufficient to manage potential impacts posed by the solar farm on hydrology and flooding. Key strategies include the designing the project to avoid the 1% AEP flood level, construction of watercourse crossings in accordance with the Guidelines for Watercourse Crossings on Waterfront Land and construction of access roads as close to natural ground levels as possible within the floodplain.

## Aboriginal heritage

A specialist Aboriginal Cultural Heritage Assessment (ACHA) report was undertaken by NGH to provide an assessment of the Aboriginal cultural values associated with the Oxley Solar Farm Proposal and to appraise the cultural and scientific significance of any Aboriginal heritage sites recorded.

The Aboriginal heritage investigations included consultation, background research, a field survey and significance assessment. The assessment was conducted in accordance with the *National Parks and Wildlife Act 1974*. The consultation with Aboriginal stakeholders was undertaken in accordance with clause 60 of the *National Parks and Wildlife Regulation 2019*. The assessment was guided by the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011) and the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH, 2010a).

The survey strategy was to cover as much ground surface as possible within the development footprint of the Proposal site. A total of 72 individual sites of Aboriginal cultural heritage within five site types were identified. These included 24 isolated finds, 18 artefact scatters, one scarred tree, eight cultural trees and 21 potential archaeological deposits (PADs). Nine isolated finds, seven artefact scatters and three cultural trees are situated within or adjacent to the area of the proposed solar arrays, tracks, fencing and associated infrastructure. These 19 sites would be impacted directly or indirectly by the proposed development. Additionally, 13 PAD locations have been identified within this area of impact. There are 40 sites including the remaining 26 sites with stone artefacts within the proposal site, the one scarred tree, the five cultural trees and eight PAD locations that will not be impacted by the proposed development.

The proposed construction methodology for the project would result in only small areas of disturbance. The construction of access and maintenance tracks may involve some grading but is expected to be minimal considering the nature of the majority of the terrain. The installation of the solar arrays involves drilling or screwing the piles into the ground and no widespread ground disturbance work such as grading is required to accomplish this. Localised areas of earthworks (cut and fill, grading and compacting) may be required in areas where there is sudden, significant changes in ground slope. The major ground disturbance will be the trenching for cables and vehicle movement during construction.

Safeguards and Management measures would be implemented to adequately address both direct and indirect impacts associated with the proposal. These include protection and management of isolated finds, artefact scatters, the scarred tree and cultural trees within the Proposal site. Recommendations to mitigate the risk of harm to Aboriginal cultural heritage also include the establishment of “no go zones” and a program of sub-surface testing in the PAD locations.

## Agriculture and land use

The proposal site is located on land zoned as RU1 Primary Production under the Armidale Dumaresq LEP. There are five existing land uses currently relevant to the proposal site, including:

- Grazing modified pastures.
- Grazing native vegetation.
- Rivers.
- Cropping.
- Residential and farm infrastructure.

The proposal site is predominantly located on land mapped LSC class 5 (moderate-low capability land), with a few sections mapped as LSC class 6 (low capability land) and class 4 (moderate capability land). The current activities onsite align with class 5, largely used for grazing with occasional cultivation for pasture crops. The class 5 area is not capable of supporting regular cultivation due to the various limitation such as erosion and low fertility. The proposal site is not mapped as Biophysical Strategic Agricultural Land (BSAL).

The proposal would result in the restriction of 895ha of agricultural land for the life of the solar farm (approximately 30 years). This represents 0.25% of the agricultural holdings within the Armidale-Dumaresq Regional LGA and does not significantly reduce the availability of land for primary production in the region. At the end of the project’s life, when the solar farm is no longer considered viable, the site will be returned to existing or better land capability.

A land use conflict risk assessment (LUCRA) was carried out in accordance with the Department of Primary Industries Land Use Conflict Risk Assessment Guide (DPI, 2011). Other potential land use conflicts identified included conflicts with Crown land, traffic flow and local amenity values during all phases of the proposal. These conflicts identified during construction, operation and decommissioning are expected to be manageable with measures presented within this EIS. Ongoing consultation would be undertaken where required, with affected stakeholders including TransGrid, Crown Lands, adjacent landholders and representatives from nearby major projects.

## Cumulative impacts

Cumulative impacts relate to the combined effect of impacts from several activities on a particular value or receiver. They may occur concurrently or sequentially. Considering the location and nature of the Oxley Solar Farm proposal, the relevant cumulative impacts are those associated with other known or foreseeable large scale developments occurring in proximity to the proposal or those requiring high ongoing traffic volumes.

Proposed developments within the locality or region which may contribute to cumulative impacts of the proposal include:

- Stringybark Solar Farm by Infinergy Pacific Ltd Renewables has been approved by the JRPP and is adjacent to the proposal site's south western boundary.
- Metz Solar Farm, proposed by Infinergy Pacific Ltd Renewables. Construction is expected to commence late 2020 and is located approximately 7km north-west of the proposal site.
- Olive Grove Solar Farm proposed by Infinergy Pacific Ltd Renewables is adjacent to the proposal site's western boundary. The project was approved by Armidale Regional Council July 2020.
- New England Solar Farm, proposed by UPC Renewables Australia Pty Ltd, Construction is expected to commence mid-2020 and is located about 20km south-west of the proposal site.
- Salisbury Solar Farm, proposed by Walcha Energy, is located about 30km south-west of the proposal site. The EIS is currently being prepared.
- Tilbuster Solar Farm, proposed by Enerpac Develop, is located about 25km north-west of the proposal site. The EIS has recently commenced public exhibition.

During construction and decommissioning, the greatest potential for cumulative impacts relate to biodiversity, traffic, land compatibility and socio-economic impacts. During operation, the cumulative impacts are considered low risk. The cumulative impacts identified for the proposal are considered to be best managed by dealing with each component individually. No additional safeguards are proposed.

### Other environmental issues

Ten lower risk issues were investigated, primarily by desktop assessment:

- Noise and vibration
- Social and economic impacts
- Water use and water quality
- Soils
- Traffic, transport and safety
- Resource and waste generation
- Historic heritage
- Electric and magnetic fields
- Bush fire
- Air quality and climate
- Hazardous materials and development

Management measures have been developed to ensure that impacts are minimised and justifiable.

## ENVIRONMENTAL MANAGEMENT FRAMEWORK

Specific impact avoidance and minimisation measures have been incorporated into the design of the proposal and form commitments of the project, pending approval. They are largely standard and highly certain strategies to manage the impacts of solar farm development, which has grown significantly as an industry sector in regional Australia over the last 10 years. These measures are considered practical and achievable by the proponent. They are set out for each area of investigation in Sections 7 and 8 and summarised in Section 9.2 of this EIS.

All commitments and environmental safeguards would be managed through the implementation of an Environmental Management Strategy, consisting of a Construction Environmental Management Plan, an Operation Environmental Management Plan and a Decommissioning Environmental Management Plan. These plans (and supporting subplans) would be prepared sequentially and submitted to the Department of Planning, Industry and Environment (DPIE), prior to each stage of works. These mechanisms ensure that the commitments of the EIS are carried through to on ground activities to ensure effective onsite mitigation of impacts for all project stages.

## CONCLUSION

The Oxley Solar Farm would result in numerous benefits, local and regional, and has been developed to ensure the benefits are spread into the longer term, reflecting community expectations specific to this proposal.

The environmental impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Mitigation strategies have been developed with the community and other relevant agencies stakeholders in many cases. On balance, the Proposal is considered appropriate to the site's constraints, of benefit to NSW broadly and the regional economy locally and is considered justifiable and acceptable.

# 1. INTRODUCTION

## 1.1. PURPOSE OF THIS REPORT

This Environmental Impact Statement (EIS) identifies and assesses the potential environmental and planning issues associated with the construction, operation and decommissioning of the proposed 225 Mega Watt (MW, AC) Oxley Solar Farm. This EIS has been prepared by NGH on behalf of the proponent, Oxley Solar Development Pty Ltd (OSD).

This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to support a Development Application (DA) to be lodged with the NSW Department of Planning, Industry and Environment (DPIE).

The objective of this EIS is to fulfil the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and Section 4.15 of the EP&A Act. The structure and content of the EIS addresses the Secretary's Environmental Assessment Requirements (SEARs), provided by DPIE on 2 August 2019 (refer to Section 6.1.1).

The proponent has engaged NGH Pty Ltd to prepare this EIS. Other independent consultants were contracted to carry out specialist technical assessments as required. This EIS provides a full analysis of all environmental, economic, physical and social implications of the proposal, as well as outlining mitigation measures to avoid or minimise potential impacts wherever practicable. Community feedback provided has been considered and utilised by the project development team to shape and enhance the proposed design. Additionally, community feedback has been considered as part of this EIS, specifically addressing any community concerns raised during the consultation to date within the relevant chapters.

This EIS will be independently evaluated by the NSW Government, considering input from the community provided during the public exhibition period. The development assessment process places the onus on the proponent to provide the information required for the State Government to make an informed decision. The process provides for public transparency, accountability and participation in development approval decision-making.

## 1.2. PROPOSAL OVERVIEW

### 1.2.1. Proposal locality

The Oxley Solar Farm proposal is located on the southern side of Waterfall Way (Grafton Road), approximately 14 kilometres (km) south-east of Armidale (Figure 1-1), in the New England region of NSW. This region has been identified as an optimal Renewable Energy Zone (REZ) in which to develop new electricity generation projects, supported by existing transmission strength and capacity (AEMO, 2020). The New England North West is the second highest solar penetration region in NSW (DPIE, 2017).

The proposal site is located within the Armidale Regional Local Government Area (LGA). Armidale is the closest regional center and includes the University of New England campus. Education and training are the largest employer in the Armidale Regional LGA, followed by health care and social assistance, and agriculture (Armidale Regional Council, 2019).

The Armidale region brings approximately 750,000 visitors annually to experience various events and natural attractions; areas of wilderness and wild rivers, granite boulder formations and waterfalls within world heritage listed national parks. It is an important nexus, linking the coastal communities to 'Big Sky' inland areas, via the Waterfall Way (Grafton Road). The area holds significant Aboriginal heritage values, including rock art sites.

The land immediately surrounding the proposal site includes agricultural land, predominantly large lot agricultural enterprises but also includes a landfill, other renewable energy projects and reserves including travelling stock reserves and national park. The Oxley Wild Rivers National Park is adjacent to the southern boundary of the proposal site. The park contains World Heritage listed Gondwana rainforest, historic sites and waterfalls. It is a popular for recreational activities including walking, camping, bike and horse riding and fishing.

There are several renewable energy projects proposed or already present in this REZ, including:

Constructed or construction pending:

- Stringybark Solar Farm by Infinergy Pacific Ltd Renewables has been approved by the JRPP and is adjacent to the proposal site's south western boundary.
- Metz Solar Farm, proposed by Infinergy Pacific Ltd Renewables. Construction is expected to commence late 2020 and is located approximately 7km north-west of the proposal site.
- New England Solar Farm, proposed by UPC Renewables Australia Pty Ltd, Construction is expected to commence early 2021 and is located about 20km south-west of the proposal site.
- Olive Grove Solar Farm proposed by Infinergy Pacific Ltd Renewables is adjacent to the proposal site's western boundary. The project was approved July 2020.
- University of New England Solar Farm has been constructed and located approximately 16km north west of the proposal site.
- Guyra Solar Farm is proposed by Providence Asset Group and has been approved by the JRPP. It is located approximately 42km north west of the proposal site.

Proposed, not yet approved:

- Salisbury Solar Farm, proposed by Walcha Energy, is located about 30km south-west of the proposal site. The EIS is currently being prepared.
- Tilbuster Solar Farm, proposed by Enerpac Develop, is located about 25km north-west of the proposal site. The submissions report is currently being prepared.
- Sundown Solar Farm is proposed by CWP Renewables, is located approximately 91km north of the proposal site. The EIS is currently being prepared.

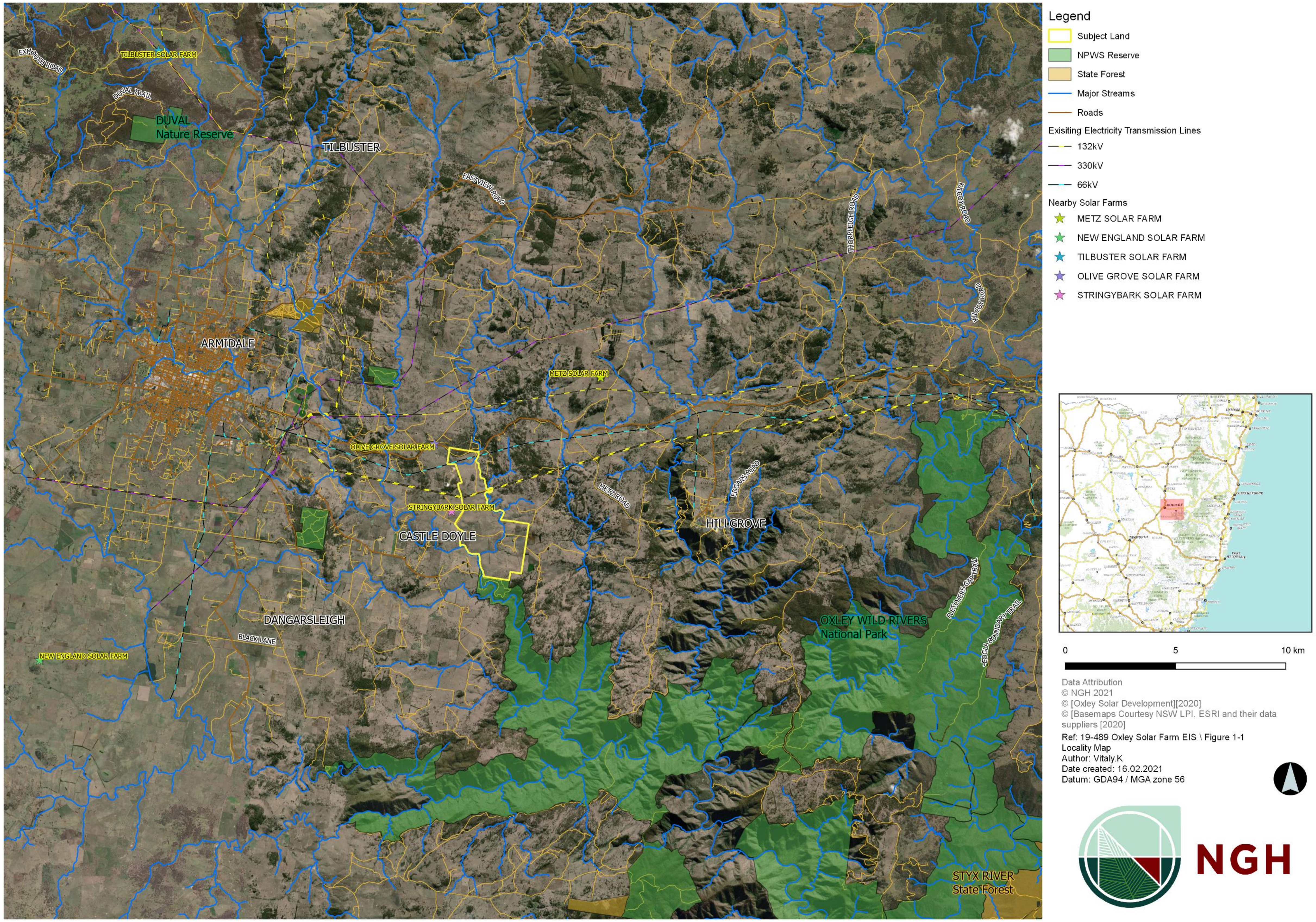



Figure 1-1 Locality map.

### 1.2.2. The proposal site

The solar farm would be located on a 1,048 hectare (ha) site (hence forth the 'Proposal site') which is currently owned by four landowners and includes areas of Council and Crown land. The site is zoned RU1 Primary Production under the *Armidale Dumaresq Local Environmental Plan 2012* (Armidale Dumaresq LEP). Pending project approval, majority of the proposal site is intended to be owned by OSD. Two existing TransGrid 132kV transmission lines run parallel to each other within the northern section (south-west to north-east) of the proposal site; the connection to the grid would be within the proposal site.

The 'development footprint' is a term to describe all land that would be directly impacted for the construction and / or operation of the solar farm. It includes land required to access the site and internal management zones, such as bushfire protection zones. It has been delineated within the proposal site based on an indicative infrastructure layout while allowing sufficient buffers for changes to the layout that will occur during the detailed design phase. Detailed design would occur pending project approval. The development footprint for the proposal is 895ha.

Table 1-1 Affected lots associated with the proposed Oxley Solar Farm.

| Referred to in the EIS | Proposed infrastructure | Lots and DP | Owner | Existing use | Ownership arrangements |
|---|---|---|---|---|---|
| **Proposal site and development footprint** | All proposed solar farm infrastructure including solar arrays, connection infrastructure, battery storage, internal roads and ancillary infrastructure. | Lot 5 DP253346 | Currently owned by one private landowner (involved landowner). | Agriculture. | OSD would purchase this land. |
| | | Lot 6 DP625427 | Currently owned by one private landowner (involved landowner). | Agriculture. | OSD would purchase this land. |
| | | Lot 2 DP1206469 | Currently owned by one private landowner (involved landowner). | Agriculture. | OSD would purchase part of this land. |
| | | Lot 7003 and 7004 DP1060201 | Crown Land | Road easement<br>Travelling stock reserve | OSD would lease or purchase this land. |
| **Connection** | Connection to existing Transmission lines. | Lot 2 DP1206469. | One private landowner (involved landowner). | Agriculture. | Easement would be established. |

| Referred to in the EIS | Proposed infrastructure | Lots and DP | Owner | Existing use | Ownership arrangements |
|---|---|---|---|---|---|
| **Site access** | Up to 1km of access track between Waterfall Way (Grafton Road) south towards the solar farm and associated substation. | Lot 2 DP1206469 | Currently owned by one private landowner (involved landowner). | Agriculture | Easement would be established. |
| | | Lot 7003 and 7004 DP1060201 | Crown Land | Road easement<br>Travelling stock reserve | Easement would be established. |

Two residences are located within the proposal site, 30 potential residences are located within 2km of the site. The closest non-involved residence is located immediately adjacent to the site (185m), south of Gara Road and in the western portion of the site.

Much of the proposal site has been extensively cleared of woody vegetation and has been highly modified by farming practices however, small fragmented areas of woodland still occur. Example of photos of the proposal site provided below (Figure 1-3 to Figure 1-8). Some of these photos were taken September 2019 during drought and prior to bushfires impacted the area. While preparing this EIS, the area has had substantial rainfall and site has changed since the September 2019 surveys (i.e. Figure 1-5)

Twenty-four dams occur within the proposal site. Twenty-two watercourses occur within the proposal site eighteen of which are tributaries of the Gara River and four of which are tributaries of Commissioners Waters. The Gara River is the most prominent watercourse within the proposal site and runs north to south along the north-eastern boundary before transecting the site, running north-east to south-west through the centre of the site. At the south-western boundary, the Gara River intersects with Commissioners Waters, which runs west to east along the south-western boundary of the site. The Gara River continues flowing south through the Oxley Wild Rivers National Park, which abuts the southern boundary of the proposal site.

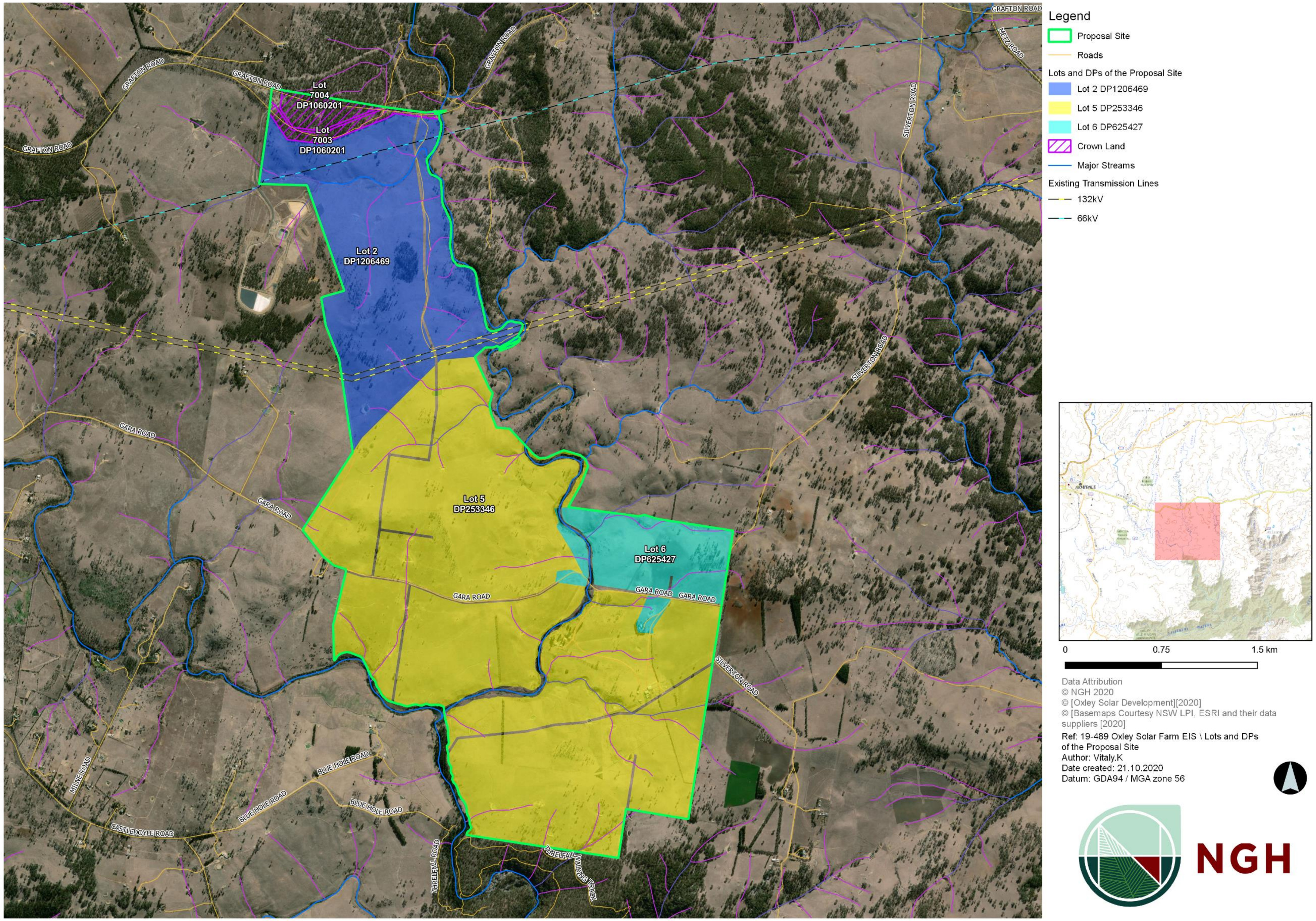



Figure 1-2 Lot and DPs of the proposal site.

Figure 1-3 Southern portion of the proposal site, north of Oxley Wild Rivers National Park.

Figure 1-4 Eastern portion of the proposal site.

Figure 1-5 North of Gara Road at the proposal site (Moir Landscapes, 2020).


Figure 1-6 Vegetation at the southern portion of the site next to Oxley Wild Rivers National Park (Moir Landscapes, 2020).

Figure 1-7 Gara River onsite.

Figure 1-8 Powerlines onsite.

### 1.2.3. Key components of the proposal

The proposed Oxley Solar Farm involves the construction, operation and decommissioning of a ground-mounted PV solar array. Approximately 225MW (AC) of renewable energy would be generated and supplied directly to the national electricity grid. The Oxley Solar Farm would provide enough clean, renewable energy for about 81,000 average NSW homes while displacing approximately 400,000 metric tons of carbon dioxide annually. It would also assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets.

The Oxley Solar Farm proposal site was selected after an extensive review of alternative sites by the proponent. The proposal site has been evaluated in terms of the Large Scale Solar Energy Guideline for SSD 2018 (DPIE) which provides recommendations regarding selection of suitable proposal sites and areas of constraint that should be identified. Once the broader site was selected, the development footprint was refined iteratively, in tandem with the environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This process responds appropriately to the site's constraints to produce the most justifiable proposal, which is presented in this EIS.

Of the 1,048ha proposal site, the development footprint would represent approximately 895ha which would be developed for the solar farm and associated infrastructure. Two existing TransGrid 132kV transmission lines run parallel to each other within the northern section of the proposal site and would be used to connect the solar farm to the national electricity grid.

Key Infrastructure components include:

- Approximately 715,000PV solar panels mounted on either fixed or tracking systems, both of which are considered feasible:
    - Fixed-tilted structures in a north orientation; or
    - East-west horizontal tracking systems.
- Approximately 45 Power Conversion Units (PCU) composed of two inverters, a transformer and associated control equipment to convert DC energy generated by the solar panels to 33kV AC energy.
- Steel mounting frames with driven or screwed pile foundations.
- An onsite 132kV substation containing up to two transformers and associated switchgear to facilitate connection to the national electricity grid via the existing 132kV transmission lines onsite.
- Underground power cabling to connect solar panels, combiner boxes and PCUs.
- Underground auxiliary cabling for power supplies, data services and communications.
- Buildings to accommodate a site office, indoor 33kV switchgear, protection and control facilities, maintenance facilities and staff amenities.
- About 1km of access track off Waterfall Way (Grafton Road) to the site which would require construction to the proposed onsite substation.
- Internal access tracks for construction and maintenance activities.
- An energy storage facility with a capacity of up to 50MWh (i.e. 50 MW power output for one hour) and comprising of lithium ion batteries with inverters.
- Perimeter security fencing up to 2.3m high.
- Native vegetation planting to provide visual screening onsite and for specific receivers.

The construction phase of the proposal would take about 12 – 18 months. The peak construction period would be a shorter period of about 6 months. Approximately 300 workers would be required during construction.

The solar farm is anticipated to be operational for about 30 years. Around five fulltime equivalent operations and maintenance staff and service contractors would operate the facility.

At the end of the project's life, when the solar farm is no longer considered viable, all above ground infrastructure, with the possible exception of the onsite substation, would be removed. Any cabling more than 500mm underground may also be left in place as it would not impact future agricultural activities following rehabilitation of the site. Similarly access tracks may be left in place, depending on the future use of the site.

The design and construction, operation and decommissioning requirements of the proposal are discussed further in Section 4.

The final infrastructure layout would be determined as part of commercial tendering process, as such, some necessary flexibility is included in the EIS proposal description. The development footprint assessed in this EIS represents the maximum impact areas that would be required.

The indicative layout of the infrastructure components is shown in and the layout of infrastructure in context of the site's identified constraints is shown in Figure 1-10. Indicative plans and images of infrastructure components and key areas are described in detail in Section 4.2. The plans and specifications of the components would be subject to detailed design and product selection through a competitive tender process.

**The indicative infrastructure layout presented in this EIS has been developed iteratively, in tandem with the environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This process aims to avoid or minimise potential impacts wherever practicable and results in a proposal that responds appropriately to the site's constraints and the Large Scale Solar Energy Guideline for SSD 2018.**

The estimated capital investment of the Oxley Solar Farm proposal would be about $370 million.

### 1.2.4. The proponent

Oxley Solar Farm is to be developed by Oxley Solar Development (ACN 629 954 329) (hereafter "OSD" or "the Proponent"), an Australian developer of utility-scale solar generation.

OSD was founded in 2018 in Australia to specialise in renewable energy developments, particularly solar projects. They take a pro-active, quality controlled and relationship-driven approach to their activities.

The company's dedicated management team is highly experienced in transmission network connection planning, renewable generation development and operation, and renewable project financing. The team has extensive experience in developing and operating utility-scale renewable generations in Australia and internationally.

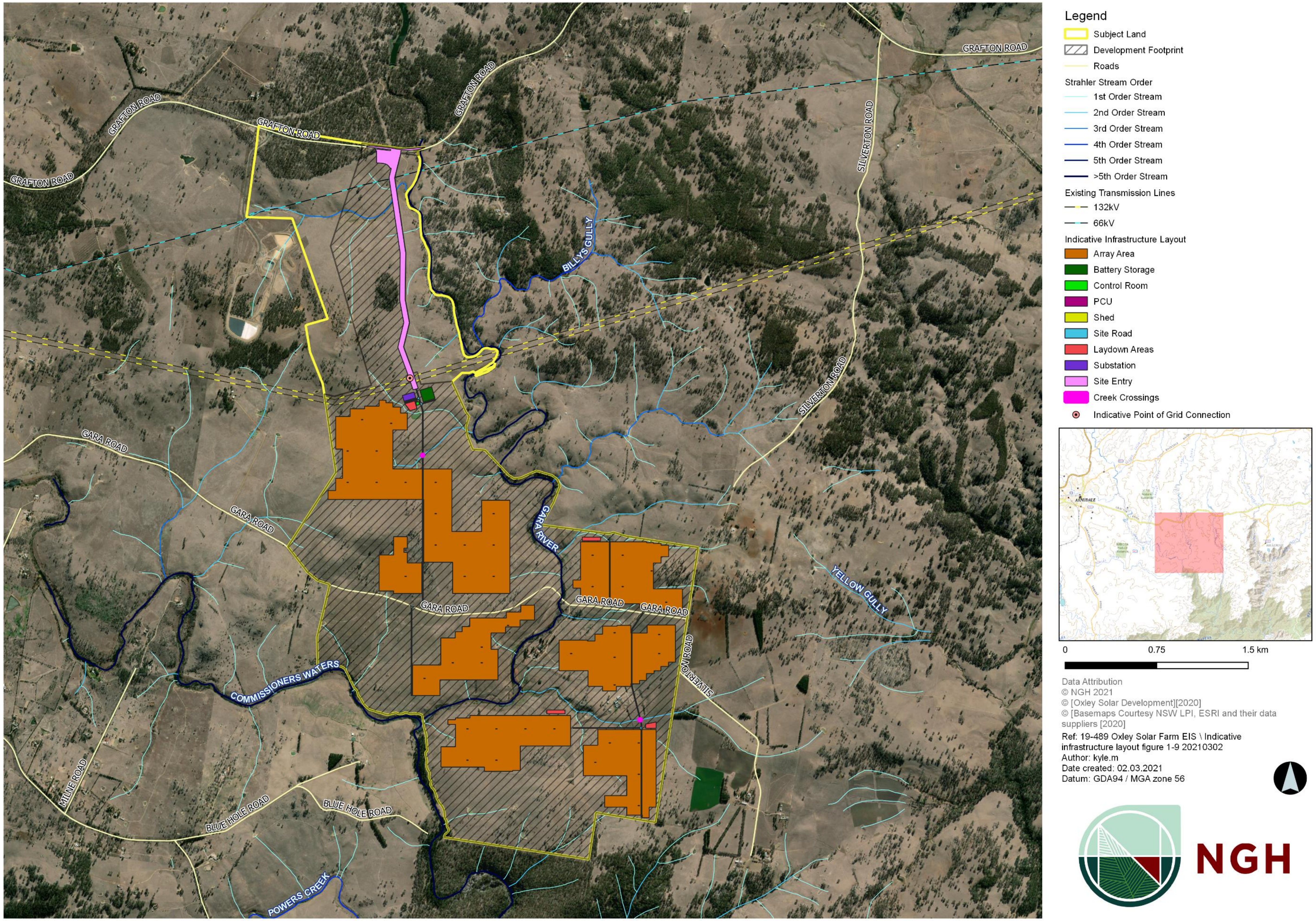



Figure 1-9 Indicative infrastructure layout.

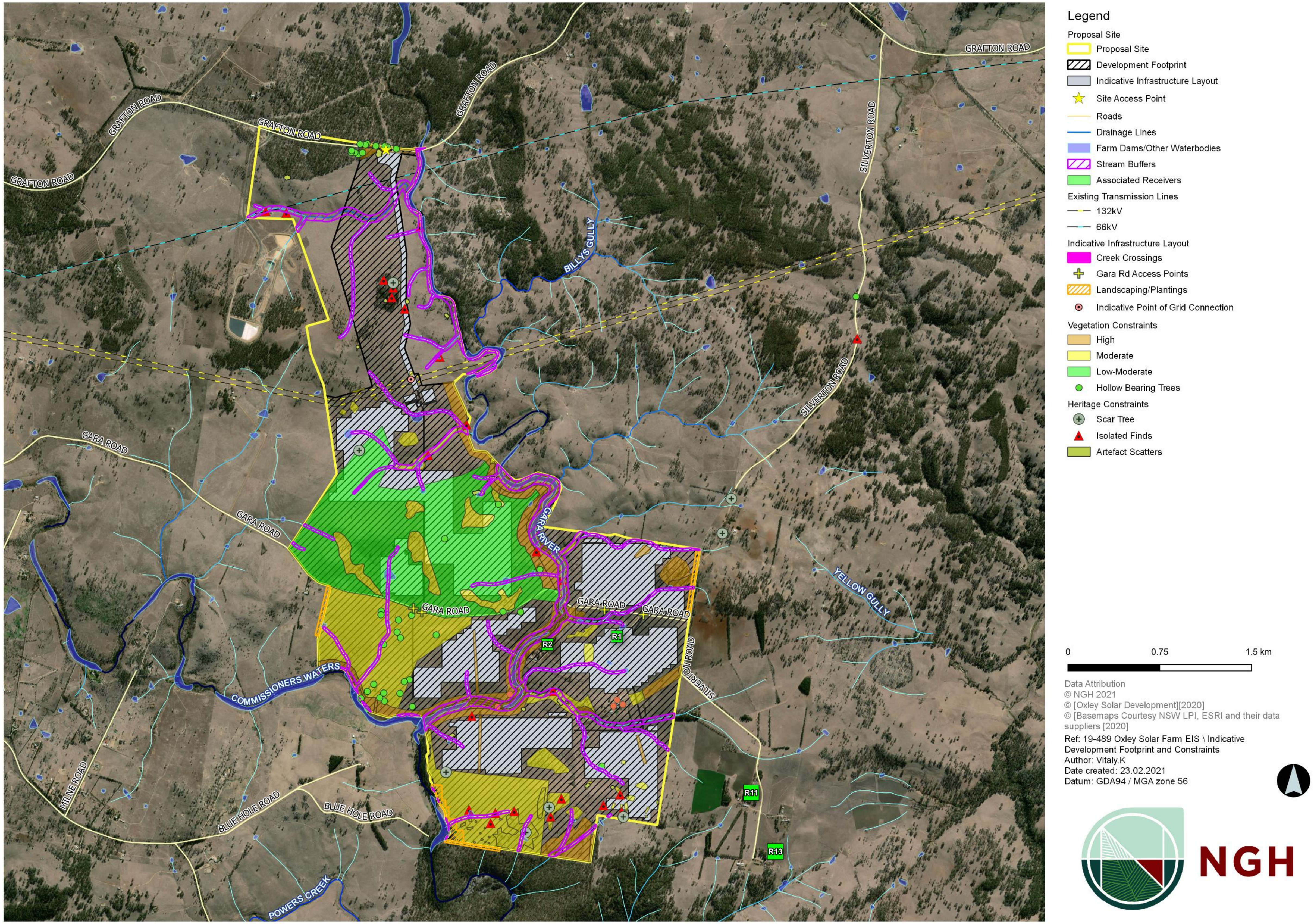



Figure 1-10 Indicative infrastructure layout in context of site constraints.

# 2. OBJECTIVES, PROJECT NEED AND BENEFITS

## 2.1. PROPOSAL OBJECTIVES

The objectives of the Oxley Solar Farm proposal are to:

- Develop a profitable, commercial scale solar electricity generation proposal.
- Include on-site energy storage to support the high voltage transmission network.
- Assist to mitigate the effects of climate change through the transition to renewable energy.
- Meet and exceed all relevant environmental and regulatory requirements for the proposal, in collaboration with key stakeholders.
- Provide local and regional employment opportunities and other social benefits during the construction and operation of the facility.

The development of the renewable energy source on the Oxley Solar Farm proposal site would:

- Assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets.
- Provide a clean and renewable energy source to assist in reducing greenhouse gas emissions.
- Generation of enough clean, renewable energy for about 81,000 average NSW homes.
- Displace approximately 400,000 metric tonnes of carbon dioxide, currently generated by non-renewable sources.

## 2.2. PROJECT NEEDS AND BENEFITS

### 2.2.1. Climate change mitigation

In the development of the renewable energy source, the proposed Oxley Solar Farm supports Commonwealth and NSW climate change commitments including:

- United Nations Paris Climate Change Agreements.
- Renewable Energy Target (RET) Scheme.
- National Energy Guarantee.
- NSW Climate change Policy Framework.
- NSW Net Zero Plan: Stage 1 2020 – 2030
- NSW Renewable Energy Target.
- NSW 2021: A Plan to Make NSW Number One.
- NSW Renewable Energy Action Plan.
- New England North West Regional Plan 2036.

The proposal's contribution to these polices and plans is detailed below.

#### Paris Agreement

In December 2015, the Australian Commonwealth Government ratified the Paris Agreement and the Doha Amendment to the Kyoto Protocol, reinforcing its commitment to action on climate change. Australia has committed to the following greenhouse gas emission reduction targets:

- 5% below 2000 levels by 2020.
- 26 to 28% below 2005 levels by 2030.
- Net zero emissions in the second half of the century.

Electricity generation is the largest single emitter of greenhouse gas in Australia contributing 35% of total greenhouse emissions. It is to be expected that significant effort will be applied to transition to renewable energy sources of electricity generation.

Utility scale solar photovoltaic projects like Oxley Solar Farm proposal have the capacity to make a significant contribution towards these goals because of the relatively shorter times required to construct and commission solar farm infrastructure.

### Net Zero Plan: Stage 1 2020 – 2030

The Net Zero Plan Stage 1: 2020 – 2030 sets out how the NSW Government will achieve its objective of net zero emissions by 2050 over the next decade. The Plan is financially supported by a Bilateral Memorandum of Understanding on Energy and Emissions Reduction Policy between the Commonwealth and NSW Governments (DPIE, 2020).

It is expected that by delivering the Plan, almost 2400 jobs will be supported over the next 10 years. Of the estimated $11.6 billion of investment expected over the next 10 years, around two-thirds will go to regional and rural NSW. In addition, delivery of the plan is expected to save household $40 per year on electricity bills.

Development of solar photovoltaic projects, such as the proposed Oxley Solar Farm, assist in delivery of the Plan by providing emissions reduction technologies in the form of renewable energy generating infrastructure.

### Renewable Energy Target (RET) Scheme

The Renewable Energy Target Scheme (RET) was established under the *Renewable Energy (Electricity) Act 2000*. The RET scheme creates a market for renewable energy with the goal of ensuring that by 2020, around 23.5% of electricity will be generated from renewable sources. The RET scheme provides a mechanism to ensure that some portion of the electricity that is sold by electricity retailers is sourced from renewable sources.

The legislated objectives of the Commonwealth RET Scheme are:

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

The RET scheme includes a Large-scale Renewable Energy Target (LRET) component which met its 33,000GWh target in September 2019. Although the RET has been reached, it continues to provide a framework for investment in renewable energy.

The proposed Oxley Solar Farm would contribute directly to the RET scheme objectives by generating approximately 225MW.

### Renewable Energy Zones (REZs)

The Australian Energy Market Operator (AEMO) has assessed 34 candidate REZ's across the National Energy Market (NEM) through consideration of a mix of resource, technical and other engineering considerations. The assessment identifies which REZ's are most optimal at present from a range of consideration, in particular the requirements for least-cost integration of REZ's into the transmission system.

AEMO has identified the New England region of NSW as an optimal REZ development area, supported by existing transmission strength and capacity (AEMO, 2020). Additionally the NSW Electricity Strategy outlines that New England REZ would be a driving force to deliver affordable energy into the future (DPIE, 2019). In July 2020, the NSW Government has committed to developing a REZ of 8,000MW in the region. Which was followed by Transgrid announcing an approach to further accelerate the development in the REZ (AEMO, 2020). The REZ has been identified to be expanded in AEMO's Integrated System Plan (2020) which will connect renewable energy to the load centre.

The proposal site for the Oxley Solar Farm is well placed within the optimal REZ development zone.

### National Energy Guarantee (NEG)

The future of the NEG is not certain in Australia. Nonetheless, this utility scale renewable energy proposal would contribute to the NEG as it was proposed, in that it would:

> *"… retain existing resources and encourage new investment in the National Energy Market (NEM) while ensuring that emissions standards are met and the system operates reliably."*

The energy generated from the proposed Oxley Solar Farm would provide opportunities for the electricity sector by supporting two key objectives of the NEG:

1. Increased competition and improving affordability: creating additional competition in the generation sector and providing new low cost electricity options for the retail market.
2. Emissions guarantee: meet defined emissions target for wholesale electricity purchased.

The Energy Security Board (ESB) predicts that 28 – 36% of electricity generation in 2030 will be renewable energy, under the NEG.

### NSW goals and policies

The NSW Climate Change Policy Framework (2016) sets out the log-term objectives of the NSW Government. The framework:

- Defines the NSW Government's role in reducing carbon emissions and adapting to the impacts of climate change.
- Sets policy directions to guide implementation of the framework.
- Commits NSW to achieving aspirational long-term objectives of net-zero emissions by 2050 and to help NSW become more resilient to a changing climate
- Sets out next steps for implementation.

The NSW Government has introduced a mandatory NSW Renewable Energy Target (NRET) relating to all electricity consumed in NSW. The scheme sets a target for the proportion of electricity sold by electricity retailers to be generated from renewable sources and imposes penalties where the retailer fails to meet these targets.

The Oxley Solar Farm is consistent with current goals and targets for renewable energy generation in NSW. These include Goal 22 of the NSW 2021: A plan to Make NSW Number One (NSW Government, 2011):

> *Contribute to the national renewable energy target [i.e. 20% renewable energy supply] by promoting energy security through a more diverse energy mix, reducing coal dependence, increasing energy efficiency and moving to lower emission energy sources*

The proposal is also consistent with the three goals of the NSW Renewable Energy Action Plan (NSW Government, 2013) which include:

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

The Oxley Solar Farm is consistent with the vision and goals of the New England North West Regional Plan. Achieving the vision of *'nationally valued landscapes and strong, successful communities from the Great Dividing Range to the rick black soil plains'* would be supported by contributing to the following goals:

- A strong and dynamic regional economy:
    - Delivering new green industries to the region.

    - Increase renewable energy generation.
    - New England North West as the renewable energy hub of NSW.
- Strong infrastructure and transport networks for a connected future:
    - Growth in freight and logistics.

The New England North West is the second highest solar penetration region in NSW, presenting vast opportunities for the region to be a leader in renewable energy within the State (DPIE, 2017).

The Large-Scale Solar Energy Guideline was released by the NSW Government in December 2018. The guideline identifies the key planning and strategic considerations relevant to solar energy State Significant Development (SSD) in NSW. It aims to assist in the site selection and design of proposals, and it would be used by DPIE to assist in the assessment of relevant DAs. The proposal has referenced this guideline throughout the impact assessment process and evaluating the site for suitability. The site selection and evaluation against these guidelines are outlined Section 3.3. The proposal site meets the preferable site conditions of optimal solar resources, suitable land, capacity to rehabilitate, proximity to electrical network and connection capacity.

### 2.2.2. Electricity reliability and security benefits

While most of Australia's electricity is currently provided by coal-fired power stations, as many as three-quarters of these plants are operating beyond their original design life (DIS, 2015). Nine coal-fired power stations have closed since 2011-2012, representing around 3,600MW of installed capacity (AER, 2015 in Commonwealth of Australia, 2016). The reduction in energy supply from coal-fired power stations requires the development of reliable and sustainable energy supply.

The renewable energy sector in Australia contributes 14.3% of the country's overall electricity. Large scale solar farm projects such as the proposed Oxley Solar Farm support long-term and stable policies such as the RET and have the potential to benefit average household electricity bills substantially and reduce power disruptions providing alternative generation sources for the energy sector.

The high average daily solar exposure of 10MJ/m$^2$ (June) to 28MJ/m$^2$ (December) (BOM, 2020) and the site's proximity to existing transmission lines (onsite) and the existing Armidale 330/132kV substation greatly reduces the transmission and distribution loss factor risk and represents an ideal location for a solar farm. In this way the Oxley Solar Farm, once commissioned, would enhance the reliability, security and affordability of the NSW electricity supply.

### 2.2.3. Socio-economic benefits

#### Employment and local economic benefits

The project would generate around 300 construction jobs during the peak construction phase. Once the project is operational, around 5 equivalent full-time staff would be employed.

Employment opportunities would extend through the local supply chain to fuel supply, vehicle servicing, hotels/motels, cafes, hotels catering and cleaning companies, tradespeople, tool and equipment suppliers and many other businesses.

In summary, the project would provide significant local economic benefits including:

- Direct and indirect employment opportunities during the construction and operating phases of the project.
- Injection of expenditure in the local area.
- Development of a new land use thereby diversifying the local land use within the region, providing a drought resilient revenue stream for the agricultural economy.

In 2015-2016, 11,500 Australians were employed directly in the renewable energy sector and the industry is anticipated to generate 18,400 new jobs by 2020 (CEC, 2014; CEC, 2016). These benefits would mostly be during construction. A smaller proportion would occur during operation mainly in relation to the maintenance and upgrade of infrastructure over the lifetime of the proposal.

## Electricity prices

The Australian Electricity Market Commission (AEMC) predicts residential electricity prices will fall 7.1% on average between 2019 and 2022, a reduction primarily driven by an 11.6% reduction in wholesale prices as 8,594 MW of new, mostly renewable energy, comes online (CEC, 2020). The commissioning of new renewable energy facilities will increase competition in wholesale energy marked and, as with any market, increased competition will tend to reduce prices.  Photovoltaic solar farms operate with no fuel costs and can, with the correct policy framework, be used to reduce the overall wholesale prices of electricity. Both the Commonwealth and State Governments have established frameworks to support this objective.

## Community Fund

OSD is currently developing a Community Fund to share the benefits of the Oxley Solar Farm with the local community.

# 3. SELECTION OF THE PREFERRED OPTION

## 3.1. EVALUATION OF ALTERNATIVES

The Oxley Solar Farm proposal site was selected after an extensive review of alternative sites by the proponent. The proposed sites were considered in accordance with DPIE's Large Scale Solar Energy Guideline for SSD 2018, which provides recommendations regarding selection of suitable proposal sites and areas of constraint that should be identified. Once the broader site was selected, the development footprint was refined iteratively, in tandem with the environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This process responds appropriately to the site's constraints to produce the most justifiable proposal, which is presented in this EIS and in accordance with the DPIE's Large Scale Solar Energy Guideline for SSD 2018.

This section outlines the alternatives that were considered and justification for the proposed option that is the subject of this EIS.

## 3.2. THE 'DO NOTHING' OPTION

The 'do nothing' option must always be considered in any evaluation of options. It represents the status quo situation; avoiding all development impacts but similarly not realising a proposal's potential benefits.

The direct consequence of not proceeding with the proposal would be to forgo the benefits outlined in Section 2.2. This would mean to forgo a meaningful contribution to:

- Climate change mitigation.
- Electricity reliability and security benefits.
- Direct or indirect socio-economic benefits.
- Providing additional generation in close proximity to high voltage networks.

The environmental impacts associated with the development, operation and decommissioning of the proposed solar farm would be avoided if the 'do nothing' option was selected. Such environmental impacts would include construction noise, Aboriginal heritage and impacts to biodiversity. The land would remain as agricultural land with grazing (sheep and cattle) and intermittent cropping for feed. Environmental impacts have been assessed in detailed and are set out in Sections 7 and 8 of this EIS and are considered to be manageable and justifiable in the context of the project's benefits.

The potential benefits and contributions of the proposed solar farm are considered to outweigh those of the 'do nothing' option. As such, the 'do nothing' option is not the preferred option.

## 3.3. ALTERNATIVE SITE LOCATIONS

The proponent, OSD, has reviewed a large number of sites within NSW on which to build a solar farm before selecting the Oxley Solar Farm proposal site. The proposed sites were considered in accordance with DPIE's Large Scale Solar Energy Guideline for SSD 2018, which provides recommendations regarding selection of suitable proposal sites and areas of constraint that should be identified. While it would have been possible to construct and operate the solar farm at some of the sites investigated, OSD considers the Oxley Solar Farm proposal site to be the most suitable for the construction of a solar farm.

The proposal site's evaluation in terms of the Large Scale Solar Energy Guideline for SSD 2018 (DPIE) described in Table 3-1 below.

Table 3-1 Evaluation of preferable conditions associated with the proposal site.

| Preferable Site Condition | Observation |
|---|---|
| **Optimal solar resources** | The proposal site is located within the New England North West REZ which is the second highest solar penetration region in NSW (DPIE, 2017).<br><br>The site has high solar exposure measuring 10MJ/$m^2$ (June) to 28MJ/$m^2$ (December) (BOM, 2020). |
| **Suitable land** | The proposal site is located within the New England North West REZ and the following suitable land characteristics:<br>• Mostly undulating land with some flat area.<br>• The land is not mapped as Biophysical Strategic Agricultural Land (BSAL).<br>• The site has no exploration or mining leases.<br>• The site has already been cleared and heavily disturbed by grazing.<br>• The site is comprised of large lots under relatively few landholdings and these are available for purchase, pending project approval. |
| **Capacity to rehabilitate** | Proposal would involve minimal site disturbance and has potential to improve land by giving the site a rest from grazing. Once the solar farm reaches the end of its operational life, the site can be remediated to its existing condition so that grazing and occasional cropping can be resumed. |
| **Community support** | Community consultation has been undertaken as part of the proposal and feedback has been considered within this EIS. The consultation undertaken and results are summarised in Section 6.3.<br><br>There is substantial community support in the region for renewable projects. The community expressed the following positives about the proposal:<br>• Economic benefits<br>• Business opportunities<br>• Revegetation potential,<br>• Benefits of renewable energy<br><br>All feedback and concerns raised by the community has been addressed within this EIS, where relevant. |
| **Proximity to electrical network** | Two existing 132kV transmission lines traverses the site which means the that the connection to the high voltage network can be made onsite without the need to construct any transmission lines. It also reduces the distribution loss factor risk.<br><br>The proposal site is also located approximately 9km from the Armidale 330/132kV substation which has been identified as a |

| Preferable Site Condition | Observation |
|---|---|
| | connection opportunity and as such, a suitable location for connecting new energy generation. |
| **Connection capacity** | The proposal site is located within the New England North West REZ. AEMO identified the New England region of NSW as an optimal REZ development area, supported by existing transmission strength and capacity (AEMO, 2018).<br><br>The ability to connect to the high voltage network via a 132kV transmission line which traverses the site brings significant benefits as the network has the capacity to absorb the total output of the solar farm and deliver it anywhere in the network. |

## 3.4. ALTERNATIVE TECHNOLOGIES

The critical components of a solar farm include:

- Solar panels to generate DC electricity from sunlight.
- Inverters to convert the DC electricity into AC electricity.
- Energy storage facility.

Over recent years, the underlying technology has been developing at an increasingly rapid rate. OSD would utilise the latest equipment which best meets the requirements of the proposal.

Solar farms are a renewable source of energy, but they do not operate continuously. The extensive use of such energy sources can lead to problems on the supply network as the available generation capacity can sometimes be inadequate to meet the demand. This issue can be mitigated by installing energy storage systems to store energy during periods of excess generating capacity. Where there are shortfalls in capacity, this stored energy can then be used to even out the load. Additionally, these storage facilities may be used to provide ancillary services to the grid. The proposed Oxley Solar Farm would include an energy storage facility with a capacity of up to 50 MWh (i.e. 50 MW power output for one hour).

## 3.5. SCALE OF THE PROPOSAL

The scale of the proposal has been determined after considering the following factors:

- A desire to make a worthwhile contribution to the electricity market using renewable energy sources.
- A need to ensure that the proposal was commercially viable.
- The capacity of the electricity grid to absorb the energy generated by the proposal.
- The desire to make maximum use of the land within the proposal site.
- The opinions expressed by landowners and the local community.
- The constraints identified during the preparation of this EIS.

The ability to connect to the high voltage network via a 132kV transmission line which traverses the site brings significant benefits as the network has the capacity to accept the total output of the solar farm and deliver it to the network.

Of the 1,048ha proposal site, the development footprint would represent approximately 895ha which would be developed for the solar farm and associated infrastructure. The development footprint area has been selected in response to the findings of the environmental assessments, site constraints and consultation with relevant government agencies, the community and other stakeholders. The remaining 226ha will be preserving important features of the site including waterways, biodiversity features and aboriginal heritage items.

On balance, it is considered appropriate to develop the solar farm with a capacity of approximately 225MW which is expected to generate around 481,000MWh of energy each year.

## 3.6. PROJECT JUSTIFICATION

The Oxley Solar Farm proposal is considered justified due to the following:

- It would contribute to meeting Australia's renewable energy targets and greenhouse gas commitments. The proposal would generate enough clean, renewable energy for about 81,000 average NSW homes, displacing approximately 400,000 metric tonnes of carbon dioxide, currently generated by non-renewable sources.
- The proposal aligns with international, commonwealth and state goals and polices for mitigating climate change and renewable energy projects.
- Being a renewable energy project, it would assist in improving electricity reliability and security benefits within Australia as the energy supply from coal-fired power stations are reduced.
- It would assist in increasing competition in the wholesale energy marked and therefore assist in reducing electricity prices within Australia.
- It would provide direct and indirect employment opportunities during the construction and operating phases of the project. As well injection of expenditure in the local area.
- The proposal would be a new land use thereby diversifying the local land use within the region, providing a drought resilient revenue stream for the agricultural economy.
- The proposal site meets the preferable site conditions of a solar farm development outlined by the Large Scale Solar Energy Guideline for SSD 2018 (DPIE) including optimal solar resources, suitable land, capacity to rehabilitate, proximity to electrical network and connection capacity.
- The proposal is located within the New England North West REZ which is the second highest solar penetration region in NSW, supported by existing transmission strength and capacity (AEMO, 2018).
- Th proposal is a viable scale while responding to site constraints and minimising environmental impacts to the site and surrounding locations.
- Two existing 132kV transmission lines traverses the site which means the that the connection to the high voltage network can be made onsite without the need to construct any transmission lines. It also reduces the distribution loss factor risk.
- Once the solar farm reaches the end of its operational life, the site can be remediated to its existing condition so that grazing and occasional cropping can be resumed.
- There is substantial community support in the region for renewable projects.

# 4. THE PROPOSAL

## 4.1. PROPOSAL SUMMARY TABLE

The key features of the proposal are summarised in Table 4-1 below. The component specifications are subject to change during detailed design. Where required, upper limit quantities and power level estimates are provided to ensure the assessment and any subsequent approval maintains the flexibility required in the detailed design stage, post approval.

Table 4-1 Summary of key features of the proposal

| Proposal element | Description |
|---|---|
| **Proposal** | Oxley Solar Farm. |
| **Proponent** | Oxley Solar Development Pty Ltd. (OSD). |
| **Capacity** | Approximately 225MW (AC). |
| **Proposal site area** | Approximately 1,048ha. |
| **Development footprint area** | Approximately 895ha. |
| **Site description** | **Proposal site:** Lot 5 DP253346, Lot 2 DP1206469 and Lot 6 DP625427.<br>**Site Access:** Lot 2 DP1206469 and Lot 7004 DP1060201 off Waterfall Way (Grafton Road).<br>All land zoned as RU1 Primary Production under Armidale Dumaresq LEP. |
| **Local Government** | Armidale Regional Council. |
| **Subdivision** | Subdivision of land for the location of assets which will become the property of TransGrid (substation). |
| **Solar array** | Number of panels: approximately 715,000<br>Area of panels: approximately 269.8 ha<br>Row spacing: approximately 6m.<br>Height: 3 – 4m (less if fixed). |
| **Substation** | Approximately 6ha.<br>132kV outdoor substation.<br>2 x 132/33kV transformers and associated infrastructure.<br>Maximum height of 6m subject to final design. |
| **Energy storage** | Located within the northern portion of the site close to the substation and laydown area.<br>With an electricity storage capacity of up to 50 MWh (i.e. 50 MW power output for one hour) and comprising of lithium ion batteries with inverters.<br>Estimated 25 shipping containers (40 foot each).<br>The footprint would be approximately 100m x 150m. |
| **Site access** | The site access off Waterway Way, north of the proposal site. A new access point and intersection is to be established. |
| **Access tracks** | Internal access tracks: up to 50km of 7m wide unsealed gravel |
| **Operations and maintenance buildings** | Steel framed, ColorBond finish demountable buildings to accommodate:<br>• 33kV switch gear.<br>• Control and protection equipment.<br>• Site office.<br>• Staff amenities.<br>• Warehouse.<br>These would likely be housed in two buildings including:<br>• A control room with a 15m x8m footprint |

| Proposal element | Description |
|---|---|
| | • An operation and maintenance shed with a footprint of 25m x 25m<br>Maximum height of 6m subject to final design |
| **Security fencing, lighting and CCTV** | Steel security fence 2.3m high with barbed wire topping.<br>Security system with CCTV and local flood lighting. |
| **Construction hours** | Standard daytime construction hours would be 7.00am to 6.00pm Monday to Friday and 8.00am to 1.00pm on Saturdays.<br>Any construction outside of these standard construction hours, if required, would only be undertaken with prior approval from relevant authorities, or unless in emergency circumstances e.g. to make work safe. |
| **Construction timing** | About 12 to 18 months commencing Q3 2023 |
| **Workforce** | Construction – approximately 300 staff during peak construction (approximately 6 – 9 months).<br>Operation – around 5 full time equivalent staff. |
| **Operation period** | Anticipated to be 30 years. |
| **Decommissioning** | The site would potentially be returned to its pre-works state. All above ground infrastructure would be removed to a depth of 500mm. The site would be rehabilitated consistent with land use requirements.<br>All infrastructure would be removed with the exception of the substation. The site would be rehabilitated consistent with future land use requirements. |
| **Capital investment** | Estimated $370 million. |

## 4.2. PROPOSAL LAYOUT

To inform the development of the most appropriate proposal, a Scoping Report (NGH, 2019) for the proposal site was undertaken in the early planning stages to determine environmental constraints associated with the site. The Scoping Report (NGH, 2019) was used to assist with developing the early solar farm layout and planning the detailed environmental assessment methodologies for the EIS.

Environmental constraints can be defined as factors which affect the 'developability' of a site and include physical, ecological, social and planning factors. A map of these constraints was prepared for the Scoping Report (NGH, 2019). Following the detailed field investigations, the mapping has been further refined and is presented in Figure 1-10. This process demonstrates how the proposal has appropriately responded to the site's constraints. With reference to the site's key constraints, the proposal assessed in this EIS has:

- Avoided higher biodiversity value land. Once the broader site was selected, the development footprint was refined iteratively, in tandem with the detailed biodiversity assessment. The layout has been developed to avoid higher quality areas of native vegetation onsite including:
  - 37.3 ha of Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion (PCT 567 woodland structure).
  - 29.2 ha of Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion (PCT 510 woodland structure).
  - 0.55 ha of EPBC listed Vegetation
- 36 no go zones to avoid identified Aboriginal Heritage items including stone artefacts, modified and cultural trees and archaeological deposits.
- Set back solar arrays further away from the Oxley Wild Rivers National Park and sensitive receivers, south and south west of the proposal site.
- Buffered waterways in accordance with their classification and the "Guidelines for Riparian Corridors on Waterfront Land", for 2nd order and above streams, to minimise impacts on hydrology and water

quality. Excepting required crossings, these areas will be avoided. Rehabilitation of impacts required in these areas will be with reference to best practice guidelines.

## 4.3. SUBDIVISION

The proposal would require the subdivision of approximately 6ha for the proposed onsite substation, battery storage and associated ancillary facilities. This land and the assets within them would become the property of TransGrid. The remainder of the development footprint land would be retained by OSD for the solar farm. Lot 2 DP1206469 (Lot B) and Lot 5 DP253346 (Lot C) would be affected by the proposed subdivision. The indicative subdivision is outlined in Figure 4-1. No other subdivisions are required.

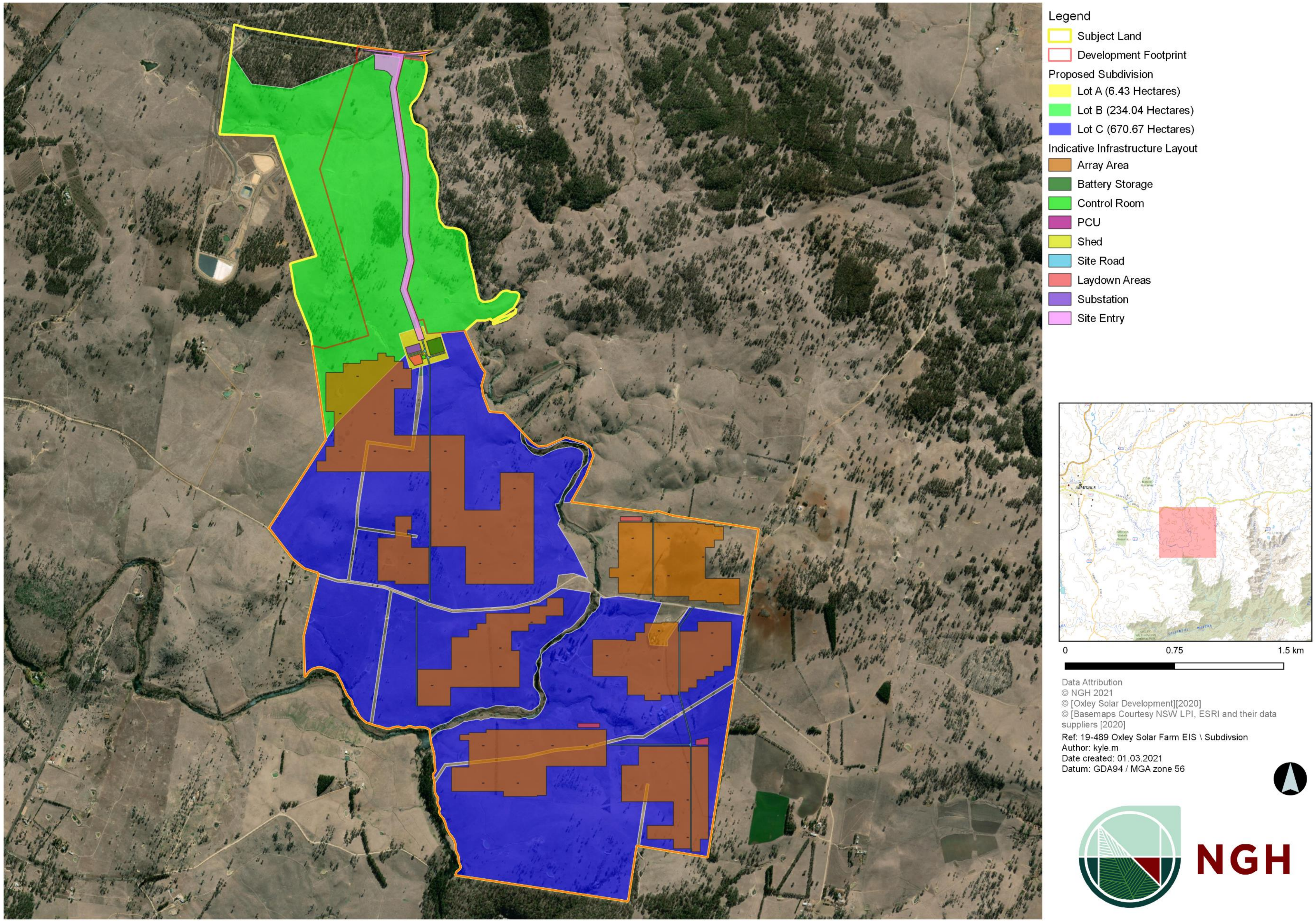



Figure 4-1 Proposed indicative subdivision of onsite substation (Lot A)

## 4.4. PROPOSED INFRASTRUCTURE

The proposed Oxley Solar Farm comprises of the following key items of infrastructure:

- Approximately 715,000 PV solar panels mounted on either fixed or tracking systems, both of which are considered feasible for the site and this project:
    - Fixed-tilted structures in a north orientation at an angle of 32 degrees, or
    - East-west horizontal tracking systems.
- Approximately 45 PCU composed of two inverters, a transformer and associated control equipment to convert DC energy generated by the solar panels to 33kV AC energy.
- Steel mounting frames with driven or screwed pile foundations.
- An onsite 132kV substation containing up to two transformers and associated switchgear to facilitate connection to the national electricity grid via the existing 132kV transmission lines onsite.
- Underground power cabling to connect solar panels, combiner boxes and PCUs.
- Underground auxiliary cabling for power supplies, data services and communications.
- Buildings to accommodate a site office, 33kV switchgear, protection and control facilities, maintenance facilities and staff amenities.
- About 1km of access track off Waterfall Way (Grafton Road) with a 25m wide easement to the site which would require construction to the proposed onsite substation site.
- Internal access tracks for construction, operation and maintenance activities.
- An energy storage facility with a capacity of up to 50 MWh (i.e. 50 MW power output for one hour) comprising of lithium ion batteries with inverters.
- Perimeter security fencing up to 2.3m high.
- Native vegetation planting to provide visual screening for specific receivers.

During the construction phase, temporary ancillary facilities would be established within the development footprint on the site and may include:

- Laydown areas.
- Construction site offices and amenities.
- Car and bus parking areas for construction staff.

### 4.4.1. Solar arrays

The solar arrays would consist of PV solar panels that would be grouped into arrays. Fixed and tracking systems are both considered feasible and would include the following:

1. Fixed tilted array: solar panels would be configured in a north facing orientation; or
2. East-west horizontal tracking systems: solar panels would be mounted on single axis trackers that would track sun from east-west.

It is anticipated that 715,000 solar panels would be installed with the capacity to generate 225MW (AC). The individual solar panel dimensions would measure approximately 2m x 1m, providing a surface area of 2m$^2$ per solar panel.

The fixed tilt solar arrays would be 3 – 4m high at most (reflecting the taller tracking option) with a row spacing of approximately 6m. The solar arrays would be installed on steel piles that are driven or screwed into the ground at a depth of approximately 2 - 3m. Excluding mounts, the array would be installed not less than 1.5m in height at its lowest point to ensure placement above 1% Annual Exceedance Probability (AEP) flood levels.

Detailed design, availability and commercial considerations at the time of construction would inform the final quantity of solar panels and layout configuration.

Figure 4-2 Typical fixed tilted system.

Figure 4-3 Typical single-axis tracking system.

### 4.4.2. Power Conversion Units (PCUs)

Array blocks consisting of approximately 16,000 solar panels would be connected to a PCU (Figure 4-4). Each array block would each generate approximately 5MW (AC). This would allow for approximately 45 PCUs that would convert DC energy generated by the solar panels to AC energy. Each PCU consists of two inverters, as transformer and associated control equipment. The PCUs may be housed in a container measuring up to 10m long, 4m high and 3m wide (Figure 4-5). The containers would be mounted on concrete footings or piles to raise them above potential flood levels.

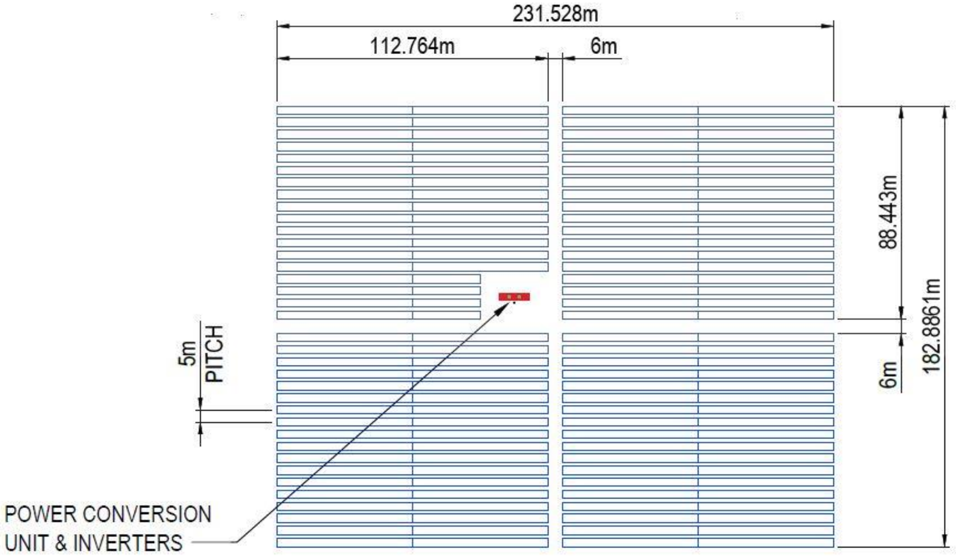



Figure 4-4 Typical array block showing location of PCU.


Figure 4-5 Typical illustration of a PCU within the array.

### Distributed Inverters

During the detailed design phase of the solar farm, consideration would be given to an alternative configuration whereby the inverting equipment is distributed throughout the array block rather than centralising it in the PCU.

If this option is adopted, inverters would be installed at the end of each row of solar cells with the AC output being connected to transformers located within the middle of each array block. The inverters would be housed in weatherproof containers approximately 1.0 x 0.6 x 0.3m in size. With this arrangement, the PCU would be replaced with a smaller cabinet which would contain only a transformer and certain control and protection equipment.

## 4.4.3. Transmission network connection

The proposal site is traversed by two TransGrid owned and operated 132kV transmission lines (Figure 4-6) that connects to the Armidale 330/132kV substation. The Armidale substation is located approximately 9km to the west of the site. The solar farm would connect to the national grid via a new substation constructed in the northern portion of the proposal site. TransGrid would maintain and operate the proposed new substation to be constructed onsite for connection of the solar farm to the national grid by connecting the existing 132kV transmission lines to the new substation. No works are proposed to occur offsite for the transmission network connection.

The onsite 132kV substation would contain up to two transformers, three or four 132kV circuit breakers, current transformers and high voltage conductors to facilitate connection to the national electricity grid. The substation would be outdoors and built in accordance with Australian and TransGrid standards. The two transformers would be used to transform the 33kV energy from the PCUs to 132kV in order to connect to the national grid. The transformers would be oil-fill, with waterproof bunds and other containment measures to ensure that in the event of an oil leakage, the oil is contained and cannot leak into the surrounding environment. The transformers would be located close to the connection point and would be approximately 200m from the nearest waterway (an ephemeral tributary of Lambing Gully).

Figure 4-6 Existing 132kV transmission lines traversing the proposal site that will connect the solar farm to the Armidale substation.

### 4.4.4. Underground cabling

Underground cabling would be required for:

- Connection of solar panels via a DC cable to a PCU.
- Connection of approximately 5 – 10 PCUs into a grouping.
- Connection of PCU grouping to the 33kV switchboard via a single 33kV feeder cable.
- Provision of auxiliary power, data services and communication facilities.

Underground cabling on the site would be designed in accordance with Australian and International standards and the cable routes would be designed to minimise ground disturbance.

The cables would be installed in trenches approximately 900mm deep and the cables may be protected by conduits. A marking tape would be provided to reduce the possibility of accidental damage and ground markers would be provided to identify the cable routes.

Copper conductors would be used wherever necessary to electrically bond the metal structures to earth to protect personnel and equipment in the event of lightning strikes and electrical faults.

### 4.4.5. Ancillary infrastructure

One or more buildings would be constructed to accommodate the following:

- Control and protection equipment.
- Staff amenities including kitchen and bathroom.
- Workshop and storage facilities.
- Water tanks.
- Wastewater system.
- 33kV switchgear.

### 4.4.6. Site access and internal tracks

Site access is proposed from Waterfall Way (Grafton Road) south towards the solar farm and associated substation via a newly constructed road across Lot 2 DP1206469 and Lot 7004 DP1060201. This new internal road would be about 1km in length with a 25m wide easement. The road width would be a minimum of 7m. The exact route will be determined after further survey work has been completed. The approximate location is outlined Figure 1-9.

The access would be used during construction and operation and would be suitable for all vehicles including heavy and oversized vehicles.

Gara Road traverses the proposal site and would be used for access within the proposal site (i.e. north and south of Gara Road). New property entrances and intersections would be constructed within the proposal site to improve safety along Gara Road.

Silverton Road is accessed from Waterfall Way (Grafton Road). Most of the construction and operational workforce will access the site from Waterfall Way (Grafton Road). Light vehicles may occasionally access site via either Gara Road or Silverton Road. All of the construction and operational workforce will be instructed to access the site from Waterfall Way (Grafton Road) as part of site inductions.

Internal access tracks would be constructed to each PCU and to the substation for use during the construction of the proposal and to facilitate ongoing maintenance. The internal roads would be approximately 7m wide to facilitate transport, unloading and mounting of the PCUs. They will be constructed in accordance with the AustRoad Guideline requirements. The actual locations of the roads would be determined during the detailed design phase of the solar farm.

Internal access tracks would require some waterway crossings. Erosion and waterway protection would be ensured by designing waterway crossings in accordance with the following:

- *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003).
- *Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI, 2003).
- *Guidelines for Watercourse Crossings on Waterfront Land* (NSW DPI, 2012).

The site access road and all internal tracks would be maintained throughout the construction and operation of the solar farm. If required, water trucks would be used to suppress dust on unsealed access roads and tracks during construction. Additional stabilising techniques and/or environmentally acceptable dust control would also be applied if required to suppress dust.

Based on the estimated peak daily demand being 20 buses and 30 cars, safe set-down and pick-up areas should be designated for bus passengers, and minimum all-weather off-street parking provision provided for 30 light vehicles.

### 4.4.7. Energy storage

The proposed Oxley Solar Farm would include a provision for an energy storage facility with a capacity of up to 50MWh (i.e. 50MW power output for one hour) consisting of approximately 25 containers (40 foot each). The energy storage infrastructure would be installed once the solar farm is in operation and would consist of power packs comprising of lithium ion batteries with inverters (Figure 4-7). They would be installed in one location near the substation (Figure 1-9), and not distributed through the site. The exact location of the future energy storage would be determined during detailed design but would be located within the development footprint. The most likely location is shown on Figure 1-9.


Figure 4-7 Typical battery storage units, located together.

### 4.4.8. Security and fencing

The following security measures would be established within the proposal site:

- The infrastructure on the site would typically be enclosed by a 2.3m high chain wire fence with wire strands. This fence type would be confirmed during the design phase and constructed early in the construction phase.
- The 132kV substation would be enclosed by a security fence in accordance with TransGrid requirements.
- An electronic security system would be established prior to commissioning of the solar farm.
- Security lighting would be installed around the entrance gates and main building areas.

### 4.4.9. Landscaping and vegetation

Landscaping and screening for the proposal would include:

- A wide band of native plantings of trees up to 5-10m in height for the southern boundary of the proposal site to address potential visual impacts from the Oxley Wild Rivers National Park. These can be positioned in three (3) rows (or approximately 6 - 9m wide) between the property boundary and security fence. The tree canopy should not intrude into the zone that exists between the edge of the security fence and the solar panels
- Screen planting along the proposal site eastern boundary, adjacent to Silverton Road to assist in screening views from residences to the east and reducing the visual impact from Silverton Road.
- Screen planting on the western boundary of the site to reduce the potential visual impact from residences to the west.

The proposed landscaping and screening can be seen on Figure 1-9.

The landscaping and screening would keep within the existing vegetation typologies (scattered grouping of a variety of natives). The trees would be planted at varying heights and arranged randomly (i.e.. not straight lines). This would ensure a naturalistic effect that blends rather than contrasts with the overall landscape, refer to Figure 4-8 and Figure 4-9.

To ensure that mitigation planting is successful all landscape works should be maintained regularly for a period of 24 months.


Figure 4-8 Typical section of proposed screen plating (Moir Landscapes, 2020).

Figure 4-9 Example screening for a substation (Moir Landscapes, 2020).

### 4.4.10. Temporary construction facilities

Temporary facilities would be located within the site boundary during the construction phase and would include:

- Material laydown areas.
- Temporary construction site offices.
- Temporary car and bus parking for construction worker's transportation. When the construction work is completed, a small car park would be retained for maintenance staff and occasional visitors.
- Temporary staff amenities.

The staff amenities would be designed to cater for the peak number of construction staff expected to be onsite and would include:

- Sanitary modules with water flush systems connected to holding tanks. The tanks would be fitted with high level alarms and they would be pumped out regularly.
- Water tanks.
- Changing rooms.
- Lunchrooms.
- Administrative offices.
- Covered walkways.
- Emergency muster point.
- Generator – if required.
- Electrical, data and water reticulation.

A steel or concrete water storage tank would be installed near the entrance to the site for firefighting and other non-potable water uses. Rainwater tanks to be installed beside the site buildings for staff amenities. Suitable fire extinguishers would be maintained at site buildings.

## 4.5. PRECONSTRUCTION WORKS

The proposed Oxley Solar Farm may include works prior to construction including upgrade of construction site access road, installation of fencing, artefact salvage, geotechnical drilling and/or surveying and preparation of construction compounds and site facilities.

# 4.6. CONSTRUCTION

## 4.6.1. Construction activities

Construction is anticipated to take approximately 12 – 18 months. The main construction activities would include:

- Geotechnical investigations and survey.
- Site establishment: site office, staff amenities, parking, fencing, laydown areas, access road and tracks.
- Earthworks.
- Installation of drainage.
- Installation of footings: concrete foundations for buildings and equipment.
- Installation of steel post and framing system for the solar panels.
- Installation of cabling: trenching and backfilling.
- Installation of solar panels.
- Construction of buildings.
- Installation of PCUs.
- Installation of high voltage equipment, switchboards.
- Cable termination.
- Testing and commissioning.
- Removal of construction facilities and rehabilitation.
- Landscaping.

## 4.6.2. Site preparation and earthworks

Ground disturbance resulting from earthworks associated with the proposal would be minimal and limited to:

- The installation of piles supporting the solar panels which would be driven or screwed into the ground.
- Establishment of external access roads.
- Decommissioning of dams currently within the development footprint which would involve filling the dams with soil excavated from other parts of the site.
- Removal of existing fences.
- Cleaning and levelling the ground for buildings and structures and arrays.
- Localised areas of earthworks (cut and fill, grading and compacting) may be required in areas where there are sudden, significant changes in ground slope.
- Construction of internal access roads.
- Excavating cable trenches.

Groundcover vegetation and topsoil under the footprint of the array area would not be removed during the construction of the solar farm. Topsoil salvaged from the construction of the access tracks and other works would be securely stored for use in site rehabilitation.

Where required weed treatments would be undertaken prior to earth works commencing in order to reduce the potential for spread of these species within the proposal footprint.

## 4.6.3. Materials and resources

The main construction materials would include:

- Aggregates, road base and concrete.

- Fencing materials.
- Steel footings and frames to support the solar arrays.
- Cables, conduits, junction boxes.
- Steel framing and ColorBond sheeting for permanent buildings.
- Timber and fixtures for building fit-out.

Estimated quantities of required resources are shown in Table 4-2 and would be confirmed during the detailed design stage.

Table 4-2 Estimated resources required.

| Resource | Estimated Quantity |
|---|---|
| **Gravel (access tracks)** | 75,000$m^3$ |
| **Sand (bedding for cables)** | 8,500$m^3$ |
| **Concrete (PCU and buildings)** | 420$m^3$ |
| **Estimated number of solar panels** | 715,680 |

## Water requirements

Non-potable water requirements are anticipated to be an upper limit of 600 kilolitres (kL) /day and total 110 megalitres (ML) to 130ML for the construction phase in its entirety. Potable water requirements are anticipated to be approximately 0.4ML during the construction phase. Detailed water requirements would be determined by EPC contractors.

Non-potable water would likely be sourced from rainwater tanks and a local water holder and potable water would be sourced from a commercial potable water supplier. Water sources would be subject to determination by EPC contractors.

Water use and water quality is discussed in detail in Section 8.1.

## Labour, machinery and equipment

It is anticipated that up to 300 construction staff comprising of supervisors, tradesmen and labourers would be engaged to complete the work during the peak construction phase (6 – 9 months). Up to 300 workers is a maximum estimation, the amount of workers required for proposal would likely be less. Every effort would be made to hire staff locally.

