Dapper Solar Farm Scoping Report

Origin Energy

Dapper Solar Farm Project

30 November 2022

Dapper Solar Farm Scoping Report

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Project manager:	Chelayne Whyte		
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Contents

Appendices

Tables

Figures

Terms and abbreviations

Term	Definition
ABS	Australian Bureau of Statistics
AEMO	Australian Energy Market Operator
AHIMS	Aboriginal Heritage Information Management System
APZ	Asset Protection Zone
BESS	Battery Energy Storage System
BSAL	Biophysical Strategic Agricultural Land
CWO REZ	Central-Orana Renewable Energy Zone
DCP	Development Control Plan
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DECC	Department of Environment and Climate Change (former)
DECCW	Department of Environment, Climate Change and Water (former)
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment (former)
EIS	Environmental Impact Statement
EMF	Electromagnetic Fields
EPA	Environment Protection Authority
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ISP	Integrated System Plan
LCVIA	Landscape Character and Visual Impact Assessment
LEP	Local Environmental Plan
LGA	Local Government Area
LSC	Land Soil Capability
LSPS	Local Strategic Planning Statement
LUCRA	Land Use Conflict Risk Assessment
MNES	Matters of National Environmental Significance
MW	Megawatt

Term	Definition
MWh	Megawatt hour
NEM	National Energy Market
NNTT	National Native Title Tribunal
NSW	New South Wales
NVIA	Noise and Vibration Impact Assessment
PCT	Plant Community Type
PCUs	Power conversion units
Project	*The proposed development of the Dapper Solar Farm, which would include a large scale solar photovoltaic (PV) generation facility, a substation and the associated infrastructure*
Project area	*The indicative development area for the Project located on land owned by Origin, including solar panel array areas and undisturbed areas, as shown in Figure 1-2*
PSI	Preliminary Site Investigation
PV	Photovoltaic
REZ	Renewable Energy Zone
RFS	Rural Fire Service
SEIA	Social Economic Impact Assessment
SEPP	State Environmental Planning Policy
SAL	Suburbs and Localities (ABS Census geographic area)
SSAL	State Significant Agricultural Land
SSD	State Significant Development
TEC	Threatened Ecological Community
VRE	Variable Renewable Energy

1. Introduction

1.1 Project overview

Origin Energy Power Limited (Origin) propose to develop the Dapper Solar Farm, which would include a large scale solar photovoltaic (PV) generation facility, a substation and the associated infrastructure (hereafter referred to as the Project). The Project is located at 1198 Sandy Creek Road and 1598 Sandy Creek Road, Dunedoo, New South Wales (NSW), about 30 kilometres south-west of the township of Dunedoo and about 60 kilometres east of the city of Dubbo in the Central West region of NSW (refer to Figure 1-1).

The Project is located across the Dubbo Regional Council and Warrumbungle Shire Council local government areas (LGA) within the Central-West Orana Renewable Energy Zone (CWO REZ). The Project area occupies approximately 730 hectares of land, with the Project infrastructure to occupy an indicative footprint of approximately 554 hectares of land (refer to Figure 1-2). All of the landholdings and associated dwellings within the Project area are wholly owned by Origin.

The Project would have a capacity of up to 300 megawatts (MW) and would connect to the CWO REZ transmission line and network infrastructure via a proposed substation which would be located along Dapper Road. The CWO REZ transmission line and network infrastructure are being delivered by Energy Corporation of NSW (EnergyCo). The transmission easement is currently planned to run along the Project area's south-western boundary and then runs east through the centre of the Project area parallel to Dapper Road (refer to Figure 1-2). The final location of the transmission line is subject to change and will be delivered by EnergyCo through their own approval as part of the CWO REZ Transmission project. The Project would further support the transition to renewable energy while increasing the supply to the National Energy Market (NEM). A detailed description of the Project is provided in Chapter 3.

1.2 Proponent

Origin has invested and structured its energy generation strategy to adapt to NEM requirements and support its own transition to renewables, reduce emissions and contribute to long term sustainability within the energy sector. In order to demonstrate continued leadership, Origin has identified large scale renewable energy as a significant technology required for supporting this transition while achieving their decarbonisation commitments, halving their emissions by 2032 and by becoming a net zero emitter by 2050.

With over ten years' experience in renewable technologies, Origin is becoming Australia's leading renewable and low-carbon energy provider, through the procurement of electricity from renewable sources such as wind and solar. Company details for Origin are provided in Table 1-1 below.

Table 1-1. Proponent details

Proponent	Origin Energy Power Limited
ABN	93 008 289 398
Address	GPO Box 148, Brisbane, QLD 4001
Contact	Leroi Fakraufon

1.3 Strategies to avoid or minimise impacts

The Project area and indicative footprint has been developed with consideration of potential benefits and constraints. Alternatives which have been considered for the Project are discussed in Section 3.5. Strategies which have been used to inform the selection of the Project area and to avoid or minimise potential impacts include the following:

- The NSW Government has identified the CWO REZ due to the region's significant potential for renewable energy infrastructure and has implemented policy to support renewable energy development within the REZ

- The Project area was selected for its close proximity to proposed CWO REZ network, reducing the distance of transmission infrastructure and associated cumulative impact
- While the Project partially includes Biophysical Strategic Agricultural Land (BSAL), it would be designed to be compatible with existing land uses. Prior to Origin's acquisition, the Project area was limited to grazing. Origin is investigating options which includes a dual use land program, such as solar and grazing, and/or carbon sequestration opportunities. Where viable, continued grazing would also deliver operational benefits to the Project by maintaining the vegetation within the Project area while reducing grass fuel load and potential fire hazard
- Origin has initiated the assessment of the land capability class within the Project area. The assessment is in accordance with the Large-Scale Solar Energy Guideline (DPE, 2022d), which would ensure that any use of the BSAL would not have a significant impact on the local and regional agricultural industry
- There is low population density and broad agricultural land use within and surrounding the Project area, resulting in a low number of sensitive receivers
- The Project is being developed on land wholly owned by Origin to minimise direct impacts to sensitive receivers within the Project area, where possible
- The Project layout is being developed to avoid areas of high biodiversity value and to reduce the risks of potential impacts to Aboriginal cultural sites and values which are often concentrated along riparian corridors, if present
- The indicative design of the solar arrays has also avoided higher risk bushfire prone land within the Project area, as well as incorporating exclusion areas around farm dams and creek lines
- The terrain is generally flat and is expected to result in simple construction compared to other geographic areas
- The Project area is located away from national parks and nature reserves to avoid impacts on important areas of biodiversity and recreation
- The Project area is located away from nearby population centres to avoid impacts to liveability in the nearby towns, local community activities and facilities.

During the preparation of the Environmental Impact Statement (EIS), Origin would continue to avoid and minimise potential environmental and social impacts with consideration of the above strategies, and consistent with any other potential constraints which may arise during detailed design development and environmental assessments.

1.4 Purpose of this report

The Project is State significant development (SSD) pursuant to the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP), as discussed further in Chapter 4. Accordingly, approval for the Project is required under Part 4, Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This Scoping Report has been prepared to support a request for the Secretary's Environmental Assessment Requirements (SEARs) for the Project in accordance with Part 8 Division 2 of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation). The SEARs will identify the level of environmental assessment required to be carried out as part of the EIS for submission to the Department of Planning and Environment (DPE) in accordance with Part 4, Division 4.1 of the EP&A Act.

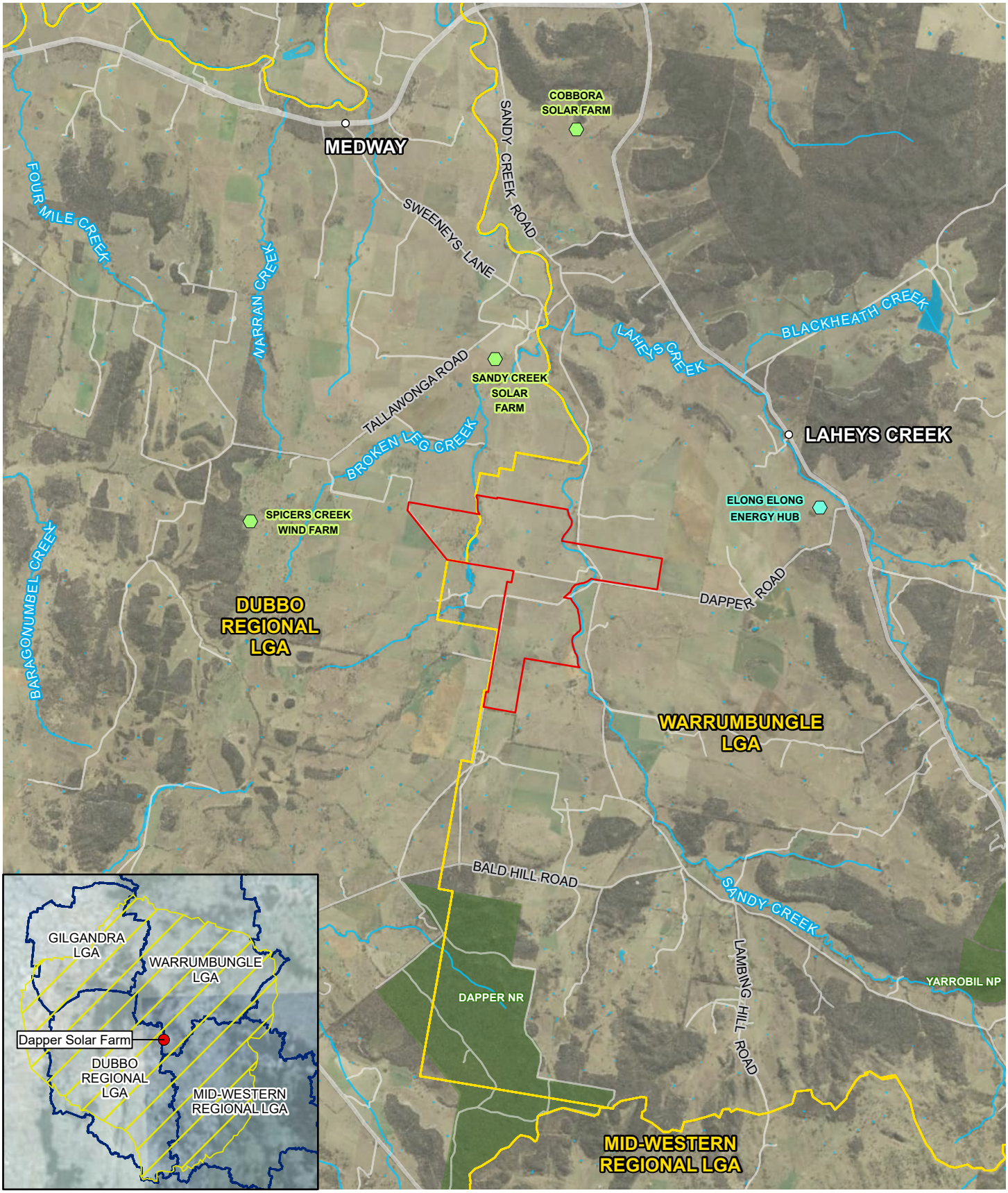

Figure 1-1 Regional context

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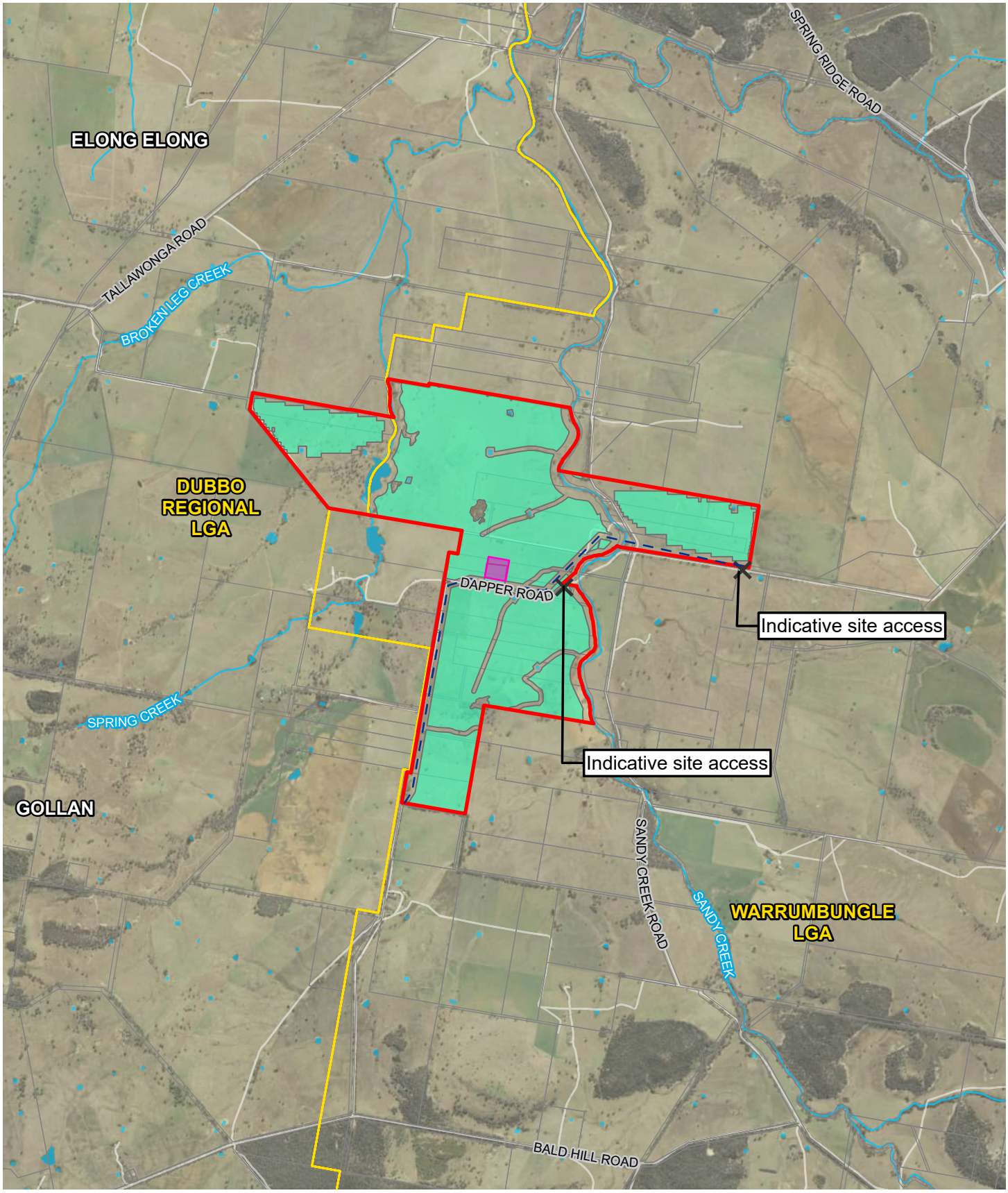

Figure 1-2 Project area

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2. Strategic context

2.1 Project need and benefit

The NSW Government has identified a need to facilitate the delivery of new generation infrastructure to replace at least four coal fire power stations that are scheduled to close within the next 15 years, starting in 2023 (NSW Government, 2020a). In addition, several expected closure dates have been proposed to be brought forward, including Eraring Power Station which may close from 2025, Bayswater Power Station by 2033, and Mount Piper Power Station by 2040. The development of electricity infrastructure is necessary to maintain a reliable, secure and affordable supply, while contributing to substantial local social and economic development and driving decarbonisation in NSW. The development of renewable energy infrastructure would contribute to a State electricity generation network with lower associated carbon emissions than non-renewables.

The Project would be located in the CWO REZ. The REZs are identified as strategically advantageous for energy generation, storage and transmission due to their exceptional renewable energy resources and geographic proximity to existing infrastructure. Establishing new renewable generation capacity, such as solar in the REZs, would align with the NSW Government's Electricity Strategy (NSW Government, 2019b) and Electricity Infrastructure Roadmap (NSW Government, 2020a). The REZs are also selected due to their relatively minor environmental, heritage and land-use constraints which also appeals to private sector investment and development and helps to further diversify energy resources throughout NSW (NSW Government, 2020a). As a result of the declaration of the CWO REZ, renewable energy development is a growing land use in the area. Several other proposed, approved, under construction and operational renewable energy developments are within the CWO REZ and the general Project area, some of which are illustrated in Figure 1-1.

The key benefits of the Project include:

- Providing low cost electricity for consumers and businesses through the renewable solar energy generation
- Supporting the transition towards increased renewable energy in the grid alongside the planned closure of coal-fired power stations in NSW
- Supplying renewable energy to help fulfil current obligations under State and National renewable energy and emissions reduction targets
- Maximising the potential for a dual use land program within the Project area to support agricultural land use alongside renewable energy development
- Contributing to economic opportunities and providing regional investment in NSW, including the provision of employment opportunities during construction and the operation of the Project.

2.2 Project area and surrounds

The Project is located within Warrumbungle Shire LGA and Dubbo Regional LGA. The Project area has predominantly been used for agricultural purposes and is zoned RU1 Primary Production under the Warrumbungle LEP and Dubbo LEP (refer to Figure 2-1). The entire Project is located on land wholly owned by Origin and contains a residential dwelling and farm sheds. The dwelling and farm sheds are unfit for use and were vacant when Origin purchased the land in 2021. The Project area boundary is intersected by Spring Creek in the west, and Sandy Creek in the east next to Sandy Creek Road. There are ten dams scattered throughout the project area and a bore with a solar pump and troughing system. Historically, the Project area was intended to be developed as a coal mine by the NSW Government as part of the discontinued Cobbora Coal Mine.

There is a large area of BSAL mapped north to south through the central portion of the Project area (refer to Figure 2-1). Origin is investigating a dual use land program, where agriculture (such as soil carbon and grazing activities) and solar would co-exist under a proposed Agri-solar model. The Agri-solar model would minimise the loss of productive agricultural land by retaining historical and current agricultural activities within the Project area, where feasible and reasonable. Strategically important land uses would be considered as part of the Project planning and design.

The Project area spans approximately 730 hectares in area, with the indicative footprint for the solar arrays being limited to about 554 hectares, inclusive of the proposed substation which is about four hectares in area. The proposed substation would be situated in the centre of the Project area along Dapper Road, where it would connect with the EnergyCo CWO REZ transmission line. The easement for the transmission line runs north along the south-western boundary of the Project and then east through the centre parallel to Dapper Road. The exact land area to be covered by the solar panels and associated infrastructure would continue to be refined during the preparation of the EIS and design development. The final location of the transmission line is subject to change and will be delivered by EnergyCo through their own approval as part of the CWO REZ Transmission project.

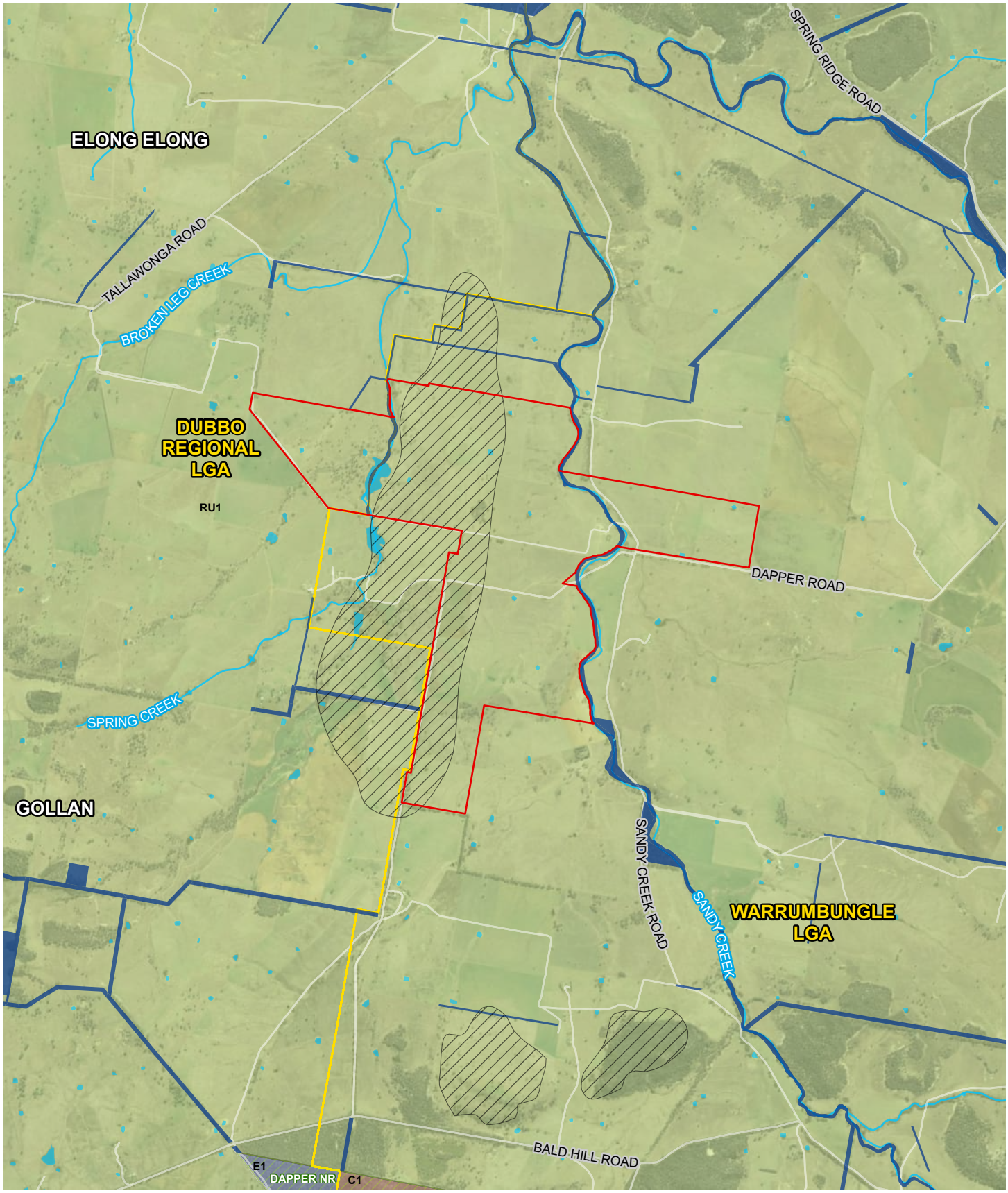
While the majority of the Project area would be used for the installation of solar panels, substation and associated infrastructure, about 176 hectares across the Project area would not be disturbed to avoid impacts to riparian habitat, waterways, areas of high biodiversity value and to minimise potential impact from areas mapped as bushfire prone land (Category 1 vegetation). Site access to the Project area would be via the Golden Highway and Spring Ridge Road into Dapper Road and Sandy Creek Road.

The Project area is about 334 kilometres (by road) from Sydney, with the closest city being Dubbo, located approximately 74 kilometres (by road) to the west of the Project area. The township of Cobbora is about 20 kilometres north-east of the Project area. The closest National Parks and Wildlife Service estate land to the Project is Dapper Nature Reserve, located approximately four kilometres south. There are no major transmission lines, pipelines or railway infrastructure near the Project, and the closest major highway is the Golden Highway, located approximately eight kilometres north of the Project area.