Staff would be accommodated in Armidale or nearby surrounding areas.

Plant to be used during construction would include:

- Small pile driving rig.
- Crane.
- Drum roller.
- Padfoot roller.
- Wheeled loader.
- Dump truck.
- 30t excavator.
- Grader.
- Chain trencher.
- Water truck.

- Telehandler.
- Forklift.

### 4.6.4. Transport and access

#### Haulage route

Road transport is the preferred option for the delivery of construction infrastructure, as opposed to rail. It is expected that the haulage route for most vehicles, including heavy and over-dimensional vehicles during construction would be from Armidale, then to the site via a new property access to be constructed off Waterfall Way (Grafton Road), approximately 130m west of the existing property access. It is expected that the equipment would be transported from port facilities in either Sydney or Newcastle and delivered to the site in 12m shipping containers or other suitable transport mode. The larger transformers would likely be delivered by low loaders on up to two occasions.

The principle haulage routes would from Sydney or Newcastle ports via the Pacific Motorway (Sydney), Hunter Expressway (Newcastle), New England Highway and Waterfall Way (Grafton Road) to the proposal site. The proposed haulage route is an approved 19m B-double route on the Transport for NSW Restricted Access Vehicles Map.

Materials would generally be transported to the site on heavy vehicles up to B-double and would include, but not limited to the following:

- PV solar panels.
- Piles, mounting structures and frameworks.
- Electrical equipment and infrastructure including cabling, auxiliary electrical equipment and machinery, inverters, switchgear, and the onsite substation (and transformer).
- Construction and permanent buildings and associated infrastructure.
- Earthworks, grading and lifting machinery and equipment.

Local site access is proposed from Waterfall Way (Grafton Road) south towards the solar farm and associated substation via a newly constructed road across Lot 2 DP1206469 and Lot 7003 and 7004 DP1060201. This new internal road would be about 1km in length with a 25m wide easement. The track would be 7m wide. The new internal road would be located within the development footprint, but its exact location will be determined through detailed design. Silverton and Gara Roads (apart from light vehicles) are not proposed to be used for site access.

Specialist oversize equipment including the grid connection transformer and 200 Tonne cranes would require oversized vehicles to transport them to the proposal site. This equipment would have 'Oversize' transport management in place to transport these items to site. Further, the cumulative impact of the site traffic with nearby developments is expected to be minimal. A design, in accordance with the Traffic Impact Assessment undertaken by New England Surveying & Engineering (2020, Appendix J), for the intersection of the site access with Waterfall Way (Grafton Road), would ensure the access would operate in a safe manner and will be able to accommodate the maximum design vehicle expected to access the site.

A Construction Traffic Management Plan would be prepared following project approval to manage haulage traffic during the construction phase.

Transport and access impacts are discussed in detail in Section 8.2.

#### Intersection upgrades

Proposed intersection upgrades were developed in consultation with Transport for NSW and based on criteria within the *Austroads Guide to Road Design*.

The existing site access off Waterfall Way (Grafton Road) was assessed and found to be unsuitable for upgrading to be the principal proposal site access. It was found to be unsuitable due to a limiting crest curve on the western side of the access preventing minimum Safe Intersection Site Distances (Section 3 of the *Austroads Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections*). The existing access gate will be closed and fenced off to prevent future access (Figure 4-10). The new access road will be constructed to comply with Figure 7.4 of the *Austroads Guide to Road Design Part 4: Intersections and Crossings - General, 2017*, and designed to accommodate the swept path of the maximum dimension freight vehicle and over-dimension vehicle which will service the site, and an Austroads basic right-turn intersection treatment (BAR) to the northern side of the access (Figure 4-11).

It is expected that tree clearing would be required for the new access driveway, and also on the northern side of Waterfall Way (Grafton Road) to permit a table drain and ensure sight distances are achieved. Tree removal/pruning may also be required immediately adjacent to Gara River north of the bridge so that these trees do not in future obstruct sight distances. The intersection and sight line work has been included in the development footprint and assessed as part of this EIS.

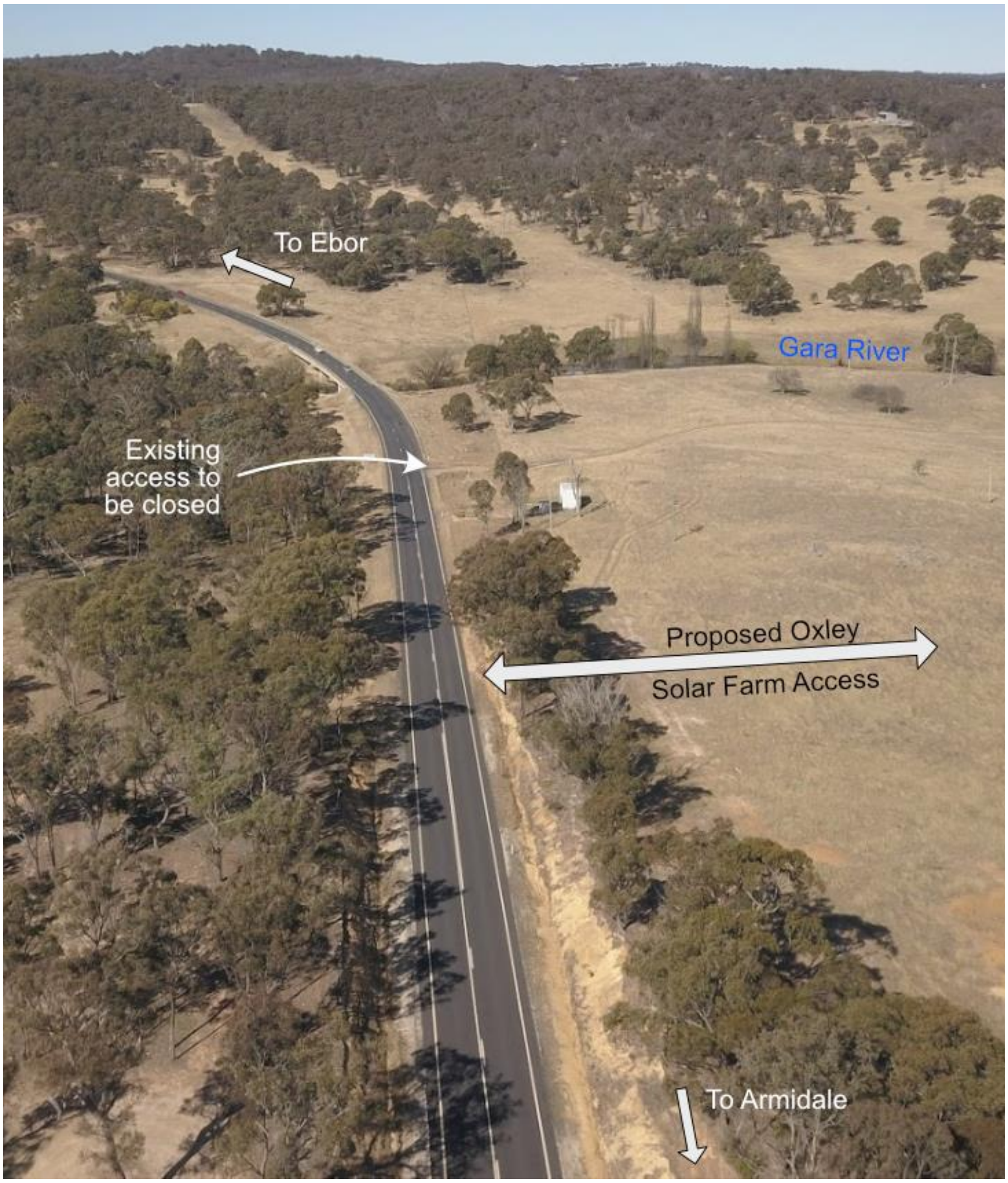



Figure 4-10 Proposed location for new property access to Waterfall Way (Grafton Road) (New England Surveying & Engineering, 2020).


Figure 4-11 Concept Diagram of new property access arrangement to Waterfall Way (Grafton Road) (New England Surveying & Engineering, 2020).

Improvements will be required along Gara Road between approximate chainages 7.7km and 9.7km, where it will be necessary for heavy vehicles to travel on Gara Road to access different parts of the Oxley Solar Farm (Figure 4-12). Such improvements would include localised widening to allow heavy vehicles to pass, four (4) new heavy vehicle property entrances, and upgrading in the vicinity of the Gara River causeway crossing where road width and sight distances are constrained. The access points will be in compliance with Austroads intersection guidelines and the Armidale Regional Council Engineering. Given there is little through-access at this part of the road, consideration could be given to temporary traffic control measures to control traffic in the vicinity of the Gara River crossing, in consultation with Armidale Regional Council.

Neither Silverton Road, nor Gara Road west of chainage 7.7km, are proposed for any regular construction or operation traffic associated with the development.

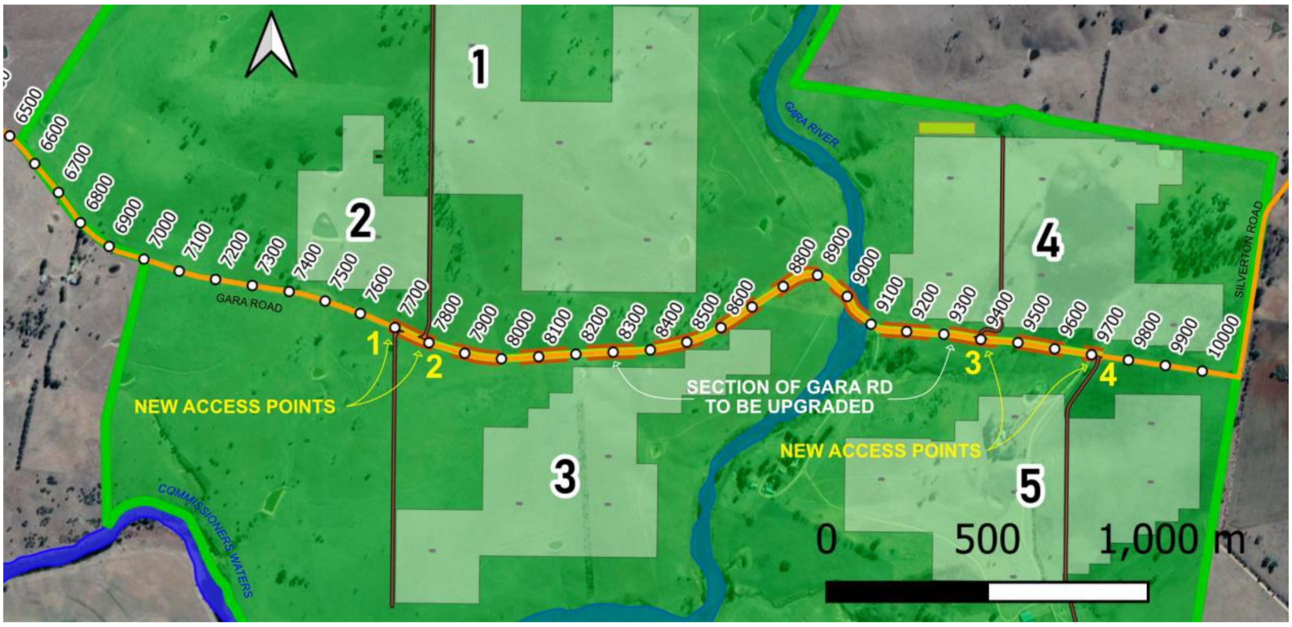



Figure 4-12 Location of accesses off Gara Road within the proposal site.

## Traffic movements

Estimated total and maximum daily traffic movements during construction and peak construction are shown in Table 4-3, and detailed traffic volumes and requirements are shown in Table 4-4. The traffic volumes include the delivery of water to site.

Table 4-3 Estimated traffic volumes and requirements for the Oxley Solar Farm.

| Type of vehicle | Estimated Vehicles over construction duration | Estimated peak maximum daily number of trips (one way) |
|---|---|---|
| Semi-Trailers | 707 | 23 |
| B Double | 518 | 2 |
| Oversized vehicles | 5 | 1 |
| Standard truck | 1,600 | 5 |
| Water tankers | 5,605 | 15 |
| Buses | 6,000 | 20 |
| Cars | 7,000 | 30 |
| **Total** | **21,435** | **96** |

Table 4-4 Estimated detailed traffic volumes and requirements.

| Item | Type of vehicle | Estimated number of vehicles during construction |
|---|---|---|
| **Equipment** | | |
| **Solar Panels** | B Double | 518 |
| **PCU's** | Semi-Trailer | 85 |
| **Switchboards** | Semi-Trailer | 2 |
| **Transformer and 200 Tonne Crane** | Oversize vehicles | 5 |
| **Total cables** | Semi-Trailer | 120 |
| **50 MWh battery storage** | Semi-Trailer | 50 |
| **Auxiliary electrical equipment and machinery** | Semi-Trailer | NA |
| **Steel posts, tables and brackets** | Semi-Trailer | 415 |
| **Buildings** | | |
| **Control room** | Semi-Trailer | 3 |
| **Warehouse** | Semi-Trailer | 1 |
| **Offices** | Semi-Trailer | 6 |
| **Water tanks** | Semi-Trailer | 4 |
| **Fences** | | |

| Item | Type of vehicle | Estimated number of vehicles during construction |
|---|---|---|
| **Posts and wire mesh** | Semi-Trailer | 5 |
| **Earthworks and grading machine** | Semi-Trailer | 3 |
| **Heavy Machineries** | | |
| **Telehandler** | Semi-Trailer | 30 |
| **Tractors/bulldozers** | Semi-Trailer | 3 |
| **Miscellaneous trucks** | Standard truck | 1,600 |
| **Water Tankers** | 20000L Tanker | 5,605 |
| **Construction personnel** | | |
| **Construction workers** | Shuttle buses | 6,000 |
| | Cars | 7,000 |

During peak construction, it is anticipated that up to 300 site personnel would be required to undertake the works. A shuttle bus system would likely be implemented to transport personnel to the site on 25 seater buses. This would generate up to 20 vehicle movements (10 to the site/10 from the site) equating to 40 daily vehicle movements. Additionally, extra allowance has been made for up to 60 daily light vehicle movements for workers to access the site.

It is expected that up to five one-way movements of oversized vehicles would be required for transport of the transformer and 200 tonne cranes.

### 4.6.5. Hours of operation during construction

During the construction phase of the solar farm, work would be undertaken during the following hours:

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

There may be a need to work outside these hours, for example:

- To avoid disrupting traffic when delivering bulky equipment.
- To avoid taking outages of existing high voltage transmission lines during periods of high load.
- To undertake emergency work to avoid serious injury or loss of property.

Any construction outside of these standard construction hours, if required, would only be undertaken with prior approval from relevant authorities.

# 4.7. OPERATION

## 4.7.1. Activities during operation

Once commissioned, the solar farm would be in operation continuously. The solar farm would only generate electricity during sunlight hours but the energy storage system could be activated at any time.

The solar farm would operate automatically but there would be provision to both locally and remotely monitor the performance of the equipment and to activate the energy storage system.

Activities undertaken during operation would include:

- Solar panel maintenance.
- Monitoring the performance of the solar farm.
- Inspection of the installation.
- Routine preventative maintenance.
- Emergency repair response (24 hours).
- Site security response (24 hours).
- Vegetation management within the development footprint in accordance with the fire management and biodiversity management plans.

## 4.7.2. Water requirements

Cleaning materials and spare parts would be made available on site for use by the maintenance staff. Panel cleaning may be required during drought conditions. As such, additional panel cleaning may also be required on occasion. As a 'worst case' upper limit, it is estimated that up to 500kL of water would be required per year.

It is estimated that up to 21.5ML would be required per year and if insufficient water is collected on site from rainwater tanks and dams, water would be obtained commercially.

## 4.7.3. Transport and access

The travel demand during the operation phase of the proposal is anticipated to be significantly less than the construction phase. It is estimated that the daily peak travel demand during operation would be approximately 8 vehicles movements a day. Site access would be via the newly established access track off Waterfall Way (Grafton Road). During operation, water may need to be delivered to site if insufficient water is collected onsite. If this were to occur, it would be approximately one water truck per month.

## 4.7.4. Personnel and work hours

A total of five equivalent full time staff would be employed onsite when the solar farm is operational. Associated work would be undertaken during the standard working hours of:

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

Work would only be undertaken outside of these hours in an emergency and would be kept to a minimum.

During the life of the solar farm, it may be necessary to engage contract staff to undertake specific major tasks at which time there could be greater numbers of people onsite. Such work would most likely relate to the replacement/refurbishment of the energy storage system, as it is assumed that the batteries would have to be replaced at least once during the life of the solar farm.

It is anticipated that the staff would drive light vehicles to the site each working day via any available road.

As noted in Section 4.4.3, TransGrid would be responsible for the operation and maintenance of the 132kV substation and TransGrid staff would require access to that part of the site.

The TransGrid owned Armidale Substation is less than 10km from the proposal site so it is expected that the maintenance of the two sites would be coordinated and, in respect of TransGrid staff, the presence of the new substation would have minimal impact on traffic in the area.

The standard working hours for TransGrid staff are:

- Monday – Friday: 7am – 6pm

### 4.7.5. Lighting and CCTV

Under normal circumstances, there would be minimal night lighting on site.

External lighting would be provided around the buildings, and in the high voltage substation but they would only be enhanced on the rare occasions that staff are working on the site during the hours of darkness.

There may be some security lighting at critical locations around the perimeter of the site, but these would only be activated when the automatic security system senses an unauthorised site entry. Task lighting would be provided at PCU's.

CCTV security cameras would be located at the entrance gate and around the substation and battery storage, and O&M facilities and office areas.

### 4.7.6. Refurbishment and upgrading

It is estimated that the solar equipment would have a life of 30 years and the benefits of refurbishing the equipment would be considered closer to this time.

It is anticipated that the batteries that would be used in energy storage system would have a life of 15 years, it is anticipated that they would need to be replaced at least once during the life of the solar farm.

## 4.8. DECOMMISSIONING AND REHABILITATION

The expected life of the proposed Oxley Solar Farm is around 30 years with the exception of the energy storage equipment which, because of the battery technology, is expected to have a life of approximately 15 years. It is anticipated that after 15 years the batteries would be replaced. Similarly, after 30 years, other solar farm infrastructure may be refurbished to continue operations or decommissioned.

When the solar farm is no longer viable, all above ground infrastructure, with the possible exception of the 132kV substation, would be removed and decommissioning and rehabilitation of the site would commence. It is noted that the 132kV substation would at that time form part of TransGrid's transmission system. Other works would need to be carried out to re-establish the link if the substation were to be removed.

The solar arrays would be removed and the steel piles on which they are supported, would be removed. Both the steel piles and the solar panels would be recycled, where possible.

All buildings would be removed, including the PCUs together with the associated footings.

Cabling would be removed where practical and recycled. Any cabling greater than 500mm below the ground may be left in place since this would not impact on future agricultural activities on the site once the restoration is complete.

The objective of this stage is to return the site to its existing land capability, for continued agricultural or other compatible land use options. The Oxley Solar Farm is largely reversible.

## 4.9. INDICATIVE TIMELINE

The earliest proposed construction timing, pending all relevant approvals, appointment of contractors and environmental planning requirements, is the third quarter of 2021. Once approved, it is understood that no end date is stipulated in the Development Consent; the consent is open ended. However, it is expected that at some point in the next 25-30 years the development will no longer be considered viable, may require refurbishment to remain so, or that an alternative land use may be preferred. After a relatively short decommissioning process that would mimic to a large degree the construction process, with its peak activity over several months, the site would be returned to its existing or better land capability and other land uses considered.

Table 4-5 Indicative timeline.

| Phase | Approximate commencement | Approximate duration |
|---|---|---|
| **Construction** | Q3 2023 | 12 - 18 months |
| **Operation** | Q2 2025 | 30 years |
| **Decommissioning** | 2055 | 9 months |

## 4.10. CAPITAL INVESTMENT

The Oxley Solar Farm would have an estimated capital investment of $370 million (including storage). A quantity surveyor’s report confirming the capital investment has been provided to DPIE.

# 5. PLANNING CONTEXT

The legislative planning context for the Oxley Solar Farm proposal is covered in this section and includes:

- Clarification of the status of the proposal as an NSW State Significant Development (SSD).
- The permissibility of the proposal under relevant State Environmental Planning Policies (SEPPs).
- Evaluation of the proposal against relevant local, NSW and Commonwealth law (Acts and Regulations).

## 5.1. ASSESSMENT CONTEXT

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and its associated regulations and instruments set the framework for development assessment in NSW.

Development assessment provisions are contained in Part 4 of the Act. Section 4.36 of the EP&A Act provides that a development would be SSD if it is declared to be SSD by a State Environmental Planning Policy (SEPP).

The *State Environmental Planning Policy (State and Regional Deve*lopment) *2011* (SRD SEPP) declares the Oxley Solar Farm to be SSD as it is development for the purpose of electricity generating works with a capital investment value of greater than $30 million (Clause 20, Schedule 1).

Section 4.12 (8) of the EP&A Act requires an SSD development application to be accompanied by an EIS prepared in accordance with the EP&A Regulation. This EIS is intended to meet the objects and assessment requirements of the EP&A Act, the Regulation and *State Environmental Planning Policy (State and Regional Development) 2011*.

The proponent made a written application to the Secretary requesting Secretary's Environmental Assessment Requirements (SEARS) for the proposed Oxley Solar Farm as required by Clause 3 of Schedule 2 of the EP&A Regulations. The proponent's application was accompanied by a Scoping Report (NGH, 2019), which provided detailed information about the proposed Oxley Solar Farm including key environmental issues.

On 2 August 2019, the Secretary issued the SEARs for the Oxley Solar Farm (Section 6.1.1). In formulating the environmental assessment requirements, the Secretary consulted with relevant public authorities and agencies and considered key issues raised by those authorities. Section 6.1.1 outlines the SEARs and provides a cross reference to where each item is addressed within this EIS. This EIS complies with the SEARs and the environment assessment requirements contained in Schedule 2 of the EP&A Regulation.

## 5.2. ENVIRONMENTAL PLANNING INSTRUMENTS

Environmental planning instruments (EPIs) are legal documents that are prepared under the EP&A Act to regulate land use and development. EPIs determine the relevant part of the EP&A Act under which a development proposal must be assessed and therefore determine the need or otherwise for development consent. EPIs consist of SEPPs, regional environmental plans (REPs), and local environmental plans (LEPs).

### 5.2.1. State environmental planning policies

#### *State Environmental Planning Policy (State and Regional Development) 2011*

The aims of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) are to identify development that is SSD, which are major projects that require approval from the Minister for

Planning and Environment or delegate (Planning Assessment Commission, Secretary or other public authority).

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

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

The Oxley Solar Farm would have an estimated capital investment cost greater than $30 million and is therefore considered SSD under Part 4 of the EP&A Act.

### *State Environmental Planning Policy (Infrastructure) 2007*

*State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) was introduced to facilitate the effective delivery of infrastructure across the state by improving regulatory efficiency through a consistent planning regime for infrastructure and services across NSW.

Clause 34(1) of ISEPP provides that development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone.

The proposed Oxley Solar Farm would be located within a rural zone (RU1 Primary Production), under the Armidale Dumaresq LEP. The proposal is therefore permissible with consent under the ISEPP.

### *State Environmental Planning Policy (Primary Production and Rural Development) 2019*

The *State Environmental Planning Policy* (*Primary Production and Rural Development) 2019,* known as the PPRD SEPP, is a framework that simplifies the NSW planning system by consolidating, updating and repealing provisions in five former agriculture-themed SEPPs, including the Rural Lands SEPP. The intention is to provide for better outcomes in balancing rural needs, including farming, and development, and to reduce the risk of land use conflict and rural land fragmentation.

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

*(a) to facilitate the orderly economic use and development of lands for primary production.*
*(b) to reduce land use conflict and sterilisation of rural land by balancing primary production, residential development and the protection of native vegetation, biodiversity and water resources.*
*(c) to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations.*
*(d) to simplify the regulatory process for smaller-scale low risk artificial waterbodies, and routine maintenance of artificial water supply or drainage, in irrigation areas and districts, and for routine and emergency work in irrigation areas and districts.*
*(e) to encourage sustainable agriculture, including sustainable aquaculture.*
*(f) to require consideration of the effects of all proposed development in the State on oyster aquaculture.*
*(g) to identify aquaculture that is to be treated as designated development using a well-defined and concise development assessment regime based on environment risks associated with site and operational factors.*

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

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

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

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

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

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

Land that is considered State Significant Agricultural Land is listed in Schedule 1 of the Primary Production SEPP. Schedule 1 of the SEPP is currently incomplete/blank, with mapping yet to be completed or publicly available. The proposal is compatible with the aims of the Primary Production SEPP, as it would not entirely remove the development site from agricultural land use, with sheep grazing persist under the solar panels during operation, nor does the proposal permanently divert the land from future cropping, as the development site would eventually be returned to the landowner following decommissioning.

#### *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*

This SEPP (The Mining SEPP) is designed to provide for the proper management and development of mineral, petroleum and extractive material resources and establish appropriate planning controls to encourage ecologically sustainable development through environmental assessment and management.

In particular, the SEPP outlines land that has been classed as Biophysical Strategic Agricultural Land (BSAL). BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity. The site is not mapped as BSAL.

#### *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*

This SEPP defines and regulates the assessment and approval of potentially hazardous or offensive development. The SEPP defines 'potentially hazardous industry' as:

> *"…development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future devel opment on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:*
>
> *(a) to human health, life or property, or*
>
> *(b) to the biophysical environment,*
>
> *and includes a hazardous industry and a hazardous storage establishment"*

'Potentially offensive industry' defined as:

> *…a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future devel opment on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.*

SEPP 33 provides for systematic assessment of potentially hazardous and offensive development for the purpose of industry or storage. For development proposals classified as 'potentially hazardous industry' the policy requires a preliminary hazard analysis (PHA) to determine risks to people, property and the environment.

A checklist and a risk screening procedure developed by DPE is used to help determine whether a development is considered potentially hazardous industry (DOP, 2011). Appendix 3 of the applying SEPP 33 guidelines lists industries that may fall within SEPP 33; the lists do not include solar farms and energy storage facilities. The hazardous development status of the proposal is assessed in Section 8.8.

***State Environmental Planning Policy No. 55 - Remediation of Land***

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

Clause 7 of the SEPP requires that the remediation of land be considered by a consent authority in determining a development application.

A search of the NSW EPA contaminated land public record (NSW Government, 2021a) was undertaken for contaminated sites within the Armidale LGA on 21 January 2021. Six recorded sites were returned for the LGA, none occur in the vicinity of the proposal site. The online list of NSW contaminated sites notified to the EPA (NSW Government, 2021b) was also searched on 21 January 2021. There are several sites listed in Armidale and surrounding areas but none are in the vicinity of the proposal site.

There may be a risk of contamination associated with agricultural activities (e.g. pesticides, petrochemicals, hydrocarbon contamination) or asbestos construction or insulation materials on the proposal site. However, there was no evidence of this during the site assessment.

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

This SEPP aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline:

*(a) by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and*

*(b) by encouraging the identification of areas of core koala habitat, and*

*(c) by encouraging the inclusion of areas of core koala habitat in environment protection zones.*

Koalas are listed under the *Biodiversity Conservation Act 2016* as a vulnerable species. The SEPP applies to each local government area listed in Schedule 1. Armidale is listed in Schedule 1 of SEPP 44. The Biodiversity Development Assessment Report, Appendix D and Summarised in Section 7.1 addresses the proposal's potential impact on Koala habitat.

### 5.2.2. Local Environmental Plans

The proposal site is located within the Armidale Regional LGA. Environmental provisions of the Former LGA (Armidale Dumaresq) are still applied under the *Armidale Dumaresq Local Environmental Plan 2012.*

The proposed solar farm and transmission line route is located across the land zone RU1 Primary Production.

Electricity generation is prohibited within the RU1 zone, however the ISEPP allows the development for the purpose of a solar energy system on any land with consent, which overrides the local provisions. The LEP states that the consent authority must have regard to the objectives for development in a zone when determining a development application. The objectives of this zone are as follows:

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

The proposal would harness a natural resource (solar energy) for the life of the solar farm. While activities associated with the solar farm would impact on land available for primary production, it would diversify the current land use to include electricity generation. The reversibility of the proposal and limited ground disturbance would result in the availability of the land for primary production or other alternative permissible rural land use at the end of the life of the proposal (expected to be 30 years). This EIS has considered the proposal's impact on agricultural land and land use conflicts onsite and adjacent to the proposal site. The proposal has minimised fragmentation and alienation of resource land through the selection of the site and design of the development footprint around environmental constraints onsite.

## 5.3. NSW LEGISLATION

### 5.3.1. Legislation to be applied

Under Section 4.42 of the EP&A Act, several authorisations cannot be refused if they are necessary for and consistent with an approved SSD, these are outlined below.

- An aquaculture permit under Section 144 of the *Fisheries Management Act 1994*.
- An approval under Section 15 of the *Mine Subsidence Compensation Act 1961*.
- A mining lease under the *Mining Act 1992*.
- A production lease under the *Petroleum (Onshore) Act 1991*.
- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in Section 43 of that Act).
- A consent under Section 138 of the *Roads Act 1993*.
- A licence under the *Pipelines Act 1967*.

Only the one highlighted act is relevant to the proposal, these are discussed below.

#### *Roads Act 1993*

The *Roads Act 1993* (Roads Act) is administered by Transport for NSW, local councils or the Department of Industry - Land. Roads and Maritime Services has jurisdiction for classified roads, local councils for non-classified roads and the Department of Industry - Land for road reserves or Crown roads.

The Roads Act regulates the carrying out of various activities in, on and over public roads. Under Section 138, the consent of the appropriate roads authority is required to:

*(a) erect a structure or carry out a work in, on or over a public road*

*(b) dig up or disturb the surface of a public road*

*(c) remove or interfere with a structure, work or tree on a public road*

*(d) pump water into a public road from any land adjoining the road*

*(e) connect a road (whether public or private) to a classified road.*

The proposal includes one site access for its operation and construction as discussed in Section 4.4.6. Consent would be required from Armidale Regional Council, Transport for NSW and Department of Industry for Crown Roads.

### 5.3.2. Approvals that do not apply

Under Section 4.41 of the EP&A Act, SSD developments do not require the following authorisations:

*(a) concurrence under Part 3 of the Coastal Protection Act 1979.*

*(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 to clear native vegetation or state protected land._

(f) _a bush fire safety authority under Section 100B of the Rural Fires Act 1997_.

(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._

Even though the proposal doesn't require these authorisations, the potential impact of the proposal on these items such as heritage, waterways and native vegetation are assessed in this EIS and identified impacts will be managed within an environmental management planning framework. Refer to Section 9.1.

### 5.3.3. Other relevant State legislation

#### _Biodiversity Conservation Act 2016_

The _Biodiversity Conservation Act 2016_ (BC Act) establishes a new regulatory framework for assessing and offsetting the biodiversity impacts of proposed developments and activities. The Act contains provisions relating to flora and fauna protection (repealing parts of the _National Parks and Wildlife Act 1974_), threatened species and ecological communities listing and assessment (repealing the _Threatened Species Conservation Act 1995_ and section 5A of the EP&A Act), a biodiversity offsets scheme (BOS), a single biodiversity assessment method (BAM), calculation and retirement of biodiversity credits and biodiversity assessment and planning approvals. The Act is supported by the _Biodiversity Conservation Regulation 2017._ This act has been considered in the preparation of this EIS and in the provision of a BDAR and BOS. Refer to Section 7.1.

#### _Biosecurity Act 2015_

The _Biosecurity Act 2015_ repealed the _Noxious Weeds Act 1993_ and provides a framework for the prevention, elimination and minimisation of biosecurity risks. The Act and supporting _Biosecurity Regulation 2017_ provide for the establishment and functions of Local Control Authorities for weeds (LGA or County Councils), and weed control obligations on public and private land. The EIS provides for the control of priority weeds occurring at the proposal site as part of the proposed works (refer Section 7.1).

#### _Mining Act 1992_

The main objective of the _Mining Act 1992_ is to encourage and facilitate the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development.

The proposal site has no mining leases.

#### _Crown Lands Management Act 2016_

The objective of the Crown Lands Management Act is to ensure that Crown land is managed for the benefit of the people of NSW. The Crown Lands Division, DPIE is responsible for the sustainable and commercial management of Crown Land.

Crown roads traverse the site in a north-south direction in the western portion of the site and along Gara River. A travelling stock reserve is located in the northern portion of the site along Waterfall Way (Grafton Road).

This would require consultation with DPIE – Crown Lands and/or Council.

### *Waste Avoidance and Resource Recovery Act 2001*

Waste management during the proposed works would be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act). Waste minimisation and management is addressed in Section 8.4 of the EIS.

## 5.4. COMMONWEALTH LEGISLATION

### *5.4.1. Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act provides an assessment and approval process for actions likely to cause a significant impact on Matters of National Environmental Significance (MNES). The nine MNES are:

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

Approval by the Commonwealth Environment Minister is required if an action is likely to have a significant impact on MNES. Assessments of significance based on criteria listed in Significant Impact Guidelines 1.1 issued by the Commonwealth (Commonwealth of Australia, 2013) are used to determine whether the proposed action is likely to have a significant impact (i.e. is likely to be considered a 'controlled action').

A search of the Commonwealth Protected Matters Search Tool (coordinate search, undertaken on 02 September 2019 indicates that there is one World Heritage or National Heritage areas or items (Gondwana Rainforests of Australia) within 10km of the proposal site. No areas of Commonwealth land were identified, and no Commonwealth heritage places were identified.

A summary of the EPBC Act search report is provided in Table 5-1. The full search report is provided in the Biodiversity Development Assessment Report (Appendix D).

Table 5-1 Summary of EPBC Act Protected Matters Report search results

| Protected Matter | Entities within the 10km search area |
|---|---|
| **World Heritage Properties** | 1 |
| **National Heritage** | 1 |
| **Wetlands of International Importance (Ramsar)** | 0 |
| **Threatened Ecological Communities** | 3 |
| **Threatened Species** | 35 |
| **Migratory Species** | 14 |
| **Listed Marine Species** | 21 |
| **Commonwealth land** | 0 |
| **Commonwealth Heritage places** | 0 |
| **Critical habitats** | 0 |
| **Commonwealth reserves (terrestrial)** | 0 |

| Protected Matter | Entities within the 10km search area |
|---|---|
| **State and Territory reserves** | 3 |
| **Regional Forest Agreements** | 1 |
| **Invasive species** | 30 |
| **Nationally Important Wetlands** | 0 |

### 5.4.2. *Native Title Act 1993*

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

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

Native title may exist in areas such as:

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

A search of the National Native Title Tribunal Registers on 8 July 2020 found no Native Title Claims for the proposal site.

### 5.4.3. *Renewable Energy (Electricity) Act 2000*

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

- Encourage the additional generation of electricity from renewable sources.
- Reduce emissions of greenhouse gases in the electricity sector.
- Ensure that renewable energy sources are ecologically sustainable.

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

Certificates for the generation of electricity are issued using eligible renewable energy sources. This requires purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire. In January 2011, renewable energy certificates were reclassified as either large-scale generation certificates or a small-scale technology certificates following changes to the RET scheme.

The Oxley Solar Farm would need to be accredited as a Renewable Energy Generator to create Renewable Energy Certificates.

## 5.5. OTHER RELEVANT POLICIES AND MATTERS

### 5.5.1. Matters of consideration

Under Section 4.15 of the EP&A Act, the consent authority is required to consider a number of matters when determining a development application under Part 4. These matters are listed in Table 5-2 and assessed in terms of their relevance to the proposal.

Table 5-2 Matters of consideration.

| Provision | Relevance to the proposal |
|---|---|
| **Any environmental planning instrument;** | Relevant environmental planning instruments (EPIs) are discussed in Section 5.2.1. They include:<br>• *State Environmental Planning Policy (State and Regional Development) 2011.*<br>• *State Environmental Planning Policy (Infrastructure) 2007.*<br>• *State Environmental Planning Policy (Rural Lands) 2008.*<br>• *State Environmental Planning Policy No. 55 - Remediation of Land.*<br>• *Armidale Regional Local Environmental Plan 2012.* |
| **Any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the consent authority;** | There are no draft instruments relevant to the proposal. |
| **Any development control plan;** | Clause 11 of the SRD SEPP provides that development control plans do not apply to SSD. |
| **Any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4;** | There are no planning agreements that have been entered into, nor are any planning agreements proposed, that relate to the proposal. |
| **The regulations (to the extent that they prescribe matters for consideration);** | Clause 92 of the EP&A Regulation requires consideration of:<br>• The Government Coastal Policy, for development applications in certain local government areas.<br>• The provisions of AS 2601 for development applications involving the demolition of structures.<br>• The provisions of a subdivision order and any development plan for development of land that is subject to a subdivision order.<br>• The provision of development under the *Dark Sky Planning Guideline.* |

| Provision | Relevance to the proposal |
|---|---|
| | The Oxley Solar Farm is not located on land that is under the provisions of the *Dark Sky Planning Guideline.* The proposal does not involve any other types of development and therefore the other provisions provided by the EP&A Regulation are not relevant to the proposal. |
| **The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;** | The likely impacts of the proposal, including environmental impacts on both the natural and built environments, and the social and economic impacts in the locality, are detailed in Section 2 and 8.5 of this EIS. This EIS demonstrates that the environmental impacts of the proposal have to the extent, reasonably and feasibly possible, been avoided or minimised through careful proposal design and through the implementation of mitigation measures provided within this EIS. |
| **The suitability of the site for the development;** | As discussed in Section 3.3 various options were considered when selecting an appropriate site for the proposal. The proposal site has a number of characteristics that make it suitable for the development of a solar farm. Most notably, its location is within close vicinity to an existing transmission line and electricity substation with good connection capacity.<br>Other characteristics include:<br>• Excellent solar exposure.<br>• Excellent access to local and major roads.<br>• A low number of non-involved dwellings.<br>Further, the Oxley Solar Farm is largely reversible; at the end of the life of the solar farm, all above ground infrastructure would potentially be removed and agricultural land use activities could resume. |
| **Any submissions made in accordance with this Act or the regulations; and** | OSD would consider and, as necessary, respond constructively to any submission made in relation to the Oxley Solar Farm. Consultation with stakeholders that has been undertaken during the planning stages including the preparation of this EIS is summarised in Section 6. |
| **The public interest** | The Oxley Solar Farm is in the public interest for several reasons. The farm would produce up to 225MW. On an annual basis, the proposed Oxley Solar Farm would provide enough clean, renewable energy for about 81,000 average NSW homes while displacing approximately 400,000 metric tonnes of carbon dioxide.<br>The solar farm would provide the following benefits:<br>• Directly contribute to helping Australia in meeting the Renewable Energy Target.<br>• Reduce greenhouse gas emissions required to meet Australia's international climate conditions.<br>• Assist in the transition towards cleaner electricity generation.<br>• Generate economic benefits to the region, through the creation of direct and indirect jobs, supporting small business and by developing skills in a growing industry. |

| Provision | Relevance to the proposal |
|---|---|
| | OSD has undertaken community consultation to inform the community and stakeholders about the proposal and their opportunities to provide input into the assessment and development process. Consultation to date has been in favour of the proposal. Further details on the consultation process is provided in Section 6. |

### 5.5.2. Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In NSW, the concept has been incorporated into legislation including the *Environmental Planning and Assessment Act 1979* and Regulation and the *Protection of the Environment Administration Act 1991*.

Based on the likely costs and benefits of the proposed solar farm, the proposal is considered to comply with the principles of Ecologically Sustainable Development. ESD principles and their relationship to the design, construction and ongoing operations of the proposal are identified below.

Table 5-3 Assessment of the proposal against the principles of Ecologically Sustainable Development.

| |
|---|
| ***(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:***<br>***(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and***<br>***(ii) an assessment of the risk-weighted consequences of various options.*** |
| The precautionary principle has been adopted in the assessment of impact; all potential impacts have been considered and mitigated where a risk is present. Where uncertainty exists, measures have been included to address the uncertainty. A ‘worst case’ impact assessment has been undertaken to account for the uncertainty in the final impact footprint. |
| ***(b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*** |
| Potential impacts of the Oxley Solar Farm are likely to be localised and would not diminish the options regarding land and resource uses and nature conservation available to future generations. Importantly, the Oxley Solar Farm provides additional renewable energy that contributes to minimising the risk of climate change to current and future generations by reducing carbon emissions intensity of electricity generation.<br><br>The Oxley Solar Farm would potentially be decommissioned at the end of its operational life, removing all above ground infrastructure with the exception of the onsite substation. Decommissioning would therefore result in returning the site to its existing land capability for future generations. |
| ***(c) conservation of biological diversity and ecological integrity— namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*** |
| The impacts of the Oxley Solar Farm on biodiversity, including EPBC listed species, have been assessed in detail in the Biodiversity Assessment in Appendix D and are summarised in Section 7.1. This has included |

| |
|---|
| avoidance of areas of higher conservation value and management prescriptions to minimise and manage residual impacts. |
| ***(d) improved valuation, pricing and incentive mechanisms— namely, that environmental factors should be included in the valuation of assets and services, such as:***<br>***(i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and***<br>***(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, and***<br>***(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*** |
| Attributes of the proposal site such as the existing native vegetation, land capability, soil and hydrology have been valued in terms of their broader contribution to the catchment and catchment processes. Pollution risks have been assessed and would place any cost of remediation solely upon the proponent. |

The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in Section 9 provide an auditable set of environmental management commitment to these parameters. Based on the social and environmental benefits accruing from the Oxley Solar Farm at a local and broader level, and the assessed impacts on the environment and their ability to be managed, it is considered that the development would be ecologically sustainable within the context of ESD.

### 5.5.3. NSW Large-scale Solar Energy Guideline for State Significant Development 2018

The guideline provides the proponent and regulators with general guidance on the planning framework for the assessment and determination of state significant large-scale solar energy projects under the EP&A Act.

The objectives of the guideline are to:

- Provide guidance to the community, applicants, industry and regulators on how DPIE assesses environmental, social and economic impacts of state significant solar energy projects.
- Encourage industry to select suitable sites for projects to reduce the likelihood and extent of land use conflicts and environmental and social impacts.
- Facilitate better on-ground outcomes by promoting early identification of potential impacts.
- Promote meaningful, respectful and effective community and stakeholder engagement.
- Support the development of a sustainable solar industry in NSW by providing a clear, consistent and responsive policy framework.

The proposal has addressed the requirements of the guidelines through the assessment of environmental impacts (Sections 7 and 8), site suitability (Section 3.3), community and agency consultation (Section 6) and policy and framework requirements (Section 5).

## 5.6. APPROVALS AND LICENCES

The approvals and licence requirements for the proposal are summarised in Table 5-4. Any additional licences or approvals that may be required would be obtained prior to the commencement of relevant activities.

Table 5-4 Summary of licences and approvals required for the proposal.

| Legal instrument | Approving authority | Approval or licence |
|---|---|---|
| ***Environmental Planning and Assessment Act 1979 (Part 4)*** | DPIE | State significant development applications require approval from the Minister for Planning or the Independent Planning Commission. This EIS has been prepared in accordance with the requirements of the Secretary of the DPIE. |
| ***Roads Act 1993 (Section 138)*** | Armidale Regional Council, TfNSW | Any works to public or classified roads require consent under this Act from the roads authority. Armidale Regional Council is the roads authority for Gara Road. Transport for NSW is the road authority for Waterfall Way (Grafton Road). |
| ***Crown Lands Management Act 2016*** | DPIE | Works on Crown Land Including Crown Roads and Traveling Stock Reserves. |

Note, if it is determined that additional licences or approvals are required, the proponent would obtain these prior to commencement of relevant activities.

# 6. CONSULTATION

## 6.1. AGENCY CONSULTATION

### 6.1.1. Secretary's Environmental Assessment Requirements (SEARs)

As the proposal is classified as SSD, a Scoping Report (NGH, 2019) was prepared, and SEARs were requested. These were provided by DPIE on 2 August 2019 (Appendix A). The SEARs are intended to guide the structure and content of this EIS and reflect the responsibilities and concerns of NSW government agencies in relation to the environmental assessment of the proposal.

The following sections provide a summary of the SEARs from the various agencies and cross reference where specific issues are addressed within this EIS.

Table 6-1 SEAR's and section they are addressed in this EIS.

| Issue summary | Addressed in this EIS |
|---|---|
| **The Environmental Impact Statement (EIS) for the development must comply with the requirements in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* The EIS must include the following:** | |
| • a stand-alone executive summary | An executive summary is provided at the beginning of this EIS. |
| • a full description of the development, including:<br>• details of construction, operation and decommissioning;<br>• a site plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of separate approvals process);<br>• a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development. | The proposal is fully described in Section 4 including details of construction, operation and decommissioning.<br>A site plan is included as Figure 1-9. No infrastructure within this plan is part of a separate approvals process.<br>A detailed constraints map updated throughout the assessment process and used to inform the design is provided as Figure 1-10. |
| • a strategic justification of the development focusing on site selection and the suitability of the proposal site with respect to potential land use conflicts with existing and future surrounding land uses (including other proposed or approved solar farms, rural residential development and subdivision potential) | A strategic justification for the proposal is outlined in Section 3 including site selection and suitability of the proposal site.<br>Section 7.7 addresses the proposal sites potential land use conflicts with existing and future surrounding land uses. |
| • an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including: | Detailed information regarding environmental legislation relevant to the proposal is included in Section 5. |

| Issue summary | Addressed in this EIS |
|---|---|
| ○ a description of the existing environment likely to be affected by the development;<br>○ an assessment of the likely impacts of all stages of the development, (which is commensurate with the level of impact), including any cumulative impacts of the site and existing or proposed developments in the region (including the approved Metz Solar Farm and the proposed New England, Salisbury Plains, Tilbuster, Olive Grove and Stringybark Solar Farms), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice.<br>○ 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).<br>○ a description of the measures that would be implemented to monitor and report on the environmental performance of the development. | Commensurate with the level of risk, detailed assessment, mitigation and monitoring are included in Section 7 and Section 8. |
| • a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; | A consolidated set of mitigation measures is included in Section 9.2. |
| • the reasons why the development should be approved having regard to:<br>○ relevant matters for consideration under the *Environmental Planning and Assessment Act 1979*, including the objects of the Act and how the principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development;<br>○ the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses; and<br>○ feasible alternatives to the development (and its key components), including the consequences of not carrying out the development. | Key matters under the EP&A Act and ESD principles are addressed in Section 5.5.<br>A summary of feasible alternatives and why the proposal should be approved is included in Section 3.<br>A summary of suitability of the proposal with respect the potential land use conflicts and surrounding land use is included in Section 3.3 and 7.7. |
| • A detailed consideration of the capability of the project to contribute to the security and reliability of the electricity system in the National Electricity Market, having regard | Consideration of the proposal's capability to contribute to the National Electricity Market is addressed in Section 2. |

| Issue summary | Addressed in this EIS |
|---|---|
| to local system conditions and the Department's guidance on the matter. | |
| • The EIS must also be accompanied by a report from a suitably qualified person providing:<br>○ a detailed calculation of the capital investment value (CIV) (as defined in clause 3 of the Regulation) of the proposal, including details of all assumptions and components from which the CIV calculation is derived<br>○ certification that the information provided is accurate at the date of preparation. | The Capital Investment Report has been provided separately to DPIE.<br>Certification by the authors precedes the Executive Summary, page i. |
| • The development application must be accompanied by the consent in writing of the owner/s of the land (as required in clause 49(1)(b) of the Regulation). | Landowners consent has been provided separately to DPIE. |
| **The EIS must address the following specific issues:** | |
| • **Biodiversity** – including:<br>○ an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the _Biodiversity Conservation Act 2016_ (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless OEH and DPE determine that the proposed development is not likely to have any significant impacts on biodiversity values;<br>○ the BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM. | A Biodiversity Development Assessment Report (BDAR) has been completed and is summarised in Section 7.1. The BDAR is provided in full in Appendix D. |
| • **Heritage** – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including consultation with the local Aboriginal community in accordance with the _Aboriginal Cultural Heritage Consultation Requirements for Proponents_; | An Aboriginal Cultural Heritage report (ACHA) has been completed and is summarised in Section 7.4. The ACHA is provided in full in Appendix G.<br>Consultation undertaken as part of the ACHA is included in Section 6.2.<br>Historic heritage is addressed in Section 8.5. |
| • **Land** – including:<br>○ an assessment of the potential impacts of the development on existing land | An assessment of agricultural land impacts is included in Section 7.7. |

| Issue summary | Addressed in this EIS |
|---|---|
| uses on the site and adjacent land, including:<br>▪ a consideration of agricultural land, flood prone land, Crown lands (including Crown Reserve 566), mining, quarries, mineral or petroleum rights, and traveling stock route and Oxley Rivers National Park;<br>▪ a soil survey to determine the soil characteristics and consider the potential for erosion to occur; and<br>▪ a cumulative impact assessment of nearby developments;<br>○ an assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including:<br>▪ consideration of the zoning provisions applying to the land, including subdivision, and;<br>▪ completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's Land Use Conflict Risk Assessment Guide; and<br>○ a description of measures that would be implemented to remediate the land following decommissioning in accordance with *State Environmental Planning Policy No 55 - Remediation of Land.* | An assessment on the impact of flood prone land is included in Section 7.3.<br><br>An assessment of the impacts on Crown Lands has been included in Section 7.7.<br><br>An assessment of the potential for erosion to occur is included in Section 8.2 and a soil survey is committed to prior to construction to inform remediation of impacts from construction, operation and decommissioning.<br><br>Cumulative impacts are considered in Section 8.10.<br><br>Consideration of the zoning provisions including subdivision is provided in Section 5.2.2. A subdivision is only required for the substation to be operated by Transgrid onsite.<br><br>A Land Use Conflict Risk Assessment is included in Section 7.7.<br><br>Land remediation following decommissioning is addressed in Sections 5.2.1 and 7.7. |
| • **Visual –** including an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners; | An assessment of visual impact, has been included in Section 7.2 and Appendix E.<br><br>A draft landscaping plan has been proposed in Section 7.2 and shown on the infrastructure map Figure 1-9. Consultation has commenced with affect landowners summarised in Section 6.3. |
| • **Noise –** including an assessment of the construction noise impacts of the development in accordance with the Interim *Construction Noise Guideline* (ICNG), operational noise impacts in accordance with the *NSW Noise Policy for Industry 2017* and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria; | A Construction and Operational Noise and Vibration assessment has been completed and has been summarised in Section 7.5. The full noise assessment is provided as Appendix H. A draft noise management plan has been provided in Appendix I. |

| Issue summary | Addressed in this EIS |
|---|---|
| • **Transport** – including:<br>○ an assessment of the peak and average traffic generation, including over-dimensional vehicles and construction worker transportation;<br>○ an assessment of the likely transport impacts to the site access route (including New England Highway, Waterfall Way (Grafton Road), Gara Road and Silverton Road), site access point(s), any Crown land, particularly in relation to the capacity and condition of the roads;<br>○ a cumulative impact assessment of traffic from nearby developments;<br>○ a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required); and<br>○ a description of the measures that would be implemented to mitigate any transport impacts during construction; | A Traffic Impact Assessment (TIA) was completed and is summarised in Section 8.3. The full TIA is provided as Appendix J.<br>Proposed road upgrades are outlined in Section 4.6.4. |
| • **Water** – including:<br>○ an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Gara River and Commissioners Waters (and their tributaries), drainage channels, wetlands, riparian land, farm dams, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts;<br>○ details of water requirements and supply arrangements for construction and operation; and<br>○ 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); | An assessment if water impacts is provided in Section 7.3 and Section 8.1.<br>Details of water requirements and supply are detailed in Section 8.1.<br>A description of erosion and sediment control measures are provided in Section 8.2.3. |
| • **Hazards and Risks** including:<br>○ a preliminary risk screening in accordance with *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33* (DoP, 2011), and if the preliminary risk screening indicates the development is "potentially | A preliminary risk screening is provided in Section 8.8. A PHA is not required.<br>An assessment of bush fire risks is included in Section 8.7.<br>An assessment of electric and magnetic fields is included in Section 8.6. |

| Issue summary | Addressed in this EIS |
|---|---|
| hazardous", a Preliminary Hazard Analysis (PHA) must be prepared in accordance with Hazard Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011); and<br>○ an assessment of all potential hazards and risks including but not limited to bushfires, spontaneous ignition, electromagnetic fields or the proposed grid connection infrastructure (including 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*; | An assessment of potential hazards is included in Section 8.8. |
| • **Socio-Economic** – including an assessment of the likely impacts on the local community and a consideration of the construction workforce accommodation; | An assessment on potential socio-economic impacts of the proposal is included in Section 7.7. |
| • **Waste** - identify, quantify and classify the likely waste stream to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste. | An assessment on potential waste impacts of the proposal is included in Section 8.4. |
| **The EIS consultation process includes:** | |
| • During the preparation of the EIS, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders. | Consultation is summarised in Section 6. |
| • In particular, you must undertake detailed consultation with affected landowners surrounding the development and Armidale Regional Council. | Consultation is summarised in Section 6. |
| • The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided. | Issues raised during consultation and how they are addressed in this EIS are included in Section 6. |

| Issue summary | Addressed in this EIS |
|---|---|
| • If you do not lodge a development application and EIS for the development within 2 years of the issue date of these SEARs, you must consult further with the Secretary in relation to the preparation of the EIS. | The EIS has been lodged within this timeframe. |

### 6.1.2. Relevant guidelines

Table 6-2 Guidelines and section they are addressed in this EIS.

| Guideline | How the guideline has been addressed? |
|---|---|
| **Biodiversity** | |
| Biodiversity Assessment Method (OEH) | Biodiversity Assessment, Section 7.1 and Appendix D. |
| Threatened Species Assessment Guidelines - Assessment of Significance (OEH) | |
| *Biosecurity Act 2015* | |
| Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI) | Water assessment and mitigation measures, Section 7.3 and Section 8.1. |
| Policy and Guidelines for Fish Habitat Conservation and Management (DPI) | |
| **Heritage** | |
| Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH) | Heritage assessment, Section 7.4, Section 8.5, and Appendix G. |
| Code of Practice for Archaeological Investigations of Objects in NSW (OEH) | |
| Guide to investigating, assessing and reporting on aboriginal cultural heritage in NSW (OEH). | |
| NSW Heritage Manual (OEH) | |
| **Land** | |
| Primefact 1063: Infrastructure proposals on rural land (DoI – L&W) | Land use, Section 7.7. |

| Guideline | How the guideline has been addressed? |
|---|---|
| Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry (ARENA) | Social and economic impacts, Section 7.6. |
| *Local Land Services Act 2013* | Biodiversity assessment, Section 7.1 and Appendix D. |
| Australian Soil and Land Survey Handbook (CSIRO) | Land and soil assessment Section 8.2<br>Land use, Section 7.7. |
| Guidelines for Surveying Soil and Land Resources (CSIRO) | |
| The land and soil capability assessment scheme: second approximation (OEH) | |
| Land Use Conflict Risk Assessment Guide (DoI – L&W) | Land use, Section 7.7. |
| **Noise** | |
| NSW Noise Policy for Industry (EPA) | Construction and Operational Noise and Vibration assessment, Section 7.5 and Appendix H. |
| Interim Construction Noise Guideline (EPA) | |
| NSW Road Noise Policy (EPA) | |
| **Light** | |
| Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring (DPE) | NA- the proposal site isn't located within the Dark Sky Planning Guideline region. |
| **Transport** | |
| Guide to Traffic Generating Developments (RTA) | Proposal description, Section 4.<br>Traffic assessment, Section 8.3 and Appendix J. |
| Austroads Guide to Road Design & relevant Australian Standards | |
| Austroads Guide to Traffic Management | |
| **Water** | |
| Managing Urban Stormwater: Soils & Construction (Landcom) | Land and soil assessment Section 8.2<br>Land use, Section 7.7.<br>Water assessment and mitigation measures, Section 7.3 and Section 8.1. |

| Guideline | How the guideline has been addressed? |
| --- | --- |
| Floodplain Development Manual (OEH) | Proposal description, Section 4.<br>Water and flooding assessment and mitigation measures, Section 7.3 and Section 8.1. |
| Guidelines for Controlled Activities on Waterfront Land (DPI Water) | |
| Water Sharing Plans (DPI Water) | |
| Floodplain Management Plan (DPI Water) | |
| Guidelines for developments adjoining land and water managed by OEH (OEH) | |
| Guidelines for Watercourse Crossings on Waterfront Land (DPI Water) | |
| **Hazards and Risks** | |
| Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DPE) | Hazard assessment, Section 8.8. |
| Multi-Level Risk Assessment (DPE) | |
| State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP, 2011) | |
| **Waste** | |
| Waste Classification Guidelines (EPA) | Resource use and waste generation, Section 8.4. |
| **Electric and Magnetic Interference** | |
| ICNIRP Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields | Electric and magnetic fields, Section 8.6. |

### 6.1.3. Agencies consultation

As part of preparing the EIS for the development applications, the SEAR's require that the relevant State or Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders be consulted.

OSD has undertaken consultation with Transgrid, Transport for NSW and Armidale Council. The consultation is summarised in Table 6-3. The proposal is unlikely to impact on any exploration licence holders, quarry operators and mineral title holders. Therefore, consultation has not been undertaken with these stakeholders.

Extensive consultation has been undertaken with the community, community groups and affected landowners. This consultation is summarised in Section 6.3.

Table 6-3 Summary of consultation with agencies.

| Agency | Summary of consultation |
|---|---|
| **TransGrid** | Communication between OSD and TransGrid regarding technical aspects for the grid connection have been occurring since March 2019. These negotiations and discussion are continuing and are ongoing. |
| **Transport for NSW** | Transport for NSW has been consulted with as part of the preparation of the Traffic Impact Assessment (Appendix J), specifically for the design of the site access intersection with Waterfall Way (Grafton Road). |
| **Armidale Regional Council** | Armidale Regional Council were informed of the proposed scope, extent and timing of proposal late 2018. Consultation and updates regarding the project have been ongoing through phone calls, newsletters and emails.<br>NGH has consulted with the heritage section of council to get some further information regarding the site to inform the historic heritage impact assessment (refer to Section 8.5).<br>Council has been consulted with as part of the preparation of the Traffic Impact Assessment (Appendix J), specifically for the upgrades required along Gara Road within the proposal site. |
| **DPIE - Crown Lands** | OSD has undertaken consultation with Crown Lands in regard to the travelling stock reserve along Waterfall Way (Grafton Road) and Crown roads onsite. |

## 6.2. ABORIGINAL COMMUNITY CONSULTATION

The consultation with Aboriginal stakeholders was undertaken in accordance with Clause 60 of the *National Parks and Wildlife Regulation 2019* following the consultation steps outlined in the ACHCRP guide. The guide outlines a four-stage process of consultation as follows:

- Stage 1 – Notification of project proposal and registration of interest
- Stage 2 – Presentation of information about the proposed project
- Stage 3 – Gathering information about the cultural significance
- Stage 4 – Review of the draft cultural heritage assessment report

The full list of consultation steps, including those groups and individuals that were contacted and a consultation log, is provided in the ACHA (Appendix G). A summary of actions carried out in following these stages are as follows.

**Stage 1.** Letters outlining the proposed works and the need to undertake survey were sent to the Armidale LALC, and various statutory authorities including the Biodiversity and Conservation Division within DPIE (formally the Office of Environment and Heritage, now Heritage NSW), as identified under the ACHCRP. An advertisement was placed in the local newspaper, the *Armidale Express* on the 28th of August 2019 seeking registrations of interest from Aboriginal people and organisations. A further series of letters was sent to other organisations identified by the Biodiversity and Conservation Division within DPIE in correspondence with NGH. In each instance, the closing date for submission was 14 days from receipt of the letter.

As a result of this process, seven groups and one individual actively registered their interest in the proposal, as listed below.

- Armidale Local Aboriginal Land Council (Armidale LALC);
- Nunnawanna;
- Anaiwan Traditional Owners Aboriginal Corporation;

- Larissa Ahoy;
- Iwatta Aboriginal Corporation;
- Armidale NE Gumbaynggir Descendants;
- Nyakka Aboriginal Cultural Heritage Corporation; and
- DFTV Enterprises.

No other party registered their interest.

**Stage 2.** On the 27th of March 2020, an Assessment Methodology document was sent to the Registered Aboriginal Parties (RAPs) as listed above for review and comment. This document provided details of the background to the project, a summary of previous archaeological surveys and the proposed heritage assessment methodology for the project. The document invited comments regarding the proposed methodology and also sought any information regarding known Aboriginal cultural significance values associated with the subject area and/or any Aboriginal objects contained therein. A minimum of 28 days was allowed for a response to the document.

None of the registered parties raised any objections to the methodology and all registered parties expressed interest in participating in fieldwork.

**Stage 3.** The Assessment Methodology included a written request to provide any information that may be relevant to the cultural heritage assessment of the study area. It was noted that sensitive information would be treated as confidential. No response regarding particular cultural information was received. Iwatta advised there was an Aboriginal Ceremony route that may run through or near the Oxley Solar Farm alignment and therefore prevalence of lithic artefacts throughout the area was anticipated to be high.

At this stage, the survey fieldwork was organised, and five of the RAPs were invited to participate in the survey fieldwork as selected by the Proponent. The survey fieldwork was carried out in May 2020 by two archaeologists from NGH accompanied by representatives from the following groups:

- Armidale Local Aboriginal Land Council - Colin Ahoy;
- Nunnawanna - Tyson Ahoy;
- Iwatta AC - Steven Ahoy and Jocelyn Blair (rotated personnel throughout the survey works);
- Armidale NE Gumbaynggir Descendants – Bruce Cohen and David Green (David participated as an unpaid trainee for some of the days); and
- Nyakka Aboriginal Cultural Heritage Corporation - Rhonda Kitchener and Robert Kitchener (Robert participated as an unpaid trainee on one of the days).

**Stage 4.** In October 2020, a draft version of this Aboriginal Cultural Heritage Assessment report for the proposal (this document) was forwarded to the registered parties inviting comment on the results, the significance assessment and the recommendations. A minimum of 28 days was allowed for responses to the document.

### 6.2.1. Aboriginal Community Feedback

The consultation with Aboriginal stakeholders was undertaken in accordance with clause 60 of the *National Parks and Wildlife Regulation 2019*. The draft report was provided to each of the RAPs and feedback was sought on the recommendations, the assessment and any other issues that may have been important.

No comments on the draft ACHA report were received from the RAPs for the project. The report has since been updated based on the revised project design and a copy of the revised report will be sent to all RAPs for comment and review. Owing to the restricted timeline of the EIS, while all review of the revised report will be subject to another 28-day review period, comments received will be incorporated in the subsurface testing ACHA report.

Owing to the proposed layout undergoing modification since this review of the draft report, NGH has redistributed the updated draft version of the report to each of the RAPs for review and comment. A minimum of 28 days will be allowed for review and comment on this draft by the RAPs. However, owing to EIS submission timeline being concurrent with this secondary review period, it should be noted that any amendments or comments on this report will be addressed in the test excavation report and these recommendations herein are contingent on the findings and recommendations discussed in the test excavation report

## 6.3. COMMUNITY CONSULTATION

OSD has undertaken consultation with the community in developing the proposal in line with the Australian Renewable Energy Agency's (ARENA's) *Establishing the social license to operate large scale solar facilities in Australia: insights from social research for industry* (ARENA, n.d.).

Consultation activities were informed by *Beyond Public Meetings: Connecting community engagement with decision making* (Twyford Consulting, 2007), *Draft Large Scale Solar Energy Guideline for State Significant Development* (NSW Government, 2017) and *Large-scale solar energy guideline for state significant development December 2018* (NSW Government, 2018).

Professional community engagement consultancy, OPF Consulting (OPF), was appointed to support OSD's consultation activities. OPF has IAP2 qualified community engagement practitioners to ensure that the consultation process reflects the increased difficulty of engagement during the current pandemic.

### 6.3.1. Community Consultation Plan

Effective engagement requires an understanding of community stakeholders and prioritisation of potential impacts. In order to contribute effectively, the community needs to understand the proposal and specific areas of interest to them. The aim of the consultation process for Oxley Solar Farm has been to provide the community with the required information to engage effectively.

A Community Consultation Plan (CCP), was developed for the proposal. This was updated to an adaptive community engagement plan with input from a community consultation expert, *19-484 Oxley Solar Farm Community Engagement Plan* (NGH, 2019). The CCP identified ways to inform the community about Oxley Solar Farm and facilitate engagement within the community.

The CCP identified:

- Community stakeholders for the project.
- Issues / risks related to the engagement of each stakeholder group.
- A consultation strategy for each stakeholder group.

Stakeholders were identified as those potentially being impacted by the solar farm proposal or having an interest in the proposal.

Table 6-4 Stakeholders identified in the CCP.

| | |
|---|---|
| **1. Adjacent neighbours** | Two residences are located close to the site. These residences are owned by the landowner and are therefore project-involved. |
| **2. Near neighbours and residents of Oxley Solar Farm** | There are 30 residences within 2km of the proposal site. |
| **3. Local Businesses** | Local businesses in the regional city centre of Armidale. |
| **4. Representative bodies** | Representatives of groups such as: Armidale Regional Council; Armidale Chamber of Commerce; Armidale Local Aboriginal Land Council. |
| **5. Agencies** | Agencies such as Transport for NSW; Rural Fire Service; Office of Environment and Heritage; National Parks and Wildlife Service; Environment Protection Authority; Department of Industry – Water; Department of Industry – Crown Land. |
| **6. Special interest groups** | Groups with special interests such as Sustainable Living Armidale; The Tourism Group Armidale; National Parks Association of NSW (Armidale branch); Armidale Local Aboriginal Land Council. |
| **7. Broader community** | People living and working in and around Armidale. |

Note: Aboriginal community stakeholder identification and consultation is guided by the Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH, 2010) and is documented separately in Section 7.4.

### 6.3.2. Community and stakeholder consultation activities to date

In accordance with the CCP (NGH, 2019), OSD and community engagement consultancy, OPF Consulting (OPF) offered a range of community engagement methods including.

- Face to face meetings with OSD and OPF community liaison team members.
- Videoconference meetings with OSD and OPF representatives.
- Telephone calls with OSD and OPF community liaison team members.
- Emails and calls to key stakeholders and special interest groups – e.g. Armidale City Council, Sustainable Living Armidale, National Parks Association and Armidale Local Aboriginal Land Council.
- Three advertisements placed in the print and digital version of the Armidale Express in the two weeks leading up to the information session.
- A media release published on the Armidale Express website and across local radio stations promoted the information session.
- A newsletter distributed to letterboxes within 5km of the proposal site.
- Attendance at an information session (together with NGH) open to stakeholders over 7 hours in Armidale on August 6, 2020.
- A dedicated community email and phone number for stakeholders to contact OSD with questions, concerns or feedback.
- A dedicated community webpage for the Oxley Solar Farm which promoted all engagement activities and how this relates to the planning process detailed the proposed methods for communication. The website also provides details about OSD, details of the project, contact details and opportunity to be provided updates about the project by joining the project mailing list. The website can be found at:
    - https://www.oxleysolarfarm.com.au/

Table 6-5 Engagement method by stakeholder group, as identified in the CCP:

| | Direct email, letter or call | Advertisements | Project update delivered to letterbox | Publicity in the newspaper and on radio | Website |
|---|---|---|---|---|---|
| **Adjacent Neighbours** | | Yes | Yes | Yes | Yes |
| **Near neighbours and residents** | | Yes | Yes | Yes | Yes |
| **Small local business** | Yes | Yes | | Yes | Yes |
| **Representative bodies** | Yes | Yes | | Yes | Yes |
| **Agencies** | Yes | Yes | | Yes | Yes |
| **Special interest groups** | | Yes | | Yes | Yes |
| **Broader community** | | Yes | | Yes | Yes |

Table 6-6 Community and stakeholder consultation chronology.

| Date (2020) | Activity |
|---|---|
| January 2019 and ongoing | Emails, calls and meetings with residents to provide updates and capture feedback as required. |
| 21 April 2019 | Proposal information newsletter emailed to National Parks Association of NSW, Armidale Branch and Sustainable Living Armidale. |
| 14 July 2020 | Brief provided to Will Winter, Principal Advisor, Economic Development at Armidale Regional Council. |
| 20 July 2020 | The Community Information page of the Oxley Solar Farm website was updated with fresh information, contact details, details of the information session and a subscription link to register for future information/project updates. |
| 27 July 2020 | Media release promoting the information session was issued to local radio stations 2ARM and 2AD and local newspaper the Armidale Express. |
| 28 July 2020 | The OSD media release is reported on local Armidale radio. |
| 29 July 2020 | The OSD media release is published on the Armidale Express website. |
| 29 July 2020 | Advertisement placed in Armidale Express (print and digital) promoting the information session and project contact details. |
| 29 July 2020 | A project update newsletter is delivered by Australia Post to all dwellings within 5km of the proposed Oxley Solar Farm site. It provided a project update, details about the upcoming information session and encouraged neighbours to get in touch. |
| 29 July 2020 | Stakeholders who had registered their interest received the project update newsletter. |

| Date (2020) | Activity |
|---|---|
| 29 July 2020 | Special interest groups received the Project Update newsletter. |
| 31 July 2020 | Advertisement placed in Armidale Express (print and digital) promoting all community feedback options including the information session. |
| 5 August 2020 | Advertisement placed in Armidale Express (print and digital) promoting all community feedback options including the information session. |
| 6 August 2020 | Community information session is held at Hughes House Community Centre in Armidale. |
| 1 September 2020 | Email sent to nine nearby residences offering follow up property visits. The residences contacted had had attended the information session, or contacted the developer, and expressed concern about the development and its impact on their property, in particular their visual amenity. |
| 17 September 2020 | Undertook property visits with four nearby residences that accepted the offer. The four meetings were used to further discuss the stakeholders' concerns and take photos of the site from their property, where appropriate. |
| Ongoing | Managing the community email address and information line |

### 6.3.3. Results of community consultation

This section details the results of the community consultation up to and including the 2 December 2020. Stakeholders were engaged by or made contact with OSD as outlined in Table 6-7.

Table 6-7 Engagement activities with the community by OSD and contact made by the public.

| *Engagement Activities* | Occurrences of contact or feedback opportunities |
|---|---|
| *Public displays/information session attendance (includes 20 feedback forms completed)* | 35 |
| *Email OUT to stakeholders* | 54 |
| *Email IN to OSD* | 36 |
| *Meeting/site visit/face to face* | 4 |
| *Phone call IN to OSD* | 3 |
| *Media – Coverage* | 2 |
| *Phone call OUT to stakeholder* | 3 |
| *Website Form IN to OSD* | 1 |
| *Onsite property meetings* | 4 |
| ***Total*** | **142** |

Of the 142 occurrences of contact or feedback opportunities with or by stakeholders to date including calls, emails and feedback forms following attendance at the information session, there were:

- 11 Positive about the proposal
- 100 Neutral about the proposal
- 31 Negative about the proposal

## August information session results

Feedback forms were distributed at the community information session in Armidale on August 6 2020. Of the 35 attendees, 20 feedback forms were completed during and after the information session. Four were from local business representatives, one from a local organisation and 15 from residents. The results on the feedback forms are shown below.

The locality of attendees that completed the feedback forms in relation of the proposal site included:

- Four attendees located 1-2 km from the proposal site.
- Two attendees located 2-5km from the proposal site.
- Eight attendees located greater than 5km from the proposal site
- Two attendees were not from the proposal site area.

The feedback forms found that the people that attended the open house were interested in a number of areas in regards to the project including environmental and social impacts, renewable energy generation, local employment and supplier opportunities and general information about the project. The full list is provided below (Figure 6-1).

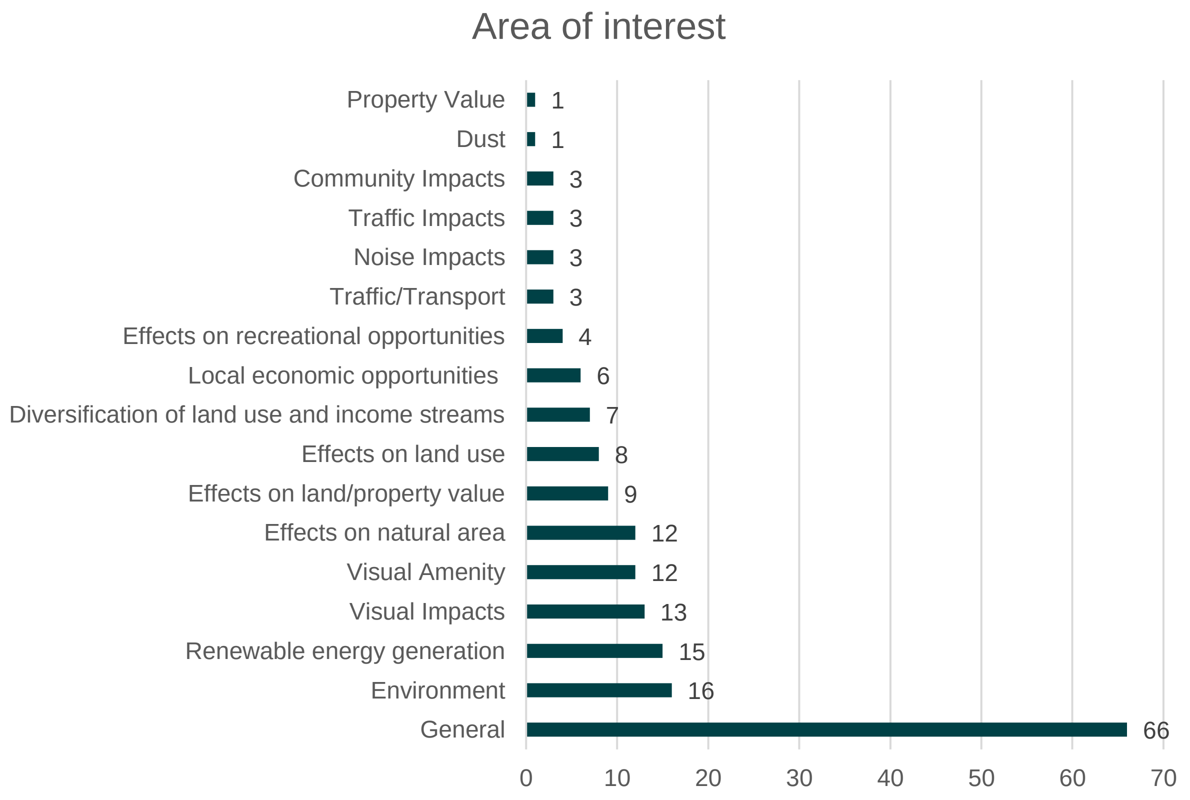



Figure 6-1 Areas of interest identified by stakeholders.

The attendees outlined that they like the local economic opportunities (6 forms), renewable energy component (15 forms) and diversification of the land (7 forms) that solar farms can develop. The concerns regarding solar farms in general are outlined in Figure 6-2, they mostly relate to environmental and social impacts as well as the foreign ownership of these kind of developments.

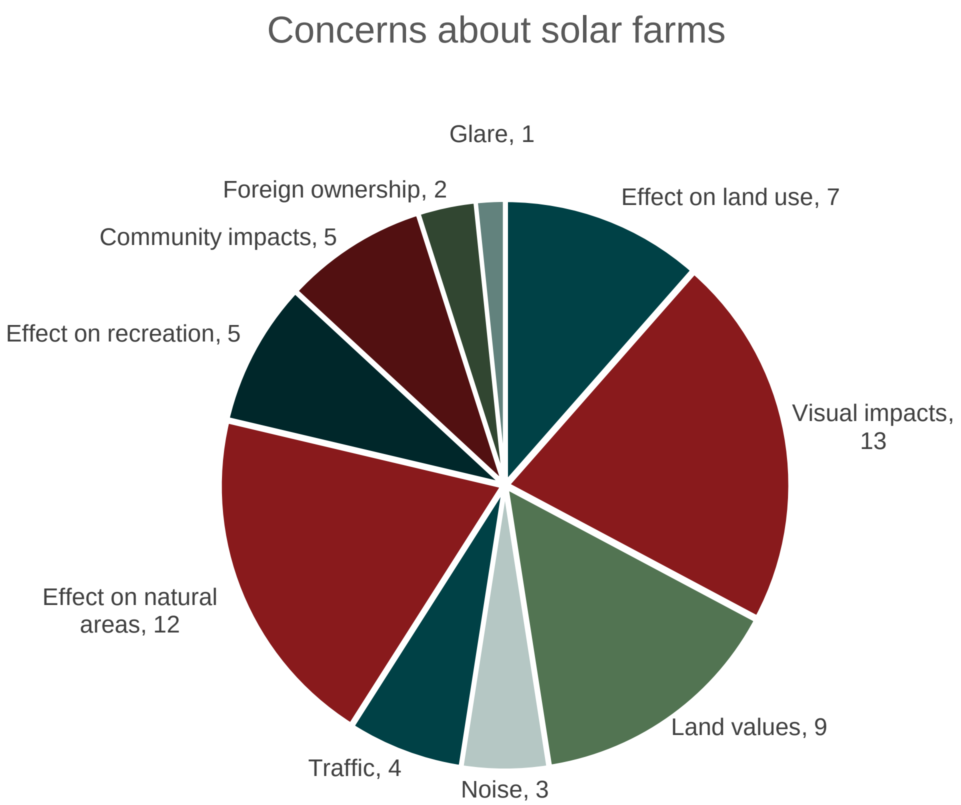



Figure 6-2 Concerns raised in feedback forms about solar farms in general.

Of the feedback forms, 16 out of the 20 completed during or following the information session included open comment. Four of these feedback forms expressed positive support citing the potential for business opportunities, revegetation potential, and the benefits of renewable energy.

Areas of interest or concerns raised on the feedback forms related to the proposal are outlined in Table 6-8. As per the concerns of solar farms in general, the concerns regards the Oxley Solar Farm is environmental and social impacts and foreign ownership.

Table 6-8 Concerns expressed in open questions of the information session feedback form.

| Issue | Number of times issue raised |
|---|---|
| Visual impacts for residents | 4 |
| Traffic | 2 |
| Property values | 2 |
| Location | 2 |
| Foreign ownership | 2 |
| Bushfire management | 2 |
| Water management | 1 |
| The environment | 1 |
| Screening opportunities | 1 |

| Issue | Number of times issue raised |
|---|---|
| Glare | 1 |
| Fencing | 1 |
| Erosion | 1 |

## September stakeholder meeting results

The results of the four property meetings undertaken in September 2020 are outlined below in Table 6-9. The four meetings were used to further discuss the stakeholders' concerns and take photos of the site from their property, where appropriate.

Table 6-9 Property meeting results

| Key issue | Specific concerns/comments |
|---|---|
| **Project process/viability** | • Stakeholders mentioned other projects in the area that seemed to have stalled or not progressed.<br>• Concerns about the approval processes relating to other projects which have left stakeholders "in the dark".<br>• Concerns that the area has quite a lot of dense mist and fog, which is not ideal for solar. |
| **Visual** | • Concerns about the site's proximity to properties and potential views of panels.<br>• Concerns about the final location of the panels and infrastructure.<br>• Stakeholders mentioned that they purposely left the view of the impacted area free of trees so they could enjoy the view and were concerned this would be impacted.<br>• Concerned about the visual impact the solar farm would have, and its impact on the value of their property.<br>• Concerns about the impact on the Blue Hole recreation area and visitation due to visual impacts.<br>• Traditional mitigation options were discussed with landowners where relevant. |
| **Fire Safety** | • Stakeholders felt that the area around Blue Hole is a high fire risk and was noted as a high bushfire risk zone for next year.<br>• Concerned about a perceived increased fire risk in the area due to the potential for grass fires. Asked questions about the project's grass maintenance. |
| **Ownership** | • Requested more detail on the owners of OSD.<br>• Stakeholders expressed frustration that there was little information available about the developers' ownership and were worried about how the commitments made in the EIS stage would be fulfilled if a company goes bankrupt. |
| **Erosion/earthworks** | • Felt erosion would be a big issue for the site and were concerned about the run-off.<br>• Interested to know if there was a soil specialist employed as part of the process as the area was quite prone to erosion. Also interested in how qualified the specialists will be.<br>• Queried how much excavation would be needed. |
| **Recycling and waste management** | • Wanted to know more about the recycling options that were being considered for the project. Concerned only aluminium parts were recycled and the panels mostly went into landfill. |

| Key issue | Specific concerns/comments |
|---|---|
| **Site Selection** | • Stakeholders don't believe the site is suitable for the proposed solar farm due to its proximity to the national park, the slope of the area, waterways and other environmental aspects.<br>• Queried why this site was selected. |
| **Koala Habitat Protection State Environmental Planning Policy (SEPP) 2019** | • Interested in how the new Koala SEPP would impact the project as the area has quite a few koalas. |
| **Grazing Land** | • Expressed concern that good grazing land was being used for solar. |

### 6.3.4. Response to community feedback

The issues raised by the community have been considered from the early planning of the proposal and continued into the preparation of this EIS, seeking advice from specialists as required. This section provides a summary of where the issues raised during consultation to date have been addressed. The EIS has responded to all issues raised to date and the proponent thanks the community for their contribution to identifying these issues for further detailed investigation.

Table 6-10 Response to community feedback.

| Key Issue | Specific concerns/comments | Addressed within the EIS |
|---|---|---|
| Visual impacts and property values | • Visual impacts for adjacent neighbours.<br>• Potential for tree planting for mitigation on neighbouring land.<br>• Proposed fencing visual impact.<br>• Ruins views.<br>• Need to minimise visual impacts.<br>• Impacts on views from the national park recreational areas and walking tracks. | During community consultation, it was noted approximately 25% of respondents identified landscape and views were the reason for living in the area. Visual impacts were among the concerns raised by the community. This included visual impacts from residences but also from Oxley Wild Rivers National Park and its recreational areas including Blue hole and picnic areas<br>This information help informed the VIA which has been prepared for the proposal, Appendix E and summarised in Section 7.2. The VIA has assessed the visual impact of the proposal on adjacent landowners, public places and recreational areas. A landscaping plan has been proposed.<br>OSD has commenced discussions with landowners regarding screening options on affected landowners properties. Discussions will continue with adjacent landowners as the proposal progresses. |
| Socio-economic | • Effects on recreational opportunities.<br>• Community impacts. | Socio-economic potential impacts from the proposal are discussed in Section 7.6. |

| Key Issue | Specific concerns/comments | Addressed within the EIS |
|---|---|---|
| Land impacts | • The site is prone to erosion. Will soil specialists be part of the process and what are their qualifications.<br>• Queries about how much excavation would be needed.<br>• Use of agricultural land and replacing grazing land.<br>• Glare.<br>• Adjacent next to a national park that receives a large number of visitors each year.<br>• Dust specifically from traffic along Silverton Road and drivers not knowing how to correctly drive on dirt roads.<br>• Animal welfare and safety – grazing along Silverton Road that doesn't have fences, requested installing fences. | • Soils are discussed Section 8.2. It is a commitment of the EIS that a soil survey is undertaken prior to construction to inform Construction Environmental Management Plan (CEMP) and sub-plans, rehabilitation and operational aspects. The soil survey is required to be undertaken by a suitable qualification consultant.<br>• The proposal description in Section 4.6 outlines the amount of excavation required for the proposal. Proposal would not require substantial amounts of excavation. The solar panel frames are piled in. Earthworks are only required for the roads and footings of buildings.<br>• The impact on agricultural land is addressed in Section 7.7. The proposal is highly reversible and at the end of the solar farms operational life, the site can return to agricultural.<br>• Community consultation undertaken for the proposal helped understand the use of the National Park and its key attributes to the region. Potential impact on the National Park is addressed in Section 7.7.<br>• Potential impact of glare and glint is addressed in Section 8.2.<br>• Silverton Road is not proposed as an access for the proposal. Dust from unsealed roads is addressed in Section 8.9. Safety is addressed in Section 8.3. |
| Biodiversity | • Potential to offset impact by revegetation along creek line onsite.<br>• Could align council vision of vegetated corridors to enable fauna movement between remnant vegetation.<br>• Interested in planned tree plantings and screening of the project.<br>• Impact on connectivity of wildlife<br>• Impact of the *Koala Habitat SEPP 2019* on the project. | Biodiversity is addressed in Section 7.1 and Appendix D. It covers impact on connectivity and Koala habitat. |
| Water management | • Water use.<br>• Requirement to wash panels. | Water use is addressed in Section 8.1. Washing of panels may only occur during drought times due to dust. The water use required for washing panels has been considered within this EIS. |
| Traffic | • Increased traffic volume on Silverton Road.<br>• Silverton Road conditions for traffic.<br>• Collision risk of fauna along Silverton Road. | The proposal site would be accessed off Waterfall Way (Grafton Road).<br>Silverton Road is not proposed as an access point for the proposal. |
| Location | • Concerns about locality to residences.<br>• Cumulative impact of other renewable energy projects within the area. | A strategic justification for the proposal is outlined in Section 3 including site selection and |

| Key Issue | Specific concerns/comments | Addressed within the EIS |
|---|---|---|
| | • Justification for location and investigation into selecting the site.<br>• Concerns that the area has quite a lot of dense mist and fog, which is not ideal for solar. | suitability of the proposal site in regards to location and solar exposure.<br>Cumulative impacts are addressed in Section 8.10. |
| Project ownership | • Concerns about foreign ownership. | Information regarding the proponent is addressed in Section 1.2.4. |
| Bushfire management | • Stakeholders felt that the area around Blue Hole is a high fire risk and was noted as a high bushfire risk zone for next year.<br>• Concerned about a perceived increased fire risk in the area due to the potential for grass fires. Asked questions about the project's grass maintenance. | Bush fire is addressed in Section 8.7. |
| Consultation | • Previous consultation has been poor<br>• Will there be consultation during the construction phase | Consultation extended to include a website, dedicated email and telephone contacts, newsletters, a letter box drop, advertisements in local media, media releases, a seven-hour community information session and meetings with neighbouring residents of the proposed site at their properties. A summary consultation is addressed above in Section 6.3.2.<br><br>Stakeholders advised consultation will continue throughout all stages. |
| Project process | • Other projects in the area that seemed to have stalled or not progressed.<br>• Concerns about the approval processes relating to other projects which have left stakeholders "in the dark". | Community consultation events and activities have sought to ensure the community know the timing and opportunities for input into this project, but also better understand the SSD process that captures other utility scale solar proposals.<br>Cumulative impacts with other projects have been considered in Section 8.10 but it is noted that commercial decisions regarding the progress of other projects is beyond the ability of the proponent or NGH to respond. |
| Waste management | • Recycling options that were being considered for the project. Concerned only aluminium parts were recycled and the panels mostly went into landfill. | Waste management is addressed in Section 8.4. |

In addition to the community feedback informing the assessments of the EIS, the community feedback has also assisted in developing the proposal design and project benefits for the local community including:

- Screening opportunities onsite and on affected landowners properties.
- Local information regarding the visual, biodiversity, recreational and traffic attributes of the region.
- Contact details for local business, contractors and suppliers.
- Contact details for groups specialised in local vegetation and plants as well as landscaping and screening experience for solar farms.

OSD is currently developing a Community Fund to further share the benefits of the Oxley Solar Farm with the local community.

### 6.3.5. Continued engagement

The values of the local community and their specific concerns regarding solar farm development at the Oxley site have been considered in assessing the impacts of the proposal and developing measures to reduce adverse impacts and promote positive impacts of the proposal, in Section 9 of this EIS.

The CCP further aims to ensure that there is ongoing effective liaison with the community. Engagement activities in the CCP extend throughout the determination period, and emphasis would be placed on submissions received during the EIS exhibition period.

The CCP would be reviewed regularly, as well as at key transition phases of the proposal development (e.g. prior to construction or operation). The Plan would continue to guide engagement activities at all phases of the proposal, ensuring that engagement is appropriate and in line with good practice and proactive in maximising the benefits of the proposal to the local community.

# 7. ASSESSMENT OF KEY ISSUES

The key issues below are those identified in the Scoping Report (NGH 2019) and SEARs as requiring more detailed investigation.

- Biodiversity
- Visual amenity and landscape character
- Watercourses and hydrology
- Aboriginal Heritage
- Noise and Vibration
- Social and economic impacts
- Compatibility with existing land uses

For each key issue, the approach (usually by specialist assessment), existing environment (specific to each issue only as a general proposal site description is provided in Section 1.2.2), impact assessment and recommendations to manage each impact are detailed. The management recommendations form commitments of the project, pending project approval, and are summarised in Section 9.

The remaining issues, assessed generally by desktop assessment and verified to be highly manageable, are set out more briefly in Section 8. Where required, management recommendations are also included in Section 9.

To ensure transparency, the SEARs requirement is stated at the beginning of each section.

## 7.1. BIODIVERSITY (FLORA AND FAUNA)

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Biodiversity** – including:*
    - *an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless OEH and DPE determine that the proposed development is not likely to have any significant impacts on biodiversity values;*
    - *the BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM.*

NGH Environmental prepared a BDAR for the Oxley Solar Farm to address the requirements of the BAM and determine appropriate avoidance, minimisation, mitigation and offset requirements for the proposal. It has been prepared by accredited BAM assessors and uses a precautionary approach to address uncertainty.

### 7.1.1. Approach

Biodiversity impacts have been assessed through comprehensive mapping and assessment, completed in accordance with the BAM. The methods and results of the desktop assessment, Land Category Assessment, field surveys and offset calculations are presented below.

## Desktop assessment

The development site occurs within the Armidale plateau IBRA subregion and the dominant Mitchell Landscape within the development site is Moonbi – Walcha.

In terms of native vegetation extent in the locality, approximately 1456 ha of native vegetation occurs in the surrounding 1500 m buffer area. This constitutes approximately 44% of the buffer area. Approximately 1819 ha occurs as cleared areas within the 1500 m buffer around the development site. This constitutes approximately 56% of the buffer area.

The Development site is located directly east of the Commissioners waters and is traversed by the Gara River. Thirty-four 1st and 2nd order tributaries of Commissioners waters and the Gara River also traverse the Proposal Site. The Gara River and one of its adjoining tributaries within the Proposal site are listed as areas of high biodiversity value under the *Biodiversity Conservation Regulation 2017* (BC Regulation). No wetlands of international importance and no Ramsar wetlands would be impacted by the proposal.

The proposal site itself is largely cleared of native overstorey and provides little connectivity at a local level. The exception to this is the Gara River corridor which is intended to be avoided where possible by the development. Oxley Wild Rivers National Park is also listed as an area of geological significance in the New England region of NSW and is part of the Gondwana Rainforests of Australia World Heritage Area. The areas landscape is highly defined by its geology – resulting in steep, deep gorges and when running, fast flowing rivers. The geology of the area is characterised by metamorphosed sediments and volcanics and intensively deformed metamorphosed sandstones, siltstones, conglomerates and tuffs. No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the development site.

## Land category assessment

The BC Act s6.8(3) allows that the biodiversity assessment can exclude any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013* (LLS Act) with the exception of impacts prescribed by the regulations under section 6.3. To meet the Category 1-exempt land requirement, land must be:

- Legally cleared at or since 1 January 1990 (Woody vegetation only).
- Significantly disturbed or modified since 1990 (Non-woody vegetation).

Approximately 517.2 ha of land within the subject land has been determined to meet the definition of Category 1- exempt land. Approximately 456ha of Category 1 – exempt land falls within the development site. There is evidence to suggest that large areas of the development site have been under regular rotational cropping or pasture improvement prior to 1990. This is supported by recent and historical imagery, as well as 2017 Land Use Mapping data. These areas include mapped areas such as:

- Exotic – areas of cropping and horticultural plantings.
- Irrigation dams and channels.
- Residential – residential buildings containing exotic plantings and non-local native species.
- Infrastructure – roads, dwellings and agricultural infrastructure.
- River – aquatic areas of the Gara River.

These areas have been excluded from the BAM assessment, except where prescribed impacts are relevant . Where in doubt, or where data sources were conflicting, a precautionary approach has been implemented for areas deemed inconclusive in terms of determining historical land use. Refer to Figure 7-1 for excluded areas.

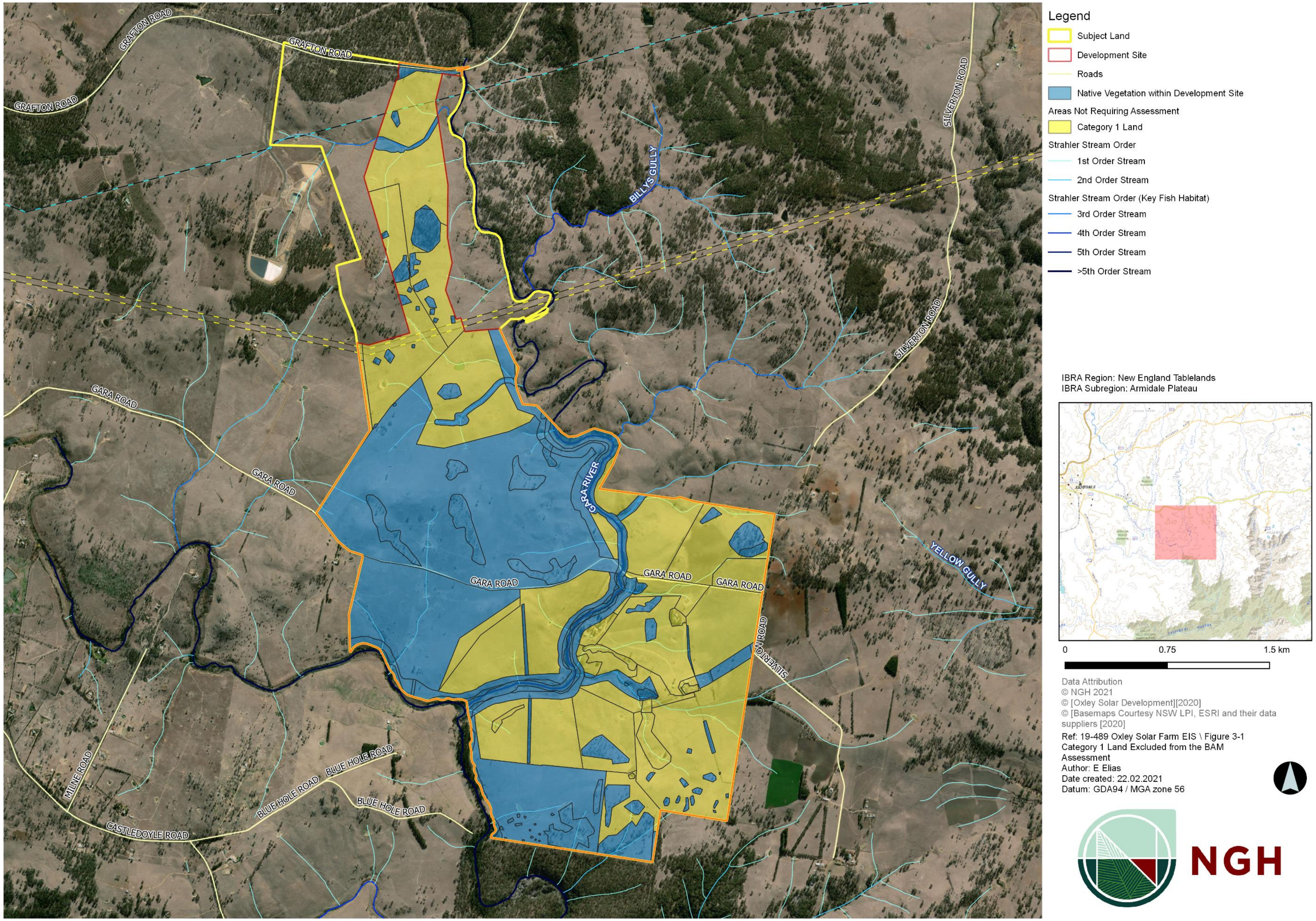



Figure 7-1 Category 1 land excluded from the BAM assessment.

## Field surveys

Field surveys were undertaken over four survey periods:

- 20th August -22nd August 2019
- 25th November – 29th November 2019
- 4th May – 8th May 2020
- 28th September – 30th September 2020

As well as collecting representative vegetation integrity plots, in accordance with the BAM, surveys targeted;

- Diurnal avifauna (Regent Honeyeater, Glossy Black-Cockatoo, Swift Parrot, Square-tailed Kite (breeding), Little Eagle (breeding), White-bellied Sea-Eagle)
- Nocturnal avifauna (Barking Owl (breeding), Masked Owl (breeding), Powerful Owl (breeding), Bush-stone Curlew)
- Nocturnal Mammals (Squirrel Glider)
- Flying-foxes and Microbats (Grey-headed Flying-fox, Southern Myotis)
- Reptiles (Glandular Frog, Pale-headed Snake, Tusked Frog)
- Koala
- Threatened Forbs and Grasses (Blue Grass, Silky Swainsona-pea, Small Snake, Hawkweed, Austral Toadflax)
- Threatened shrubs and trees (Narrow-leaved Bertya, Granite boronia, Pygmy Cypress, Northern Blue Box, Narrow-leaved Black Peppermint, Beadle's grevillea, Tall Velvet Sea-Berry)

Survey timing was in accordance with the BAM and lead by accredited BAM assessors.

## Key results

Following the surveys and analysis of the data, three PCTs were identified within the development site, these are:

- PCT 84: River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
- PCT 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

The latter two PCTs are considered NSW listed White Box-Yellow Box- Blakely's Red Gum Woodland (Box-gum Woodland Threatened ecological community).

- Impacts to 87 ha of native vegetation will generate ecosystem credits for the project. This includes:
  - 86.7 ha of Box Gum Woodland TEC (around 70% of this would be impacted by panel shading rather than direct removal).
  - 20 hollow bearing trees would be removed by the proposal.
- Three ecosystem credit species were detected within the development site during field surveys. Offsets for these species are included in the ecosystem credit requirement for the project:
  - Glossy Black- Cockatoo *Calyptorhynchus lathami*
  - Little Eagle *Hieraaetus morphnoides*

- Square-tailed Kite *Lophoictinia isura*

- 5 species credit species were assumed to occur as survey effort could not confidently rule them out. They will generate an offset requirement:
    - Tusked Frog *Adelotus brevis* (assumed present)
    - Glandular Frog *Litoria subglandulosa* (assumed present)
    - Southern Myotis *Macropus* (assumed present)
    - Hawkweed *Picris evae* (assumed present)
    - Austral toadflax *Thesium australe* (assumed present)

The remainder of the candidate species credit species were considered absent with reference to targeted surveys or habitat (lack or required components or sufficiently degraded) as allowed under the BAM.

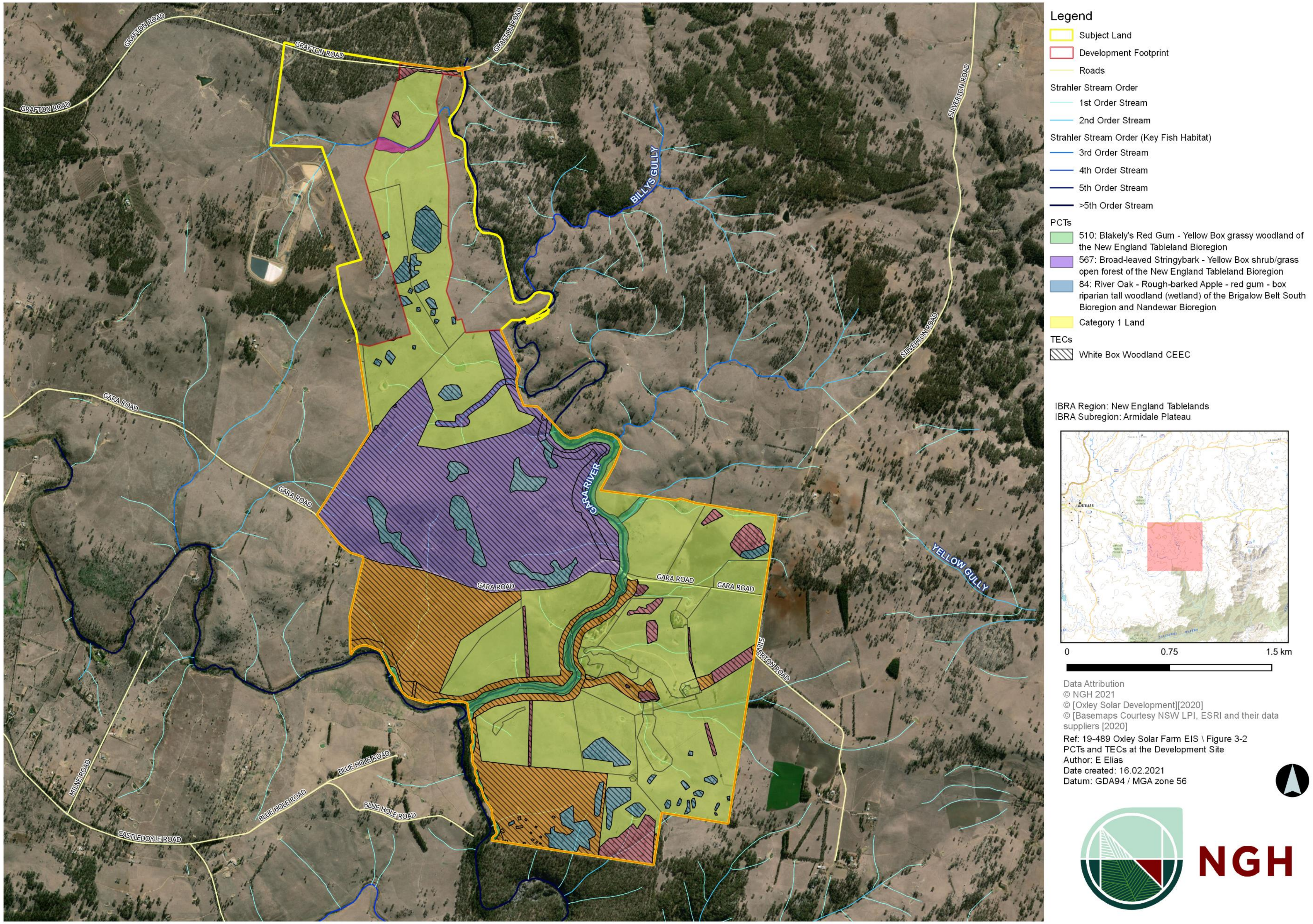



Figure 7-2 Plant community types and Threatened Ecological Communities.

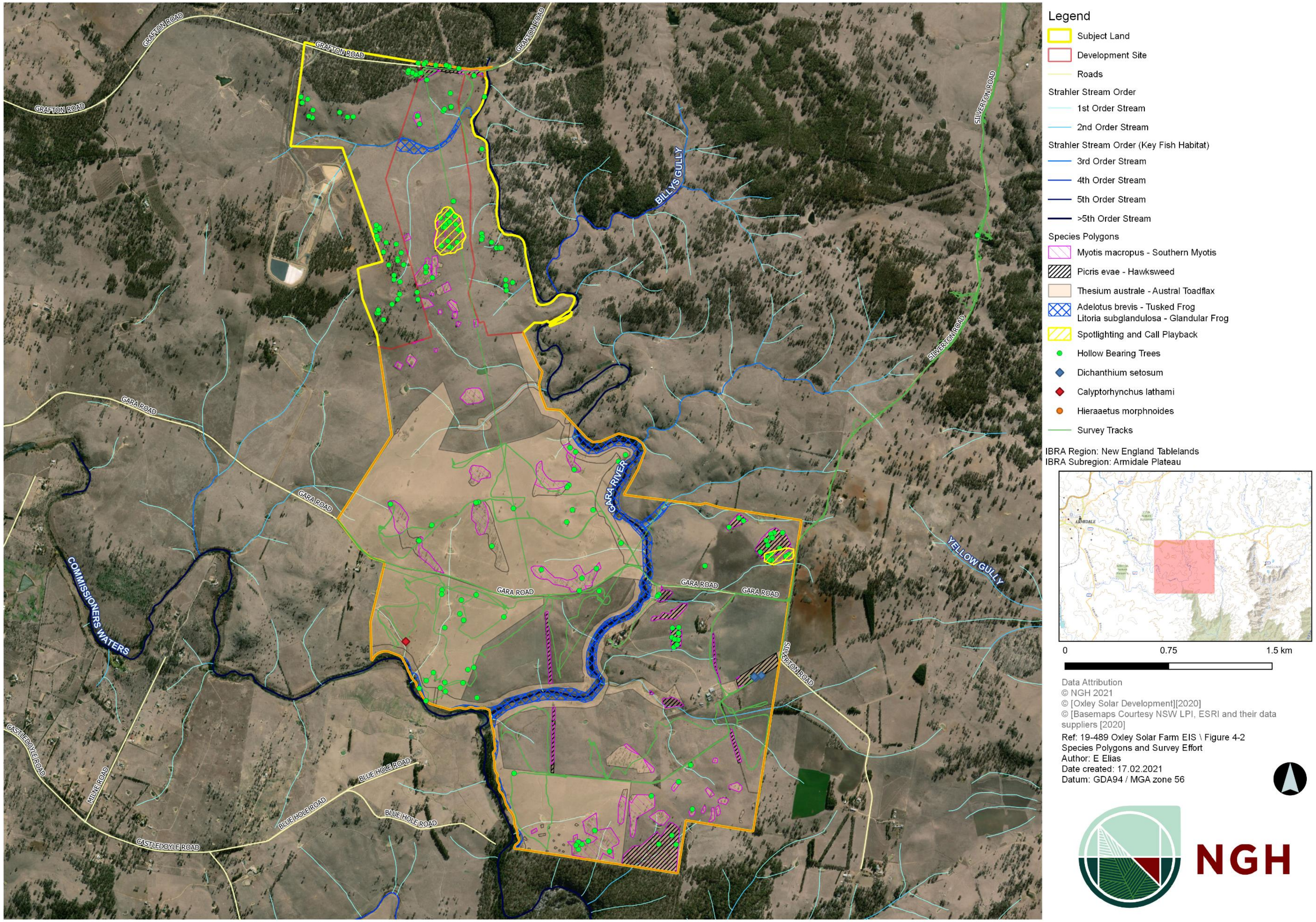



Figure 7-3 Species credit polygons and survey effort.

### 7.1.2. Potential impacts

#### Avoidance

To avoid impacts where possible, the site selection, technology options and areas of higher biodiversity value were considered carefully.

The proponent has reviewed a large number of sites within NSW on which to build a solar farm before selecting the Oxley Solar farm proposal site. The proposed sites were considered in accordance with DPIE's Large Scale Solar Energy Guideline for SSD 2018, which provides recommendations regarding selection of suitable proposal sites and areas of constraint that should be identified.

In terms of physical impacts, the critical components of a solar farm include:

- Solar panels to generate DC electricity from sunlight
- Inverters to convert the DC electricity into AC electricity
- Energy storage facility

Photovoltaic solar technology was chosen because it is cost-effective, low profile, durable and flexible regarding layout and siting. It is a proven and mature technology which is readily available for broad scale deployment at the site. In terms of its impacts on biodiversity, PV solar installation creates minimal ground disturbances. Solar array mounts are either pile driven or on small footings, retaining the natural ground cover largely intact beneath the array. Ancillary infrastructure has relatively small areas of disturbance for cabling, permitter access tracks and transmission infrastructure.

Once the broader site was selected, the development footprint was refined iteratively, in tandem with the environmental assessments and consultation with relevant government agencies, the community and other stakeholders. This process ensures the proposal responds appropriately to the site's constraints to produce the most justifiable proposal. The layout has been developed to avoid higher quality areas of native vegetation onsite including:

- 37.3 ha of Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion (PCT 567 woodland structure).
- 29.2 ha of Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion (PCT 510 woodland structure).
- 0.55 ha of EPBC listed Vegetation

#### Direct impacts

The construction and operational phases of the proposal has the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts including:

- Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks)
- Displacement of resident fauna
- Injury or death of fauna
- Removal of habitat features e.g. hollow bearing trees
- Shading by solar infrastructure
- Existence of permanent infrastructure.

## Indirect impacts

Indirect impacts of the proposal include may include:

- Inadvertent impacts on adjacent habitat or vegetation
- Reduced viability of adjacent habitat due to edge effects
- Reduced viability of adjacent habitat due to noise, dust or light spill
- Transport of weeds and pathogens from the site to adjacent vegetation
- Increased risk of starvation, exposure and loss of shade or shelter
- Loss of breeding habitats
- Increase in pest animal populations
- Bush rock removal and disturbance
- Earthworks and mobilisation of sediments.

## Prescribed impacts

The following prescribed biodiversity impacts are relevant to the proposal:

- Impacts of the development on the connectivity of different areas of habitat of threatened species that facilitates the movement of these species across their range
- Impacts of the development on movement of threatened species that maintains their life cycle
- Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities
- Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC.

## Serious and irreversible impacts

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

These were evaluated for the relevant SAII candidate: White Box-Yellow Box- Blakely's Red Gum Woodland (Box-gum Woodland TEC). SAII are not considered likely as a consequence of the proposal.

## Impacts that are uncertain

Once commissioned, the majority of the development footprint (around 70%) will consist of solar panels. The impacts of shading and diversion of rainfall runoff from the panels themselves is largely unknown. For the purpose of the BDAR report, the entire development footprint is assumed to be removed however, as the indicative layout shows, substantial peripheral areas are likely to be unimpacted and it is likely that a number of perennial native species will persist underneath the solar arrays. Certainly, only a minor proportion of the seed bank will be impacted, given the limited excavation proposed.

In this assessment an assumption has been made that all vegetation within the development footprint would be removed. This is a 'worst case' conservative approach. There is currently limited ability to vary this assumption without specific scientific data to justify a lesser impact; such as the results of ground cover monitoring beneath the solar array. Therefore, the costs associated with purchasing and retiring ecosystem and species credits or the need for offset areas is currently an 'over estimated result' of the impacts of this solar farm undertaken to address current uncertainty.

## EPBC impacts

The BDAR includes assessment of EPBC Act listed entities. An evaluation was undertaken for species predicted to occur within the broader study locality (10 km radius). An EPBC Act Assessment of Significance was completed for each entity with a moderate to high likelihood of presence within the development site, addressing the nine criteria under the Act. Additionally, the EPBC Act Referral Guidelines for the Koala (DoE 2014) were addressed.

An EPBC Act Assessments of Significance was completed for:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered
- *Dichanthium setosum* Bluegrass – Vulnerable
- *Lathamus discolor* Swift Parrot – Critically Endangered
- *Rostratula australis* Australian Painted Snipe – Endangered
- *Dasyurus maculatus* Spot-tailed Quoll – Endangered
- *Petrogale penicillata* Brush-tailed Rock-wallaby – Vulnerable
- *Phascolarctos cinereus* Koala - Vulnerable
- *Ardea alba* Great Egret – Migratory
- *Ardea ibis* Cattle Egret – Migratory
- *Gallinago hardwickii* Latham's Snipe – Migratory
- *Merops ornatus* Rainbow Bee-eater – Migratory
- *Tringa nebularia* Common Greenshank – Migratory

Approximately 4.87 ha of CEEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland meeting the threshold for consideration as the EPBC Act listed form of the community occurs within the development site, occurring as a portion of vegetation zone 2 (PCT 510 Woodland). Of that, approximately 0.6 ha would be impacted by the development footprint, within the north of the development footprint in association with the Grafton Road intersection.

Additionally, the EPBC Act Referral Guidelines for the Koala (DoE 2014) were addressed.

The summary in Table 7-6 below against the significance criteria concludes significant impacts are not anticipated and therefore referral is not recommended under the EPBC Act.

Table 7-1: Summary of Assessments of significance.

| Threatened species, or communities | Significance assessment question[1] | | | | | | | | | Likely significant impact? |
|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | |
| **White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland** | No | No | No | No | No | No | No | No | No | No |
| ***Dichanthium setosum*** **Bluegrass** | No | No | No | No | No | No | No | No | No | No |
| ***Lathamus discolor*** **Swift Parrot** | No | No | No | No | No | No | No | No | No | No |
| ***Rostratula australis*** **Australian Painted Snipe** | No | No | No | No | No | No | No | No | No | No |
| ***Dasyurus maculatus*** **Spot-tailed Quoll** | No | No | No | No | No | No | No | No | No | No |
| ***Petrogale penicillata*** **Brush-tailed Rock-wallaby** | No | No | No | No | No | No | No | No | No | No |
| ***Phascolarctos cinereus*** **Koala** | No | No | No | No | No | No | No | No | No | No |
| ***Ardea alba*** **Great Egret** | No | No | No | No | No | No | No | No | No | No |
| ***Ardea ibis*** **Cattle Egret** | No | No | No | No | No | No | No | No | No | No |
| ***Gallinago hardwickii*** **Latham's Snipe** | No | No | No | No | No | No | No | No | No | No |
| ***Merops ornatus*** **Rainbow Bee-eater** | No | No | No | No | No | No | No | No | No | No |
| ***Tringa nebularia*** **Common Greenshank** | No | No | No | No | No | No | No | No | No | No |

## Offset requirement

After consideration of avoidance measures, mitigation measures have been outlined to reduce the impacts to biodiversity (refer to Table 7-3). The residual impacts will be offset.

The retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets scheme, and will be achieved by either;

(a) Retiring credits under the Biodiversity Offsets Scheme, or

(b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

(c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

The credit requirement has therefore been defined as:

Table 7-2 Offset requirement

| Zone ID | PCT ID | PCT name | Ecosystem credits required |
|---|---|---|---|
| **1** | 84_Riparian | River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion | 1 |
| **6** | 84_Sedgeland | River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion | 6 |
| | | **Total for PCT 84** | **7** |
| **2** | 510_Woodland | Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion | 186 |
| **3** | 510_Derived Native Grassland | Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion | 7 |
| | | **Total for PCT 510** | **193** |
| **4** | 567_Woodland | Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion | 73 |
| **5** | 567_Derived Native Grassland | Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion | 947 |
| | | **Total for PCT 567** | **1020** |

| Species credit species | Species credits required |
|---|---|
| **Tusked Frog *Adelotus brevis*** | 12 |
| **Glandular Frog *Litoria subglandulosa*** | 12 |
| **Southern Myotis *macropus*** | 220 |
| **Hawkweed *Picris evae*** | 186 |
| **Austral toadflax *Thesium australe*** | 910 |

### 7.1.3. Safeguards and mitigation measures

Detailed mitigation measures are set out in the BDAR and summarised below.

Table 7-3 Safeguards and mitigation measures for biodiversity impacts.

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| B1 | Time works to avoid critical life cycle events. Hollow-bearing trees would not be removed during breeding season (spring to summer) for threatened hollow dependant fauna. If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure no impacts to fauna would occur. | C | | |
| B2 | Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler. A tree clearing procedure would be implemented to minimise harm to resident fauna. | C | | |
| B3 | Relocate habitat features (fallen timber, hollow logs) from within the development site. A procedure for relocation of habitat features to adjacent area for habitat enhancement would be implemented. | C | | |
| B4 | Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed. Additionally:<br>• Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing.<br>• No stockpiling or storage within dripline of any mature trees.<br>• Access and laydown in areas of White Box Yellow Box Blakely's Red Gum Woodland TEC will be minimised to reduce impacts.<br>• Exclusion fencing and signage or similar would be installed around habitat to be retained | C | | |
| B5 | Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise. Construction Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible. | C | | |
| B6 | Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill:<br>• Avoid night works where possible.<br>• Direct lights away from vegetation. | C | O | |
| B7 | Adaptive dust monitoring programs to control air quality.<br>• Daily monitoring of dust generated by construction activities.<br>• Construction would cease if dust observed being blown from site until control measures were implemented.<br>• All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the development site. | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| B8 | Temporary fencing to protect significant environmental features such as riparian zones. Prior to construction commencing, exclusion fencing, and signage would be installed around habitat to be retained. | C | | |
| B9 | Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas.<br>• A Weed Management procedure would be developed for the proposal to prevent and minimise the spread of weeds. This would include:<br>• Management protocol for declared priority weeds under the Biosecurity Act 2015 during and after construction<br>• Weed hygiene protocol in relation to plant, machinery, and fill.<br>• Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported.<br>• The weed management procedure would be incorporated into the Biodiversity Management Plan | C | O | |
| B10 | Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.<br>• Site induction and toolbox talks for ecologically sensitive areas would be undertaken.<br>• Staff training and site briefing to communicate impacts of traffic strikes on native fauna.<br>• Awareness training during site inductions regarding enforcing site speed limits.<br>• Site speed limits to be enforced to minimise fauna strike. | C | O | |
| B11 | Preparation of a management plan to regulate activity in vegetation and habitat adjacent to the proposed development. Preparation of a Biodiversity management plan that would include protocols for:<br>• Protection of native vegetation to be retained.<br>• Best practice removal and disposal of vegetation.<br>• Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist.<br>• Weed management.<br>• Unexpected threatened species finds.<br>• Exclusion of vehicles through sensitive areas.<br>• Rehabilitation of disturbed areas. | C | | |
| B12 | Preparation of a vegetation management plan to monitor ground cover beneath the solar array modules. A Ground cover management plan would be developed to:<br>• Ensure that ground cover is retained beneath panels, to resist erosion and weeds.<br>• Preserve the native composition as much as possible. | | O | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| B13 | Erosion and sediment controls. An erosion and sediment control plan would be prepared in conjunction with the final design and implemented. | C | | |
| B14 | Creek lines and retained dams would be planted with native riparian vegetation and transformed into small created wetlands for wildlife. Riparian plantings would comprise local native sedges, rushes, grasses and small shrubs. | C | | |
| B15 | Screening and landscaping plantings to be comprised of local indigenous species representative of the vegetation in the development site. Screening and landscaping plantings (up to 50 m where practicable) to be comprised of local indigenous species representative of the vegetation in the development site. | | O | |
| B16 | Involve a local landcare group or educational institution in ongoing biodiversity monitoring and enhancement. Involve a third party organisation to monitoring and maintain biodiversity enhancement activities. Communicate outcomes with third parties to contribute knowledge of how biodiversity can be preserved on solar farms. | | O | |
| B17 | Plain wire instead of barbed used on top of the perimeter fence and stock fencing to reduce impacts on birds and Squirrel Glider. Security fencing would be comprised of approximately 2 m high cyclone fencing. Use plain wire perimeter fencing where this intersects woodland to avoid potential entrapment of fauna on fence. | C | | |
| B18 | Perimeter fence would be located to avoid, where possible, segmenting patches of native vegetation to facilitate native fauna movements. The final 'for construction' design would include the perimeter fencing avoiding rather than intersecting patches or retained woodland. | C | | |
| B19 | Install approximately 120 nesting boxes for birds and mammals across the development site. Nesting boxes would be designed to meet the requirements of target species including Squirrel Gliders, bats, parrots and owls. Nesting boxes would be monitored periodically for use and/or replacement. | C | | |

## 7.2. VISUAL AMENITY AND LANDSCAPE CHARACTER

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

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

Moir Landscape Architecture Pty Ltd prepared a Landscape and Visual Impact Assessment (LVIA) for the proposed construction and operation of Oxley Solar Farm (provided in full in Appendix E and summarised below). The VIA provides a full assessment of the visual impacts associated with the proposal, including:

- A Landscape Character Assessment, including an overview of the existing landscape characters and identification of key landscape features of the site and surrounds;
- An assessment of visual impacts.
- Mitigation methods, including recommendations for impact mitigation to maintain the area's visual quality.

### 7.2.1. Approach

VIA is used to identify and determine the value, significance and sensitivity of a landscape. The assessment was undertaken as follows:

- Landscape character assessment, which involves an overview of the existing landscape character and identification of key landscape features of the site and surrounds.
- Assessment of visual impacts using computer modelling and viewpoints analysis.
- Consideration of mitigation measures, where warranted.

There are no visual specific guidelines for the development of solar farms, other than SEARS in NSW. The following has been utilised to form the methodology for this visual impact assessment:

***Armidale Dumaresq Local Environmental Plan 2012***

The proposal site is located within Armidale Regional Council LGA. The site is zoned RU1 Primary Production under the *Armidale Dumaresq Local Environmental Plan 2012*. The proposal is broadly consistent with the objectives of the RU1 zone. The objectives are:

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

**Guidelines for developments adjoining land managed by the Office of Environment and Heritage**

The proposal site is bounded to the south by Oxley Wild Rivers National Park. Consideration for development adjoining OEH (now known as Biodiversity and Conservation Division) lands is outlined in the *Guidelines for developments adjoining land managed by the Office of Environment and Heritage.* These guidelines provide general information on NPWS's expectations in relation to development that has the potential to impact NPWS lands. The guidelines in relation to visual amenity are as follows:

- Aim: There is no reduction of amenity on OEH land due to adjacent development.
- Risks to OEH land: These impacts may particularly affect native fauna species (for example, noise, vibration and lighting may disrupt foraging and breeding habits). They may also adversely affect the use and public enjoyment of walking trails, camping and picnic areas.
- Recommended approach: Planning authorities should take into account the visual (including lighting), noise, odour and air quality impacts of development adjacent to OEH land to ensure that it is sympathetic with natural and cultural heritage values, and does not impact upon amenity or public enjoyment of the land. Planning authorities should consider whether it is appropriate to apply control measures, such as landscaping with local native plant species, implementing buffer areas, limiting hours of operation, and use of appropriate colours, building materials, lighting and height controls.

Some types of developments, such as quarries and road works, can result in particularly significant impacts (for example noise and dust). Large-scale developments of this type are likely to need detailed site-specific management plans. OEH land should not be considered as a buffer zone between a development and other surrounding uses (such as residential areas).

### 7.2.2. Landscape character assessment

The landscape character of a site refers to the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects how particular combinations of geology, landform, soils, vegetation, land use and human settlement create a particular sense of place for different areas within the landscape (The Landscape Institute and the institute of Environmental Management and Assessment, 2002). The landscape character of the study area has been assessed at a regional, local and site scale.

#### Landscape character

The landscape character of the proposal site and surrounding area can be broken down as follows:

**Land use:** The proposal site is located in an agricultural area and is used primarily for grazing with a small amount of feed cropping. Land and soil capability mapping describes the majority of the proposed site as having severe to very severe limitations, with the south-eastern portion is described as having moderate to severe limitations (Class 4, 5 and 6). This indicates the area is limited in its potential use for high impact land management uses, such as cropping, and is not capable of supporting regular cultivation due to limitations including slope, erosion, and soil types. This land classification is generally best used for grazing, in terms of ongoing agricultural use (NSW OEH, 2012).

**Roads:** The current access to the proposal site is from Waterfall Way (Grafton Road), which is located approximately 14 km south-east of Armidale. Gara Road runs through the centre of the Proposal site in an east to west direction, approximately 3.5km south of Waterfall Way (Grafton Road). Crown roads connect to the site from Waterfall Way (Grafton Road) in a north-south direction.

**Towns:** The site is located approximately 14km south-east of Armidale. The population of Armidale is 23,352 (ABS, 2016); it is the administrative centre for the Northern Tablelands region of NSW.

**Infrastructure:** Two existing 132 kV transmission lines are located within the northern section of the proposal site and run west to east. Both transmission lines are being considered as a connection point for the proposed solar farm to the electricity grid.

**Vegetation:** The proposal site occurs on the Armidale plateau and contains a combination of scattered trees and small remnant clumps of Box-Gum Grassy Woodland. Much of the proposal site has been extensively cleared of woody vegetation and has been highly modified by historical farming practices. Remnant vegetation within the site are restricted to fragmented areas of woodland and isolated paddock trees that occur within the proposal site as well small patches of derived native grassland where native species appear more abundant. The majority of the woodland patches have been subject to high and regular grazing pressure and additionally, are showing evidence of dieback impacting on their long term viability.

**Topography:** The northern portion of the site is just south of Waterfall Way (Grafton Road). The topography falls in a south direction towards the Gara River. The area is predominately cleared for grazing with some scattered vegetation and dams evident.

The southern boundary of the proposal site borders Oxley Wild Rivers National Park. Vegetation within this area consists of the better condition vegetation within the proposal site evident by a higher abundance of native species and less evidence of dieback. Additionally, throughout the proposal site, the hillier and rocky portions of the proposal site that have had a lower intensity of sustained grazing pressure and farming have more abundant native species.

**Waterbodies:** Twenty-four dams occur within the proposal site, mostly fed by watercourses within the site. Twenty-two watercourses occur within the proposal site eighteen of which are tributaries of the Gara River and four of which are tributaries of Commissioners Waters.

The Gara River is the most prominent watercourse within the proposal site. It is a tributary of Salisbury Waters, which is located approximately 10km south of the proposal site within the Oxley Wild Rivers National Park. At the south-western boundary, the Gara River intersects with Commissioners Waters, which runs west to east along the south-western boundary of the site. The Gara River continues flowing south through the Oxley Wild Rivers National Park.

## Landscape values

During community consultation, OSD undertook a survey to gain an understanding of the community values and concerns. Approximately 25% of respondents identified landscape and views were the reason for living in the area. Visual impacts were among the concerns raised by the community. This included visual impacts from residences but also from Oxley Wild Rivers National Park and its recreational areas including Blue hole and picnic areas (Figure 7-4 and Figure 7-5).

Figure 7-4 Blue Hole.

Figure 7-5 Oxley Wild Rivers National Park Picnic Area.

### 7.2.3. Potential impacts

#### Criteria

The potential visual impact of the proposal is assessed based on the relationship between the visual sensitivity and visual effect of a proposal, as per Figure 7-6. These terms are defined in the sections below.

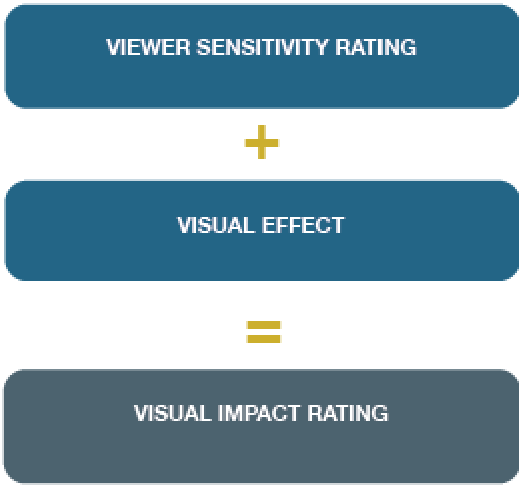



Figure 7-6 Visual impact rating.

**Visual sensitivity**

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the proposal (EDAW, 2000).

For example, a significant change that is not frequently seen may result in a low visual sensitivity although its impact on a landscape may be high. Generally, the following principles apply:

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

Sensitivity ratings are defined as high, moderate or low and are shown in the Table 7-4 below (adapted from URBIS, 2009).

Table 7-4 Visual sensitivity criteria.

| VISUAL SENSITIVITY RATING | | | | | |
|---|---|---|---|---|---|
| | DISTANCE FROM SITE | | | | |
| LANDUSE | 0-1 km | 1-2 km | 2 - 4.5 km | 4.5 -7 km | > 7 km |
| Townships | HIGH | HIGH | HIGH | MODERATE | LOW |
| Recreational Reserve | HIGH | HIGH | HIGH | MODERATE | LOW |
| Homestead | HIGH | HIGH | HIGH | MODERATE | LOW |
| Rural Township | HIGH | HIGH | MODERATE | LOW | NIL - LOW |
| Main Highway | MODERATE | MODERATE | LOW | LOW | NIL - LOW |
| Local Roads | MODERATE | MODERATE | LOW | LOW | NIL - LOW |
| Farm Road | LOW | LOW | NIL - LOW | NIL - LOW | NIL |
| Agricultural Land | LOW | LOW | NIL - LOW | NIL - LOW | NIL |

**Visual effect**

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

- **Low level:** occurs when a proposal blends in with its existing viewed landscape due to a high level of integration of one or several of the following: form, shape, pattern, line, texture or colour. It can also result from the use of effective screening i.e. topography and vegetation.
- **Moderate level:** occurs where a proposal is visible and contrasts with its viewed landscape however, there has been some degree of integration (e.g. good siting principles employed, retention of significant existing vegetation, provision of screen landscaping, appropriate colour selection and/or suitably scaled development).
- **High level:** results when a proposal has a high visual contrast to the surrounding landscape with little or no natural screening or integration created by vegetation or topography.

**Visual impact**

Visual impact refers to the change in appearance of the landscape as a result of development. (EPHC, 2010). Visual impact is the combined effect of visual sensitivity and visual effect. Various combinations of visual sensitivity and visual effect will result in high, moderate and low overall visual impacts as suggested in Table 7-5 below (URBIS, 2009).

Table 7-5 Visual impact rating table.

| VISUAL IMPACT RATING | | | | |
|---|---|---|---|---|
| | | VISUAL EFFECT | | |
| | | HIGH | MODERATE | LOW |
| VISUAL SENSITIVITY | HIGH | HIGH IMPACT | HIGH IMPACT | MODERATE IMPACT |
| | MODERATE | HIGH IMPACT | MODERATE IMPACT | LOW IMPACT |
| | LOW | MODERATE IMPACT | LOW IMPACT | LOW IMPACT |

## Viewpoint analysis

The viewpoint analysis considers the likely impact that development would have on the existing landscape character and visual amenity by selecting prominent sites, otherwise referred to as viewpoints. The development includes all proposed new infrastructure including site access and tracks, panels and buildings.

Once the viewpoint had been selected, panoramic photographs were taken on a level tripod at a height of 150cm (to represent eye level). Photographs were taken with a Canon EOS 5D Mark IV Full Frame digital SLR through a 50mm fixed focal lens which closely represents the central field of vision of the human eye.

The visual impact of the viewpoint was then assessed both on site and with the topographic and aerial information to ensure accuracy. For each viewpoint, the potential visual impact was analysed through the use of a combination of the 3D terrain modelling, topographic maps and on its analysis. Viewpoint photographs and analysis is included in the following pages.

A total of 15 viewpoints were recorded as part of the field work process. The locations of the viewpoints have been identified in

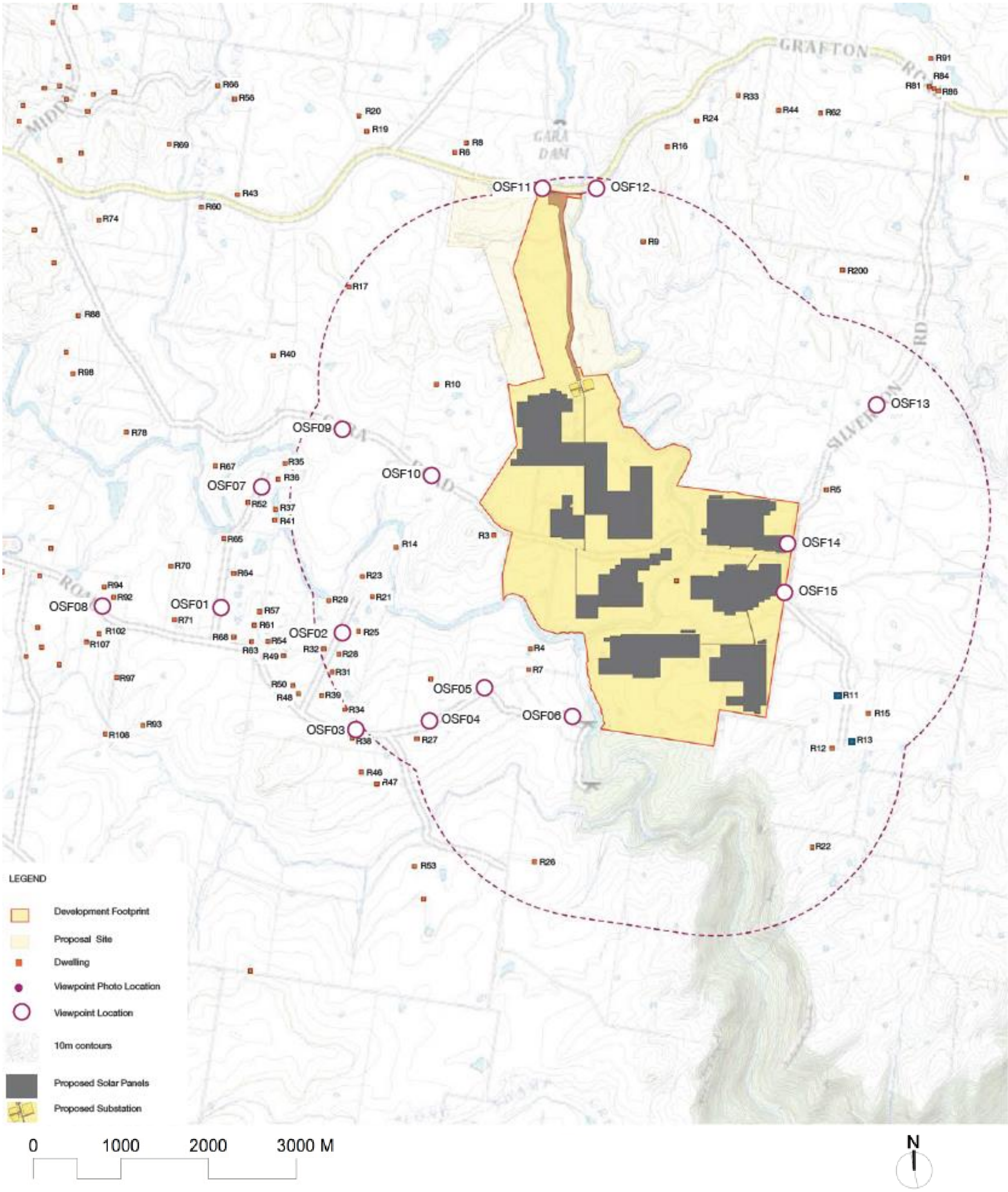



Figure 7-7 and the general viewing direction of each viewpoint is identified on each viewpoint. Viewpoints have been carefully selected to be representative of the range of views within the study area. The selection of viewpoints is informed by topographical maps, field work observations and other relevant influences such as access, landscape character and the popularity of vantage points.

- Viewpoints are selected to illustrate a combination of the following:
- Areas of high landscape or scenic value.

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

Table 7-36 below evaluates the representative viewpoints based on their land use, effect and impact.

It is important to note that the majority of these viewpoints for this study have been taken only from accessible public land (typically gates, walking tracks, roads, recreation reserves and lookouts) which were identified as having a potentially high visual impact through the desktop review process.

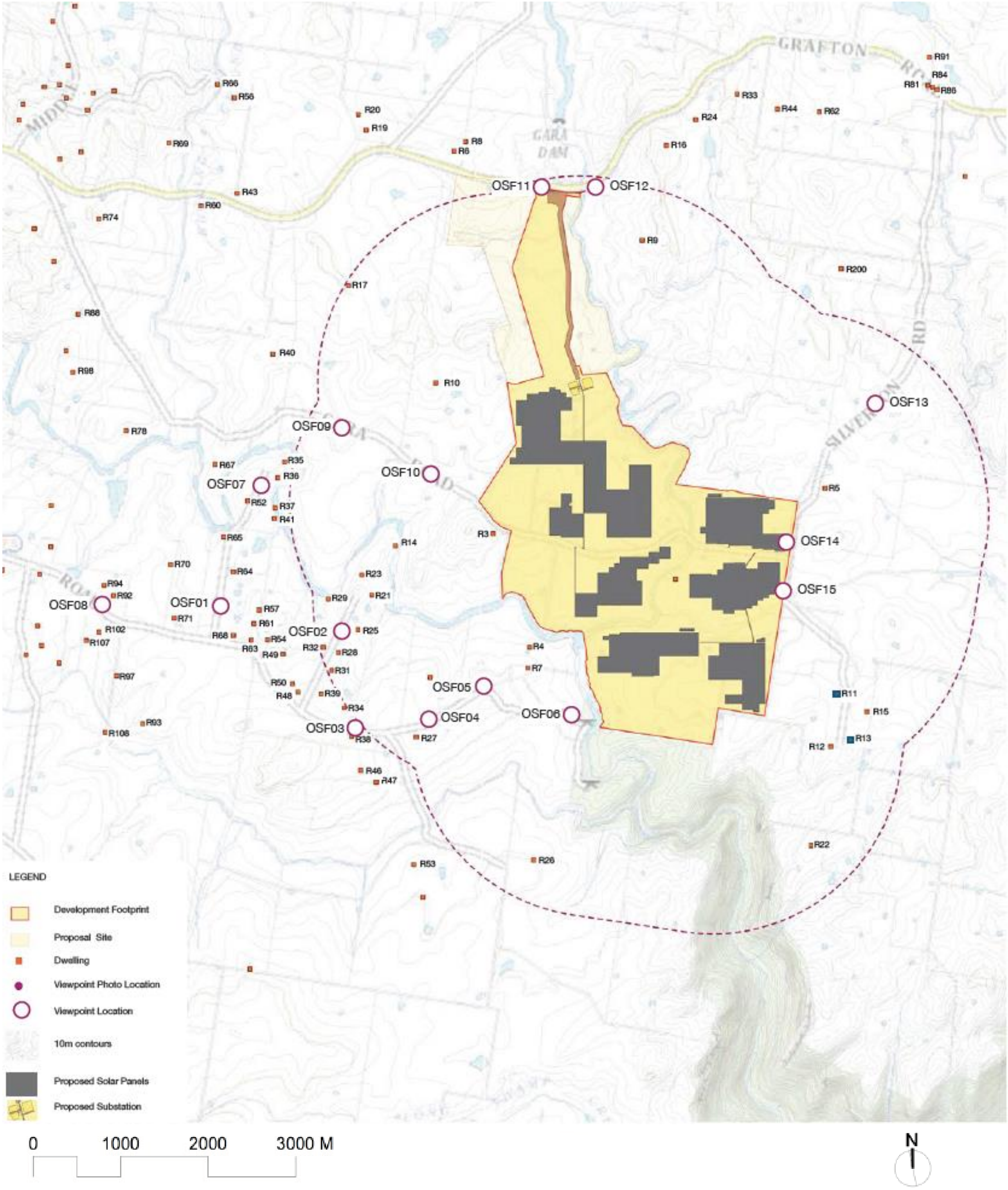
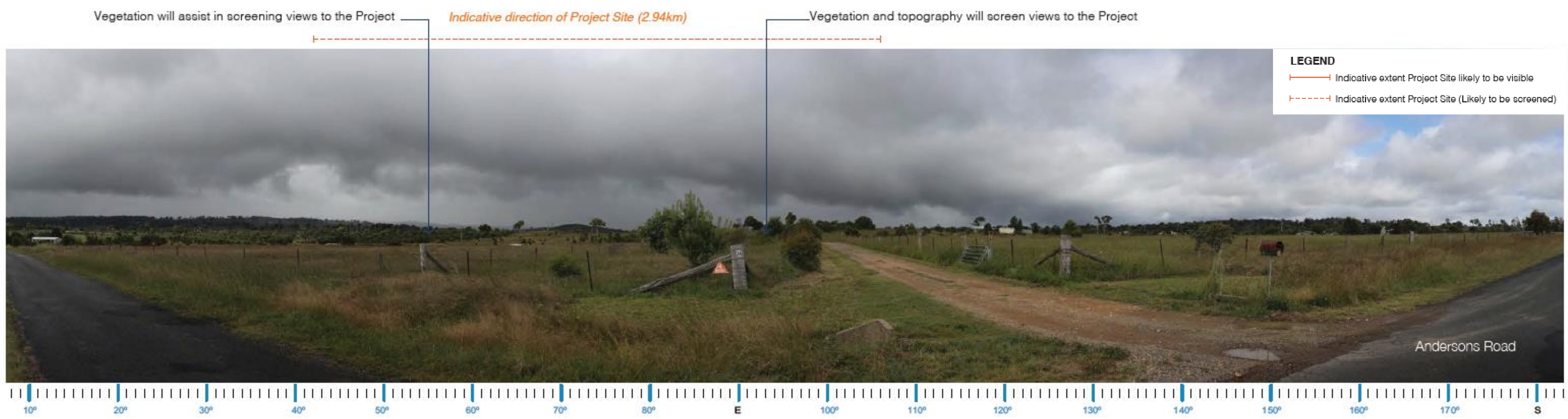



Figure 7-7 Viewpoint assessment locations (Moir Landscapes, 2020).

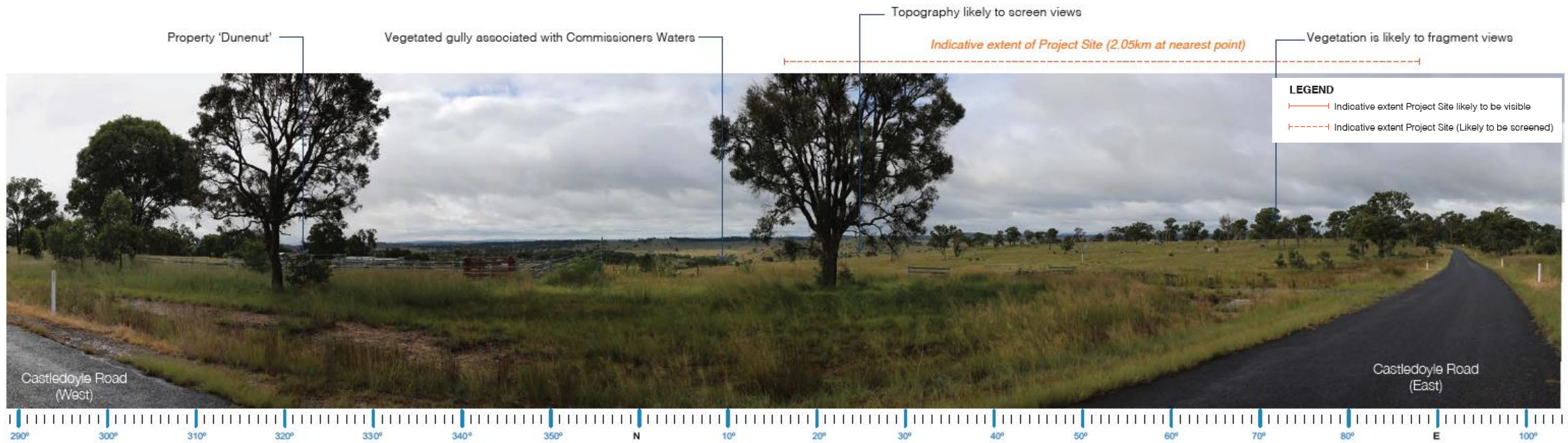
Table 7-6 Viewpoint analysis.

| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF01 | Andersons Road | 2.94km | 960m<br>East | Rural residential | High | Nil | Nil | Photograph taken from Andersons Road at the entry to rural residence 34. Andersons Road runs in a generally north direction from Castledoyle Road to Commissioners Waters servicing approximately 10 rural residential dwellings. Land is generally flat with slight undulations in the middle ground to the east.<br>Visual sensitivity for rural residence is generally high. | The proposed development will not be visible from this viewpoint as it is concealed by topography and vegetation to the east.<br>**The visual effect is assessed as nil and the resulting visual impact rating is nil.** |



| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF02 | Milne Road | 1.7km | 952m<br>North east | Rural residential | High | Low | Moderate | View from Milne Road, a minor road which runs in a northerly direction from Castledoyle Road, providing access to a dozen rural residential properties. Land slopes to the north towards Commissioners Waters. Land is predominately cleared with mature trees scattered through the landscape. Views are screened to the east by vegetation in the middle ground. Views to the north east extend to distant vegetated hills.<br>Visual sensitivity for rural residence is generally high. | From this viewpoint it is likely views to a small portion of the proposal site will be visible (approximately 1.74km at its nearest point). Existing landscape elements including topography and vegetation in the middle ground will assist in screening views to a large percentage of the site from this location.<br>The visual effect is likely to be low as the proposal will occupy a small portion of the view from this location.<br>**When combined with the high visual sensitivity, the resulting visual impact from this location is moderate**. |

| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF03 | Castledoyle Road | 2.06km | 979m<br>North | Local road | Low | Nil | Nil | View from Castledoyle Road looking in a north direction across the gently undulating grazing land. Castledoyle Road is a local road which runs in a generally east west direction providing access to rural residential properties. The road continues to become Blue Hole Road and provides access to the Oxley Wild Rivers National Park (approximately 2.5km from this viewpoint). Views from this location are expansive towards distant vegetated ranges with some scattered vegetation in the middle ground screening views (to the north east).<br><br>The visual sensitivity of this viewpoint has been rated as low due to land use being classified as a local road. | From this viewpoint the proposal is located in a generally north east direction. Views in this direction are mostly screened by vegetation in the middle ground. The proposal is located over 2km from this location and therefore it is likely it will be screened.<br><br>**The visual impact has been rated as nil from this location.** |



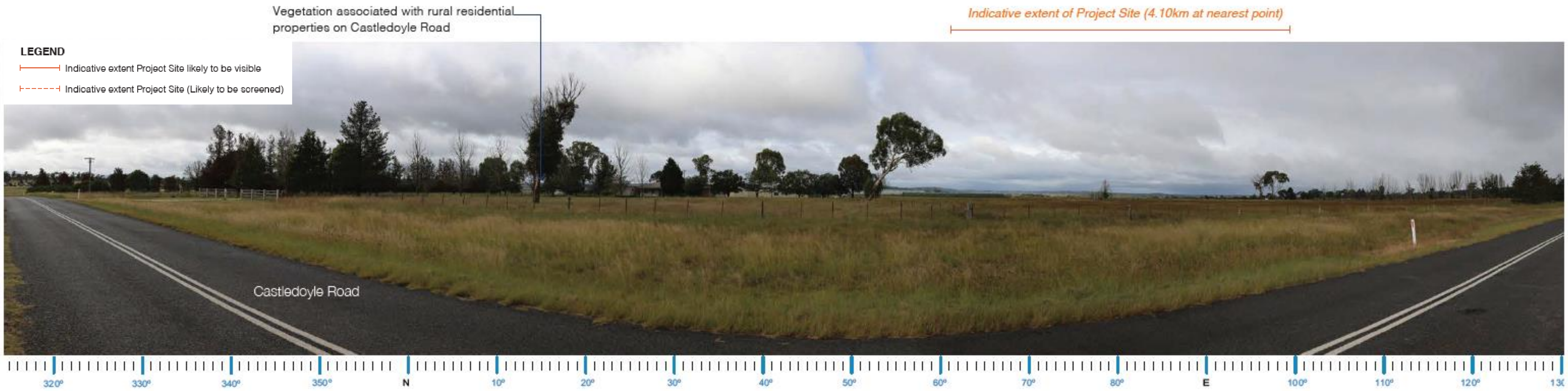
| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OS04 | Blue Hole Road | 1.5km | 975m<br>North east | Local road | Low | Low | Low | View from Blue Hole Road, approximately 400m east of the intersection with Castledoyle Road. Blue Hole Road is an unsealed minor road which provides access to Oxley Wild Rivers National Park. Land in this area is predominately cleared with some stands of remnant vegetation. Land falls away to the north east towards the Gara River.<br><br>The visual sensitivity of this viewpoint has been rated as low due to the land use of local road. | From this viewpoint it is likely the proposal will be visible to the north east. The proposal is approximately 1.5km from this location. Existing vegetation and a low rise in topography provides screening to majority of the proposal Site. The small portion of the proposal that will be visible will be a minor element in the overall visual landscape and will result in a low visual effect.<br><br>**The resulting visual impact from this location is likely to be low from this location.** |

| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF05 | Castledoyle Road | 1.05km | 965m<br>North east | Local road | Moderate | Moderate | Moderate | View from Blue Hole Road, the photograph is taken from a bend in the road at the entry to house number 111. Views from this location are expansive, with screening across grazing land to the north, with vegetation associated with the property visible in the foreground. Vegetation associated with the Gara River and Oxley Wild Rivers National Park is visible to the east.<br><br>The visual sensitivity of this viewpoint has been rated as moderate. | From this viewpoint the proposal is likely to be visible on low lying land approximately 1km away to the east. Vegetation in the foreground associated with 111 Blue Hole Road is likely to screen a portion of the site. The proposal site will be visible (although fragmented by foreground vegetation) on the hill in the middle ground to the north.<br><br>**The visual effect from this location has been assessed as moderate resulting in a moderate visual impact rating.** |

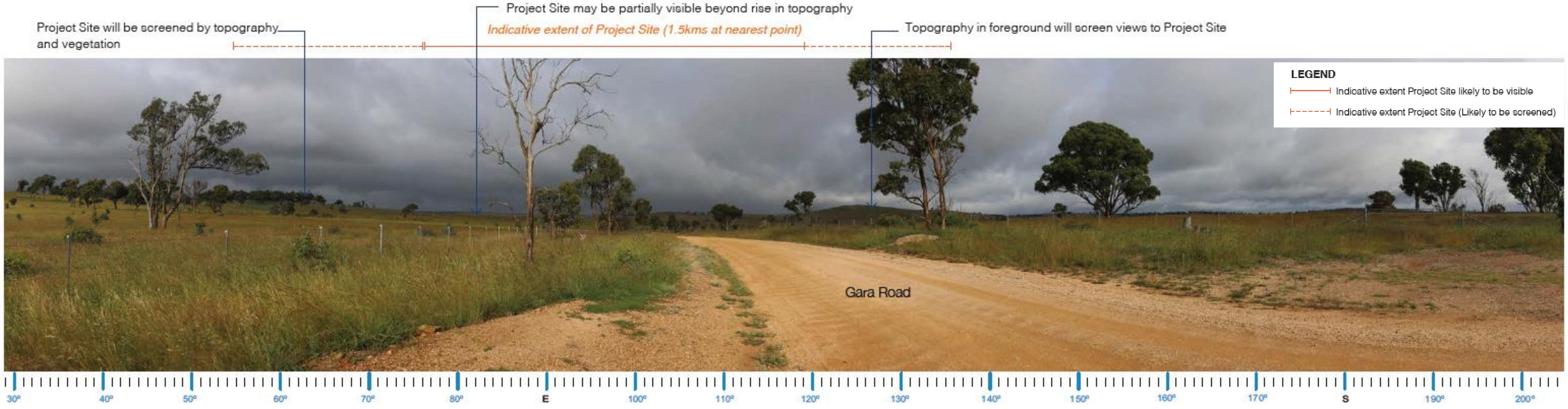
| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF06 | Blue Hole Road | 270m | 928m<br>North | Local road | Moderate | High | High | View from Blue Hole Road approximately 150m to the entry to Oxley Wild National Park. Land in this area is predominately cleared with the exception of vegetation associated with the Gara River to the north. Topography is gently undulating and slopes down to the river. Views are available across the proposal site to vegetated hills in the distance.<br>The visual sensitivity has been rated as moderate due to land use and close proximity to the site. | From this location the proposal site will be visible and occupy a large portion of the view. Vegetation associated with Oxley Wild National Park will screen a portion of the site to the south.<br>**The visual effect has been rated as high resulting in a high visual impact rating.** |

| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF07 | Andersons Road | 2.26km | 951m<br>East | Rural residential | High | Nil | Nil | View from the northern end of Andersons Road near the entry to 171 Andersons Road. Land in this area is characterised by rural residential properties. Views are generally contained by vegetation and a slight rise in topography in the foreground. | The visual sensitivity of this viewpoint has been rated as high due to the rural residential land use<br>The proposal will be screened by a combination of vegetation and topography from this location. Resulting in nil visual effect or impact. |

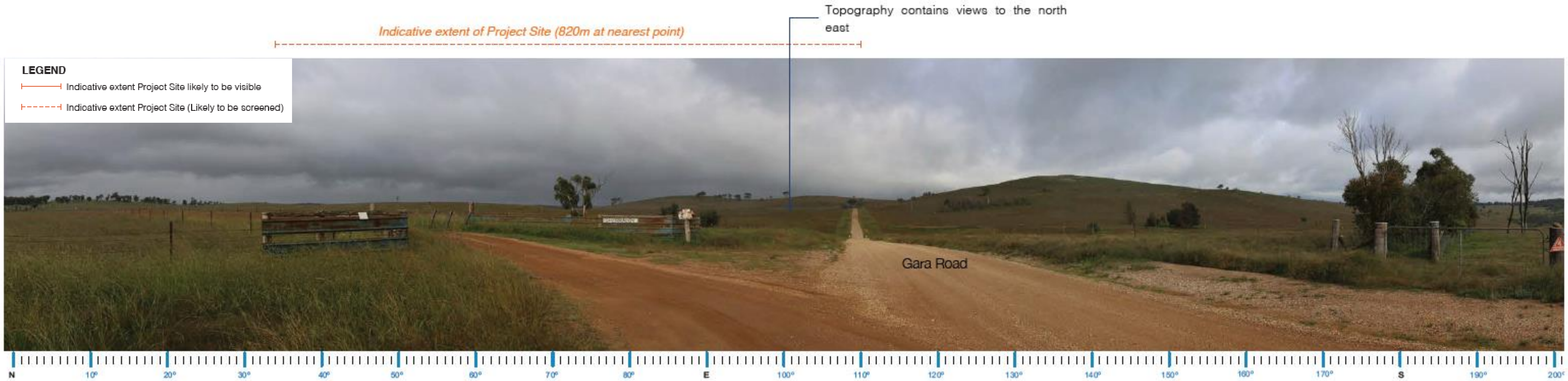
| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF08 | Castledoyle Road | 4.10km | 966m<br>East | Main road | Low | Nil-low | Low | View from Castledoyle Road, approximately 4.1km west of the proposal site. Views from this location extend to distance vegetated hills to the east across cleared grazing land. Vegetation associated with rural residential dwellings is visible in the foreground to the north.<br><br>The visual sensitivity of this viewpoint has been rated as low. | From this location the proposal site has the potential to be visible in the distance (in excess of 4km from this location). Views to the proposal would be fleeting for motorist travelling along Castledoyle Road, and occupy a small portion of the overall view.<br><br>**The visual effect has been rated as low resulting in a visual impact rating of low.** |



| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF09 | Blue Hole Road | 1.55km | 960m<br>East | Agricultural | Low | Low | Low | View from Gara Road, an unsealed minor road which is located between Castledoyle Road and Waterfall Way (Grafton Road). Gara Road runs in a generally east west direction from Waterfall Way (Grafton Road) to Silverton Road. The road provides access to a small number of isolated homesteads.<br>The visual sensitivity has been rated low for this viewpoint. | From this location, views to the proposal site will be available to the east when travelling along Gara Road. As the road has a low number of users it is likely to affect a small number of receptors.<br>**The visual effect is likely to be low as the proposal would occupy a small portion of the view from this location, resulting in a low visual impact.** |

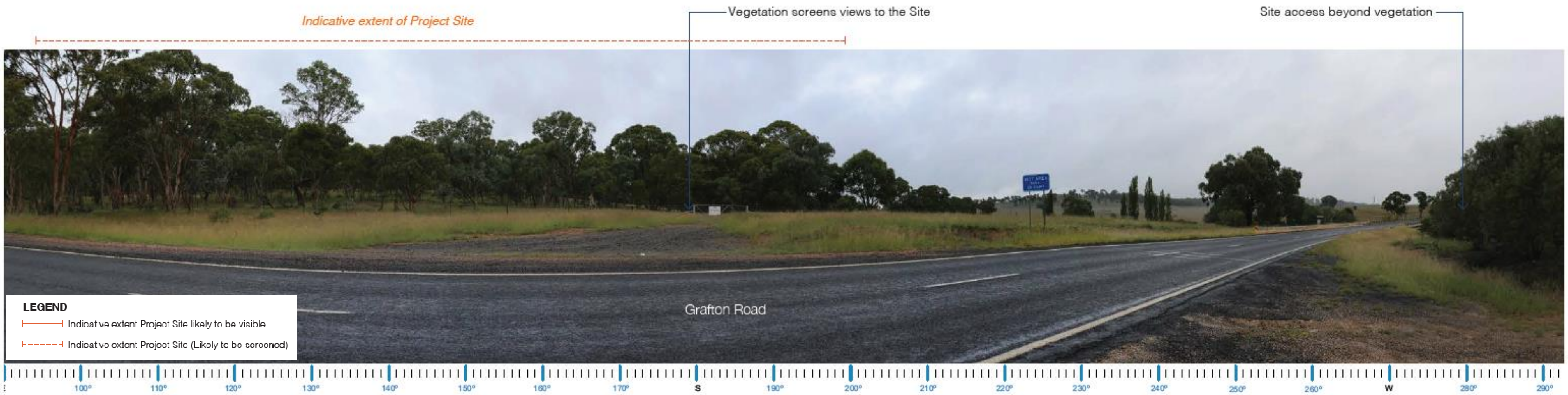


| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF10 | Gara Road | 820m | 952m East | Minor road | Low | Nil-low | Nil-low | View from Gara Road, approximately 800m west of the proposal site. Land in this area is characterised by gently undulating, predominately cleared grazing land. Views to the east (towards the site) are largely contained by a rise in topography in the middle ground. Vegetation associated with Commissioners Waters is visible to the south.<br><br>The visual sensitivity of this viewpoint has been rated as low due to the land use. | From this location it is likely the rise in topography in the foreground will screen views to the majority of the proposal site. Some associated infrastructure may be visible above the hills.<br><br>**The visual effect and visual impact has been rated as nil - low from this location. The resulting visual impact is nil - low.** |



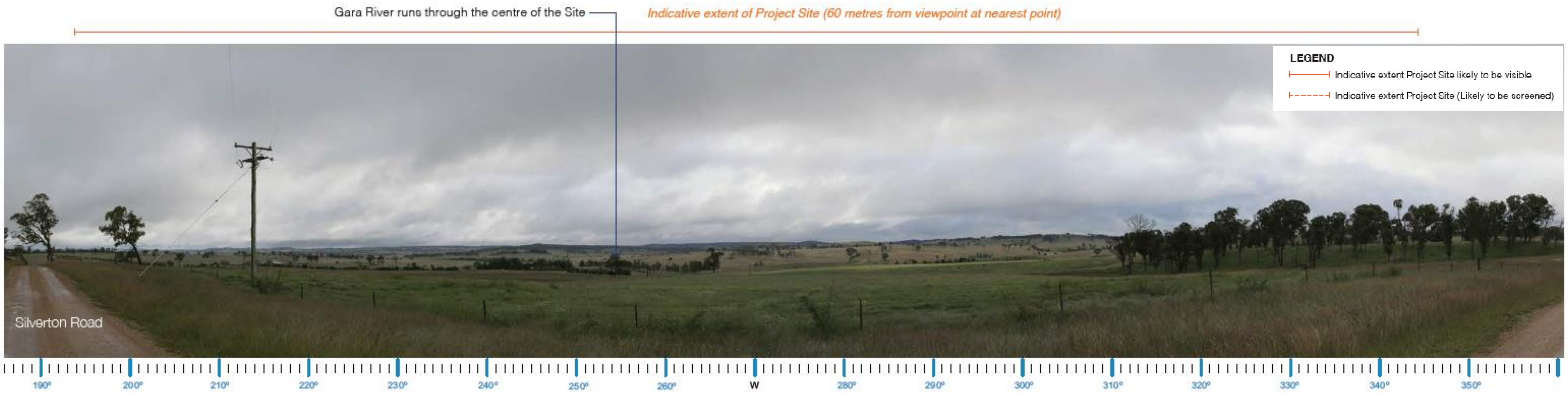
| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF11 | Waterfall Way (Grafton Road) | 2.06km | 966m<br>South | Rest area | Moderate | Nil | Nil | View from a rest area located on Waterfall Way (Grafton Road), approximately 2km north of the proposal site. Waterfall Way is a main arterial road which runs in a generally east direction from Armidale towards the coast. Views from this location are typical of this section of Waterfall Way (Grafton Road) with roadside vegetation containing views.<br>The visual sensitivity of this viewpoint has been rated as moderate. | Views to the site are not available from this location due to a combination of the rise and roadside vegetation on the southern edge of the road. Access to the site is approx. 250m east of this location.<br>**The visual impact from this location is nil.** |

| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF12 | Waterfall Way (Grafton Road) | 350m | 946m<br>South west | Main road | Moderate | Nil-low | Nil-low | View from Waterfall Way (Grafton Road) travelling in a generally west direction (towards Armidale). Views from this location are generally contained by vegetation to the north and south of the road corridor. The road crosses the Gara River approximately 160m west of this viewpoint.<br>The visual sensitivity of this viewpoint has been rated as moderate. | A proposed site access point is located approximately 350m west of this viewpoint providing access into the Site from the north. The proposed site access is unlikely to be noticeable to motorists travelling along Waterfall Way (Grafton Road). There are a number of similar access roads in the vicinity. The proposed solar farm is approximately 2km to the south of this location and is not visible due to vegetation and distance.<br>**The visual effect has been rated as nil from this location and therefore there will be no visual impact from this viewpoint.** |



| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF13 | Silverton Road | 1.45km | 995m | Minor road | Low | Moderate | Low | View from Silverton Road, approximately 3.5km south of Waterfall Way (Grafton Road). Land in this area is predominately cleared for grazing with scattered vegetation and stands of trees throughout the landscape. Views are expansive, across grazing land that slopes gently towards the Gara River. Vegetated hills form a backdrop to views in the distance.<br>The visual sensitivity of this viewpoint is low due to the land use and distance to site. | From this location it is likely views of the solar array will be visible in the middle ground. Scattered vegetation may assist in fragmenting views.<br>**The visual effect is likely to be moderate, however when combined with a low visual sensitivity the visual impact rating is low**. |

| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF14 | Silverton Road | 60m | 972m<br>West | Minor road | Moderate | High | High | View from Silverton Road, approximately 125m north of the intersection with Gara Road. Views from this location are expansive across cleared grazing land which slopes down towards the Gara River. Vegetated ranges are visible in the background. Scattered vegetation and stands of vegetation associated with properties are visible in the middle ground.<br>The visual sensitivity of this viewpoint has been rated as moderate due to the close proximity to the site. | The proposal will be visible from this location and is likely to alter the existing landscape character. Views across land to the west of this location will be dominated by the proposed solar array.<br>Access along Silverton Road is limited to people travelling to homesteads along Silverton Road or Gara Road and therefore the frequency of the view is low number of people affected by the view is limited.<br>**The visual effect has been rated as high resulting in a high visual impact from this location.** |



| Viewpoint | Location | Distance to site | Elevation and direction | Land use | Visual sensitivity | Visual effect | Visual impact | Viewpoint description | Potential visual impact |
|---|---|---|---|---|---|---|---|---|---|
| OSF15 | Silverton Road | 50m | 961m<br>West | Minor road | Moderate | High | High | View from Silverton Road, near the gate to 'Silverton'. Views from this location are expansive across cleared grazing land which slope down towards the Gara River. Vegetated ranges are visible in the background. Scattered vegetation and stands of vegetation associated with properties are visible in the middle ground.<br><br>The visual sensitivity of this viewpoint has been rated as moderate due to the close proximity to the Site. | The proposal will be visible from this location and is likely to alter the existing landscape character. Views across land to the west of this location will be dominated by the proposed solar array.<br><br>**The visual effect has been rated as high resulting in a high visual impact from this location.** |

The visual sensitivity and visual effect of each viewpoint have been assessed which, when combined, result in an overall visual impact for the viewpoint, a summary is provided in Table 7-7.