Land use in and around the Project area is largely agricultural with sheep and cattle grazing, as well as dry land cropping. The historical and current land use of the Project area is grazing. There is currently no flood mapping for the Project area, however there are areas of groundwater vulnerability mapped, as well as areas of bush fire risk vegetation Category 2 across the Project area. In addition, the Project area does not contain mining or mineral titles and is not within any mine subsidence district or landslide risk land.

There are a total of 17 associated and non-associated dwellings (including farm sheds and structures) identified within 2.5 kilometres of the Project area, with the closest being about 240 metres from the Project areas north eastern boundary (R87) (refer to Figure 2-2). There are two receivers within the Project area, both of which are associated dwellings and are within land wholly owned by Origin.

Energy development is an emerging land use in the region with several proposed solar farm and wind farms proposed in the vicinity of the Project, including Sandy Creek and Cobbora solar farms and the Spicers Creek wind farm, as well as the CWO REZ Transmission project which together can result in cumulative impacts (refer to Figure 1-1 and Table 6-9). Origin would continue to carry out consultation with the local community and relevant agencies (including Councils) to develop Voluntary Planning Agreements or similar mechanisms, which would be confirmed as part of the EIS.



Project area

Biophysical Strategic Agricultural Land

Land zoning

C1,National Parks and Nature Reserves

E1,National Parks and Nature Reserves

RU1 - Primary Production

Waterway

Waterbody

Local Government Area

National park

Crown land

0 1 2 km

1:50,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2022
Origin 2022
Department of Planning and Environment 2022
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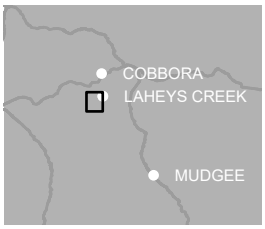

Figure 2-1 Local context

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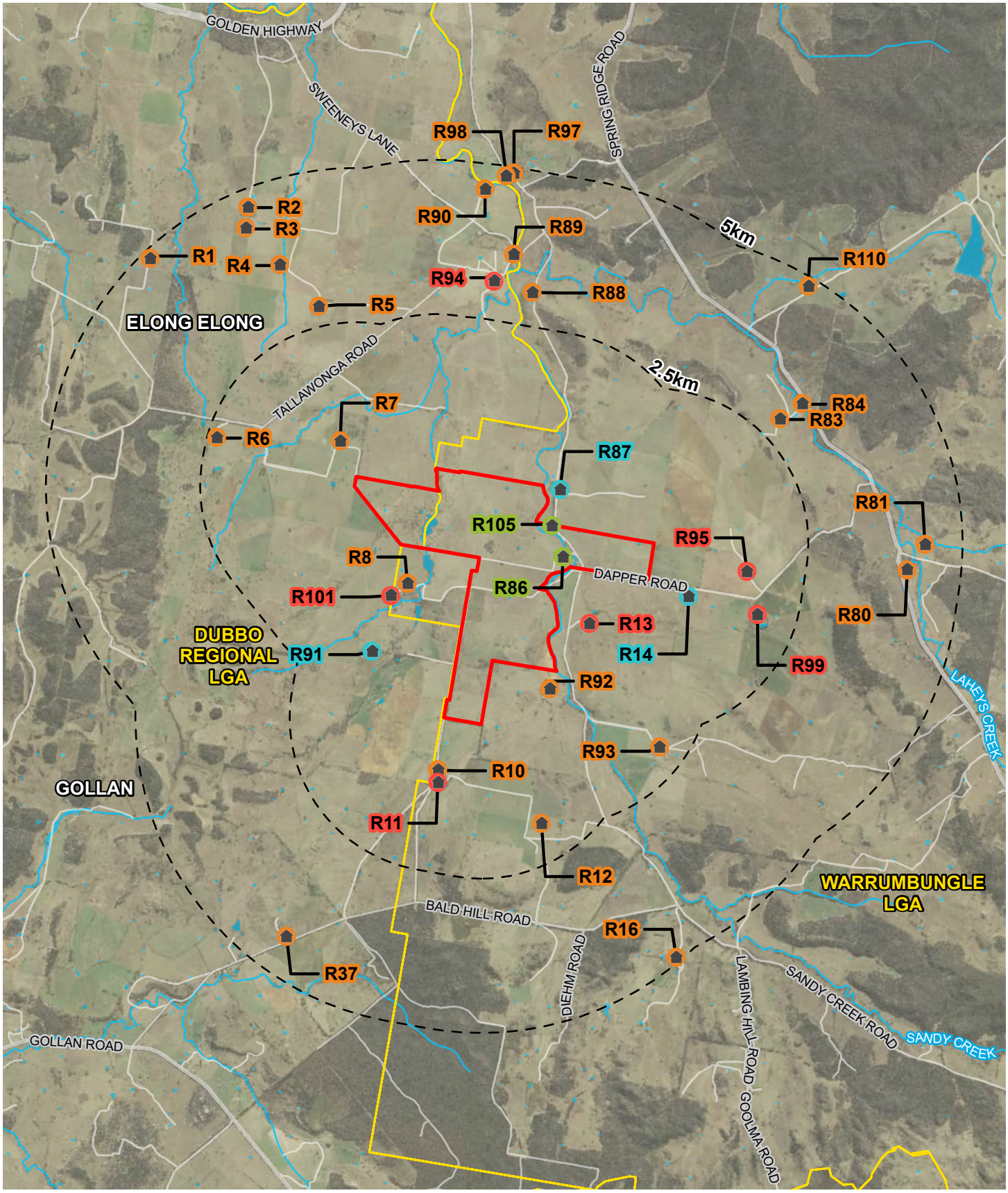

Project area
Project area buffer

Sensitive receiver
- Associated dwelling
- Non-associated dwelling (Occupied)
- Non-associated dwelling - Unoccupied
- Non-associated dwelling - Unoccupied structure (shed or yard)

Road
Waterway
Waterbody
Local Government Area

0 2 4 km

1:85,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2022
Origin 2022
Department of Planning and Environment 2022
© Department of Customer Service 2020

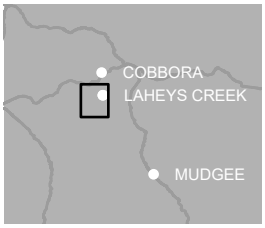

Figure 2-2 Sensitive receivers

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2.3 Strategic policy context

The Project would align with various strategies, policies and plans across National, State, regional, and local jurisdictions. The strategic framework for the Project is outlined in Table 2-1 below.

Table 2-1. Alignment with key strategic documents

Policy	Objectives or targets	How the Project aligns
National context		
United Nations Framework Convention on Climate Change Conference of Parties (COP26) – Glasgow 2021 and COP21 – Paris Agreement	The aim of the Paris Agreement is to limit emissions globally to net zero in the second half of this century. Australia is one of 195 countries that signed on to the Paris Agreement in 2015 and the Australian Government has set an updated target to reduce emissions by 43 per cent below 2005 levels by 2030, with legislation to be ratified by parliament. The updated Nationally Determined Contribution (NDC) has been communicated to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat. The updated NDC also reaffirmed the target to achieve net zero emissions by 2050.	The Project would be consistent with the overall national emissions reduction commitment and increase the generation of renewable solar energy, resulting in a reduction in greenhouse gas emission.
2022 Integrated System Plan	The supply and use of electricity in the NEM are managed by the Australian Energy Market Operator (AEMO). The AEMO published the 2022 Integrated System Plan (ISP) which provides an actionable roadmap for eastern Australia's grid network (AEMO, 2022). The 2022 ISP identifies the optimal development path for the NEM including development opportunities and has forecast significant growth in in Distributed Energy Resources such as household and commercial photovoltaic (PV) installations, and Variable Renewable Energy (VRE) such as grid scale solar and wind energy.	The Project would contribute to the VRE requirements identified in the 2022 ISP and would strengthen renewable energy supply in the NEM.
Large-scale Renewable Energy Target (LRET)	The Australian Government Clean Energy Regulator administers the LRET which incentivises investment in renewable energy power stations such as wind and solar farms. The LRET target of 33,000 GWh of additional renewable electricity generation was met at the end of January 2021 (Clean Energy Regulator 2021). The annual target will remain at 33,000 GWh until the scheme ends in 2030.	The Project will generate up to approximately 800 GWh of electricity annually, which will make significant contributions beyond the LRET target in future years.
State context		
NSW Net Zero Plan Stage 1: 2020-2030	The NSW Net Zero Plan Stage 1: 2020-2030 (Net Zero Plan) (NSW Government, 2020b) outlines the NSW Government's approach to growing the economy and employment and reducing emissions over the next decade. The Net Zero Plan targets net zero emissions by 2050 in NSW. The NSW Government has announced in 2021 that the updated objective is to deliver a 50 per cent emissions reduction by 2030, compared to 2005 emissions levels. The Net Zero Plan: Stage 1 Implementation Update (NSW Government, 2021) builds on the Net Zero Plan. The Plan is forecast to reduce the State's annual emissions by 28.6–37.3 million tonnes of carbon dioxide equivalent by 2030 and this has been reinforced in the Implementation Update. This means the State's annual emissions are projected to	The Project would align with the emissions reduction target in NSW by developing renewable solar energy infrastructure and contributing to decarbonisation and the transition away from coal-fired power generation.

Policy	Objectives or targets	How the Project aligns
	reduce from 47 per cent to 52 per cent below 2005 levels by 2030.	
NSW Electricity Strategy 2019 and NSW Electricity Infrastructure Roadmap 2020	The NSW Electricity Strategy 2019 (NSW Government, 2019b) sets out a plan to deliver the first five REZs in the State's CWO, New England, South-West, Hunter-Central Coast and Illawarra regions. The NSW Government strategies supports the implementation of the 2022 ISP, and the NSW Government has committed to a minimum 12 GW of new transmission capacity by 2030 and has determined the cheapest resources of generation are large-scale solar and wind farms located in the REZs (DPIE, 2020b). The objectives of the Electricity Infrastructure Roadmap are to encourage investment in new generation, storage and transmission in REZs, while using a holistic approach to land-use planning and community consultation to drive social and economic development in regional NSW.	The Project is located within the CWO REZ and would be in proximity to the indicative REZ transmission corridor. The Project would be consistent with the objectives of the Electricity Infrastructure Roadmap and would supply solar renewable energy to the NEM and support the growth and co-location of low-emission generation capacity in the CWO REZ.
Large-Scale Solar Energy Guideline 2022	The Large-Scale Solar Energy Guideline (DPE, 2022d) has been finalised and seeks to support sustainable solar development, encourage suitable site selection to avoid or reduce land use conflicts and environmental or social impacts. The guideline provides guidance on assessing key environmental impacts related to solar development and promotes meaningful community and stakeholder engagement. .	The Project has considered ways to minimise or avoid impacts in the initial scoping phase and would continue to consider the requirements of the guideline during the preparation of the EIS and further design development. The Project has initiated stakeholder and community engagement and would continue to facilitate best-practice consultation throughout the Project planning and design phases.
Draft State Significant Agricultural Land map	The NSW Department of Primary Industries (DPI) is currently developing the draft State Significant Agricultural Land (SSAL) map, which would inform future agricultural land use planning policies (DPI, 2021a). The SSAL map is at an early draft stage and would support the development of a State Significant Agricultural Land Use Planning Policy in the future.	While the Draft SSAL map has not been finalised and no applicable planning policies are in force, there are mapped areas of SSAL within the Project area. Should the SSAL map come into force and any statutory State Significant Agricultural Land Use Planning Policy be developed during the preparation of the EIS, any strategically important agricultural land uses would be considered as part of the Project planning and design.
Regional context		
Central West and Orana Regional Plan 2036	The Central West and Orana Regional Plan 2036 is a 20-year blueprint for the future of the Central West and Orana Region (DPIE, 2017). The Regional Plan aims to develop a strong, diverse and competitive economy through the following four key goals: • The most diverse regional economy in NSW • A stronger, healthier environment and diverse heritage • Quality freight, transport, and infrastructure networks • Dynamic, vibrant, and healthy communities.	The Project is consistent with relevant directions and actions of the Regional Plan and would directly contribute to Goal 1 (to become the most diverse regional economy in NSW). The Project would also align with Direction 9 (to increase renewable energy generation).

Policy	Objectives or targets	How the Project aligns
Local context		
Warrumbungle Shire Local Strategic Planning Statement 2019	The Warrumbungle Shire Local Strategic Planning Statement (LSPS) set the framework for Warrumbungle Shire's economic, social and environmental land use needs over the next 20 years. The LSPS presents a vision for the future that includes more economic diversity the townships across the region.	The Project would align with the LSPS by contributing to a diversifying economy and bringing investment into the local and regional economy.
Warrumbungle Shire Economic Development & Tourism Strategy 2019— 2023	The purpose of the economic development strategy is to provide the direction and framework to encourage, support and facilitate economic development within Warrumbungle Shire.	The Project would directly contribute to the aims of this strategy, being economic growth and a shift to investment in renewable energy and alternative energy production.
Warrumbungle Shire Community Strategic Plan 2022-2037	The strategic plan identifies the main priorities and vision for the LGA and establishes objectives and strategies to address social, environmental, economic and civic leadership issues and to reflect the needs and aspirations of the community. The four key themes identified are: • Caring for the Environment: Protecting and valuing our natural assets • Civic Leadership: Community-based leadership • Strengthening the Local Economy: A sustainable local economy characterised by thriving towns and villages and diverse agriculture • Supporting Community Life: Maintaining and growing vibrant and connected communities. Specifically, the objective for Local Economy LE3 aims for the community to benefit from the economic returns of local renewable energy production, and mining and extractive industries.	The Project would directly contribute to the long term goal LE3 - local renewable energy production and would support the overarching themes and goals of the strategic plan.
Warrumbungle Shire Council Land Use Strategy 2013	The Warrumbungle Shire Council Land Use Strategy sets out the 25 year vision for land use planning in the Warrumbungle LGA and forms the foundation for the development of the LEP. The community wanted to preserve the natural environment and actively foster renewable energy principles such as solar. Economic growth will be facilitated through giving priority to investment that improves necessary energy infrastructure. Identified economic growth actions include permitting sustainable energy production forms in the new LEP such as wind, solar or geothermal.	The Project would directly contribute to the strategy's focus on supporting economic growth and diversity while maintaining a considered approach to land use needs.
Dubbo Local Strategic Planning Statement 2020	The Dubbo Region LSPS plans for the economic, social and environmental land use needs of the community over the next 20 years. Key infrastructure and services need to be provided to further enhance the quality of life of our community, maintain and attract economic growth, including reliable energy supply. Renewable energy will play a key part in Dubbo's sustainable future, particularly as the Queensland–NSW Interconnector transmission lines are constructed, facilitating energy transfer to the north and south of the LGA.	The Project would directly contribute to economic growth through an investment in infrastructure and provision of renewable electricity.

Policy	Objectives or targets	How the Project aligns
Dubbo Region 2040 Community Strategic Plan	The 2040 Community Strategic Plan will guide and influence the actions and initiatives of Dubbo Regional Council, the community, all tiers of government and community stakeholders over a 22 year period through to 2040. The Dubbo Regional LGA has one of the highest take up rates for solar energy provision in Australia and the plan recognises the financial and environmental benefits of renewable energies and the role it plays in a sustainable future. Strategy 2.1.1: Investment in renewable energy opportunities are encouraged and supported.	The project directly aligns with Strategy 2.1.1 by investing in solar energy generation.

3. Project

3.1 Project details

The key Project components would include the construction, operation and decommissioning of the following:

- Solar farm with a generation capacity of up to 300 MW, consisting of Photovoltaic (PV) solar array on a single-axis tracking framing system mounted on steel piles
- New substation and connection to proposed CWO REZ transmission and network infrastructure
- Power conversion units (PCUs) and associated equipment
- Associated infrastructure including underground cabling, site offices, storage areas to support operations, internal access tracks, perimeter security fencing and landscaping where required.

The indicative features of the Project are outlined in Table 3-1.

Table 3-1. Key Project features

Component	Summary
Location	The Project area consists of 32 separate lots which are wholly owned by Origin, as follows: • Lots 3, 4, 5, 7, 8, 9, 10 of DP 1190816 • Lots 27 and 28 of DP 754317 • Lots 1, 2, 3 of DP 130882 • Lot 1/DP 134329 • Lots 8, 9, 10, 15, 16, 17, 24, 26, 27, 31, 32, 33, 34, 35, 43, 53, 88, 101, 115 of DP 754305.
Capacity	Up to 300 MW
Solar array	The PV modules would occupy approximately 554 hectares of land, with row spacing of about six metres and height of up to 5.5 metres at the top of the array.
Substation	The substation would require an area of about four hectares enclosed by security fencing.
Electrical reticulation network	Internal underground cabling will generally follow rows of panels and parallel the internal access tracks.
Access tracks	Internal access tracks are proposed across the Project area and would be up to 15 metres wide to include roadside drainage. Access to the Project area is proposed to be via the Golden Highway, Spring Ridge Road and Dapper Road. No additional internal site access roads are required however a creek crossing would be established across Spring Creek, for access to the western portion of the Project area.
Ancillary activities and infrastructure	Ancillary infrastructure would be located within the Project area, including a temporary construction compound, temporary laydown areas, concrete batching plant, security fencing, lighting and CCTV.
Operational and maintenance building	The building would be constructed to include a control room and areas for maintenance and storage facilities for the Project.
Construction hours	Construction hours would be limited to Monday to Friday 7 am to 6 pm, and Saturday 8 am to 1 pm.
Construction timing	The construction period would take approximately 18-24 months, with an additional nine months for commissioning. It will also be contingent upon commissioning of the new transmission line.
Operational phase	The expected operational life of the Project infrastructure is about 30 years. However, the Project may involve upgrades at the end-of-life to extend its operational life.

Component	Summary
Decommissioning and rehabilitation	The Project would involve decommissioning at the end of design life, where all above ground infrastructure would be removed, and the land rehabilitated to the pre-existing condition.

3.2 Construction activities

Development of Origin's Dapper Solar Farm Project requires the securing of a formal Access Right, via a tender process, to connect into the new dedicated transmission infrastructure of the CWO REZ. Origin will be partaking in this tender process which commences in 2023, with Origin continuing to progress the planning and approvals process in parallel. The standard connection requirements would also apply, with Origin seeking a formal connection agreement post acceptance of Generator Performance Standards (GPS) modelling.

As export of energy from the Project is contingent upon the new CWO REZ Transmission project being developed by EnergyCo under their own approval separate to the Dapper Project, Origin intends to tailor the approximately 18 to 24 month construction program to meet the delivery of the commissioned transmission infrastructure. Therefore, construction could be expected to begin in the 2025 calendar year. During the construction phase, a workforce of 250 full time equivalent workers is anticipated to be required for the Project with a maximum of about 350 workers during the peak construction period. Any construction workforce that are not local workers would be anticipated to stay at temporary accommodation options in the townships surrounding the Project area.

3.3 Operation

The operational phase of the Project is planned to commence in 2026-27 for a 30-year minimum period, subject to detailed design. The Project would largely be operated remotely. Operational staff would be expected to access the Project area for maintenance activities and during any emergency situations. Operational maintenance activities of key equipment would be undertaken by specialist subcontractors and/or equipment manufacturers. It is anticipated that the operation phase of the Project would require about 15-20 full time equivalent employees.

The implementation of the Agri-solar model would continue historical and current grazing activities while delivering operational benefits through vegetation maintenance, reducing the need for mowing, treatment of weed species and the associated costs. Grazing activities would also contribute to a reduced fuel load and the overall risk of bushfire hazard to the Project area and neighbouring properties (Clean Energy Council, 2021). Origin would also be exploring the potential to implement carbon sequestration (soil carbon agriculture), which would involve removing carbon from the atmosphere and storing it in the soil. This would be achieved by increasing the amount of decomposing plant material and microbes that are present within the soil.

3.4 Decommissioning and rehabilitation

Potential options for decommissioning and rehabilitation of the Project area would be detailed in the EIS. Further assessment and future decisions would determine whether the existing infrastructure would be upgraded, and new PV modules installed, or whether the existing PV modules would be removed, and the Project area rehabilitated.

3.5 Alternatives considered

Alternatives to the Project have been considered, including alternative sourcing of energy, Project location, and the indicative solar array footprint, however, it is considered that large-scale solar is the ideal development for renewable energy generation for the Project. This is based on the availability of solar resource in the Project area and region, generally sparse rural population, locality and accessibility to the CWO REZ transmission line and network infrastructure via the proposed substation within the Project area boundary.

Origin has considered a range of alternative options and Project designs, all of which have considered strategies to minimise environmental and social impacts while maximising renewable energy generation while meeting Project objectives.

Alternatives considered include:

- Alternative siting of the Project within the CWO REZ, however the proposed siting and location of the Project are considered optimal due to:
  - Availability and limited agricultural use facilitating the acquisition of the Project area by Origin
  - Proximity to proposed CWO REZ transmission corridor, with the proposed transmission line passing through the centre of the Project area, adding to the ease of Project connection to the grid
  - Surface area and space available to avoid areas with high environmental constraints
  - Ability to minimise potential impacts to sensitive receivers, including all dwellings within the Project area being owned by Origin, and relative few neighbours direct adjacent to the Project area
  - Ability to avoid major townships
  - Favourable topography with high solar irradiance
  - Road access with accessible construction routes
  - Ability to establish Agri-solar development and support historical and existing agricultural land uses.
- Alternative Project layout and configuration based on different solar farm design and technology options such as:
  - Fixed versus tracking options for PV modules with tracking preferred to maximise morning and evening generation
  - Mono-facial versus bi-facial PV modules with bi-facial PV modules allowing for more efficient electricity generation in some circumstances
  - Project-only or shared grid connection with nearby development.
- The do-nothing approach has been considered; however the do-nothing approach is not considered suitable due to the following:
  - Origin has identified large scale renewable energy generation as a significant technology required to support the company's transition towards decarbonisation, the Project would contribute to this transition while providing increased electricity supply to meet current and future demand
  - Replacing retiring coal-fired power plants with a combination of solar farms, wind farms, and large-scale battery energy storage systems is the most economically viable option for the foreseeable future
  - Alternative power generation options are economically limited from a private investment standpoint, with solar power generation, along with wind, becoming the cheapest forms of new build electricity in Australia
  - Development for the purpose of a solar farm can be undertaken in a manner that avoids significant adverse biophysical, cultural or social impacts.

4. Statutory context

The key relevant statutory requirements for the Project having regard to the EP&A Act, other NSW and Commonwealth legislation, and environmental planning instruments are outlined in Table 4-1 below. The table has been set out in accordance with the State Significant Development Guidelines – Preparing a Scoping Report (DPIE, 2021c) to cover the following:

- Power to grant approval
- Permissibility
- Consistent approvals
- Commonwealth approvals
- Approvals not required (pursuant to Section 4.41 of the EP&A Act)
- Mandatory matters for consideration (refer to Table 4-2).

Detailed consideration of relevant statutory requirements would be provided in the EIS.