Table 7-7 Viewpoint visual impact summary.

| Viewpoint | Associated residences | Location | Visual sensitivity | Visual effect | Potential visual impact |
|---|---|---|---|---|---|
| OSF01 | R40, R54, R57, R61, R63, R68, R70, R71, R84, R85, | Andersons Road | High | Nil | **Nil** |
| OSF02 | R14, R21, R23, R25, R28, R29, R31, R32, R97 | Milne Road | High | Low | **Moderate** |
| OSF03 | R39, R34, R38, R48, R50,R93, R106 | Castledoyle Road | Low | Nil | **Nil** |
| OSF04 | R27, R46, R47, R53 | Blue Hole Road | Low | Low | **Low** |
| OSF05 | R4, R7 | Blue Hole Road | Moderate | Moderate | **Moderate** |
| OSF06 | Oxley Wild Rivers National Park, R26 | Blue Hole Road | Moderate | High | **High** |
| OSF07 | R3, R35, R36, R37, R41, R52, R67 | Andersons Road | High | Nil | **Nil** |
| OSF08 | R94, R102, R107 | Castledoyle Road | Low | Nil - low | **Nil - low** |
| OSF09 | R40, R58, R74, R78, R88, R98 | Gara Road | Low | Low | **Low** |
| OSF10 | R10 | Gara Road | Low | Nil - low | **Nil - low** |
| OSF11 | R6, R8, R19, R20 | Waterfall Way (Grafton Road) | Moderate | Nil | **Nil** |

| Viewpoint | Associated residences | Location | Visual sensitivity | Visual effect | Potential visual impact |
|---|---|---|---|---|---|
| OSF12 | R9, R16, R24, R33, R44, R66, , R81, R82, R84, R91 | Silverton Road | Low | Low | **Low** |
| OSF13 | | Silverton Road | Low | Moderate | **Low** |
| OSF14 | R5 | Silverton Road | Moderate | High | **High** |
| OSF15 | R12, R15, R22 | Silverton Road | Moderate | High | **High** |

Of the 15 viewpoints assessed as part of this VIA, the proposal would be visible from a total of 11 viewpoints. Of the 11 viewpoints from which the proposal would be visible:

- 6 were assessed as having a visual impact rating of low or nil – low.
- 2 were assessed as having visual impact rating of moderate.
- 3 received a visual impact rating of high.

It is noted visual impacts associated with the proposed development are likely to be higher during the construction phases and mitigated overtime with the implementation of measures to ultimately achieve a low or negligible visual impact level. The incorporated mitigation measures outlined below seek to avoid, reduce and where possible remedy adverse visual effects arising from the proposed development.

The viewpoints which were rated as having a ***high*** visual impact were taken within close proximity of the proposal in locations where there was an absence of existing vegetation to screen views into the proposed development. Mitigation measures such as effective screen planting will reduce the visual effect to being rated as low, resulting in an overall visual impact of ***moderate***.

Primarily viewpoints that were rated as ***moderate*** consisted of views into the site that were already partially screened by topography or existing established vegetation. The addition of screen planting would further reduce the visual impact.

Generally, viewpoints that were rated as ***low*** contained limited views to the site, adequate screening or roadside vegetation and landforms from the viewpoint to obscure views.

## Visual impact assessment

In addition to the photographic viewpoint assessment, the following section provides an overview of the potential visibility from areas surrounding the site. This is by no means an exhaustive description of the visibility from every locality, it is intended to provide an overall assessment of the potential visual impact on areas potentially affected by the proposal.

Overall, the proposed development will result in the modification of the existing visual landscape. However due to the relatively small vertical scale, existing landscape features including vegetation and topography screen the proposal from a distance. Therefore, the highest visual effect is likely to be from areas within close proximity to the site.

**Public land**

Publicly accessible viewing locations are generally limited to the minor roads which transverse the landscape. These roads have a very low frequency of use, providing access to isolated residences and farmland.

There will be limited areas within publicly accessible land where the development can be viewed in its entirety. The highest visual impact is likely to be from Gara Road and Silverton Road. These roads are generally used to provide access to isolated homesteads and have a relatively low frequency of use.

Views to the proposal will also be available from a small portion of Blue Hole Road, which is utilised by visitors to the Oxley Wild Rivers National Park and has a slightly higher frequency of use. Views to the proposal have the potential to be visible to the north of the National Park, discussed further below.

Roads with a higher frequency of use including Waterfall Way (Grafton Road) and Castledoyle Road are less likely to have views to the proposal. The main travel route in the area is the Waterfall Way (Grafton Road). Roadside vegetation characterises the road and contains views (refer to Viewpoint OSF11). At its closest point the road is approximately 2km from the site. A combination of speed, roadside vegetation, distance and topography limit the views into the site and it is unlikely views would be available to motorists travelling along Waterfall Way (Grafton Road).

Any views to the proposal from Castledoyle Road, Milne Road and Anderson Road would be relatively distant and a combination of roadside vegetation, undulating topography and general road direction would limit the opportunities to view the proposal.

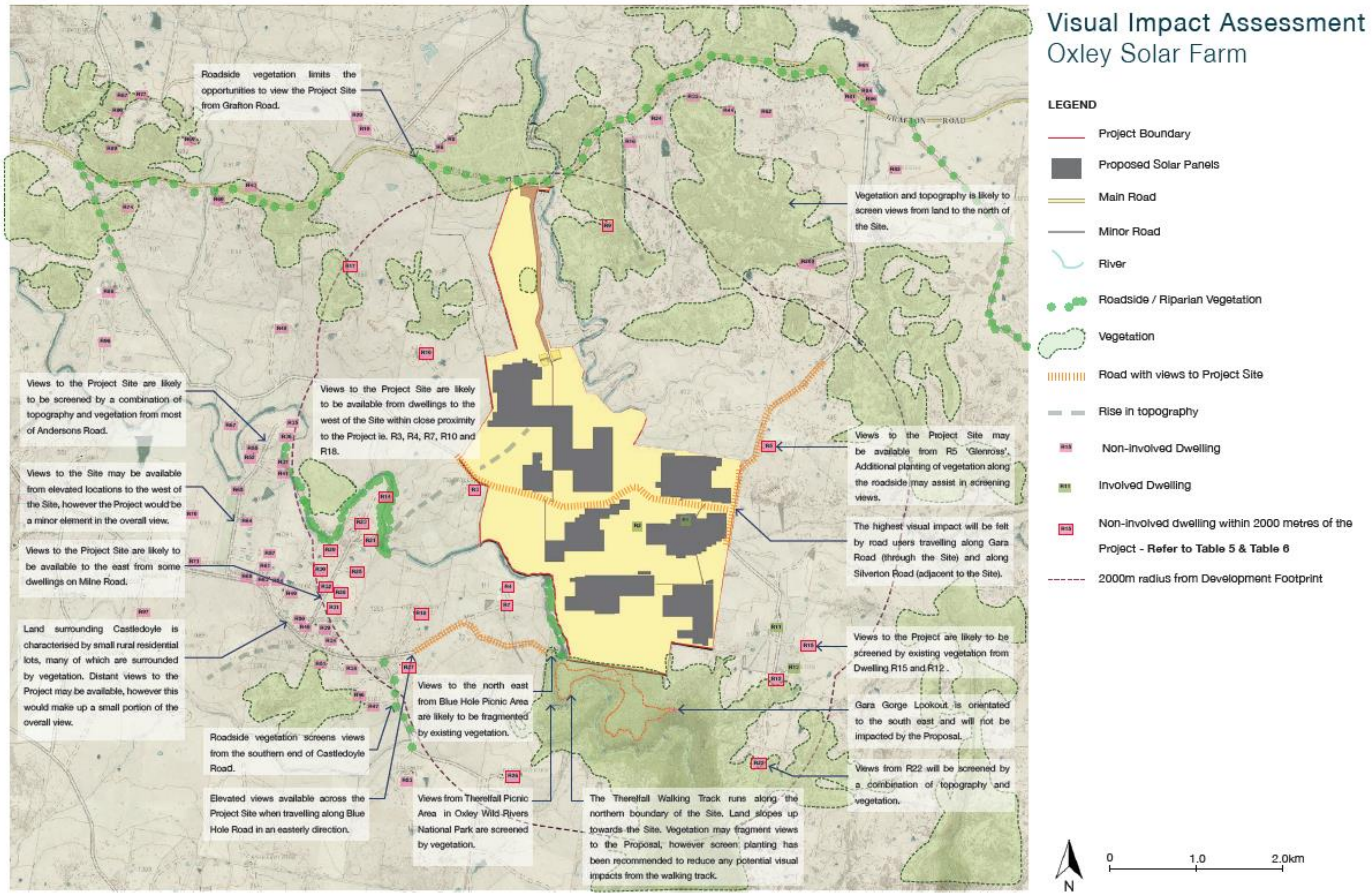



Figure 7-8 Landscape impact assessment.

**Oxley Wild River National Park**

The proposal site is bounded to the south by the Oxley Wild River National Park. Oxley Wild River National Park is accessed via Blue Hole Road. The National Park has two picnic areas, Blue Hole Picnic Area, situated at the entry to the National Park from Blue Hole Road in the north) and Therelfall Picnic Area (approximately 600m to the south). Views from Therelfall Picnic Area are concealed by dense vegetation.

Access through the National Park is generally limited to the Therelfall Walking Trail which runs in a loop from Blue Hole Picnic Area out to Gara Gorge and past Therelfall Picnic Area. Views to the north from the southern end of the trail and Gara Gorge Lookout are contained by vegetation. The Therelfall Walking Track runs close to the northern boundary of the Oxley Wild Rivers National Park. Topography rises to the north of the walking trail and when combined with vegetation, opportunities to view the proposal from the walking trail are limited. Mitigation methods outlined below include screen planting along the southern boundary of the proposal to minimise any potential views to the proposal from the walking trail within the National Park.

Blue Hole Picnic Area is located at the entry to Oxley Wild Rivers National Park. The Picnic Area has a BBQ shelter, picnic tables and signage that serves as an entry point to the National Park. Blue Hole is a popular swimming area. The proposal site extends to the north eastern edge of the National Park and has the potential to be visible from Blue Hole Picnic Area. Screen planting suggested would reduce the potential visibility.

**Residences**

It is likely a number of surrounding residences would have varying degrees of visibility toward the proposal site. However, some residences would have fragmented views due to existing vegetation, orientation of the dwelling or topography.

There is a total of 30 residences within 2km of the indicative layout. The VIA concentrated on the visual impact of the key infrastructure components onsite, the site access is addressed in below sections. Castledoyle is the most populated area within close proximity to the proposal site. Castledoyle is characterised by rural residential properties that are generally accessed via Castledoyle Road. Dwellings associated with Castledoyle Road are generally set back from the roadside and a large majority have wind break planting along boundaries and fence lines. It is likely some views will be available to dwellings associated with Castledoyle Road, however these views are likely to form only a small element in the visual catchment.

Andersons Road and Milne Road run in a generally north direction from Castledoyle Road. Residences on the eastern side of Milne and Andersons Road are likely to have views to the proposal to the east. The proposal is likely to form a small portion of these views and in the context of the visual character would have a low visual impact.

The highest visual impact is likely to be experienced from dwellings within close proximity to the site (within approximately 1km). This includes a relatively small numbers of dwellings typically located along Gara Road, Blue Hole Road and Silverton Road.

Table 7-8 provides an overview of potential visual impact from all dwellings within 2km of the indicative layout. The assessment identified a total of eight (8) dwellings located within 1km, twelve (12) between 1-1.5km and ten (10) dwellings between 1.5-2.5km of the indicative footprint. Of these dwellings the proposal will be screened by either topography, vegetation or both from fifteen (15) dwellings and visible in varying degrees from fifteen (15) dwellings. Therefore for the fifteen dwellings with views, mitigation measures have been recommended to reduce any potential visual impacts of the proposal. If mitigation methods of this LVIA are employed, the potential visibility and associated visual impacts of the proposal is likely to be significantly reduced from these dwellings.

Table 7-8 Overview of dwellings within 2km of the proposal.

| Residence | Location | Distance to proposal (m) | Elevation (m) | Visual Assessment | Recommended Measures |
|---|---|---|---|---|---|
| **Dwellings within 1km of the indicative layout** | | | | | |
| **R3** | Trig Hill 686<br>Gara Road | 200m | 980m | The proposal is located 200m east of R3. Views to the southern portion of the proposal will be available. | Proposed screen planting along western boundary of the site will assist in screening views to the proposal from this residence. Screen planting could be undertaken in consultation with the landowner of R3 to further assist in screening views. |
| **R4** | 111 Blue Hole Road | 320m | 930m | R4 is elevated above proposal and views to the proposal will be available to the north and east. | Screen planting could be undertaken in consultation with the landowner of R4 to assist in reducing the potential impact. |
| **R5** | Glenross 455<br>Silverton Road | 317m | 970m | Views to the proposal may be available to the south east. Existing scattered vegetation to the south east of the dwelling is likely to fragment views. | Proposed screen planting along eastern boundary of the Site will assist in screening views to the proposal from this residence. Supplementary planting could be undertaken in consultation with the landowner of R5 to further assist in screening views. |

| Residence | Location | Distance to proposal (m) | Elevation (m) | Visual Assessment | Recommended Measures |
|---|---|---|---|---|---|
| **R6** | 8 Argyle-Mining Road, Metz | 330m | 990m | Dwelling is located to the north of the Site on the northern side of Grafton Road. Dense vegetation to the south of the dwelling screens views toward the proposal. | Not required |
| **R7** | 109 Blue Hole Road | 550m | 940m | Dwelling is in an elevated position and appears to be orientated to the NE towards the proposal. | Proposed supplementary planting to the east of R7, in consultation with the landowner and in keeping with existing band of vegetation would assist in reducing views to the proposal from this dwelling. |
| **R8** | 52 Argyle-Mining Road, Metz | 430 | 988m | Dwelling is located to the north of the Site on the northern side of Grafton Road. Dense vegetation to the south of the dwelling screens views toward the proposal. | Not required |
| **R10** | 597 Gara Road | 905m | 990m | The proposal is located 905m south east of R3. Views to the northern portion of the proposal will be available. | Screen planting could be undertaken in consultation with the landowner of R10 to assist in reducing the potential impact. |
| **R12** | 761 Silverton Road | 825m | 970m | Existing wind break planting to the north west is likely to screen the proposal from R12. | Not required |

| Residence | Location | Distance to proposal (m) | Elevation (m) | Visual Assessment | Recommended Measures |
|---|---|---|---|---|---|
| **Dwellings within 1-1.5km of the indicative layout** | | | | | |
| **R9** | 1392 Waterfall Way (Grafton Road) | 1471m | 980m | The proposal is likely to be screened by vegetation. | Not required. |
| **R11** | Involved landowner | | | | |
| **R13** | Involved landowner | | | | |
| **R14** | 132 Milne Road | 1185m | 980m | The proposal will be screened by topography. | Not required. |
| **R15** | 723 Silverton Road | 1078m | 980m | Existing vegetation to the west is likely to screen the proposal from R15. | Not required. |
| **R16** | 1490 Grafton Road, Metz | 1100m | 1012m | The proposal will not be visible from this dwelling due to topography and vegetation. | Not required. |
| **R18** | 21 Blue Hole Road | 1295m | 960m | Dwelling is slightly elevated, views will be available to the east. | Supplementary planting could be undertaken in consultation with the landowner of R18 to assist in reducing the potential impact. |
| **R21** | 128 Milne Road | 1443m | 930m | The southern portion of the site may be visible. | Screen planting could be undertaken in consultation with the landowner of R21 to assist in reducing the potential impact. |

| Residence | Location | Distance to proposal (m) | Elevation (m) | Visual Assessment | Recommended Measures |
|---|---|---|---|---|---|
| **R22** | 711 Silverton Road | 1500m | 970m | The proposal will be screened by topography and vegetation. | Not required. |
| **R23** | 133 Milne Road | 1479m | 930m | The proposal will be screened by a combination of topography and vegetation from R23. | Not required |
| **R24** | 1514 Grafton Road, Metz | 1490m | 998m | The proposal will not be visible from this dwelling due to topography and vegetation. | Not required |
| **Dwellings within 1.5-2km of the indicative layout** | | | | | |
| **R17** | 1060 Waterfall Way (Grafton Road) | 1964m | 1000m | The proposal will be screened by topography. | Not required. |
| **R25** | 90 Milne Road | 1561m | 940m | Views to the proposal may be available to the north east. | Screen planting could be undertaken in consultation with the landowner of R25 if deemed necessary to assist in reducing the potential impact. |
| **R26** | Kenwood Park 1474 Castledoyle Road | 1560m | 950m | Vegetation associated with the Oxley Wild Rivers NP is likely to screen views to the proposal. Some distant views to the north may be available. | Screen planting to the north could be undertaken in consultation with the landowner of R26 if deemed necessary to assist in reducing the potential impact. |

| Residence | Location | Distance to proposal (m) | Elevation (m) | Visual Assessment | Recommended Measures |
|---|---|---|---|---|---|
| **R27** | 'Meroo' 22 Blue Hole Road | 1750m | 970m | Views to the proposal are likely to be available to the north east. | Screen planting to the north could be undertaken in consultation with the landowner of R27 if deemed necessary to assist in reducing the potential impact. |
| **R28** | 66 Milne Road | 1825m | 960m | A small portion of the proposal may be visible to the north east. | Screen planting to the north east could be undertaken in consultation with the landowner of R28 if deemed necessary to assist in reducing the potential impact. |
| **R29** | 113 Milne Road | 1840m | 930m | Topography and existing vegetation to the east is likely to screen the proposal. | Not required. |
| **R30** | 73 Milne Road | 1923m | 940m | A small portion of the proposal may be visible to the north east. | Proposed supplementary planting to the north east of R29, in consultation with the land owner and in keeping with existing band of vegetation would assist in reducing views to the Project from this dwelling. |
| **R31** | 52 Milne Road | 1950m | 960m | A small portion of the proposal may be visible to the north east. | Screen planting to the north could be undertaken in consultation with the landowner of R31 if deemed necessary to |

| Residence | Location | Distance to proposal (m) | Elevation (m) | Visual Assessment | Recommended Measures |
|---|---|---|---|---|---|
| | | | | | assist in reducing the potential impact. |
| **R32** | 57 Milne Road | 1954m | 960m | A small portion of the proposal may be visible to the north east. | Proposed supplementary planting to the north east of R29, in consultation with the land owner and in keeping with existing band of vegetation would assist in reducing |
| **R33** | 1584 Grafton Road | 2000m | 1015m | The proposal will be screened by topography and vegetation. | Not required. |

## Associated infrastructure

The impact assessment outlined above for each viewpoint, receiver, public lands and National Park addresses the potential visual impact of infrastructure proposed. This section addresses specific concerns regarding to the associated infrastructure and lighting.

The proposal doesn't include the construction of any new transmission lines. Connection to the national grid would be via a new onsite substation. The proposed substation is situated in the northern end of the site. The footprint of the substation is around 120m x 60m, although only approximately a half of this will be built form. The majority of the substation will remain under 10m high, although the lightening poles will reach up to 20m high and the gantry up to 18m high. The proposed substation is located in a generally isolated location. If mitigation methods outlined in below are employed, overtime the proposed substation and battery storage facilities will be screened.

There will be no permanent night lighting installed within the array. Night lighting will only be used in the case of maintenance and in the event of an emergency and would designed to ensure reduce disturbance to neighbouring properties. Any lighting installed will be in accordance with AS4228-1997 - Control of Obtrusive Effects of Outdoor Lighting.

Some minor vegetation clearing is required along Waterfall Way (Grafton Road) for the construction of the new site access intersection and to achieve its safe sight distances. The vegetation clearing would be minor and is unlikely to be noticeable for receivers along Waterfall Way (Grafton Road) due to their short duration of views and existing landscape characteristic of liner infrastructure with patches of roadside vegetation.

## Glare and Glint

Due to the materials used in the construction of PV panels being primarily glass and steel there is a perceived issue of glint and glare surrounding the reflectivity solar panels. As a result of the perceived reflection levels, there is a concern of possible distractions to motorists, aircraft and the hazard of eye damage. Glint is a quick reflection that occurs when the sun is reflected on a smooth surface. Glare is a longer reflection.

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

The level of glare and reflectance from the PV solar panels are considerably lower than the level of glare and reflectance of common surfaces, particularly those surrounding the proposed solar farm. The PV panels would reflect approximately 6.5% of energy which is less than typical rural environments which have a reflectivity of approximately 15-30% (Figure 7-9). Seen from above (such as from aircraft) they appear dark grey and do not cause a glare or reflectivity hazard. Solar PV plants have been installed on a number of airports around the world and in Australia including Tamworth NSW, Karratha in WA and Darwin in NT.

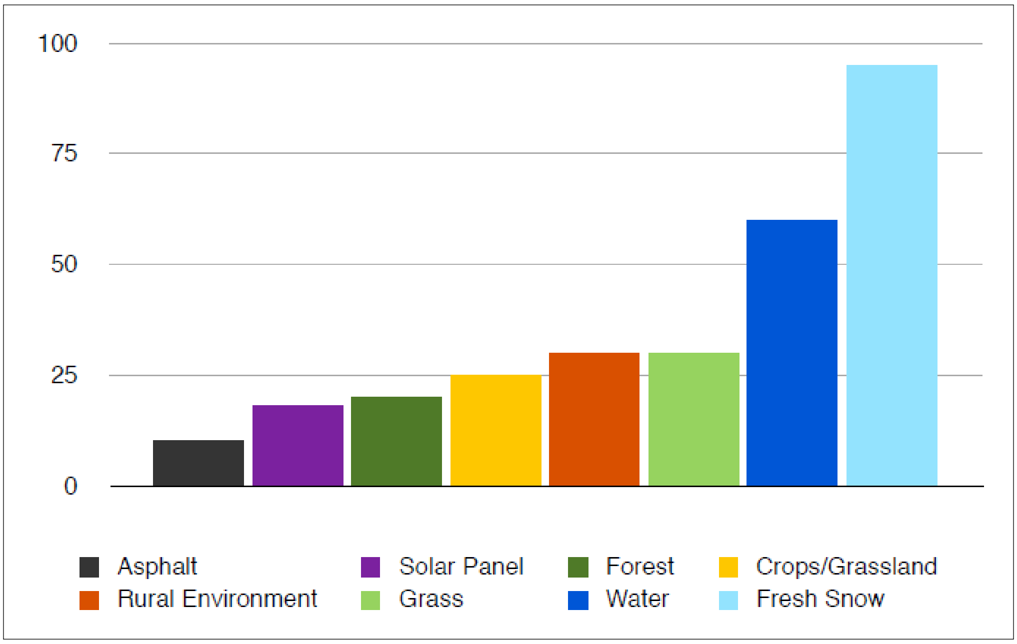



Figure 7-9 Comparative reflection analysis (Spaven Consulting, 2011).

It is noted that the onsite infrastructure may have potential to cause glint or glare depending on the sun angle, specifically:

- Steel array mounting – array mounting would be steel or aluminium.
- PCUs.
- Transmission line poles, if steel is used.
- On-site substation.
- Temporary construction site buildings.

As per the visual impact outlined above, it would be the receivers and public locations that has views of the proposal that have potential to experience glint and glare from the infrastructure. The receivers and public locations include:

- R3
- R4
- R5
- R7
- R10
- R18
- R21
- R25
- R26
- R27
- R28
- R30
- R31
- R32
- Vehicles along Gara and Silverton
- Visitors to the northern part of Oxley Wild Rivers National Park (Therelfall Track and Blue Hole Picnic Area).

Infrastructure would be relatively dispersed and unlikely to present a glare or reflectivity hazard to residences, traffic or aircraft. The glare or glint would be short term depending on the angle of the sun and time of the day. Additionally, with the implementation of the screening and proposed mitigation measures outlined in this EIS, the potential for glare and glint impacts would be substantial reduced.

### 7.2.4. Safeguards and mitigation measures

These recommendations seek to achieve a better visual integration of the proposed development within the existing landscape character of the area. The mitigation measures suggested are intended to lessen the visual impact of the development whilst ensuring the existing visual character of the area is not altered significantly.

Table 7-9 Safeguards and mitigation measures for visual impacts.

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| V1 | The following design considerations will be applied to the proposal:<br>• Consideration of potential visual impacts should be considered when siting the PCU's and storage shed within the proposed development footprint. They should be situated at a suitable distance from residences. Excess material should be used to berm the southern section to assist in fragmenting views.<br>• The design should retain the existing roadside planting along the eastern boundary of the site. This would reduce the overall visual impact of proposed development.<br>• Consideration should be given to the material and colours of the PCU's, the battery, and storage shed to ensure minimal contrast and to help blend into the surrounding landscape. In general materials should be nonreflective and should be painted in neutral colours that are sensitive to the surrounding landscape.<br>• Consideration should be given to controlling the type and height of PCU's, the battery, and storage shed to ensure the development does not contrast significantly with surrounding landscape.<br>• Security fencing and frames will be non-reflective. | Design | | |
| V2 | Existing vegetation should be retained and protected, where possible, during the works to maintain the existing level of screening. | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| V3 | A landscaping plan will be prepared and implemented. The plan will include a variety of landscape mitigation strategies to assist in the integration of the proposal into the existing landscape character, specifically:<br>• A wide band of native plantings of trees up to 5-10m in height for the southern boundary of the proposal site to address potential visual impacts from the Oxley Wild Rivers National Park. These can be positioned in three (3) rows (or approximately 6 - 9m wide) between the property boundary and security fence. The tree canopy should not intrude into the zone that exists between the edge of the security fence and the solar panels (refer to Figure 7-10).<br>• Screen planting along Silverton Road to assist in screening views from R5 and reducing the visual impact from Silverton Road.<br>• Screen planting on the western boundary of the site to reduce the potential visual impact from R3.<br>• Consultation with landowners identified in Table 7-8 within 1.5km of the proposal site to undertake screen planting near dwelling as required. Screen planting is to be undertaken in consultation with landowners to ensure desirable views are not diminished. | C | O | |
| V4 | Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations). | | O | |

## Draft landscaping plan

The proposed landscaping plan is outlined in Figure 7-10.

It is recommended that any landscaping and screening keep within the existing vegetation typologies (scattered grouping of a variety of natives). It is important that the trees are planted at varying heights and arranged randomly (i.e. not straight lines). This ensures a naturalistic effect that blends rather than contrasts with the overall landscape.

The species selected should tolerate severe drought and have low flammability. The species for consideration include;

- *Myoporum montanum*
- *Acacia implexa*
- *Geijera parviflora*

To ensure that mitigation planting is successful all landscape works should be maintained regularly for a period of 24 months.

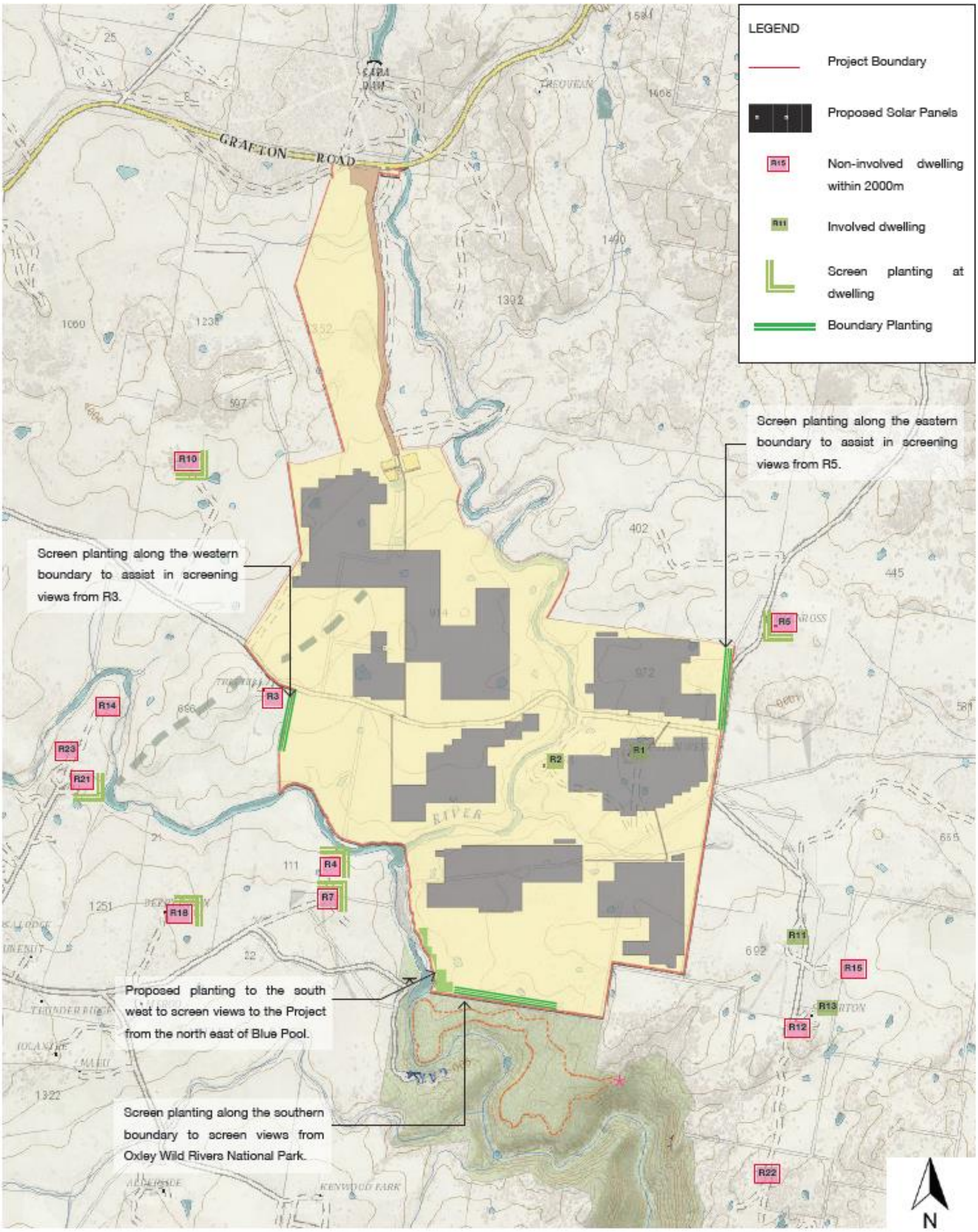



Figure 7-10 Draft Landscaping plan.

# 7.3. WATERCOURSES AND HYDROLOGY

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Water –** including:*
    - *an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Gara River and Commissioners Waters (and their tributaries), drainage channels, wetlands, riparian land, farm dams, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts;*

## 7.3.1. Approach

A Hydrological and Hydraulic Analysis Report was prepared by Footprint NSW Pty Ltd (2021) to assess potential impacts of the proposal on existing hydrological conditions of the site. The report has been provided as Appendix F and is summarised below.

## 7.3.2. Existing environment

The Armidale - Dumaresq Local Flood Plan covers preparation for response to and recovery from emergencies including flooding (NSW SES, 2013).

According to the Armidale - Dumaresq Council Flood Plan, the area is almost entirely contained within the Macleay River Basin. The Armidale Regional Council area is located in the New England Tablelands and Gorge sections of the upper Macleay River Valley. The primary tributaries are the Gara River, Commissioners Waters, Salisbury Waters and the Chandler River and its main tributaries.

Floods do not significantly affect the rural community of the LGA. However, flooding does cause damage to several roads, which may be cut for short periods. The areas so affected include roads in the proposal area, which may be cut by Gara River and Commission Waters and their tributaries.

No existing flood studies of relevance to the proposal site are available.

The proposal site is traversed by two major watercourses in the Gara River, which traverses the proposal site in a north-south direction, and Commissioners Waters, which traverses the proposal site in a west-east direction. These two watercourses meet on the western boundary in the southern portion of the proposal site before entering the Gara Gorge within the Oxley Wild Rivers National Park which abuts the southern boundary of the proposal site. The proposal site also contains numerous other minor un-named tributaries of the above creeks, most of which are first or second order watercourses.

Except for the two primary watercourses all other watercourses within the proposal site would be described as ephemeral and would only contain flowing water during and shortly after rainfall events.

The proposal site has been extensively cleared of woody vegetation and has been highly modified by historical farming practices.

The proposal site typically falls from north to south with elevation ranging from 1015m Australian Height Datum (AHD) to 905 AHD. These elevations are shown in Figure 7-11.

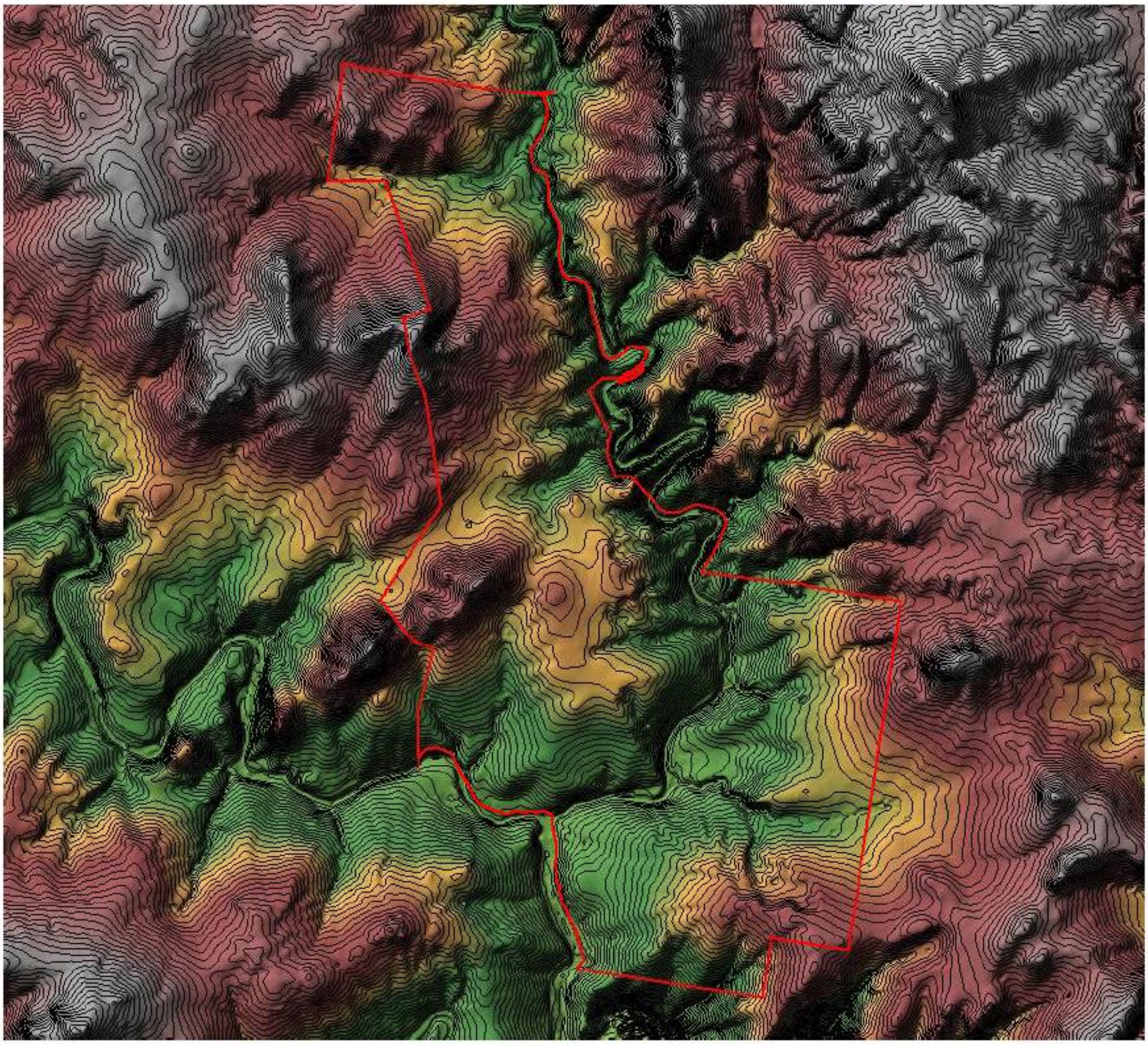


Figure 7-11 Terrain analysis over proposal site (2m contour interval) (Footprint, 2021)

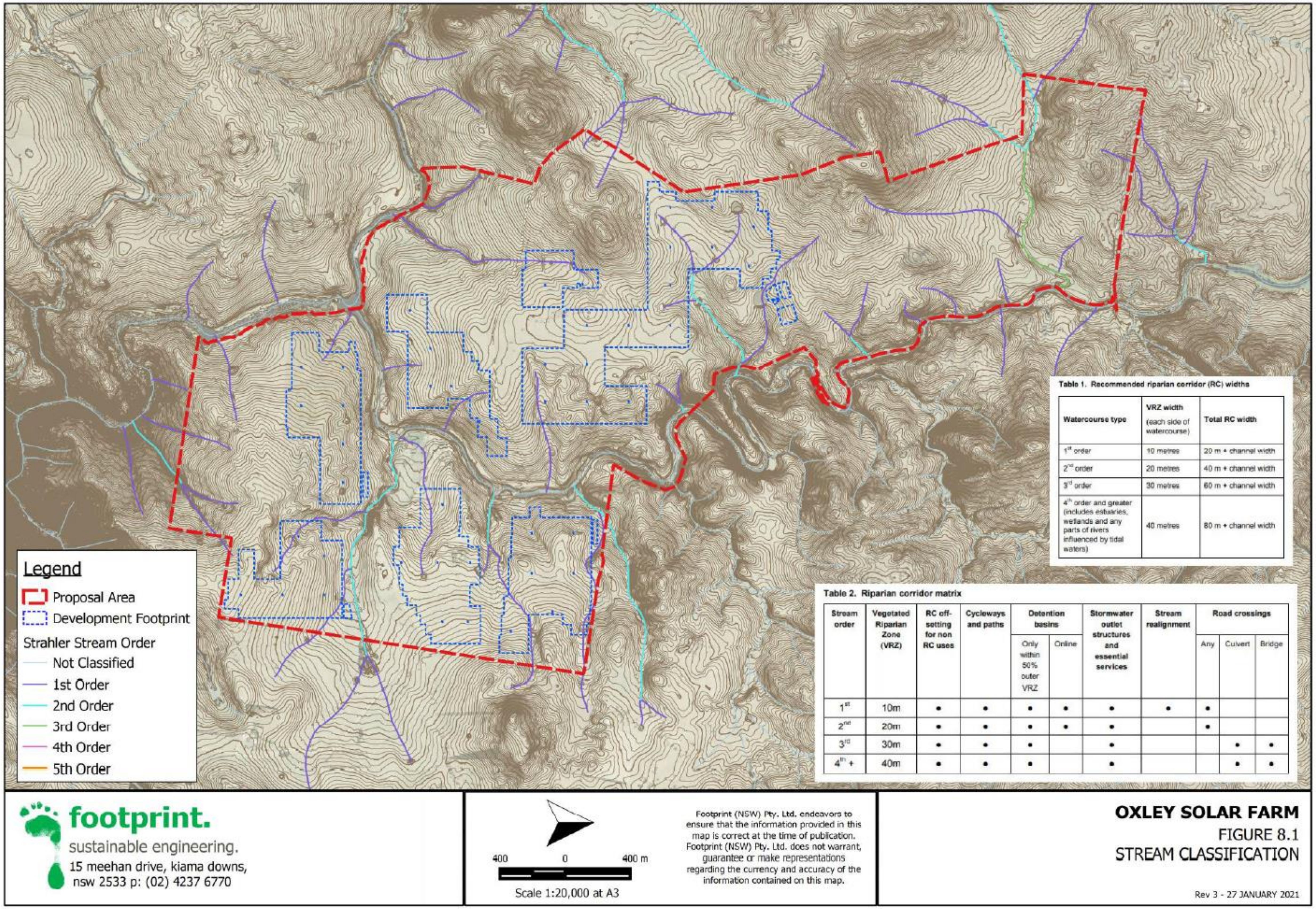



**Table 1. Recommended riparian corridor (RC) widths**

| Watercourse type | VRZ width (each side of watercourse) | Total RC width |
|---|---|---|
| 1st order | 10 metres | 20 m + channel width |
| 2nd order | 20 metres | 40 m + channel width |
| 3rd order | 30 metres | 60 m + channel width |
| 4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters) | 40 metres | 80 m + channel width |

**Table 2. Riparian corridor matrix**

| Stream order | Vegetated Riparian Zone (VRZ) | RC off-setting for non RC uses | Cycleways and paths | Detention basins | | Stormwater outlet structures and essential services | Stream realignment | Road crossings | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Only within 50% outer VRZ | Online | | | Any | Culvert | Bridge |
| 1st | 10m | • | • | • | • | • | • | • | | |
| 2nd | 20m | • | • | • | • | • | | • | | |
| 3rd | 30m | • | • | • | | • | | | • | • |
| 4th + | 40m | • | • | • | | • | | | • | • |

Figure 7-12 Watercourses and stream orders within the Proposal Site (Footprint, 2021).

### 7.3.3. Hydrological and hydraulic modelling results

In a 1% AEP event, the hydrological and hydraulic modelling shows that significant flood depth (>1m) is expected to occur within Gara River and Commissioners Waters with velocities of 3m/s and up to 4m/s where flood depth is highest. Within the other smaller tributaries of the proposal site, flow depths can reach up to >1m, however predominately do not exceed 0.30m in the 1% AEP event and velocity is predominately 1m/s to 1.5m/s, except where flood depth is highest in which case velocity can exceed >4m/s (Figure 7-13 and Figure 7-14).

### Hazard vulnerability

The flood hazard vulnerability over the proposal site is primarily classified as a H1 hazard vulnerability in the 1% AEP event (Figure 7-15), except for flooding within Gara River and the second order watercourses that discharges into Gara River. Gara River reached H6 classification and the second order watercourses that discharges into Gara River, reached H5 classification in parts. As expected, hazard increases over the proposal site in the Probable Maximum Flood (PMF) event. The areas classified as H6 and H5 would therefore be unsuitable for development.

Figure 7-16, Figure 7-17 and Figure 7-18 demonstrate that there is not predicted to be a significant impact on flood behaviour within the floodplain as a result of the proposed works, with flood levels, depths, velocities and hazards remaining relatively unchanged. The change in maximum flood level and peak velocity resulting from the proposed development are anticipated to remain unchanged, due primarily to the infrastructure being located outside of areas subject to flooding. Some minor increases in flood levels and corresponding decreases in velocity are shown to occur within the proposed laydown, parking and buildings, however these changes are very localised and not anticipated to adversely affect adjoining properties.

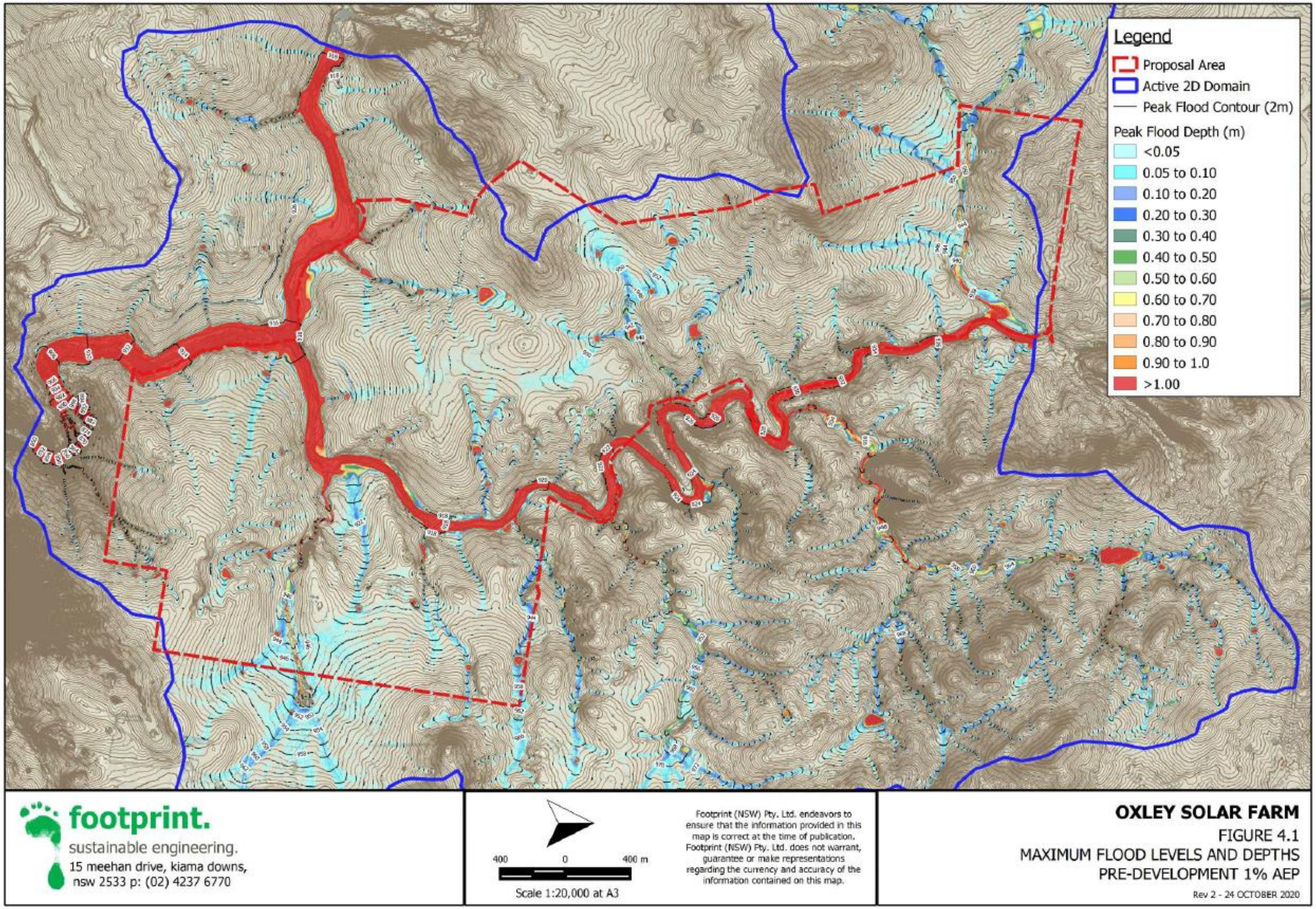



Figure 7-13 Existing 1% AEP peak flood levels (Footprint, 2021)

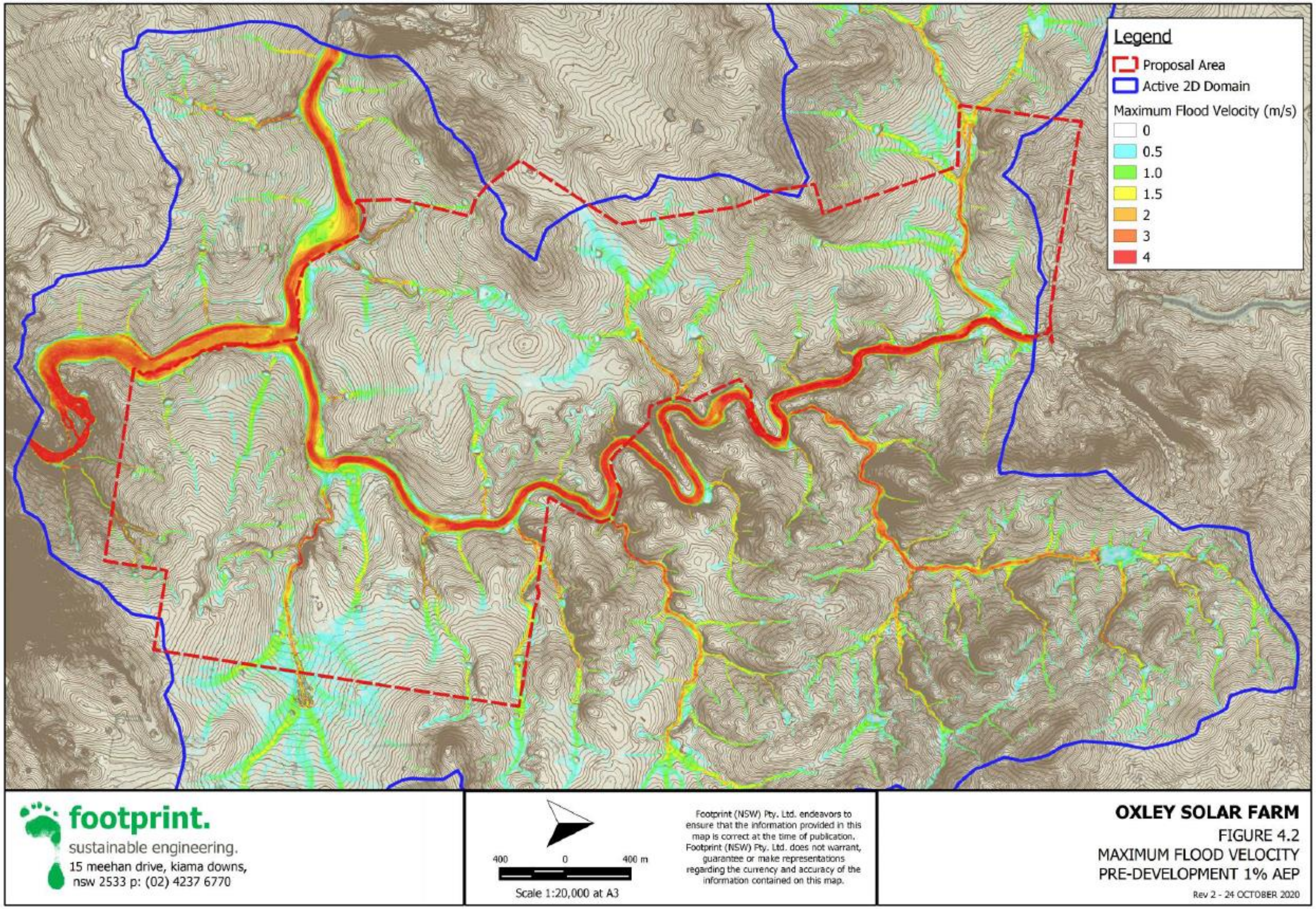



Figure 7-14 Existing 1% AEP Peak flood velocities (Footprint, 2021).

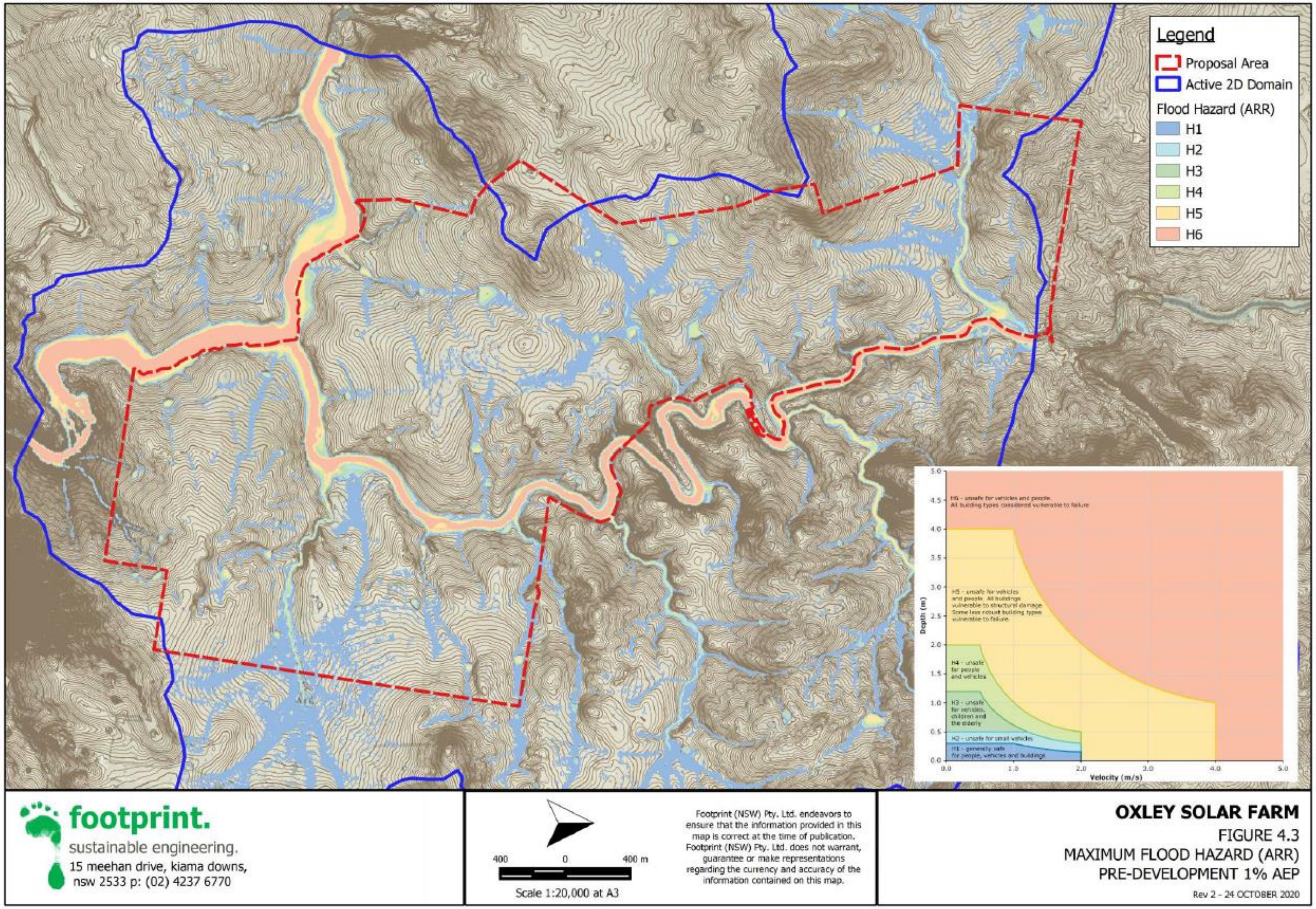



Figure 7-15 Existing 1% AEP flood hazard vulnerability (Footprint, 2021).

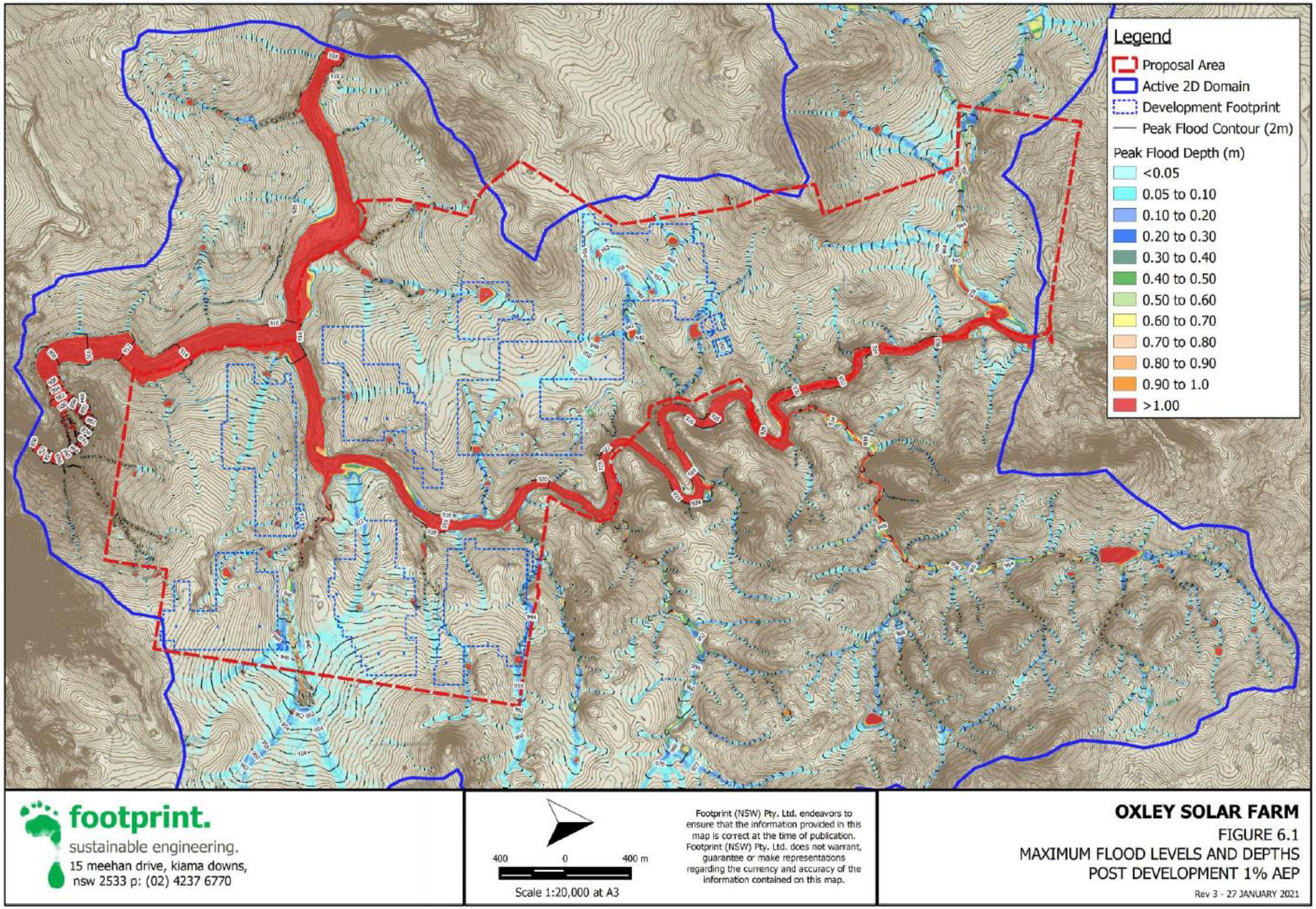



Figure 7-16 - Post development 1% peak flood levels and depths (Footprint, 2021).

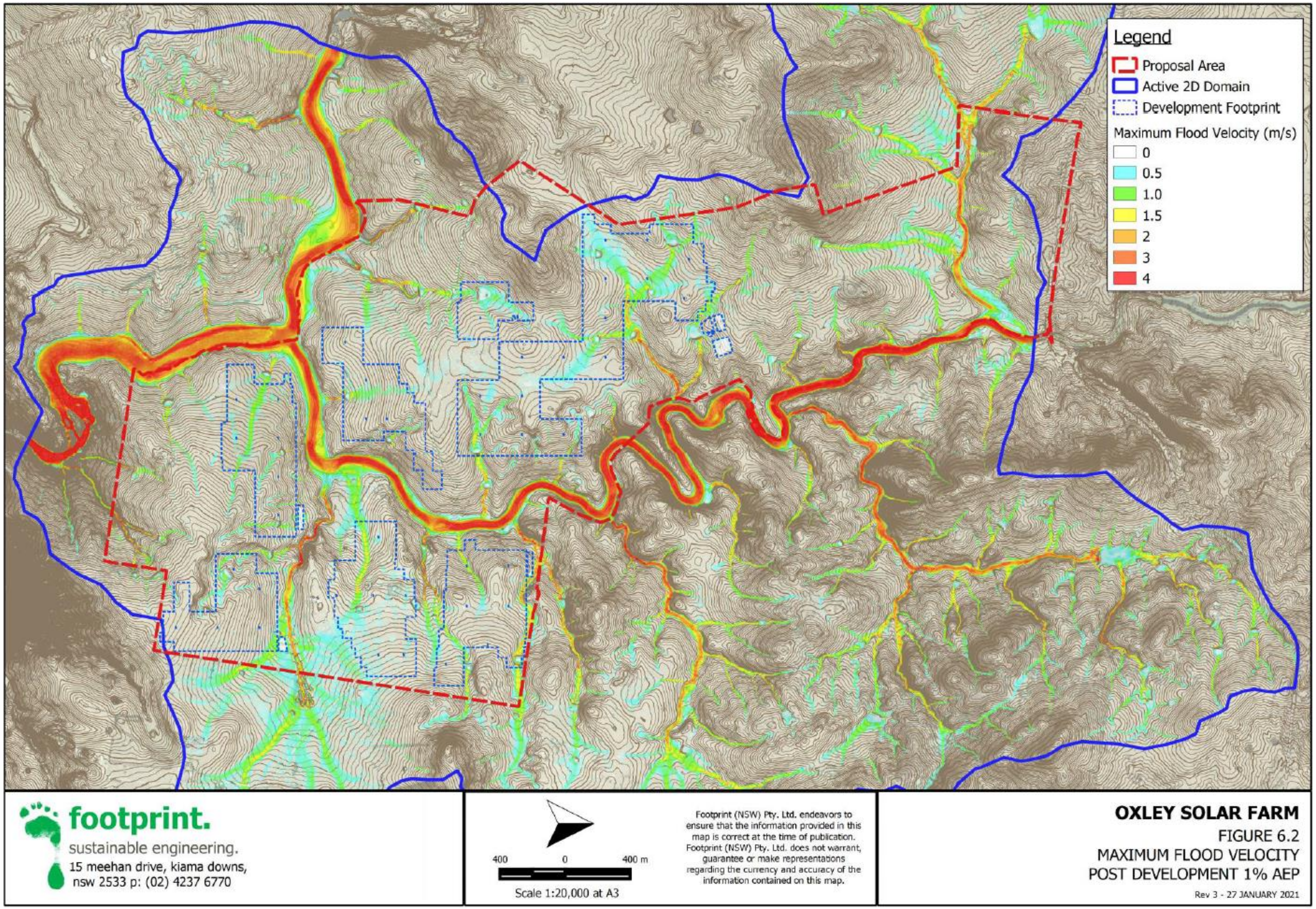



Figure 7-17 Post development 1% AEP peak flood velocities (Footprint, 2021).

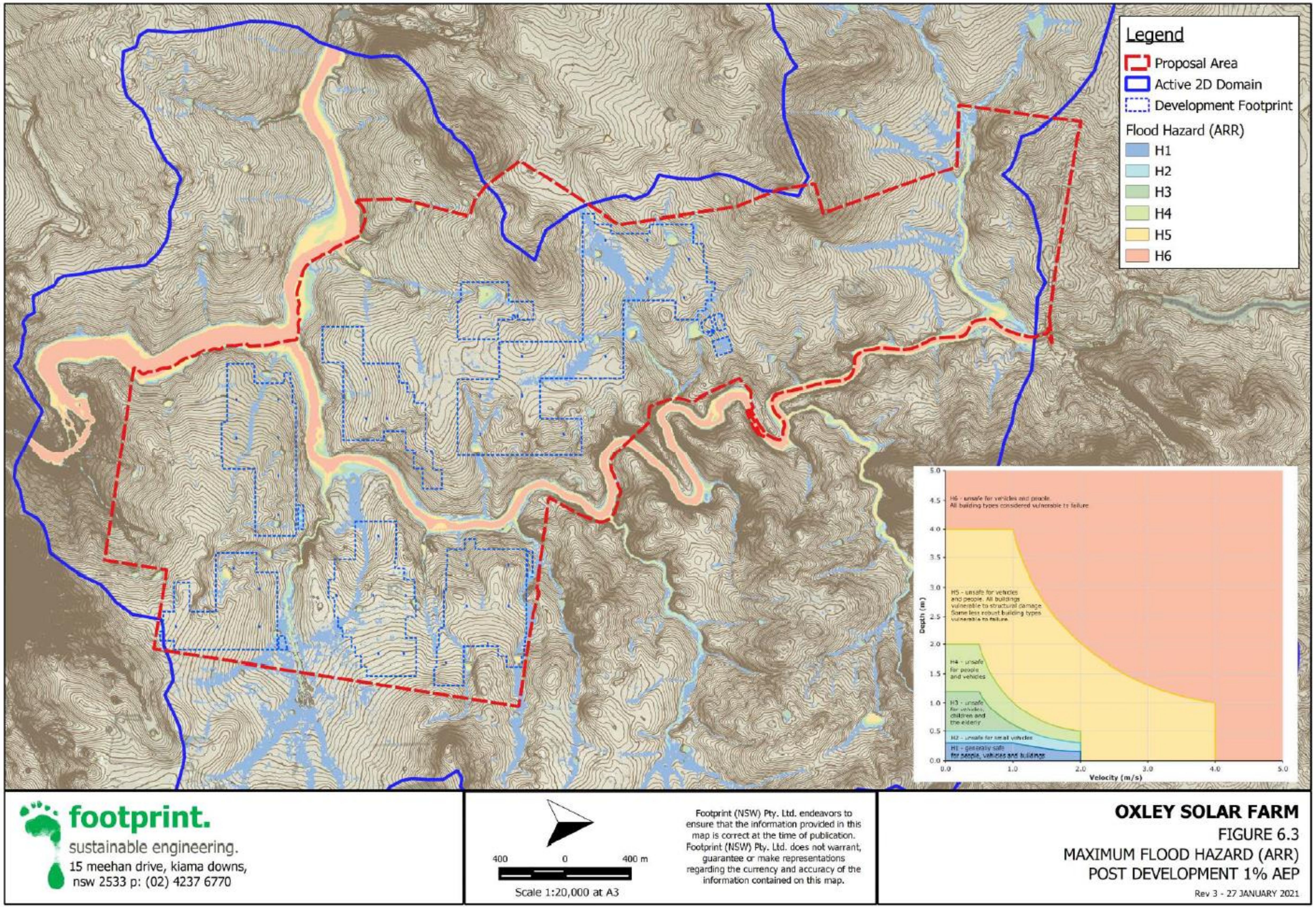



Figure 7-18 Post development 1% AEP hazard vulnerability (Footprint, 2021).

### 7.3.4. Potential impacts

#### Construction and decommissioning

Flood impacts can relate to the potential of a development to increase the risk of flood occurrence or severity, or the potential to create hazards in the event of a flood affecting the site.

Parts of the site may be at risk of temporary minor flooding during high rainfall events and high flows within the vicinity of Gara River, Commissioners Waters and their tributaries. Temporary localised flooding has the potential to interfere with construction and poses a safety risk for workers onsite. The proposal has potential to create the following hazards in the event of a localised flood:

- Electrical hazards to staff, emergency workers and assets due inundation of infrastructure.
- Pollution risks from leakage of stored pollutants (hydrocarbons, pesticides, solvents).
- Physical damage from the mobilisation of components in flood waters.

Buildings, equipment foundations and footings would be considered during detailed design in relation to the potential for flooding at the site. No components are considered susceptible to becoming mobile and entering waterways during construction. All potential pollutants stored on-site during construction would be stored in accordance with HAZMAT requirements and bunded.

The primary access point during construction and operation for light and heavy vehicles would be off the Waterfall Way (Grafton Road), east of the site. It is considered Gara River would be impassable during significant flood events. It is noted that emergency access from both sides of the Gara River back to Waterfall Way (Grafton Road) is possible using Gara Road to the west and Gara Road and Silverton Road to the east. Water crossings across the proposal site will be upgraded in accordance with Guidelines for Riparian Corridors on Waterfront Land (DPI Water, 2012).

A flood response plan would be developed to manage the safety of workers and equipment in the event of extended flooding in the region.

Maintaining grass cover across the site as far as practicable during construction, particularly within the existing waterways, would help maintain soil stability during floods, and would improve soil permeability over time.

#### Operation

The addition of the solar array and associated infrastructure would result in an increase in surface roughness over the site, from grazed/cropped pasture to a regular grid of steel piers. The change in floodplain roughness associated with the proposed development was assessed using the Modified Cowan Method for Floodplain Roughness and is shown in Table 7-10 . It demonstrates that the roughness is anticipated to slightly increase because of the proposed development.

It should be noted that only $n_3$ (effect of obstructions) has been modified to represent the change in roughness associated with the solar array piers, all other variables remain at pre-development values which are variable across the site and hence have remained at $n_b$, $n_1$ etc.

Table 7-10 Modified Cowan method for estimation of floodplain roughness (Footprint, 2021).

| Roughness component | Existing (grazed pasture) | Proposed (solar array) |
|---|---|---|
| Floodplain material ($n_b$) | NA | NA |
| Degree of irregularity ($n_1$) | NA | NA |
| Variation in floodplain cross section ($n_2$) | NA | NA |
| Effect of obstructions ($n_3$) | 0.000 | 0.003[3] |
| Amount of vegetation ($n_4$) | NA | NA |
| **Total** | **0.000** | **0.003** |

It should be noted that the proposed development would include a network of access roads and these would be constructed from gravel and within the floodplain itself would be constructed at the existing surface level so as not to result in adverse impact on flood behaviour.

In accordance with the Modified Cowan Method of Floodplain roughness gravel has a similar floodplain roughness to that of the surrounding pre-development floodplain roughness. On this basis and considering the fact these tracks are likely to be less than 10m in width and therefore not well represented by the model, the marginal increase in floodplain roughness associated with the proposed road network was not included in the post development models.

Furthermore, watercourse crossings were not included in the models as fords or bridges, which minimise any hydraulic impact have been recommended (refer Table 7-11).

The post development hydraulic model is therefore considered to be representative of the development as proposed and therefore reflective of the hydraulic impacts associated with the development.

Localised flooding during operation may pose the following risks:

- A safety risk for workers and assets, where electrical infrastructure becomes inundated.
- A pollution risk, where stored pollutants may be leaked to the environment.
- A local flooding risk should any components become mobile in flood waters.

Structural damage to buildings and structures (including solar arrays) could be expected in areas categorised as being within high hazard areas (H5 and above). Development in these areas are being avoided.

All infrastructure would be located above the 1% AEP flood level plus 500mm freeboard so as not to impact on existing flood behaviour and to prevent infrastructure from being damaged. Infrastructure would be designed to withstand periods of local flooding. No components are considered susceptible to becoming mobile and entering waterways.

Access to the site will cross Gara River. It is considered Gara River would be impassable during significant flood events. As such, flood warning signs, flood level indicators, and a Business Floodsafe Plan should be implemented. It is noted that emergency access from both sides of the Gara River back to Waterfall Way (Grafton Road) is possible using Gara Road to the west and Gara Road and Silverton Road to the east.

[3] Based on an obstruction of 2.5% of the available flow area (i.e. 150mm piers at 5-6m intervals)

## 7.3.5. Safeguards and mitigation measures

The proposed solar farm is unlikely to have potential impacts on existing hydrological conditions of the site through the design mitigation measures outlined below. Further any potential safety risks during construction or operation are addressed through the preparation of plans and installation of signs and indicators where required.

Table 7-11 Safeguards and mitigation measures for hydrology impacts

*PC: Pre-Construction, C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| W1 | The design of buildings, equipment foundations and footings for electrical componentry and panel mounts would be designed to avoid the 1% AEP flood level to minimise impacts from potential flooding including:<br>• The solar array mounting piers would be designed to withstand the forces of floodwater (including any potential debris loading) up to the 1% AEP flood event plus 500mm freeboard, giving regard to the depth and velocity of floodwaters.<br>• The tracking axis for solar tracking modules would be located above 1% AEP flood event plus 500mm freeboard.<br>• The mounting height of the solar module frames would be designed such that the lower edge of the module is clear of the predicted 1% AEP flood level.<br>• All electrical infrastructure, including inverters, would be located above the 1% AEP flood level plus 500mm freeboard.<br>• Where electrical cabling is required to be constructed below the 1% AEP flood level it would be capable of continuous submergence in water.<br>• The proposed perimeter security fencing would be constructed in a manner which does not adversely affect the flow of floodwater and should be designed to withstand the forces of floodwater, or collapse in a controlled manner to prevent impediment to floodwater.<br>• Any fencing across Gara River or Commissioners Waters should be avoided in preference to creating separate fenced compounds on either side of the creeks.<br>• The finished floor level of all buildings should be a minimum of 500mm above the 1% AEP flood level. | | Design | |
| W2 | At the substation site, slight raising of the adjacent roadway (or similar type bunding) is recommended in order to divert upslope runoff around this critical piece of infrastructure. | | Design | |
| W3 | All buildings and structures (including solar arrays) associated with the proposal should be located outside high hazard areas (H5 and above) where they may be vulnerable to structural damage and have significant impact on flood behaviour. | | Design | |
| W4 | If the proposed crossing structures over Gara River will be rendered impassable during significant flood events, the following would occur: | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Flood warning signs and flood level indicators would be placed on each approach to the proposed crossings.<br>• A Business Floodsafe Plan be prepared for the development to ensure the safety of employees during flood events in general accordance with the NSW SES "Business Floodsafe Toolkit and Plan". | | | |
| W5 | Any road crossings on watercourses within the Proposal Area would be of the type defined in Table 2 of the Hydrological and Hydraulic Analysis Report was prepared by Footprint NSW Pty Ltd in Appendix F. Any proposed crossings (vehicular or service) of existing watercourses on the subject site should be designed in accordance with the following guidelines, and in the case of vehicle crossing should preferably consist of bed level crossings constructed flush with the bed of the watercourse on first and second order watercourses to minimise any hydraulic impact:<br>• Guidelines for Watercourse Crossings on Waterfront Land (DPI, 2012)<br>• Guidelines for Laying pipes and Cables in Watercourses on Waterfront Land (Office of Water, 2010)<br>• *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003).<br>• *Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI, 2003). | | Design | |
| W6 | Within the floodplain access roads should be constructed as close to natural ground levels as possible so as not to form an obstruction to floodwaters.<br>The surface treatment of roads should be designed giving regard to the velocity of floodwaters to minimise potential for scouring during flood events. | C | | |
| W7 | An Emergency Response Plan incorporating a Flood Response Plan would be prepared prior to construction covering all phases of the Proposal . The plan would:<br>• Detail who would be responsible for monitoring the flood threat and how this is to be done.<br>• Detail specific response measures to ensure site safety and environmental protection.<br>• Outline a process for removing any necessary equipment and materials offsite and out of flood risk areas (i.e. rotate array modules to provide maximum clearance of the predicted flood level).<br>• Consider site access in the event that some tracks become flooded.<br>• Establish an evacuation point.<br>• Define communication protocols with emergency services agencies. | C | O | D |

## 7.4. ABORIGINAL HERITAGE

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

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

In accordance with the SEARs, an Aboriginal Cultural Heritage Assessment (ACHA) has been prepared to assess the presence or absence of Aboriginal objects, their significance and the potential for the Proposal to impact these sites. Aboriginal heritage sites are found to be present within the proposal site. As such, the proposal will likely impact on Aboriginal heritage sites and objects which are protected under the NSW *National Parks and Wildlife Act 1974* (EP&A Act).

### 7.4.1. Approach

A specialist ACHA was undertaken by NGH (Appendix G) to provide an assessment of the Aboriginal cultural values associated with the Oxley Solar Farm (proposal) site and to assess the cultural and scientific significance of any Aboriginal heritage sites recorded.

The full report is provided in Appendix G and is summarised below. Note: unless stated otherwise, the assessment below considers the full scope of works proposed as per the development footprint provided by OSD.

The ACHA Report was prepared in line with the following:

- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011) .
- *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010a)
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (ACHCRP) (DECCW, 2010b)

Consultation with Aboriginal stakeholders was undertaken in accordance with clause 60 (formerly 80C) of the *National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2019* following the consultation steps outlined in the ACHCRP guide. A comprehensive account of the consultation steps undertaken to comply with the guide, as well as a summary of the actions completed by NGH and responses received from RAPs are provided in Appendix G. As a result of this process, seven groups and one individual actively registered their interest in the proposal, as listed below.

- Armidale Local Aboriginal Land Council (Armidale LALC);
- Nunnawanna;
- Anaiwan Traditional Owners Aboriginal Corporation;
- Larissa Ahoy;
- Iwatta Aboriginal Corporation;
- Armidale NE Gumbaynggir Descendants;
- Nyakka Aboriginal Cultural Heritage Corporation; and
- DFTV Enterprises.

A project methodology was provided for comment, which was provided to the above RAPs. An archaeological survey was then undertaken on the 12th to the 21st of May 2020. The field survey of the proposal site, in conjunction with an assessment of contour data, archaeological modelling and consideration of the comments from the RAPs resulted in the identification of several locations within the overall Proposal site which were considered to have some potential to contain subsurface material. In total, there were 21 areas of potential archaeological deposits (PAD) identified, the depth of which would determine whether *in situ* material would be present or not. Additionally, owing to the extremely low visibility due to dense vegetation cover, effective coverage ascertained through the survey was considered very low and therefore test excavation will also facilitate better characterisation of the archaeological nature of the area. As such, these areas required further assessment.

A copy of the draft ACHA report was provided to the registered Aboriginal parties for review and comment and any comments received have been incorporated into the final ACHA report.

NGH are currently preparing the updated methodology to distribute to the RAPS to undertake a test excavation program onsite during March 2021.

### 7.4.2. Archaeological context

This assessment includes a review of relevant background information relating to the proposed solar farm location, a review of previous archaeological studies undertaken in the local and regional area, as well as an overview of the existing environmental context and studies undertaken within the Proposal site. A search of the AHIMS database also formed part of the background analysis.