Table 4-1. Statutory context

Statutory reference	Requirement
Power to grant approval	
Environmental Planning and Assessment Act 1979 (EP&A Act)	Approval for the Project will be sought under Part 4, Division 4.7 of the EP&A Act, which outlines the approval pathway for development deemed to be State significant development (SSD). Section 4.36(2) of the EP&A Act states: *(2) A State environmental planning policy may declare any development, or any class or description of development, to be State significant development.* Relevant State environmental planning policies (SEPPs) include State Environmental Planning Policy (Planning Systems) 2021 (the Planning Systems SEPP), and State Environmental Planning Policy (Transport and Infrastructure) 2021 (the Transport and Infrastructure SEPP). Under the provisions of Section 2.6(1) of the Planning Systems SEPP, a development is classified as SSD if: *(a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and* *(b) the development is specified in Schedule 1 or 2.* Schedule 1, Section 20 of the Planning Systems SEPP determines 'electricity generating works' to be SSD if it meets the following criteria: *Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that:* *(a) has a capital investment value of more than $30 million* The Project involves development for the purpose of 'electricity generating works' using solar power which would have a capital investment value of more than $30 million. Therefore, the Project is classified as SSD under Part 4 of the EP&A Act. Under Section 4.5(a) of the EP&A Act, the consent authority for the Project is the Independent Planning Commission or the Minister for Planning. The consent authority would evaluate the SSD application in accordance with Section 4.15 of the EP&A Act.

Statutory reference	Requirement	
Permissibility		
Transport and Infrastructure SEPP	Section 2.36(1b) of the Transport and Infrastructure SEPP states that 'electricity generating works' may be carried out with development consent on land within a prescribed rural, industrial or special use zone. The Project area is zoned in as RU1 – Primary Production under the Warrumbungle Local Environmental Plan 2013 (Warrumbungle LEP) and the Dubbo Regional Local Environmental Plan 2022 (Dubbo LEP). As the Project meetings the definition of 'electricity generating works' and land zoned RU1 – Primary Production is a prescribed rural zone, the Project is permissible with consent under the provisions of Section 2.36(1) of the Transport and Infrastructure SEPP.	
Consistent approvals		
Section 4.42 of the EP&A Act outlines that these approvals cannot be refused if necessary for carrying out an approved SSD and are to be consistent with the terms of the SSD approval.	*Roads Act 1993*	The Project would require consent from the appropriate roads authority under Section 138 of the *Roads Act* for any works undertaken on public roads. The impacts of the Project on roads, access and traffic would be assessed within the EIS.
Approvals not required		
Section 4.41 of the EP&A Act provides that the following approvals are not required for an approved SSD.	*Fisheries Management Act 1994*	A permit under the *Fisheries Management Act 1994* (FM Act) to block fish passage or dredge or carry out reclamation work on water land would not be required pursuant to Section 4.41 of the EP&A Act. Construction work, such as creek crossings to provide access, may be required. Any works will be undertaken in accordance with relevant NSW guidelines.
	Heritage Act 1977	An approval under Part 4, or an excavation permit under Section 139, of the Heritage Act would not be required pursuant to Section 4.41 of the EP&A Act. There are no listed heritage items within the Project area.
	National Parks and Wildlife Act 1979	An Aboriginal heritage impact permit under Section 90 of the *National Parks and Wildlife Act 1974* would not be required pursuant to Section 4.41 of the EP&A Act. There is potential for Aboriginal heritage items to occur within the Project area, primarily associated with the watercourses. Any Aboriginal heritage identified within the Project area would be avoided as far as practicable through design development during the preparation of the EIS.
	Water Management Act 2000	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* pursuant to Section 4.41 of the EP&A Act. Construction work near or within watercourses within the Project area may be required. These works would be carried out in accordance with relevant NSW guidelines.

Statutory reference	Requirement	
	Rural Fires Act 1997	A bushfire safety authority under Section 100B of the *Rural Fires Act 1997* would not be required pursuant to Section 4.41 of the EP&A Act. An assessment of hazards and risks would be undertaken to assess potential hazards associated with the Project including from bushfires.
EPBC Act approval		
Relevant EPBC Act considerations	*Environment Protection and Biodiversity Conservation Act 1999*	If an action will, or is likely to, have a significant impact on any Matters of National Environmental Significance (MNES), it is deemed to be a 'controlled action' and requires approval from the Commonwealth Environment Minister or the Minister's delegate. A search of the Commonwealth Protected Matters Search Tool indicates that there are no world heritage properties or national heritage places within the vicinity of the Project area. Further, no Commonwealth land is expected to be affected by the Project. There are Listed Threatened Ecological Communities (TECs), Listed Threatened Species and Listed Migratory Species within 10 kilometres of the Project. Refer to Appendix B for results of the search and further discussion on potential matters. The preliminary biodiversity assessment indicates that the risk of a significant impact on ecological communities and threatened species is possible, however considering the indicative footprint avoids the area highest in biodiversity value (riparian and woodland areas), this risk is considered to be low. Detailed assessment of the Project area is required prior to determining whether an EPBC Act referral for the Project is necessary and would be carried out as part of the EIS.
Other approvals		
Approvals that are not expressly integrated into the SSD assessment process	*Native Title Act 1993 (Cth)*	Under Section 13 of the *Native Title Act 1993*, an individual can apply to the Federal Court for a determination of native title. A review of the potential for native title will be undertaken for the Project in the EIS, however the Native Title Vision online mapping tool (NNTT, 2022) currently indicates there are no Native Title claims or applications over the Project area.
	Biodiversity Conservation Act 2016	The Biodiversity Development Assessment Report (BDAR) which would be prepared to accompany the EIS. The BDAR would assess the management and protection of listed threatened species of native flora and fauna and TECs and assess biodiversity offsets consistent with the Biodiversity Offset Scheme. Given the Project is SSD, entry into the Biodiversity Offset Scheme is automatically triggered.
	Crown Land Management Act 2016	There are two Crown waterways intersecting the Project area, being Spring Creek and Sandy Creek. There are existing creek crossing over Sandy Creek which would be used by the Project, and a creek crossing (either a ford crossing or culvert) over Spring Creek is proposed as part of the Project. It is considered unlikely that the Project would impact on any Crown roads, as no use or upgrades to Crown road parcels are proposed. Consultation would be carried out with DPE – Crown Lands in relation to Crown lands intersecting the Project area and access agreement would be negotiated prior to use of any Crown land parcels.

The consent authority is required to consider a range of matters when deciding whether to approve the Project, as detailed in Table 4-2.

Table 4-2. Mandatory matters for consideration

Statutory reference	Mandatory considerations
Considerations under the EP&A Act and Regulation	
Section 1.3 – Objects of the Act	Pursuant to Section 1.3 of the EP&A Act, the Objects of the Act are: *(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,* *(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,* *(c) to promote the orderly and economic use and development of land,* *(d) to promote the delivery and maintenance of affordable housing,* *(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,* *(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),* *(g) to promote good design and amenity of the built environment,* *(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,* *(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State, to provide increased opportunity for community participation in environmental planning and assessment.*
Section 4.15 – Evaluation	Pursuant to Section 4.15 of the EP&A Act, the consent authority is required to take the following matters into consideration in determining a development application: • The provisions of relevant environmental planning instruments including: - State Environmental Planning Policy (Resilience and Hazards) 2021 - State Environmental Planning Policy (Transport and Infrastructure) 2021 - Dubbo LEP - Warrumbungle LEP • The provisions of any proposed instrument(s) • The provisions of any planning agreement that have been entered into, or any draft planning agreement that a developer has offered to enter into • The provisions of the regulations (the EP&A Regulation) • 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 suitability of the site for the development • The public interest. These would be considered in the EIS.

Statutory reference	Mandatory considerations
Considerations under relevant environmental planning instruments	
Resilience and Hazards SEPP	The Resilience and Hazards SEPP assesses the potential hazards associated with the proposed development by providing definitions and guidelines for hazardous industry, offensive industry, hazardous storage establishments, and offensive storage establishments. In accordance with Section 3.7 of the Resilience and Hazards SEPP, consideration will be given to current circulars or guidelines published by the DPE relating to hazardous or offensive development, including: • Hazardous Industry Planning Advisory Paper No 3 – Risk Assessment • Hazardous Industry Planning Advisory Paper No 12 – Hazards In addition, a preliminary risk screening assessment would be undertaken for the Project at the EIS phase in accordance with the Resilience and Hazards SEPP. Under Section 4.6 of the Resilience and Hazards SEPP, a consent authority is required to consider whether a proposed development site is affected by soil or other contaminants before granting consent. An assessment would be prepared as part of the EIS to determine the potential contamination risk associated with the Project. Noting the agricultural land use across the Project area, the assessment will take into consideration historical land use that may have resulted in contamination within and surrounding the Project area.
Warrumbungle LEP	The EIS will consider: • The relevant objectives for the RU1 – Primary Production zone • Clause 5.14 Siding Spring Observatory - maintaining dark sky • Clause 6.1 Earthworks • Clause 6.3 Terrestrial biodiversity • Clause 6.4 Groundwater vulnerability • Clause 6.5 Riparian land and watercourses.
Dubbo LEP	The EIS will consider: • The relevant objectives for the RU1 – Primary Production zone • Clause 5.14 Siding Spring Observatory - maintaining dark sky • Clause 5.15 Defence communications facility • Clause 7.1 Terrestrial biodiversity • Clause 7.2 Earthworks • Clause 7.3 Natural resource – riparian land and waterways • Clause 7.5 Groundwater vulnerability.

5. Engagement

5.1 Stakeholder identification and approach

Origin is committed to establishing and maintaining meaningful and respectful relationships with stakeholders and the community in areas where it operates. Effective and efficient communication is a fundamental element in the successful delivery of Origin's projects. Origin has adopted the engagement principles detailed in the Undertaking Engagement Guidelines for State Significant Projects (DPIE, 2021d). These principles emphasise the need to consult early and regularly, with a view to address any issues raised by the community as the Project progresses.

Any solar farm project, including the Dapper Solar Farm Project, may result in negative feedback from the community due to many different stakeholder viewpoints, which is why efficient communication is required to manage any negative perceptions and sentiment. While the Project area may attract local interest, Origin would continue to provide consultation opportunities and enhance transparency and openness with the local community and stakeholders, including government agencies.

Engagement undertaken throughout the planning phase would ensure:

- Proactive consultation with key stakeholders providing clear and consistent messaging
- The identification of all key issues and concerns
- Opportunities for stakeholders to have their say and provide input into project planning
- Regular Project progress updates.

Stakeholder identification has been undertaken and the following key stakeholders have been identified:

- Directly impacted neighbours
- Broader community landholders and neighbours
- Local councils
- Local Aboriginal groups including Traditional Owners
- Community Interest Groups.

Specifically, Origin has identified a wide range of agencies and private stakeholders that are expected to have an interest or be impacted by the Project (refer to Table 5-1).

Table 5-1. Identified Stakeholders

Category	Stakeholder
Government Agencies	NSW Department of Planning and Environment, including the Environment and Heritage Group NSW Department of Primary Industries NSW Environmental Protection Authority (EPA) NSW Crown Lands (Dubbo) EnergyCo Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Transport for NSW Elected Representatives – Federal and State
Council Administration	Dubbo Regional Council Warrumbungle Shire Council
Neighbours	Directly affected landowners

Category	Stakeholder
	Indirectly affected landowners
Traditional Owners	Wiradjuri and Kamilaroi/Gamilaroi
Economic Development Groups	Regional Development Australia Dubbo Chamber of Commerce NSW Farmers Association National Farmers Federation Dunedoo & District Development Group
Local Businesses	Potentially including equipment suppliers, tourism operators, plant hire, contractors, accommodation, food and others.
Education	Dunedoo Central School St Michael's Catholic Primary School Dunedoo - TAFE NSW
Recreation and Tourism	Warrumbungle Region Visitor Information Pandora Gallery & Tourist Information Centre Visit Dubbo
Environmental Groups	Dunedoo Coolah Landcare
Media	The Daily Liberal (Dubbo) Dubbo Photo News (Dubbo) Dubbo Mailbox Shopper (Dubbo) Coonabarabran Times (Warrumbungle) ABC
Emergency Departments	NSW Rural Fire Service (RFS) SES Unit Dunedoo Police Ambulance

Origin would continue to proactively inform stakeholders ahead of any work associated with the Project. Communication would provide stakeholders with information on EIS and ongoing design development, including potential impacts and steps taken to mitigate impacts.

5.2 Consultation to date

A summary of engagement activities to date are provided in Table 5-2. The matters raised and issues considered by stakeholders would continue to be addressed through ongoing engagement during the EIS phase.

Table 5-2. Engagement summary

Stakeholder	Method	Purpose	Issues raised
Department of Planning and Environment	Virtual Meeting	To introduce the Project, and present intent to lodge scoping report for the Project.	DPE referred to the new Large-Scale Solar Energy Guideline published in August 2022 (DPE, 2022d). The Project EIS will consider the requirements of the updated Large-Scale Solar Energy Guideline.
EnergyCo	Email correspondence In-person meeting Virtual meeting	To introduce the Project, and discuss the following: • The location of the transmission lines • Workforce accommodation considerations and potential need to coordinate • Workforce skills requirements • Coordination of engagement with community • Coordination of infrastructure upgrades required such as telecommunications, recycling capabilities and transport infrastructure.	EnergyCo understood the need for coordination of various projects within the CWO REZ and would continue discussions with Origin as the planning and design of the Project progresses.
Federal Member for Parkes Mark Coulton MP	Virtual meeting	To introduce Origin and the Project	Some of the issues raised include: • Concern over rising land value and market competition between corporations and local landholders • Recent protesting and increasing community concern regarding rising costs (freight, fertiliser), CSG, and visual impacts • Concern that fire risk, fire management and emergency vehicle accessibility are not adequately considered • Concern employment is short term and there is no long term workforce plan post construction.
Local Member of Parliament (Barwon) Royal (Ry) Butler MP (Shooters, Fishers and Farmers)	In-person meeting Virtual meeting	To introduce Origin and the Project	Some of the issues raised include: • Perceived lack of transparency around future workforce requirements and workforce housing availability • Request ongoing communication with the local MP office regarding the project and its progress.

Stakeholder	Method	Purpose	Issues raised
Dubbo Regional Council	Virtual meeting Email correspondence	Origin met with Dubbo Regional Council on 17 August to introduce Origin and the Project	Some of the issues raised include: • Community impacts and opportunities • Workforce accommodation • The potential for impact to biodiversity, agricultural activities, land devaluation, roads, increased waste, and waste management • Cumulative impact for the region and lack of effective coordination with EnergyCo.
Warrumbungle Shire Council	Virtual meeting Email correspondence	An email was sent to Council requesting a meeting to discuss the project. A meeting took place virtually on 15 August 2022 to introduce Origin and provide an overview of the Project.	Some of the issues raised include: • Community impacts and opportunities • Workforce shortages (skills and accommodation) • The potential for impact to agricultural activities, land devaluation, roads, increased waste, and waste management • Locally sourced materials for the construction requirements • Cumulative impact for the region and lack of effective coordination with EnergyCo.
Nearby landowners	Notification letter	Twenty notification letters introducing Origin, the proposed Project, and including a request to provide details to the Community Manager for further communication were delivered by an Origin person to letterboxes up to approximately 5 km from the Project area boundary.	No issues raised to date.
Non-associated dwellings located within 2.5 km of the Project area (R6, R7, R8, R91, R10, R11, R12, R13, R14)	Face to face Email correspondence Phone call	To introduce the Project and understand any issues and/or concerns. Attempts have been made to engage with R87 as a non-associated dwelling, and Origin will continue to try to engage.	One neighbour expressed general objection to solar farms in the region and has indicated that companies should lease land rather than purchase. They also raised solar farms should coexist with agriculture. Two neighbours raised concern about visual impacts.

5.3 Ongoing consultation

Following the lodgement of the application and request for SEARs, Origin consultation is expected to include a planning focus meeting with State and local government stakeholders, public information day(s) and ongoing consultation with neighbours and directly affected landowners.

The following community consultation is committed to in the preparation of the EIS:

- Advertising in local media regarding the project and how additional information can be obtained via the website link
- Postal area mail-out to advise of project website and public information session details
- Hosting of at least one public information session during the preparation of the EIS
- Continued direct engagement with involved landholders and property owners
- Collaborate with EnergyCo in local, joint community sessions for efficient consultation related to Origin's Project and the EnergyCo transmission line and CWO REZ wide cumulative impact assessment.

The ongoing input and feedback from consultation would be considered during the design development of the Project and outcomes of consultation would be included in the EIS. The EIS would then be publicly displayed and the opportunity for stakeholder submissions would be made available via the DPE Major Projects website. The community and stakeholder submissions would be considered in a Response to Submissions Report, to outline how submissions have been addressed.

5.4 Identified and anticipated stakeholder issues

Considering the location of the Project within the CWO REZ and other proposed development nearby, it is anticipated that the local community and landowners would raise issues including:

- Visual amenity and landscape changes
- Land devaluation and effects on agricultural use or production
- Biodiversity impacts and vegetation removal
- Aboriginal heritage site impacts
- Community cohesion and social impact
- Community infrastructure impacts and opportunities
- Waste management and locally sourced construction materials
- Cumulative impacts across the REZ.

Future engagement activities would focus on EIS preparation and Project assessment outcomes, with specific aims to:

- Consult proactively with stakeholders to provide as much information as is available, using clear and consistent messaging
- Continue to engage with identified and emerging stakeholders to identify issues and concerns, as well as potential opportunities and mitigation measures for the Project
- Provide opportunities to inform community members, stakeholders, and the public on progress of the Project
- Enable stakeholders to provide input to the preparation of the EIS and Project planning or design where feasible, and to receive feedback on an ongoing basis.

5.5 Aboriginal consultation

The EIS would be accompanied by an Aboriginal Cultural Heritage Assessment Report undertaken in consultation with registered Aboriginal parties. Origin has commenced the process to establish registered Aboriginal parties for the Project and undertake consultation in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010).

6. Proposed assessment of impacts

This chapter outlines matters requiring further assessment in the EIS and the level of assessment that should be undertaken for each matter.

A scoping summary table has been completed in accordance with the State Significant Development Guidelines – Preparing a Scoping Report (DPIE, 2021c) to identify the potential matters associated with the proposed construction and operation of the Project. Each matter and its proposed level of assessment (detailed or standard) is identified in Table 6-1. A scoping summary table has been included in Appendix A.

Table 6-1. Matters requiring further assessment

Level of assessment	Matter
Detailed	Biodiversity
	Heritage – Aboriginal cultural
Standard	Amenity – landscape and visual
	Amenity – noise and vibration
	Heritage – historical
	Access – traffic and transport
	Social and economic impacts
	Land resources – agriculture and soils
	Water resources – flooding and hydrology
	Hazards and risks
	Air quality
	Waste management

The EIS would be prepared in accordance with the SEARs to be issued by DPE in response to this Scoping report, and would incorporate the issues, which have been outlined in Table 6-1 above. All assessments (including specialist assessments) would be completed by taking into consideration consultation with stakeholders and relevant government and industry guidelines.

6.1 Biodiversity

The results of the preliminary and targeted biodiversity assessments undertaken within the Project area (2022) are summarised below and are provided in Appendix B:

- Preliminary Biodiversity Constraints Assessment: This report provides an overview of preliminary biodiversity constraints across the Project area. It included a desktop assessment of existing data and outcomes of field surveys undertaken during May 2022. It was prepared to help inform the indicative solar array design in order to avoid and minimise the potential impacts to biodiversity and offset costs
- Targeted Species Surveys Spring 2022: This report was prepared following the outcomes of the preliminary biodiversity constraints assessment to support the progression of the Project and avoid future delays. It comprised a desktop assessment and outcomes of field surveys undertaken during October 2022. The assessment consisted of:
  - Early consultation with NSW DPE Biodiversity Conservation Science (BCS) division.
  - Targeted species surveys for candidate species (species credit species) that have survey requirements restricted to the Spring period (September- October).
  - Vegetation Integrity (VI) plots to inform vegetation mapping and the land categorisation assessment.

The results of the two assessments are summarised in the section below. Some of the site information gained during the Targeted Species Surveys Spring 2022 has superseded the information detailed in the Preliminary Biodiversity Constraints Assessment. Where there are discrepancies between the two reports, the Targeted Species Surveys Spring 2022 prevails to the extent of the inconsistency. This updated information is summarised in the following sections.

6.1.1 Existing environment

6.1.1.1 Landscape context

The Project area is located at the southern extent of the Brigalow Belt South Interim Biogeographic Regionalisation for Australia (IBRA) region and the Talbragar IBRA sub-region. The Project area is within the NSW (Mitchell) Landscape of the Goonoo Slopes. This landscape is characterised by extensive undulating to stepped low hills with long slopes on sub-horizontal Triassic to Jurassic quartz sandstone, conglomerates, siltstone, shale and some coal (DPIE, 2017).

6.1.1.2 Plant community types

Five Plant Community Types (PCTs) have been preliminarily identified as occurring within the Project area. PCTs are listed in Table 6-2 and the preliminary PCT mapping is shown in Figure 6-1. PCTs vary in condition and patch sizes across the Project area. Areas of native vegetation generally comprise woodland communities in which canopy vegetation is present, albeit sparse.

However, most of the Project area is in low condition pasture which is not consistent with a PCT. VI Plots were used to confirm this, as such, these areas are mapped as 'exotic pasture/cropped lands' (ie. non-native vegetation) due to the lack of, or very low abundance and density, of native species. These areas are also considered 'Category 1-Exempt land' (refer to Section 6.1.1.9).

During the detailed assessment, additional data may influence the change of this preliminary PCT mapping, resulting in other PCTs being assigned and/or the distribution and extent of PCT coverage being changed.

6.1.1.3 Threatened ecological communities

A total of seven Threatened Ecological Communities (TECs) have the potential to occur within the local Project area. From the preliminary PCT mapping, it is likely that two Threatened Ecological Communities (TECs) are present, including:

- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* – listed as Critically Endangered under the BC Act and EPBC Act
- *Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions* – listed as Endangered under the BC Act.