The results of previous archaeological surveys in the region show that sites and artefacts are present throughout the landscape, albeit concentrated closer to water courses. Additionally, there appears to be a pattern of site location relating to the presence of potential resources for Aboriginal use, with high density sites generally located in elevated flat areas adjacent to waterways. Lower density background scatters also occur on crests, spurs, slopes, and flats in proximity to water. Modified trees are recorded in the area where old growth trees remain.

Based on previous archaeological investigations in the region it was determined that the Proposal site has a possibility of containing archaeological sites, especially given that Aboriginal people have lived in the region for tens of thousands of years. This would most likely be in the form of low to moderate artefact scatters, isolated artefacts and scarred trees in remnant old growth vegetation areas or as isolated paddock trees. Furthermore, modelling based on the environmental context and archaeological studies undertaken within the local area indicates that there is an increased likelihood for evidence of Aboriginal occupation to be located within the Proposal site, specifically in association with Commissioners Waters and the Gara River.

### 7.4.3. Archaeological investigation results

An archaeological survey was undertaken of the Proposal site in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a). The survey conducted for the purposes of this assessment was undertaken on the 12th to the 21st of May 2020.

It should be noted that a small number of sites were identified and recorded outside the boundary of the Proposal site along its southern perimeter. These have been incorporated into the results as part of the nearest survey unit. In general, the majority of the Proposal site comprised grey-brown sandy silt.

The field survey of the proposed Oxley Solar Farm site, in conjunction with an assessment of contour data, archaeological modelling and consideration of the comments from the RAPs resulted in the identification of several locations within the overall site which were considered to have some potential to contain subsurface material. In total, there were 21 areas of PAD identified (Figure 7-19), the depth of which would determine whether *in situ* material would be present or not. Additionally, owing to the extremely low visibility due to dense vegetation cover, effective coverage ascertained through the survey was considered very low and therefore test excavation will also facilitate better characterisation of the archaeological nature of the area. As such, these areas required further assessment.

Discussions regarding the technological characteristics, manufacture, and type of toolkit of the artefacts as well as indications of occupation distribution and frequency across the sites require further data. Survey coverage was hindered by low visibility and, without subsurface testing, the nature and extent of archaeological deposits is not known. These factors limit the broader understanding of Aboriginal past use of the Proposal site.

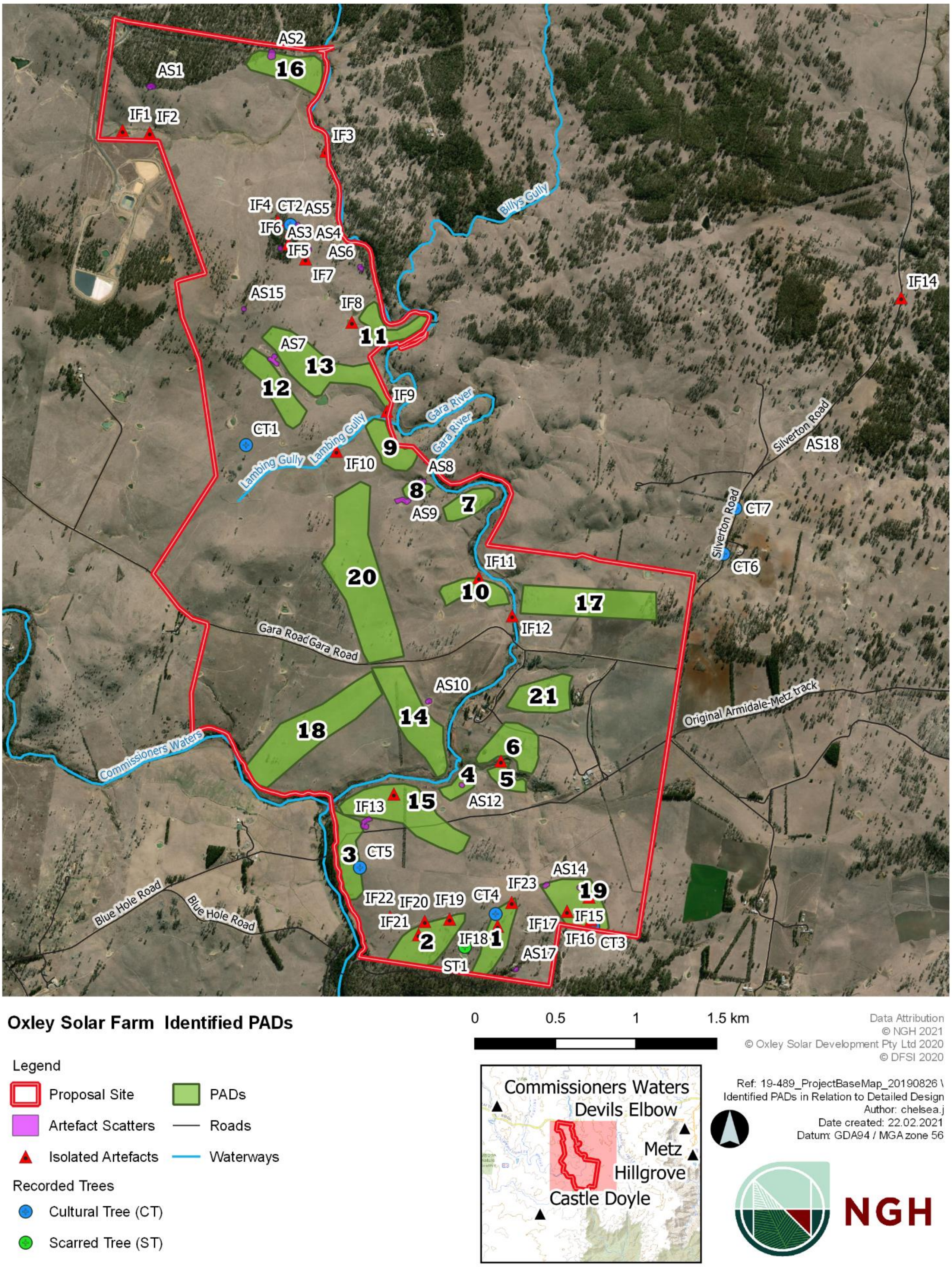



Figure 7-19 Identified PADs

### 7.4.4. Potential impacts

The installation of the ground-mounted PV solar arrays will involve ground surface disturbance, as will the construction of site facilities such as operations buildings, parking perimeter fencing, access tracks throughout the site, and the planting of vegetation screens. However, the proposed construction methodology for the Oxley Solar Farm would result in only small areas of disturbance. The construction of access and maintenance tracks may involve some grading but given the generally cleared nature of the terrain, this is likely to be minimal. The major ground disturbances will likely be trenching for cables and vehicle movement during construction.

A total of 72 individual sites of Aboriginal cultural heritage within five site types were identified. These included 24 isolated finds, 18 artefact scatters, one scarred tree, seven cultural trees and 21 PADs. Nine isolated finds, seven artefact scatters and three cultural trees are situated within or adjacent to the area of the proposed solar arrays, tracks, fencing and associated infrastructure. These 19 sites would be impacted directly or indirectly by the proposed development. Additionally, 13 PAD locations have been identified within this area of impact. The table below (Table 7-12) provides a summary of the degree of harm and the consequence of that harm upon the heritage value of each site type resulting from the proposed works.

Table 7-12 Summary of site types to be impacts and avoided by the proposal.

| Site Type | Type of Harm | Degree of Harm | Consequence of harm | No. of Sites |
|---|---|---|---|---|
| **Isolated Finds** | Indirect | Partial | Partial loss of value | 8 |
| | Direct | Complete | Total loss of value | 1 |
| | Nil | Nil | Not Applicable | 15 |
| **Artefact Scatters** | Indirect | Partial | Partial loss of value | 6 |
| | Direct | Complete | Total loss of value | 1 |
| | Nil | Nil | Not Applicable | 11 |
| **Scarred Trees** | Nil | Nil | Not Applicable | 1 |
| **Cultural Trees** | Indirect | Partial | Partial loss of value | 2 |
| | Direct | Complete | Total loss of value | 1 |
| | Nil | Nil | Not Applicable | 5 |
| **PADs** | Direct | Partial | Unknown/ yet to be established loss of value | 13 |
| | Nil | Nil | Not Applicable | 8 |

It should be noted that, subsequent to the Aboriginal heritage survey, significant design changes to the project layout have ensured the scarred tree and cultural trees are avoided. There are 40 sites including the remaining 26 sites with stone artefacts within the Proposal site, the one scarred tree, the five cultural trees and eight PAD locations that will not be impacted by the proposed development.

Table 7-13 Identified risk to sites.

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| **21-4-0358** | **Oxley Solar Farm IF1** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0359** | **Oxley Solar Farm IF2** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0360** | **Oxley Solar Farm IF3** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0332** | **Oxley Solar Farm IF4** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0333** | **Oxley Solar Farm IF5** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0361** | **Oxley Solar Farm IF6** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0334** | **Oxley Solar Farm IF7** | Poor – 100+ year history of agricultural and pastoral use. | Low | Direct | Whole | Total loss of value | Salvage surface objects prior to the development of Proposal site that will not be avoided by the proposed development. |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| **21-4-0335** | **Oxley Solar Farm IF8** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | Site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around site. |
| **21-4-0362** | **Oxley Solar Farm IF9** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0336** | **Oxley Solar Farm IF10** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | Site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around site. |
| **21-4-0337** | **Oxley Solar Farm IF11** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0338** | **Oxley Solar Farm IF12** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0339** | **Oxley Solar Farm IF13** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0363** | **Oxley Solar Farm IF14** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| **21-4-0340** | **Oxley Solar Farm IF15** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0318** | **Oxley Solar Farm IF16** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0364** | **Oxley Solar Farm IF17** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0319** | **Oxley Solar Farm IF18** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0320** | **Oxley Solar Farm IF19** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0321** | **Oxley Solar Farm IF20** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0366** | **Oxley Solar Farm IF 21** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| **21-4-0365** | **Oxley Solar Farm IF 22** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0354** | **Oxley Solar Farm IF 23** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0353** | **Oxley Solar Farm IF 24** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0367** | **Oxley Solar Farm AS1** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0342** | **Oxley Solar Farm AS2** | Poor – 100+ year history of agricultural and pastoral use. | Moderate | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0343** | **Oxley Solar Farm AS3** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0344** | **Oxley Solar Farm AS4** | Poor – 100+ year history of agricultural and pastoral use. | Low | Direct | Whole | Total loss of value | Salvage surface objects prior to the development of Proposal site that will not be avoided by the proposed development. |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| **21-4-0345** | **Oxley Solar Farm AS5** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0346** | **Oxley Solar Farm AS6** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0347** | **Oxley Solar Farm AS7** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0348** | **Oxley Solar Farm AS8** | Poor – 100+ year history of agricultural and pastoral use. | Moderate | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0352** | **Oxley Solar Farm AS9** | Poor – 100+ year history of agricultural and pastoral use. | Moderate | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0351** | **Oxley Solar Farm AS10** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0349** | **Oxley Solar Farm AS11** | Poor – 100+ year history of agricultural and pastoral use. | Moderate | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| **21-4-0350** | **Oxley Solar Farm AS12** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0322** | **Oxley Solar Farm AS13** | Poor – 100+ year history of agricultural and pastoral use. | Low-Moderate | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0355** | **Oxley Solar Farm AS14** | Poor – 100+ year history of agricultural and pastoral use. | Moderate | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0356** | **Oxley Solar Farm AS15** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0323** | **Oxley Solar Farm AS16** | Poor – 100+ year history of agricultural and pastoral use. | Moderate | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |
| **21-4-0324** | **Oxley Solar Farm AS17** | Poor – 100+ year history of agricultural and pastoral use. | Low | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with a minimum 5 m buffer around the site. |
| **21-4-0357** | **Oxley Solar Farm AS18** | Poor – 100+ year history of agricultural and pastoral use. | Low | Indirect | Partial | Partial loss of value | Salvage surface objects prior to the development of Proposal site so that they may not be indirectly impacted by the proposed development. |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| **21-4-0325** | **Oxley Solar Farm ST1** | Good – *in situ* living tree | High | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with 20 m buffer around the site. |
| **21-4-0326** | **Oxley Solar Farm CT1** | Fair – the tree is alive however exhibits damage through limb fall. | N/A | Direct | Whole | Total loss of value | Design needs to be amended to avoid this site plus a 20m buffer to preserve the root system. Ensure avoidance with 20 m buffer around the site. |
| **21-4-0327** | **Oxley Solar Farm CT2** | Poor – the tree is dead | N/A | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with 20 m buffer around the site. |
| **21-4-0328** | **Oxley Solar Farm CT3** | Good – *in situ* living tree | N/A | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with 20 m buffer around the site. |
| **21-4-0329** | **Oxley Solar Farm CT4** | Good – *in situ* living tree | N/A | Nil | Nil | Nil | Site to be avoided by proposed development. Ensure avoidance with 20 m buffer around site. |
| **21-4-0330** | **Oxley Solar Farm CT5** | Good – *in situ* living tree | N/A | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with 20 m buffer around the site. |
| **21-4-0341** | **Oxley Solar Farm CT6** | Good – *in situ* living tree | N/A | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with 20 m buffer around the site. |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| **21-4-0331** | **Oxley Solar Farm CT7** | Good – *in situ* living tree | N/A | Nil | Nil | Nil | The site will be avoided by the proposed development. Ensure avoidance with 20 m buffer around the site. |
| **TBC** | **Oxley Solar Farm PAD1** | Unknown | Unknown | Nil | Nil | Nil | No action required. To be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD2** | Unknown | Unknown | Nil | Nil | Nil | No action required. To be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD3** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD4** | Unknown | Unknown | Nil | Nil | Nil | No action required. To be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD5** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD6** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD7** | Unknown | Unknown | Nil | Nil | Nil | No action required. To be included as no impact zone in CHMP and site inductions. |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| **TBC** | **Oxley Solar Farm PAD8** | Unknown | Unknown | Nil | Nil | Nil | No action required. To be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD9** | Unknown | Unknown | Nil | Nil | Nil | No action required. To be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD10** | Unknown | Unknown | Nil | Nil | Nil | No action required. To be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD11** | Unknown | Unknown | Nil | Nil | Nil | No action required. To be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD12** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD13** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD14** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD15** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| | | | | | | | of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD16** | Unknown | Unknown | Indirect | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD17** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD18** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD19** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD20** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder of PAD to be included as no impact zone in CHMP and site inductions. |
| **TBC** | **Oxley Solar Farm PAD21** | Unknown | Unknown | Direct | Partial | Partial | Subsurface testing of only those areas of the PAD that intersect with the proposed design. Remainder |

| AHIMS # | Site name | Site integrity | Scientific significance | Type of harm | Degree of harm | Consequence of harm | Recommendation |
|---|---|---|---|---|---|---|---|
| | | | | | | | of PAD to be included as no impact zone in CHMP and site inductions. |

### 7.4.5. Safeguards and mitigation measures

A series of site-specific safeguards have been developed to manage the cultural heritage impacts of the proposal.

Table 7-14 Safeguards and mitigation measures for impacts to heritage

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| AH1 | The proposed layout of the solar farm must be amended to avoid CT1 plus a 20 m buffer surrounding the site. | PC | | |
| AH2 | A small heavily vegetated area to north of the proposal site near Waterfall Way (Grafton Road) has not been subject to archaeological survey. Further archaeological assessment would be required in this area. This would include consultation with the registered Aboriginal parties and further field survey[4]. | PC | | |
| AH3 | Archaeological test excavation of those sections of PAD that intersect with the proposed design is required in order to establish the nature and extent of the deposits and therefore inform, significance, impact and proposed mitigation measures. This subsurface excavation will be undertaken following the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2011). An addendum ACHA report must be prepared to address the findings of the test excavation, significance assessment, impact assessment and proposed management of these PAD areas and any additional sites identified during the subsurface testing programme of works. | PC | | |
| AH4 | The subsurface testing of the PADs (3, 5, 6, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21) which will be impacted by the development must be undertaken prior to any works and/or the issuing of any approvals for the Oxley Solar Farm.[5] | PC | | |
| AH5 | During construction works, high visibility fencing must be erected around CT6 and CT7 to ensure indirect impacts through use of Silverton Road as a transport corridor do not occur and the designated “no go zones” surrounding these areas must be included in the CHMP for the project. The development avoids the scarred tree (Oxley Solar Farm ST1) as well as the five cultural trees (Oxley Solar Farm CT1-5 and CT8) within the Proposal site. A minimum of a 20-m buffer should be established around each of these sites by placing high visibility bunting (or similar) to avoid any inadvertent impacts | C | O | D |

[4] This area will be surveyed at the same time as the subsurface testing of the PADs outlined in mitigation measure AH4.

[5] The timing of the subsurface testing of PADs to be undertaken post lodgement of this EIS was undertaken in consultation with Heritage NSW.

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | to the root system and canopy during construction, preconstruction and decommission works. | | | |
| AH6 | If complete avoidance to any of the isolated finds and/or artefact scatters recorded within the proposal site is not possible the surface stone artefacts within the development footprint must be salvaged. The surface collection salvage of these stone artefacts must occur prior to the proposed construction works commencing for the Oxley Solar Farm. Until surface collection salvage has occurred a minimum 5 m buffer must be observed around all stone artefact sites. | PC | | |
| AH7 | The collection and relocation of the surface artefacts should be undertaken by an archaeologist with representatives of the registered Aboriginal parties, as selected by the Proponent, and be consistent with Requirement 26 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.* The salvage of Aboriginal objects can only occur following development consent that is issued for State Significant Developments and must occur prior to any construction works commencing. | PC | | |
| AH8 | Any artefacts salvaged may be temporarily stored at an NGH office for further analysis if it is unable to be undertaken at the time of salvage onsite. The with permanent storage of the artefacts will be at Armidale and Region Aboriginal Cultural Centre & Keeping Place with any formal tools likely to be stored/displayed at the Cultural Centre. Where the storage of artefacts cannot occur at the Armidale and Region Aboriginal Cultural Centre & Keeping Place they will be buried on-site, outside of the development footprint. The burial of salvaged artefacts onsite is proposed to be within the "no go zones" outside the extent of the sites recorded which are not to be impacted. | PC | | |
| AH9 | All objects salvaged and buried within the proposal site must have their burial location submitted to the AHIMS database. | PC | | |
| AH10 | A care agreement with Heritage NSW must be undertaken for the artefacts to be stored at Armidale and Region Aboriginal Cultural Centre & Keeping Place | PC | | |
| AH11 | An Aboriginal Site Impact Recording Form must be completed and submitted to AHIMS following harm for each site collected or destroyed from salvage and/or construction works as approved for impacts in line the development consent for this State Significant Development. | PC | | |
| AH12 | A minimum 5 m buffer should be observed around all stone artefact sites that are being avoided by the proposed development. The implantation of heritage "no go zones" within the proposal site should be implemented to ensure that sites which are being avoided by the proposed development are not inadvertently impacted. | PC, C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| AH13 | For any impacts to additional sites and PADs currently being avoided by this proposal or areas outside those assessed as part of the survey for the Oxley Solar Farm, as assessed in this report, further assessment and consideration of impacts on Aboriginal Heritage as determined by an archaeologist should occur. Additional Aboriginal consultation and further assessment which may include survey and/or subsurface testing may be required. | C | O | D |
| AH14 | The Proponent should prepare a Cultural Heritage Management Plan (CHMP) to address the potential for finding additional Aboriginal artefacts during the construction of the Oxley Solar Farm and for the management of known sites, artefacts and PADs within the Project area. The Plan should include the unexpected finds procedure to deal with construction activity. Preparation of the CHMP should be undertaken in consultation with the registered Aboriginal parties. A draft unexpended finds procedure is provided in Appendix G. | PC | | |
| AH15 | In the unlikely event that human remains are discovered during the construction of the Oxley Solar Farm, all work must cease in the immediate vicinity. Heritage NSW and the local police should be notified. Further assessment would be undertaken to determine if the remains are Aboriginal or non-Aboriginal. If the remains are deemed to be Aboriginal in origin the Registered Aboriginal Parties should be advised of the find as directed by Heritage NSW. | C | O | D |
| AH16 | A further archaeological assessment would be required if the proposal activity extends beyond the area assessed in this report. This would include consultation with the registered Aboriginal parties and may involve further field survey. | C | O | D |

# 7.5. NOISE AND VIBRATION

**SECRETARY'S REQUIREMENTS**

_The EIS must also address the following specific issues:_

- **_Noise –_** _including an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG), operational noise impacts in accordance with the NSW Noise Policy for Industry 2017 and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria;_

## 7.5.1. Approach

A Construction and Operational Noise and Vibration Assessment for the proposed Oxley Solar Farm was undertaken by Renzo Tonin and Associates. The full report is provided in Appendix H and is summarised below. It includes consideration of noise and vibration impacts from the construction and operation phases of the proposal in accordance with SEARs. The approach includes:

- Undertaking onsite noise monitoring to determine the background noise level of the site and surrounding environment.
- Determining the applicable noise management levels for the site and surrounding residential receivers.
- Model potential noise impacts from the construction, traffic and operation of the proposal for each residential receiver within 2km of proposal site. The model is based on proposed individual equipment and infrastructure noise levels, location of noise sources, topography, separation distances between sources and receivers, ground type and attenuation from barriers.
- Identify appropriate mitigation measures based on the potential and level of noise exceedances.

### 7.5.2. Existing environment

The existing background and ambient noise at the proposal site is dominated by traffic along the Waterfall Way (Grafton Road) and agricultural activities such as operation of tractors, quad bikes and 4WD vehicles. Waterfall Way (Grafton Road) is located north adjacent to the proposal site and has an Annual Average Daily Traffic Volume of 1,597. Agricultural activities occur within the proposal site and common within the surrounding properties due to it being the dominate land use in the area. Noise from agricultural activities would include operation of tractors, quad bikes and 4WD vehicles as well as from livestock grazing and management, spraying, cultivating and harvesting crops. Noise levels from farm activities are concentrated at peak times during the year such as seeding and harvesting whereas noise from local roads and waste facility is more continuous throughout the year.

Recreational activities would also occur within the Oxley Wild Rivers National Park, south of the proposal site. However, the recreational activities of hiking, swimming and picnics would not generate substantial background noise for the locality. A landfill is also adjacent to the proposal site, however it's not currently operational and construction has been completed.

Identified receivers surrounding the proposal site are classified as rural under the NSW 'Noise Policy for Industry' (NPfI) (NSW EPA, 2017). Receiver locations are outlined in Table 7-15 and shown in Figure 7-20. There are 28 non-associated receivers and 4 associated receivers within 2km of the proposal site. The closest non-involved receiver is located approximately 185m west of the project site at 686 Gara Road, Metz (R3).

Table 7-15 Receiver locations.

| ID | Address | Description |
|---|---|---|
| **R3** | 686 Gara Road, Metz | Residential property located approximately 185m west of the proposal site. |
| **R4** | 111 Blue Hole Road, Castle Doyle | Residential property located approximately 310m west of the proposal site. |
| **R5** | 445 Silverton Road Metz | Residential property located approximately 320m east of the proposal site. |
| **R6** | 8 Argyle-Mining Vale Road, Metz | Residential property located approximately 950m north-east of the proposal site. |
| **R7** | 109 Blue Hole Road, Castle Doyle | Residential property located approximately 610m west of the proposal site. |
| **R8** | 52 Argyle-Mining Vale Road, Metz | Residential property located approximately 900m north-east of the proposal site. |

| ID | Address | Description |
|---|---|---|
| **R9** | 1392 Grafton Road, Metz | Residential property located approximately 800m east of the proposal site. |
| **R10** | 597 Gara Road, Metz | Residential property located approximately 760m west of the proposal site. |
| **R11** | 692 Silverton Road, Metz | Residential property located approximately 720m east of the proposal site. |
| **R13** | 761-765 Silverton Road, Metz | Residential property located approximately 780m west of the proposal site. |
| **R17** | 1060 Grafton Road, Metz | Residential property located approximately 2,300m east of the proposal site. |
| **R22** | 771 Silverton Road, Metz | Residential property located approximately 1,450m south of the proposal site. |
| **R26** | 1474 Castledoyle Road, Castle Doyle | Residential property located approximately 1,600m south of the proposal site. |

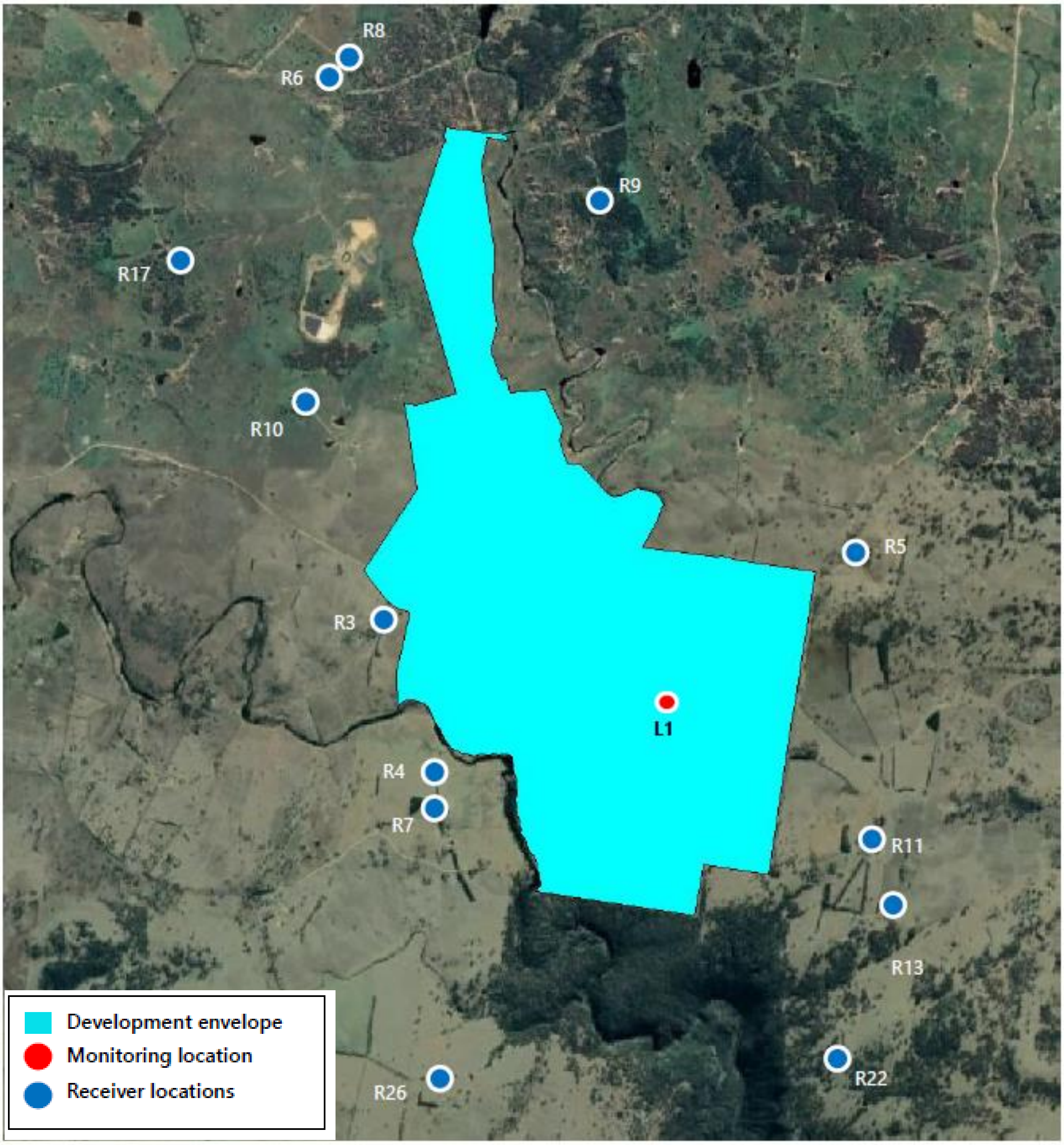



Figure 7-20 Residential receivers and noise monitoring locations adjacent to the proposal site (Renzo Tonin & Associates, 2020).

## Noise monitoring

Criteria for the assessment of construction and operational noise are derived from measuring the existing background noise levels. The NSW Policy for Industry (NPfl) (NSW EPA, 2017) outlines methods for determining the background noise level of an area. This assessment of the proposed works has used long-term noise monitoring.

Noise monitoring was undertaken within the proposal site and represents the background and ambient noise environment for receivers surrounding the proposal site (L1 Figure 7-20). To quantify the existing ambient noise environment, long-term (unattended) noise monitoring was conducted at Location L1 between Monday 4th and Thursday 21st May 2020. The existing background and ambient noise levels determined from the monitoring are presented in Table 7-16.

Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level. Ambient noise level is the all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.

Table 7-16 Measured existing background (L90) and ambient (Leq) noise levels, dB(A).

| Monitoring location | $L_{90}$ Background Noise Levels | | | $L_{eq}$ Ambient noise level | | |
|---|---|---|---|---|---|---|
| | Day | Evening | Night | Day | Evening | Night |
| **L1 – 914 Gara Road, Metz** | 24 | 22 | 20 | 45 | 32 | 38 |

Based on Table 2.1 of the NPfl Guidelines, where background noise levels are less than the minimum assumed Rating Background Noise Levels (RBLs), the minimum assumed RBL's are adopted for all receiver locations. Therefore, the background noise levels relevant to the proposal are as per the fourth column of below.

Table 7-17 Rating Background Noise Level, dB(A).

| Time of day | Measured Existing Background ($L_{90}$), dB(A) | Minimum Assumed RBLs, dB(A)[1] | Applicable Rating Background Level, dB(A) |
|---|---|---|---|
| **Day** | 24 | 35 | **35** |
| **Evening** | 22 | 30 | **30** |
| **Night** | 20 | 30 | **30** |

[1] In accordance with Table 2.1 of the NSW NPfl.

### 7.5.3. Construction noise impact assessment

The NSW 'Interim Construction Noise Guideline' (DECC, 2009) provides guidelines for assessing noise generated during the construction phase of developments. According to the guideline, a quantitative assessment of noise impacts is warranted when works are likely to impact an individual or sensitive land use for more than three weeks in total. The construction of the Oxley Solar Farm meets the requirements of a quantitative assessment.

The guideline specifies noise targets, or 'noise management levels', for residences and other noise sensitive receivers (Table 7-18). The Rating Background Level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period. Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified below.

Table 7-18 Noise management levels at residential receivers

| Time of day | Management Level |
|---|---|
| **Recommended standard hours:**<br>**Monday to Friday**<br>**7 am to 6 pm**<br>**Saturday 8 am to 1 pm**<br>**No work on Sundays or public holidays** | Noise affected<br>Rating Background Level + 10dB(A) |
| | Highly noise affected<br>75dB(A) |
| **Outside recommended standard hours** | Noise affected<br>Rating Background Level + 5dB(A) |

Table 7-18 identifies the adopted construction Noise Management Levels (NMLs) for the nearest noise sensitive residential receivers for the Oxley Solar Farm Proposal (refer to Figure 7-20). The NMLs for the receiver locations are derived from the RBLs represented by the background noise levels measured at the monitoring location (L1) and NSW ICNG (DECC, 2009) criteria (Table 7-17). During standard construction hours, a highly affected noise criteria of 75 dB(A) applies for all receivers.

Table 7-19 Construction noise management levels at residential receivers

| Location description | Day $L_{A90}$ background noise level (RBL) | Day noise management $L_{A90\ (15min)}$ |
|---|---|---|
| **All residential receivers** | 35[6] | 45 |

Noise impact predictions take into account the typical noise levels of construction equipment likely to be used for the construction phase of the project. The equipment and their sound power levels are shown in Table 7-20.

[6] Construction works occur during the daytime period only; hence, only the day period is assessed.

Table 7-20 Typical solar farm construction equipment and their expected sound power levels.

| Equipment used | Number of items required | Laeq Sound power levels (dBA) per single item |
|---|---|---|
| **Small Pile Driving Rig** | 6 | 114 |
| **Crane** | 2 | 110 |
| **Drum roller** | 2 | 109 |
| **Padfoot roller** | 2 | 109 |
| **Wheeled loader** | 2 | 109 |
| **Dump Truck** | 4 | 108 |
| **30T Excavator** | 8 | 107 |
| **Grader** | 4 | 107 |
| **Chain trencher** | 2 | 104 |
| **Water truck** | 4 | 104 |
| **Telehandler** | 4 | 98 |
| **Forklift** | 4 | 90 |

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using the CadnaA (version 2020 MR 1) noise modelling computer program. The program calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction models take into account:

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

Table 7-21 presents the noise levels likely to be experienced at the nearby affected receiver locations during the construction works within the proposal site. The predicted levels are considered a worst-case scenario with up to three nosiest plants operating concurrently.

Table 7-21 Predicted Laeq 15 min construction noise levels at receiver locations for works with the proposal site.

| Receiver location (refer to Figure 7-20) | Noise management level[7] | Predicted construction noise Level, $L_{Aeq\ (15\ min)}$ [8] | Compliance with criteria? (Yes/No) |
|---|---|---|---|
| **R3** | 45 | <20-57 | No |
| **R4** | | <20-47 | No |
| **R5** | | <20-48 | No |
| **R6** | | <20-41 | Yes |
| **R7** | | <20-45 | Yes |
| **R8** | | <20-42 | Yes |
| **R9** | | <20-44 | Yes |
| **R10** | | <20-43 | Yes |
| **R11** | | <20-36 | Yes |
| **R13** | | <20-43 | Yes |
| **R17** | | <20-31 | Yes |
| **R22** | | <20-36 | Yes |
| **R26** | | <20-32 | Yes |

Based on the predicted construction noise levels presented above, the construction management level will be exceeded when works are conducted when the three noisiest plant items are operating concurrently, to the three closest receivers R3, R4 and R5 by up to 12dB(A). R3 and R4 are south west within 610m of the proposal site and R5 is north east within 320m of the proposal site. Predicted construction noise levels at all other receivers would comply with the construction management level. Construction noise levels at all receivers are predicted to be below the highly noise affected level of 75dB(A).

[7] Noise management for standard day time construction works (i.e. Monday to Friday 7am to 6pm and Saturday 8am to 1pm).

[8] Up to 3 (noisiest) plant operating concurrently

It should be noted that the exceedances predicted are based on the loudest plant and equipment or the three loudest plant and equipment operating concurrently and at a location closest to the corresponding receiver location. This scenario would not typically occur on site and can be managed to minimise impacts to nearby receivers.

For receivers R3, R4 and R5, it is expected that exceedance of the noise management level would likely occur when the construction works are conducted within approximately 700m of the dwelling / building. Construction works conducted within approximately 700m of the dwelling / building would typically be completed over two to three days out of the approximately 540 day construction program. Construction works conducted beyond 700m of the dwelling building of receivers R3, R4 and R5 and would comply with the noise management level. In light of the short duration of predicted noise exceedances, it is recommended that a feasible and reasonable approach towards noise management measures be applied, in consultation with the potentially affected residents. These mitigation measures are outlined in Table 7-32 and the draft Noise Management Plan provided in Appendix I.

An additional 17 receivers were identified within 2km of the development footprint, located between 825m to 2km from the development footprint. Given that the separation distance is greater 700m from each receiver to the development, the construction noise management levels are unlikely to be exceeded at these additional 17 receivers during the construction phase.

### 7.5.4. Operational noise assessment

The background noise data collected to assess construction noise was also used to assess operational noise. Noise impact from the general operation of the proposed solar farm is assessed against the NSW ‘*Noise Policy for Industry*’ (NPfI). The assessment procedure in terms of the NPfI has two components:

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

In accordance with the NPfI, noise impact should be assessed against the project noise trigger level which is the lower value of the project intrusiveness noise levels and project amenity noise levels. The assessment criteria under the NPfI for the Oxley Solar Farm is outlined in Table 7-22.

Table 7-22 Proposal specific criteria.

| Assessment Criteria | Proposal Specific Criteria |
|---|---|
| **Intrusive** | Rating background level + 5dBA |
| **Amenity** | $L_{Aeq\ period}$ recommended amenity noise levels – 5dBA<br>$L_{Aeq\ period}$ + 3dBA |

The operational noise criteria for the proposed Oxley Solar Farm, based on the NPfI criteria and guidelines, (Table 7-22) is shown in Table 7-23 and Table 7-24 and is between 35 and 48dBA, depending on the time of day.

Table 7-23 Intrusiveness noise criteria

| Receiver | Period | RBL, dB(A) | Laeq (15 minute) (dBA) |
|---|---|---|---|
| **All residential receivers [1]** | Day | 35 | 35+5 = 40 |

| | | | |
|---|---|---|---|
| | Evening | 30 | 30+5=35 |
| | Night | 30 | 30+5=35 |

Table 7-24 Applicable amenity noise criteria

| Type of Receiver | Indicative noise amenity area | Time of day | Recommended noise level | |
|---|---|---|---|---|
| | | | $L_{Aeq}$ Period | $L_{Aeq\ 15\ min}$ |
| **Residence** | Rural | Day[9] | 50-5 = 45 | 45+3 = 48 |
| | | Evening [10] | 45-5 = 40 | 40+3 = 43 |
| | | Night [11] | 40-5=35 | 35+3=38 |

In accordance with the NPfI the project noise trigger level, which is the lower (i.e. more stringent) value of the project intrusiveness noise level and project amenity noise level, has been determined and reproduced in Table 7-25 below.

Table 7-25 Proposal Noise Trigger Levels, dB(A).

| Receiver location (refer to Figure 7-20). | $L_{Aeq\ 15\ min}$ Proposal Noise Triggers[12] | | |
|---|---|---|---|
| | Day | Evening | Night |
| **Residential receivers** | | | |
| **All residential receivers** | 40 | 35 | 35 |

The proposed solar farm considers two options for the configuration of the PV panels:

1. Fixed configuration, where the panels would be placed on fixed frames running in rows from east to west and tilted to the north; or

[9] Day is defined as 7.00am to 6.00pm, Evening 6.00pm to 10.00pm; Night 10.00pm to 7.00am

[10] On Sundays and Public Holidays, Day 8.00am to 6.00pm; Evening 6.00pm to 10.00pm; Night 10.00pm to 8.00am

[11] The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

[12] Monday-Saturday, Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am.
On Sundays and Public Holidays, Daytime 8.00 am – 6.00 pm; Evening 6.00 pm – 10.00 pm; Night-time 10.00 pm – 8.00 am. .

2. Single axis tracking, where the panels would be in rows configured in a north to south direction and the panels would track the sun from east to west throughout the day.

For this 'worse case' noise assessment only the single axis tracking has been considered. The single axis tracking system involves the panels being driven by motors to track the arc of the sun to maximise the solar effect. Hence, the tracking motors are a potential source of mechanical noise and therefore, has been included for a more conservative assessment.

The potential sources of noise during operation of the solar plant considered for the assessment included:

- Mechanical noise from the tracking system of the solar panels, from a total of 9,300 tracking units (ATI DuraTrack Tracker or equivalent) evenly distributed across the solar farm area.
- Operation of up to 45 PCUs (SMA MV Power Station) with each PCU containing two (2) inverters and one (1) transformer, which will be evenly distributed across the solar farm area.
- A new substation located in the middle of the site. The dominant noise source from the new substation will be from two (2) 100MVA transformers (generic brand). There will also be battery storage systems (generic brand) located in this area.
- Five staff members onsite daily with the use of a light vehicle.

The predicted power levels of these operation activities are shown in Table 7-26.

Table 7-26 Typical operational plant and equipment & sound power levels.

| Plant Item | Plant Description | LAeq Sound Power Levels, dB(A) re. 1pW[13] |
|---|---|---|
| **1** | Tracker motor (9,300 in total) | 81 (each) |
| **2** | PCU inverter (90 in total) | 88 (each) |
| **3** | PCU Transformer (45 in total) | 83 (each) |
| **4** | Substation transformer (2 in total) | 96 (each) |
| **5** | Energy storage unit | 87 (each) |
| **6** | Light vehicle (5 in total) | 88 (each) |

For the assessment of the solar farm, the noise from the inverters and transformers are considered to be tonal in nature. Therefore, a 5dB(A) penalty has been applied to the predicted noise contributions from the inverters and transformers.

In order to predict the noise impacts of the operating solar farm, a computer model incorporating all significant noise sources, receiver locations, topographical features of the intervening area, and potential noise control treatments surrounding the study area was undertaken. The modelling calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

[13] Based on sound power level data from past projects and/or RT&A's acoustic database

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

- Calm and isothermal conditions (acoustically neutral) – no wind and no temperature inversion.
- Slight to gentle breeze –3m/s wind velocity at 10m from ground level between each noise source and each noise receiver (as per INP default wind conditions). Wind direction was based on wind travelling from the source to the receiver.
- Moderate temperature inversion – applicable for noise predictions during night time periods only.

Table 7-27 presents the predicted noise levels for the 'worst case scenario' based on concurrent operation all plant and equipment shown in Table 7-26.

Table 7-27 Predicted cumulative Laeq 15min operational noise levels at residential receiver locations, dB(A).

| Receiver location (refer to Figure 7-20). | Proposal noise triggers | | | Predicted operational noise levels, Laeq (15 min) | | | Comply? (Yes/No) |
|---|---|---|---|---|---|---|---|
| | Day | Evening | Night | Calm and isothermal conditions | Slight to gentle breeze | Moderate temperature inversion[14] | |
| R3 | 40 | 35 | 35 | 24 | 31 | 30 | Yes |
| R4 | | | | 23 | 29 | 28 | Yes |
| R5 | | | | 23 | 29 | 28 | Yes |
| R6 | | | | <20 | <20 | <20 | Yes |
| R7 | | | | 21 | 28 | 27 | Yes |
| R8 | | | | <20 | <20 | <20 | Yes |
| R9 | | | | 20 | 27 | 26 | Yes |
| R10 | | | | 22 | 29 | 28 | Yes |
| R11 | | | | 21 | 28 | 26 | Yes |
| R13 | | | | <20 | 26 | 25 | Yes |
| R17 | | | | <20 | 20 | 21 | Yes |
| R22 | | | | <20 | 20 | <20 | Yes |
| R26 | | | | <20 | <20 | <20 | Yes |

Based on the predicted noise levels presented in the table above, operational noise levels from the proposed solar farm and the upgraded substation at the nearest receivers each comply under all scenarios and meteorological conditions. Compliance with the nominated criteria under all scenarios and meteorological conditions will also achieved for the additional 17 receivers discussed in Section 7.5.3.

### 7.5.5. Sleep disturbance assessment

To assess the likelihood of sleep disturbance, the potential of maximum noise level events from premises during the night-time period has been considered in this assessment. In accordance with the NPfI, a detailed

[14] Criteria for night time period only

maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

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

Where there are noise events found to exceed the initial screening level, further analysis is undertaken to identify:

- The likely number of events that might occur during the night assessment period,
- The extent to which the maximum noise level exceeds the rating background noise level.

During the night time period, only mechanical plant will be operating, including the tracking motors, inverters and the substations. Noise emissions from these plant items are considered to be continuous with no potential for high peak noise level events. Therefore, the LAmax noise levels experienced at the identified receivers will be similar to the predicted LAeq,15min noise levels shown in Table 7-27. Hence, it is expected that both the LAeq,15min and LAFmax will be well below the nominated sleep disturbance criteria of 40dB(A) and 52dB(A), respectively.

### 7.5.6. Vibrational assessment

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with the EPA's 'Assessing Vibration; a technical guideline' (DEC, 2006). The guideline provides criteria which are based on British Standard BS 6472-1992 'Evaluation of human exposure to vibration in buildings (1-80Hz)'.

Based on the proposed plant items presented, vibration generated by construction plant was estimated and potential vibration impacts are summarised in Table 7-28 below. The assessment is relevant to the identified receiver locations. The potential for vibration impacts from the proposal was found to be very low and no monitoring is required.

Table 7-28 Potential vibration impacts for identified receivers.

| Receiver location | Approx. distance to nearest buildings from works | Type of nearest sensitive buildings | Assessment on potential vibration impacts | Vibration monitoring |
|---|---|---|---|---|
| **R3** | 185m | Residential | Very low risk of adverse comments | Not required |
| **R4** | 310m | Residential | Very low risk of adverse comments | Not required |
| **R5** | 320m | Residential | Very low risk of adverse comments | Not required |
| **R6** | 950m | Residential | Very low risk of adverse comments | Not required |

| Receiver location | Approx. distance to nearest buildings from works | Type of nearest sensitive buildings | Assessment on potential vibration impacts | Vibration monitoring |
|---|---|---|---|---|
| **R7** | 610m | Residential | Very low risk of adverse comments | Not required |
| **R8** | 900m | Residential | Very low risk of adverse comments | Not required |
| **R9** | 800m | Residential | Very low risk of adverse comments | Not required |
| **R10** | 760m | Residential | Very low risk of adverse comments | Not required |
| **R11** | 720m | Residential | Very low risk of adverse comments | Not required |
| **R13** | 780m | Residential | Very low risk of adverse comments | Not required |
| **R17** | 2,300m | Residential | Very low risk of adverse comments | Not required |
| **R22** | 1,450m | Residential | Very low risk of adverse comments | Not required |
| **R26** | 1,600m | Residential | Very low risk of adverse comments | Not required |

### 7.5.7. Road traffic noise assessment

Noise impact from the potential increase in traffic on the surrounding road network due to construction activities is assessed against the NSW 'Road Noise Policy' (RNP). The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for sensitive receivers that are potentially affected by road traffic noise associated with the construction of the proposal site, with the aim of preserving the amenity appropriate to the land use.

Site access would be off Waterfall Way (Grafton Road). The anticipated peak vehicle movements during the construction stage of the project are presented in Table 7-29. Vehicle movements will only occur during the daytime period when construction works occur.

Table 7-29 Summary of estimated construction traffic volumes during peak (excluding one off delivery and pick up).

| Vehicle type | Trips per day |
|---|---|
| **Semi-trailers** | 46 |
| **B-doubles** | 4 |
| **Oversized vehicles** | 2 |
| **Standard trucks** | 10 |
| **Water tanks** | 30 |
| **Cars/light vehicles** | 60 |
| **Buses** | 40 |
| **Total** | **192** |

During the operational stage, vehicle access to the site will be maintenance vans or delivery trucks which would occur on an irregular basis. Traffic noise impacts during the operational stage of the project would be minimal and insignificant and do not warrant further assessment.

Waterfall Way (Grafton Road) is categorised as an arterial road and Gara Road is categorised as a sub-arterial road. For existing residences affected by additional traffic on existing arterial roads generated by land use developments, the following RNP road traffic noise criteria apply.

Table 7-30 RNP Road Traffic Noise Criteria, dB(A)

| Road Category | Type of Proposal /Land Use | Assessment Criteria, dB(A) | |
|---|---|---|---|
| | | Day 7am – 10pm | Night 10pm – 7am |
| **Freeway/arterial/sub-arterial roads** | Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments | $L_{Aeq,(15\ hour)}$ 60 (external) | $L_{Aeq,(9\ hour)}$ 55 (external) |

The results of the road traffic noise predictions are presented in Table 7-31. It is noted that the predicted noise levels represent the traffic noise contribution from the vehicle movements associated with the construction works and does not take into account existing traffic noise levels due to existing general traffic flows as existing traffic volumes along the Waterfall Way (Grafton Road), Silverton Road and Gara Road are unknown.

It can be seen that road traffic noise level contributions from the vehicle movements associated with the construction works are at least 4dB(A) below the applicable noise criterion based on dwellings being 20m from the roads. Given that residences are located within a rural environment, distances between the road and the dwellings would likely be significantly greater than 20m. Furthermore, as the predicted levels are 4dB(A) less than the traffic noise criterion, it is not expected that the traffic noise contribution from the construction vehicles would result in an exceedance of the traffic noise criterion and/or increase the existing traffic noise levels by more than 2dB. The proposal complies with the criteria for road traffic noise, for both construction and operation.

Table 7-31 Predicted road traffic noise contribution levels along public roads, dB(A).

| Receiver | Criteria | Truck traffic movements | Speed (km/h) | Distance to Road | Predicted Noise Level | Comply? (Yes/No) |
|---|---|---|---|---|---|---|
| **Residences on Waterfall Way (Grafton Road)** | $L_{Aeq, (15\ hour)}$ 60 | As per Table 7-29. | 100 | 20m | 56 dB(A) | Yes |
| **Residences on Gara Road** | $L_{Aeq, (15\ hour)}$ 60 | As per Table 7-29. | 100 | 20m | 43 dB(A) | Yes |

## 7.5.8. Safeguards and mitigation measures

The Construction and Operational Noise and Vibration Assessment determined that only during construction was there potential for the proposal to exceed noise criteria. The exceedance is only likely to occur when construction works occur within 700m of the closest receivers (R3, R4, R5 and R7). Due to the size of the site and proposal type, the predicted noise exceedances are to be at short durations and manageable through the implementation of noise management plan during construction. A draft noise management plan has been prepared and provided in Appendix I.

Based on the predicted noise levels, operational noise levels from the proposed solar farm and the upgraded substation would comply under all scenarios and meteorological conditions. The proposal noise level will also be well below the nominated sleep disturbance criteria. In regards to the predicted traffic noise, it would below the criteria for residences along Waterfall Way (Grafton Road) and Gara Road. The proposal is very low risk for potential vibration impacts.

Table 7-32  Safeguards and mitigation measures for noise and vibration impacts

*PC: Pre-Construction, C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| NV1 | A Noise Management Plan would be developed as part of the CEMP. The plan would include, but not be limited to:<br>• Consultation with receivers R3, R4 and R5. | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Time restrictions and/or providing periods of repose for receivers R3, R4 and R5 for when construction works are within approximately 700m of their dwellings.<br>• Use less noisy plant and equipment where feasible and reasonable.<br>• Plant and equipment to be properly maintained.<br>• Provide special attention to the use and maintenance of 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended.<br>• Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel.<br>• Avoid any unnecessary noise when carrying out manual operations and when operating plant.<br>• Any equipment not in use for extended periods during construction work should be switched off.<br>• Complaints procedure deal with noise complaints that may arise from construction activities. Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.<br>• Establish good relations with people living in the vicinity of the site at the beginning of Proposal and maintain. Keep people informed, deal with complaints seriously and expeditiously. The community liaison member of staff should be adequately experienced. | | | |

## 7.6. SOCIAL AND ECONOMIC IMPACTS

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Socio-Economic*** *– including an assessment of the likely impacts on the local community and a consideration of the construction workforce accommodation;*

Large and new types of developments produce social and economic impacts on local communities. These impacts can be positive, such as the provision of employment and increased retail trade. They can also be unintendedly adverse, by putting strains on existing infrastructure (e.g. public transport or accommodation facilities, or services such as volunteer fire brigades, health care, litter collection etc.). This section investigates the socio-economic profile of the region to understand the potential impacts of the proposal on the socioeconomics and the local community.

### 7.6.1. Existing environment

The proposal site is within the Armidale Regional LGA in northern NSW, which covers an area of 621km$^2$. The LGA was formed in 2016 after the merger of the former Armidale Dumaresq Shire with the surrounding Guyra Shire. The population of Armidale in 2016 was 29,449 (ABS, 2016).

The region includes several historic towns, large agricultural land holdings, education centres, including the University of New England, as well as a number of national parks, including Oxley Wild Rivers National Park adjacent to the proposal site. The Armidale region brings approximately 750,000 visitors annually to experience various events and natural attractions; areas of wilderness and wild rivers, granite boulder formations and waterfalls within world heritage listed national parks. It is an important nexus, linking the coastal communities to 'Big Sky' inland areas, via the Waterfall Way (Grafton Road). Table 7-33 outlines localities that are within close proximity and are relevant to the proposal site.

Table 7-33 Localities close to the proposal site and with relevance to the proposal.

| Location | Distance from proposal site | Size |
|---|---|---|
| **Hillgrove** | 9km east | Hillgrove is the closest village to the proposal site. |
| **Guyra** | 38km north-west | Next largest town after Armidale with a strong agricultural industry. |
| **Llangothlin** | 47km north-west | Small agricultural village. |
| **Ben Lomond** | 58km north-west | Small agricultural village. |
| **Ebor** | 71km north-east | Small rural village. |

## Accommodation and services availability

Armidale is located approximately 15 mins north-west of the site. In 2016, there were 12,671 private dwellings in Armidale, including 1,588 unoccupied private dwellings. Online rental websites indicate 169 properties available to rent (Domain, 2020). Armidale has multiple accommodation options, including 5-star accommodation, self-contained apartments, guesthouses, hotels motels and caravan parks. The following accommodation options were included in this assessment:

Table 7-34 Accommodation options within Armidale area.

| Accommodation type | Number within Armidale area |
|---|---|
| **Caravan Park** | 3 |
| **Motel** | 15 |
| **Hotel** | 3 |
| **Bed and Breakfast** | 6 |
| **Self-contained establishment** | 15 |
| **Total** | **42** |

In addition to Armidale, the town of Guyra is approximately 40 minutes north-west of the proposal site. In 2016, there were 903 private dwellings in Guyra, including 108 unoccupied private dwellings. Online rental websites indicate 181 properties available to rent (Domain, 2020).

Guyra has two motels, one self-contained cottage, one caravan park, one hotel and one bed and breakfast to provide accommodation within Guyra.

Other services required by temporary construction staff that are not local include (but are not limited to) food outlets, local retail, health services and entertainment.

## Industry profile

The Armidale Regional Council's gross regional product (GRP) was at $1,535 million in June 2019. Overall economic growth is comprised mainly of contributions from education and training, health care, and agriculture. Of the 2,969 registered businesses in the region, approximately 913 are engaged in agriculture and approximately 338 in construction. Significant population growth is expected in line with ongoing expansion of tourism sector and the establishment of state significant developments.

The New England North West Regional Plan 2036 (DPE, 2016) describes the regions strong agricultural industry as the base for "emerging industries across renewable energy, green technology and food and fibre processing". In 2011, the largest gross regional product contributors according to the plan were:

1. Agriculture, forestry and fishing, contributing $1.3 billion.
2. Education and training, contributing $686 million.

While the GRP for education and training is lower than agriculture in the region, it is a good representation in terms of the communities values and perceptions. During consultation for the proposal it has been recognised that the local community is well educated about renewable energy projects and their potential impacts.

Additionally, health care and social assistance contributed $677 billion, public administration and safety contributed $481 billion and manufacturing contributed $481 million.

The most recent agricultural census (ABS, 2015-16) showed the total value of agricultural commodities in the Armidale Regional LGA to be $181 million (1.4 % of NSW).

The top 3 contributors to agribusiness in 2015-16 within the Armidale Regional LGA were:

1. Livestock slaughtering's, contributing $110 million.
2. Wool, contributing $20.1 million.
3. Vegetables, contributing $18.2 million.

This region has also been identified as an optimal Renewable Energy Zone (REZ) in which to develop new electricity generation projects, supported by existing transmission strength and capacity (AEMO, 2020). In July 2020, the NSW Government has committed to developing a REZ of 8,000MW in the region. Which was followed by Transgrid announcing an approach to further accelerate the development in the REZ (AEMO, 2020). The proposed network upgrades and additional renewable projects will increase jobs and business for the region.

## Socio-economic profile

The socio-economic profile of the Armidale Regional LGA is presented in Table 7-35.

Table 7-35 Socio-economic overview of Armidale Regional LGA (ABS, 2016; Armidale Regional Council, 2018).

| Statistic | Armidale Regional LGA |
|---|---|
| **Population** | 29,449 |
| **Average age** | 36 |
| **Dominant employment industries** | Higher education<br>Beef cattle farming<br>Hospitals<br>Primary and secondary education |

| Statistic | Armidale Regional LGA |
|---|---|
| **Unemployment rate** | 7.7% |
| **Aboriginal/ Torres Strait Islander population** | 7.4% |
| **SEIFA index[15]** | Ranked 980<br>7th decile |

## Economic strategy

A draft Economic Development Strategy has been developed by the Armidale Regional Council with the aim of:

> *'… enhancing the vibrancy, diversity and sustainability of the Armidale Region's economy and its influence on the liveability of the local government area as a whole"* (Armidale Regional Council, 2017).

A set of key themes and strategic objectives are identified by the Armidale Regional Council as essential in influencing economic development. The proposed Oxley Solar Farm would contribute to a number of these, specifically:

- Theme 1: A Region of Choice for Smart and Sustainable Agri-business
  *Capitalise on the Armidale Region's competitive strengths in technology-driven agri-business in livestock and horticulture by establishing an agri-tech 'cluster' focusing on the benefits that flow from networked businesses, institutions and agencies sharing information, ideas, infrastructure and services.*
- Theme 2: A Globally-connected 'Knowledge Region'
  *Capitalise Establish the Armidale Region as a location of choice for 'knowledge workers', entrepreneurs and major innovative businesses seeking a sophisticated, family-friendly city-region lifestyle.*
- Theme 3: A Skilled Workforce and Dynamic Regional Business Sector
  *Collaborate with industry, the education and training sector and other tiers of government to enhance the Armidale Region's skills base and to support the growth of the region's innovative, productive and prosperous micro, small-to-medium and large businesses.*

Establishing large scale solar in the region is highly compatible with these objectives. A new innovative technological industry such as solar would strengthen and diversify the economy which is currently dominated by agriculture and education.

Diversification and innovation is also in line with the *New England North West Regional Plan 2036* which identifies renewable energy as a more sustainable energy source for the region. Additionally, the plan states that growth in solar energy will promote local jobs in smaller communities and development opportunities for future industries.

## Emergence of new local industries

In 2017, about 700MW of renewable energy made up of 16 projects were constructed and began generating electricity (Clean Energy Council, 2018). Total large-scale solar capacity reached 450MW at the end of 2017

[15] Socio Economic Indexes for Areas (SEIFA) is a suite of indexes created by the ABS. The Index of Relative Socio-economic Advantage and Disadvantage (IRSDAD) summarises data about economic and social conditions of people and households in an area. Ranking of NSW suburb's and LGA's are used in this report with 1 being most disadvantaged (1st decile) to 2643 being most advantaged (10th decile).

after four new large-scale projects were completed. The equivalent number of households powered annually through large-scale solar in Australia is 151,243, and through all renewable energy generation sources totals 8,297,986 households. The beginning of 2018 saw an additional 21 large-scale solar projects under construction, contributing to the 6,080 jobs created by renewable projects as a whole as of April 2018.

The successful introduction of battery storage into renewable energy projects was highlight in 2017. The Hornsdale Wind Farm installed the world's largest lithium-ion battery which supplies energy back into the grid. This proved valuable during a large power disruption in January 2018 when the battery delivered 100MW into the national electricity grid in 140 milliseconds (Clean Energy Council, 2018). The effectiveness of solar power was also further realised in the February 2018 Queensland heatwave during which power generated by rooftop solar contributed between 400MW to 585MW each day to assist in meeting electricity needs across the state.

Electricity consumption in Australia is exceptionally high, resulting in costly electricity bills and frequent disruptions to electricity supply during peak times. The renewable energy sector has responded to this high demand and to the need for viable alternative options for electricity generation contributing to 17% of Australia's overall electricity (Clean Energy Council, 2018).

An analysis of electricity price increases between 2006 and 2016 was undertaken by the Australian National University (ANU). The ANU reported that those states with relatively low levels renewable energy experienced higher electricity prices (NSW, QLD and VIC). States with higher levels of renewable energy, in particular South Australia which generated almost half of its energy from renewables, had a far lower electricity price.

Although electricity prices have been increasing, the Australian Electricity Market Commission predicts electricity prices would fall an average of 6.2% over the following two years coinciding with more wind and solar generation. The NSW governments long term goal to reach zero-net emissions by 2050 is supported by the Climate Change Fund Strategic Plan that aims to double renewable energy capacity in NSW to more 10,000MW by 2021. Reaching this goal would contribute to higher levels of renewable energy and consequently lower electricity prices as experienced by households and businesses in SA.

## Community attitudes to renewable energy

Generally, solar energy development enjoys community support. OEH commissioned community research regarding attitudes to renewable energy in 2014 found that 89% of people support the use of renewable energy in the form of solar farms in NSW. Furthermore, 78% of respondents supported having a solar farm within 1-2 km of where they lived. Among the reasons for this were benefits to the environment and local economy. A significant amount (83%) of respondents believed that NSW should produce more of its energy from renewables over the following 5 years (OEH, 2015).

In research carried out by Ipsos for the Australian Renewable Energy Agency (ARENA), 48% of respondents agreed that the local economy is positively impacted by large scale solar facilities and 68% agreed that establishing more large-scale solar facilities would reduce Australia's carbon emissions. Making funding available for large scale solar facilities was viewed as a priority over non-renewable energy by 60% of respondents.

However, as more proposals become concentrated in suitable regions and particularly Renewable Energy Zones (those with good irradiance, electricity connections, generally flat and away from dense population centres), concern over local character loss and local agricultural impacts can be seen to emerge. The outcomes of the ARENA research resulted in five key themes that are important in establishing a social license to operate (SLO). These are noted below and are addressed in the following EIS sections:

1. Reliability and efficiency (Section 4.2).
2. Visual Impacts (Section 7.1).
3. Environmental Impacts (Sections 7 and 8).
4. Economic and employment impacts (Sections 2.2 and 7.6).
5. Health impacts (Sections 8.6, 8.8 and 8.9).

### Community feedback on the Oxley Solar Farm proposal

Section 6.3 outlines the community consultation OSD has undertaken for the proposal.

Of the 133 occurrences of contact/feedback with or by stakeholders to date including calls, emails and feedback forms following attendance at the information session, there were:

- 11 Positive about the proposal
- 97 Neutral about the proposal
- 25 Negative about the proposal

Positive comments centred on the benefits of renewable energy and the economic benefits for the community.

The concerns regards the proposal include:

- Visual amenity and property values including glare.
- Land use impacts including erosion, water use and use of grazing land.
- Traffic impacts
- Community and recreational impacts
- Noise impacts
- Project process and viability
- Site suitability
- Proponent ownership.
- Bush fire and fire safety
- Recycling and waste management
- Biodiversity impacts.

Table 6-10 in Section 6.3.4 outlines the concerns and comments raised by the community and where they have been addressed in the EIS. Generally, concerns/comments have been addressed throughout the EIS by ensuring the concerns have been considered as part of the impact assessment and appropriate measures have been included to mitigate the potential risks and impacts from the proposal. The mitigation measures outlined in this EIS are summarized in Section 9.

## 7.6.2. Potential impacts

### Construction

The key socio-economic construction impacts of the proposal include:

- Increased jobs
- Injection of money into the local economy
- Pressures on local services
- Safety risks and hazards associated with construction activities

During peak construction, the Oxley Solar Farm would generate approximately 300 jobs directly contributing to strengthening the economy. Up to 300 workers is a maximum estimation during peak construction (6 – 9 months), the amount of workers required for proposal would likely be less. Local residents would make up a large proportion of the workforce, with the remaining workers moving to the area for the duration of the construction phase. These benefits are anticipated to extend to local service centres including Armidale. These townships would provide accommodation, food, fuel and trade equipment and services. Local employment would be maximised by consulting with local employment and training organisations, and potentially supporting training and apprenticeships relevant to the proposal.

Conversely, the temporary influx may place pressures on local services such as schools, health services and accommodation. Additional traffic may be noticeable and could present an adverse effect on local tourism if coinciding with local festivals for example. Additional hazards accompany construction traffic (refer to Section 8.2). Mitigation strategies to address these impacts centre on consultation with the community, so that benefits can be maximised, and conflicts resolved proactively, wherever possible.

Armidale and Guyra would likely be the main town centres providing accommodation for construction staff. The proposal commits to hiring locally (to reduce accommodation and service pressures) and liaising with local representatives to coordinate accommodation services. It is expected approximately 50% of the workforce (approximately 175 workers) would be from the local community. Based on the accommodation types and availability in Armidale and Guyra, there would be sufficient accommodation for the proposal.

The change in land use of the proposal site from agricultural to renewable energy can be viewed as either positive or negative within a community and can vary depending on the values of each individual, views among the community vary substantially. The development may be viewed as an opportunity for jobs and economic stimulus within the region and a sign of protecting the environment through the generation of renewable energy. Alternatively, some community members are hesitant of changes to the rural landscape and would consider the development to be in conflict with the existing environment and scenic values.

## Operation and decommissioning

Increased economic security of rural communities may be provided through the conversion of agriculturally compatible rural land to solar power generation by diversifying employment opportunities and income streams. Additionally, solar power generation contributes to state and national greenhouse emission reductions objectives by providing stable and renewable electricity generation.

The operation of the Oxley Solar Farm would also contribute to meeting the goals of the Armidale Regional Council 8 year Economic Development Plan by:

- Generating employment opportunities
- Supporting sustainable economic growth
- Contributing to diversification of local industry
- Facilitating investment opportunities

There is a limited amount of information specifically regarding the effect of rural solar farms on local land values. The key driver of land value is and has been historically, the agricultural productivity of the area. The highly reversible nature of the proposal aims to ensure that existing land capability is restored during decommissioning (refer to Section 7.7). Amenity values, such as views, rural lifestyle and proximity to Armidale, could also be considered to enhance land value. While visual impacts would occur during operations (and would be minimised via specific areas of vegetation screening), they would similarly be reversible during decommissioning. Land values have been addressed in Section 7.8.

Agriculture is prevalent in the local community, however the soil capability at the proposal site is limited and has high limitations for high-impact land uses (Section 7.8). Given the low impact nature of installing solar array modules, solar farms have the potential to provide an alternative stream of income. This is particularly relevant for the proposal site where drought has been a considerable and costly issue.

Adverse socio-economic impacts are anticipated to be minimal during operation and decommissioning. During operation, maintenance staff and associated activities would be consistent but limited. The additional accommodation, traffic and use of services are not likely to be noticeable. Where possible, maintenance staff would be sourced from the local area.

Less staff are likely to be required for decommissioning than during construction. The economic benefits during this stage would be similar to construction, introducing local opportunities for employment, accommodation and services. Additionally, local recycling of infrastructure components would potentially occur during the decommissioning stage.

### 7.6.3. Safeguards and mitigation measures

It is recommended that consultation be undertaken with key stakeholders of region to so that benefits can be maximised, and potential pressures and conflicts are resolved proactively, wherever possible. Additionally OSD is currently developing a Community Fund to share the benefits of the Oxley Solar Farm with the local community. This would be key during construction and decommissioning when there is likely to be an influx of workers and potential impact on the local community. During operation, maintenance staff and associated activities would be consistent but limited. The additional accommodation, traffic and use of services are not likely to be noticeable during operational.

The implementation of CCP aims to keep ongoing effective liaison with the community. It would ensure that engagement is appropriate and in line with good practice and proactive in maximising the benefits of the proposal to the local community.

Table 7-36 Safeguards and mitigation measures for Social and economic impacts.

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| SE1 | Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials. | C | | |
| SE2 | Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services. | C | | D |
| SE3 | Liaison with local tourism industry representatives to manage potential timing conflicts with local events. | C | | D |
| SE4 | The Community Consultation Plan would be implemented to manage impacts to community stakeholders, including but not limited to:<br>• Protocols to keep the community updated about the progress of the Proposal and proposal benefits.<br>• Protocols to inform relevant stakeholders of potential impacts (haulage, noise, air quality etc.).<br>• Protocols to respond to any complaints received. | C | | D |
| SE5 | The Proponent will consult with local employment agencies and training organisations and where practicable, will consider supporting training and apprenticeships. | C | O | D |

## 7.7. COMPATIBILITY WITH EXISTING LAND USES

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Land – including:***
  - *an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:*
    - *a consideration of agricultural land, flood prone land, Crown lands (including Crown Reserve 566), mining, quarries, mineral or petroleum rights, and traveling stock route and Oxley Rivers National Park;*
    - a soil survey to determine the soil characteristics and consider the potential for erosion to occur;
    - a cumulative impact assessment of nearby developments.
  - *an assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including:*
    - *consideration of the zoning provisions applying to the land, including subdivision, and;*
    - *completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's Land Use Conflict Risk Assessment Guide; and*
  - a description of measures that would be implemented to remediate the land following decommissioning in accordance with *State Environmental Planning Policy No 55 - Remediation of Land.*

The nature of a development determines whether a permanent land use change occurs or whether the development is reversible. Apart from direct uses of the land, such as agriculture, electricity generation or mining, associated impacts, such as the degree of visual impact and traffic regimes, can affect the compatibility of alternative land uses. These issues as they relate to the proposal are discussed below.

Potential for impacts on existing and future land uses at and near to the proposal site have been assessed with reference to:

- Armidale Dumaresq LEP land use zones.
- MinView and Common Viewer databases.
- Primefact 1063 Infrastructure proposals on rural land.
- Land Use Conflict Risk Assessment Guide (DPI, 2011).
- Landholder, ABS and ABARES agricultural production.
- Guidelines for developments adjoining land managed by OEH

### 7.7.1. Existing environment

The proposal site is located on land zoned as RU1 Primary Production under the Armidale Dumaresq LEP (Figure 7-22). There are five existing land uses currently relevant to the proposal site, including:

- Grazing modified pastures.
- Grazing native vegetation.
- Rivers.
- Cropping.
- Residential and farm infrastructure.

Land use classifications within the region are shown in Figure 7-22. Existing land uses adjacent to the proposal site with the potential to be affected by the proposal, or that may be supported by the proposal in the future include:

- Cropping and grazing.
- Crown land (paper road easements).

- Electricity assets and easements.
- National Parks.
- Mining.
- Landfill.
- Renewable energy projects.

While the dominant land use by area is grazing on native pastures, it is assumed the higher incomes are obtained per hectare on the modified and cropped areas.

Existing land uses adjacent to the proposal site are shown in Table 7-37 and Figure 7-22.

Table 7-37 Land use within the proposal site.

| Land use | Area (ha) |
|---|---|
| 1.1.3 National park | 0.001 |
| 2.1.0 Grazing native vegetation | 426.457 |
| 3.2.0 Grazing modified pastures | 524.382 |
| 3.3.0 Cropping | 54.088 |
| 5.4.0 Residential and farm infrastructure | 7.275 |
| 5.7.2 Roads | 2.655 |
| 5.8.2 Quarries | 0.165 |
| 6.3.0 River | 32.643 |

- 

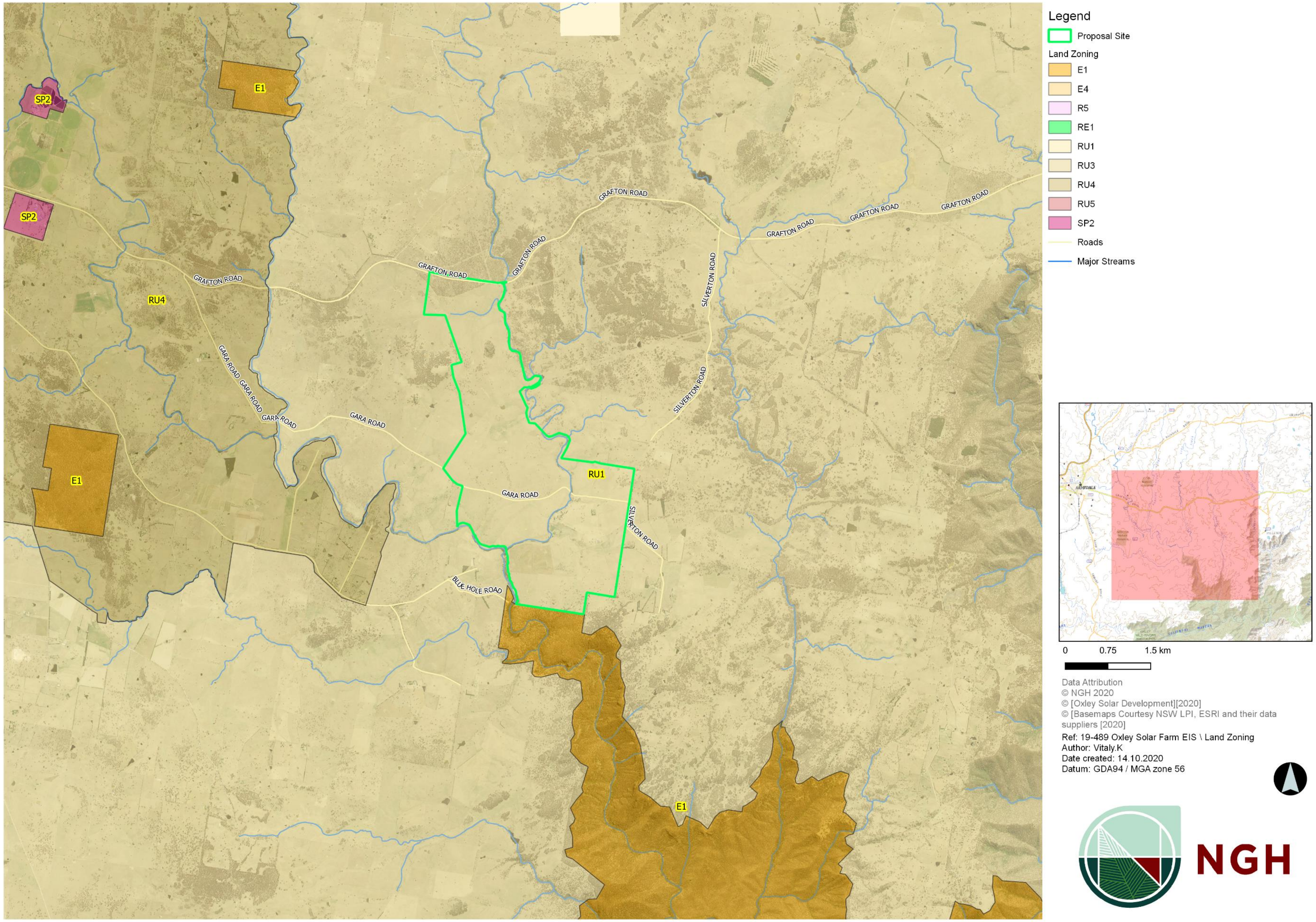



Figure 7-21 Land zoning surrounding the proposal site.

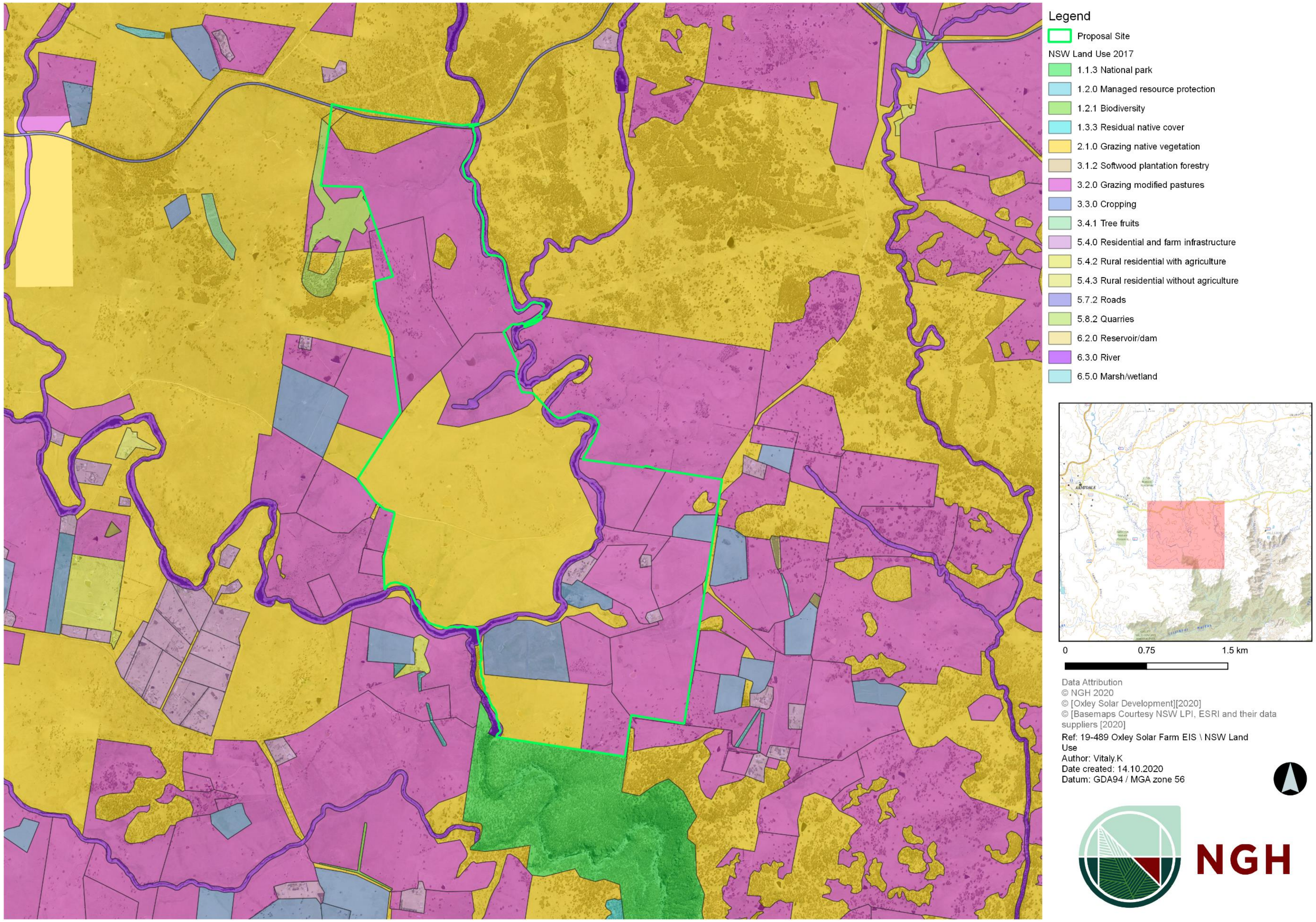



Figure 7-22 Land uses surrounding the proposal site.

## Agricultural and land capability

The proposal site is located within the New England and North West region of NSW which occupies 99,100km$^2$ (12%) of NSW; 79,400km$^2$ (80%) of which is agricultural land (ABS, 2016). The most common land use by area within the region is grazing modified pastures, which occurs on 39,200km$^2$ (40%) of the New England and North West region. The number of agricultural businesses has remained relatively stable over recent years in the region from 7,900 in 2014 to 7,904 in 2018 (ABS, 2020).

In order of economic contribution, important local industries are cotton, contributing $884 million to the New England and North West region, cattle and calves, contributing $679 million and wheat, contributing $215 million.

The proposal site is approximately 1,048ha and is comprised mostly of grazed agricultural pastures with patches of remnant woodland, some of which retains high native diversity in the groundcover. The land on which the development footprint is located is predominantly grazed by sheep and cattle and intermittent cropping for feed.

Alternative higher value land uses, given the local area, could potentially include wheat but given access to water and soil capability classes, are unlikely to include sustained cropping or the higher value crops such as cotton.

The *Mining, Petroleum, Production and Extractive Industries State Environmental Planning Policy 2007* (the Mining SEPP) extends across the development site. The SEPP outlines land that has been classed as Biophysical Strategic Agricultural Land (BSAL). BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity. Across NSW, 2.74 million hectares of land has been mapped as BSAL as a means of sustaining the agriculture industry. The proposal site is not mapped as BSAL.

The Land and Soil Capability Assessment Scheme (OEH, 2012) provides land and soil capability (LSC) classes useful for broad-scale assessment of land capability. The eight classes describe land capability ranging from extremely high capability land (class 1) to extremely low capability land (class 8). A pre-determined set of biophysical land and soil features including landform position, slope gradient, drainage, climate, soil type and soil characteristics are used to determine potential land and soil hazards. These classes are used to inform long term land management practices with the aim of ensuring degradation to soil, land, air and water resources does not occur.

The proposal site is predominantly located on land mapped LSC class 5 (moderate-low capability land), with a few sections mapped as LSC class 6 (low capability land) and class 4 (moderate capability land) as shown in Figure 7-23. An overview of the general description of LSC class 4, 5 and 6 is provided in Table 7-38. The current activities onsite align with class 5, largely used for grazing with occasional cultivation for pastures. The class 5 area is not capable of supporting regular cultivation due to the various limitation such as erosion and low fertility.