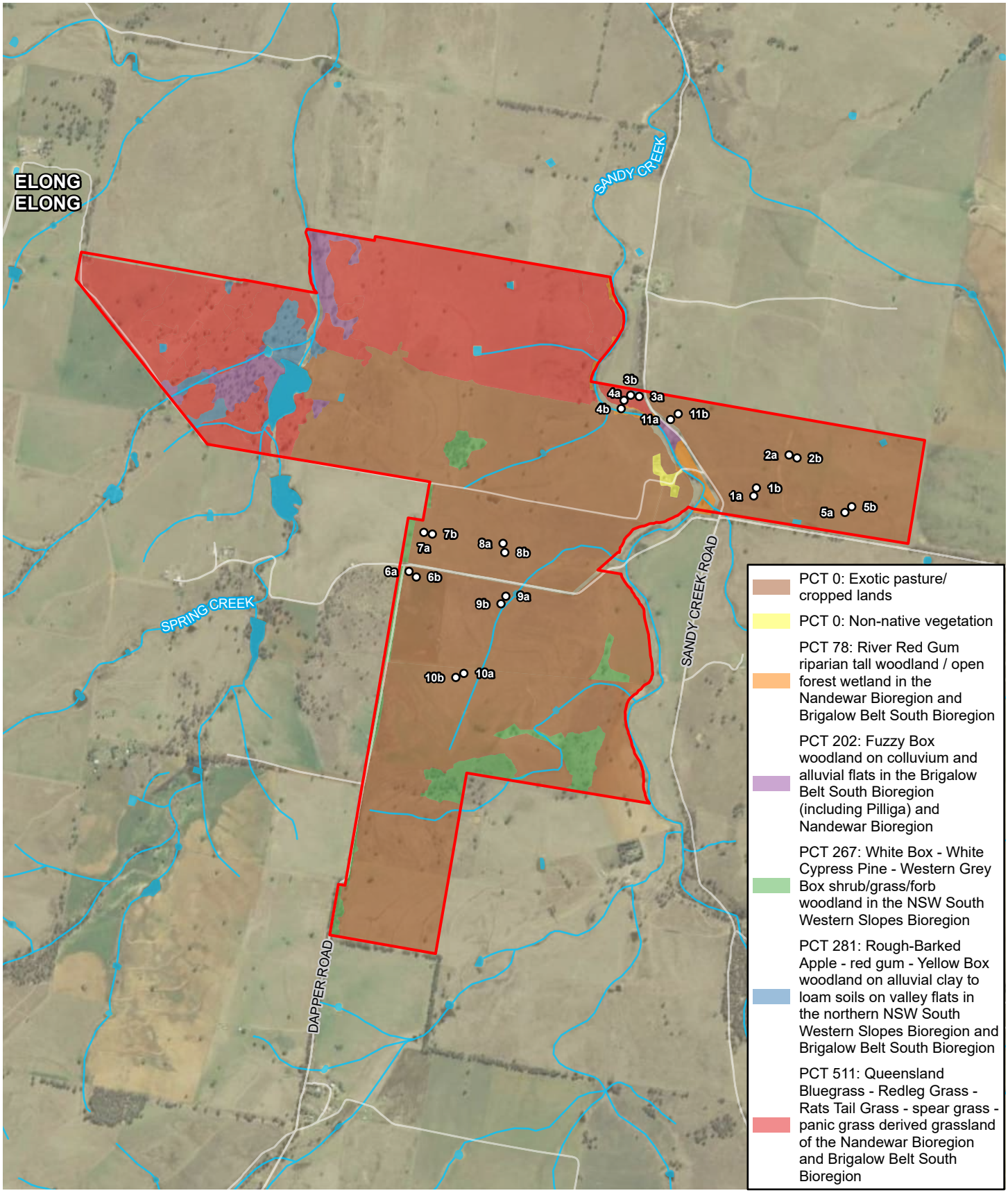
Although most PCTs in the Project area are associated with these TECs, due to the condition of the vegetation and patch size, it is possible that some may not meet the thresholds required for listing under the EPBC Act however (particularly areas of PCT 511), the State listing criteria is much broader and can include highly degraded patches.

Table 6-2. PCTs and associated TECs

PCT ID	PCT	Area and condition**	BC Act TEC	EPBC Act TEC
511	Queensland Bluegrass - Redleg Grass - Rats Tail Grass - spear grass - panic grass derived grassland of the Nandewar Bioregion and Brigalow Belt South Bioregion	186 hectares Low to moderate	*Possible* White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CE)	*Unlikely* White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CE)
202	Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion	18 hectares Moderate	*Likely* Fuzzy Box Woodland on alluvial Soils (E)	-
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	10 hectares Low to moderate	*Likely* White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CE)	*Likely* White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CE)
78	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	57 hectares Low to moderate	-	-
267	White Box – White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion	27 hectares Low to moderate	*Likely* White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CE)	*Possible* Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (E) *Likely* White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CE)
-	Exotic pasture/cropped lands (ie. non-native vegetation)	468 hectares	-	-

*This is considered to the 'worst-case' extent of the PCT. During the detailed surveys, some areas of the grassland paddocks may be re-mapped as exotic grasslands and determined not to be native vegetation communities.

**Some areas that were inaccessible during the field surveys were generally assumed to be in moderate condition / CE: critically endangered, E: endangered



Project area

VI plots

Road

Waterway

Waterbody

In reference to the VI plots, 'a' is the start and 'b' is the end of the plot
The area to the West of Spring Creek has not been subject to ground based surveys due to inaccessibility

0 400 800 m

1:30,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2022
Origin 2022
Department of Planning and Environment 2022
© Department of Customer Service 2020

Figure 6-1 Preliminary PCT mapping and vegetation integrity plots

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Created by : NT | QA by : KD

6.1.1.4 Groundwater dependant ecosystems

The level of water dependence of vegetation communities in the Project area has been identified using the Atlas of Groundwater Dependent Ecosystems (GDE) (BOM, 2022) and the Risk Assessment Guidelines for Groundwater Dependant Ecosystems released by the NSW DPI (Serov et al., 2012). The level of groundwater dependence and potential for interaction for terrestrial PCTs in the Project area is high for PCT 202, 281 and 78 and low for PCT 267 and 511.

6.1.1.5 Wildlife corridors and fauna habitat

There are no formal biodiversity corridors within the Project area, however, there are several reserves and woodland areas within 10 kilometres of the Project area, including:

- Dapper Nature Reserve about 3 kilometres to the south
- Yarrobil National Park about 9 kilometres to the south-east
- Tuckland State Forest about 8 kilometres to the north-east.

Vegetative connectivity to these areas is fragmented, with about 500-800 metre distances across cleared agricultural lands. Patches of woodland vegetation in the Project area can provide habitat and refuge (stepping stones between larger patches of woodland) for several native fauna species (birds, microbats, and large macropods). The creek lines and riparian vegetation also provide important linkages for wildlife movement, aquatic species, and a water resource. Several small stick nests and several hollow bearing trees were identified during the field surveys.

6.1.1.6 Threatened species

The desktop study identified the following threatened and/or migratory species that have potential to occur, or may have suitable habitat, within 10 kilometres of the Project area:

- 56 threatened terrestrial fauna species
- 17 threatened flora species
- 10 listed migratory species (of which some are also threatened species).

During the field surveys, numerous non-threatened fauna species were incidentally observed. The full list of species is provided in Appendix B. The BAM Important Areas Viewer (DPE, 2022a) indicates that there is important *Anthochaera phrygia* (Regent Honeyeater) habitat about 35 kilometres south-east of the Project area. The nearest known flying fox camps are in Dubbo, Wellington and Mudgee, each 40-50 kilometres from the Project area (DAWE, 2022).

Targeted species surveys

Targeted species surveys were undertaken for species which have survey requirements restricted to the Spring period (September-October). Surveys were undertaken over five days in early October 2022 within the Project area, to the east of Spring Creek for the species outlined in Table 6-3.

No targeted threatened species were recorded during the surveys. The Project area to the east of Spring Creek is not considered to be suitable breeding habitat for any of the target bird species.

A small patch (about 0.8 hectares) of low quality rocky habitat was observed in the south of the Project area. This is considered possible habitat for the Pink-tailed Legless Lizard (*Aprasia parapulchella*). Further targeted surveys would be required to confirm the presence of the species. Details of the targeted species surveys are provided in Appendix B.

Table 6-3. Targeted candidate species

Scientific name	Common name	Survey months	Survey method summary
Threatened flora species			
Acacia ausfeldii	Ausfeld's Wattle	Aug-Oct	10m wide walked transects conducted in accordance with 'Survey Guidelines for Australia's Threatened Orchids' (Department of the Environment, 2013) and 'Surveying threatened plants and their habitats' (DPIE, 2020b), as relevant, in suitable PCTs.
Commersonia procumben	-	Aug-May	
Diuris tricolor	Pine Donkey Orchid	Sept-Oct	
Indigofera efoliata	Leafless Indigo	Sept-Oct	
Pomaderris queenslandica	Scant Pomaderris	All year	
Tylophora linearis	-	Oct-May	
Swainsona recta	Small Purple-pea	Sept-Nov	
Swainsona sericea	Silky Swainson-pea	Sept-Nov	
Breeding birds and nest trees			
Hieraaetus morphnoides	Little Eagle	Aug-Oct	Targeted bird surveys, mapping of nest trees and hollow bearing trees was undertaken in suitable breeding habitat, where accessible. This aimed to determine if the targeted breeding bird species were present within the Project area and if there is suitable breeding habitat present. Targeted threatened bird surveys were undertaken in accordance with the 'Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft)' (DEC, 2004a) and Survey guidelines for Australia's threatened birds' (DEWHA, 2010), as relevant.
Hamirostra melanosternon	Black-breasted Buzzard	Sept-Nov	
Polytelis swainsonii	Superb Parrot	Sept-Nov	
Lophoictinia isura	Square-tailed Kite	Sept-Jan	
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Sept-Dec	
Haliaeetus leucogaster	White-bellied Sea-Eagle	July-Dec	
Threatened reptile habitat assessment			
Aprasia parapulchella	Pink-tailed Legless Lizard	Sept-May	Rapid surveys were undertaken to identify areas of potential habitat and classify it into three quality classes (High, moderate, low).

6.1.1.7 Aquatic values

The results of desktop review identified five threatened fish species that have potential to occur, or may have suitable habitat, within 10 kilometres of the Project area. Of these, the Purple Spotted Gudgeon (*Mogurnda adspersa*) (Endangered under the FM Act) has mapped habitat within the Project area.

Key waterways within the Project area include Sandy Creek (3rd order stream) and Spring Creek (2nd and 3rd order stream) are considered Key Fish Habitat and are mapped as having 'very poor' fish community status (DPI, 2022). There are no nationally important wetlands within the locality.

The Biodiversity Values Map and Threshold Tool (DPE, 2022b) maps the extent of Sandy Creek and Spring Creek as well as a wetland within Spring Creek as 'Biodiverse Riparian Land'.

6.1.1.8 Serious and irreversible impact entities

Serious and irreversible impact (SAII) entities are threatened species and communities that are most at risk of extinction from potential development. The following potential SAII entities may occur in the Project area:

Threatened Ecological Communities:

- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*
- *Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.*

Threatened species:

- *Anthochaera phrygia* (Regent Honeyeater)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Indigofera efoliata* (Leafless Indigo)
- *Lathamus discolor* (Swift Parrot)
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat).

Of these SAII entities, the most notable risk is associated with the potential impact to the *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* TEC. Origin has committed to avoid impacts to SAII entities wherever possible and would consider this during the EIS preparation and further design development.

6.1.1.9 Land categorisations

The *Local Land Services Act 2013* (LLS Act) categorises land to determine native vegetation management options for landholders. It assists in identifying where approval is required for impact to vegetation on rural lands. The current mapping is provided in the Transitional Native Vegetation Regulatory Map (DPE, 2022e) and the Draft Native Vegetation Regulatory Map (DPE, 2022c), however, many areas have not yet been published. During the transitional period until the full map is published, land categories are to be determined in accordance with the definitions in the LLS Act.

Part of the Project area is mapped as Category 2 – Vulnerable Regulated Land and therefore requires assessment under the NSW Biodiversity Offset Scheme (BOS). All other areas are not already, therefore an assessment against the criteria has been undertaken to identify the most suitable land categorisation. The assessment generally concluded that (excluding the area that are already mapped as Category 2 – Vulnerable Regulated Land) comprise Category 2 – Regulated Land in native woodland areas, and Category 1 – Exempt Land in areas of 'exotic pasture/cropped land' and 'exotic vegetation'.

This assessment is still to be endorsed by the BCS North West Planning team. Once endorsement is provided, the area approved as Category 1 – Exempt Land are exempt from assessment under the BOS. Details and justification of the land categorisation assessment is provided in Appendix B.

6.1.1.10 Matters of national environmental significance

The results of desktop review identified the following Matters of National Environmental Significance (MNES) that have potential to occur, or may have suitable habitat, within 10 kilometres of the Project area:

- Six TECs
- 15 threatened terrestrial fauna species
- 11 threatened flora species
- Four threatened fish species
- 10 listed migratory species (of which some are also threatened species).

The full list of species is provided in Appendix B. During the detailed assessment as part of the EIS preparation, the above list would be refined with TECs, and species possibly being excluded as more data is collected about the biodiversity values in the Project area (habitat characteristics).

6.1.2 Further assessment approach

The Project area contains various biodiversity constraints relating to the landscape features, vegetation communities and the potential for threatened species to be present. The current indicative footprint is located in the most suitable location to avoid and minimise biodiversity impacts and offset obligations, as it is primarily located on low condition vegetation which has been subject to historical disturbance.

A summary of the key constraints within the Project area are summarised below, and should be considered in terms of direct and potential indirect impacts:

- Possible occurrence of four TECs, including two listed under the BC Act and two under the EPBC Act
- Potential occurrence of 78 threatened species (including 56 terrestrial fauna species, 17 flora species and five fish species) and 10 migratory species (some of which are also threatened species) listed under the BC Act and/or EPBC Act
- Riparian areas (including drainage lines), Groundwater Dependant Ecosystems, Key Fish Habitat and potential threatened fish habitat
- Locally significant fauna habitat, including hollow bearing trees and patches of woodland for fauna refuge and connectivity to larger areas of vegetation
- Offset obligations for unavoidable biodiversity impacts.

The proposal would require assessment under the NSW BOS and the preparation of a BDAR to support the EIS. Estimated survey effort for the BDAR is provided in Table 6-4. The estimate is in accordance with the Biodiversity Assessment Method (BAM) (DPIE, 2020a) and is based on the results of the preliminary assessment. The required survey timing of potential candidate species is provided in Appendix B.

Table 6-4. Estimated survey effort for BDAR

Type of assessment	Estimated survey effort	Time of year
Vegetation integrity	About 25-35 BAM plots	All year
Terrestrial and aquatic habitat survey	3 days (diurnal)	All year
Targeted species surveys: birds (breeding)	5 days (diurnal, nocturnal)	Winter (Jun-Aug)
Targeted species surveys: flora, reptiles, birds (breeding)	10-15 days (diurnal)	Spring (Sept-Oct) (complete)
Targeted species surveys: flora, reptiles, arboreal mammals, microbats, birds (breeding)	10-15 days (diurnal, nocturnal)	Summer (Nov-Jan)

A EPBC Act referral may be required for potential impacts to MNES, however further assessment is required to determine if significant impacts on MNES are likely. An EPBC Act referral would be submitted to the Commonwealth DCCEEW depending on the findings of further targeted surveys across the Project area as part of the BDAR. The referral would consider whether the Project would significantly impact MNES, including to threatened species and communities, and whether the Project is considered to be a 'controlled action'. If the Project is determined to be a 'controlled action', approval under the EPBC Act will be required.

6.2 Aboriginal heritage

6.2.1 Existing environment

The Project area is predominately located across the Ballimore Soil Landscape which is characterised by undulating low hills and gently inclined slopes. The Ballimore Soil Landscape features open-woodland dominated by a Grey Box-Fuzzy Box association. Grey Box is dominant on upper slopes with Fuzzy Box on lower slopes. White Cypress Pine dominates on ridges with shallow soils. The central portion of the Project area contains the Mebul Soil Landscape, characterised by undulating low hills. The native vegetation for the Mebul Soil Landscape consists of tall woodland with White Box on upper slopes and Yellow Box along drainage lines and in valleys.

The land surrounding the Project area has historically been used for dryland cropping of wheat, canola and oats, as well as pasture for grazing of cattle and sheep producing prime lambs and wool. Only rocky ridges or hills retain native forest vegetation. The area has been subject to moderate sheet erosion and gully erosion, with surface soils often structurally degraded under cultivation and heavy stocking.

The Ballimore Soil Landscape is generally comprised of a deep sediment deposit, and it is possible that subsurface Aboriginal objects are present in this landscape. However, the presence and survivability of Aboriginal objects is dependent on the presence of archaeological sensitive landforms and the nature and extent of ground disturbing activities that have occurred. The Mebul Soil Landscape is predominantly comprised of soil which has formed in-situ from the degradation of the basal bedrock. As a result, it is unlikely that subsurface archaeological deposits will be associated with the Mebul Soil Landscape. However, Aboriginal objects may be present on the ground surface.

Particular landforms in NSW are known to have been favoured locations for repeated or long-term human occupation and hence, more likely to retain archaeological evidence of past Aboriginal use. In accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW, 2010:12), land within 200 metres of waterways is considered to be archaeological sensitive. Sandy Creek and its associated tributaries are located within the Project area and as a result, the Project area is located on an archaeologically sensitive landform which may contain Aboriginal objects.

6.2.1.1 AHIMS search

Known Aboriginal objects are recorded on the Aboriginal Heritage Impact Management System (AHIMS) and Aboriginal Places are recorded on the Aboriginal Place Atlas. Items of state significance for Aboriginal and shared heritage values are recorded on the State Heritage Inventory. An extensive search of the AHIMS database was undertaken on 8 April 2022. A total of 21 registered sites were identified by the AHIMS search. AHIMS lists 20 standard site features that can be used to describe a registered site, and more than one feature can be used for each site. For the 21 sites within the search area, five site features were recorded. The frequency of recorded site types is summarised in Table 6-5.

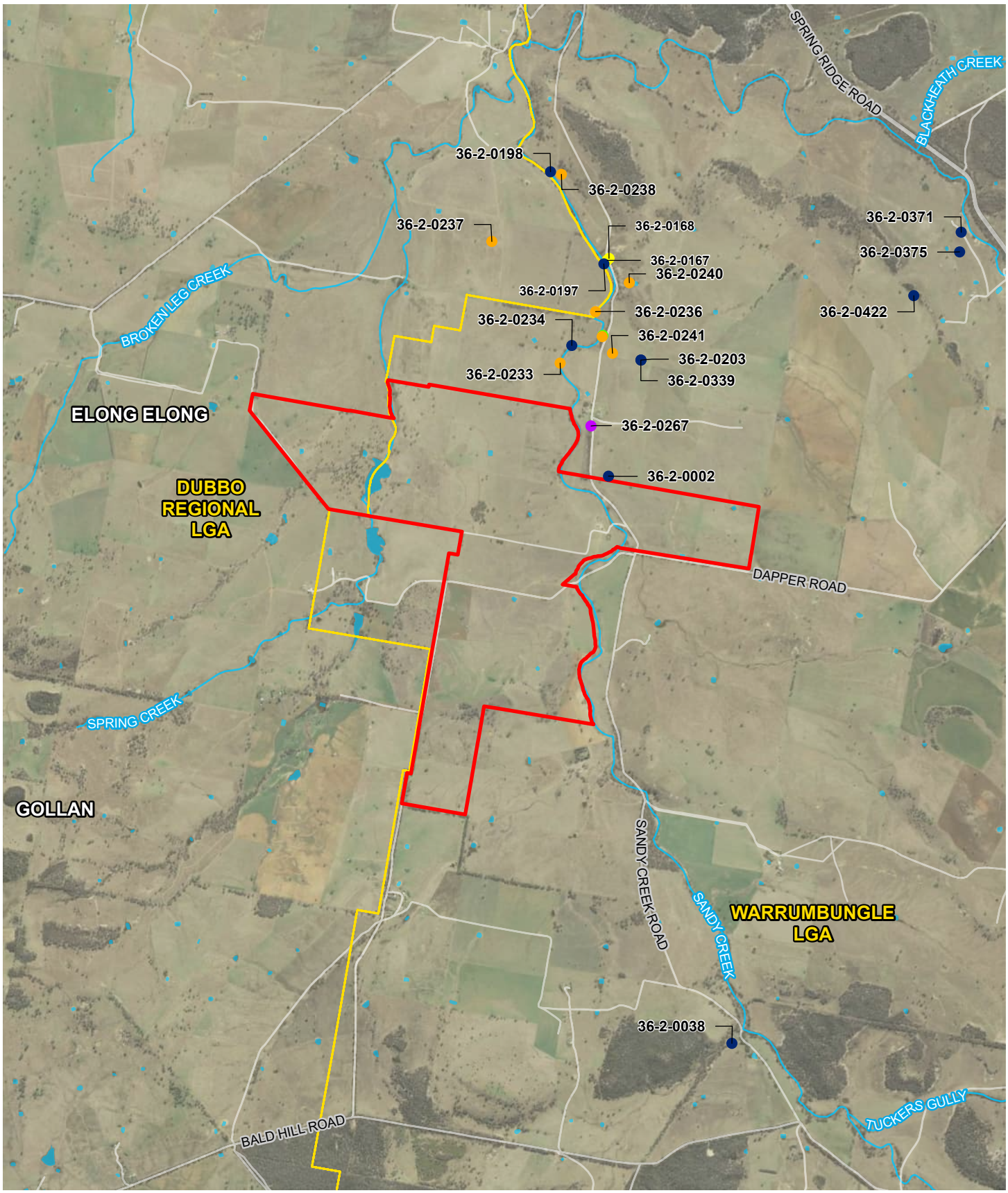
Stone artefacts, potential archaeological deposit (PAD), grinding grooves, hearths and scarred trees have been identified within the AHIMS search area. No AHIMS registered sites are located within the Project area. The distribution of recorded sites near the Project area is shown in Figure 6-2. The closest AHIMS registered site (AHIMS ID 36-2-0267) is located 120 metres to the east of the Project area. There are also no registered Aboriginal Places and no items listed on the State Heritage Register in the vicinity of the Project area.

Table 6-5. Frequency of AHIMS site features

Site feature	Frequency	Percentage
Artefact	10	47.62%
Artefact, Potential Archaeological Deposit (PAD)	7	33.33%
Grinding Groove	2	9.52%
Modified Tree (Carved or Scarred)	1	4.76%
Hearth	1	4.76%
Total	**21**	**100.00%**

The nature and location of the registered sites reflects the past Aboriginal occupation from which they derive, but is also influenced by historical land-use, and the nature and extent of previous archaeological investigations. Although Aboriginal occupation covered the whole of the landscape, the availability of fresh water, and associated resources were significant factors in repeated and long-term occupation of specific areas within the landscape.

Certain site types, such as culturally modified trees, are particularly vulnerable to destruction through historical occupation, while others, such as stone artefacts, are more resilient. The majority of recorded sites are associated with access tracks, roads and areas with high surface visibility. It is likely that the distribution of the sites is the result of the limitations of archaeological survey and additional sites may be present in areas of low ground surface visibly. Several recorded sites are associated with Sandy Creek north of the Project area, supporting the assumption that land within 200 metres of water is archaeologically sensitive.



Project area

AHIMS sites
- Artefact
- Artefact, Potential Archaeological Deposit (PAD)
- Grinding Groove
- Hearth
- Modified Tree (Carved or Scarred)

Waterway
Waterbody
Local Government Area

0 1 2 km

1:50,000 at A4
GDA 1994 MGA Zone 55

Data sources
Jacobs 2022
Origin 2022
Department of Planning and Environment 2022
Department of Premier and Cabinet 2022
© Department of Customer Service 2020

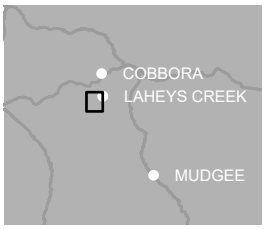


Figure 6-2 AHIMS sites near the Project area

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6.2.1.2 Native Title search

The *Native Title Act 1993* (Cth) recognises and protects Native Title in Australia. The National Native Title Tribunal (NNTT) maintains the following registers:

- National Native Title Register
- Register of Native Title Claim
- Unregistered claimant applications
- Register of Aboriginal land use agreements.

A search of the NNTT registers was completed on 12 April 2022. There are no Native Title claims currently registered within or near the Project area. The *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a) stipulates that consultation must be conducted with Native Title holders or registered Native Title claimants.

6.2.1.3 Preliminary predictions

Predictive models are important in providing assessments on the most likely areas of archaeological potential within a given area. These models also indicate the likely types of archaeological evidence, if present, with a given locations and / or subject site. The predictive model comprises a series of statements about the nature and distribution of evidence of Aboriginal land use that is expected in the Project area. These statements are based on the information gathered regarding:

- Landscape context and landform units
- Historical descriptions of Aboriginal land use
- Historical disturbance and landscape modification
- Results of previous archaeological work in the vicinity of the subject site
- Historical accounts of Aboriginal occupation, and landscape character
- Predictive modelling proposed in previous archaeological investigations.

Based on the results of desktop assessment the most common Aboriginal site types likely to be identified in the Project area include:

- Grinding grooves – these sites occur on sandstone outcroppings usually along waterways, swamps, or water pans. The presence of these sites will be dependent on the availability of suitable sandstone sources
- Stone artefact – the visibility of these sites is dependent on surface visibility and exposure and are affected by the nature of the soil landscape
- Scarred Trees – these require the presence of mature native trees and are likely to be concentrated along major waterways and around swamps areas. There are patches of remnant vegetation and isolated old growth trees within the Project area. Therefore, this feature is likely to occur
- Hearths/Ovens – generally identified by burnt clay or stone used for heat retainers. Some are recorded in the district in association with resource locations. However, they could occur either independently or in association with other Aboriginal cultural features such as campsites. While it is possible for this feature to occur, it is likely they have been disturbed or previously destroyed by farming and irrigation activities.

Background research has identified that the Ballimore Soil Landscape is considered to have sensitivity to contain subsurface Aboriginal objects. In addition, areas where native vegetation is present have been assessed as having moderate potential to contain Aboriginal objects as this may be an indicator of location where old trees with cultural modification may be present. These areas may also indicate less ground disturbance and high potential for Aboriginal objects to be present. All land located within 200 metres of a water source is considered to have high potential to contain Aboriginal objects.

Background research completed for this assessment resulted in the development of several predictive statements that would be verified by field investigation during the EIS phase:

- It is likely that scarred trees would be present within the Project area at locations where native vegetation has not been subject to historical land clearance

- Stone artefacts would likely be identified within close proximity to existing roads due to increased surface visibility and exposure facilitating high survey efficiency
- Aboriginal objects would likely be located within 200 metres of major/permanent waterways
- Locations associated with Ballimore Soil Landscape are likely to contain deposits (up to approximately 800 millimetres deep) that have the potential to contain Aboriginal objects.

6.2.2 Assessment approach

An Aboriginal Cultural Heritage Assessment Report (ACHAR) would be prepared as part of the EIS and would consider the archaeological potential of the Project area. The ACHAR would involve:

- Assessing the Aboriginal archaeological potential within the Project area and identifying relevant Aboriginal sites
- Carrying out consultation with relevant Aboriginal parties in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010a)
- Carrying out field inspection with members of the local Aboriginal community to identify and record any Aboriginal objects or places within and surrounding the Project area
- Identifying the potential for the Project to disturb Aboriginal archaeological objects including any previously unidentified objects, and assessing the extent and significance of impacts to Aboriginal heritage
- Identifying appropriate measures to avoid, minimise and/or mitigate potential impacts to Aboriginal heritage.

6.3 Landscape character and visual amenity

6.3.1 Existing environment

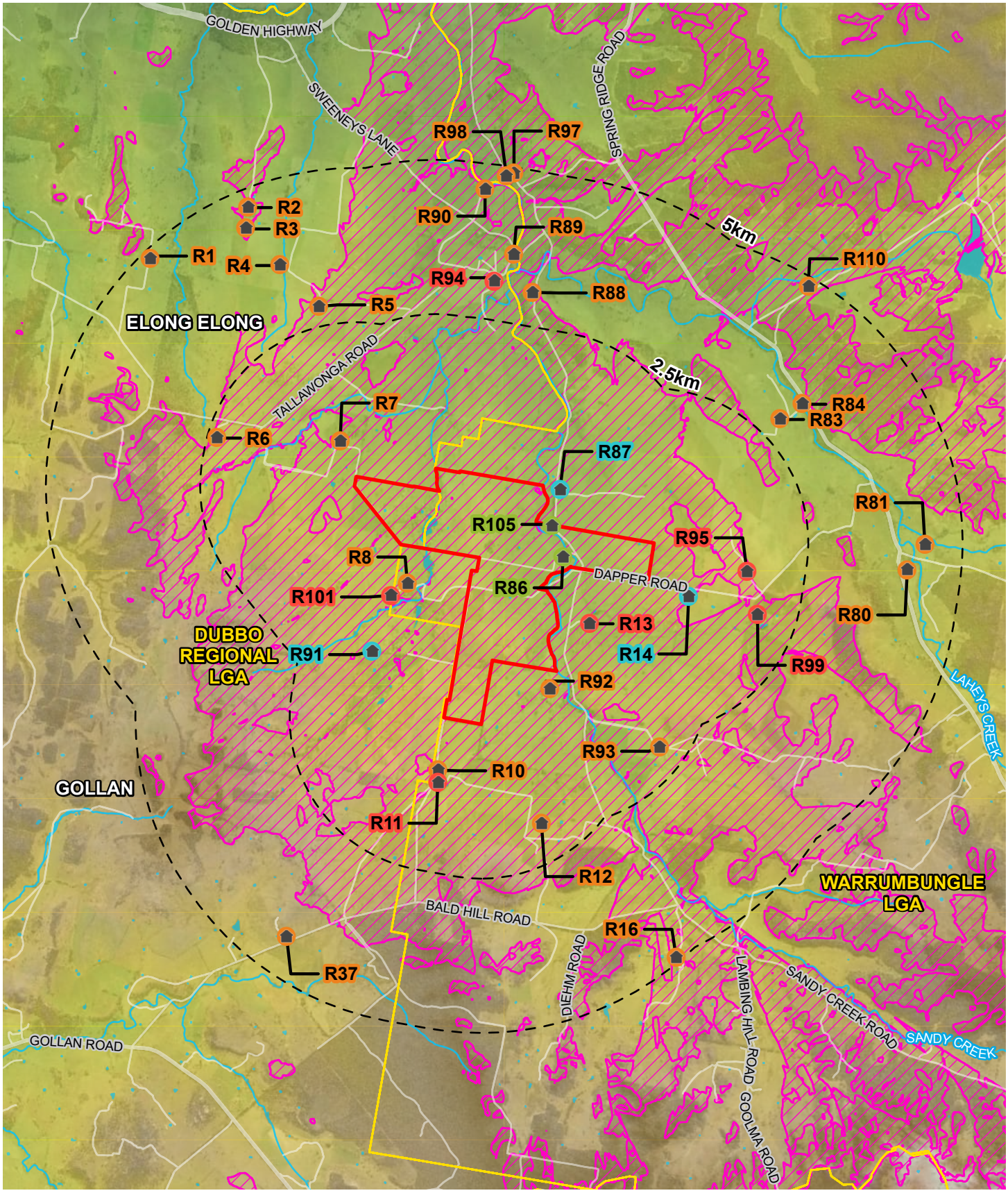
The landscape within and surrounding the Project area is dominated by flat to gently undulating agricultural land, with scattered farm dams, farm structures and residences scattered across the area. The Project area intersects Spring Creek on the western side and Sandy Creek on the eastern side. Taller trees such as *Angophora floribunda* (Rough-Barked Apple) and *Eucalyptus camaldulensis* (River Red Gum) are dotted across the Project area, mainly around the frontage to the creeks, as well as along Sandy Creek Road where the vegetation provide occasional screening of views along the road and further to the east of the Project.

The Project is located on land wholly owned by Origin, therefore the current list of dwellings associated with the Project are also owned by Origin and would not be occupied by private residents. Dapper Union Church (R105) is located near the northern extent of the Project area boundary at Sandy Creek Road, under the current lease agreement cannot be occupied. Figure 2-2 shows dwellings in the surrounding areas and indicates whether they are associated with the Project or non-associated. Dapper Road intersects the centre of the Project area in the east-west direction and users of this road would have views of the Project. Both Dapper Road and Sandy Creek Road are predominantly used and accessed by local landowners and nearby rural dwellings with limited public road users as they are unsealed tracks.

The northern boundary of the Project area borders the proposed Sandy Creek Solar Farm, where at least one identified dwelling north of the Project would become an associated dwelling of the Sandy Creek Solar Farm project. In addition, at least five associated dwellings for the proposed Spicers Creek Wind Farm are located south-west of the Project area, about 1.5 kilometres from the southern extent of the Project area boundary. Should Sandy Creek Solar Farm and/or Spicers Creek Wind Farm be approved and constructed, they could both lead to cumulative visual impacts with the Project during construction and operation phases.

A preliminary visual impact assessment was undertaken using Geographical Information System (GIS) mapping and viewshed analysis. The viewshed analysis identified areas from which the Project once constructed may be visible, based on terrain only (refer to Figure 6-3). The viewshed shown in Figure 6-3 accounts for topography but does not include other intervening factors such as built structures and existing vegetation screening.

The viewshed analysis identified a total of 17 receivers, of which five are farm sheds and farm structures, within the 2.5 kilometre buffer of the Project area boundary which may have views of the Project once constructed. The Project would be expected to have varying levels of visibility from these receiver's, as the undulating topography and screening vegetation may help reduce this visibility. Not accounting for existing structures or vegetation, the analysis identified a total of 26 receivers (including farm sheds) within a 5 kilometre buffer of the Project area boundary which may have views of the Project (refer to Figure 6-3). Further detailed landscape and visual assessment prepared as part of the EIS would examine individual viewpoints from identified receivers (associated and non-associated dwellings).



Project area
Project area buffer
Zone of theoretical visibility

Sensitive receiver
Associated dwelling
Non-associated dwelling (occupied)
Non-associated dwelling - Unoccupied
Non-associated dwelling - Unoccupied structure (shed or yard)

Road
Waterway
Waterbody
Local Government Area

Elevation (m)
660.00
320.46

0 2 4 km

1:85,000 at A4

GDA 1994 MGA Zone 55

N

Data sources

Jacobs 2022
Origin 2022
Department of Planning and Environment 2022
© Department of Customer Service 2020

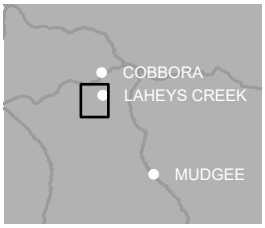


Figure 6-3 Viewshed

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6.3.2 Assessment approach

A Landscape Character and Visual Impact Assessment (LCVIA) would be prepared as part of the EIS, which would include detailed assessment of potential visual impacts on receivers near the Project. The LCVIA would be in accordance with the Large-Scale Solar Energy Guideline (DPE, 2022d) and would involve the following:

- Field investigations to identify and assess the landscape character and viewsheds surrounding the Project area, including identifying visually sensitive receivers with consideration of local topography, relative distance, and potential screening vegetation
- Carrying out consultation with potentially affected landowners near the Project and other relevant stakeholders
- Determining the sensitivity of the existing viewpoints and visual receivers inclusive of photomontages
- Assessing potential visual impacts upon the viewpoints and receivers, considering the sensitivity of receivers and magnitude of impacts
- Assessing potential Project impacts on landscape character
- Assessing potential impacts associated with glare, reflectivity, and night lighting
- Assessing potential cumulative visual impacts associated with nearby major projects
- Outlining mitigation measures to reduce potential landscape and visual impacts, including preparing a preliminary landscape plan to identify any planting required for the Project.

6.4 Noise and vibration

6.4.1 Existing environment

Land use in the Project area and surrounds is predominantly agricultural. Given the Project's rural setting, background noise at nearby sensitive receivers is likely to be low and characterised by natural noise sources such as from birds or livestock, as well as agricultural equipment and machinery noises associated with agricultural production activities and vehicle movements. Vehicle movements along the local roads of Dapper Road and Sandy Creek Road would also contribute to the background noise.

The construction of the Project has potential to create noise impacts for surrounding landowners and users of local roads. No sensitive receiver dwellings are located within the Project area. The Dapper Union Church is the closest sensitive receiver structure, located on the south-eastern boundary of the Project area. Noise generated by the Project would include construction noise, and noise generated by increased traffic along the local road network.

During the operational phase of the Project, noise generation is anticipated to be minimal, consisting of noise associated with vehicle movements within the Project area and electrical infrastructure such as transformers, PCUs and the substation, as well as the tracker motors on solar arrays. The potential for cumulative noise impacts associated with nearby proposed developments such as the Sandy Creek Solar Farm and Spicers Creek Wind Farm would also be considered in further design development of the Project and assessed as part of the EIS.

6.4.2 Assessment approach

A Noise and Vibration Impact Assessment (NVIA) would be prepared as part of the EIS in accordance with guidelines including the NSW Noise Policy for Industry (EPA, 2017), Interim Construction Noise Guideline (DECC, 2009), NSW Road Noise Policy (DECCW, 2011) and Assessing Vibration: A Technical Guideline (DECC, 2006). The NVIA would involve:

- Establishing the relevant levels of background noise using minimum noise levels specified in the NSW Noise Policy for Industry
- Undertaking predictive noise modelling for the Project's construction and operational activities including am and pm hours
- Assessing the road traffic noise impacts during construction
- Assessing potential vibration impacts at sensitive receivers nearby
- Assessing potential cumulative noise impacts associated with nearby major projects
- Outlining mitigation measure to reduce potential noise and vibration impacts.

6.5 Historical heritage

6.5.1 Existing environment

A search of the available historical heritage databases was carried out on 10 May 2022 including:

- Warrumbungle LEP
- Dubbo LEP
- Australian Heritage Database, which includes places in the World Heritage List, the National Heritage List, Commonwealth Heritage List, Register of the National Estate, and places under consideration for any of the listings
- NSW State Heritage Inventory mapping tool, which includes listed Aboriginal Places, the State Heritage Register, and the Interim Heritage Order.

There are no National, State or local listed heritage items identified within the Project area. The closest listed heritage item is Pineview Homestead and Woolshed, listed under the Mid-Western Regional Local Environmental Plan 2012, located about 10 kilometres south of the Project area. Dapper Nature Reserve is listed on the Register of the National Estate (non-statutory archive), located about 4.2 kilometres south of the southern extent of the Project area.

6.5.2 Assessment approach

There is potential for previously unreported heritage items associated with historical agricultural land use to be located within the Project area. A Historical Heritage Impact Assessment (HHIA) would be carried out as part of the EIS, which would include further database and desktop research, consideration of potential heritage values, analysis of historical aerial imagery and site inspection of the Project area. Stakeholder consultation with Heritage NSW and relevant stakeholders would also be carried out during the EIS and in the event that items of potential heritage values are identified.

6.6 Traffic and transport

6.6.1 Existing environment

The Project area would be accessed via the Golden Highway via Spring Ridge Road, Sandy Creek Road or Dapper Road. The Golden Highway is an approved B-double transport route. Spring Ridge Road is a sealed Council owned local road. Other local roads are unsealed Council-owned roads with minimal through traffic and are used primarily to access the agricultural landholdings and scattered rural residences in the locality.

6.6.2 Assessment approach

The Project is expected to generate significant levels of traffic during the construction phase related to the movement of construction workers and the delivery of materials, plant and equipment. Temporary disruption to traffic on Dapper Road and Sandy Creek Road, access track or intersection upgrades, and an overall increase in local traffic volumes would impact on the community in the immediate vicinity as well as road users passing through the area.

Potential cumulative traffic impacts associated with the proposed Sandy Creek Solar Farm, Cobbora Solar Farm and Spicers Creek Wind Farm could also arise should any of the projects overlap during construction phases. A Traffic and Transport Impact Assessment would be prepared as part of the EIS, which would involve the following:

- Characterising existing road network, including the existing road widths and the condition of the road surface, existing road capacity (or 'level of service'), daily and peak traffic volumes (considering the peak holiday period and at other times of the year), and the proportion of light and heavy vehicle traffic movements
- Consultation with Transport for NSW and any surrounding receivers or potential receivers which may be impacted by changes to traffic

- Reviewing key intersection performance on designated construction access routes and document relevant accident history and safety requirements
- Describing expected traffic movements during the relevant project stages, including the maximum and average light and heavy vehicle traffic movements travelling to the Project area
- Assessing potential traffic, transport and access impacts associated with the construction and operational phases of the Project
- Outlining mitigation measures to minimise identified potential traffic and transport impacts of the Project.

6.7 Socio-economic impacts

6.7.1 Existing environment

The area of social influence for the Project would include the sensitive receivers adjacent to the Project area, as well as the following Australian Bureau of Statistics (ABS) geographic regions:

- LGAs of Warrumbungle Shire, Dubbo Regional and Mid-Western Regional
- Suburb and Localities (SAL) of Elong Elong, Goolma, Dunedoo, Gollan, Spicers Creek
- Townships with accommodation options within a one-hour drive of the Project, including Dubbo, Dunedoo, Gulgong, Wellington and Mudgee.

It is anticipated that the landowners and local community closest to the Project would be most likely to experience social-economic impacts as a result of the Project. The communities in Dubbo Regional and Mid-Western Regional are also likely to experience direct and indirect social and economic impacts associated with the construction workforce and accommodation during the construction of the Project.

It is recognised that cumulative socio-economic impacts may be significant as a result of the concentration of renewable development within the CWO REZ, much of which may be outside the control of Origin. The baseline social and economic profile for regions can be obtained from key demographic indicators in the 2021 ABS Census (ABS, 2021). Key demographic characteristics relating to communities surrounding the Project area are provided in Table 6-6.

Table 6-6. Select demographic characteristics from 2021 ABS Census for communities near Project area

Indicator	Elong Elong SAL	Goolma SAL	Dunedoo SAL	Gollan SAL	Spicers Creek SAL	Warrumbungle Shire LGA	Dubbo Regional LGA	Mid-Western Regional LGA	NSW
Population (2021)	142	95	1,097	109	55	9,225	54,922	25,713	8,072,163
Median age (2021)	43	54	51	40	51	50	36	42	39
Private dwelling number (2021)	68	58	602	48	22	4,711	22,693	12,207	3,357,785
Median weekly household income (2021)	$1,145	$1,291	$985	$1,562	$1,125	$1,068	$1,597	$1,486	$1,829
Median weekly rent (2021)	$250	$400	$200	$200	$150	$200	$300	$330	$420
Unemployment rate (2021)	0.0%	-	4.9%	0.0%	-	6.1%	3.6%	4.0%	4.9%
Top occupation (2021)	Managers (23.8%)	-	Managers (28.1%)	Managers (40.3%)	-	Managers (25.9%)	Professionals (18.4%)	Technicians and Trades Workers (17.5%)	Professionals (25.8%)
Top industry of employment (2021)	Sheep Farming (Specialised) (12.7%)	-	Combined Primary and Secondary Education (7.0%)	Beef Cattle Farming (Specialised) (13.9%)	-	Beef Cattle Farming (Specialised) (8.6%)	Hospitals (except psychiatric hospitals) (5.4%)	Coal Mining (14.7%)	Hospitals (except psychiatric hospitals) (4.2%)

Source: (ABS, 2021)

To understand the community which would likely be the most affected by the Project, Origin has carried out early engagement with Federal and State elected representatives, Warrumbungle Shire Council, Dubbo Regional Council and introduced Origin to nearby landowners. The outcomes of early consultation and preliminary consideration of potential social and economic issues have been incorporated into the SEIA Scoping Worksheet (refer to Appendix D). A summary of the potential socio-economic impacts associated with the Project are provided in Table 6-7.

Table 6-7. Preliminary scoping of socio-economic issues

Potential opportunities	Potential impacts
Construction	
• Local employment and training opportunities for construction workers, including apprentices • Local procurement of services and materials, including accommodation, hospitality, trades, and construction, which can benefit local businesses • Local roads upgrade or improved access to private properties.	• Construction noise in Project area and from construction traffic movements impacting amenity for nearby dwellings and road users • Perceived or actual increase in road safety risks and potential disruptions to local traffic and access • Changes to local population composition due to influx of construction workers could raise concerns about social behaviour and social cohesion • Construction workforce requirement for temporary accommodation options could limit availability for other visitors and local residents • Increased demand for social infrastructure, including emergency services.
Operation	
• Development of Agri-solar as part of the Project could benefit agricultural productivity and co-locate solar farm with grazing activities • Local employment or training opportunities in the long term for operational staff • Establishment of a community benefit fund • Financial contributions to associated landowners and/or as part of the neighbour benefit program, which can support community cohesion and community initiatives	• Changes to the landscape and visual amenity and potential operational noise impacts which could affect amenity for nearby private properties • Local community is concerned about the impacts of market competition over land, and changes to land use and land values as a result of cumulative renewable energy and transmission projects being developed in the region • Potential changes of fire risk and safety, emergency management and accessibility as a result of the Project • Changes to sense of place and sense of community as a result of the Project and other nearby proposed energy projects • Impacts on long-term workforce and employability in the region following the construction period of the Project.

6.7.2 Assessment approach

A Socio-Economic Impact Assessment (SEIA) would be prepared as part of the EIS, which would include continued community and stakeholder consultation to understand and assess potential socio-economic benefits and adverse impacts of the Project. The SEIA would involve:

- Desktop assessment of relevant ABS Census data and other relevant sources of demographic and economic information, as well as a review of relevant strategic planning policies and documents
- Defining and understanding the SEIA study area and the socio-economic baseline
- Assessing potential social and economic impacts (both positive and negative) on local and regional communities associated with the construction and operation of the Project

- Assessing potential cumulative socio-economic impacts on local and regional communities as a result of nearby major projects
- Evaluating the level of significance of identified impacts
- Identifying mitigation measures to minimise potential socio-economic impacts and maximise benefits and how Origin can best contribute to management of cumulative social impacts.

6.8 Land resources

6.8.1 Existing environment

Land within and surrounding the Project area have been subject to clearing associated with historical and current agricultural land uses and is predominantly used for grazing and cropping activities. Land use in the region within the LGAs are also similarly agricultural, with some areas of nature conservation and reserves. The Project area intersects Crown waterways, namely Spring Creek and Sandy Creek. The Project area does not intersect any Crown roads (refer to Figure 2-1).

The Project area is zoned RU1 Primary Production under the Dubbo LEP and Warrumbungle LEP (refer to Figure 2-1). Land in the Project area is mapped as Land and Soils Capability (LSC) Class 3 under the NSW Land and Soil Capability Assessment Scheme (OEH, 2012) (refer to Figure 6-4). LCS Class 3 is considered high capability land able to sustain high-impact land uses such as cropping with cultivation (DPE, 2021). For LSC Class 3, careful management is required for cropping and intensive grazing to avoid land and environmental degradation.