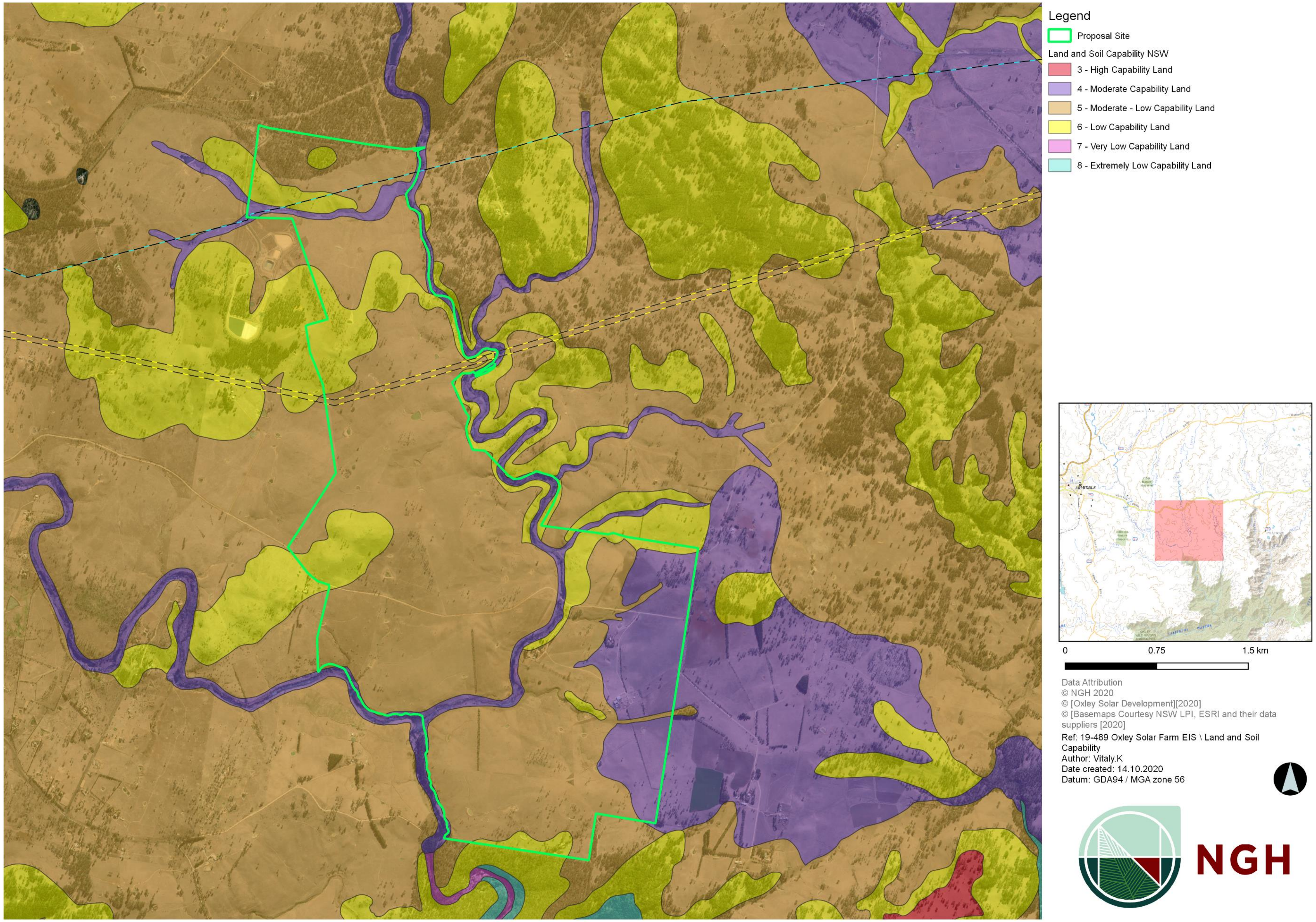



Figure 7-23 Proposal site Land and Soil Capability Classes mapping (modified from OEH, 2020).

Table 7-38 Land and Soil Capability Class definitions (OEH, 2012).

| Class | Category | Definition | Limitations | Area (ha) and percentage within the proposal site | Area (ha) and percentage within the development footprint |
|---|---|---|---|---|---|
| **Class 4** | Moderate capability land | Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology. | Sloping lands (10–20% slope), erosion hazard, weak structure, salinity, acidification, shallowness of soils, climate, wetness and stoniness. | 155.0ha<br>15% | 144.9ha<br>16% |
| **Class 5** | Moderate – Low capability land | Land has high limitations for high-impact land uses. Would largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. Very occasional cultivation for pasture establishment. The limitations need to be carefully managed to prevent long-term degradation. | Sloping lands (10–20% slope) with highly erodible soils and/or significant existing soil erosion, or land that will be subject to wind erosion when cultivated and left bare. Other limitations include shallow soils, stoniness, climatic limitations, acidification, potential for structure decline and salinity hazards. | 750.5ha<br>71% | 660.2ha<br>74% |
| **Class 6** | Low capability land | Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation | Steeply sloping lands (20–33% slope) that can erode severely even without cultivation, or land that will be subject to severe wind erosion when cultivated and left exposed. Other limitations can include shallow soils (less than 50 cm deep), stoniness, rock outcrop (50– | 142.2ha<br>14% | 90.3ha<br>10% |

| Class | Category | Definition | Limitations | Area (ha) and percentage within the proposal site | Area (ha) and percentage within the development footprint |
|---|---|---|---|---|---|
| | | | 70% coverage), salt outbreaks, naturally acid soils of low fertility, major flow lines with high flows and flooding, areas that are poorly drained and wet for long periods, areas that are severely eroded, including scalds, and strong climatic limitations. | | |

### Residential

Two involved residences are located within the proposal site, 30 potential residences are located within 2km of the site and 169 potential residences are located within 7km. The closest non-involved residence is located immediately adjacent to the site (185m), south of Gara Road and in the eastern portion of the site. All receivers can be seen on Figure 7-7.

A large portion of these residences are located along Castledoyle Road, south west of the proposal site. This area is made up of large allotments with substantial views of the surrounding landscape. The remaining receivers to the north and east of the site are larger agricultural properties for mostly used for grazing and have sparse buildings.

### Other surrounding land uses

Other land uses within the locality of the proposal site, other than agriculture and residential are outlined in Table 7-39 and shown in Figure 7-22.

Table 7-39 Surrounding land uses of the proposal site

| Land use | Description |
|---|---|
| **Reserves** | The Oxley Wild Rivers National Park is adjacent to the southern boundary of the proposal site. The park contains World Heritage listed Gondwana rainforest, historic sites and waterfalls. It is a popular for recreational activities including walking, camping, bike or horse riding and fishing. The Blue Hole picnic area, walking tracks and a popular swimming spot is located south adjacent to the proposal site within the park. Use of the park has potential to be visible and audible from the proposal site due peak time i.e. during summer or spring, depending on the number of visitors.<br><br>A travelling stock reserve is also adjacent to the northern boundary. It is popular for walking and birdwatching as well as for stock use. |

| Land use | Description |
|---|---|
| **Renewable energy projects** | There are six solar farms proposed within the Armidale Regional LGA. Three of these, the New England Solar Farm, Metz Solar Farm, Stringybark Solar Farm and Olive Grove Solar Farm have already received planning approval. Construction of the New England Solar Farm and Metz Solar Farm is expected to commence by Mid-2020. Stringybark Solar Farm has completed construction is directly adjacent to Oxley Solar Farm.<br><br>There are also another two solar farms proposals within the vicinity of the proposal site currently preparing the environmental assessments, Tilbuster Solar Farm and Salsibury Solar Farm.<br><br>The location of these renewable projects can be seen in Figure 1-1. |
| **Industry and commercial use** | Two existing TransGrid 132kV transmission lines transect the northern section of the proposal site. This transmission lines connect to the 330/132kV Armidale Substation approximately 9km to the west of the site. The proposal would loop into one the existing 132kV transmission lines onsite to connect to the 330/132kV Armidale Substation.<br><br>The Armidale Regional Landfill is adjacent to the western boundary of the proposal site. Its construction was completed at the end of 2019. Armidale Regional Council is not planning to commission the new regional landfill immediately. It will be commissioned once the existing landfill nears its capacity. |
| **Crown land and paper roads** | Crown Land is located within the north west corner of the proposal site (associated with the travelling stock reserve) and along the Gara River (associated with the riparian corridor. Development would not occur within these areas of Crown Land with the exception of intersection works along Waterfall Way (Grafton Road).<br><br>There are four paper roads within the proposal site that have been identified as Crown Roads. The placement of permanent infrastructure on Crown land is not allowed without a licence or purchase of the land from DPIE – Crown Lands. |
| **Aviation** | Solar farms are sometimes identified as a concern with regard to airports, in relation to perceived issues of glare and being an attractant for waterbirds (which may perceive the solar arrays as a water body). A number of airports are located within the vicinity of the proposal site:<br><br>• Armidale airport about 20km west.<br>• Kelvin Station airport about 32km south west.<br>• Wollomombi airport about 30km east.<br>• Woodville airport about 28 km north west.<br><br>Armidale Airport is a principle regional airport that provides direct flight services to major Australian airports. The remaining airports are smaller scale and are primarily used by light aircrafts, private charter flights and medical services.<br><br>Due to the nature of the mining and agricultural industry in the area, there are potentially other smaller (private) airstrips at the locality used for transport or aerial spraying of crops. |

| Land use | Description |
|---|---|
| **Exploration licences and mining leases** | No exploration or mining leases occur within or adjacent to the proposal site. |

### 7.7.2. Potential impacts

#### Land use risk assessment

A Land Use Conflict Risk Assessment (LUCRA) has been carried out in accordance with the DPI *Land Use Conflict Risk Assessment Guide* (DPI, 2011). Given the surrounding land uses are different the proposed solar farm, specifically agriculture, this assessment aims to identify and rank potential land use conflicts to ensure they are adequately managed. Where expected conflicts are adequately managed, the rights of the existing and proposed land uses can be protected.

The risk ranking in Table 7-41 has been determined using the risk ranking matrix shown in Table 7-40, and in accordance with the probability table and measure consequence table in Department of Primary Industries Land Use Conflict Risk Assessment Guide (DPI, 2011). The matrix ranks the risk of impacts according to the probability of occurrence and the consequence of the impact. Probability 'A' is described as 'almost certain' to probability 'E', which is described as 'rare'. The level of consequence starts at 1 – Severe to 5 – Negligible. The risk ranking from 1 to 25 is a result of the probability and consequence. For example, a risk ranking of 25 is the highest magnitude of risk (DPI, 2011).

Table 7-40 LUCRA evaluation criteria.

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

Potential impacts of the proposal are assessed against the land use conflict risk assessment table from the Land Use Conflict Risk Assessment Guide (DPI 2011) in Table 7-41.

Table 7-41 LUCRA assessment for Oxley Solar Farm.

| Identified Potential Conflict | Risk Ranking | | Management Strategy | Revised Risk Ranking | |
|---|---|---|---|---|---|
| Agricultural spraying (aerial) | C4 | 8 | There is unlikely to be an impact to aerial spraying activities given low levels of glare and the limited height of infrastructure. | D4 | 8 |
| Contaminated surface water runoff | B3 | 17 | Implementation of a soil and water management plan and an erosion and sediment control plan would minimise the potential impact. | D4 | 5 |
| Dust | B3 | 17 | Dust generated during the construction and decommissioning stages to be managed using water carts when required.<br>Dust is not expected to generate a significant land use conflict during operation. | C5 | 4 |
| Fire/ Bushfire | C1 | 22 | Implementation of a Bushfire Management Plan and higher than required APZ would significantly reduce the probability of solar farm operation starting a fire or a bushfire damaging the solar farm infrastructure. | D3 | 9 |
| Visual amenity | A3 | 20 | Screen landscaping along boundaries where identified in Section 7.1 would substantially mitigate expected impact on visual amenity. | A5 | 11 |
| Noise | B3 | 17 | Noise generated during construction and decommissioning stages would be minimised through the implementation of mitigation measures.<br>Where regular maintenance practices are incorporated into operation, noise is not expected to generate a land use conflict. | C4 | 8 |
| Traffic generation and disruption | B3 | 17 | Traffic generation and disruptions during construction and decommissioning stages are | C4 | 8 |

| Identified Potential Conflict | Risk Ranking | | Management Strategy | Revised Risk Ranking | |
|---|---|---|---|---|---|
| | | | considered likely however the impact would be temporary and able to be managed (refer to section 8.3). Traffic is not expected to generate a land use conflict during operation. | | |
| Weed and pest control | A3 | 20 | Implementation of pest and weed management plan during construction and operation phases | D4 | 5 |

## Construction and operation

The range of scores in the mitigated risk rating were medium to low, demonstrating that the proposed construction and operation of the solar farm would have minimal impact on the surrounding land uses and is considered manageable with implementation of mitigation measures.

The potential impacts of the proposal during construction and operation are discussed in detail below.

**Agriculture**

The potential impacts of the proposal on agriculture are detailed below with respect to *Primefact 1063: Infrastructure proposals on rural land* (DPI, 2013). During operation, the proposal site would change from agricultural land use to power generation.

<u>Resource loss and fragmentation</u>

- Agricultural activities would temporarily cease upon commencement of construction in areas within the proposal site and areas involved with primary access to the site.
- The proposal would result in the loss of 895ha of agricultural land for the life of the solar farm (approximately 30 years). This represents 2.1% of the agricultural holdings within the Armidale-Dumaresq Regional LGA and does not significantly reduce the availability of land for primary production in the region.
- The proposal site is bound by Crown Land along the northern boundary and Oxley Rivers National Park along the southern boundary. This minimises resource fragmentation of the surrounding land zoned as RU1 Primary Production.
- Connection to the national grid does not require additional power lines as the proposal would connect via an existing 132kV transmission line that traverses the northern section of the site. This reduces the potential for limiting ground clearance and impacting on safe movement of agricultural machinery. Furthermore, access to the site is anticipated to be via existing road reserves and tracks.

<u>Impacts on farming operations and livestock</u>

- Agricultural activities would temporarily cease upon commencement of construction in areas within the proposal site and areas involved with primary access to the site.
- Some sheep grazing may continue to be undertaken at the proposal site to control grass and weed growth around the solar arrays. Grass fuel levels within the site would be managed to

minimise bushfire risks (refer to Section 8.7). Adequate groundcover would be maintained to protect soil and water values (refer Section 7.1 and 8.1).

- The proposal would not affect access or agricultural land uses on surrounding properties during the operation phase. The existing surrounding land uses are known and the solar farm is not considered to be an incompatible land use with a potential to create land use conflicts. Local pastoral companies have the potential to benefit from future grazing arrangement within the proposal site.
- Best practice waste and wastewater management, fuel storage and re-fuelling and chemical handling would be stringently applied to prevent soil and water pollution (refer Section 8.4 and 8.1).
- Impacts on soils and erosion risk are assessed in Section 8.2, impacts on downstream water quality are assessed in Section 8.1 and impacts on local air quality are assessed in Section 8.9. These assessments conclude that the proposal would not be likely to adversely affect land uses or activities on neighbouring properties or elsewhere in the locality, subject to identified mitigation measures.

<u>Biosecurity risks – pests diseases and weeds</u>

- The increased movement of vehicles, machinery and people to within the proposal site, particularly during construction and decommissioning poses the largest risk to biosecurity. Weed seeds can be transported via the tyres and undercarriages of vehicles and clothing of staff resulting in a risk of spreading weeds to the proposal site. Confining vehicles and machinery movements to formed access tracks during all phases, and implementing a wash down procedure for vehicle entering the proposal site would mitigate potential risk of seed dispersal.
- Risk of increasing pest animals (cats and foxes) at the proposal site during operation would be managed by ensuring waste from rubbish bins containing food are covered and regularly removed. Targeted pest management during the operational phase of the proposal would control rabbit and fox numbers. Resources and cover for pest species would be reduced grazing pressure and reduced plant matter.
- Preparation of a Weed Management Plan for the construction and decommissioning phases based on Armidale Regional Council and NSW DPI requirements would assist in the management of weeds.
- A temporary construction site compound would be established with the aim of reducing pest animals at the proposal site.

Prior to commencement of construction, representative soil samples would be gathered as part of a specialist soil survey in order to establish baseline data on the existing agronomic characteristic of the soil. The survey would include sampling for soil texture and structure, nutrients, acidity and organic matter.

**Residential**

Residences located near the site or along the access route may experience temporary noise, dust and traffic during construction. During operation there is potential for visual impacts (glare and glint are discussed below). Traffic and activities onsite during operation would be minimal compared to construction and are unlikely to generate substantial noise and dust. These potential impacts to residences during construction and operation are best managed through consultation and mitigation measures outlined for each specific issue outlined in Sections 7.2, 7.5, 8.3 and 8.9.

**Aviation**

There is unlikely to be any construction impacts on aviation or aerial spraying during construction of the proposal. The proposed infrastructure is low-lying with the transmission line poles being the tallest infrastructure. The installation of this infrastructure would not impact on any flight paths or present a hazard to aircraft.

Seen from above (such as from aircraft) they appear dark grey and do not cause a glare or reflectivity hazard. Solar PV plants have been installed on a number of airports around the world and in Australia including Tamworth NSW, Karratha in WA and Darwin in NT. Glare and glint is addressed in Section 7.2.

**Other land uses**

The proposal site is bounded to the south by Oxley Wild Rivers National Park. Consideration for development adjoining OEH (now known as Biodiversity and Conservation Division) lands is outlined in the *Guidelines for developments adjoining land managed by the Office of Environment and Heritage.* These guidelines provide general information on NPWS's expectations in relation to development that has the potential to impact NPWS lands. The issues and their impacts that need to be considered for the proposal in regards to being adjacent to Oxley Wild Rivers National Park are outlined in Table 7-42.

Table 7-42 Addressing the Guidelines for developments adjoining land managed by the Office of Environment and Heritage for the proposal.

| Issue | Risks | Approach |
|---|---|---|
| Erosion and sediment control | Removal of vegetation and disturbance of groundcover from construction activities will expose the soil and increase the risk of erosion. Eroded sediments, including those from soil stockpiles, may be transported downstream or down slope and deposited on vegetation and in creeks, rivers, wetlands and other aquatic habitats. | A Soil and Water Management Plan (SWMP) with erosion and sediment control plans would be prepared, implemented and monitored during the proposal. Refer to Section 8.2.3. |
| Stormwater runoff | The discharge of stormwater to OEH land poses a threat to the values of land and downstream environments by:<br>• Dispersing litter and pest species (especially weeds)<br>• Altering nutrient composition and pollutant levels, which can damage native vegetation and aquatic ecosystems, reduce water recreation safety and promote weed growth<br>• Causing potential erosion and sedimentation in watercourses, particularly where new developments have led to an increased volume and concentration of flow | The proposal would not discharge stormwater to Oxley Wild Rivers National Park. This would be through design of the solar farm with implementation of erosion and sediment controls.<br>Stormwater management is outlined in Section 8.1.3. |

| Issue | Risks | Approach |
|---|---|---|
| | • Impacting on Aboriginal sites, which are frequently located close to watercourses, and historic heritage. | |
| Wastewater | If wastewater disposal systems are not designed, installed, operated and maintained correctly they can pose significant risks to OEH land. These risks are similar to the risks from stormwater runoff, although the degree of risk is relatively greater given the nature of waste products involved and the potential impacts to ecosystem and human health. | Septic system is installed and operated according to the Armidale Regional Council regulations. Refer to Section 8.4. |
| Pests, weeds and edge effects | Development adjoining OEH land has the potential to significantly affect the operation or management of OEH land, resulting in damage to conservation values and cost implications for future management. Development may result in:<br>• Increased informal and inappropriate access (such as by trail-bike riders)<br>• Increase in invasive species and decline in biodiversity and ecosystem health (such as dieback)<br>• Impacts on areas of particular environmental sensitivity, including Aboriginal and historic heritage sites, watercourses and threatened species habitat<br>• Disturbance and predation by domestic pets or stock animals.<br>Clearing of vegetation (including aquatic vegetation) along or near the boundary of OEH land can lead to edge effects such as: | Potential biodiversity and weed impacts are addressed in section 7.1.<br>The proposal site would be fenced off from the national park and screening with native species is proposed along the boundary, Section 7.1. |

| Issue | Risks | Approach |
|---|---|---|
| | • Increased drying of soils and consequent changes to vegetation at the land boundary<br>• Decline in fauna species that are sensitive to changes in vegetation along newly created edges<br>• Increased predation in the vicinity of the OEH land boundary associated with aggressive species in open situations (such as nest predation by ravens and currawongs). | |
| Fire and asset protection zones | OEH recognises fire as a natural and recurring factor which shapes the environment. However, it also acknowledges that altered fire regimes may pose a significant threat to life, property and other values including biodiversity, cultural heritage and tourism, and that the onset of climate change may exacerbate these risks. Fire management is one of the most important tasks in managing protected areas. | Bush fires is considered within Section 8.7. The chapter has considered bush fire guidelines and the establishment of asset protection zones on the proposal site. |
| Boundary encroachments and access through OEH land | Unauthorised access to OEH land can have direct physical impacts on the conservation values of parks, such as those due to the removal of vegetation, erosion and soil disturbance. If such access continues or other encroachments occur (such as the construction of buildings, car-parks or roads) this can have long-term implications affecting park planning, park management (for example fire protection) and public use and enjoyment | The proposal would impact on the access to the Oxley Wild Rivers National Park , as they have different access routes. Additionally the proposal site would be fenced off from the park. |
| Visual, odour noise, vibration, air | These impacts may particularly affect native fauna species (for example, noise, vibration and lighting may disrupt foraging and breeding habits). They may | These potential impacts have been considered in Sections 7.2, 7.5, 8.3 and 8.9. The proposal would not adversely affect the park through |

| Issue | Risks | Approach |
|---|---|---|
| and amenity impacts | also adversely affect the use and public enjoyment of walking trails, camping and picnic areas. | the implementation of mitigation measures outlined in this EIS. |
| Threats to ecological connectivity and groundwater dependent ecosystems | Naturally, vegetated areas adjoining OEH land provide essential linkages for the maintenance of biodiversity and also minimise potential edge effects. These areas have a role in maintaining the viability of local populations and form an important component of home ranges of mobile species, as well as providing valuable wildlife refuge areas (including during periods of stress). Streams, rivers and other water bodies adjacent to OEH land may play similar roles. | Potential biodiversity and connectivity impacts are addressed in Section 7.1.<br>The proposal is unlikely to extract or intersect groundwater, refer to Section 8.1. |
| Cultural heritage | OEH land contains some of the most significant and intact areas of Aboriginal and historic cultural heritage values in NSW. This includes physical objects, items and places, as well as areas that are significant with respect to cultural traditions, customs, beliefs and history. It can include values that pre-date the arrival of settlers to Australia (for example, Aboriginal objects), as well as more contemporary associations (such as cemeteries). | Aboriginal heritage is addressed in Section 7.4. Historic heritage is addressed in Section 8.5. |

Minimal impact is anticipated during construction and operation on the existing 132kV transmission line and 330/132kV Armidale Substation. This would be ensured through consultation with TransGrid to ensure access to the proposal site via the northern access does not disrupt operation and maintenance of the TransGrid substation.

It is currently unclear when the Armidale Regional Landfill will be commissioned. OSD will continue to consult with council.

### Decommissioning

The potential impacts of the proposal during decommissioning on surrounding land uses is considered to be manageable with the implementation of the mitigation measures presented in this EIS. Potential impacts to surrounding land uses include:

**Agricultural activities**

Existing agricultural land uses or future agricultural land uses on the proposal site or adjacent land are not anticipated to be impacted due to the highly reversible nature of the proposal.

The potential impacts of the Proposal on agricultural activities is detailed below with respect to *Primefact 1063: Infrastructure proposals on rural land* (DPI, 2013).

Site rehabilitation

A Rehabilitation Plan associated with decommissioning activities would be developed and implemented with the objectives of:

- Returning the land to its pre-solar capability, and improving the current state of the land.
- Soil resource management.
- Landform and land use areas.
- Development of completion criteria and monitoring reporting.

The plan would be informed by soil information derived from a soil survey using:

- *The Australian Soil and Land Survey Handbook* (CSIRO, 2009).
- *The Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008).
- *The land and soil capability assessment scheme: second approximation* (OEH, 2012).

**Other land uses**

Impacts during decommissioning for the other surrounding land uses would be similar to construction and operation, as discussed above.

Residences located near the site may experience temporary noise, dust and traffic during decommissioning. These impacts are considered manageable and are addressed in Sections 7.2, 7.5, 8.3 and 8.9.

There is unlikely to be any impacts on aviation or aerial spraying during decommissioning of the proposal. The proposed infrastructure is low-lying with the substation being the tallest infrastructure. The removal of infrastructure would not impact on any flight paths or present a hazard to aircraft.

Minimal impact during decommissioning on the existing 132kV transmission line and 330/132kV Armidale Substation would be ensured through consultation with TransGrid.

The proposal is considered highly reversible given the relatively low impact on the soil surface. Following decommissioning, rehabilitation of the site would be undertaken to restore the site to its pre-existing condition. All above ground infrastructure would be removed upon decommissioning and alternate land uses including agriculture and mining could resume.

### 7.7.3. Safeguards and mitigation measures

The mitigation measures outlined below are to ensure the proposal reduces its potential impact on the existing and future agricultural land of the proposal site and existing and future land uses of adjacent land i.e. Oxley Wild Rivers National Park. Other mitigation measures within this EIS are considered to also assist in reducing any potential impacts of the proposal on the regions land use, i.e. visual, noise, water and air quality.

Specific measures are outlined below to manage the potential impacts identified.

*PC: Pre-construction C: Construction; O: Operation; D: Decommissioning*

Table 7-43 Mitigation measures for land use impacts.

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| LU1 | Undertake a soil survey prior to construction to inform the CEMP and sub-plans, rehabilitation and operational aspects. | PC | | |
| LU2 | Consultation would be undertaken with TransGrid regarding connection to the substation and design of electricity transmission infrastructure. | C | O | D |
| LU3 | Consultation with DPIE-Crown Lands would be ongoing and the following would be undertaken:<br>• Prior to construction, a lease will be applied for to allow construction to commence within Crown roads on the proposal site. | PC | | |
| LU4 | A pest and weed management plan would be prepared to manage the occurrence of priority weeds and pest species across the site during construction and operation. The plans must be prepared in accordance with Armidale Regional Council and NSW DPI requirements. | C | O | |
| LU5 | A Rehabilitation Plan would be prepared to ensure the array site is returned to at least or better than pre-solar farm land and soil capability. The plan would be developed with reference to the base line soil testing and with input from an agronomist to ensure the site is left stabilised, under a cover crop or other suitable ground cover. The soil survey would be based on:<br>• *Australian Soil and Land Survey Handbook* (CSIRO, 2009)<br>• *Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008)<br>• *The land and soil capability assessment scheme: second approximation (OEH, 2012)* | | | D |

# 8. ASSESSMENT OF ADDITIONAL ISSUES

## 8.1. WATER USE AND WATER QUALITY

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

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

The quality of water resources is closely linked to the surrounding environment and land use. Water usage, surface water and groundwater quality impacts are discussed below.

### 8.1.1. Existing environment

#### Surface Water

The Oxley Solar Farm proposal site is located in the Northern Tablelands Local Land Services area within the Gwydir Murray Darling Basin Catchment area. The dominant surface water feature within the site is the Gara River, located along the eastern boundary of the proposal site and crosses into the southern section of the proposal area. The Gara River feeds the three water storage dams for Armidale and Guyra. Additionally Commissioners Waters traverses adjacent to the proposal site southern boundary in a west-east direction. These two watercourses meet on the western boundary in the southern portion of the proposal site before entering the Gara Gorge within the Oxley Wild Rivers National Park which abuts the southern boundary of the proposal site. No Nationally Important Wetland and Ramsar Wetlands are listed within 10km of the proposal site.

The existing surface water environment within the proposal site is characterised by 34 dams, two named watercourse (Gara River and Commissioners Waters), one named tributary (Lambing Gully) and approximately 15 unnamed tributaries. The dams are located mostly along the watercourses that traverse the site.

Gara River and Commissioners Waters are perennial rivers and tributaries of Macleay River. Gara River is approximately 97km long starting within the Great Dividing Range near Llangothlin. It flows generally south and south east to join Salisbury waters within the Oxley Wild Rivers National Park. Commissioners Waters is formed by the Dumaresq Creek and Tilbuster Ponds. The river is approximately 19km long and flows generally to the southeast by south before joining the Gara River. Gara River onsite contains aquatic habitat and vegetation and is also mapped as Key Fish Habitat. During site inspections Gara River was flowing. Gara River is described further in Table 8-1 and shown and Figure 8-3.

Most of the smaller watercourses on the proposal site are tributaries of Gara River which discharges into Salisbury Waters approximately 8.9km south-east of the proposal site. All other watercourses are described as ephemeral and would only contain flowing water during significant rainfall events. No flowing water or pooling was observed on any of the site visits (Figure 8 1).

Water quality onsite for all the waterways would be influenced by the surrounding agriculture activities specifically stock access, informal waterway crossings and runoff of chemicals (e.g. fertilisers and herbicides) and animal waste.

Table 8-1 Named watercourses within the proposal site.

| Waterway | Strahler Stream order[16] | Mapped as Key Fish Habitat? | Water present during site inspection? | Aquatic vegetation or habitat present | Water quality? | Description |
|---|---|---|---|---|---|---|
| **Gara River** | 6th | Yes | Yes – River flowing | Yes – aquatic vegetation and habitat | Moderate – aquatic habitat present. However, the waterway is accessed by stock. | Main watercourse onsite that flows from the north to the south within the proposal site. |
| **Lambing Gully** | 2nd | Yes | No | No | NA | Flows east to west near the centre of the proposal site. |

Figure 8-1 Gara River onsite.

Figure 8-2 Lambing Gully

[16] As determined by Footprint, (Footprint 2021).

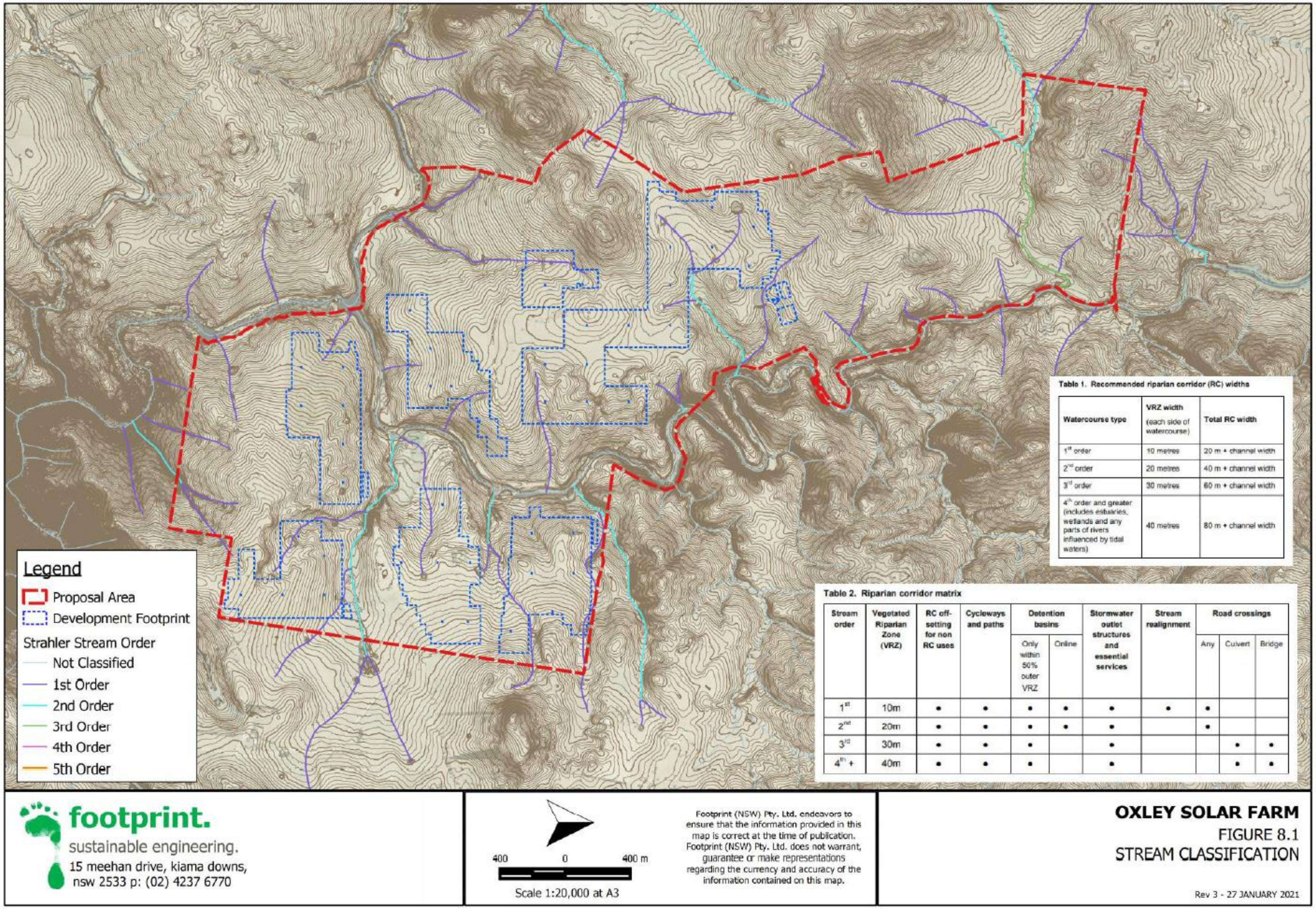



Table 1. Recommended riparian corridor (RC) widths

| Watercourse type | VRZ width (each side of watercourse) | Total RC width |
|---|---|---|
| 1st order | 10 metres | 20 m + channel width |
| 2nd order | 20 metres | 40 m + channel width |
| 3rd order | 30 metres | 60 m + channel width |
| 4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters) | 40 metres | 80 m + channel width |

Table 2. Riparian corridor matrix

| Stream order | Vegetated Riparian Zone (VRZ) | RC off-setting for non RC uses | Cycleways and paths | Detention basins | | Stormwater outlet structures and essential services | Stream realignment | Road crossings | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Only within 50% outer VRZ | Online | | | Any | Culvert | Bridge |
| 1st | 10m | • | • | • | • | • | • | • | | |
| 2nd | 20m | • | • | • | • | • | | • | | |
| 3rd | 30m | • | • | • | | • | | | • | • |
| 4th + | 40m | • | • | • | | • | | | • | • |

Figure 8-3 Waterways and stream orders within the proposal site (Footprint, 2021).

## Groundwater and Water Entitlements

The NSW DPI database of groundwater lists no bores located at the proposal site or within 400m of the proposal site (Figure 8-4).

The Armidale Dumaresq Regional LEP has no mapping of areas identified as having groundwater vulnerability.

The proposal site is subject to the Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources.

## Groundwater Dependent Ecosystems (GDEs)

Groundwater Dependent Ecosystems (GDEs) include ecosystems which may rely on the surface expression of groundwater (including surface water ecosystems that may have a groundwater component) and ecosystems which may rely on the subsurface presence of groundwater (including vegetation ecosystems).

The Groundwater Dependent Ecosystems Atlas (BOM, 2020) maps potential GDE's within the vicinity of the proposal site. Low to moderate aquatic and terrestrial GDE's occur within and surrounding the proposal site (Figure 8-5).

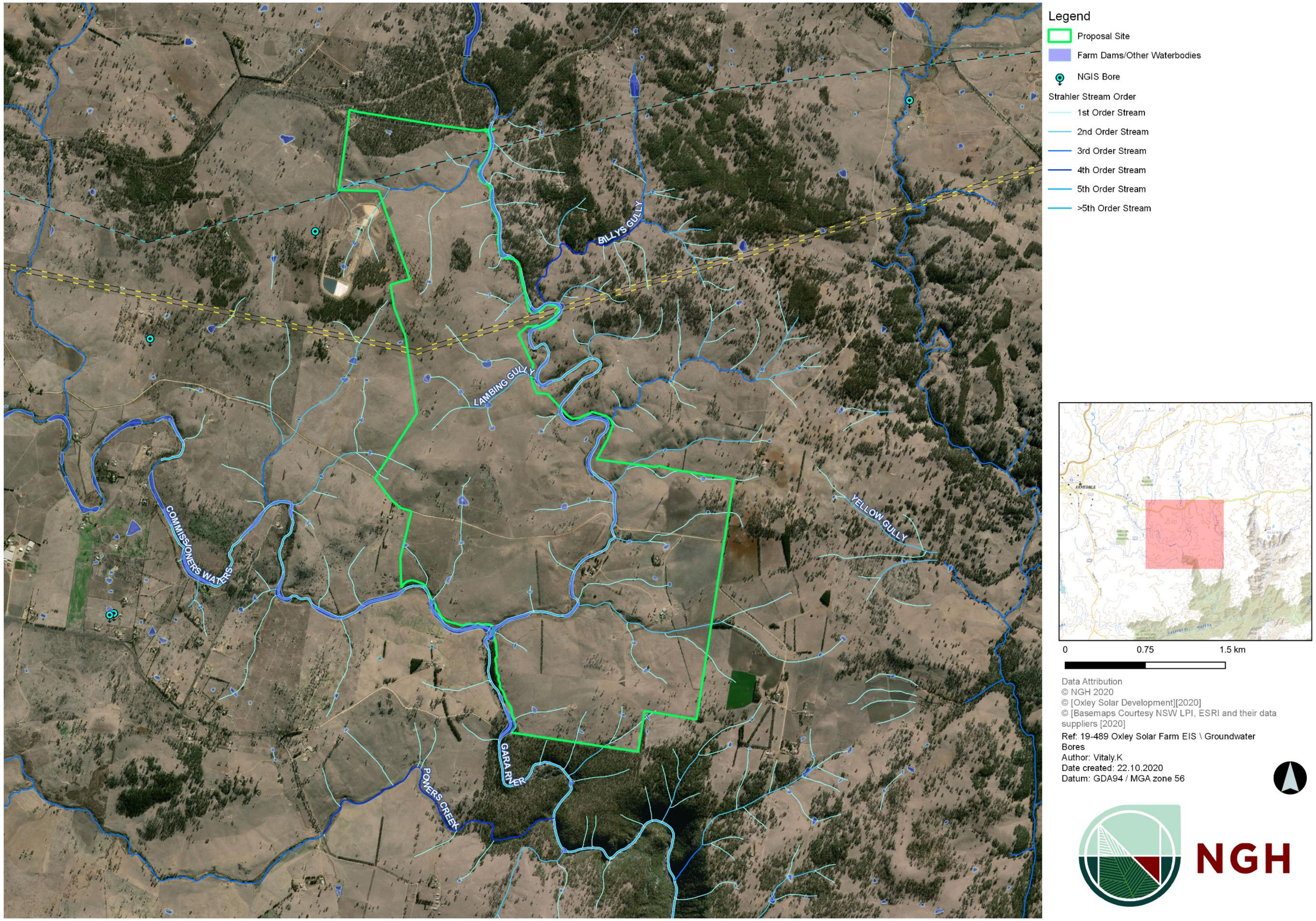



Figure 8-4 Groundwater bores surrounding the proposal site.

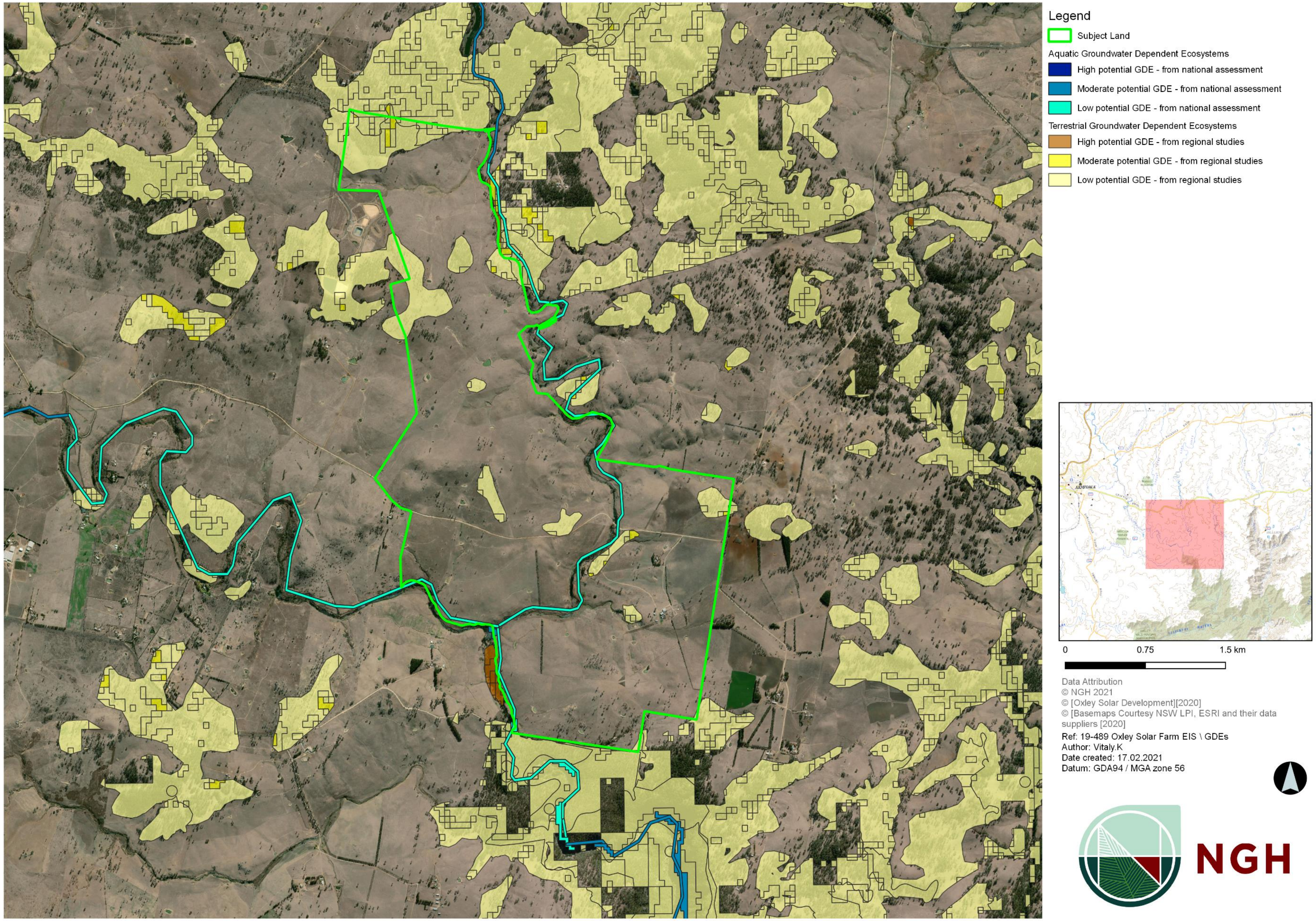



Figure 8-5 Aquatic and terrestrial GDE's within the proposal site.

### 8.1.2. Potential impacts

## Construction and decommissioning

**Surface Water**

Construction of the solar farm would disturb soils and potentially lead to sediment or other pollutants being present in runoff, mobilising and entering local waterways. Activities that may contribute to this include:

- Excavations for the construction of internal roads and associated drainage, parking areas, footings for onsite substation, inverters and maintenance building and footings for temporary staff amenities and offices during construction.
- Construction of up to two waterway crossings for internal access roads. The crossings would be located at Gara River.
- Trenching for underground cable installation.
- Construction of hardstand areas and access tracks would result in soil compaction, consequently reducing soil permeability, increasing surface water runoff and the potential for concentrated flows.

During construction however, as much ground cover as possible would be retained and protected, by rationalising laydown areas and tracks and use steel piles that are driven or screwed into the ground rather than excavated footings. Ground cover and the soil profile would remain largely undisturbed in area where the solar arrays would be mounted.

Construction may slightly alter surface water drainage patterns, this would be managed by ensuring flow is directed to existing locations. Surface water would still drain via the ephemeral drainage lines which flow into Gara River. The two main tributaries (Gara River and Lambing Gully) would not be altered by the proposal with the exception for the construction of crossings for the internal access roads and for the installation of underground cables. This is addressed in Section 7.3.

The construction phase would entail the following water pollution risks:

- A hydrocarbon spill risk from use and re-fuelling of construction vehicles and machinery.
- On-site concreting for building and equipment foundations.
- Wash off from curing asphalt pavement and road seal.
- Storage and use of paints, cleaning solvents and other chemicals.
- Pesticide and herbicide storage and use.
- Fertilisers used for revegetation.
- Runoff from waste materials.

Sediment and chemical pollutants which enter the drainage lines present on the site have the potential to flow into Gara River and be further transferred into Commissioners Waters, Salisbury Rivers and Oxley Wild Rivers National Park.

Activities with the potential for adverse water quality impacts would be managed through the development of site specific sediment control plans and spill control plans, as detailed in Sections 7.3 and 8.2. Additionally, impacts to local water quality can be minimised by ensuring erosion and sediment control plans include measures to ensure _Managing Urban Stormwater: Soils and Construction, Volume 1_ (Landcom) criteria are met prior to discharge of water offsite.

**Groundwater and Groundwater Dependent Ecosystems**

No groundwater is anticipated to be intercepted, and no groundwater would be extracted. The maximum depth of infrastructure would be pile driven or screwed mounting structures up to a depth of 2 - 3m. Impacts to groundwater are considered unlikely to occur.

Groundwater supplies would not be affected, as such, impacts to Terrestrial and Aquatic GDE's that are known to occur within the proposal site would not occur as a result of impact to groundwater supplies. No groundwater is anticipated to be intercepted and no groundwater would be extracted.

**Water Use**

Water use during the construction phase would be minimal and used predominantly for dust suppression on unsealed tracks and for the construction of new roads. The requirement for water is dependent on weather conditions, such as wind and rainfall, and is anticipated to be up to 110 – 130ML in total. About 0.4ML of potable water would be required for employees and contractors (Table 8-2).

Table 8-2 Water requirements for construction of the proposal.

| Water quality | Total construction water requirement (ML) | Sources | Availability |
|---|---|---|---|
| **Potable (drinking)** | 0.4ML (for about 12 – 18 months) | Bottled water | Available as required – commercial supply |
| **Non-potable** | 110 – 130ML (for about 12 – 18 months) | Truck delivery<br>Dams<br>Rainwater tanks | Available as required |

The development footprint is approximately 1,048ha, of which 895ha would incorporate solar panels. It is likely that the runoff due to rainfall from the site will be similar despite the addition of solar panels, however additional flows may occur from access roads and hardstands.

Based on data collected at Armidale airport weather station between 1994 and 2020, the area has an average annual rainfall of 742.9 mm per annum (BOM, 2020). The average annual runoff is about 5% dependent on the year, the timing, intensity and duration of rainfall events. Based on 5% runoff, approximately 143.55 ML is generated by the development footprint over the construction period on average. The harvestable right is 10% of runoff. Based on 10% of 143.55 ML, the harvestable right is approximately 14.36 ML. This represents 11.04-13.05% of the total water required for the construction phase.

The indicative layout for solar farm infrastructure requires approximately 14 of the 34 existing dams within the proposal footprint to be filled in prior to construction. The dams to be filled in would be dewatered, and the water would be used for construction or transferred to another dam onsite. The remaining dams may be cleaned or enlarged as required to retain the overall harvestable right volume for the proposal site. During construction, grey construction water will be stored and treated in temporary sediment basins. This grey water will be beneficially reused onsite and displace proposal demand for clean and potable water.

Gara River is located with proposal site and it is also referred to as the Gara River Water Source with 8 Water Access Licences (WALs) available. As the river is located within the proposal site there is an opportunity to establish a standpipe and draw water from the river when flows are sufficient. 1,065ML of unregulated water was made available in 2019/2020, of which none was used. The water required for construction represents 12% of the volume available for that financial year. Using a proportion of this water would also supplement the proposal's water needs. The impact of drawing the130ML over the 12 -18 month construction period is considered acceptable because ample remaining water is available in the system based on previous year's figures.

Commissioners Waters is adjacent to the proposal site. This section of the Commissioners Waters is also referred to as the Commissioners Waters Water Source and has 45 WALs available. As the river is adjacent to the southern boundary of the proposal, an opportunity exists to establish a standpipe and draw water from the river when flows are sufficient. 2,247ML of unregulated water was made available in 2019/2020, of this volume, 52.9ML was used, or 2.4% of the water available. The water required for construction represents 5.9% of the volume available for that financial year. Using a proportion of this water would also supplement the proposal's water needs. The impact of drawing the 130ML over the 12-18 month construction period is considered acceptable because ample remaining water is available in the system based on previous year's figures.

A WAL will be obtained prior to the extraction of any water sources which form part of the Gara River Water Source or the Commissioners Waters Water Source for the purpose of the proposal.

The combined water sources would be available to supply the construction requirement of the solar farm many times over. The proposal's use of water over the construction period is not anticipated to create shortfall of water supply in the local area or impact other local users of water.

## Operation

**Surface Water**

During operation, there is minimal potential for any impacts to surface water quality to occur. Suitable drainage features would be constructed along internal roads to minimise the risk of polluted water leaving the site or entering the waterways. As part of construction, the site would be revegetated with grass cover with the exception of internal roads, parking areas and areas around the substation. As such, water quality impacts during operation would be low and not considered substantially different to the existing potential water quality impacts occurring from onsite activities including cropping, and use of vehicles and machinery. There is potential for water quality onsite to be improved through revegetation of areas that are eroded with low levels of vegetation. Additionally, improvements to water quality may occur due to waterway crossings being constructed in accordance with waterfront land and water crossing guidelines and with the removal of agricultural impacts such as cattle access.

**Groundwater and Groundwater Dependent Ecosystems**

No operational activities would affect groundwater at the proposal site. No groundwater is proposed to be sourced during the operation of the solar farm.

**Water Use**

It is estimated that up to 21.5ML would be required per year during operation and if insufficient water is collected on site from rain water tanks and dams, water would be obtained commercially.

Should panel cleaning be required, it is estimated that up to 500kL of water would be needed per year.

Water would be sourced from farm dams or trucked in from established standpipes drawing water from the Gara River Water Source, or Commissioners Waters Water Source if required. A license under the WM Act is not required to draw water from onsite dams, and a water use approval is not required for SSD.

## 8.1.3. Safeguards and mitigation measures

Additional measures that would be implemented to manage water quality and water use impacts are provided below. The measures are in response to potential contaminations risks of the proposal.

Table 8-3 Safeguards and mitigation measures for water quality and water use impacts.

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| WQ1 | All fuels, chemicals, and liquids would be stored at least 40m from any waterways or drainage lines, not on sloping land and would be stored in an impervious bunded area. | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| WQ2 | The refuelling of plant and maintenance would be undertaken in impervious bunded areas on hardstand areas only. | C | O | D |
| WQ3 | Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills. | C | O | D |
| WQ4 | All potential pollutants stored on-site would be stored in accordance with HAZMAT requirements and bunded. | C | O | D |
| WQ5 | Adequate incident management procedures would be incorporated into the Construction and Operation Environmental Management Plans, including requirement to notify EPA for incidents that cause material harm to the environment (refer s147-153 Protection of the Environment Operations Act). | C | O | D |
| WQ6 | Ensure appropriate drainage controls are incorporated into the design to minimise the area of disturbance, runoff and pollutant generation. | Design | | |
| WQ7 | If groundwater is to be intercepted at any stage of the development the proponent must obtain the relevant entitlement and approval where required prior to any extraction. | C | O | D |
| WQ8 | Re-use of stormwater should be considered wherever possible. | | O | |
| WQ9 | Inspect stormwater control measures at least quarterly, and before and after rainfall of more than 10 mm in 24 hours. | C | O | |

## 8.2. SOILS

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Land – including:***
  - *an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:*
    - *a consideration of agricultural land, flood prone land, Crown lands (including Crown Reserve 566), mining, quarries, mineral or petroleum rights, and traveling stock route and Oxley Rivers National Park;*
    - a soil survey to determine the soil characteristics and consider the potential for erosion to occur;
    - a cumulative impact assessment of nearby developments.
  - *an assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including:*
    - *consideration of the zoning provisions applying to the land, including subdivision, and;*

- *completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's Land Use Conflict Risk Assessment Guide; and*
  - *a description of measures that would be implemented to remediate the land following decommissioning in accordance with State Environmental Planning Policy No 55 - Remediation of Land.*
- ***Water** – including:*
  - *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*);

### 8.2.1. Existing environment

The topography of the proposal site is generally undulating (Figure 8-6). The elevation ranges from 917- – 990m Australian Height Datum (AHD). The proposal site includes the following topographical features:

- Undulating hills with rocky outcrops.
- Ephemeral waterways Lambing Gully with several other unnamed tributaries and drainage lines.

Figure 8-6 Example of typical topography across the proposal site.

The Dorrigo-Coffs Harbour 1:250,000 geological map (MinView, 2020C) indicates that the geology underlying the proposal site consists of carboniferous sedimentary rocks for the majority of the proposal site. Within the southern most section of the proposal site the geology consists of Permian S-type granites formed by the melting of sedimentary rocks.

The majority of the proposal site is within the New England Orogen rock unit and is comprised of Permian sedimentary and volcanic rocks. More specifically, the proposal site belongs to the following:

1. Coffs Harbor Association at the northern and central section of the proposal site, which is A thick turbidite sequence dominated by siltstone that has been deformed and regionally metamorphosed up to biotite grade.
2. Gara Monzogranite at the southern section of the proposal site, which is Biotite monzogranite-granodiorite, amphibole, orthopyroxene and garnet bearing variants.

The proposal site is encompassed by three Mitchell Landscapes of the New England Tablelands bioregion. The Mitchell Landscape descriptions are provided in Table 7-9 below.

Table 8-4 Description of the Mitchell Landscape relevant to the proposal (DECC NSW, 2002).

| Mitchell Landscape |
|---|
| **Dingo Spur Meta-sediments** |
| Steep ranges and hills intersected by a dendritic drainage pattern leading into deep gorges with high waterfalls on the Great Escarpment. Gorges incised into faulted, steep dipping Devonian quartzose sandstone, greywacke, massive argillite and slate. General elevation 300 to 1400m, local relief 600m. Shallow stony loam on steep scree slopes with moderate organic content. Shallow gradational loam and sandy loam elsewhere with deeper uniform profiles in low valleys. |
| **Moonbi-Walcha Granites** |
| Steep ranges, plateau and rounded peaks with abundant large tors and rock domes on Permian granite, granodiorite and porphyry, general elevation 500 to 1320m, local relief 100 to 300m with the plateau at an average of 1000 to 1150m. Soils vary with rock type, depth of alteration and topographic position. Thin gritty loams near rock outcrop on crests, uniform to gradational earths on gentle slopes and red and yellow texture-contrast profiles in valleys. |
| **Uralla Basalts and Sands** |
| Undulating stepped high plateau on Tertiary basalt with underlying fluvial sand and gravel resting on an exhumed landscape of Permian granites. General elevation 950 to 1250m, local relief 150m. Red structured loams on ridges, brown structured gradational clay loams on slopes, dark self-mulching clays in valleys and red or yellow earth on sands and exposed granite. . |

Soil landscape and land resource mapping provide a more detailed assessment of the landscapes and potential physical constraints of the proposal site based on information at a scale of 1:250,000. Seven soil landscapes are described that occur within the proposal site and are described in Table 8-5.

Table 8-5 Published soil and land resource landscapes and associated limitations relevant to the proposal site (DPIE 2020a).

| Soil Landscape | Soil type | Limitations |
|---|---|---|
| **Argyle**<br>**(9236ar)** | Very shallow to shallow soils. Well drained Lithosols on crests, ridges and upper slopes.<br>Shallow to moderately deep Yellow Earths on midslopes.<br>Shallow to moderately deep Yellow and Red Podzolic Soils on midslopes, footslopes and drainage lines. | • Sheet erosion.<br>• Gully erosion.<br>• Localised low fertility.<br>• Localised dieback.<br>• Localised engineering hazard.<br>• Localised slow permeability.<br>• High acidity.<br>• Localised hard setting surfaces.<br>• Localised low pH buffering capacity.<br>• High erodibility.<br>• Localised sodicity.<br>• High limitations for cultivation.<br>• Moderate to high limitations for grazing. |
| **Castledoyle**<br>**(9236cd)** | Moderately deep well drained Yellow Podzolic soils on the slopes.<br>Shallow well drained Siliceous Sands/Earthy Sands on the crests, upper slopes and rocky outcrops.<br>Deep, moderately well drained Mottled-Subnatric Eutrophic Brown and Yellow Sodosols/Haplic, Bleached-Mottled Sodic and Bleached-Mottled Eutrophic Brown and Yellow Chromosols in the lower slopes and gullied drainage depressions. | • Severe gully erosion risk.<br>• Localised shallow soils.<br>• Localised non-cohesive soils.<br>• Dieback.<br>• Localised dryland salinity.<br>• Poor moisture availability.<br>• Localised groundwater pollution hazard.<br>• Hard setting surfaces.<br>• High erodibility.<br>• Localised low water holding capacity.<br>• Sodicity.<br>• Localised high salinity.<br>• Localised slow and high permeability.<br>• Low fertility. |
| **Commissioners Waters**<br>**(9236cm)** | Shallow to moderately deep, well drained alluvial sands and loams.<br>Moderately deep to deep, moderately well drained Mottled Eutrophic Grey Chromosols/Grey Sodosols. | • Gully erosion.<br>• Permanently high water tables.<br>• Engineering hazard.<br>• Poor moisture availability.<br>• Localised flood hazard.<br>• Groundwater pollution hazard.<br>• Localised dieback.<br>• Localised non-cohesive soils.<br>• Localised sodicity.<br>• High erodibility.<br>• Localised high and slow permeability.<br>• Localised high plasticity.<br>• Not suitable for cultivation.<br>• Low soil fertility. |

| Soil Landscape | Soil type | Limitations |
|---|---|---|
| **Ironstone (9236ir)** | Shallow to very shallow, well drained Rudosols and Red Podzolic soils on crests and upper slopes.<br>Moderately deep to deep, moderately well drained Yellow and Brown Podzolic soils and Lateritic Podzolic soils on the mid to lower slopes and footslopes.<br>Deep to moderately well drained Vertosols and Black Chromosols om the footslopes. | • Localised shallow soils.<br>• High run-on.<br>• Risk of sheet and gully erosion.<br>• Localised engineering hazard.<br>• Dieback.<br>• Localised acidity.<br>• Localised high erodibility.<br>• Localised sodicity.<br>• Localised hard setting surfaces.<br>• Localised stoniness. |
| **Long point variant b (9236lpb)** | Moderately deep, well drained Ferrosols/Dermosols on crests and side slopes.<br>Minor shallow, well drained Rudosols around rocky outcrops.<br>Moderately deep and well drained Chernozems/Black Earths on lower slopes and drainage lines. | • Localised shallow soils.<br>• Localised sheet erosion.<br>• Localised engineering hazard.<br>• Localised high permeability.<br>• High shrink-well properties.<br>• Low wet bearing strength.<br>• Localised high erodibility.<br>• Localised high plasticity. |
| **Middle Earth (9236me)** | Moderately deep to deep, moderately well drained Yellow Podzolic soils.<br>Deep poorly drained Soloths and Lateritic Podzolic Soils/Grey Brown Podzolic Soils around drainage depressions and poorly drained areas. | • Localised groundwater pollution hazard.<br>• Localised low fertility.<br>• Severe gully erosion risk on the lower slopes and depressions.<br>• Sheet erosion.<br>• Localised shallow soils.<br>• Dieback.<br>• Low wet bearing strength.<br>• Localised shrink-swell properties.<br>• Localised acidity.<br>• Localised high erodibility.<br>• Localised slow and high permeability. |
| **Silverton (9236si)** | Shallow, well drained Rudsols.<br>Shallow to moderately deep yellow and brown earths on steep slopes.<br>Moderately deep to deep yellow Podzolic /yellow Solodic/Soloths soils on lower slopes and narrow drainage lines. | • Steep slopes.<br>• Sheet erosion.<br>• Gully erosion.<br>• Localised rockfall hazard.<br>• High run-on.<br>• Localised shallow soils.<br>• Localised low fertility.<br>• Strongly acidic.<br>• Localised hard setting surfaces.<br>• Sodicity.<br>• High erodibility.<br>• Localised slow and high permeability. |

An inspection of the proposal site during August 2019, found the proposal site is consistent with the soil landscape mapping as outlined in Figure 7-10. There was no soil erosion evident onsite. This site inspection was undertaken during drought conditions and groundcover across the proposal site was low.

A search of the NSW EPA contaminated land public record (NSW Government, 2021a) was undertaken for contaminated sites within the Armidale LGA on 21 January 2021. Six recorded sites were returned for the LGA, none occur in the vicinity of the proposal site. The online list of NSW contaminated sites notified to the EPA (NSW Government, 2021b) was also searched on 21 January 2021. There are several sites listed in Armidale and surrounding areas but none are in the vicinity of the proposal site.

It is noted that the site has a history of agricultural land use and as such, agricultural sites may contain buried rubbish including contaminants such as herbicides that may be encountered during excavation. No indications of potential sources of contamination were identified during the site assessment.

The Australian Resource Information System (ASRIS) database (CSIRO, 2018) indicates there is a low to extremely low probability of acid sulfate soils occurring within the proposal site.

### 8.2.2. Potential impacts

#### Construction

The proposed disturbance area for the proposal is approximately 895ha, which includes the infrastructure included in Figure 1-9.

Construction activities that may adversely impact soils include the use of equipment and earthworks. Risks for the site have been shown to be sheet, rill and gully erosion.

The construction of the solar farm would disturb soils through the following activities:

- Establishment of external access road, subject to final detailed design.
- Decommissioning of dams currently on the site, which would involve filling the dams with soil excavated from other parts of the site.
- Removal of existing fences and construction of perimeter security fencing.
- Foundations for the inverter stations, substation and maintenance buildings.
- Establishment of temporary staff amenities and offices for construction.
- Levelling the ground for buildings and structures.
- Localised areas of earth works (cut and fill, grading and compacting) may be required in areas where there is sudden, significant changes in ground slope.
- Construction of internal access roads approximately 7m in width.
- Excavation of cable trenches up to 900mm deep and 500m wide.
- Installation of mounting structures (pile driven or screwed to a depth of 2 - 3m).
- Vegetation clearance.

The soil disturbance has the potential to result in the following impacts:

- Reduce soil stability and increased susceptibility to erosion due to vegetation removal or soil exposure, especially if the subsoil is sodic and dispersive.
- Loss of topsoil and impacts on waterways due to increased erosion and sedimentation hazard.
- Reduced soil permeability and increased run-off as a result of soil compaction for internal access roads and hardstand areas.
- Risk of exposing buried contaminant (pesticides and hydrocarbons).

The earthworks and excavations associated with the access tracks, buildings and cabling trenches would require removal of vegetation cover and soil disturbance in some areas. The pile driving or screwing of steel posts associated with the installation of arrays and the installation of security fencing would have a small discrete footprint at the pole location and is unlikely to result in substantial soil disturbance. Ground cover would be maintained where possible during the pre-construction and construction stages of the proposal, and would be rehabilitated upon decommissioning. Sheep grazing would be limited to the area within the development footprint as a maintenance strategy to reduce biomass and assist weed management. This would also provide an opportunity to rest, rehabilitate and improve land that has already been degraded by agricultural practices in the areas of the proposal site that are not within the development footprint.

Erosion and sedimentation impacts that may arise as a result of construction and decommissioning works can be minimised by carrying out the activities in accordance with the provisions of the *Managing Urban Stormwater: Soils and Construction* series, in particular:

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

Soil compaction occurring as a result of hardstand and access road construction and vehicle movements would reduce soil permeability; this may increase runoff and the potential for concentrated flows across the proposal site. Groundcover would be maintained beneath solar panels to control concentrated flows after heavy rainfall events.

## Operation

The land within the proposal site has significant gully and sheet erosion present and poses the primary risk during operation as a result of the following:

- Localised erosion as a result of concentrated runoff from solar panels during significant rain events if ground cover is not maintained underneath the solar arrays. This is particularly relevant to fixed solar array systems.
- Ongoing erosion from disturbed areas associated with unsealed tracks and drainage structures.
- Soil compaction.
- Other factors such as dispersive subsoils would be identified as part of the soil survey of the site, and appropriate management actions be identified to deal with this.

Activities associated with the operation stage would be mostly confined to formalised access tracks. Vehicle access between panel arrays where there would not be access tracks would be required occasionally. It is anticipated this would occur infrequently and is unlikely to pose a significant erosion risk.

Soil disturbance would be minimised by rehabilitation measures undertaken during construction and establishment of groundcover following soil disturbance activities. The risk to soil impacts are considered low with the implementation of appropriate mitigation measures.

During operation, the primary land use would transition from agricultural land use to power generation. Grazing would be limited to the area within the development footprint as a maintenance strategy to reduce biomass and assist weed management. This would provide an opportunity to rehabilitate the existing degraded land on the proposal site in areas outside of the development footprint.

## Decommissioning

When the solar farm is no longer viable, all above ground infrastructure, with the possible exception of the 132kV substation, would be removed and decommissioning and rehabilitation of the site would commence. The solar arrays would be removed and the steel piles on which they are supported, would be removed. Both the steel piles and the solar panels would be recycled, where possible. All buildings would be removed, including the PCUs together with the associated footings. Cabling would be removed where practical and recycled. Any cabling greater than 500mm below the ground may be left in place since this would not impact on future agricultural activities on the site once the restoration is complete.

Groundcover management during decommissioning would be ensured through the development and implementation of a Ground Cover Management Plan.

Following decommissioning, rehabilitation of the site would be undertaken to restore the site to its pre-existing condition. Rehabilitation is discussed in Section 7.7.

### 8.2.3. Safeguards and mitigation measures

The main potential impacts of the proposal on soils is disturbance resulting in erosion, sedimentation and compaction. These potential impacts can be reduced through the design of the solar farm as well as through preparation and implementation of a Soil and Water Management Plan, erosion and sediment control plans and Groundcover Management Plan. These are outlined below.

Table 8-6 Safeguards and mitigation measures for soil.

*PC: Pre-Construction, C: Construction, O: Operation, D: Decommissioning*

| ID | Mitigation measures | C | O | D |
|---|---|---|---|---|
| S1 | As part of the CEMP, a Soil and Water Management Plan (SWMP) (with erosion and sediment control plans) would be prepared, implemented and monitored during the proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to:<br>• Install, monitor and maintain erosion controls.<br>• Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads which may cause risks to other road users through reduced road stability.<br>• Manage topsoil in all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. Stockpile topsoil appropriately so as to minimise weed infestation, maintain soil organic matter, maintain soil structure and microbial activity.<br>• Minimise the area of disturbance from excavation and compaction; rationalise vehicle movements and restrict the location of activities that compact and erode the soils as much as practical. Any compaction caused during construction would be treated such that revegetation would not be impaired.<br>• Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site should be stabilised, and work ceased until the wet period had passed.<br>• Areas of soil disturbed by the proposal would be rehabilitated progressively or immediately post-construction, reducing views of bare soil. | C | | |

| ID | Mitigation measures | C | O | D |
|---|---|---|---|---|
| S2 | A Groundcover Management Plan would be developed in consultation with an agronomist and to ensure final land use includes perennial grass cover establishment across the site as soon as practicable after construction and maintained throughout the operation phase. The plan would cover:<br>• Soil handling, restoration and preparation requirements.<br>• Plant Species election.<br>• Soil preparation.<br>• Establishment techniques.<br>• Maintenance and monitoring requirements.<br>• Perennial groundcover targets, indicators, condition monitoring, reporting and evaluation arrangements – i.e. A target of 70% live grass cover would apply to protect soils, landscape function and water quality. Additional measures would be implemented where practical when live grass cover falls below 70%. Grass cover would be monitored on a fortnightly basis using an accepted methodology.<br>• Contingency measures to respond to declining soil or groundcover condition. I.e. any grazing stock would be removed from the site when cover falls below the target of 70% live ground cover.<br>• Identification of baseline conditions for rehabilitation following decommissioning.<br>• Preserve the native composition as much as possible | C | O | D |
| S3 | The array would be designed to allow sufficient space between panels to establish and promote groundcover beneath the panels and allow for implementation of weed controls. | | Design | |
| S4 | A Spill and Contamination Response Plan would be developed as part of the overall Emergency Response Plan to prevent contaminants affecting adjacent surrounding environments. The plan would include measures to:<br>• Respond to the discovery of existing contaminants at the site (e.g. pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements.<br>• Requirement to notify the EPA for incidents that cause material harm to the environment (refer s147-153 of the POEO Act).<br>• Manage the storage of any potential contaminants onsite. | C | O | D |

| ID | Mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and the EPA notification procedures and remediation.<br>• Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks.<br>• Prevent contaminants affecting adjacent pastures, dams, water courses and native vegetation.<br>• Monitor and maintain spill equipment<br>• Induct and train all site staff. | | | |
| S5 | The transformers will be filled with oil, and waterproof bunds built around them to manage oil spills. | | Design | |
| S6 | A protocol would be developed in relation to discovering buried contaminants within the proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements. | C | O | D |

## 8.3. TRAFFIC, TRANSPORT AND SAFETY

**SECRETARY'S REQUIREMENTS**

_The EIS must also address the following specific issues:_

- **Transport –** including:
  - an assessment of the peak and average traffic generation, including over-dimensional vehicles and construction worker transportation;
  - an assessment of the likely transport impacts to the site access route (including New England Highway, Waterfall Way (Grafton Road), Gara Road and Silverton Road), site access point(s), any Crown land, particularly in relation to the capacity and condition of the roads;
  - a cumulative impact assessment of traffic from nearby developments;
  - a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required); and
  - a description of the measures that would be implemented to mitigate any transport impacts during construction;

New England Surveying & Engineering (2021) prepared a Traffic Impact Assessment for the proposed construction, operation and decommissioning of Oxley Solar Farm, in accordance with the guidelines contained within the following publications:

- Austroads Guide to Traffic Management Part 12 and TfNSW supplement.
- Austroads Guide to Road Design and TfNSW supplements.
- TfNSW (RTA) Guide to Traffic Generating Developments.

The report is summarised below and provided in full in Appendix J.

Overall, subject to a number of recommended roadworks detailed in Table 8-11, there are no traffic or transport issues that would inhibit development approval.

### 8.3.1. Existing environment

#### Existing road network

Waterfall Way (Grafton Road) is a state road, for which TfNSW is the managing authority. It runs in an east-west direction between the Pacific Highway at Raleigh and the New England Highway at Armidale, and functions as a Major Distributor road (Armidale Regional Council's Road Design Guide). In the vicinity of the site, the road comprises a 7m sealed undivided carriageway, with a 1m sealed shoulder on each side. It has a speed limit of 100km/hr. All bridges and culverts between Armidale and the site exceed the minimum 8.4m width recommended in the Performance Based Standards Scheme Network Guidelines. The public road reservation is of variable width but includes sections of constant 30 metre width. As of September 2020, the road is approved for a range of Restricted Access Heavy Vehicle movements which would accommodate the proposed construction, including:

- B-Doubles of length 19m, 23m and 25/26m operating on the General Mass Limit (GML) and Concessional Mass Limit (CML) networks.
- 25/26 m B-Doubles and short combinations operating on the Higher Mass Limit (HML) network.
- 4.6 m high vehicles.
- Level 1, 2, 3, 4 and 6 Special Purpose Vehicles (the bridge over the Gara River, east of the site, is a restricted structure for Level 6 Special Purpose Vehicles).

Gara Road and Silverton Road are minor unsealed local rural roads, for which Armidale Regional Council is the managing authority. Both Gara and Silverton Roads intersect Waterfall Way (Grafton Road) 9km and 19km from Armidale, respectively. Gara Road is sealed for approximately 75m south of the Waterfall Way (Grafton Road) intersection, is typically between 5-7 m wide and is suitable for two-way traffic. As of August 2020, the unsealed parts of both roads were in good condition, with hazards such as crests, causeways and sharp bends well signposted. However, signage to indicate priority where roads narrow to single lanes is lacking. The default rural speed limit of 100 km/hr applies to both roads. Both roads are approved for several Restricted Access Heavy Vehicle movements, including:

- B-Doubles of length 19m, 23m and 25/26 m operating on the GML and CML networks, subject to road network manager area travel restrictions.
- Level 2, 3, 4 and 6 Special Purpose Vehicles.

Figure 8-7 Waterfall Way (Grafton Road)

Figure 8-8 Gara Road

Figure 8-9 Silverton Road

## Site access

Primary construction and operational access to the site will be via the new access road to be constructed off Waterfall Way (Grafton Road), approximately 130m west of the existing site access point. This new access road would be used by all vehicles. Light vehicles may occasionally use Gara or Silverton Roads to access the southern portions of the site, but it would not be an access point for the development. Gara Road is located within the proposal site and would be used to access areas within the site (i.e., north and south of Gara Road).

## Haulage

The principle haulage routes for most construction materials will be via Armidale and the proposed new main access road off Waterfall Way (Grafton Road). Specialist equipment, e.g. solar panels, will likely arrive from overseas at ports in Sydney or Newcastle and be freighted to the site. From Sydney or Newcastle the haulage route would be via the Pacific Motorway (Sydney), Hunter Expressway (Newcastle), New England Highway and Waterfall Way (Grafton Road) to the Proposal Site.

It is expected that the haulage route for heavy and over-dimensional vehicles, during construction would be from Armidale then east to the site via Waterfall Way (Grafton Road). The larger transformers would likely be delivered by low loaders on up to two occasions. The proposed haulage route is an approved 19m B-double route on the RMS Restricted Access Vehicles Map. The haulage route is shown in Figure 8-10.

## Crash data

Crash data was analysed for the 5-year period 2014 to 2018 inclusive, and revealed that there were no crashes on either Gara Road or Silverton Road or their respective intersections with Waterfall Way (Grafton Road), and there were no recorded crashes on Waterfall Way (Grafton Road) between the Armidale Regional Landfill access and Gara River bridge.

Based on the review of crash data, there are no specific road safety issues relating to the proposed development.

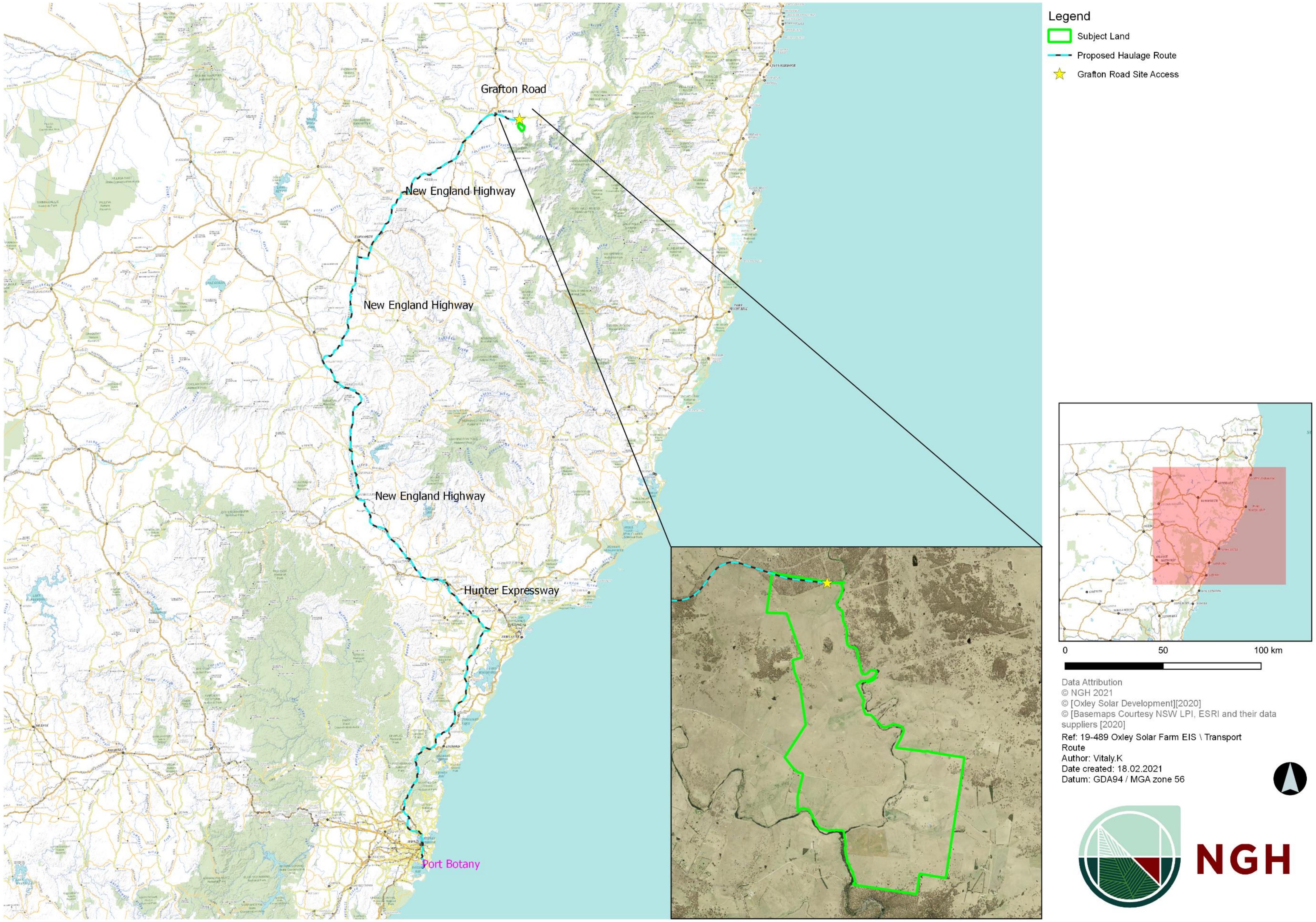



Figure 8-10 Haulage route from Port Botany to Proposal Site.

## Existing vehicle volumes

Traffic counts were undertaken by Armidale Regional Council between 28 May and 11 June 2020, however due to the removal of COVID-19 travel restrictions on 1 June which likely affected count data, results are based on the shorter period from 1-11 June. Counts were taken at the following locations:

- Waterfall Way (Grafton Road), 100m east of the Armidale Regional Landfill entrance.
- Gara Road, 25m from the Waterfall Way (Grafton Road) intersection.
- Silverton Road, 100m form the Waterfall Way (Grafton Road) intersection.

The Annual Average Daily Traffic Volume (AADT) count for local roads are outlined in Table 8-7. Based on the 2020 counts, and historic traffic count data for Waterfall Way (Grafton Road) from TfNSW, traffic volume is currently growing at ~1% per annum.

Table 8-7 Traffic volumes on approach roads.

| Road name | 2020 AADT (two way) | AM Peak (period) | Pm Peak (period) | Heavy vehicles | | |
|---|---|---|---|---|---|---|
| | | | | **Medium** | **Long** | **Total** |
| **Waterfall Way (Grafton Road)** | 1,597 | 141<br>(11:15-12:15) | 159<br>(15:15-16:15 | 6.1% | 4.5% | 10.6% |
| **Gara Road** | 104 | 11<br>(08:00-09:00) | 13<br>(15:45-16:45) | 9.6% | 0.3% | 9.8% |
| **Silverton Road** | 18 | 4<br>(07:45-8:45) | 3<br>(15:45-16:45) | 22.2% | 0.4% | 22.6% |

Edwards Coaches operate two school bus services on Waterfall Way (Grafton Road) between Armidale and Wollomombi, and between Armidale and Hillgrove. Student pickups commence at around 7:30am for arrival in Armidale at 8:15am, and in the afternoons travel commences at approximately 3:45pm with the last stops at around 4:30pm.

Gara Road provides direct access to approximately 17 rural properties and 12 dwellings. Silverton Road provides access to approximately 11 rural properties and 6 dwellings. The rural properties have regular roadside mail deliveries. Heavy vehicles are typically related to primary production including carting of livestock, and fuel and material deliveries.

A review of the Strava Global Heatmap reveals that Waterfall Way (Grafton Road) has relatively minor use for active modes of transport such as cycling and running. Some walking and running activity occurs near the Gara River Rest Area including the reserve north of Waterfall Way (Grafton Road), near Gara Dam.

### 8.3.2. Potential impacts

## Construction impacts

The potential traffic, transport and road safety impacts associated with construction of the proposal relate primarily to the increased numbers of vehicles on the road network which may lead to:

- Increased collision risks (other vehicles, pedestrians, stock and wildlife).
- Damage to road infrastructure.
- Associated noise and dust (particularly where traffic is on unsealed roads) which may adversely affect nearby receivers.
- Disruption to existing services (school buses).
- Reduction of the level of service on the road caused by platooning of construction traffic.

**Increased vehicle numbers**

During the 6-9 month peak construction phase, up to 300 staff will be onsite. Construction activities would generally take place between 7:00 am and 6:00 pm, Monday to Friday, and 8:00 am to 1:00 pm on Saturdays. Any construction outside of these normal working hours would only be undertaken with prior approval from relevant authorities.

A proposed system of 25-seat shuttle buses will transport staff housed in Armidale and the surrounds to the site via the Waterfall way (Grafton Road) access point, adding a potential 20 daily vehicle movements to the road (one-way), in addition to 30 daily light vehicle movements for transporting other staff (one way). Construction workers will typically be arriving onsite between 6:30-8:00 am and leaving between 4:00-5:00 pm, thus most light vehicle movements are expected to occur within a two-hour period at the start and end of each day.

Most solar farm components will be manufactured overseas and freighted to the site via Waterfall Way (Grafton Road) from Sydney or Newcastle. During peak construction periods, heavy vehicles (including staff buses) are expected to make 66 trips per day (one way), distributed throughout the day with an average of 6 trips per hour.

The estimated peak daily traffic increase of 96 vehicles for Waterfall Way (Grafton Road) represents an increase in daily traffic movements of approximately 12%, which would be easily absorbed by the existing road (refer Table 8-8 for breakdown of vehicle types).

Peak hourly traffic is predicted to increase to 24 vehicles per hour between 6:00-7:00 am, however this is out of sync with the current morning peak period on Waterfall Way (Grafton Road) of 11:15-12:15 am. During the existing morning peak, vehicle numbers will only increase by 7 per hour or 5%, below the current peak afternoon traffic figures for the road.

In the existing afternoon peak hour on Waterfall Way (Grafton Road) between 3:15pm and 4:15pm, the estimated future peak traffic of 161 vehicles per hour will be supplemented by an additional 15 vehicles per hour from the Oxley Solar Farm. This represents an increase of 9% on the afternoon peak traffic, which is considered to be well within the existing capacity of Waterfall Way (Grafton Road).

Just over 100 vehicles per day currently use Gara Road, as measured near the Waterfall Way (Grafton Road) intersection where traffic figures are the highest. Where Gara Road is within the Oxley Solar Farm extents there is very low existing traffic estimated at up to 10 vehicles per day, with only one residence at 973 Gara Road requiring access through the length of Gara Road used by Oxley Solar Farm traffic. The eastern section of Gara Road between approximate chainages 7,710m and 9,730m is expected to have additional light and heavy traffic totalling up to 96 vehicles per day as they access different areas of the proposal site. As proposed this section of Gara Road will require upgrades to be suitable for two-way traffic and turning for heavy vehicles.

While a detailed haulage program has not yet been developed, it is expected that the project's components would be delivered by road from Sydney or Newcastle, via the New England Highway and Waterfall Way (Grafton Road). The proposed route brings traffic through outskirts of Armidale, bypassing a large number of residences smaller and local roads. The roads would have sufficient capacity to accommodate the haulage of components required for the construction of the solar farm.

Accordingly, the road network is able to accommodate the traffic generated by the solar farm during the construction period.

Table 8-8 Estimated construction vehicle types and peak daily number of trips on Waterfall Way (Grafton Road).

| Vehicle type | Estimated peak maximum daily number of trips (one-way) |
|---|---|
| Semi-trailers | 23 |
| B Double | 2 |
| Oversize vehicles | 1 |
| Standard trucks | 5 |
| Water tankers | 15 |
| Buses | 20 |
| Cars | 30 |
| **TOTAL** | **96** |

**Increased collision risk**

The increased collision risk relates primarily to traffic entering and exiting the site from Waterfall Way (Grafton Road). This relates to both oncoming traffic and traffic following vehicles that are turning on and off Waterfall Way. Slow moving vehicles may also present a risk to through traffic, requiring signage to warn motorists of the construction timeframes.

Traffic accessing the site will do so via the single access point to/from Waterfall Way. Figure 8-11 and Table 8-9 outline the access distribution for the Oxley Solar Farm construction traffic.

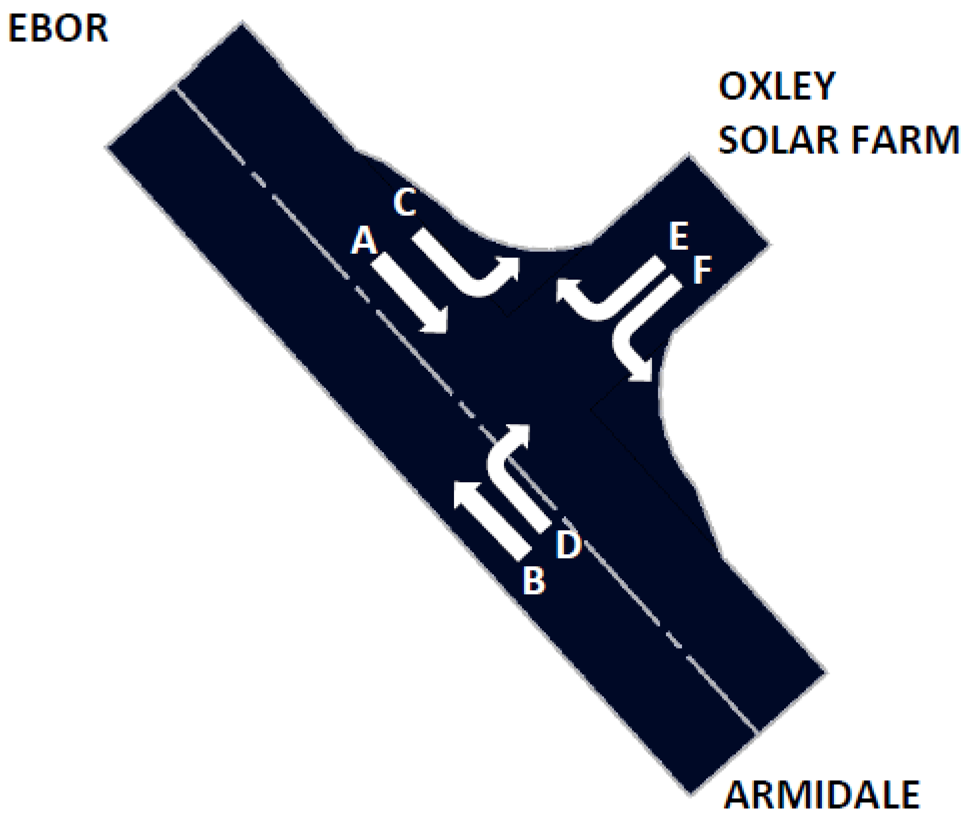



Figure 8-11 Traffic directions at Waterfall Way (Grafton Road) at Oxley Solar Farm site access.

Table 8-9 Peak hourly movements by direction at proposed Oxley Solar Farm site access.

| Arrow | Pre-development | | Construction | | Operation | |
|---|---|---|---|---|---|---|
| | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak |
| **A** | 71 | 80 | 74 | 83 | 79 | 89 |
| **B** | 71 | 80 | 74 | 83 | 79 | 89 |
| **C** | 0 | 0 | 0 | 0 | 0 | 0 |
| **D** | 0 | 0 | 7 | 7 | 1 | 1 |
| **E** | 0 | 0 | 0 | 0 | 0 | 0 |
| **F** | 0 | 0 | 7 | 11 | 1 | 1 |

At the proposed access location, safe intersection sight distance is available in each direction, and average downwards gradient on the eastbound approach is 3.7%. It is suggested that a new BAR/BAL intersection would represent the minimum intersection treatment for a new property access to the Oxley Solar Farm (Figure 7.4).

The new access road will be constructed to comply with Figure 7.4 of the *Austroads Guide to Road Design Part 4: Intersections and Crossings - General, 2017*, and designed to accommodate the swept path of the maximum dimension freight vehicle and over-dimension vehicle which will service the site, and an Austroads basic right-turn intersection treatment (BAR) to the northern side of the access (Figure 4-11).

It is expected that tree clearing would be required for the new access driveway, and also on the northern side of Waterfall Way (Grafton Road) to permit a table drain and ensure sight distances are achieved. Tree removal may also be required immediately adjacent to Gara River north of the bridge so that these trees do not in future obstruct sight distances. The intersection and sight line work has been included in the development footprint and assessed as part of this EIS.

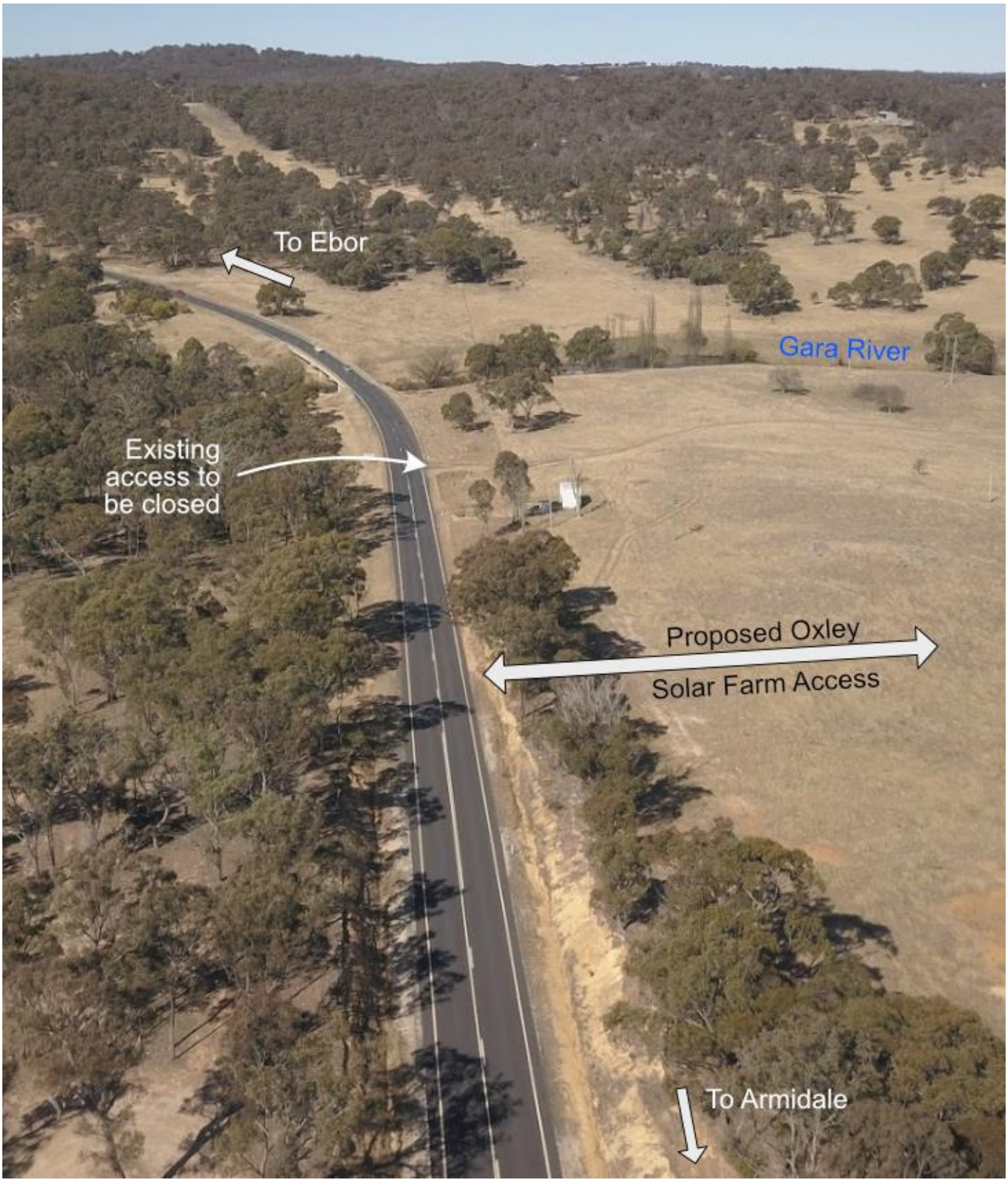



Figure 8-12 Proposed Location for New Property Access to Waterfall Way (Grafton Road).


Figure 8-13 Concept Diagram of New Property Access Arrangement to Waterfall Way (Grafton Road).

Improvements will be required along Gara Road between approximate chainages 7.7km and 9.7km, where it will be necessary for heavy vehicles to travel on Gara Road to access different parts of the Oxley Solar Farm (Figure 8-14). Such improvements would include localised widening to allow heavy vehicles to pass, four (4) new heavy vehicle property entrances, and upgrading in the vicinity of the Gara River causeway crossing where road width and sight distances are constrained (Figure 8-15). The access points will be in compliance with Austroads intersection guidelines and the Armidale Regional Council Engineering. Given there is little through-access at this part of the road, consideration could be given to temporary traffic control measures to control traffic in the vicinity of the Gara River crossing, in consultation with Armidale Regional Council.

Neither Silverton Road, nor Gara Road west of chainage 7.7km, are proposed for any regular construction or operation traffic associated with the development. However, it is recommended that advance warning signage be installed on the approaches to all stock grids and causeways, consistent with AS1742.1 Manual of Uniform Traffic Control Devices, and to the satisfaction of Armidale Regional Council as the road's authority.

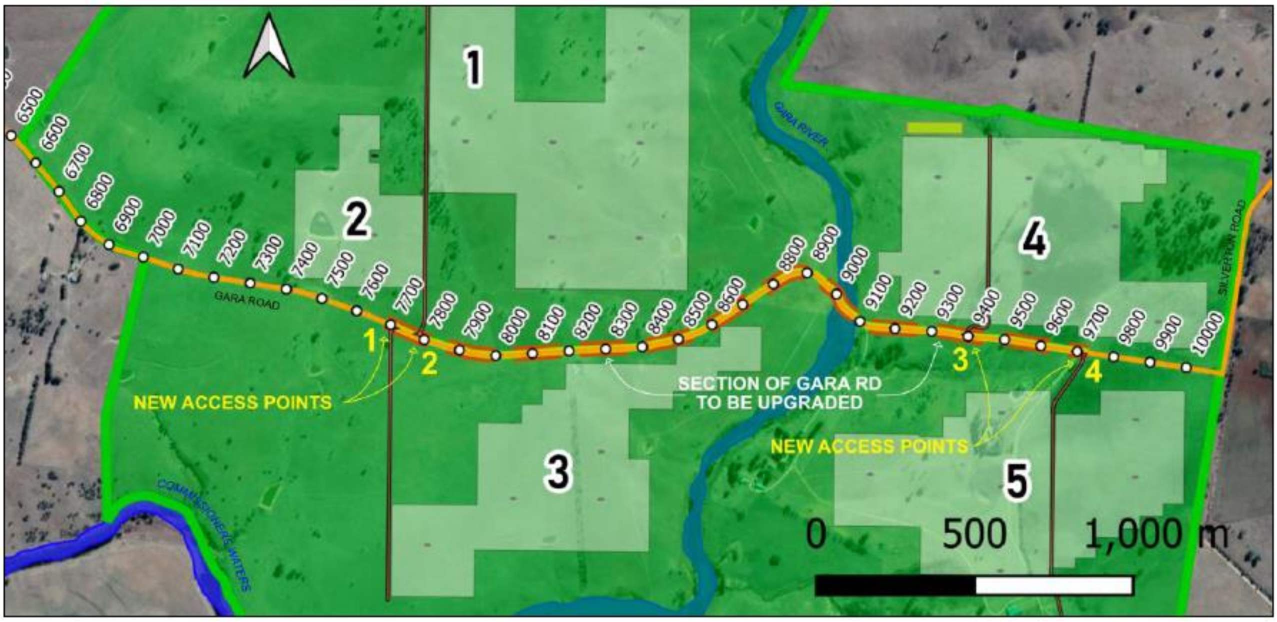



Figure 8-14 Location of accesses off Gara Road within the proposal site.

Figure 8-15 Causeway Crossing of Gara River on Gara Road, Chainage 9.05km.

**Damage to road infrastructure**

The increase in traffic and heavy vehicle movement could impact the condition of roads on the haulage network. For Waterfall Way (Grafton Road), the impact is expected to be negligible due to the existing capacity of the road network. However the impact of turning traffic at the intersection of the site would likely require monitoring to ensure that the road is maintained in an adequate condition. Any damage as a consequence of the works would be rectified.

A dilapidation survey of the haulage routes between the New England Highway and the site would be completed prior to the commencement of any site works. Internal access roads would be constructed or upgraded as required to accommodate the Proposal volumes and loads of traffic. The tracks would be compacted but unsealed gravel.

**Associated noise and dust**

The increase in traffic during construction may increase noise and dust in the local area, particularly on the unsealed access road, Gara Road. Impacts from dust generated from the proposed activity, including that associated with increased traffic is considered in Section 8.9. During construction, water would be used to minimise dust generation along access tracks.

The *NSW Road Noise Policy* (DECCW, 2011) have been used to evaluate impacts from road traffic noise. This policy outlines a range of measures required to minimise road traffic noise and its impacts, including noise generated by developments that generate additional traffic on existing roads. A road traffic noise assessment is included in Appendix H and Section 7.5 of this EIS.

**Disruption to existing services**

Edwards Coaches operate two school bus services on Waterfall Way (Grafton Road) between Armidale and Wollomombi, and between Armidale and Hillgrove. Student pickups commence at around 7:30 am for arrival in Armidale at 8:15 am, and in the afternoons travel commences at approximately 3:45 pm with the last stops at around 4:30 pm. School bus operational times fall outside the predicted increased morning and afternoon peak traffic times, thus construction is not anticipated to affect school bus routes.

Increased traffic during construction may cause disruptions to general traffic flows and to public transport services along Waterfall Way (Grafton Road) and Gara Road (within the proposal site). The use of buses to transport workers to and from site would reduce the amount of disruption to traffic along the Waterfall Way (Grafton Road). Road widening and traffic control along Gara Road within the proposal site would assist with the disruption to traffic flow along the road for the local community. Silverton Road would not be an access point for the project (staff would be instructed not to use it) but may occasionally be used by light vehicles visitor access the southern portions of the site. The limited amount of vehicles along Silverton Road as of a result of the proposal is unlikely to disrupt traffic flow.

**Cumulative construction traffic impacts**

A number of additional developments have been proposed or approved within the area:

- Stringybark Solar Farm, located north of Gara Road and immediately east of the Oxley Solar Farm site.
- Olive Grove Solar Farm, west of the Armidale Regional Landfill along Waterfall Way (Grafton Road).
- Metz Solar Farm, 18km east of Armidale off Waterfall Way (Grafton Road).
- New England Solar Farm about 20km south-west of the proposal site.
- Salisbury Solar Farm about 30km south-west of the proposal site.
- Tilbuster Solar Farm, about 25km north-west of the proposal site.
- Armidale Regional Landfill, west of the proposal site.

If approved, the Metz Solar Farm is the only development expected to result in increased traffic along the Waterfall Way (Grafton Road) access point for Oxley Solar Farm.

The Metz Solar Farm Traffic Impact Assessment prepared by TTM Consulting Pty Ltd (2017) notes that overall daily traffic movements during peak construction will be 75 light vehicles and 27 heavy vehicles. Average monthly truck movements are estimated to be 13 trucks per day over the 10-month construction period.

Existing traffic on Waterfall Way (Grafton Road) is estimated to be 1,597 vehicles per day, combining eastbound and westbound directions. Assuming typical 1.04% compound traffic growth on Waterfall Way (Grafton Road), and conservatively allowing additional traffic of 102 vehicles per day in 2022 to account for the Metz Solar Farm construction and an additional 10 vehicles per day thereafter associated with operational activities for the Metz Solar Farm, estimated traffic over the next ten (10) years at Gara River is shown in Table 8-10.

Along Waterfall Way (Grafton Road) adjacent the site, the AM peak period was measured to occur between 11:15am and 12:15pm, and the PM peak period is between 3:15pm and 4:15pm.

Table 8-10 Estimate daily traffic volumes (both directions), Waterfall Way (Grafton Road)

| Year | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Daily traffic** | 1597 | 1614 | 1834 | 1667 | 1684 | 1701 | 1719 | 1736 | 1754 | 1772 | 1790 | 1809 |
| **Am Peak hour** | 141 | 142 | 162 | 147 | 149 | 150 | 152 | 153 | 155 | 156 | 158 | 160 |

| Year | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PM Peak hour** | 159 | 161 | 183 | 166 | 168 | 169 | 171 | 173 | 175 | 176 | 178 | 180 |

Assuming in the worst-case scenario that peak construction for the Oxley Solar Farm coincides with peak construction of the Metz Solar Farm, Waterfall Way (Grafton Road) would experience an increase in daily and peak hour traffic during 2021 and 2022. However, Waterfall Way (Grafton Road) has the capacity for the increase in traffic, therefore the projects will have a minimal impact on the road network.

### Operation

During operation (approximately 30 years), the solar farm is expected to generate a maximum of 10 light and 4 heavy vehicle movements per day.  Activities undertaken during the operation phase would include travelling to the site office or maintenance building and carrying out maintenance activities on the solar farm infrastructure. Some emergency responses are likely to occur outside these times, however such movements would be kept to a minimum. Operational staff would be confined to designated parking areas and access roads/tracks within the proposal site.

It is considered unlikely that the low levels of operational traffic would obstruct public or private local access or be above the background noise levels. Additional risks to road safety from operational traffic would be minimal.

### Decommissioning

Decommissioning impacts are likely to follow a similar pattern as construction, as components are dismantled and removed. It is considered that the construction traffic generated during decommissioning would consist of less daily vehicular movements than the construction of the plant.

## 8.3.3. Safeguards and mitigation measures

The potential traffic, transport and road safety impacts associated with the proposal are higher during construction than operation and decommissioning due primarily to the increased numbers of vehicles on the road network. The mitigation measures outlined below are to be implemented to reduce the risk of collision, damage to road infrastructure and disruption to services through design of road infrastructure and preparation and implementation of management plans.

Associated potential noise and dust impacts with increased traffic from the proposal would be reduced through mitigation measures outlined in other sections of this EIS (Section 7.5 and 8.9).

Table 8-11. Safeguards and mitigation measures for traffic, transport and safety impacts. *PC: Pre-Construction, C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| T1 | A Haulage Plan would be developed and implemented during construction and decommissioning, including but not limited to:<br>• Direction of traffic flow (both heavy and light).<br>• Loads, weights and length of haulage and construction related vehicles and the number of movements of such vehicles. | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Scheduling of deliveries of major components to minimise safety risks (on other local traffic).<br>• Traffic controls (signage and speed restrictions etc.).<br>• All heavy vehicle movements to/from the access point are to be managed to ensure that only one inbound or outbound vehicle is travelling along the access route in the vicinity of the site at a time.<br>• Heavy vehicle movements into and out of the Proposal Site will be controlled via traffic management means, including a traffic controller, temporary lowered speed limit and additional road signage alerting vehicles of truck movements in the area. | | | |
| T2 | The proponent would engage an appropriately qualified person to prepare a Road Dilapidation Report for all road routes between the New England Highway and the site, and on Gara Road between chainages 7.7 km and 9.7 km, to be used during the construction (and decommissioning) activities, in consultation with the relevant road authority. This report is to address all road related infrastructure. Reports must be prepared prior to commencement and after completion of construction (and decommissioning). | PC | | D |
| T3 | The proponent would repair any damage resulting from project traffic (except that resulting from normal wear and tear) as required at the proponent's cost. | C | | D |
| T4 | The design and construction of a new vehicular access from Waterfall Way (Grafton Road) to Lot 2 DP1206469, complying with the rural style BAL / BAR treatments specified in the Austroads Guide to Road Design, as amended by Transport for NSW in their supplementary road design guidelines, and designed to accommodate the swept path of the maximum dimension vehicles which will service the site.<br><br>For works on the State road network the developer is required to enter a Works Authorisation Deed (WAD) with TfNSW before finalising the design or undertaking any construction work within or connecting to the road reserve. The WAD documentation is to be submitted for each specific change to the state road network for assessment and approval by TfNSW prior to commencement of any works within the road reserve. | C | | |
| T5 | Closure of the existing rural property access from Waterfall Way (Grafton Road) to Lot 2 DP1206469, including alteration of boundary fencing, after the construction of the replacement access. | PC,C | | |
| T6 | The design and construction of four (4) new heavy vehicle property accesses between Gara Road and the development site, in a manner consistent with Armidale Regional Council Engineering Code and Austroads guidelines.<br><br>Each access is to be located so that Austroads sight distance requirements can be achieved, be designed to achieve a maximum intersection angle between 70° and 110° with Gara Road, and contain the swept path of the maximum dimension design access vehicles. | PC,C | | |

<table>
<tr><th>ID</th><th>Safeguards and mitigation measures</th><th>C</th><th>O</th><th>D</th></tr>
<tr><td></td><td>The proposed access north of Gara Road at approximate chainage 9,450m as measured from Waterfall Way (Grafton Road) should be relocated eastwards to approximate chainage 9,400m, unless other alternate positioning satisfactory to Armidale Regional Council permits adequate sight distances to be demonstrated.</td><td></td><td></td><td></td></tr>
<tr><td>T7</td><td>Gara Road should be upgraded suitable to achieve minimum Austroads sight distances and be sufficiently widened to enable two-way heavy vehicle traffic in that section between the proposed new solar farm access locations at approximate chainages 7.7km and 9.7km, except as approved otherwise by Armidale Regional Council (for example, traffic control measures may be implemented during construction on either side of the Gara River crossing to ensure the passage of only one heavy vehicle at a time). Any upgrades should be consistent with the Armidale Regional Council Engineering Code and referenced standards.</td><td>PC,C</td><td>O</td><td>D</td></tr>
<tr><td>T8</td><td>The design and installation of warning signage at those locations on Gara Road and Silverton Road where the road suddenly narrows as identified in the table below, to provide advance warning to motorists who may be unfamiliar with road conditions. All signage is to comply with the requirements of Australian Standard 1742.1 Manual of Uniform Traffic Control Devices and the Armidale Regional Council Engineering Code.
<table>
<tr><th>Chainage</th><th>Constraint to two-way traffic</th></tr>
<tr><td colspan="2">Gara Road</td></tr>
<tr><td>3,255m</td><td>Single lane causeway across Burying Ground Creek</td></tr>
<tr><td>4,285m</td><td>Single lane causeway across an unnamed non-perennial waterway</td></tr>
<tr><td>5,350m</td><td>Single lane causeway across an unnamed non-perennial waterway</td></tr>
<tr><td>9,050m</td><td>Single lane causeway across Gara River</td></tr>
<tr><td colspan="2">Silverton Road</td></tr>
<tr><td>1,450m</td><td>Single lane causeway over unnamed non-perennial waterway</td></tr>
<tr><td>2,075m</td><td>Public gate including single-lane stock grid</td></tr>
<tr><td>5,270m</td><td>Public gate including single-lane stock grid</td></tr>
</table>
Engineering plans for all roadworks are to be prepared by a suitably qualified person and submitted to Armidale Regional Council for approval prior to the issue of Section 138 Roads Act approval for the work.</td><td>PC</td><td></td><td></td></tr>
<tr><td>T9</td><td>A Traffic Management Plan would be developed and implemented during construction and decommissioning. The plan will be prepared in consultation with the relevant road authority and the appointed transport contractor. The plan would include, but not be limited to:
<ul>
<li>The designated routes and vehicular access of construction traffic (both light and heavy) to the site. This will include the management and coordination of movement of vehicles for construction and worker related access to limit disruptions to other motorists, emergency vehicles, school buses and other public transport. Note, construction and operational staff will be advised not to use Silverton Road as a site access.</li>
<li>Procedure for informing the public where any road access will be restricted as a result of the project.</li>
<li>The designated routes of construction traffic to the site.</li>
</ul></td><td>C</td><td></td><td>D</td></tr>
</table>

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction.<br>• Scheduling of deliveries.<br>• Community consultation regarding traffic impacts for nearby residents.<br>• Consideration of cumulative impacts.<br>• Traffic controls (speed limits, signage, etc.), and any proposed precautionary measures to warn road users such as motorists about the construction activities for the project, especially at the access site along New England Highway.<br>• Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts.<br>• Details of measures to be employed to ensure safety of road users and minimise potential conflict.<br>• A driver Code of Conduct to address such items as appropriate driver behaviour including adherence to all traffic regulations and speed limits, driver fatigue, safe overtaking and maintaining appropriate distances between vehicles, etc. and appropriate penalties for infringements of the Code.<br>• Details of procedures for receiving and addressing complaints from the community concerning traffic issues associated with truck movements to and from the site.<br>• Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.<br>• Water to be used on unsealed roads to minimise dust generation through increased traffic use.<br>• Following construction, a post condition survey of the relevant sections of the existing road network to be undertaken to ensure it is of similar condition to that prior to construction. | | | |
| T10 | All internal circulation roads, parking and manoeuvring areas are to be designed and constructed in accordance with the planned number, dimension and mass of construction service vehicles, and in compliance with the previsions of the Armidale Regional Councils Engineering code, and AS/NZS 2890.1 Off Street Parking. Any internal roads which are not designed for two-way travel should have regular hard-standing provision for heavy vehicles travelling in opposite directions to pass. | PC,C | | |
| T11 | Obtain a Section 138 Consent from the relevant council/agency to perform works within the road reserve. | C | | |
| T12 | Prior to the commencement of construction on-site, the Proponent would undertake all works to upgrade relevant state roads, their associated road reserve and any public infrastructure in that road reserve to a standard suitable for use by heavy vehicles to meet any reasonable requirements that may be specified by TfNSW. The design, specifications and construction of these works must be completed and certified by an appropriately qualified person to a standard to accommodate the traffic generating requirements of | PC | | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | the project. On Classified Roads the geometric road design and pavement design must be to the satisfaction of the TfNSW. | | | |

## 8.4. RESOURCE USE AND WASTE GENERATION

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Waste*** *- identify, quantify and classify the likely waste stream to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.*

### 8.4.1. Resource Use

The key resources and estimated quantities (pending the completion of the detailed proposal design) required to construct the proposed Oxley Solar Farm are listed in Table 8-12. The majority of the required resources would be used during the construction of the proposed solar farm. During operation and decommissioning, resource requirements would relate to maintenance activities including the use of machinery, vehicles and water resources. Water resources would be required throughout construction, operation and decommissioning. Water use is considered in Section 8.1 of this EIS.

Table 8-12 Resource requirements for the Oxley Solar Farm.

| Resource | Quantity |
|---|---|
| **Gravel (access tracks)** | 75,000$m^3$ |
| **Sand (bedding for cables)** | 8,500$m^3$ |
| **Concrete** | 420$m^3$ |
| **Estimated no of solar panels** | 715,680 |
| **Water during construction** | 110 – 130ML |

### 8.4.2. Waste

Legal requirements for the management of waste are established under the POEO Act and the *Protection of the Environment Operations (Waste) Regulation 2005*. Unlawful transportation and deposition of waste is an offence under Section 143 of the POEO Act. Littering is an offence under Section 145 of the POEO Act.

The *Waste Avoidance and Resource Recovery Act 2001* includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The proposal's resource management options would be considered against a hierarchy as shown in Figure 8-16.

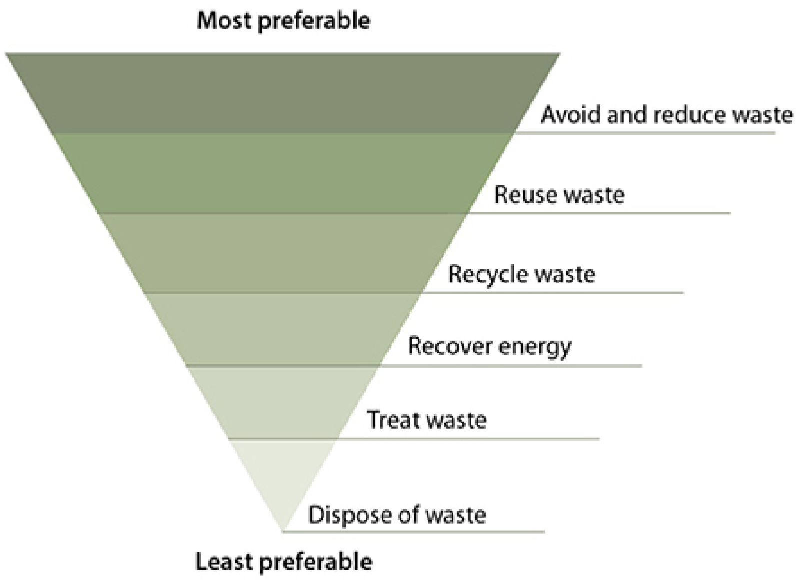



Figure 8-16 Waste hierarchy (source: (EPA, 2020))

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

### 8.4.3. Potential impacts

## Construction

#### Resource use

While increasing scarcity of resources and environmental impacts are emerging from the use of non-renewable resources, the supply of the materials required for the proposal are not currently limited or restricted. In considering the volumes required, the proposal is unlikely to place significant pressure on the availability of local or regional resources. The use of the required resources is considered reasonable in light of the benefits of offsetting fossil fuel electricity generation.

Water would be required during construction for activities including watering of roads and in the site office and amenities. Water use is considered in Section 8.1.

#### Waste

The management of waste during the construction phase would observe the objectives of the WARR Act.

Solid waste is one of the major pollutants caused by construction. A number of different construction activities associated with the proposal would produce solid wastes, including:

- Spoil from trenching.
- Packaging materials.
- Excess building materials.
- Scrap metal and cabling materials.
- Plastic and masonry products, including concrete wash.
- Excavation of topsoils and vegetation clearing (expected to be minimal).
- Bio wastes, from onsite septic systems.

In accordance with the definitions in the POEO Act and associated waste classification guidelines, most waste generated during the construction and decommissioning phases would be classified as building and demolition waste within the class general solid waste (non-putrescibles). Ancillary facilities in the site compound would also produce sanitary wastes classified as general solid waste (putrescibles) in accordance with the POEO Act. Waste produced during construction would be disposed of at an appropriately licensed waste facility. Green waste from tree clearing would be mulched for use in rehabilitation at the site or removed from the site.

The impact from waste generation, on regional waste facilities is assessed to be moderate without the implementation of any recycling or re-use measures. However, with the implementation of a Waste Management Plan and identification of recycling waste facilities in the LGA, the impacts from construction waste disposal on regional landfills, the biological environment and social environment is assessed to be minor.

The Waste Management Plan would include a requirement for separate waste receptors to be located on site during construction to receive recyclable and non-recyclable waste. Recyclable waste is likely to be generated from packaging (carboard, plastic, wood). Non-recyclable waste would be disposed of at an appropriate licensed facility. The following waste facilities are located within the Armidale LGA:

- Armidale Waste Management Facility
- Armidale Recycling Centre
- Guyra Recycling and Transfer Station
- Ebor Waste Transfer Station
- Hillgrove Waste Transfer Station
- Wollomombi Waste Transfer Station

In the event that these waste facilities cannot accept the volume of waste generated, commercial landfills and waste management companies (including those which recycle polystyrene) would be engaged to dispose of the material legally at other facilities.

Where possible, more sustainable packaging material options would be selected (e.g. reduced insulation/padding thickness and the use of biodegradable starch over cardboard and polystyrene). The proponent would work with Armidale Regional Council and commercial services to recycle as much packaging as practicable.

## Operation

### Resource use – lifecycle analysis

Lifecycle analysis (LCA) assesses and quantifies the energy and material flows associated with a given process to identify the resource impacts of that process and potential for resource recovery. LCA estimates energy and emissions based on the total life cycle of materials used for a project, being the total amount of energy consumed in procuring, processing, working up, transporting and disposing of the respective materials (Schleisner, 2000).

A lifecycle inventory of multicrystalline PV panels was undertaken by European and US photovoltaic module manufacturing companies in 2005-2006. Over the lifetime of the panels, it is expected that 28 g of GHG emissions would be produced per kWh of energy generated (Fthenakis *et al*. 2011). The 'energy payback time' for multicrystalline PV panels is dependent on the geographical location, however on average it is estimated to be 1.5 years. A solar installation in Southern Europe would be even less than 1.5 years (Fraunhofer Institute for Solar Energy Systems (ISE), 2015), which is considered comparable to the proposal.

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

The energy yield ratio of a product is a ratio of the energy produced by, in this case, a solar PV system over its lifetime, to the energy required to make it, which is referred to as the system's lifecycle. PV system energy yield ratio in Northern Europe was estimated to be more than ten, indicating the system would produce more than ten times the amount of energy required to make it (Fraunhofer Institute for Solar Energy Systems (ISE), 2015). This positive energy yield ratio also means that GHG emissions generated from the production of solar energy systems are more than offset over the systems' lifecycle (GA and ABARE, 2010).

When compared to the major electricity generating methods employed in Australia, solar farms are favourable for the following reasons:

- $CO_2$ emissions generated per kilowatt hour of energy produced.
- Short energy payback time in comparison to the life span of the project.
- Potential to reuse and recycle component parts.

**Waste**

During operation, the solid waste streams would be associated with maintenance activities and presence of employees. Some materials, such as fuels and lubricants, and metals may require replacement over the operational life of the Oxley Solar Farm. These materials would be reused or recycled wherever practicable. Given the minimal amount of moving parts and limited wear and tear of equipment, the operational waste streams generated by the solar farm would be very low and impacts to regional waste disposal facilities would be minor.

## Decommissioning

During decommissioning, all above ground infrastructure and materials would be removed, with the possible exception of the 132kV substation. It is noted that the 132kV substation would at that time form part of TransGrid's transmission link between Oxley and Armidale. Some fencing may also remain at the request of the landowner. Underground cables buried at 500mm deep and greater would likely remain in situ.

The following materials would either be recycled or reused:

- Solar panels and mounting system.
- Metals from posts, cabling, fencing.
- Buildings and equipment such as the PCUs, transformers and similar components would be removed for resale or reuse, or for recycling as scrap.

Buildings and major electrical equipment would be removed for resale or reuse, or for recycling as scrap. Items that cannot be recycled or reused, such as excess of above, would be disposed in accordance with applicable regulations and to appropriate facilities.

The proposed energy storage facility would be accompanied with MSDS (Material Safety Data Sheets) which details the exact chemical composition and disposal/recycling requirements of facility components. Potential hazardous waste is discussed in Section 8.8. It is noted that lithium-ion batteries are not currently regulated as a hazardous waste by state governments and hence transport within the state is not required to be tracked in hazardous waste tracking systems (Randell Consulting, 2016). Lithium-ion batteries do not contain any heavy metals. They do contain valuable material that can be recycled. The Australian Battery Recycling Initiative (ABRI) website indicates four companies which provide a collection and recycling service for used lithium-ion batteries.

The majority of the proposal components are recyclable and mitigation measures are in place to maximise reuse and recycling in accordance with resource management hierarchy principles.

### 8.4.4. Safeguards and mitigation measures

A Waste Management Plan would be developed to minimise waste and maximise the opportunity for reuse and recycling. Potential impacts are to be addressed with regards to the mitigation measures in Table 8-13.

Table 8-13 Safeguards and mitigation measures for resource use and waste generation impacts.

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| WR1 | A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to:<br>• Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy.<br>• Quantification and classification of all waste streams.<br>• Provision for recycling management onsite.<br>• Provision of toilet facilities for onsite workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant).<br>• Tracking of all waste leaving the site.<br>• Disposal of waste at facilities permitted to accept the waste.<br>• Requirements for hauling waste (such as covered loads). | C | O | D |
| WR2 | Septic system is installed and operated according to the Armidale Regional Council regulations. | C | O | |

## 8.5. NON-INDIGENOUS HERITAGE

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

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

### 8.5.1. Approach

A desktop study was undertaken to identify any historic heritage (Non-indigenous) items or places in proximity to the study area, with a focus on the proposal site and surrounding landscape. Research was limited to secondary sources with some primary research undertaken through the investigation of historical maps and plans. No additional primary research was undertaken as it was assessed that no likely historic heritage would be impacted by the proposed works.

Heritage databases searched as part of this assessment were:

- The Australian Heritage Database, this includes items on the National and Commonwealth Heritage Lists, to identify any items that are currently listed within or adjacent to the proposal site.
- The NSW State Heritage Inventory (SHI), this includes items on the State Heritage Register and items listed by state agencies and local Government, to identify any items currently listed within or adjacent to the proposal site.
- Heritage schedule of the Armidale Dumaresq LEP 2012, for locally listed heritage items, that are within or adjacent to the proposal site.

### 8.5.2. Results

The results of the heritage searches listed above indicate that no known historic items or places occur on the site. A summary of the results of the heritage searches are illustrated in Table 8-14. Details of listed items are provided below.

Table 8-14 Summary of heritage listed items in the Armidale Dumaresq LGA.

| Name of register | Number of listings |
|---|---|
| World Heritage List | 1 |
| National Heritage List | 1 |
| Commonwealth Heritage Places | 2 |
| NSW State Heritage Register | 18 |
| NSW State Agency Heritage Register (section 170) | 346 |
| Armidale Dumaresq Local Environmental Plan (LEP) 2012 | 323 |

#### Australian Heritage Database

The Australian Heritage Database search was undertaken on the 30 April 2020. 95 items were found to be listed under the National Heritage List for the Armidale Dumaresq LGA. None of these occur within, or adjacent to, the proposal site. Two places within the Armidale Dumaresq LGA are listed on the Commonwealth Heritage Places register: *Hunter River Lancers Training Depot* and *Armidale Post Office*. The Hunter River Lancers Training Depot is about 10km north west of the proposal site, and the Armidale Post office is about 13km north west of the proposal site. Therefore, both sites would not be impacted by the proposal.

The Gondwana Rainforest of Australia is listed on the National Heritage List and World Heritage List. The Oxley Wild Rivers National Park forms part of the Hastings-Macleay group of the Gondwana Rainforests of Australia. Part of the Oxley Wild Rivers National Park begins at the southern boundary of the proposal site.

#### NSW State Heritage Inventory

The SHI database search was undertaken on the 30 April 2020. There were 18 items listed under the NSW State Heritage Register and 346 items listed under the NSW State Agency Heritage Register (Section 170) for the Armidale Dumaresq LGA. None of these items were identified as being within the proposal site. However, it should be noted that the Gara River Hydro-Electric Scheme curtilage is directly adjacent to the southern border of the Project Area. This item is listed on the NSW State Heritage Register (00986), Armidale Regional Council Local Heritage Register and s.170 NSW State agency heritage register. There are no other items within the SHI database in proximity to the proposal site, the closest being a Culvert located at the south-east intersection of Gara Road and Waterfall Way (Grafton Road), approximately 4.3km west of the proposal site.

### Armidale Dumaresq Local Environmental Plan 2012

The Armidale Dumaresq LEP database search was conducted on the 30 April 2020. No local heritage items have been recorded within, or adjacent to, the proposal site. The closest listed items are located approximately 4km or more from the proposal site. The listed items include:

- Site of Abattoir, “Wongalea”.
- Site of Brookstead fellmongery and woolwashing works, “Earthorpe”.
- Homestead, “St Helena”.
- Shearing shed, “Hillgrove Station”.
- House, “Kotupna”.
- Homestead, “Milamba”
- Tattersalls Hotel Brick Outbuildings
- Cottage
- Garibaldi Mine Chimney
- Eleanora Mine – Chimney
- Cemetery
- Baker's Creek Winding Engine House
- Baker's Creek Mine Surface Buildings
- Baker's Creek Mine Chimney

### Unlisted potential heritage items

During the course of the site inspection, two areas of potential historical heritage significance were identified. These included:

- Site one, including non-native cherry trees/rose bushes, old fence posts, small wall foundations and pipe along a small river terrace. Situated along a slightly raised landform directly adjacent to the river the site is presumed to represent an old cottage.
- Site two, Gara station sheds and buildings: including the older shearing sheds on Gara from the 1920s and 1950s with the older components composed of wood and younger composed of iron materials. The hearers quarters and cottage. The homestead itself is likely to be dated c. 1908.

The two identified potential heritage sites have not been subject to a significance assessment, however the development footprint avoids these properties and, as such, there is no proposed impact to the potential heritage items.

### Land disturbances and historic land use

The proposal area encompasses the Parish of Gara to the north and the Parish Metz to the south. John Oxley’s expedition reached the southern part of the plateau in 1818, however, European movement into the New England region didn’t commence in earnest until the 1830s and 1840s during the expansion of squatters west into the interior of what is now NSW. As such the main activity during the early development of the area related to farming and pastoralism. The number of sheep and cattle stations had reached 178 by 1852. Through the second half of the nineteenth century, mining of gold, diamonds, asbestos, antimony and tin commenced in other parts of the New England region, however, farming remained the primary economy in Armidale and the surrounds. Wheat, maize, oats and potatoes were grown in the area (RPS 2019:9-11).

Livestock grazing and agriculture are still major economic activities for the region, with the proposal site having been extensively cleared of native vegetation in order to make way for grazing livestock and the planting of crops. A number of other land modifications associated with farming practices have occurred including terracing on slopes, dam construction and drainage modification.

As a result of these disturbances, the landscape has been significantly altered since European arrival and such disturbances may have resulted in the removal or disturbance of heritage sites. As a result of vegetation clearance and broad-scale pastoral activity, a chain reaction of topsoil erosion has been set in motion leading to the deflation of the soil profile across the proposal site.

In particular, the influx of occupation to the Hillgrove area was attributed to the gold mining which began in 1877 (Neal et al 1981; Mainwaring 1986a, 1986b; Baker 1971 as cited in Gojak 1988). Resource deficiencies associated with the powering of the mine and steam engines led to the discussions and the eventual development of the Gara River Hydro-Electric Scheme (Gojak 1988).

Much of the proposal site encompasses the lands referred to as 'Gyra', 'Gara/Gyra Run' or 'Cara Holding'. Gara Station and its associated lands have been utilised for agricultural pastoral and grazing for generations. The establishment of the Hillgrove and Gara Station is attributed to Major General Sir Maurice O'Connell, the commander and chief of the colony. Gara was later sold to Edward Allingham who ran a store and mill in Armidale (Walker 1966). In 1901 the property encompassed 527 acres of freehold and 3.542 acres of C.P of pastoral and agricultural land (The Sydney Wool and Stock Journal 1901). Some accounts reference the running of sheep during the 1860s (The Maitland Mercury and Hunter River General Advertiser 1864). Several of the paddocks were used to run sheep and cows, while select few are maintained for cropping of foods such as radishes.

Details available through mapping of the Parish of Gara identify the location of Site Two was owned by the Commercial Banking Co. of Sydney from the earliest available parish map (1915) through to the first identified landowner on the 1984 map of Gyra Run (aka Cara Holding), D. M. Marks ACP.  Site One, located within the Parish of Metz is also shown on the 1984 map of Gyra Run, however this site is around the boundary of two allotments, one owned by M. Marks and the other by David Cohen, Samuel Cohen and L. W. Levy. The owners of these properties remain the same from the earliest available mapping for the Parish of Metz (1893). Of historical note are the potential owners Lewis Wolfe Levy and his cousins, brothers David and Samuel Cohen. Lewis Wolfe Levy (1815-1855) was born in London and emigrated to Australia in 1840. He purchased land and moved to Tamworth in 1846 to open a general store. It was around this time that he became a partner with his cousins in Dacid Cohen & Co., a mercantile firm based in Maitland, NSW. While no specific details of this particular landholding are outlines, the details provided in the *Australian Dictionary of Biography* (vol. 5 (MUP), 1974) outlines Lewis Wolfe Levy as a businessman with a good reputation who would represent the Liverpool Plains in the Legislative Assembly in 1871. Levy was noted as having multiple investments including several pastoral interests as well as being a partner in over seven pastoral runs (including Yarraman on the Liverpool Plains). My Levy also held the position of director of the Commercial Banking Co. of Sydney during the 1870s, notable as the landowner of the property at site two. While written records suggest that this prominent historical figure did not occupy his land holding in the Parish of Metz, the association to Levy highlights a potential historic significance of the identified potential heritage items at Site Two.

### 8.5.3. Potential impacts

Several heritage items were identified during the desktop study as outlined above. None of the above registered items are in located within to the proposal site. There were two identified potential heritage sites, as described above, which will be avoided by the development footprint with no potential impacts. However, if impact is proposed to the unlisted potential heritage sites, further assessment will be required to determine their significance.

The proposal is not considered likely to have a significant impact in accordance with the NSW *Heritage Act 1977*, the EP&A Act, or the EPBC Act, in terms of heritage.

There are no anticipated impacts on any of the above identified heritage items during construction, operation or decommissioning, due to the location of the proposed solar farm.

### 8.5.4. Safeguards and mitigation measures

In the event of an item of heritage significance being uncovered, works should cease in the vicinity of the find and the site manager contacted immediately. Works should not recommence until an investigation has been completed by suitably qualified person in accordance with NSW Heritage Branch guidelines.

Table 8-15 Safeguards and mitigation measures for Non-Aboriginal Heritage.

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| HH1 | Should an item of historic heritage be identified, the Heritage Division (EES) would be contacted prior to further work being carried out in the vicinity. | C | O | D |

## 8.6. ELECTRIC AND MAGNETIC FIELDS (EMFS)

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Hazards and Risks** including:*
    - *an assessment of all potential hazards and risks including but not limited to bushfires, spontaneous ignition, electromagnetic fields or the proposed grid connection infrastructure (including 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;*

### 8.6.1. Existing environment

Electric and magnetic fields (EMFs) are produced whenever electricity is used. EMFs also occur naturally in the environment, such as the Earth's magnetic field and discharges during thunderstorms (WHO, 2012).

Electric fields are produced by voltage and magnetic fields are produced by current. When electricity flows, EMFs exist close to the wires that carry electricity and close to operating electrical devices and appliances (WHO, 2007). Electric and magnetic field strength reduces rapidly with distance from the source.

Over decades of EMF research, no major public health risks have emerged, but uncertainties remain (WHO, n.d.). While it is accepted that short-term exposure to very high levels of electromagnetic fields can be harmful to health, the International EMF Project, established by the World Health Organisation, has thus far concluded that there are no substantive health consequences from exposure to Extremely Low Frequency (ELF) electric fields at the low levels generally encountered by the public (WHO, 2007), such as those that would be produced by electricity generation at the proposed solar farm.

The International Commission on Non-Ionizing Radiation Protection (ICNPR) published *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHz)* in 1998. The guidelines were updated in 2010. The objective of the paper was to establish guidelines for limiting EMF exposure that would provide protection against known adverse health effects. To prevent health-relevant interactions with Low Frequency fields, ICNIRP recommends limiting exposure to these fields so that the threshold at which the interactions between the body and the external electric and magnetic field causes adverse effects inside the body is never reached.

The exposure limits, called basic restrictions, are related to the threshold showing adverse effects, with an additional reduction factor to consider scientific uncertainties pertaining to the determination of the threshold. They are expressed in terms of the induced internal electric field strength in V/m. The exposure limits outside the body, called reference levels, are derived from the basic restrictions using worst-case exposure assumptions, in such a way that remaining below the reference levels (in the air) implies that the basic restrictions would also be met (in the body) (ICNIRP, 2016). Reference levels for occupational and general public exposure are shown in Table 8-16.

Table 8-16 ICNIRP reference levels (ICNIRP, 2010).

| Exposure characteristics | Electric field strength (kVolts per metre – kV/m) | Magnetic flux density (microteslas - µT) |
|---|---|---|
| **Occupational** | 10 | 1000 |
| **General public** | 5 | 200 |

The proposal includes six main types of infrastructure that could create EMFs:

1. Solar arrays (up to 1600V DC).
2. Power Conversion Stations (up to 5MW capacity).
3. Underground cables.
4. 132kV overhead transmission lines.
5. 132kV onsite substation.
6. Energy storage facility with a capacity of up to 50 MWh (i.e. 50 MW power output for one hour).

Typical and maximum EMF levels for these types infrastructure are discussed below. Strength attenuates with distance from the infrastructure and electric field levels for underground infrastructure are lessened by the shielding that the fill (approximate depth of 900mm) provides.

## Solar arrays

Research into electric and magnetic fields undertaken at utility scale PV installations in California[17] by Chang and Jennings (1994), indicated that magnetic fields were significantly less for solar arrays than for household applications. Chang and Jennings (1994) found magnetic fields from solar arrays were not distinguishable from background levels at the site boundary, suggesting the health risk of EMFs from solar arrays is minimal.

The proposal would require installation of DC wiring between panels and the PCUs. This cabling would be underground and would have a voltage of around 1600V. The potential for electromagnetic interference as a result of the solar array cabling is considered to be negligible.

## Power Conversion Units

Up to 45 PCUs would be installed across the site. The units would have an output of approximately 5MW. The PCUs would have an AC power frequency output that is 50Hz. In addition, the PCUs would be located within the fenced proposal site with no public access and would operate only during the day reducing the total time that EMFs are generated by the solar panel infrastructure (Figure 1-4).

[17] Note the U.S.A electricity supply operates at 60 Hz frequency.

## Underground cabling

The electric and magnetic fields generated by underground cabling are expected to be low and restricted to the proposal site.

## Overhead powerlines

Figure 8-17 displays the typical electric fields emanating from different voltage overhead powerlines. The proposal site has two existing 132kV powerlines at the northern section of the proposal site. These connect to the existing Armidale 330/132kV substation. The proposed solar farm would connect to the existing 132kV powerlines through the proposed onsite substation.

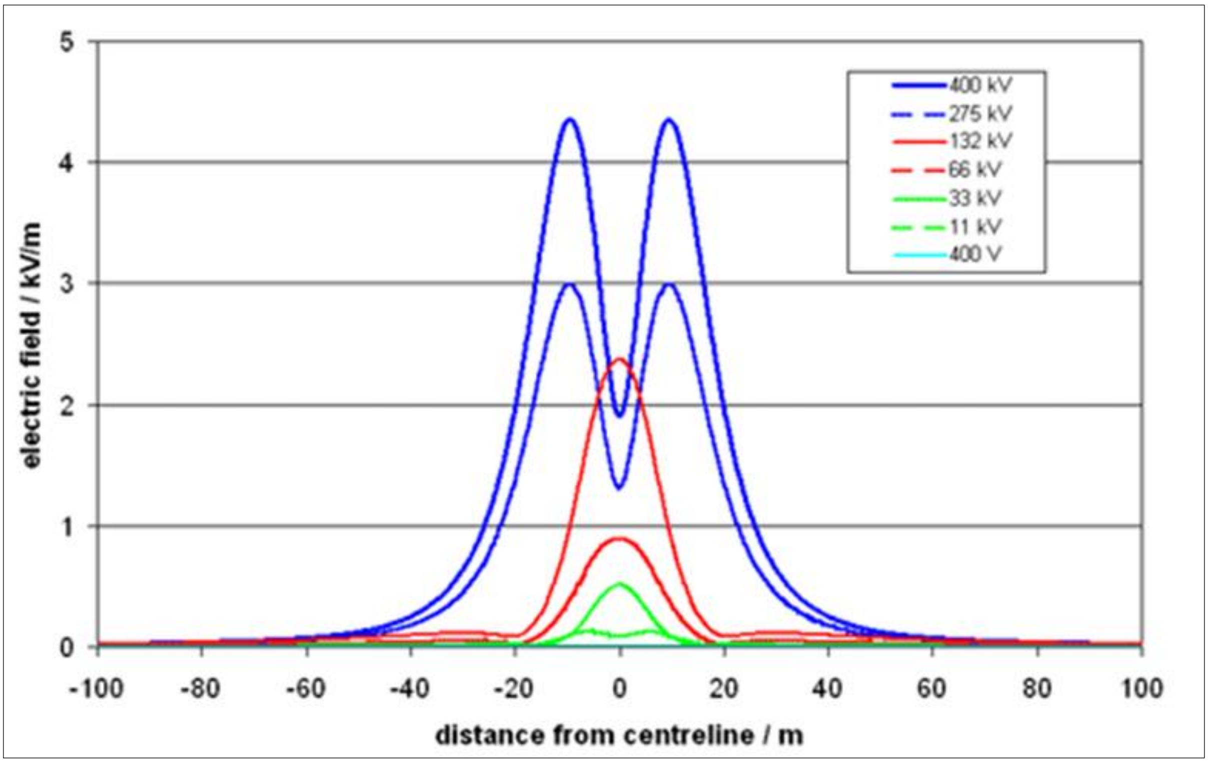



Figure 8-17 Typical electric fields from overhead powerlines (EMFs.info 2017).

## Substation

For the substation and transformers the magnetic fields at distances of 5-10m from the substation fence are generally indistinguishable from typical background levels in a home. The closest non-involved residence is 1.38 km west of the proposed substation location. Works undertaken to facilitate the connection of the transmission line would require mitigation measures to ensure reduced exposure.

## Energy Storage Facility

Lithium-ion batteries are not associated with high levels of EMF and the EMF produced by the proposed ESF would be well below ICNIRP reference levels.

### 8.6.2. Potential impacts

#### Construction and decommissioning

There is low potential for EMF impacts during the construction and decommissioning phases of the proposal. Staff would be exposed to EMFs over intermittent periods during works at and around the existing 132kV transmission line. Exposure to EMFs during the construction would be short term, therefore the effects are likely to be negligible.

#### Operation

During operation, EMF sources would include overhead transmission lines, underground cabling, and the solar array incorporating PCUs.

Electric fields can be reduced with distance from operating electrical equipment and by shielding, while magnetic fields are reduced more effectively with distance. Through prudent design and siting of this infrastructure, the exposure to EMFs can be minimised and potential for adverse health impacts minimised also.

The site is surrounded by agricultural land. Public access would be restricted by site fencing around the site and existing substation during the operational phase. Given the levels associated with the infrastructure components, and the distance to the site perimeter fence, EMFs from the solar farm are likely to be indistinguishable from background levels at the boundary fence. The underground cabling would not produce external electric fields due to shielding from soil, and its magnetic fields are expected to be well within the public and occupational exposure levels recommended by ARPANSA and ICNIRP.

By prudently designing and siting infrastructure, exposure to EMFs and potential for adverse health impacts can be further reduced. Adverse health impacts from EMFs are therefore unlikely as a result of the proposal.

### 8.6.3. Safeguards and mitigation measures

The potential risks associated with EMFs for the solar farm can be reduced by designing the infrastructure in accordance with the codes and best practice standards by a suitable qualified person. These measures are outlined below.

Table 8-17 Mitigation measures for EMFs

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| E1 | All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia. | C | | |
| E2 | All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required. | C | | |
| E3 | Design of electrical infrastructure would minimise EMFs. | C | | |

# 8.7. BUSH FIRE

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Hazards and Risks** including:*
    - *an assessment of all potential hazards and risks including but not limited to bushfires, spontaneous ignition, electromagnetic fields or the proposed grid connection infrastructure (including 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;*

Bush fire presents a threat to human life and assets and can adversely impact ecological values. Bush fire risk can be evaluated and managed by considering environmental factors that increase the risk of fire (fuel load and type, topography and weather patterns), as well as specific activities (such as hot works) or infrastructure components that exacerbate combustion or ignition risks (such as transmission lines, energy storage systems and other electrical components).

This proposal is an SSD exempt from requiring a bush fire safety authority (BFSA) under section 4.41(f) *Environmental Planning and Assessment Act 1979*. Section 5.16(3) requires "the Planning Secretary is to consult relevant public authorities and have regard to the need for the requirements to assess any key issues raised by those public authorities", which includes consulting with the Rural Fire Service (RFS) in regard to bush fire considerations.

## 8.7.1. Existing environment

The proposal site has been predominantly cleared of overstorey vegetation for agricultural purposes and is comprised mostly of grassland and patches of trees. The topography of the proposal site is gently undulating with some steep areas. The elevation is 930 – 1000m Above Sea Level. The land immediately surrounding the proposal site is higher in elevation in the north, east and north-west.

The majority of the proposal site is not identified as bushfire prone land on Armidale Regional Councils bush fire prone land map. A proportion of the northern, north-eastern and southern boundary of the proposal site is identified as category 1 vegetation; this vegetation category extends throughout the surrounding area (Figure 8-18). Category 1 vegetation is considered to be the highest risk for bush fire, has the highest combustibility and likelihood of forming fully developed fires (NSW RFS, 2015a). A patch of vegetation in the northern section of the proposal site is also identified as category 1 vegetation.

The New England Bush Fire Risk Management Plan (NSW RFS, 2015b) identifies the Proposal site as being within the New England Bush Fire Management Committee (NEBFMC) area. Section 1.3.4 of the plan states that there are on average 95 bush fires per year, 12 of which are considered major fires. The fires are typically ignited by escaped private burns, lightning strikes, and arson. The area has a cool climate with rainfall throughout summer, and a bush fire season running from August to March.

The main bushfire hazards for the proposal site include the following:

- Vegetation along the northern, eastern and southern boundaries, Oxley Wild Rivers National Park, and remnant patches of trees throughout the proposal site.
- Unmanaged grassland vegetation within and adjacent the proposal area.
- Two existing transmission lines transecting the northern section of the Proposal site.
- The substation proposed to be constructed along the north-eastern boundary of the site.
- Car accidents and incorrect cigarette disposal along the minor local roads passing the site.

Resources available for fire-fighting include 24 farm dams and Gara River that will be retained on the proposal site. The nearest Rural Fire Service is at Armidale, approximately 12 km west of the proposal site.

Two occupied residences (involved landowner) are located within the proposal site, and 30 residences are located within 2km. Most of these appear to have associated farm sheds, watering points, silos and other equipment.

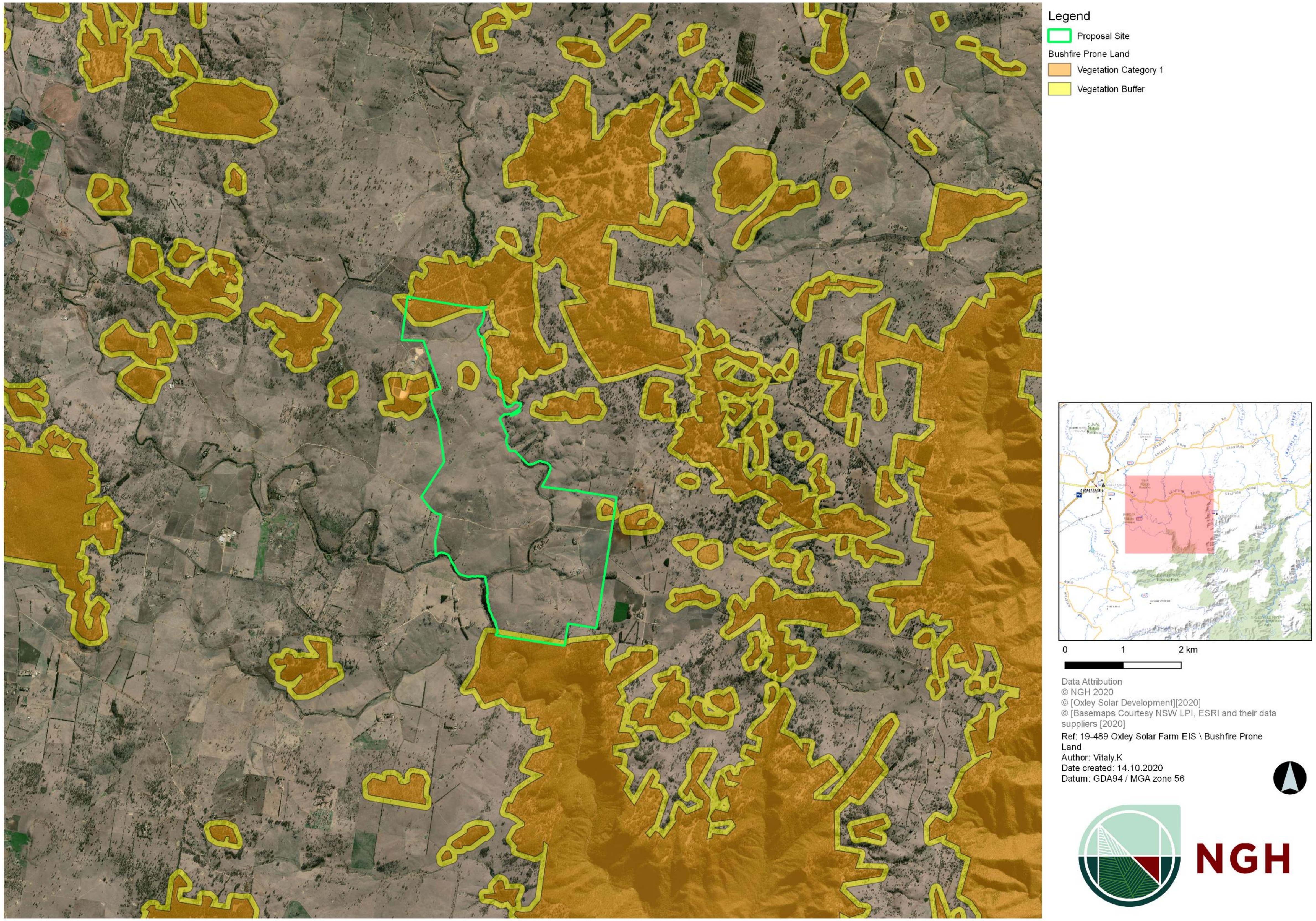



Figure 8-18 Bush fire prone land.

## Planning for Bushfire Protection Guidelines

According to NSW RFS *Planning for Bush Fire Protection 2019* (PBP) (RFS 2019), an acceptable level of protection from bushfires is achieved for developments through a combination of strategies which:

- *Control the types of development permissible in bush fire prone areas;*
- *Minimise the impact of radiant heat and direct flame contact by separating development from bush fire hazards;*
- *Minimise the vulnerability of buildings to ignition and fire spread from flames, radiation and embers;*
- *Enable appropriate access and egress for the public and firefighters;*
- *Provide adequate water supplies for bush fire suppression operations;*
- *Focus on property preparedness, including emergency planning and property maintenance requirements; and*
- *Facilitate the maintenance of Asset Protection Zones (APZs), fire trails, access for firefighting and on site equipment for fire suppression.*

The PBP guidelines provide six key Bush Fire Protection Measures for developments:

- *APZs;*
- *Access;*
- *Construction, siting and design;*
- *Landscaping;*
- *Services; and*
- *Emergency and evacuation planning.*

### *Planning for Bush Fire Protection 2019*

With regard to Section 8.3.5 (of PBP) Solar Farms are identified and require the following measures to be incorporated into the design and operation of the Proposal:

- A minimum 10-metre Asset Protection Zone (APZ) for the structures and associated buildings/infrastructure.
- The APZ must be maintained to the standard of an inner protection area (IPA) for the life of the development (to the specifications identified in Appendix 4 of PBP).

PBP also requires a bush fire emergency management and operations plan, covering:

- Work that should not be carried out during total fire bans.
- Detailed measures to prevent or mitigate fires igniting.
- Notification of the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate.
- Appropriate bush fire emergency management planning and availability of fire-suppression equipment, access and water.
- Storage and maintenance of fuels and other flammable materials., covering:
  - The suspension of work involving risk of ignition during total fire bans.
  - The availability of fire-suppression equipment, storage and maintenance of flammable materials.
  - Notification of the local NSW RFS District Fire Control Centre for any works during the fire danger period that have the potential to ignite surrounding vegetation.
  - Bush fire emergency management planning.

A bush fire emergency management and operations plan would be prepared in consideration of the above for this project and outlined as a mitigation measure.

### 8.7.2. Potential impacts

## Construction and decommissioning

The potential for increased bushfire risk may coincide with the construction and decommissioning stages of the proposal. Ignition sources during these stages include:

- Earthworks and slashing machinery causing sparks.
- Hot works activities such as welding, soldering, grinding and use of a blow torch.
- Sparks and contact ignition from vehicles in long combustible vegetation.
- Smoking and careless disposal of cigarettes.
- Use of petrol powered tools.
- Operating plant fitted with power hydraulics on land containing combustible material.
- Electrical faults during testing and commissioning.
- Storage of chemicals and hazardous materials.

The development footprint proposed within the proposal site is predominantly on undulating land in a low fuel environment. As such, bushfire risks during construction and decommissioning are considered to be low and would be managed through the mitigation measures recommended in this EIS.

## Operation

The operational stage of the proposal has the following associated bushfire risks:

- Powerline failure or contact with vegetation within clearances.
- Overheating in the substation.
- Grass fire ignition from vehicles and maintenance machinery.
- Poor groundcover management and associated increase in fuel loads.

During operation of the solar farm, bushfire and structural fire risks are considered manageable provided the following strategies are adopted:

- Control of grass fuels including maintenance of groundcover beneath panels.
- Maintenance of equipment.
- Application of best practice and technical standards.
- Design of electrical components to minimise ignition potential.

The key risk identified and discussed below is in relation to the operation of Lithium-ion batteries.

**Lithium-ion batteries**

All energy storage systems carry risks associated with the uncontrolled release of energy. While lithium-ion batteries (LIB) offer significant advantages over competing commercialised storage technologies in terms of energy density, efficiency and charging times, these advantages also elevate the risk of fire. The Lithium-ion based Energy Storage Facility would be designed with proper disconnects, relays, thermal management, enclosures, layout, monitoring and controls to mitigate the fire risk to the required level of safety.

Operating strategies spanning proper planning, risk assessment, storage methods, maintenance protocols, and response protocols are the other important factors in mitigating Lithium-ion fire risks (Butler, 2013).

<u>Fire risks</u>

Lithium-ion cells contain highly flammable electrolytes within a metal prismatic can or metalized pouch that have seals designed for a 10 to 20-year service life. The ambient operating temperature range for Lithium-ion systems can span -10 to 50 degrees Celsius but the cells inside the containers are kept within a smaller range, 10 to 30 degrees Celsius, through the enclosure’s thermal management system that is sized to keep the cells within the recommended operating temperature range under normal conditions. Excessive overcharging leads to heating within cells that can initiate ‘thermal runaway’ triggering new chemical reactions through breakdown of the electrolyte, additional heat generation and ultimately the venting of gases containing carbon monoxide, carbon dioxide and hydrogen.

Gas combustion occurs when the electrolyte vapours or combustible decomposition products come into contact with air and there is an ignition source, or the temperature reaches the autoignition point of 350 - 400°C (Recharge, 2013). Monitoring of module temperature and voltage combined with a well-designed controls system prevents excessive overcharging and heating by taking the system offline before critical conditions are reached. Since thermal runaway in one battery cell can initiate thermal runaway in adjacent cells it is important to design features that prevent propagation of fire among modules in the event that a fire is initiated.

<u>Fire causes</u>

Battery overheating may be caused by a range of factors including electrical shorting, rapid discharge, overcharging, manufacturers defect, poor design and mechanical damage (Butler, 2013). LIB do not produce any exhaust gases during normal operation, but they can produce flammable and toxic gases if there is a fault (Department of Commerce, 2017). The main failure modes for these battery systems are either latent (manufacturing defects, operational heating, etc.) or abusive (mechanical, electrical, or thermal) (Blum and Long, 2016).

A large majority of incidents involving Lithium-ion batteries have been due to failure to adhere to packing and transport requirements, use by non-professionals for innovative applications or use in non-controlled storage conditions (Recharge, 2013).

<u>Risk and incident management</u>

Factors listed in Department of Commerce (2017) to avoid and mitigate battery fire impacts include:

- Building codes applicable to batteries (national and local), changes to floor loadings and National Construction Code requirements for battery installations.
- Manufacturer’s recommendations to protect the system from weather and extreme heat, light and temperature.
- Adequate ventilation.
- Containment of electrolyte spills.
- Adequately fire-rated walls are used to avoid or delay the spread of fire.
- Adequate access/egress for installation and maintenance.
- Adequate mechanical protection.

Battery location and spatial design are also important safety factors. Large-scale Lithium-ion energy storage systems can further mitigate widespread impact by isolating different parts of a system.

Fire containment and suppression systems need to be employed to deal with a potential battery fire event, applying the Suppression through Cooling, Isolation, and Containment (SCIC) approach (Butler, 2013). However, while most current systems have automated and manually triggered fire suppression systems, the technology is new and there is limited knowledge about the usefulness of the suppression systems in the event of fire (Blum and Long, 2016).

Lithium-ion fires require specific training, planning, storage, and extinguishing interventions, catering for both progressive burn-off or explosive events (Butler, 2013).

Though the specific battery manufacturer and model has not yet been determined, it is anticipated that each battery module within the implemented solution would have its temperature and voltage monitored.

The fire suppression system within the Energy Storage System would comprise the storage and release of inert gas within each battery container using either electrical detectors/ionisers, or a mechanical system in which the heat destroys a seal to release the gas.

There would be spare aircon units in storage on site for replacement. In the event of failure of one of the units, the system would be able to maintain safe operating temperatures. If all aircon units fail, the auto shutdown of the batteries would prevent overheating.

Standards and guidelines

The installation of lithium-ion batteries has been identified as in need of relevant standards and Standards Australia is developing a new standard (AS/NZS 5139) for smaller scale battery installations (Standards Australia, 2017). The Clean Energy Council provides requirements for accredited installers, the Australian Energy Storage Council has produced a Guide for Energy Storage Systems, and the WA Department of Commerce has released a guide for electrical contractors in relation to battery storage systems (Department of Commerce, 2017).

It is unlikely that the proposal would present a substantial bushfire and structural fire threat or represent an unacceptable hazard in the event of a bushfire affecting the proposal site. Implementation of the mitigation measures in this EIS are considered sufficient in managing the identified risks.

### 8.7.3. Safeguards and mitigation measures

Bush fire risks during construction and decommissioning are considered to be low and would be managed through standard mitigation strategies. During operation of the solar farm, specific fire risks strategies would be adopted including:

- Adequate setbacks, access and firefighting facilities maintained onsite.
- Control of grass fuels including maintenance of groundcover beneath panels in addition to an area around the BSU and other ancillary infrastructure.
- Proper design and maintenance of equipment.
- Application of best practice and technical standards.

These form commitments of the proposal, as set out below.

Table 8-18 Mitigation measures for bushfire.

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| BF1 | Copper conductors would be used where necessary to electrically bond the metal structures to earth to protect personnel and equipment in the event of lightning strikes and electrical faults. | Design | | |
| BF2 | Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*. | C | O | D |
| BF3 | Develop a Bush Fire Management Plan to include but not be limited to:<br>• Specific management of activities with a risk of fire ignition (hot works, vehicle use, smoking, use of flammable materials, blasting).<br>• Incorporation of fire safety and response in staff and contractor induction, training, OHS procedures and Work Method Statements. | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Designation of a staff safety officer tasked with ensuring implementation of the plan and regular liaison with firefighting agencies.<br>• Document all firefighting resources maintained at the site with an inspection and maintenance schedule.<br>• Monitoring and management of vegetation fuel loads.<br>• A communications strategy incorporating use of mobile phones, radio use (type, channels and call-signs), Fire Danger Warning signs located at the entrance to the site compounds, emergency services agency contacts.<br>In developing the Bush Fire Management Plan, NSW RFS would be consulted on the volume of water supplies, fire-fighting equipment maintained on-site, fire truck connectivity requirements, proposed APZ and access arrangements, communications, vegetation fuel levels and hazard reduction measures. | | | |
| BF4 | An APZ of minimum 10m would be maintained between remnant or planted woody vegetation and solar farm infrastructure. The APZ around the perimeter of the site would incorporate a 4m wide gravel access track.<br>Average grass height within the APZ would be maintained at or below 5 centimetres on average throughout the August - March fire season. Average grass height outside the APZ, including beneath the solar array, would be maintained at or below 10 centimetres throughout the fire season. | C | O | |
| BF5 | The overhead powerlines at the site would be managed by maintaining appropriate vegetation clearance limits to minimise potential ignition risks, in accordance with the *ISSC 3 Guideline for Managing Vegetation Near Power Lines*. | | O | |
| BF6 | Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction. This equipment would include fire extinguishers, a 1000 litre water cart (fitted with suitable hosing, fittings and diesel firefighting pump) retained on site on a precautionary basis, particularly during any blasting and welding operations. Equipment lists would be detailed in Work Method Statements. | C | | |
| BF7 | The NSW RFS and Fire and Rescue would be provided with a contact point for the solar farm, during construction and operation. | C | O | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| BF8 | Following commissioning of the solar farm, the local RFS and Fire and Rescue brigades would be invited to an information and orientation day covering access, infrastructure, firefighting resources on-site, fire control strategies and risks/hazards at the site. | | O | |
| BF9 | The perimeter access track would comply with the requirements of property access roads in accordance with Table 5.3b of the PBP. All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bush fire emergencies. Access tracks would be constructed as through roads as far as practicable. Dead end tracks would be signposted and include provision for turning firefighting vehicles. | C | O | D |
| BF10 | A Hot Works Permit system would be applied to ensure that adequate safety measures are in place. Fire extinguishers would be present during all hot works. Where practicable hot works would be carried out in specific safe areas (such as the Construction Compound temporary workshop areas). | C | O | D |
| BF11 | Machinery capable of causing an ignition would not be used during bushfire danger weather, including Total Fire Ban days. | C | O | D |
| BF12 | Prior to operation of the solar farm, an Emergency Response Plan (ERP) would be prepared in consultation with the RFS and Fire and Rescue NSW. This plan must include but not be limited to:<br>• Specifically addresses foreseeable on site and off site fire events and other emergency incidents.<br>• Risk control measures would include the level of personal protective clothing required to be worn, the minimum level of respiratory protection required, decontamination procedures, minimum evacuation zone distances and a safe method of shutting down and isolating the PV system (either in its entirety or partially, as determined by risk assessment).<br>• Outline other risk control measures that may need to be implemented in a fire emergency due to any unique hazards specific to the site.<br>• Two copies of the ERP are stored in a prominent 'Emergency Information Cabinet' which is located in a position directly adjacent to the site's main entry point/s. | | O | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Once constructed and prior to operation, the operator of the facility would contact the relevant local emergency management committee (LEMC). | | | |
| BF13 | Fire risks associated with the lithium-ion energy storage facility would include:<br>• Locating the Energy Storage Facility as far as practicable from any sensitive receptors or large stands of vegetation.<br>• Installing reliable automated monitoring (voltage and temperature), alarm and shutdown response systems.<br>• Installing reliable integrated fire detection and fire suppression systems (inert gas).<br>• Ensuring the battery containers are not vulnerable to external heat effects in the event of a bushfire.<br>• Designing appropriate separation and isolation between battery containers and between batteries and other infrastructure, including gravel surfacing around the facility for a minimum 10 m in accordance with asset protection zone standards.<br>• Compliance with all relevant guidelines and standards.<br>• Preparation of a specific Battery Fire Response Plan, under the general Bushfire Management Plan, in consultation with fire authorities, fire suppression experts and in reference to relevant standards and guidelines.<br>• Facilitation of first responder training in the management of Lithium-ion battery fires at the site for local brigades. | | O | |

## 8.8. HAZARDOUS MATERIALS AND DEVELOPMENT

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Hazards and Risks** including:*
  - *a preliminary risk screening in accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP, 2011), and if the preliminary risk screening indicates the development is "potentially hazardous", a Preliminary Hazard Analysis (PHA) must be prepared in accordance with Hazard Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011); and*

### 8.8.1. Potential impacts

SEPP 33 Hazardous and Offensive Development requires a Preliminary Hazard Assessment (PHA) to be prepared for potentially hazardous or offensive development. Appendix 3 of the Applying SEPP 33 Guidelines (DOP, 2011) lists industries that may fall within SEPP 33; the guidelines do not include solar farms and/or energy storage facilities. Appendix 2 of the guidelines provides a risk screening procedure and a checklist to identify Hazardous and Offensive Development in instances where the applicability of SEPP 33 is not immediately apparent. Information relevant to the risk screening and the checklist is provided below.