The Project area is predominantly located on the Ballimore and Mebul soil landscapes. Both of these soil landscapes are noted to present high erosion hazard and the occurrence of sodic, tunnelling and gully susceptible soils. The Ballimore soil landscape dominates the Project area is associated with chromosols and also has high erosion hazard under cultivation, with surface soils structurally degraded and low in organic matter (Murphy & Lawrie, 1998a). These soils would need to be carefully managed during construction and ground-disturbing activities associated with the Project, including to minimise runoff and erosion during development. No acid sulfate soils are mapped within or in the vicinity of the Project area.

The Mebul soil landscape, associated with dermosols are concentrated near the centre of the Project area and where Spring Creek intersects the Project, and the landscape is noted to have high erosion hazard under cultivation and low surface cover, as well as high shrink-swell potential (Murphy & Lawrie, 1998b). The area mapped as Mebul soils landscape and two smaller patches of land in the southern extent of the Project area are also mapped as BSAL (refer to Figure 2-1), indicating areas of higher quality soil and water resources capable of sustaining high levels of productivity. The Project area is also mapped within the Draft State Significant Agricultural Land map being developed by DPI.

There are no exploration or mining titles or applications relevant to the Project area and there are no Mine Subsidence Districts within or near the Project area. The Project would be wholly located on land owned by Origin; therefore Origin would be the host landholder and no other properties would be directly affected or required for hosting Project infrastructure.

6.8.2 Assessment approach

A Land and Soils Impact Assessment (LSIA) would be prepared as part of the EIS and would assess potential erosion risks associated with the Project area, land use and strategic agricultural land. The assessment would include ways to minimise land use conflict risks during construction and operation of the Project and would be in accordance with Large-Scale Solar Energy Guideline (DPE, 2022d). The assessment would involve the following:

- Origin has commenced soil sampling and survey to determine the soil characteristics and to verify the agricultural capability and LSC class of the land in accordance with the Large-Scale Solar Energy Guideline (DPE, 2022d) and the Land and Soil Capability Assessment Scheme (OEH, 2012)
- Completing a Land Use Conflict Risk Assessment (LUCRA) in accordance with the LUCRA Guidelines (DPIE, 2011)

- Undertaking a Level 3 – Detailed level of assessment (pending verification from the soil survey), should the Project be confirmed to be located on rural zone land mapped as LSC Class 3 and BSAL in accordance with Appendix A Large-Scale Solar Energy Guideline (DPE, 2022d)
- Outline strategies to minimise and mitigate potential impacts on agricultural land and minimise land use conflict.

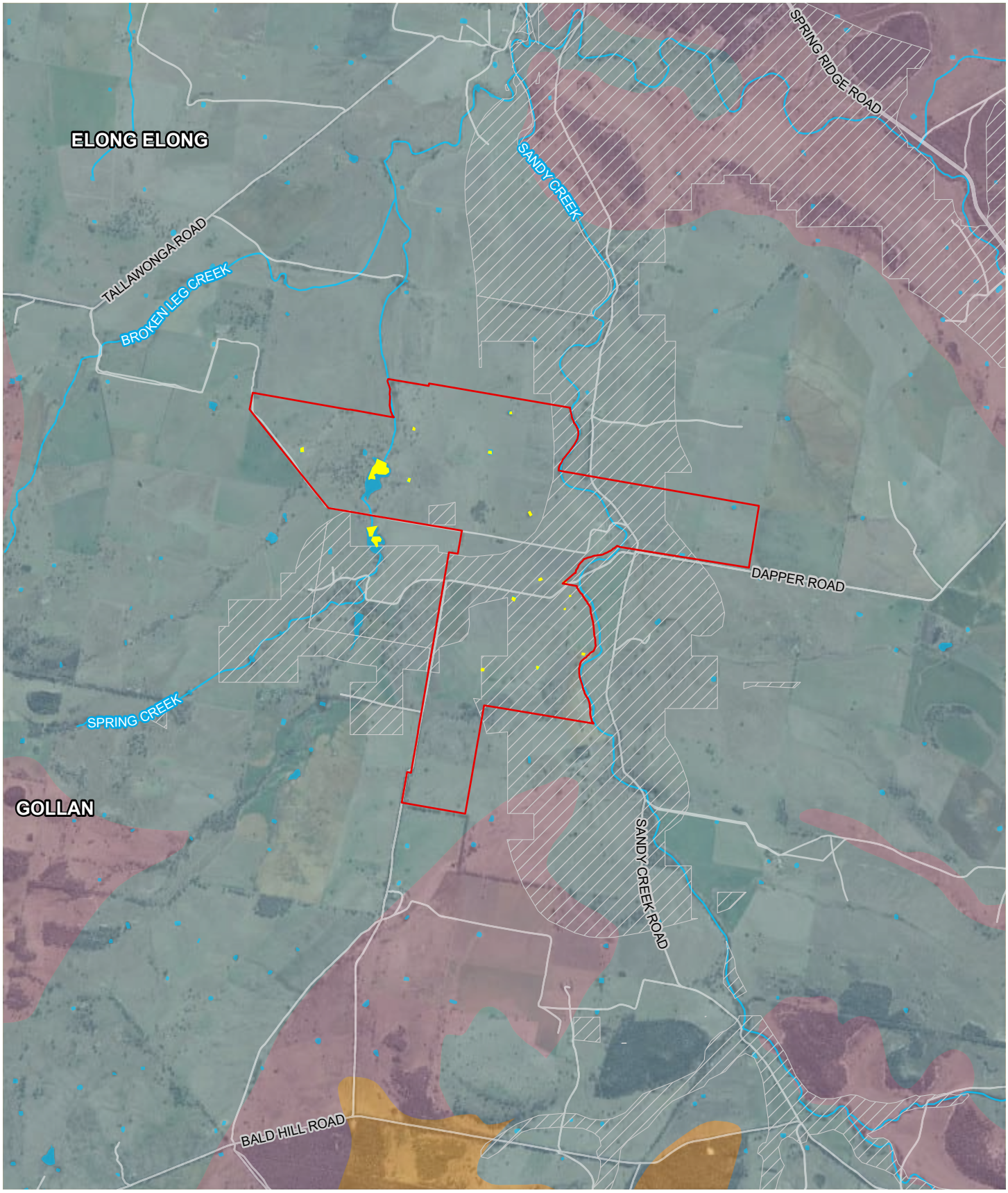

Figure 6-4 Land resource characteristics

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6.9 Water resources

6.9.1 Existing environment

The Project area is located within the Macquarie-Bogan River Catchment. Spring Creek, Sandy Creek and smaller unnamed water courses flow through the Project area in a general northern direction. Spring Creek joins Sandy Creek about 3.6 kilometres north of the Project area, and Sandy Creek eventually flows into the Talbragar River about 11 kilometres north of the Project area. There are numerous small farm dams within the Project area with the largest three farm dams located on the western side along Spring Creek (refer to Figure 6-4).

Based on a review of the Dubbo LEP and Warrumbungle LEP, the Project area is not mapped within any flood planning areas or mapped as flood prone land, however Origin has commenced flood modelling for the Project area to confirm whether it is flood prone. Both LEPs indicate the south-eastern section of the Project area and the immediate surrounds have vulnerable groundwater resources present, related to potential risk of aquifers to contamination from the surface (refer to Figure 6-4).

6.9.2 Assessment approach

Potential impacts to water resources from the Project are expected to include demand for water during the construction phase, as well as for land management during operational phase. The Project is not anticipated to impact groundwater during construction, operation and decommissioning due to the limited amount of subsurface disturbance activities required during the installation and decommissioning of Project infrastructure.

It is anticipated that further design development would enable the Project to avoid the most significant watercourses, riparian corridors and other sensitive receptors where regulations and guidelines do not allow or recommend development. Specific design considerations and mitigation measures will be recommended to minimise potential impacts within and along drainage lines. Roads and services that require watercourse crossings will be designed and constructed in accordance with relevant regulations and best practice design and construction methods. An internal creek crossing would be required across Spring Creek, for access to the western portion of the Project area.

A Water Resources Impact Assessment would be prepared as part of the EIS and would include a qualitative assessment involving the following:

- Characterising the existing surface water and groundwater environment relevant to the Project
- Reviewing relevant legislation, regulation, and guidelines
- Considering the likelihood of groundwater contamination and potential impacts on groundwater dependent ecosystems
- Assessing potential surface water and groundwater impacts
- Assessing potential flood level risks
- Estimating quantity of water required for construction and operational phases of the Project
- Proposing mitigation measures to minimise potential impacts to surface water, groundwater resources and minimise potential flooding risks in the Project area.

6.10 Hazards and risks

6.10.1 Bushfire risks

The Project area has been subject to clearing and agricultural activities and includes vegetation mapped as Category 2 under the NSW Rural Fire Service (RFS) bushfire prone land mapping (RFS, 2022). Small areas within the Project area are also mapped as Category 1 vegetation. Category 2 is considered a lower bushfire risk than Category 1 or Category 3 and covers the majority of the Project area (refer to Figure 6-5).

A Bushfire Hazard Assessment would be prepared as part of the EIS, which would assess bushfire risks associated with the Project during construction and operation. The assessment would be in accordance with Planning for Bushfire Protection 2019 (RFS, 2019) and would involve the following:

- Reviewing relevant legislation, regulations, standards, and guidance to identify applicable requirements for the bushfire assessment and appropriate bushfire risk protection measures
- Analysing bushfire risk factors including fire weather conditions, topography, vegetation, access, fire history, ignition sources and failure modes that might lead to fire ignitions during the Project's construction and operation
- Developing suitable bushfire protection measures for the construction and operational phases of the Project.

6.10.2 Electromagnetic fields

Electromagnetic fields (EMFs) are invisible, physical fields that surround electrical charges and exert forces on all charged particles and objects in the field. The electric charge supplied to or generated by electrical and electronic equipment produces EMFs at a 50 hertz (Hz) power frequency and harmonics thereof. Transmission lines, substations, electrical wiring, household appliances and electrical equipment all produce power frequency EMFs.

It is expected that EMF risks associated with the Project would be below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines. A review of potential EMF risks associated with the Project would be undertaken in accordance with ICNIRP Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields (1 Hz to 100 kHz) (ICNIRP, 2010). Suitable safeguards and mitigation measures would be proposed to minimise potential risks and impacts.

6.10.3 Land contamination

A search of the NSW EPA contaminated land public record of notice and list of sites notified to the EPA under Section 60 of the *Contaminated Land Management Act 1997* (CLM Act) on 10 May 2022 indicated no record of site contamination in the Project area. The Project area has historically been, and is currently, used for agricultural activities.

The Managing Land Contamination Planning Guidelines: SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning, 1998) lists agricultural/horticultural activities as an activity which potentially causes contamination. There is potential that agricultural land uses could have resulted in isolated contamination in the Project area which if present could become mobilised as a result of construction activities. Potential contamination risks associated with the Project are expected to be readily managed by the implementation standard controls during construction and design to remove future exposure pathways.

Construction of the Project would also involve the storage, treatment or handling of fuels, chemicals, building materials, wastes and other potential contaminants. Any contamination spill during construction would be managed and mitigated to prevent impacts on human health and the environment. Contamination risks would be managed through the application of Australian Standards for the storage and handling of fuels and chemicals and appropriate engineering design. In the unlikely event of significant leaks or spills of contaminants, remediation would be implemented immediately during construction.

Land contamination in the existing environment is not likely to be a significant risk given any soil disturbance during construction would be shallow. A Preliminary Site Investigation (PSI) would be undertaken within the Project area. Further investigation, such as sampling may be required and would be based on the results of the PSI should potential contamination sources or risks be identified. If contamination is found, standard mitigation measures would apply, and such measures would be detailed in the EIS.

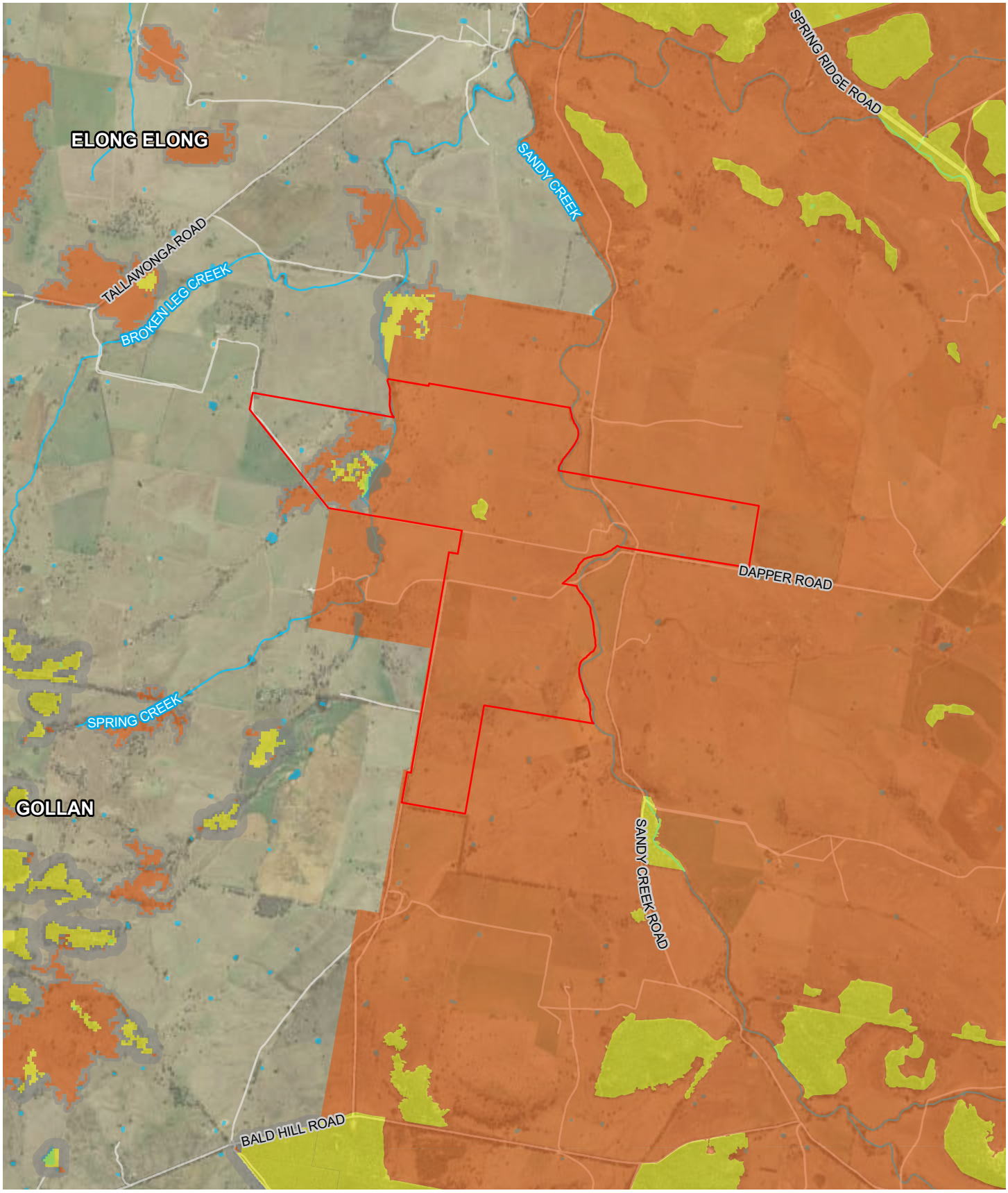

Figure 6-5 Bushfire risk

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6.11 Other issues

The EIS would also consider and assess other potential impacts relating to the following matters:

- Air quality and dust management – the EIS would assess potential air quality impacts of the Project in accordance with relevant NSW guidelines in relation to construction activities
- Waste – the EIS would classify and quantify the likely waste streams to be generated during construction and operation and describe measures to manage, reuse, recycle and dispose of this waste in accordance with relevant guidelines
- Decommissioning and rehabilitation – the EIS would assess potential impacts of the Project arising from decommissioning and rehabilitation activities, particularly on the final landform and compatibility with existing land uses.

6.12 Cumulative impacts

The Project would contribute to the overall development of the CWO REZ. Other proposed, approved, under construction and operational renewable energy developments within the vicinity of the Project would be considered in the EIS. The key for different levels of assessment is provided in Table 6-8 and the cumulative scoping summary with indicative nearby projects is provided in Table 6-9. .

The Project may generate cumulative impacts in conjunction with surrounding projects during both construction and operation. These impacts would generally be limited to cumulative traffic and social impacts. The Project may also provide cumulative benefits to the local and regional communities in the CWO REZ through landowner contributions and generation of jobs during construction and operation.

A Cumulative Impact Assessment would be carried out as part of the EIS, in accordance with the Cumulative Impact Assessment Guidelines for Significant Projects (DPIE, 2021a).

Table 6-8. Key for the cumulative impact assessment scoping table

Level of assessment	Description
Detailed assessment	The project may result in significant impacts on the matter, including cumulative impacts. Detailed assessment is characterised by: • Potential overlap in impacts between a future project (Project A) and the proposed project • Potential for significant cumulative impacts as a result of the overlap, requiring detailed technical studies to assess the impacts • Sufficient data is available on the future project to allow a detailed assessment of cumulative impacts with the proposed project for the relevant matter • Uncertainties exist with respect to data, mitigation, assessment methods and criteria.
Standard assessment	The project is unlikely to result in significant impacts on the matter, including cumulative impacts. Standard assessments are characterised by: • Impacts are well understood • Impacts are relatively easy to predict using standard methods • Impacts are capable of being mitigated to comply with relevant standards or performance measures • The assessment is unlikely to involve any significant uncertainties or require any detailed cumulative impact assessment.
N/A	• No potential overlap in impacts between a future project (Project A) and the proposed project that would warrant any consideration in the cumulative impact assessment

Table 6-9. Preliminary cumulative impacts scoping table

Project	Distance to the Project area	Project status	Potential overlap impacts with other Projects			
			Access (traffic)	Amenity (noise)	Amenity (visual)	Social / economic
CWO REZ Transmission and the Elong Elong Energy Hub (substation)	A section of the transmission line corridor intersects the Project area	EIS preparation				
	Key features: • Transmission lines from the existing network near Merriwa, passing south of Dunedoo before connecting to the existing network east of Wellington.		Potential overlap of construction and operational phases, with potential risk of cumulative traffic and access impacts.	Potential overlap of construction and operational phases, with potential risk of cumulative noise impacts.	Potential overlap of construction and operational phases, with potential risk of cumulative visual and landscape impacts.	Potential risk of cumulative social impacts related to construction workforce, and potential cumulative economic benefits.
Sandy Creek Solar Farm	Located adjacent to Project area to the north	EIS preparation				
	Key features: • 750 MW solar farm • Battery Energy Storage System (BESS) up to 3,000 MWh • Site is about 1,600 hectares		Potential overlap of construction and operational phases, with potential risk of cumulative traffic and access impacts.	Potential overlap of construction and operational phases, with potential risk of cumulative noise impacts.	Potential overlap of construction and operational phases, with potential risk of cumulative visual and landscape impacts.	Potential risk of cumulative social impacts related to construction workforce, and potential cumulative economic benefits.
Cobbora Solar Farm	Located adjacent to the Project area to the north-west	EIS preparation				
	Key features: • 700 MW solar farm • 200 MW/200 MWh BESS • Site is about 2,700 hectares		Potential overlap of construction and operational phases, with potential risk of cumulative traffic and access impacts.	Potential overlap of construction and operational phases, with potential risk of cumulative noise impacts.	Potential overlap of construction and operational phases, with potential risk of cumulative visual and landscape impacts.	Potential risk of cumulative social impacts related to construction workforce, and potential cumulative economic benefits.

Project	Distance to the Project area	Project status	Potential overlap impacts with other Projects			
			Access (traffic)	Amenity (noise)	Amenity (visual)	Social / economic
Spicers Creek Wind Farm	Located adjacent to the Project area to the west	EIS preparation				
	Key features: • 63 wind turbines, 441 MW wind farm • BESS up to 1,000 MW • Site is about 7,548 hectares		Potential overlap of construction and operational phases, with potential risk of cumulative traffic and access impacts.	Potential overlap of construction and operational phases, with potential risk of cumulative noise impacts.	Potential overlap of construction and operational phases, with potential risk of cumulative visual and landscape impacts.	Potential risk of cumulative social impacts related to construction workforce, and potential cumulative economic benefits.
Orana Wind Farm	Indicative location between four to 12 km east of the Project area	Pre-scoping				
	Key features: • 700 MW wind farm • Project has been announced however no detailed project footprint has been determined		Potential overlap of construction and operational phases, with potential risk of cumulative traffic and access impacts.	Currently unknown cumulative impacts. Further assessment required depending on the footprint of this wind farm	Currently unknown cumulative impacts. Further assessment required depending on the footprint of this wind farm	Potential risk of cumulative social impacts related to construction workforce, and potential cumulative economic benefits.
Birriwa Solar Farm	Located about 35 km north-east of the Project area	EIS published				
	Key features: • 600 MW solar farm • BESS up to 1,000 MW • Site is about 1,250 hectares		Potential overlap of construction and operational phases, with potential risk of cumulative traffic and access impacts.	No potential overlap in impacts.	No potential overlap in impacts.	Potential risk of cumulative social impacts related to construction workforce, and potential cumulative economic benefits.

Project	Distance to the Project area	Project status	Potential overlap impacts with other Projects			
			Access (traffic)	Amenity (noise)	Amenity (visual)	Social / economic
Tallawang Solar Farm	Located about 30 km east of the Project area	EIS published				
	Key features: • 500 MW solar farm • 500 MW/1,000 MWh BESS • Site is about 1,370 hectares		Potential overlap of construction and operational phases, with potential risk of cumulative traffic and access impacts.	No potential overlap in impacts.	No potential overlap in impacts.	Potential risk of cumulative social impacts related to construction workforce, and potential cumulative economic benefits.
Barneys Reef Wind Farm	Located about 30 km east of the Project area	EIS preparation				
	Key features: • 63 wind turbines, 441 MW wind farm • 441 MW/1,764 MWh BESS • Site is about 7,548 hectares		No potential overlap in impacts.	No potential overlap in impacts.	No potential overlap in impacts.	Potential risk of cumulative social impacts related to construction workforce, and potential cumulative economic benefits.
Bellambi Heights Solar Farm	Located about 33 km south-east of the Project area	EIS preparation				
	Key features: • 200 MW solar farm • 200 MW/400 MWh BESS • Site is about 304 hectares		No potential overlap in impacts.	No potential overlap in impacts.	No potential overlap in impacts.	Potential risk of cumulative social impacts related to construction workforce, and potential cumulative economic benefits.

Project	Distance to the Project area	Project status	Potential overlap impacts with other Projects			
			Access (traffic)	Amenity (noise)	Amenity (visual)	Social / economic
Dunedoo Solar Farm	Located about 33 km north-east of the Project area	Approved				
	Key features: • 55 MW solar farm • Site is about 112 hectares		No potential overlap in impacts.	No potential overlap in impacts.	No potential overlap in impacts.	No potential overlap in impacts.
Uungula Wind Farm	Located about 45 km south of the Project area	Approved				
	Key features: • 97 wind turbines, 400 MW wind farm • BESS up to 150 MW • Site is about 2,770 hectares		No potential overlap in impacts.	No potential overlap in impacts.	No potential overlap in impacts.	No potential overlap in impacts.