### Risk Screening

The SEPP 33 screening procedure is based on the quantity of dangerous goods stored or transported, the frequency of transportation movements and, in some cases, the distance of the materials from the site boundary. The guidelines require goods to be classified according to the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). The ADG Code lists the following classes of dangerous goods:

- Class 1 Explosives.
- Class 2 Gases.
- Class 3 Flammable liquids.
- Class 4 Flammable solids.
- Class 5 Oxidising substances and organic peroxides.
- Class 6 Toxic and infectious substances.
- Class 7 Radioactive material.
- Class 8 Corrosive substances.
- Class 9 Miscellaneous dangerous substances and articles, including environmentally hazardous substances.

A development which exceeds screening thresholds in the guidelines would be considered potentially hazardous, and a PHA would need to be submitted with the development application. For quantities below the given thresholds, the SEPP indicates that there is unlikely to be a significant off-site risk, in the absence of other risk factors.

The dangerous goods that would require transportation and storage during construction and operation of the proposed solar farm are identified in Table 8-19, with ADG Code classification, relevant quantity and transportation thresholds, and storage arrangements. The proposed storage sites would be located at the O&M building and the Energy Storage Facility would be located south of the onsite substation (refer to Figure 1-4). In terms of the class, transportation and storage of dangerous goods, the proposal would not exceed SEPP 33 thresholds, would not be considered potentially hazardous and would not require the preparation of a PHA.

Table 8-19 Dangerous goods and SEPP 33 thresholds relevant to the proposal.

| Hazardous material | Storage threshold | Transport threshold | | Onsite storage arrangements for the proposal | Exceeds SEPP 33 thresholds? |
|---|---|---|---|---|---|
| | | Movements | Quantities | | |
| **Class 2.1 Flammable gases** | | | | | |
| **LPG** | 10 tonnes or 16m$^3$ (above ground) | >500 cumulative >30/week | 2-5 tonnes | Up to 45kg cylinders beside control building, 20 m from boundary. | No |
| **Class 2.2 Non-flammable, non-toxic gases** | | | | | |

| Hazardous material | Storage threshold | Transport threshold | | Onsite storage arrangements for the proposal | Exceeds SEPP 33 thresholds? |
|---|---|---|---|---|---|
| | | Movements | Quantities | | |
| **Inert fire suppression gas** | NA | NA | NA | Compressed in steel bottles in Energy Storage Facility. | No |
| **Class 3 – Flammable liquids (PGII)** | | | | | |
| **Fuel (petrol)** | 5 tonnes | >750 cumulative >45/week | 3-10 tonnes | Stored in a bunded Area. | No |
| **Class 6.1 Toxic substances (PG II, III)** | | | | | |
| **Pesticides (herbicides)** | 2.5 tonnes | All | 1-3 tonnes | Secure operations storage building. | No |
| **Class 9 Miscellaneous dangerous substances and articles** | | | | | |
| **Li-ion batteries** | NA | >1000 cumulative >60/week | No limit | Energy Storage Facility buildings in a secure compound. | No |

## Class 2.2 Non-flammable, non-toxic gases

The inert gas stored in compressed form in the Energy Storage Facility for fire suppression would belong to Class 2.2 Non-flammable, non-toxic gases. Gases within this class/division are excluded from the SEPP 33 risk screening process and are not considered to be potentially hazardous with respect to off-site risk. These materials have a Workcover notification threshold of 10,000 litres.

The use of inert gases for fire suppression in enclosed spaces carries asphyxiation risks for staff, site visitors and emergency personnel. Gases commonly used are blends of argon, nitrogen and carbon dioxide. Inert gases are used to reduce oxygen content to below 15% to extinguish fires. Levels below 18% are hazardous for humans, and levels below 10% are extremely dangerous. The risk of accidental asphyxiation can be minimised by:

- Proper installation and operation.
- Regular equipment inspection maintenance.
- Provision of warning signs and information to staff.
- Staff and emergency responder training (including during maintenance and rescue/first aid).
- Fixed or personal oxygen monitoring equipment.
- Activation of an audible and visible internal and external alarm prior to gas release.
- Incorporation of an odour in the gas.
- Effective ventilation and air exchange.
- Safe and effective purging system.

## Energy Storage Facility – Lithium-ion Batteries

The proposed Energy Storage Facility would provide electricity storage capacity of approximately 2MWh for each container (40 foot) subject to final specifications. The location and description of the Energy Storage Facility is provided in Section 4.2.7. The average life of the lithium-ion PV solar batteries is assumed to be 15 years. Batteries may require replacement up to a maximum of two times during the life of the solar farm. The batteries are designed for outdoor use, generally only require a secure foundation i.e. concrete slab, and specified clearances for service access. The batteries are designed for excellent energy density, the ability to operate at any state of charge and reliability and safety (Photon energy, 2017).

Lithium-ion batteries are classified as a Class 9 miscellaneous dangerous goods and Class 9 hazardous goods (both new and waste batteries). They pose little threat to people or property, although they may pose an environmental hazard (DOP, 2011). Class 9 goods are excluded from the SEPP 33 risk screening process.

Lithium-ion batteries are classified as hazardous waste under the Commonwealth *Hazardous Waste Act 1989*, and are classified as Dangerous Goods under the ADG Code. The ADG Code requires dangerous goods to be carried in a secure, safe and environmentally controlled manner. The code specifies 'special provisions' and 'packing instructions' applying to the transportation of Lithium-ion batteries. The *National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 1998* (the NEPM), which sets the regulatory framework for transporting 'controlled wastes' between Australian states and territories, does not currently cover Lithium-ion batteries.

Waste lithium-ion batteries are not currently regulated as a hazardous waste by state governments and hence transport within the state is not required to be tracked in hazardous waste tracking systems (Randell Consulting, 2016). Lithium-ion batteries do not contain any heavy metals. They do contain valuable material that can be recycled. Recycling processors for lithium-ion batteries are similar to recycling of other electronic device battery packs (Photon energy, 2017). The Australian Battery Recycling Initiative (ABRI) website indicates four companies which provide a collection and recycling service for used lithium-ion batteries.

The major hazard offered by lithium-ion battery technologies is fire, as a result of the flammability of the substances used in the battery (Recharge, 2013). Fire risks associated with lithium-ion batteries are discussed in Section 8.6. Class 9 materials have a Workcover notification threshold of 10,000 litres or kilograms, the proposal is above this threshold. Workcover notification will be required.

## Other risk factors

The proposal would not involve the storage or transport of incompatible materials, generation of dusts within confined areas, activities involving hazardous materials, incompatible, reactive or unstable materials and process conditions, storage or processing operations involving high (or extremely low) temperatures. There are no known past incidents (or near misses) involving hazardous materials and processes at solar farms.

## Potentially offensive industry

The proposal would result in vehicle and machinery exhaust emissions during the construction phase, as in any construction project. The emissions occur outside, in a rural locality, and would be readily dispersed. The emissions would not be considered hazardous within the context of SEPP 33. Noise impacts would also largely be confined to standard working hours during the construction phase and would not be hazardous to employees or neighbouring residents. Noise impacts have been assessed in Section 7.3. Water pollution risks are assessed as low, subject to identified mitigation measures, with longer term benefits following cessation of cultivation and establishment of groundcover across the site.

### 8.8.2. Safeguards and mitigation measures

The potential risks associated with hazardous materials the solar farm can be reduced by handling them in accordance with Australian Standards and codes as well developing protocols for maintenance and incident response. These measures are outlined below.

Table 8-20 Mitigation measures for hazards.

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| H1 | Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*. | C | O | D |
| H2 | Protocols would be developed for lithium-ion battery storage, maintenance, and incident response to mitigate Li-ion fire risks. | C | O | D |
| H3 | The transportation of new and waste lithium-ion batteries would comply with the requirements of the Dangerous Goods Code, including specific ‘special provisions’ and ‘packing instructions’ applying to the transportation of Li-ion batteries. | C | O | D |

## 8.9. AIR QUALITY AND CLIMATE

### 8.9.1. Existing environment

#### Air quality

Air quality for the Armidale Dumaresq LGA is generally expected to be good and typical of that found in a rural setting of NSW. Existing sources of air pollution within the LGA would include:

- Vehicle emissions – expected to be low for the site considering the low traffic amounts in the vicinity of the site and low intensity of land use and low density of settlement.
- Dust during dry periods – expected to be higher in dry and windy weather, generated from traffic on unsealed roads and bare areas of ground.
- Agricultural activities, particularly stubble burning and harvests. Cropping is limited in the immediate area.

During colder months, there may be a small increase in air contaminants due to smoke emissions from the operation of solid fuel heating. As above, locally this would be negligible given the low density of settlement.

A search of the National Pollutant Inventory (Australian Government, 2020) identified three facilities within the Armidale Dumaresq LGA that are required to record emissions. The facilities include one quarry, one gas manufacture and one Airport. The closest facility is the Boral Metz Quarry, approximately 18km north west of the proposal site.

The proposal site is not located within the 200km radius of the *Dark Sky Region* and is approximately 272km north-east of the Siding Spring Observatory. The Dark Sky Region is centred upon the site of this observatory, which is considered Australia’s most important visible-light observatory.

The proposed solar farm is located on land zoned as RU1 Primary Production. The land surrounding the proposal site is predominately grazed agricultural land to the north, east, and west. Two residences are located within the proposal site and is an involved landowner. There are 30 residences within 2km of the proposal site. The closest receiver is 185m west from the site. Traffic on the surrounding roads of the proposal site would be limited to private transport, with heavy vehicles being used in the harvest season or cattle transport.

## Climate

The proposal site is located within the New England Tableland Bioregion. The New England Tableland is dominated by temperate to climate characterised by warm summers (NSW Government, 2016). The closest climate data for the proposal site is the Armidale Airport weather station (site number 056238).

Table 8-21 outlines the available data for this weather station from the Bureau of Meteorology (BOM, 2020).

Table 8-21 Armidale Airport weather station (site number 056238).

| Aspect | Annual Mean | Mean Minimum Range | Mean Maximum Range |
|---|---|---|---|
| **Temperature**[18] | 19.6°C maximum<br>7.5 °C minimum | 13.6 °C (January) to<br>1.3 °C (July) | 26.4 °C (January) to<br>12.3 °C (July). |
| **Rainfall**[19] | 742.9mm | 34.7mm (April) | 95.6mm (November) |
| **Wind**[20] | NA | 15.6km per hour (9am)<br>17.6km per hour (3pm) | 19.9km per hour (9am)<br>21.2km per hour (3pm) |

## Climate change

Climate change refers to the warming temperatures and altered climatic conditions associated with the increased concentration of greenhouse gases in the atmosphere. Climate change projections for Australia includes more frequent and hotter hot days and fewer frost days, rainfall declines in south eastern Australia and more extreme weather events including intense rainfall, severe drought and harsher fires (CSIRO, 2016). 2019 was Australia's hottest and driest year on record, with the annual mean temperature 1.52 °C above average and rainfall 40% below average nationally (BOM, 2020). At the global level, 2019 was the second-warmest year on record, and the fifth hottest year in a row (BOM, 2020). The annual mean air temperature in Australia is projected to increase by 2.8-5.1°C by 2090 (above the 1986-2005 period) (CSIRO, 2015).

In 2014, the NSW OEH published climate change projection snapshot reports for the NSW and ACT governments as part of the NSW and ACT Regional Climate Modelling (NARCliM) project. The study focused on projections for two future 20 year time periods: 2020-2039 as the near future and 2060-2079 as the far future. The snapshot included the analysis of over 100 climate variables, including temperature, rainfall and wind. The projected climatic changes by 2030 (near future) for the New England North West region of NSW, which the proposal site is located in, included the following:

- Maximum temperatures are projected to increase by 0.4 to 1.0 degrees Celsius.

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[18] Based on data collected between 1994 – 2020.

[19] Based on data collected between 1994 – 2020.

[20] Based on data collected between 1994 – 2010.

- Minimum temperatures are projected to increase by 0.5 to 1.0 degrees Celsius.
- The number of hot days would increase and cold night decrease.
- Rainfall is projected to decrease in winter and increase in autumn.
- The risk of fire is projected to increase during summer, spring and winter.

Rural and regional communities are disproportionately affected by the impacts of climate change, through worsening extreme weather events and impacts to capacity, productivity and resilience in some rural industries (Climate Council, 2016). A significant proportion of Australian exports are agricultural products that are sensitive to global warming impacts (AGO, 2003). Some incremental adaptations in agricultural enterprises would be straightforward, but the more transformational adaptive changes may be risky and expensive, especially for individual farmers (Climate Council, 2016).

### 8.9.2. Criteria

It is noted that POEO Act regulates pollution including air pollution. It requires that no vehicle shall have continuous smoky emissions for more than ten seconds. Limits on dust emission of less than 4 mg/m/m2 are also specified.

### 8.9.3. Potential impacts

## Construction and decommissioning

**Air quality**

Air quality can be affected by dust and emissions generated during the construction works. The sources of dust and emissions at the proposal site during construction would include:

- Excavation and earthworks, such as ground breaking, levelling (cutting and filling), piling works, trenching, etc. – generally, the impacts would be in discrete areas and located well away from receivers.
- Vehicle movements over unsealed surfaces including internal and external access tracks. Up to 50km of track would be installed. There are currently a limited number of unsealed informal tracks onsite.
- Dust from uncovered stockpiled powdery materials or truckloads.
- Emissions (e.g. Nox, Sox and CO) and particulates from vehicles, diesel generators, heavy plant and other mechanical equipment.
- Stored VOCs and other volatile hazardous materials such as paints, fuels and solvents. These would be limited.

Dust and air emissions can be a nuisance to nearby receivers including residences, farm workers and motorists. Thirty residences occur within 2km of the proposal site. The closest non-involved receiver is 185m west of the site and would potentially be impacted by dust generated by the proposal's traffic.

The degree of impact can be influenced by weather and climate. Work carried out during long periods of dry weather and high winds have a greater potential to generate dust which can impact air quality (refer to Table 8-21). Construction work during summer months may require greater dust suppression measures to manage any increased impacts.

The construction phase is expected to be approximately 12 -18 months in duration. The air quality impacts from construction works on the proposal site, are considered to be negligible due the proposed minor earthworks and the distance from receivers. Potential air quality impacts are likely to occur along Gara Road and Silverton Road due to the roads being unsealed and are used by motorists. However, the potential impacts are considered manageable with the implementation of mitigation measures.

No air quality impacts in addition to those mentioned for construction are anticipated during the decommissioning phase. Traffic requirements would be similar in type but of shorter duration than that required for the construction phase.

**Climate and climate change**

No climatic impacts are anticipated as a consequence of the construction and decommissioning activities for the solar farm. Haulage traffic and plant and equipment would generate emissions, however, the short duration of the work and the scale of the solar farm proposed suggests this contribution would be negligible in a local or regional context.

## Operation

**Air quality**

Operational and maintenance process of the solar farm would generate very low emissions of pollutants. Specifically, the source of these pollutants is vehicle emissions from staff vehicles and maintenance equipment. However, it is likely that no vehicles would be present at the site on a permanent basis, with only occasional visits by standard vehicles. Fuel would also be required for temporary power generation in the event of an unplanned outage.

Maintenance activities during operation would result in some minor, localised dust generation from vehicles travelling on the unsealed access roads. A groundcover management plan would be implemented to reduce dust production from disturbed areas. The impacts on local and regional air quality are expected to be negligible during normal operation.

**Climate**

Concerns have been previously raised regarding the possibility of the heat created from solar arrays resulting in a heat island effect. 'Heat island' is defined as an area having higher average temperature than its surroundings owing to the greater absorption, retention and generation of heat by buildings, pavements and activities. This is usually used in reference to the impact of an urban area on its rural surroundings. Studies have shown that Photovoltaic (PV) panels convert incident solar radiation into heat and this can alter the air-flow and temperature profiles near the panels. Whether such changes may subsequently affect the thermal environment of near-by populations of humans and other species have been questioned (Fthenakis and Yu, 2013). However, to date there have been limited empirical studies on the potential for a heat island effect in utility scale solar farms.

The limited studies that do exist also show results that can be seen as contradictory, as they are so site and project specific. Some studies suggest that PV systems can actually cause a cooling effect on the local environment, depending on the efficiency and placement of the PV panels while others demonstrate a warming effect (Barron-Gafford, Minor, Allen, Cronin, Brooks, and Pavao-Zuckerman, 2016). Other studies conclude that whilst air temperatures may increase within the solar farm itself, they rapidly decrease to the ambient temperature beyond the perimeter of the solar farm (Fthenakis and Yu, 2013).

Fthenakis and Yu (2013) undertook an analysis of the potential for large solar farms to generate a heat island effect and increase air temperature within the solar farm area. The study found at the centre of the solar farm, the annual average air temperature at a height of 2.5m increased by up to 1.9$^{0}$C. However, this increase in temperature dissipated at a height of 5m. Additionally, the solar farm completely cooled overnight.

The research suggested a small potential effect on climate within the proposal site. This effect may actually enhance retention of ground cover in very cold or hot conditions onsite. No impacts on adjacent properties and agricultural activities would occur.

The topic has also been subject to recent consideration by a Victorian Planning Panel for solar farms proposed in Greater Shepparton for solar farms proposed by Neoen and X-Elio. This is detailed in the *Panel Report for the Greater Shepparton Solar Energy Facility Planning Permit Application 2017-162, 2017-274, 2017-301 and 2017-344* (Panel Report, 2018). Neoen, in preparation of a response to key issues raised in objecting submissions, commissioned a *Statement of Evidence by Greg Barron-Gafford* from the Research Group Biography, Ecosystem Science (University of Arizona) (Barron-Gafford, 2018).

Barron-Gafford (2018), in his Statement of Evidence (SoE) to the Victorian Planning Panel included results on the radius of the measured heat effects. This identified that the PVHI effect was indistinguishable from air temperatures over native vegetation when measured at a distance of 30 m from the edge of the PV array (Figure 8-19). In his SoE he states that:

*'this pattern held true for both daytime and night-time conditions. Because the PV panels themselves trap the energy from diffuse sunlight that was able to reach the ground underneath them, air temperatures remain elevated within a PV array. As you leave this "overstorey" of PV panels, energy is able to radiate back towards the atmosphere, as it does in a natural setting, and the PVHI quickly dissipates'*.

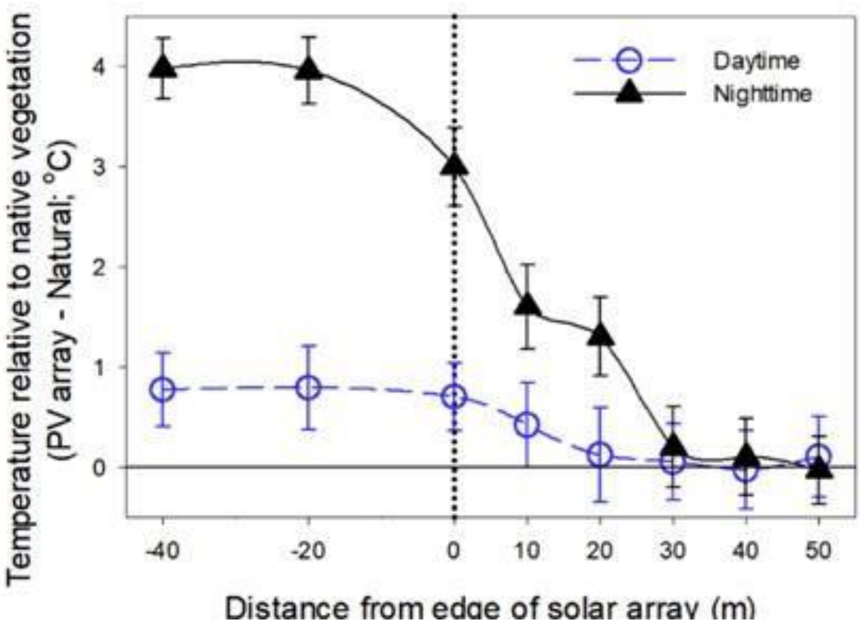


Figure 8-19  Measures of air temperature within and outside of the PV array (Barron-Gafford, 2018)

In conclusion, the Victorian Planning Panel Report (Panel Report, 2018), accepted that solar arrays will affect air and soil temperatures within the solar array perimeter, but that in relation to outside of the solar array perimeter a heat island effect is unlikely to occur.

**Climate change**

The proposal would, as part of the transition to renewable energy sources, contribute to reducing greenhouse gas emissions and the mitigation of the negative effects of climate change. On an annual basis, the proposed Oxley Solar Farm would provide enough clean, renewable energy for about 81,000 average NSW homes. At the same time, it would displace approximately 400,000 metric tonnes of carbon dioxide.

The operation of the solar farm would produce minimal $CO_2$ emissions when compared to conventional coal and gas fired power stations, refer to Table 8-22.

Table 8-22 Comparison of $CO_2$ equivalent emissions produced per kilowatt hour.

| Generation method | Emissions produced (grams $CO_2$ equivalent per kWh) | Source |
|---|---|---|
| **PV solar farm** | 19-59 | Wright and Hearps (2010) |
| **Coal-fired power station** | 800-1000 | Wright and Hearps (2010) |
| **Combined cycle gas turbine** | 400 | Alsema *et al*. (2006) |

### 8.9.4. Safeguards and mitigation measures

The proposal is low risk of impacting of air quality and climate change and would be managed through the mitigation measures outlined below.

Table 8-23 Safeguards and mitigation measures for climate and air quality impacts

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| A1 | Track width of internal tracks would be minimised during detailed design. | Design | | |
| A2 | Dust generation by vehicles accessing the site and earthworks at the site would be suppressed using water applications or other means as required. | C | | D |
| A3 | Vehicle loads of material which may create dust would be covered while using the public road system. | C | | D |
| A4 | All vehicles and machinery used at the site would be in good condition, fitted with appropriate emission controls and comply with the requirements of the POEO Act, relevant Australian standards and manufacturer's operating recommendations. Plant would be operated efficiently and turned off when not in use. | C | O | D |
| A5 | Fires and material burning is prohibited on the proposal site. | C | O | D |

## 8.10. CUMULATIVE IMPACTS

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Land – including:***
  - *an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:*
    - *a cumulative impact assessment of nearby developments;*

### 8.10.1. Existing environment

Cumulative impacts relate to the combined effect of impacts from several activities on a particular value or receiver. They may occur concurrently or sequentially. Considering the Oxley Solar Farm proposal, the relevant cumulative impacts are those associated with other known or foreseeable developments occurring in proximity to the Proposal.

Major projects listed on the Major Projects Register within the Armidale Dumaresq LGA are presented in Table 8-24. In summary, the Oxley Solar Farm has potential to generate cumulative impact risks:

- During construction with the Tilbuster Solar Farm, Salisbury Solar Farm, Metz Solar Farm and New England Solar Farm due to the overlap of construction periods.
- During operation with Metz Solar Farm, Stringybark Solar Farm and Olive Grove Solar Farm due to their locality to the proposal site.

Table 8-24 Major Projects within the Armidale Dumaresq LGA (orange indicates potential cumulative impact).

| Project title | Status | Potential for cumulative impact | Cumulative impact type |
|---|---|---|---|
| **Armidale High School** | Approved (2018) | Unlikely, construction currently underway with forecast completion early 2021. Oxley Solar Farm won't start construction until Q3 2023 at the earliest. | NA |
| **Armidale-Dumaresq Waste Facility** | Approved (2012). | No. Construction has been completed. The landfill is currently not operational and there is currently no information on when it would be operational. Consultation is proposed with council to understand the timing for the new landfill becoming operational. | NA |
| **Tilbuster Solar Farm** | EIS on public exhibition. | Yes. There is a potential for an overlap with construction periods. Tilbuster Solar Farm, if approved, is proposed to commence construction Q3 2021.Oxley Solar Farm, if approved, is proposed for Q3 2023. | Tilbuster Solar Farm is 17km north of Armidale along the New England Highway. The project is likely to share a haulage route from Sydney/Newcastle and accommodation and services within the region. Therefore the cumulative impacts are related to:<br>• Traffic<br>• Pressure on local facilities, goods and services |
| **UNE New Wright Block** | Recommendation | Unknown. Anticipated construction timing is not provided within documentation available on the Major Projects Website. | NA |
| **Salisbury Solar Farm** | Prepare EIS | Yes. Construction of Salisbury West is anticipated to commence by Q2 2021. Construction of | Salisbury Solar Farm is 30km south of the proposal site near Kentucky, NSW. The project is likely to share a haulage route |

| Project title | Status | Potential for cumulative impact | Cumulative impact type |
|---|---|---|---|
| | | Salisbury East is anticipated to commence by Q2 2022. | from Sydney/Newcastle and accommodation and services within the region. Therefore, the cumulative impacts are related to:<br>• Traffic<br>• Pressure on local facilities, goods and services |
| **Metz Solar Farm** | Approved (2017) | Yes, potential operational due to locality.<br>There is unlikely to be a construction overlap. Metz Solar Farm is anticipated construction timing is noted as Q4 2020 and would take 9 to 12 months to complete. Oxley won't commence until Q3 2023. However due to the locality of the project to Oxley, we have assumed there would be a potential for an overlap during construction. | Metz Solar Farm is 7km north west of the proposal site along the Waterfall Way (Grafton Road). The project is likely to share a haulage route from Sydney/Newcastle and accommodation and services within the region. Therefore the cumulative impacts are related to:<br>• Traffic<br>• Pressure on local facilities, goods and services.<br>Due to the project's locality to Oxley Solar Farm there is potential cumulative visual and noise impacts specifically for receivers along Waterfall Way (Grafton Road) and land capability impacts. |
| **New England Solar Farm** | Approved (2020) | Yes. Construction was anticipated to commence in 2020 for a total of three years. Construction has not commenced and may be concurrent with the Oxley Solar Farm. | New England Solar Farm is 20km south west of the proposal site along the New England Highway, south of Armidale. The project is likely to share a haulage route from Sydney/Newcastle and accommodation and services within the region. Therefore the cumulative impacts are related to:<br>• Traffic<br>• Pressure on local facilities, goods and services |

In addition to the major projects, there is also council approval solar farms adjacent to the proposal site:

| Project title | Status | Potential for cumulative impact | Cumulative impact type |
|---|---|---|---|
| Stringybark Solar Farm | Operational | The solar farm has already been constructed. Therefore no potential for cumulative impacts during construction.<br>However there is potential for operational cumulative impacts due to the locality of the project, adjacent to the western boundary of the Oxley Solar Farm. . | Operational cumulative impacts relate to:<br>• Visual<br>• Traffic<br>• Noise<br>• Land compatibility |
| Olive Grove Solar Farm | Approved (2020). | It is unlikely the construction would overlap with the Oxley Solar Farm, due to the Oxley Solar Farm approval timeline and small construction timeline of the Olive Grove Solar Farm (30MW).<br>However there is potential for operational cumulative impacts due to the locality of the project, adjacent to the western boundary of the Oxley Solar Farm. | |

## 8.10.2. Potential impacts

Potential cumulative impacts are primarily associated with the following issues:

- Biodiversity impacts;
- Visual and landscape character impacts;
- Noise impacts;
- Traffic impacts;
- Pressure on local facilities, goods and services; and
- Land compatibility impacts.

### Biodiversity

Cumulative biodiversity impacts may include loss of connectivity and loss of habitat, when factoring in the addition of this project to agricultural land clearing and modification; the largest land clearing impact operating in NSW.

In reality, the majority of the development footprint (around 70%) will consist of solar panels. In grasslands, which predominate onsite, the impacts of shading and diversion of rainfall runoff from the panels themselves is largely unknown and therefore the entire development footprint is assumed to be removed. However, as the indicative layout shows, substantial peripheral areas are likely to be unimpacted and it is likely that a number of perennial native species will persist underneath the solar arrays, as they do in open woodlands subject to a degree of shading. Certainly, only a minor proportion of the seed bank will be impacted by the project, given the limited excavation proposed. It is considered likely that with the establishment of more long term ground cover monitoring programs for solar farms in NSW, as would be undertaken for this project, that the impacts of shading will become better understood and this overestimation of impacts better quantified.

## Visual and landscape character impacts

During construction there is unlikely to be potential for cumulative visual impacts for receivers along Waterfall Way (Grafton Road) from the Oxley Solar Farm and Metz Solar Farm. The construction periods would not overlap to increase traffic along Waterfall Way (Grafton Road).

During operation, with the exception of infrequent maintenance operations such as inverter or transformer replacement, a small maintenance team using standard vehicles is all that will be required. Cumulative visual traffic impacts are considered negligible.

Due to the locality of the Metz Solar Farm, Stringybark Solar Farm and Olive Grove Solar Farm to the Oxley Solar Farm, there is potential for cumulative visual impact for associated receivers surrounding these projects. Generally, adverse cumulative visual impacts are anticipated to be manageable due to the existing and retained vegetative screening and undulating nature of the site that blocks out the majority of views. Specifically, a landscape plan and screening has been proposed for Oxley Solar Farm to soften the views for the affected landowners and public places.

## Noise impacts

Noise impacts through the use of plant, machinery and vehicles would ordinarily be increased if the construction of other developments is undertaken concurrently.

There is no proposed major projects within 7km of the proposal site that would overlap the construction period of Oxley Solar Farm. Additionally the predicted construction noise levels from the proposal are mostly lower than noise management levels, with the exception of works within 700m of dwellings. Construction noise is considered manageable through the implementation of mitigation measures outlined in Section 7.5.8.

During operation, the proposal would generate negligible noise impacts. With the operation of Stringybark and Olive Grove Solar Farm adjacent to the proposal site, the operational noise is also likely to be negligible due to the noise nature of solar farms. Cumulative impacts are therefore unlikely to increase noise impacts and are expected to be minor and manageable.

## Traffic impacts

The existing traffic volumes within the road network relevant to the proposal site (refer Section 8.2) would have included the construction of the Metz Solar Farm and operation of the Stringybark Solar Farm.

Cumulative traffic impacts may occur if construction of the Oxley Solar Farm occurs concurrently with the Tilbuster Solar Farm, Salisbury Solar Farm and New England Solar Farm. If construction does occur concurrently with Oxley Solar Farm, the New England Highway is the only road that would be utilised as part of the transport route for all four projects. The amount of traffic generated by these projects would be negligible relative to the amount of daily traffic along New England Highway.

The Metz Solar Farm is the only development expected to result in increased traffic along the Waterfall Way (Grafton Road) at the same time as the construction of Oxley Solar Farm. The Metz Solar Farm Traffic Impact Assessment prepared by TTM Consulting Pty Ltd (2017) notes that overall daily traffic movements during peak construction will be 75 light vehicles and 27 heavy vehicles. Average monthly truck movements are estimated to be 13 trucks per day over the 10-month construction period.

Existing traffic on Waterfall Way (Grafton Road) is estimated to be 1,597 vehicles per day, combining eastbound and westbound directions. Assuming typical 1.04% compound traffic growth on Waterfall Way (Grafton Road), and conservatively allowing additional traffic of 102 vehicles per day in 2021 and 2022 to account for the Metz Solar Farm construction and an additional 10 vehicles per day thereafter associated with operational activities for the Metz Solar Farm, estimated traffic over the next ten (10) years at Gara River is shown in Table 8-10.

Table 8-25 Estimate daily traffic volumes (both directions), Waterfall Way (Grafton Road)

| Year | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Daily traffic** | 1597 | 1614 | 1834 | 1667 | 1684 | 1701 | 1719 | 1736 | 1754 | 1772 | 1790 | 1809 |
| **Am Peak hour** | 141 | 142 | 162 | 147 | 149 | 150 | 152 | 153 | 155 | 156 | 158 | 160 |
| **PM Peak hour** | 159 | 161 | 183 | 166 | 168 | 169 | 171 | 173 | 175 | 176 | 178 | 180 |

Assuming in the worst case that peak construction for the Oxley Solar Farm coincides with peak construction for the Metz Solar Farm, it is considered that Waterfall Way (Grafton Road) would experience an increase in daily and peak hour traffic during 2021 and 2022. However, Waterfall Way (Grafton Road) has the capacity for the increase in traffic, therefore the projects will have a minimal impact on the road network.

During operation of Oxley Solar Farm, traffic would be minimal. There is unlikely to be a cumulative impact with the operation of the adjacent Metz Solar Farm, Stringybark Solar Farm and Olive Grove Solar Farm due to the low operational traffic numbers for all projects and different site access points.

## Pressures on local facilities, goods and services

The construction of the Tilbuster Solar Farm, Salisbury Solar Farm and New England Solar Farm would result in a large influx of workers required for the projects. It is proposed for all projects that workers would be accommodated in Armidale and other surrounding towns throughout the construction period. throughout the construction period.

This has the potential to put substantial strain on local facilities, good and services. The use of accommodation for workers would reduce the amount of accommodation available for tourists visiting the region. However, there is also a potential for positive cumulative economic effects from the construction of multiple developments in the area. Socio-economic benefit in relation to developments in the region will be a continuous ongoing benefit for the community with increased jobs and economic input into local business.

Consultation with community liaison representatives for the Tilbuster Solar Farm, Salisbury Solar Farm, Metz Solar Farm and New England Solar Farm would be ongoing to ensure this influx is managed appropriately so as to not place stress on stakeholders including business owners in Armidale.

The proposal would not result in significant impacts to local businesses, residents and road users, subject to the range of identified mitigation measures. It is unlikely that there would be negative cumulative impacts to local facilities, goods and services.

### Land compatibility impacts

Approximately 895ha of agricultural land would be converted into solar farm development. The proposal would not fragment any resource lands throughout the operational period. Upon decommissioning of the solar farm, the development footprint would require rehabilitation to restore it to its pre-existing productive capacity for agricultural land use.

Continued use of this land for sheep grazing would be maintained. Therefore, the development of a solar farm would potentially result in the following agricultural impacts:

- Limited resource loss for the lifetime of the solar farm.
- A potential change to biosecurity risks.
- Potential increased bushfire risks.

These impacts have been assessed in detail in Section 7.7 and found to be highly manageable.

A number of other solar farms are all proposed within the Armidale Regional LGA (refer to Table 8-24). If all the development applications are submitted and successful, the close proximity of the proposed solar farms has the potential to increase the cumulative impacts affecting land use change and local agriculture. The combined development footprint of the Oxley Solar Farm and these proposals equates to approximately 7530 ha.

The Armidale Regional LGA covers an area of approximately 8,621km$^2$ (~826,100 ha) and contributes 1.4% of the total agriculture value of NSW. The temporary loss of 895ha of agricultural land within the Armidale Regional LGA represents a small fraction (2.1%) of the agricultural holdings within the New England and North West region of NSW and would result in a negligible decrease in the overall productivity of the region. A case study of a solar farm in Nyngan by Dr Turlough Guerin of the Agricultural Institute of Australia (Australia Farm Institute, 2017) indicated that the project did not significantly reduce the agricultural output of the locality.

Solar farm infrastructure is typically low in height and results in minimal physical impact to the land surface. In relation to the Oxley Solar Farm, approximately 473.7ha of the proposal would remain vegetated and approximately 18.8ha would be compacted gravel surfaces. These surfaces would include internal access tracks, compounds, inverter and batter storage, hardstands and the substation. As a result of the low scale of development of the solar farms, the agricultural capability of the land would not be affected by the proposals. As previously mentioned, grazing could continue to be managed across the sites to maintain the height of groundcover during the operational period.

The land can be returned to agricultural use following decommissioning of the proposals. There are many benefits of resting the land for a period of time including:

- Increased groundcover and diversity of groundcover with biosecurity management.
- Increase in soil moisture and nutrients.
- Increases in soil organic matter means less evaporation, less impact of raindrops, less impact of runoff and less erosion.
- Controlled stocking rates will reduce soil compaction.
- Perennial grasses can be encouraged to increase soil stability of the grassland around the panels.
- A return of soil organisms for decomposition of organic matter, nutrient cycling and improving soil structure.

Potential loss of 895ha of agricultural land within the region should be measured against wider government strategic goals and environmental benefits, which include:

- Strategic goals of the Commonwealth and NSW Governments for renewable energy development going forward.

- The environmental benefits of solar energy production, in particular the reduction of greenhouse gas emissions.
- The economic benefits of using an area with reliable solar resources and access to existing electricity infrastructure.
- The benefits of alternative and increased energy supply for grid stability and reliability.

Currently, there are a small number of part - time staff employed in agriculture at the proposal site. The figure is likely to be higher for the proposed Oxley Solar Farm. During construction there would be approximately 300 full time equivalent staff on average and 5 full time equivalent staff during operation.

The potential cumulative impact of the reduction in agricultural employment would be balanced by the additional employment during construction and on-going employment of staff during operation. Additional local services could be maintained during operation. For example, to maintain the solar farm area mowing/slashing services would be required. Local agricultural services could be maintained if sheep grazing is maintained within the solar farm.

As such, no cumulative impacts to agricultural enterprise or local agricultural land use are expected.

### 8.10.3. Safeguards and mitigation measures

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| C1 | The proponent would liaise with representatives for the Tilbuster Solar Farm, Salisbury Solar Farm, Metz Solar Farm and New England Solar Farm to manage impacts on local services, accommodation and businesses. | C | | |

# 9. ENVIRONMENTAL MANAGEMENT

## 9.1. ENVIRONMENTAL MANAGEMENT FRAMEWORK

The environmental risks associated with the proposed Oxley Solar Farm would be managed by implementing a proposal-specific suite of mitigation measures detailed in Sections 7 and 8 and summarised below.

All commitments and mitigation measures would be managed through the implementation of a Project Environmental Management Strategy (EMS). The EMS would comprise a Construction Environmental Management Plan (CEMP), an Operation Environmental Management Plan (OEMP) and a Decommissioning Environmental Management Plan (DEMP). These plans would be prepared sequentially, prior to each stage of works by the contractor (CEMP, DEMP) and proponent (OEMP).

The EMS would include performance indicators, timeframes, implementation and reporting responsibilities, communications protocols, a monitoring program, auditing and review arrangements, emergency responses, induction and training and complaint/dispute resolution procedures. The monitoring and auditing program would clearly identify any residual impacts after mitigation. Adaptive management would be used to ensure that improvements are consolidated in updated EMPs.

## 9.2. CONSOLIDATED MITIGATION MEASURES

The mitigation measures contained in this report comprise proposal-specific safeguards, recommendations from specialist assessment reports and reference to a range of best practice guidelines and regulatory requirements. The measures are to be incorporated in proposal plans and designs, contract specifications and the Construction Environmental Management Plan, Operation Environmental Management Plan and Decommissioning Environmental Management Plan as appropriate. The mitigation measures are consolidated below. Where measures are relevant to more than one environmental aspect, they are cited only once under the most relevant aspect, to avoid duplication.

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| **Biodiversity** | | | | |
| B1 | Time works to avoid critical life cycle events. Hollow-bearing trees would not be removed during breeding season (spring to summer) for threatened hollow dependant fauna. If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure no impacts to fauna would occur. | C | | |
| B2 | Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler. A tree clearing procedure would be implemented to minimise harm to resident fauna. | C | | |
| B3 | Relocate habitat features (fallen timber, hollow logs) from within the development site. A procedure for relocation of habitat features to adjacent area for habitat enhancement would be implemented. | C | | |
| B4 | Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed. Additionally:<br>• Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing.<br>• No stockpiling or storage within dripline of any mature trees.<br>• Access and laydown in areas of White Box Yellow Box Blakely's Red Gum Woodland TEC will be minimised to reduce impacts.<br>• Exclusion fencing and signage or similar would be installed around habitat to be retained | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| B5 | Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise. Construction Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible. | C | | |
| B6 | Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill:<br>• Avoid night works where possible.<br>• Direct lights away from vegetation. | C | O | |
| B7 | Adaptive dust monitoring programs to control air quality.<br>• Daily monitoring of dust generated by construction activities.<br>• Construction would cease if dust observed being blown from site until control measures were implemented.<br>• All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the development site. | C | | |
| B8 | Temporary fencing to protect significant environmental features such as riparian zones. Prior to construction commencing, exclusion fencing, and signage would be installed around habitat to be retained. | C | | |
| B9 | Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas.<br>• A Weed Management procedure would be developed for the proposal to prevent and minimise the spread of weeds. This would include:<br>• Management protocol for declared priority weeds under the Biosecurity Act 2015 during and after construction<br>• Weed hygiene protocol in relation to plant, machinery, and fill.<br>• Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported.<br>• The weed management procedure would be incorporated into the Biodiversity Management Plan | C | O | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| B10 | Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.<br>• Site induction and toolbox talks for ecologically sensitive areas would be undertaken.<br>• Staff training and site briefing to communicate impacts of traffic strikes on native fauna.<br>• Awareness training during site inductions regarding enforcing site speed limits.<br>• Site speed limits to be enforced to minimise fauna strike. | C | O | |
| B11 | Preparation of a management plan to regulate activity in vegetation and habitat adjacent to the proposed development. Preparation of a Biodiversity management plan that would include protocols for:<br>• Protection of native vegetation to be retained.<br>• Best practice removal and disposal of vegetation.<br>• Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist.<br>• Weed management.<br>• Unexpected threatened species finds.<br>• Exclusion of vehicles through sensitive areas.<br>• Rehabilitation of disturbed areas. | C | | |
| B12 | Preparation of a vegetation management plan to monitor ground cover beneath the solar array modules. A Ground cover management plan would be developed to:<br>• Ensure that ground cover is retained beneath panels, to resist erosion and weeds.<br>• Preserve the native composition as much as possible. | | O | |
| B13 | Erosion and sediment controls. An erosion and sediment control plan would be prepared in conjunction with the final design and implemented. | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| B14 | Creek lines and retained dams would be planted with native riparian vegetation and transformed into small, created wetlands for wildlife. Riparian plantings would comprise local native sedges, rushes, grasses and small shrubs. | C | | |
| B15 | Screening and landscaping plantings to be comprised of local indigenous species representative of the vegetation in the development site. Screening and landscaping plantings (up to 50 m where practicable) to be comprised of local indigenous species representative of the vegetation in the development site. | | O | |
| B16 | Involve a local landcare group or educational institution in ongoing biodiversity monitoring and enhancement. Involve a third party organisation to monitoring and maintain biodiversity enhancement activities. Communicate outcomes with third parties to contribute knowledge of how biodiversity can be preserved on solar farms. | | O | |
| B17 | Plain wire instead of barbed used on top of the perimeter fence and stock fencing to reduce impacts on birds and Squirrel Glider. Security fencing would be comprised of approximately 2 m high cyclone fencing. Use plain wire perimeter fencing where this intersects woodland to avoid potential entrapment of fauna on fence. | C | | |
| B18 | Perimeter fence would be located to avoid, where possible, segmenting patches of native vegetation to facilitate native fauna movements. The final 'for construction' design would include the perimeter fencing avoiding rather than intersecting patches or retained woodland. | C | | |
| B19 | Install approximately 120 nesting boxes for birds and mammals across the development site. Nesting boxes would be designed to meet the requirements of target species including Squirrel Gliders, bats, parrots and owls. Nesting boxes would be monitored periodically for use and/or replacement. | C | | |
| **Visual amenity and landscape character** | | | | |
| V1 | The following design considerations will be applied to the proposal:<br>• Consideration of potential visual impacts should be considered when siting the PCU's and storage shed within the proposed development footprint. They should be situated at a suitable distance from residences. Excess material should be used to berm the southern section to assist in fragmenting views. | | Design | |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • The design should retain the existing roadside planting along the eastern boundary of the site. This would reduce the overall visual impact of proposed development.<br>• Consideration should be given to the material and colours of the PCU's, the battery, and storage shed to ensure minimal contrast and to help blend into the surrounding landscape. In general materials should be nonreflective and should be painted in neutral colours that are sensitive to the surrounding landscape.<br>• Consideration should be given to controlling the type and height of PCU's, the battery, and storage shed to ensure the development does not contrast significantly with surrounding landscape.<br>• Security fencing and frames will be non-reflective. | | | |
| V2 | Existing vegetation should be retained and protected, where possible, during the works to maintain the existing level of screening. | C | | |
| V3 | A landscaping plan will be prepared and implement. The plan will include a variety of landscape mitigation strategies to assist in the integration of the proposal into the existing landscape character, specifically:<br>• A wide band of native plantings of trees up to 5-10m in height for the southern boundary of the proposal site to address potential visual impacts from the Oxley Wild Rivers National Park. These can be positioned in three (3) rows (or approximately 6 - 9m wide) between the property boundary and security fence. The tree canopy should not intrude into the zone that exists between the edge of the security fence and the solar panels (refer to Figure 7-10).<br>• Screen planting along Silverton Road to assist in screening views from R5 and reducing the visual impact from Silverton Road.<br>• Screen planting on the western boundary of the site to reduce the potential visual impact from R3.<br>• Consultation with landowners identified in Table 7-8 within 1.5km of the proposal site to undertake screen planting near dwelling as required. Screen planting is to be undertaken in consultation with landowners to ensure desirable views are not diminished. | C | O | |
| V4 | Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations). | | O | |

| ID | Safeguards and mitigation measures | C | O | D |
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| **Watercourses and hydrology** | | | | |
| W1 | The design of buildings, equipment foundations and footings for electrical componentry and panel mounts would be designed to avoid the 1% AEP flood level to minimise impacts from potential flooding including:<br>• The solar array mounting piers would be designed to withstand the forces of floodwater (including any potential debris loading) up to the 1% AEP flood event plus 500mm freeboard, giving regard to the depth and velocity of floodwaters.<br>• The tracking axis for solar tracking modules would be located above 1% AEP flood event plus 500mm freeboard.<br>• The mounting height of the solar module frames would be designed such that the lower edge of the module is clear of the predicted 1% AEP flood level.<br>• All electrical infrastructure, including inverters, would be located above the 1% AEP flood level plus 500mm freeboard.<br>• Where electrical cabling is required to be constructed below the 1% AEP flood level it would be capable of continuous submergence in water.<br>• The proposed perimeter security fencing would be constructed in a manner which does not adversely affect the flow of floodwater and should be designed to withstand the forces of floodwater, or collapse in a controlled manner to prevent impediment to floodwater.<br>• Any fencing across Gara River or Commissioners Waters should be avoided in preference to creating separate fenced compounds on either side of the creeks | Design | | |
| W2 | At the substation site, slight raising of the adjacent roadway (or similar type bunding) is recommended in order to divert upslope runoff around this critical piece of infrastructure. | Design | | |
| W3 | All buildings and structures (including solar arrays) associated with the proposal should be located outside high hazard areas (H5 and above) where they may be vulnerable to structural damage and have significant impact on flood behaviour. | Design | | |
| W4 | If the proposed crossing structures over Gara River will be rendered impassable during significant flood events, the following would occur: | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Flood warning signs and flood level indicators would be placed on each approach to the proposed crossings.<br>• A Business Floodsafe Plan be prepared for the development to ensure the safety of employees during flood events in general accordance with the NSW SES "Business Floodsafe Toolkit and Plan". | | | |
| W5 | Any road crossings on watercourses within the Proposal Area would be of the type defined in Table 2 of the Hydrological and Hydraulic Analysis Report was prepared by Footprint NSW Pty Ltd in Appendix F.<br>Any proposed crossings (vehicular or service) of existing watercourses on the subject site should be designed in accordance with the following guidelines, and in the case of vehicle crossing should preferably consist of bed level crossings constructed flush with the bed of the watercourse on first and second order watercourses to minimise any hydraulic impact:<br>• Guidelines for Watercourse Crossings on Waterfront Land (DPI, 2012)<br>• Guidelines for Laying pipes and Cables in Watercourses on Waterfront Land (Office of Water, 2010)<br>• *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003).<br>• *Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI, 2003). | | Design | |
| W6 | Within the floodplain access roads should be constructed as close to natural ground levels as possible so as not to form an obstruction to floodwaters.<br>The surface treatment of roads should be designed giving regard to the velocity of floodwaters to minimise potential for scouring during flood events. | C | | |
| W7 | An Emergency Response Plan incorporating a Flood Response Plan would be prepared prior to construction covering all phases of the Proposal. The plan would:<br>• Detail who would be responsible for monitoring the flood threat and how this is to be done.<br>• Detail specific response measures to ensure site safety and environmental protection.<br>• Outline a process for removing any necessary equipment and materials offsite and out of flood risk areas (i.e. rotate array modules to provide maximum clearance of the predicted flood level).<br>• Consider site access in the event that some tracks become flooded.<br>• Establish an evacuation point. | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • Define communication protocols with emergency services agencies. | | | |
| **Aboriginal heritage** | | | | |
| AH1 | The proposed layout of the solar farm must be amended to avoid CT1 plus a 20 m buffer surrounding the site. | PC | | |
| AH2 | A small heavily vegetated area to north of the proposal site near Waterfall Way (Grafton Road) has not been subject to archaeological survey. Further archaeological assessment would be required in this area. This would include consultation with the registered Aboriginal parties and further field survey. | PC | | |
| AH3 | Archaeological test excavation of those sections of PAD that intersect with the proposed design is required in order to establish the nature and extent of the deposits and therefore inform, significance, impact and proposed mitigation measures. This subsurface excavation will be undertaken following the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2011). An addendum ACHA report must be prepared to address the findings of the test excavation, significance assessment, impact assessment and proposed management of these PAD areas and any additional sites identified during the subsurface testing programme of works. | PC | | |
| AH4 | The subsurface testing of the PADs (3, 5, 6, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21) which will be impacted by the development must be undertaken prior to any works and/or the issuing of any approvals for the Oxley Solar Farm. | PC | | |
| AH5 | During construction works, high visibility fencing must be erected around CT6 and CT7 to ensure indirect impacts through use of Silverton Road as a transport corridor do not occur and the designated “no go zones” surrounding these areas must be included in the CHMP for the project. The development avoids the scarred tree (Oxley Solar Farm ST1) as well as the five cultural trees (Oxley Solar Farm CT1-5 and CT8) within the Proposal site. A minimum of a 20-m buffer should be established around each of these sites by placing high visibility bunting (or similar) to avoid any inadvertent impacts to the root system and canopy during construction,  preconstruction and decommission works. | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| AH6 | If complete avoidance to any of the isolated finds and/or artefact scatters recorded within the proposal site is not possible the surface stone artefacts within the development footprint must be salvaged. The surface collection salvage of these stone artefacts must occur prior to the proposed construction works commencing for the Oxley Solar Farm. Until surface collection salvage has occurred a minimum 5 m buffer must be observed around all stone artefact sites. | PC | | |
| AH7 | The collection and relocation of the surface artefacts should be undertaken by an archaeologist with representatives of the registered Aboriginal parties, as selected by the Proponent, and be consistent with Requirement 26 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.* The salvage of Aboriginal objects can only occur following development consent that is issued for State Significant Developments and must occur prior to any construction works commencing. | PC | | |
| AH8 | Any artefacts salvaged may be temporarily stored at an NGH office for further analysis if it is unable to be undertaken at the time of salvage onsite. The with permanent storage of the artefacts will be at Armidale and Region Aboriginal Cultural Centre & Keeping Place with any formal tools likely to be stored/displayed at the Cultural Centre. Where the storage of artefacts cannot occur at the Armidale and Region Aboriginal Cultural Centre & Keeping Place they will be buried on-site, outside of the development footprint. The burial of salvaged artefacts onsite is proposed to be within the “no go zones” outside the extent of the sites recorded which are not to be impacted. | PC | | |
| AH9 | All objects salvaged and buried within the proposal site must have their burial location submitted to the AHIMS database. | PC | | |
| AH10 | A care agreement with Heritage NSW must be undertaken for the artefacts to be stored at Armidale and Region Aboriginal Cultural Centre & Keeping Place | PC | | |
| AH11 | An Aboriginal Site Impact Recording Form must be completed and submitted to AHIMS following harm for each site collected or destroyed from salvage and/or construction works as approved for impacts in line the development consent for this State Significant Development. | PC | | |

| ID | Safeguards and mitigation measures | C | O | D |
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| AH12 | A minimum 5 m buffer should be observed around all stone artefact sites that are being avoided by the proposed development. The implantation of heritage “no go zones” within the proposal site should be implemented to ensure that sites which are being avoided by the proposed development are not inadvertently impacted. | PC,C | O | D |
| AH13 | For any impacts to additional sites and PADs currently being avoided by this proposal or areas outside those assessed as part of the survey for the Oxley Solar Farm, as assessed in this report, further assessment and consideration of impacts on Aboriginal Heritage as determined by an archaeologist should occur. Additional Aboriginal consultation and further assessment which may include survey and/or subsurface testing may be required. | C | O | D |
| AH14 | The Proponent should prepare a Cultural Heritage Management Plan (CHMP) to address the potential for finding additional Aboriginal artefacts during the construction of the Oxley Solar Farm and for the management of known sites, artefacts and PADs within the Project area. The Plan should include the unexpected finds procedure to deal with construction activity. Preparation of the CHMP should be undertaken in consultation with the registered Aboriginal parties. A draft unexpended finds procedure is provided in Appendix G. | PC | | |
| AH15 | In the unlikely event that human remains are discovered during the construction of the Oxley Solar Farm, all work must cease in the immediate vicinity. Heritage NSW and the local police should be notified. Further assessment would be undertaken to determine if the remains are Aboriginal or non-Aboriginal. If the remains are deemed to be Aboriginal in origin the Registered Aboriginal Parties should be advised of the find as directed by Heritage NSW. | C | O | D |
| AH16 | A further archaeological assessment would be required if the proposal activity extends beyond the area assessed in this report. This would include consultation with the registered Aboriginal parties and may involve further field survey. | C | O | D |
| **Noise and vibration** | | | | |
| NV1 | A Noise Management Plan would be developed as part of the CEMP. The plan would include, but not be limited to: | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • Consultation with receivers R3, R4 and R5.<br>• Time restrictions and/or providing periods of repose for receivers R3, R4 and R5 for when construction works are within approximately 700m of their dwellings.<br>• Use less noisy plant and equipment where feasible and reasonable.<br>• Plant and equipment to be properly maintained.<br>• Provide special attention to the use and maintenance of 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended.<br>• Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel.<br>• Avoid any unnecessary noise when carrying out manual operations and when operating plant.<br>• Any equipment not in use for extended periods during construction work should be switched off.<br>• Complaints procedure deal with noise complaints that may arise from construction activities. Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.<br>• Establish good relations with people living in the vicinity of the site at the beginning of Proposal and maintain. Keep people informed, deal with complaints seriously and expeditiously. The community liaison member of staff should be adequately experienced. | | | |
| **Social and economic** | | | | |
| SE1 | Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials. | C | | |
| SE2 | Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services. | C | | D |
| SE3 | Liaison with local tourism industry representatives to manage potential timing conflicts with local events. | C | | D |
| SE4 | The Community Consultation Plan would be implemented to manage impacts to community stakeholders, including but not limited to: | C | | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • Protocols to keep the community updated about the progress of the Proposal and proposal benefits.<br>• Protocols to inform relevant stakeholders of potential impacts (haulage, noise, air quality etc.).<br>• Protocols to respond to any complaints received. | | | |
| SE5 | The Proponent will consult with local employment agencies and training organisations and where practicable, will consider supporting training and apprenticeships. | C | O | D |
| **Compatibility with existing land uses** | | | | |
| LU1 | Undertake a soil survey prior to construction to inform the CEMP and sub-plans, rehabilitation and operational aspects. | PC | | |
| LU2 | Consultation would be undertaken with TransGrid regarding connection to the substation and design of electricity transmission infrastructure. | C | O | D |
| LU3 | Consultation with DPIE-Crown Lands would be ongoing and the following would be undertaken:<br>• Prior to construction, a lease will be applied for to allow construction to commence within Crown roads on the proposal site. | PC | | |
| LU4 | A pest and weed management plan would be prepared to manage the occurrence of priority weeds and pest species across the site during construction and operation. The plans must be prepared in accordance with Armidale Regional Council and NSW DPI requirements. | C | O | |
| LU5 | A Rehabilitation Plan would be prepared to ensure the array site is returned to at least or better than pre-solar farm land and soil capability. The plan would be developed with reference to the base line soil testing and with input from an agronomist to ensure the site is left stabilised, under a cover crop or other suitable ground cover. The soil survey would be based on:<br>• *Australian Soil and Land Survey Handbook* (CSIRO, 2009)<br>• *Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008) | | | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • *The land and soil capability assessment scheme: second approximation (OEH, 2012)* | | | |
| **Water use and water quality** | | | | |
| WQ1 | All fuels, chemicals, and liquids would be stored at least 40m from any waterways or drainage lines, not on sloping land and would be stored in an impervious bunded area. | C | O | D |
| WQ2 | The refuelling of plant and maintenance would be undertaken in impervious bunded areas on hardstand areas only. | C | O | D |
| WQ3 | Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills. | C | O | D |
| WQ4 | All potential pollutants stored on-site would be stored in accordance with HAZMAT requirements and bunded. | C | O | D |
| WQ5 | Adequate incident management procedures would be incorporated into the Construction and Operation Environmental Management Plans, including requirement to notify EPA for incidents that cause material harm to the environment (refer s147-153 Protection of the Environment Operations Act). | C | O | D |
| WQ6 | Ensure appropriate drainage controls are incorporated into the design to minimise the area of disturbance, runoff and pollutant generation. | Design | | |
| WQ7 | If groundwater is to be intercepted at any stage of the development the proponent must obtain the relevant entitlement and approval where required prior to any extraction. | C | O | D |
| WQ8 | Re-use of stormwater should be considered wherever possible. | | O | |
| WQ9 | Inspect stormwater control measures at least quarterly, and before and after rainfall of more than 10 mm in 24 hours. | C | O | |

| ID | Safeguards and mitigation measures | C | O | D |
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| **Soils** | | | | |
| S1 | As part of the CEMP, a Soil and Water Management Plan (SWMP) (with erosion and sediment control plans) would be prepared, implemented and monitored during the proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to:<br>• Install, monitor and maintain erosion controls.<br>• Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads which may cause risks to other road users through reduced road stability.<br>• Manage topsoil in all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. Stockpile topsoil appropriately so as to minimise weed infestation, maintain soil organic matter, maintain soil structure and microbial activity.<br>• Minimise the area of disturbance from excavation and compaction; rationalise vehicle movements and restrict the location of activities that compact and erode the soils as much as practical. Any compaction caused during construction would be treated such that revegetation would not be impaired.<br>• Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site should be stabilised, and work ceased until the wet period had passed.<br>• Areas of soil disturbed by the proposal would be rehabilitated progressively or immediately post-construction, reducing views of bare soil. | C | | |
| S2 | A Groundcover Management Plan would be developed in consultation with an agronomist and to ensure final land use includes perennial grass cover establishment across the site as soon as practicable after construction and maintained throughout the operation phase. The plan would cover:<br>• Soil handling, restoration and preparation requirements.<br>• Plant Species election.<br>• Soil preparation.<br>• Establishment techniques.<br>• Maintenance and monitoring requirements. | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • Perennial groundcover targets, indicators, condition monitoring, reporting and evaluation arrangements – i.e. A target of 70% live grass cover would apply to protect soils, landscape function and water quality. Additional measures would be implemented where practical when live grass cover falls below 70%. Grass cover would be monitored on a fortnightly basis using an accepted methodology.<br>• Contingency measures to respond to declining soil or groundcover condition. I.e. any grazing stock would be removed from the site when cover falls below the target of 70% live ground cover.<br>• Identification of baseline conditions for rehabilitation following decommissioning.<br>• Preserve the native composition as much as possible | | | |
| S3 | The array would be designed to allow sufficient space between panels to establish and promote groundcover beneath the panels and allow for implementation of weed controls. | Design | | |
| S4 | A Spill and Contamination Response Plan would be developed as part of the overall Emergency Response Plan to prevent contaminants affecting adjacent surrounding environments. The plan would include measures to:<br>• Respond to the discovery of existing contaminants at the site (e.g. pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements.<br>• Requirement to notify the EPA for incidents that cause material harm to the environment (refer s147-153 of the POEO Act).<br>• Manage the storage of any potential contaminants onsite.<br>• Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and the EPA notification procedures and remediation.<br>• Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks.<br>• Prevent contaminants affecting adjacent pastures, dams, water courses and native vegetation.<br>• Monitor and maintain spill equipment<br>• Induct and train all site staff. | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| S5 | The transformers will be filled with oil, and waterproof bunds built around them to manage oil spills. | Design | | |
| S6 | A protocol would be developed in relation to discovering buried contaminants within the proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements. | C | O | D |
| **Traffic, transport and safety** | | | | |
| T1 | A Haulage Plan would be developed and implemented during construction and decommissioning, including but not limited to:<br>• Direction of traffic flow (both heavy and light).<br>• Loads, weights and length of haulage and construction related vehicles and the number of movements of such vehicles.<br>• Scheduling of deliveries of major components to minimise safety risks (on other local traffic).<br>• Traffic controls (signage and speed restrictions etc.).<br>• All heavy vehicle movements to/from the access point are to be managed to ensure that only one inbound or outbound vehicle is travelling along the access route in the vicinity of the site at a time.<br>• Heavy vehicle movements into and out of the Proposal Site will be controlled via traffic management means, including a traffic controller, temporary lowered speed limit and additional road signage alerting vehicles of truck movements in the area. | C | O | D |
| T2 | The proponent would engage an appropriately qualified person to prepare a Road Dilapidation Report for all road routes between the New England Highway and the site, and on Gara Road between chainages 7.7 km and 9.7 km, to be used during the construction (and decommissioning) activities, in consultation with the relevant road authority. This report is to address all road related infrastructure. Reports must be prepared prior to commencement and after completion of construction (and decommissioning). | PC | | D |
| T3 | The proponent would repair any damage resulting from project traffic (except that resulting from normal wear and tear) as required at the proponent's cost. | C | | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| T4 | The design and construction of a new vehicular access from Waterfall Way (Grafton Road) to Lot 2 DP1206469, complying with the rural style BAL / BAR treatments specified in the Austroads Guide to Road Design, as amended by Transport for NSW in their supplementary road design guidelines, and designed to accommodate the swept path of the maximum dimension vehicles which will service the site.<br>For works on the State road network the developer is required to enter a Works Authorisation Deed (WAD) with TfNSW before finalising the design or undertaking any construction work within or connecting to the road reserve. The WAD documentation is to be submitted for each specific change to the state road network for assessment and approval by TfNSW prior to commencement of any works within the road reserve. | C | | |
| T5 | Closure of the existing rural property access from Waterfall Way (Grafton Road) to Lot 2 DP1206469, including alteration of boundary fencing, after the construction of the replacement access. | PC,C | | |
| T6 | The design and construction of four (4) new heavy vehicle property accesses between Gara Road and the development site, in a manner consistent with Armidale Regional Council Engineering Code and Austroads guidelines.<br>Each access is to be located so that Austroads sight distance requirements can be achieved, be designed to achieve a maximum intersection angle between 70° and 110° with Gara Road, and contain the swept path of the maximum dimension design access vehicles.<br>The proposed access north of Gara Road at approximate chainage 9,450m as measured from Waterfall Way (Grafton Road) should be relocated eastwards to approximate chainage 9,400m, unless other alternate positioning satisfactory to Armidale Regional Council permits adequate sight distances to be demonstrated. | PC,C | | |
| T7 | Gara Road should be upgraded suitable to achieve minimum Austroads sight distances and be sufficiently widened to enable two-way heavy vehicle traffic in that section between the proposed new solar farm access locations at approximate chainages 7.7km and 9.7km, except as approved otherwise by Armidale Regional Council (for example, traffic control measures may be implemented during construction on either side of the Gara River crossing to ensure the passage of only one heavy vehicle at a time). Any upgrades should be consistent with the Armidale Regional Council Engineering Code and referenced standards. | PC,C | O | D |
| T8 | The design and installation of warning signage at those locations on Gara Road and Silverton Road where the road suddenly narrows as identified in the table below, to provide advance warning to motorists who may be | PC | | |

<table>
<tr><th>ID</th><th>Safeguards and mitigation measures</th><th>C</th><th>O</th><th>D</th></tr>
<tr><td></td><td>unfamiliar with road conditions. All signage is to comply with the requirements of Australian Standard 1742.1 Manual of Uniform Traffic Control Devices and the Armidale Regional Council Engineering Code.<br><br>
<table>
<tr><th>Chainage</th><th>Constraint to two-way traffic</th></tr>
<tr><td colspan="2">Gara Road</td></tr>
<tr><td>3,255m</td><td>Single lane causeway across Burying Ground Creek</td></tr>
<tr><td>4,285m</td><td>Single lane causeway across an unnamed non-perennial waterway</td></tr>
<tr><td>5,350m</td><td>Single lane causeway across an unnamed non-perennial waterway</td></tr>
<tr><td>9,050m</td><td>Single lane causeway across Gara River</td></tr>
<tr><td colspan="2">Silverton Road</td></tr>
<tr><td>1,450m</td><td>Single lane causeway over unnamed non-perennial waterway</td></tr>
<tr><td>2,075m</td><td>Public gate including single-lane stock grid</td></tr>
<tr><td>5,270m</td><td>Public gate including single-lane stock grid</td></tr>
</table>
<br>Engineering plans for all roadworks are to be prepared by a suitably qualified person and submitted to Armidale Regional Council for approval prior to the issue of Section 138 Roads Act approval for the work.</td><td></td><td></td><td></td></tr>
<tr><td>T9</td><td>A Traffic Management Plan would be developed and implemented during construction and decommissioning. The plan will be prepared in consultation with the relevant road authority and the appointed transport contractor. The plan would include, but not be limited to:<br>
• The designated routes and vehicular access of construction traffic (both light and heavy) to the site. This will include the management and coordination of movement of vehicles for construction and worker related access to limit disruptions to other motorists, emergency vehicles, school buses and other public transport. Note, construction and operational staff will be advised not to use Silverton Road as a site access.<br>
• Procedure for informing the public where any road access will be restricted as a result of the project.<br>
• The designated routes of construction traffic to the site.<br>
• Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction.<br>
• Scheduling of deliveries.<br>
• Community consultation regarding traffic impacts for nearby residents.<br>
• Consideration of cumulative impacts.</td><td>C</td><td></td><td>D</td></tr>
</table>

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Traffic controls (speed limits, signage, etc.), and any proposed precautionary measures to warn road users such as motorists about the construction activities for the project, especially at the access site along New England Highway.<br>• Procedure to monitor traffic impacts and adapt controls (where required) to reduce the impacts.<br>• Details of measures to be employed to ensure safety of road users and minimise potential conflict.<br>• A driver Code of Conduct to address such items as appropriate driver behaviour including adherence to all traffic regulations and speed limits, driver fatigue, safe overtaking and maintaining appropriate distances between vehicles, etc. and appropriate penalties for infringements of the Code.<br>• Details of procedures for receiving and addressing complaints from the community concerning traffic issues associated with truck movements to and from the site.<br>• Providing a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures.<br>• Water to be used on unsealed roads to minimise dust generation through increased traffic use.<br>• Following construction, a post condition survey of the relevant sections of the existing road network to be undertaken to ensure it is of similar condition to that prior to construction. | | | |
| T10 | All internal circulation roads, parking and manoeuvring areas are to be designed and constructed in accordance with the planned number, dimension and mass of construction service vehicles, and in compliance with the previsions of the Armidale Regional Councils Engineering code, and AS/NZS 2890.1 Off Street Parking. Any internal roads which are not designed for two-way travel should have regular hard-standing provision for heavy vehicles travelling in opposite directions to pass. | PC,C | | |
| T11 | Obtain a Section 138 Consent from the relevant council/agency to perform works within the road reserve. | C | | |
| T12 | Prior to the commencement of construction on-site, the Proponent would undertake all works to upgrade relevant state roads, their associated road reserve and any public infrastructure in that road reserve to a standard suitable for use by heavy vehicles to meet any reasonable requirements that may be specified by TfNSW. The design, specifications and construction of these works must be completed and certified by an appropriately qualified person to a standard to accommodate the traffic generating requirements of the project. | PC | | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | On Classified Roads the geometric road design and pavement design must be to the satisfaction of the TfNSW. | | | |
| **Resource use and waste generation** | | | | |
| WR1 | A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to:<br>• Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy.<br>• Quantification and classification of all waste streams.<br>• Provision for recycling management onsite.<br>• Provision of toilet facilities for onsite workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant).<br>• Tracking of all waste leaving the site.<br>• Disposal of waste at facilities permitted to accept the waste.<br>• Requirements for hauling waste (such as covered loads). | C | O | D |
| WR2 | Septic system is installed and operated according to the Armidale Regional Council regulations. | C | O | |
| **Non-indigenous Heritage** | | | | |
| HH1 | Should an item of historic heritage be identified, the Heritage Division (EES) would be contacted prior to further work being carried out in the vicinity. | C | O | D |
| **Electric and Magnetic Fields** | | | | |
| E1 | All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia. | C | | |
| E2 | All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required. | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| E3 | Design of electrical infrastructure would minimise EMFs. | C | | |
| **Bush fire** | | | | |
| BF1 | Copper conductors would be used where necessary to electrically bond the metal structures to earth to protect personnel and equipment in the event of lightning strikes and electrical faults. | Design | | |
| BF2 | Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*. | C | O | D |
| BF3 | Develop a Bush Fire Management Plan to include but not be limited to:<br>• Specific management of activities with a risk of fire ignition (hot works, vehicle use, smoking, use of flammable materials, blasting).<br>• Incorporation of fire safety and response in staff and contractor induction, training, OHS procedures and Work Method Statements.<br>• Designation of a staff safety officer tasked with ensuring implementation of the plan and regular liaison with firefighting agencies.<br>• Document all firefighting resources maintained at the site with an inspection and maintenance schedule.<br>• Monitoring and management of vegetation fuel loads.<br>• A communications strategy incorporating use of mobile phones, radio use (type, channels and call-signs), Fire Danger Warning signs located at the entrance to the site compounds, emergency services agency contacts.<br>In developing the Bush Fire Management Plan, NSW RFS would be consulted on the volume of water supplies, fire-fighting equipment maintained on-site, fire truck connectivity requirements, proposed APZ and access arrangements, communications, vegetation fuel levels and hazard reduction measures. | C | O | D |
| BF4 | An APZ of minimum 10m would be maintained between remnant or planted woody vegetation and solar farm infrastructure. The APZ around the perimeter of the site would incorporate a 4m wide gravel access track. | C | O | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | Average grass height within the APZ would be maintained at or below 5 centimetres on average throughout the August - March fire season. Average grass height outside the APZ, including beneath the solar array, would be maintained at or below 10 centimetres throughout the fire season. | | | |
| BF5 | The overhead powerlines at the site would be managed by maintaining appropriate vegetation clearance limits to minimise potential ignition risks, in accordance with the *ISSC 3 Guideline for Managing Vegetation Near Power Lines*. | | O | |
| BF6 | Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction. This equipment would include fire extinguishers, a 1000 litre water cart (fitted with suitable hosing, fittings and diesel fire fighting pump) retained on site on a precautionary basis, particularly during any blasting and welding operations. Equipment lists would be detailed in Work Method Statements. | C | | |
| BF7 | The NSW RFS and Fire and Rescue would be provided with a contact point for the solar farm, during construction and operation. | C | O | |
| BF8 | Following commissioning of the solar farm, the local RFS and Fire and Rescue brigades would be invited to an information and orientation day covering access, infrastructure, firefighting resources on-site, fire control strategies and risks/hazards at the site. | | O | |
| BF9 | The perimeter access track would comply with the requirements of property access roads in accordance with Table 5.3b of the PBP. All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bush fire emergencies. Access tracks would be constructed as through roads as far as practicable. Dead end tracks would be signposted and include provision for turning firefighting vehicles. | C | O | D |
| BF10 | A Hot Works Permit system would be applied to ensure that adequate safety measures are in place. Fire extinguishers would be present during all hot works. Where practicable hot works would be carried out in specific safe areas (such as the Construction Compound temporary workshop areas). | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| BF11 | Machinery capable of causing an ignition would not be used during bushfire danger weather, including Total Fire Ban days. | C | O | D |
| BF12 | Prior to operation of the solar farm, an Emergency Response Plan (ERP) would be prepared in consultation with the RFS and Fire and Rescue NSW. This plan must include but not be limited to:<br>• Specifically addresses foreseeable on site and off site fire events and other emergency incidents.<br>• Risk control measures would include the level of personal protective clothing required to be worn, the minimum level of respiratory protection required, decontamination procedures, minimum evacuation zone distances and a safe method of shutting down and isolating the PV system (either in its entirety or partially, as determined by risk assessment).<br>• Outline other risk control measures that may need to be implemented in a fire emergency due to any unique hazards specific to the site.<br>• Two copies of the ERP are stored in a prominent 'Emergency Information Cabinet' which is located in a position directly adjacent to the site's main entry point/s.<br>• Once constructed and prior to operation, the operator of the facility would contact the relevant local emergency management committee (LEMC). | | O | |
| BF13 | Fire risks associated with the lithium-ion energy storage facility would include:<br>• Locating the Energy Storage Facility as far as practicable from any sensitive receptors or large stands of vegetation.<br>• Installing reliable automated monitoring (voltage and temperature), alarm and shutdown response systems.<br>• Installing reliable integrated fire detection and fire suppression systems (inert gas).<br>• Ensuring the battery containers are not vulnerable to external heat effects in the event of a bushfire.<br>• Designing appropriate separation and isolation between battery containers and between batteries and other infrastructure, including gravel surfacing around the facility for a minimum 10 m in accordance with asset protection zone standards. | | O | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Compliance with all relevant guidelines and standards.<br>• Preparation of a specific Battery Fire Response Plan, under the general Bushfire Management Plan, in consultation with fire authorities, fire suppression experts and in reference to relevant standards and guidelines.<br>• Facilitation of first responder training in the management of Lithium-ion battery fires at the site for local brigades. | | | |
| **Hazardous materials and development** | | | | |
| H1 | Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*. | C | O | D |
| H2 | Protocols would be developed for lithium-ion battery storage, maintenance, and incident response to mitigate Li-ion fire risks. | C | O | D |
| H3 | The transportation of new and waste lithium-ion batteries would comply with the requirements of the Dangerous Goods Code, including specific 'special provisions' and 'packing instructions' applying to the transportation of Li-ion batteries. | C | O | D |
| **Air quality and climate** | | | | |
| A1 | Track width of internal tracks would be minimised during detailed design. | Design | | |
| A2 | Dust generation by vehicles accessing the site and earthworks at the site would be suppressed using water applications or other means as required. | C | | D |
| A3 | Vehicle loads of material which may create dust would be covered while using the public road system. | C | | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| A4 | All vehicles and machinery used at the site would be in good condition, fitted with appropriate emission controls and comply with the requirements of the POEO Act, relevant Australian standards and manufacturer's operating recommendations. Plant would be operated efficiently and turned off when not in use. | C | O | D |
| A5 | Fires and material burning is prohibited on the proposal site. | C | O | D |
| **Cumulative impacts** | | | | |
| C1 | The proponent would liaise with representatives for the Tilbuster Solar Farm, Salisbury Solar Farm, Metz Solar Farm and New England Solar Farm to manage impacts on local services, accommodation and businesses. | C | | |

# 10. CONCLUSION

## 10.1. PROPOSAL OVERVIEW

The Oxley Solar Farm proposal is located on the southern side of Waterfall Way (Grafton Road), approximately 14km south-east of Armidale in the New England region of NSW. Two existing TransGrid 132kV transmission lines run parallel to each other within the northern section (south-west to north-east) of the proposal site; the connection to the grid would be within the proposal site.

The proposed Oxley Solar Farm involves the construction, operation and decommissioning of a ground-mounted PV solar array. Approximately 225MW (AC) of renewable energy would be generated and supplied directly to the national electricity grid. The Oxley Solar Farm would provide enough clean, renewable energy for about 81,000 average NSW homes while displacing approximately 400,000 metric tons of carbon dioxide annually. It would also assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets. The Proposal is considered compatible with existing land uses and highly reversible upon decommissioning, returning the site to its current land capability, for agricultural or other alternative land uses.

## 10.2. BENEFITS OF AND NEED FOR THE PROPOSAL

The Oxley Solar Farm has been designed with the following objectives:

- Develop a profitable, commercial scale solar electricity generation project.
- Include on-site energy storage to support the high voltage transmission network.
- Assist to mitigate the effects of climate change through the transition to renewable energy.
- Meet and exceed all relevant environmental and regulatory requirements for the proposal, in collaboration with key stakeholders.
- Provide local and regional employment opportunities and other social benefits during the construction and operation of the facility.

The specific benefits of the development of the renewable energy source on the Oxley Solar Farm proposal site include:

- Assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets.
- Provide a clean and renewable energy source to assist in reducing greenhouse gas emissions.
- Generation of enough clean, renewable energy for about 81,000 average NSW homes.
- Displace approximately 400,000 metric tonnes of carbon dioxide, currently generated by non-renewable sources.

## 10.3. ENVIRONMENTAL IMPACTS AND MANAGEMENT

The key environmental risks of the proposal have been investigated through specialist investigations, and include:

1. Biodiversity
2. Aboriginal heritage
3. Agriculture and land use
4. Hydrology and flooding
5. Visual amenity and landscape character

OSD has undertaken comprehensive consultation with affected landowners, the local community and other relevant stakeholders in developing the proposal. OSD has informed and engaged with relevant local, State and Commonwealth Government authorities, infrastructure and service providers, community groups and affected landowners on the proposal.

The impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Specific impact avoidance and minimisation measures have been incorporated into the design of the proposal and form commitments of the project, pending approval. They are largely standard and highly certain strategies to manage the impacts of solar farm development, which has grown significantly as an industry sector in regional Australia over the last 10 years. These measures are considered practical and achievable by the proponent.

## 10.4. ABILITY TO BE APPROVED

This EIS indicates that the proposal can be approved, subject to the identified mitigation measures. In summary, this is because:

- The proposal meets relevant planning requirements, as set out in Section 5.
- The environmental risks associated with the proposal are well understood and manageable, as set out in Section 7 and Section 8. Specifically:
  - The proposal has demonstrated consideration of avoidance and minimisation of key environmental features as part of the layout and mitigation strategy development.
  - The impacts are largely reversible, and offsetting would be undertaken to ensure an overall 'not net biodiversity loss' outcome for the proposal.
  - The principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development.

Consideration has been given to the compatibility of the proposal with the existing electricity network and the compatibility of the site for the generation of solar energy. This ensures construction and operating costs are reduced, maximising the viability of the proposal and its contribution to meeting energy needs into the future. Considerations during initial site investigations included:

- Proximity to and capacity of the electrical transmission network
- Availability of an abundant solar resource
- Availability of suitable land (i.e. topography, aspect, presence of native vegetation)
- Suitability in terms of the interests of other stakeholders and the environment.

The consequences of not proceeding with the proposed Oxley Solar Farm would result in:

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

The Oxley Solar Farm would result in numerous benefits, local and regional, and has been developed to ensure the benefits are spread into the longer term, reflecting community expectations specific to this proposal. It provides a balance between technological, energy and environmental aspects, while retaining the flexibility required in the final design stage of the proposal. Furthermore, the proposal is consistent with the principles of ESD and forms an important part of Australia's transition to renewable energy generation. It is considered justifiable and acceptable.

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# APPENDIX A SECRETARYS ENVIRONMENTAL ASSESSMENT REQUIREMENTS

# APPENDIX B PROPOSAL PLANS

# APPENDIX C COMMUNITY CONSULTATION PLAN

# APPENDIX D BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT (BDAR)

# APPENDIX E LANDSCAPE AND VISUAL IMPACT ASSESSMENT

# APPENDIX F HYDROLOGICAL AND HYDRAULIC ANALYSIS

# APPENDIX G ABORIGINAL CULTURAL HERITAGE ASSESSMENT (ACHA)

# APPENDIX H NOISE ASSESSMENT

# APPENDIX I DRAFT NOISE MANAGEMENT PLAN

# APPENDIX J TRAFFIC IMPACT ASSESSMENT