The cumulative impact assessment methods and potential cumulative noise and visual impacts would be assessed as part of standard environmental impact process in accordance with relevant guidelines. Noting the concentration of renewable development in the region in response to NSW government REZ policy and implications for cumulative traffic and socio-economic impacts of which the Project constitutes a minor contributor, it is considered that these issues should be addressed on a regional level and separately from the EIS. Origin will proactively engage with EnergyCo in CWO REZ wide cumulative impact identification and management.

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Appendix A. Scoping summary table

Level of assessment	Matter	Cumulative impact assessment	Engagement	Relevant government plans, policies and guidelines	Scoping report reference
Detailed	Biodiversity	Yes	General	• Matters of National Environmental Significance Significant impact guidelines 1.1 (Commonwealth of Australia, 2013) • Commonwealth Department of the Environment – Nationally Threatened Ecological Communities and Threatened Species Guidelines (various) • Threatened Species Survey and Assessment Guidelines (various) • The Biodiversity Assessment Method 2020 (DPIE, 2020a) • Framework for Biodiversity Assessment (OEH, 2014a) • NSW Biodiversity Offsets Policy for Major Projects (OEH, 2014b)	Section 6.1
Detailed	Heritage – Aboriginal cultural	Yes	Specific	• Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011) • The Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010a) • The Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010b)	Section 6.2
Standard	Amenity – landscape and visual	Yes	Specific	• Large-Scale Solar Energy Guideline (DPE, 2022d)	Section 6.3
Standard	Amenity – noise and vibration	Yes	General	• Draft Construction Noise Guideline (NSW EPA, 2021) • Construction Noise Strategy (TfNSW, 2012) • NSW Noise Policy for Industry (NSW EPA, 2017) • Assessing Vibration: A Technical Guideline (DEC, 2006) • German Standard DIN 4150-3: Structural Vibration – Effects of Vibration on Structures • NSW Road Noise Policy (DECCW, 2011) • Interim Construction Noise Guidelines (DECC, 2009) • Assessing Vibration: A Technical Guideline (DEC, 2006)	Section 6.4

Level of assessment	Matter	Cumulative impact assessment	Engagement	Relevant government plans, policies and guidelines	Scoping report reference
Standard	Heritage – historical	No	General	• NSW Heritage Manual (NSW Heritage Office and DUAP, 1996) • Assessing Heritage Significance (NSW Heritage Office, 2001) • Statement of Heritage Impact (NSW Heritage Office, 2002) • Assessing Significance for Historical Archaeological Sites and 'Relics' (NSW Heritage Branch, 2009)	Section 6.5
Standard	Social and economic impacts	Yes	Specific	• Social Impact Assessment Guidelines for State Significant Projects (DPIE, 2021b) • Community Consultative Committee Guidelines for State Significant Projects (NSW Government, 2019a) • Undertaking Engagement Guidelines for State Significant Projects (DPIE, 2021d)	Section 6.7
Standard	Access – traffic and transport	Yes	General	• Guide to Traffic Management – Part 3 Traffic Studies and Analysis (Austroads, 2017) • Guide to Traffic Generating Developments Version 2.2 (RTA, 2002).	Section 6.6
Standard	Land resources agriculture and soils	No	General	• Land Use Conflict Risk Assessment Guide (DPI, 2011) • Land and Soil Capablity Assessment Scheme (OEH, 2012) • Acid Sulfate Soils Assessment Guidelines (Department of Planning, 2008) • Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (DUAP and NSW EPA, 1998) • National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 2013) • Guidelines for Consultants Reporting on Contaminated Land: Contaminated Land Guidelines (NSW EPA, 2020) • Guidelines on the Duty to Report Contamination Under the Contaminated Land Management Act 1997 (NSW EPA, 2015).	Section 6.8
Standard	Water resources – flooding and hydrology	No	General	• Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Volume 2 (DECC, 2008) • Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC, 2004b) • Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2018) • Guidelines for Controlled Activities (Department of Industry, 2012)	Section 6.9

Level of assessment	Matter	Cumulative impact assessment	Engagement	Relevant government plans, policies and guidelines	Scoping report reference
Standard	Hazards and risks	No	General	• Electromagnetic Fields Management Handbook (Energy Networks Australia, 2016) • Guidelines for limiting exposure to Time-varying Electric, magnetic and Electromagnetic Fields (ICNIRP, 2010) • Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines (Department of Planning, 2011a) • Hazardous Industry Planning Advisory Paper No. 6 Guidelines of Hazard Analysis (DPE, 2011a) • Hazardous Industry Planning Advisory Paper No. 10 Land Use Safety Planning (DPE, 2011b) • Planning for Bush Fire Protection 2019 (NSW RFS, 2019) • Australian Standard 3959-2018 Construction of Buildings in Bushfire Prone Areas • NSW Rural Fire Service Guideline for Bushfire Prone Land Mapping (NSW RFS, 2015)	Section 6.10
Standard	Air quality	No	General	• National Environment Protection (Ambient Air Quality) Measure (NEPC, 1998) • Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA, 2016)	Section 6.11
Standard	Waste management	No	General	• Waste Avoidance and Resource Recovery Strategy 2014-21 (NSW EPA, 2014a) • Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014b)	Section 6.11

Appendix B. Preliminary biodiversity assessments

Appendix B1. Preliminary Biodiversity Constraints Assessment

Jacobs

Memorandum

Dapper Solar Farm
Preliminary Biodiversity Constraints Assessment

Subject	**Dapper Solar Farm Project** **Preliminary Biodiversity Constraints Assessment**
Date	**02 September 2022**
Author	**Kirsty Raines**
Review	**Chris Thomson, Chelayne Whyte**

1.0 Introduction

1.1 Project overview

Origin proposes to develop the Dapper Solar Farm, a large scale solar photovoltaic (PV) generation facility with a battery energy storage system (BESS) and associated infrastructure (the Project). The Project is located in the suburbs of Dunedoo and Goolma, about 30 kilometres south west of the township of Dunedoo and about 60 kilometres east of the city of Dubbo in the Central West region of NSW.

1.2 Project area and indicative design

The Project area is located on the rural property of 'Dapper' which is on the boundary of the Dubbo and Warrumbungle Local Government Areas (LGA). The Project area covers about 720 hectares over several lots. A transmission easement, approximately 60 metres wide, is located along the south western boundary of the Project area and then runs east adjacent to Dapper Road. The indicative design covers about three quarters of the Project area with an array of solar panels. The Project area and indicative design are shown in **Figure 1-1**.

1.3 Report purpose

This report has been prepared to identify biodiversity values, including threatened species, populations and ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act), *Fisheries Management Act 1994* (FM Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This has been used to develop a biodiversity constraints analysis which will inform design development in order to avoid and minimise the potential impacts to biodiversity and offset costs. It also provides guidance and requirements of future assessment.

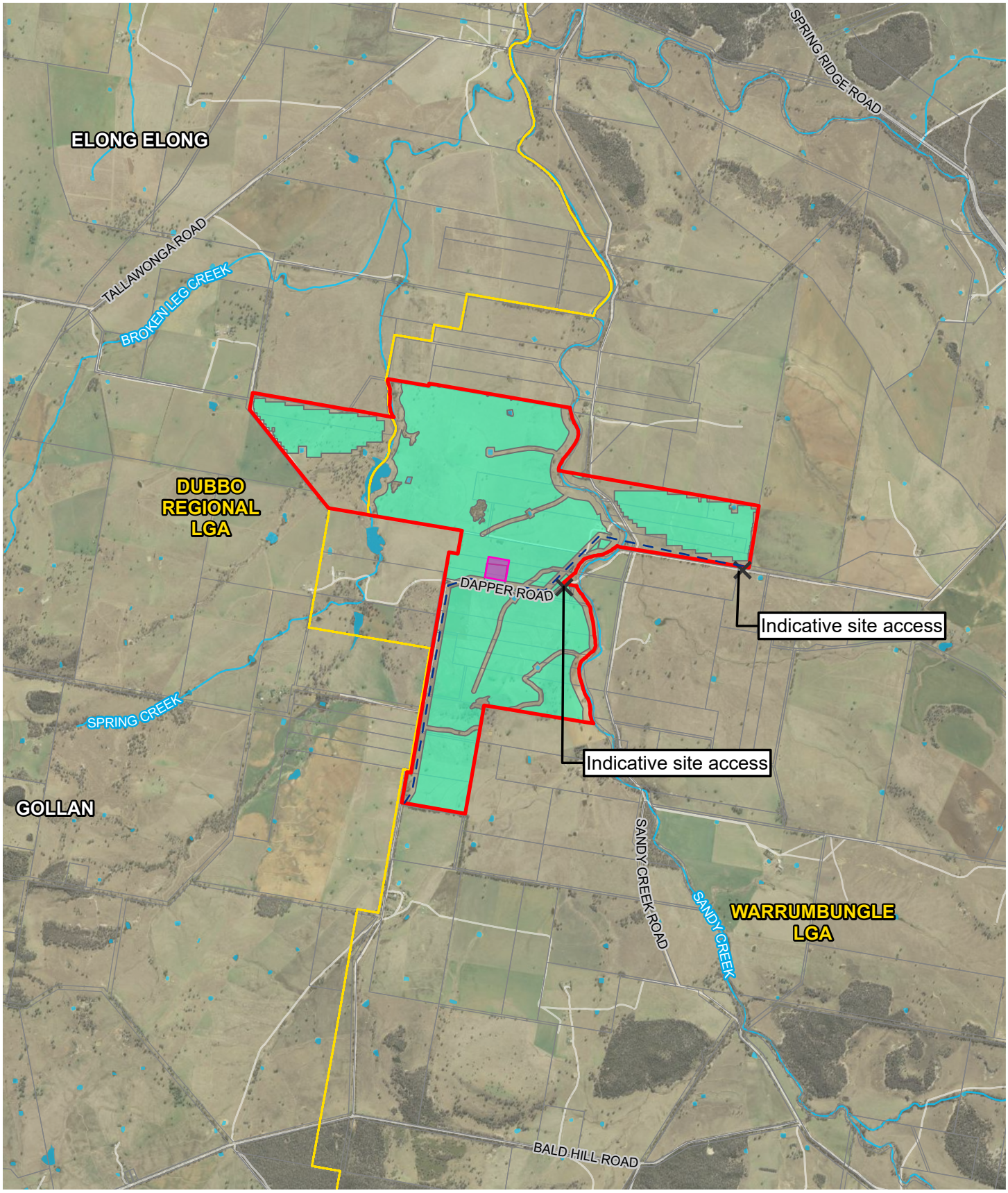

Figure 1-1 Location of Project area and indicative footprint

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2.0 Methods

2.1 Desktop study

A database search and literature review were undertaken within a ten kilometre radius of the Project area to obtain information on the potential biodiversity values present within the Project area. This information was used to inform and target areas for the preliminary field investigations. The desktop study included, but was not limited to:

- Preliminary indicative designs
- Existing vegetation mapping captured at a broad regional level and including parts of the site (DPIE, 2015)
- Spatial mapping and spatial data pertaining to the site and surrounding area (Spatial Services, 2022)
- Soil type mapping (DPE, 2022f)
- Land use mapping (DPE, 2018; 2020)
- Records of all threatened species, populations and ecological communities within 10 kilometres of the Project area (DAWE, 2022a; DPE, 2022g)
- Threatened aquatic species and habitat distributions (DPE, 2022)
- The Atlas of Groundwater Dependent Ecosystems (GDE) (BOM, 2022)
- The federal Directory of Important Wetlands in Australia (DAWE, 2021)
- The Biodiversity Values Map (BV Map) (DPE, 2022d)
- Transitional Native Vegetation Regulatory Map (DPE, 2022h)
- The Biodiversity Assessment Method Calculator (DPE, 2022c)
- The national flying-fox monitoring viewer (DAWE, 2022b)
- Areas of Outstanding Biodiversity Value (DPE, 2022a)
- The Important Areas Map (DPE, 2022b).

Preliminary determinations from NSW Threatened Species Scientific Committee and the Commonwealth annual final priority assessment list of nominated species and ecological communities were also reviewed. At the time of writing, there are no preliminary or provisional listings of relevance to the Project.

The Biodiversity Assessment Method Calculator (BAM-C) was used to input likely Plant Community Types (PCTs) and identify associated species credit species which may require targeted surveys or an expert report to confirm the presence of species in the Project area.

2.2 Field surveys

Field surveys were conducted on 18-19 May 2022 and included rapid PCT mapping and habitat surveys in accessible parts of the Project area. The existing vegetation mapping was used to as a resource to gather a list potential PCTs and guide the focus locations for rapid vegetation surveys. Vegetation was mapped into vegetation zones based on the relevant PCTs and broad condition classes. Each PCT was assigned to the relevant corresponding Threatened Ecological Community (TEC) where applicable.

This survey method generally included the collection of data from rapid data points (RDPs) to obtain information on vegetation community structure, composition and landscape position, soil, and past land uses/disturbance history, to assign stratification units to PCTs and vegetation zones. The types and

distributions of indicative PCTs within the Project area were identified and mapped, however will be further refined during future detailed assessments.

The assessment of broad condition states was used to stratify areas of the same PCT into a vegetation zone for the purpose of predicting the level of constraint where different vegetation integrity scores are likely to influence the biodiversity offset obligation for the project. Different condition classes were generally assigned by consideration of structural strata present (ground, mid-storey, and canopy vegetation), weed prevalence, historical disturbance, and level of assessment (desktop or field based, limited by accessibility).

No targeted surveys for threatened species were carried out as part of the assessment.

The extent of native vegetation in the Project area was mapped using aerial imagery. Polygons were digitised in a GIS (ArcGIS 10.8.1) at a scale of about 1:3,000.

2.3 Limitations

The assessment provides a brief assessment of the whole Project area, with field surveys generally focused on vegetation and habitat within the indicative design. Due to safety and accessibility issues, several areas of the Project area were not surveyed on-ground, notably the Project area west of Spring Creek. Future assessments will require access via properties outside the Project area or across the creek to access this location. As such, some surveys were conducted from distance observations and relied on desktop data only.

Due to the lack of plot-based data (which would be collected in the detailed assessment stage), the assigned PCTs and extent mapping is preliminary only. The true classification and distribution of PCTs can only be determined by detailed survey and floristic analysis, this is particularly true for exotic grasslands and derived communities. Therefore, a true estimation of potential offset credits cannot be made. As such, the price per credit had been provided for vegetation likely present in the Project area. However, without calculations of the number of credits required, the price is uninformative. Discussion regarding credit offset options has been provided.

In June 2022, the systematics of numerous PCTs were revised for eastern NSW (coast and tablelands bioregions). At the time of preparation of this report, the PCTs described were approved and currently in use. Nevertheless, with further changes to the systematics planned, the PCTs numbers and names may be changed to equivalent PCTs in the future.

This report provides a list of threatened species that have potential to occur within the Project area or may have suitable habitat. This provides a high-level indication of species that may require targeted surveys; however, the actual species may change due various factors including updates to the BAM-Calculator, changes to listings and future habitat assessments. During the detailed assessment, this list will require review and a comprehensive likelihood of occurrence assessment will be undertaken to confirm the required targeted species surveys.

The conclusions of this report are based upon currently available data and preliminary field surveys. They are indicative of the environmental conditions of the Project area at the time of the assessment. It should be recognised that site conditions, including the presence of threatened species and vegetation composition can change with time.

3.0 Biodiversity constraints

3.1 Existing environment

3.1.1 Landscape context

The Project area is located at the southern extent of the Brigalow Belt South Interim Biogeographic Regionalisation for Australia (IBRA) region and the Talbragar IBRA sub-region. The Brigalow Belt South bioregion in northern NSW and southern Queensland, extends from south of Dubbo in central-western NSW to the mid-Queensland coast. The bioregion has a total area of 27,196,933 ha, of which 5,333,469 ha (19.61%) falls within NSW, occupying 6.7% of the State (NSW NPWS, 2003).

The Talbragar Valley sub-region is located at the southern extent of the Brigalow Belt South IBRA region and is generally situated between Gulgong in the south to Dunedoo to the north and Dubbo to the west. It is characterised by residual rocky hills, undulating long slopes and wash plains, wide valley floors with sandy streams. The geology typically comprises Mesozoic quartz sandstone, conglomerates and shales with minor tertiary basalt caps. As such, the soils are generally thin stony loams and texture contrast soils over most of the landscape with deeper sands and brown earths on the valley floors (NSW NPWS, 2003).

The Project area is within the NSW (Mitchell) Landscape of the Goonoo Slopes. This landscape is characterised by extensive undulating to stepped low hills with long slopes on sub-horizontal Triassic to Jurassic quartz sandstone, conglomerates, siltstone, shale and some coal. The landscape lies at between 300 to 500m above sea level with a generally westerly slope and a poorly defined drainage network (DPIE, 2017).

3.1.2 Land use

Extensive clearing associated with agricultural activities and rural landholdings have resulted in a fragmented and modified landscape. Historic and recent cropping, cattle and sheep grazing was evident across the Project area at the time of survey.

3.1.3 Vegetation communities

Grasslands paddocks

Grassland paddocks within the Project area have been historically used for cropping and grazing. These areas have been frequently ploughed and cultivated and are limited in terms of native fauna habitat but may provide suitable foraging habitat for raptors, parrots and macropods. They are generally dominated by annual and perennial exotic plant species, however, contain components of native flora species derived from former vegetation, generally with low diversity and cover.

The grassland areas have been preliminarily assigned as a native vegetation community (mostly PCT 511, refer to **Table 3-1**) and differentiated into vegetation zones based on condition to demonstrate the 'worst-case scenario'. During the detailed surveys, some areas of the areas mapped as 'native' grassland paddocks may be re-mapped as 'exotic' grasslands based on species composition.

The grassland paddocks comprise a mixture of native and exotic species. Common species include the exotic *Verbena bonariensis*, *Phalaris* sp., *Cichorium intybus, Dactylis glomerata, Conyza bonariensis, Setaria sphacelata*, and the native *Aristida ramosa, Bothriochloa macra; Vittadinia* sp., *Echinochloa colona, Austrostipa* sp. *and Calotis* sp.

Grassy Woodlands

There are a number of different woodland communities present across the Project area. Along Sandy Creek, the communities are dominated by *Angophora floribunda* (Rough-Barked Apple) and *Eucalyptus*

camaldulensis (River Red Gum) (PCT 78, 281). In the west of the Project area and near Spring Creek, box gum communities occur and are comprised a sparse canopy of *Eucalyptus conica* (Fuzzy Box), *Eucalyptus melliodora* (Yellow Box) and *Callitris glaucophylla* (White Cypress-pine). The ground-storey of the grassy woodland areas are comprised of a mixture of native and exotic grass and herbs, and generally have a lower density of weed species.

3.1.4 Plant community types

A total of six PCTs have been preliminarily identified as occurring within the Project area. PCTs are listed in **Table 3-1** and preliminary PCT mapping is shown in **Figure 3-1**. PCTs vary in condition and patch sizes across the Project area. PCT 511 is the dominant community covering about 595 ha (83%) of the Project area. All other PCTs comprise woodland communities in which canopy vegetation is present, albeit sparse.

During the detailed assessment, additional data may influence the change of this preliminary PCT mapping, resulting in other PCTs being assigned and/or the distribution and extent of PCT coverage being changed.

3.1.5 Threatened ecological communities

The desktop study identified seven TECs that have the potential to occur, or may have suitable habitat, within ten kilometres of the Project area (refer to **Appendix A**). From the preliminary PCT mapping, it is likely that two of these are present in the Project area, including:

- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* – listed as Critically Endangered under the BC Act and EPBC Act
- *Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions* – listed as Endangered under the BC Act.

Although most PCTs in the Project area are associated with these TECs, due to the condition of the vegetation and patch size, it is possible that some may not meet the thresholds required for listing under the EPBC Act (refer to **Table 3-1).**

The areas of grassland paddocks (PCT 511) which are highly disturbed are unlikely to meet the EPBC Act TEC listing criteria for the derived native grassland community, however, may still meet the State listing. Under the BC Act the listing criteria for this community is much broader and can include highly degraded patches that are considered likely to respond to assisted natural regeneration (removal of cropping and stock). Comparatively, most of the other areas mapped as grassy woodland are likely to meet Commonwealth and/or State listing criteria, as they contain suitable canopy species and a higher diversity of native species. The determination of TECs would be undertaken during the detailed assessment.

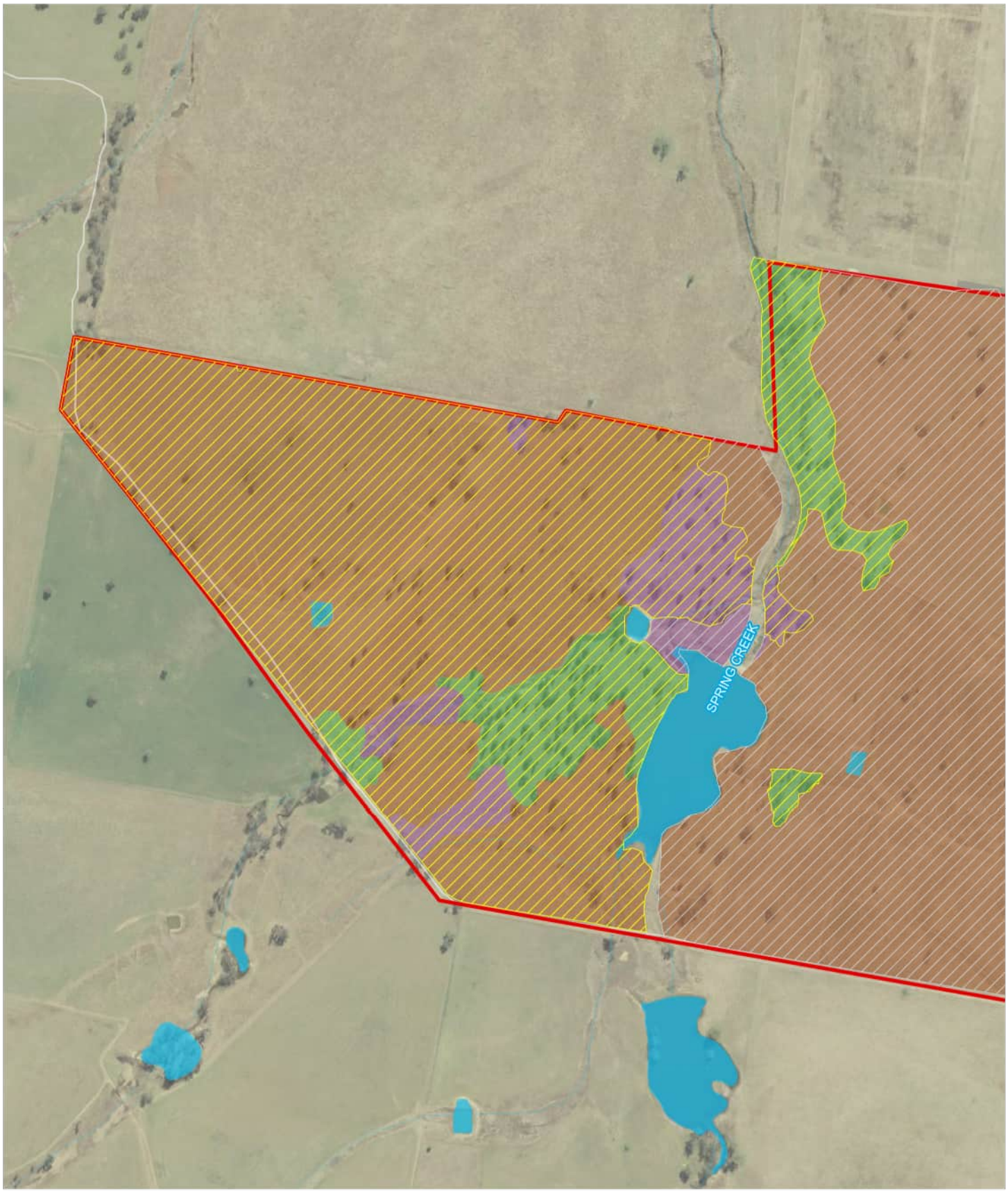
Table 3-1: Plant Community Types (PCT) and associated TECs, preliminary analysis of area and condition

PCT ID	Plant Community Type (PCT) (DPE, 2022e)	Condition	Area in Project area	Associated BC Act TECs	Associated EPBC Act TECs
511	Queensland Bluegrass - Redleg Grass - Rats Tail Grass - spear grass - panic grass derived grassland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Low	*595ha	*Possible* White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (CE)	*Unlikely* White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CE)
		**Mod	77ha		
202	Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion	**Mod	12ha	*Likely* Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions (E)	-
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Mod	30ha	*Likely* White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (CE)	*Likely* White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CE)
78	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Mod	3ha	-	-
468	Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)	**Mod	2ha	-	-

PCT ID	Plant Community Type (PCT) (DPE, 2022e)	Condition	Area in Project area	Associated BC Act TECs	Associated EPBC Act TECs
437	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	**Mod	1ha	*Likely* White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (CE)	*Unlikely* White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CE)

*This is considered to the 'worst-case' extent of the PCT. During the detailed surveys, some areas of the grassland paddocks may be re-mapped as exotic grasslands and determined not to be native vegetation communities.

**Some areas that were inaccessible during the field surveys were generally assumed to be in moderate condition / CE: critically endangered, E: endangered



Project area

Preliminary PCT mapping
- Cleared
- 202
- 281
- 511

Condition
- Moderate
- Low

0 100 200 m

1:10,000 at A4

GDA 1994 MGA Zone 55

Data sourcesa

Jacobs 2022
Origin 2022
Department of Planning and Environment 2022
© Department of Customer Service 2020

COBBORA
LAHEYS CREEK
MUDGEE

Figure 3-1 Preliminary PCT mapping

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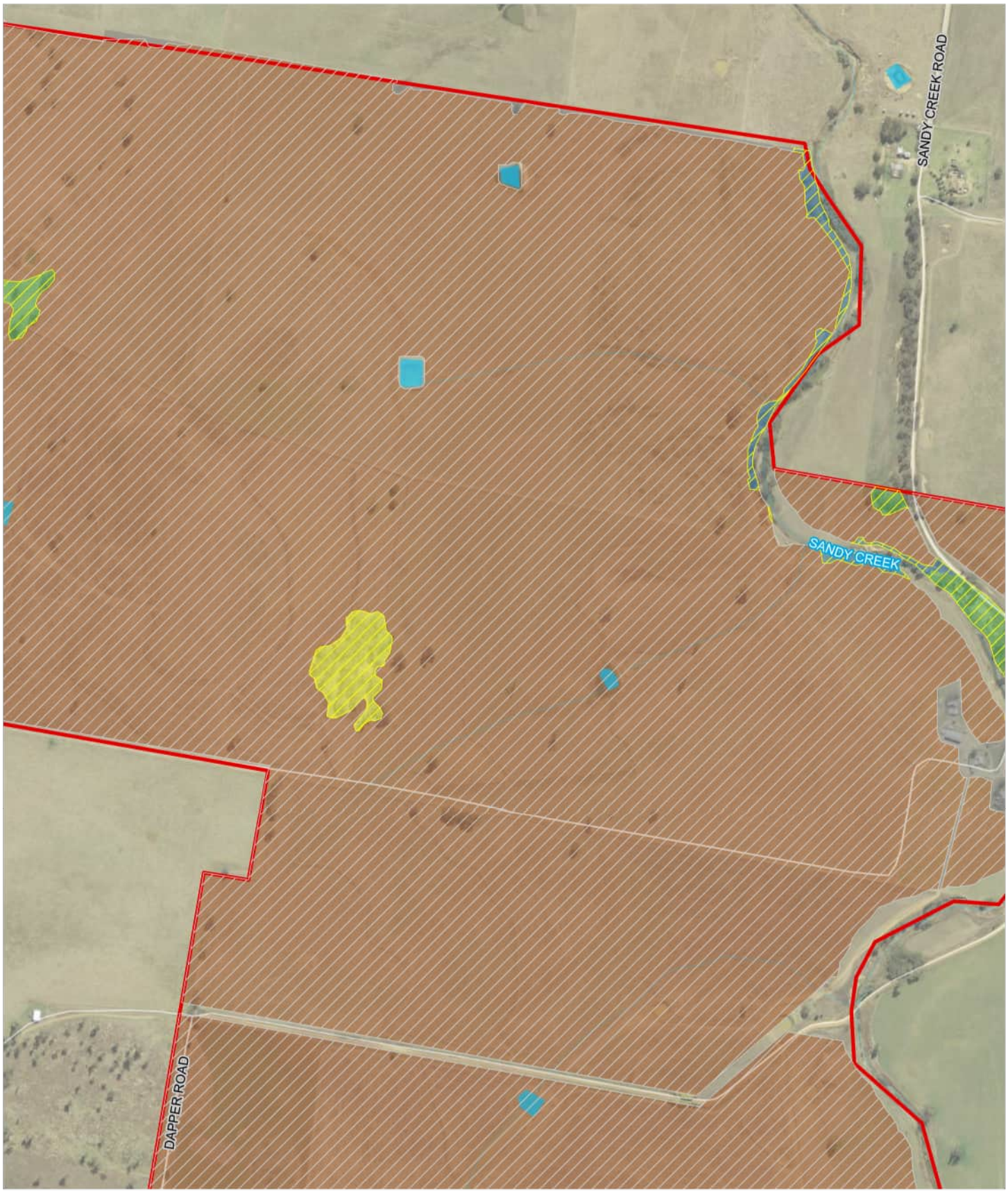

Figure 3-1 Preliminary PCT mapping

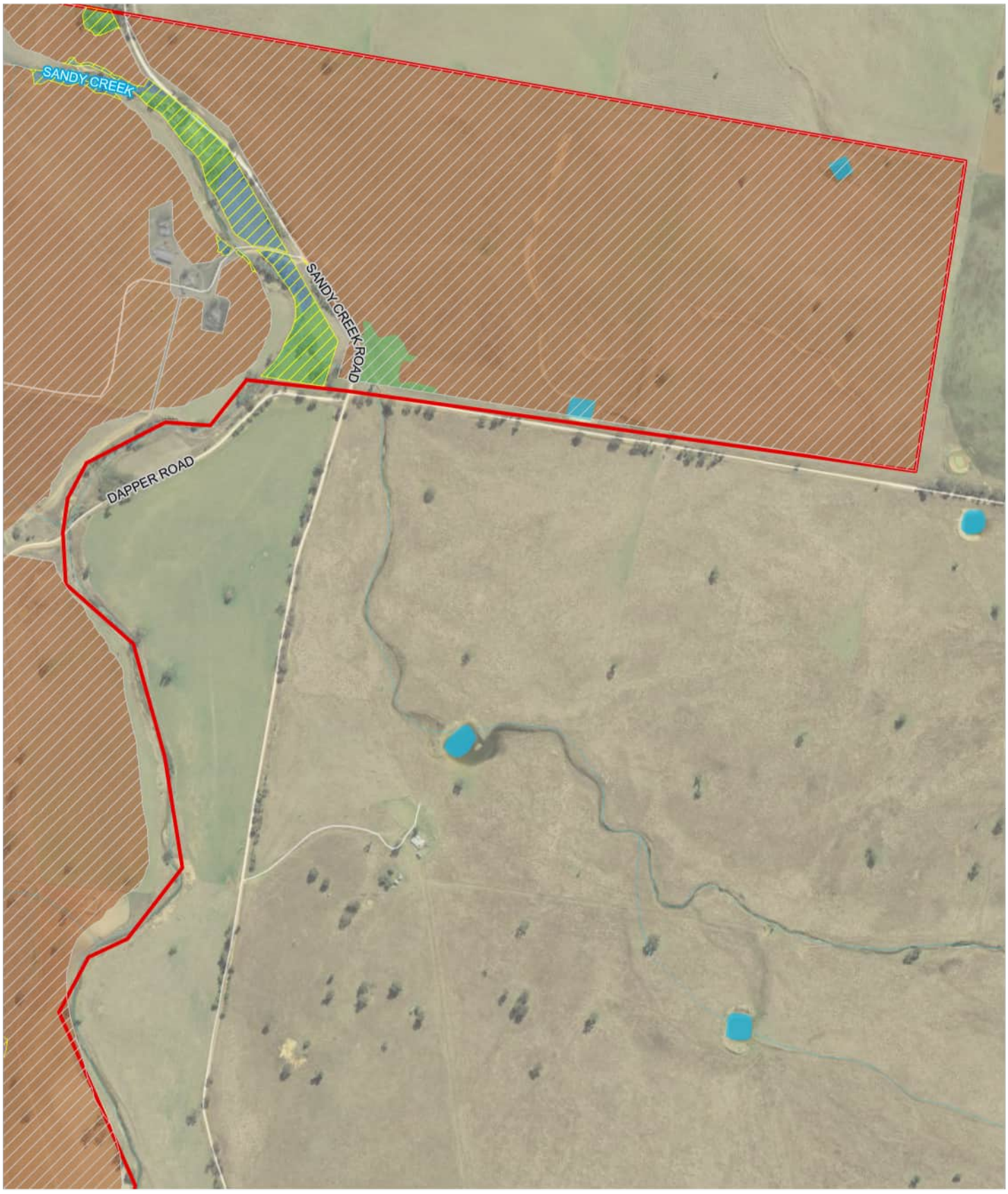

Figure 3-1 Preliminary PCT mapping

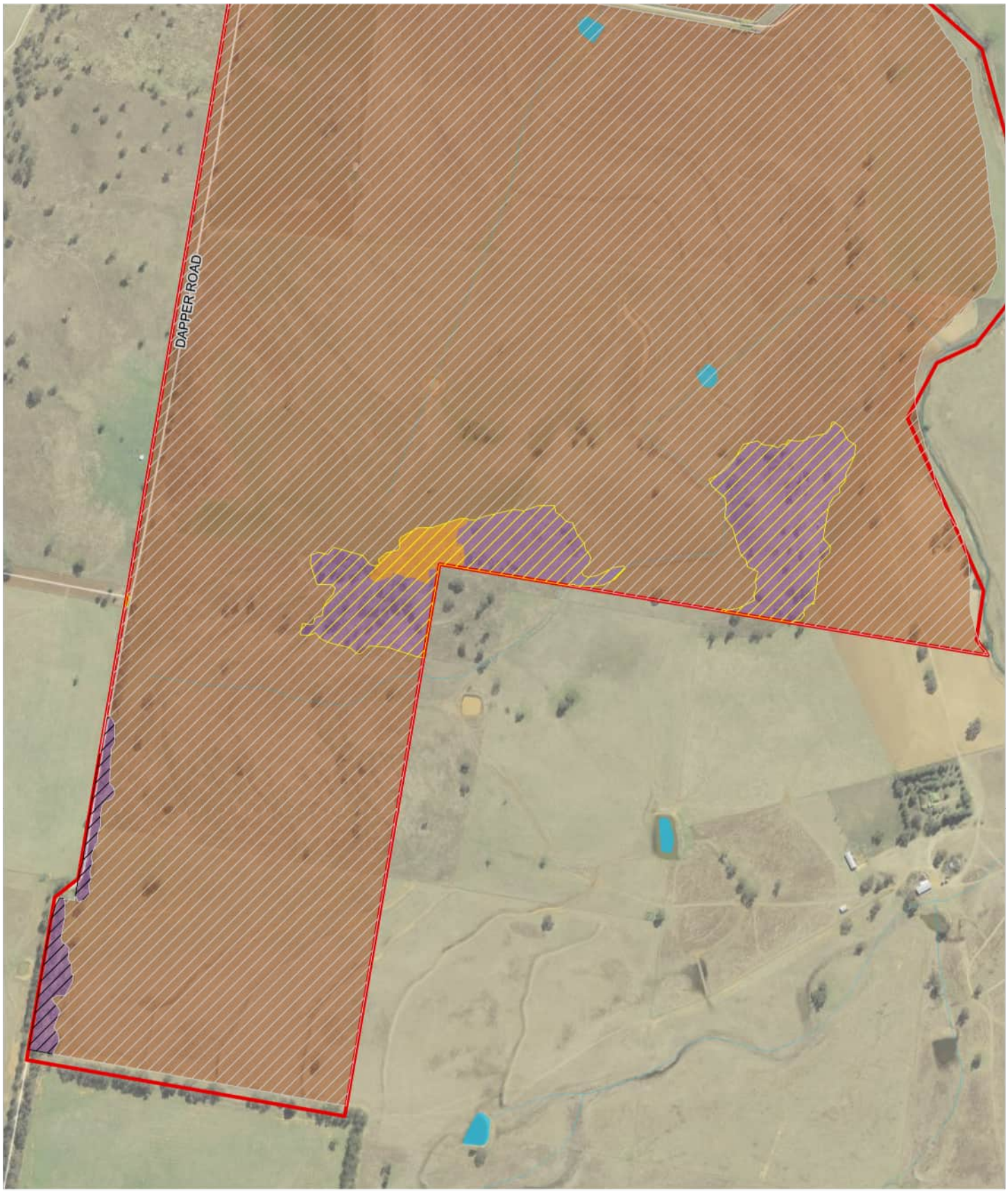

Figure 3-1 Preliminary PCT mapping

3.1.6 Groundwater dependant ecosystems

The level of water dependence of vegetation communities in the Project area has been identified using the Atlas of GDE (BOM, 2022) and the *Risk Assessment Guidelines for Groundwater Dependant Ecosystems* released by the NSW DPI (Kuginis, Byrne, Serov, & Williams, 2012). The level of groundwater dependence and potential for interaction has been identified for terrestrial PCTs in the Project area which are listed in **Table 3-2**.

The PCTs with high groundwater dependence are typically found along the creek lines and in adjacent floodplain areas. They are in lower areas where the interaction between the surface water in the creeks and adjacent groundwater is close. The PCTs with a low groundwater dependence are typically found on small rises often with more sandy soils.

Table 3-2: Level of groundwater dependence of vegetation communities in Project area

GDE potential*	PCT ID	PCT Name
High	202	Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion
	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
	78	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Low	437	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion
	511	Queensland Bluegrass - Redleg Grass - Rats Tail Grass - spear grass - panic grass derived grassland of the Nandewar Bioregion and Brigalow Belt South Bioregion
	468	Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)

*GDE potential as recognised by the Atlas of GDEs (Bureau of Meteorology, 2016)

3.1.7 Wildlife corridors

There are no formal biodiversity corridors within the Project area, however, there are several reserves and woodland areas within ten kilometres of the Project area, including:

- Dapper Nature Reserve about three kilometres to the south
- Yarrobil National Park about nine kilometres to the south-east
- Tuckland State Forest about eight kilometres to the north-east.

Vegetative connectivity to these areas is fragmented, with about 500- 800 metre distances across cleared agricultural lands. Patches of woodland vegetation in the Project area can provide habitat and refuge (stepping stones between larger patches of woodland) for several native fauna species (birds, microbats, and large macropods). The creek lines and riparian vegetation also provide important linkages for wildlife movement, aquatic species and a water resource.

3.1.8 Fauna habitat

There are various habitats and available resources for threatened and non-threatened species within the Project area. These include water resources and riparian habitats along Sandy Creek and Spring Creek as well as open woodland and with mixed aged trees, coarse woody debris and a diversity of understorey and groundcover species. Several small stick nests and several hollow bearing trees were incidentally recorded within the Project area during the field surveys.

3.1.9 Threatened species

The desktop study identified the following threatened and/or migratory species that have potential to occur, or may have suitable habitat, within ten kilometres of the Project area:

- 56 threatened terrestrial fauna species
- 17 threatened flora species
- Ten listed migratory species (of which some are also threatened species).

The full list of species is provided in **Appendix A**.

The BAM Important Areas Maps (DPE, 2022b) indicates that there is important *Anthochaera phrygia* (Regent Honeyeater) habitat about 35 kilometres south-east of the Project area, to the east of Gulgong. There is no *Lathamus discolor* (Swift Parrot) important habitat within 120 kilometres of the Project area.

The nearest known flying fox camps are in Dubbo, Wellington and Mudgee, each 40-50 kilometres from the Project area (DAWE, 2022b).

During the field survey, 36 fauna species were incidentally observed, none of which were threatened species. The list of incidentally observed fauna species is provided in **Appendix B**.

3.1.10 Aquatic ecological communities, key fish habitat and threatened fish

Key waterways within the Project area include Sandy Creek (3rd order stream) and Spring Creek (2nd and 3rd order stream) which flow northwards into Talbragar River about ten kilometres away (linear distance). Both creeks are considered Key Fish Habitat and are mapped as having 'very poor' fish community status (DPI, 2022). There are no nationally important wetlands within the locality, the closest is the Macquarie Marshes about 150 kilometres to the north-west.

Sandy Creek has considerable gully erosion and sparse vegetation. Depositional material can be observed up to 20 metres from the creek banks in some locations from recent high water flows. Within the Project area, Sandy Creek flows at different speeds forming small riffles and pools. Spring Creek has been dammed at several locations and has formed a small open wetland. It has slow moving water and some emergent vegetation and wetland species. Both streams have sandy and rocky substrates.

The results of desktop review identified five threatened fish species that have potential to occur, or may have suitable habitat, within ten kilometres of the Project area (**Appendix A**). Of these, the Purple Spotted Gudgeon (*Mogurnda adspersa*) (Endangered under the FM Act) has mapped habitat within the Project area (DPI, 2022). Key aquatic habitats and threatened fish populations are mapped in **Figure 3.2.**

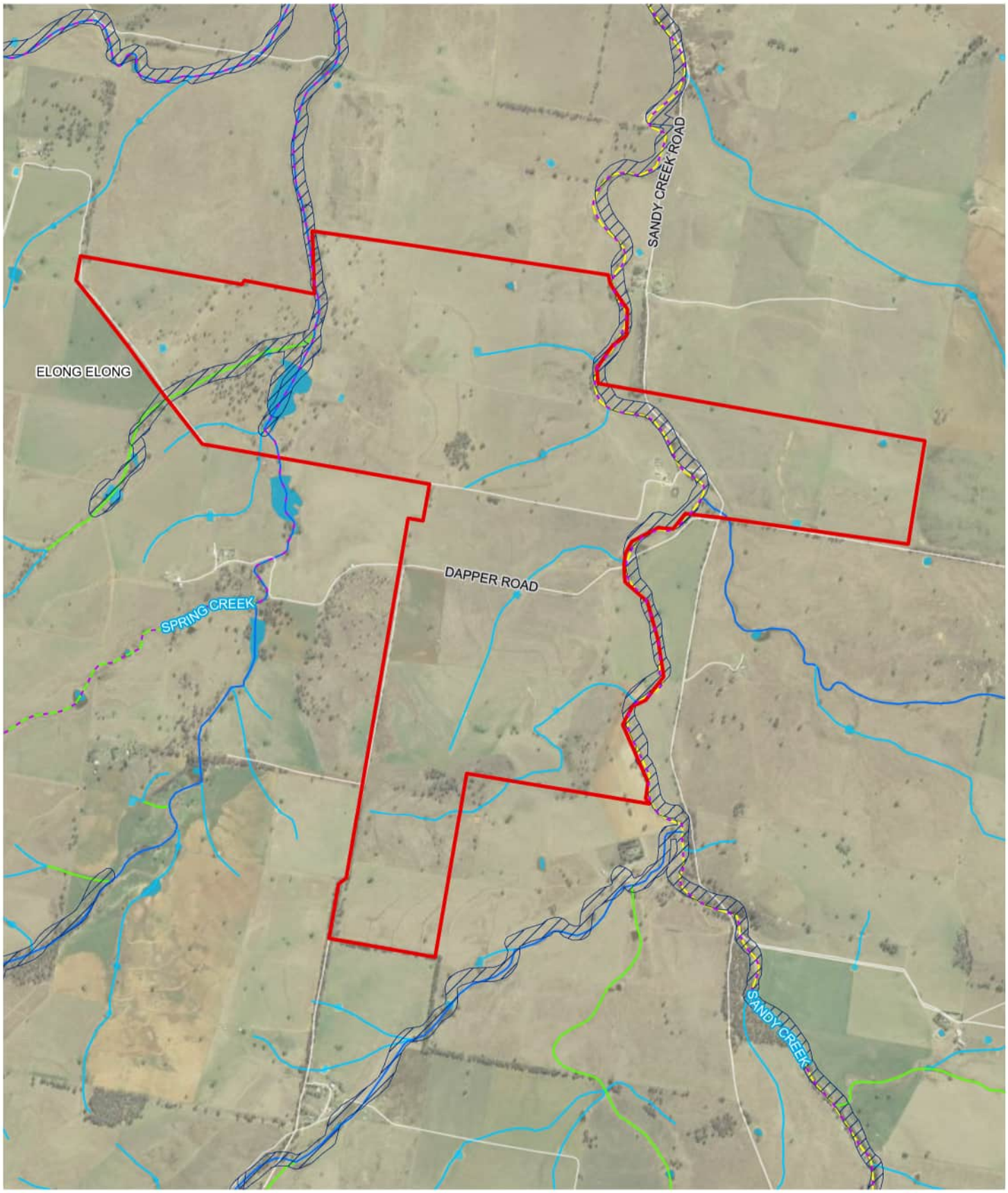

Figure 3-2 Key aquatic habitats and threatened fish populations

3.1.11 Biodiversity values map

The Biodiversity Values Map (BV Map) identifies land with high biodiversity value that is particularly sensitive to impacts from development and clearing. The BV Map is one of the triggers for determining whether the Biodiversity Offset Scheme (BOS) applies to a clearing or development proposal and indicates areas of high conservation significant biodiversity.

The Biodiversity Values Map and Threshold Tool spatial data (DPE, 2022d) identified biodiversity values that occur within the Project area specified as 'Biodiverse Riparian Land'. These mapped areas are generally along the extent of Sandy Creek and Spring Creek as well as a wetland within Spring Creek.

There are no Areas of Outstanding Biodiversity Values mapped within the Project area.

The extent areas on the Biodiversity Values Map within the Project area are shown in **Figure 3-3.**

3.1.12 Serious and irreversible impact entities

Serious and irreversible impact (SAII) entities are threatened species and communities that are most at risk of extinction from potential development. An approval authority can approve a proposal which is likely to have serious and irreversible impacts for State significant infrastructure or State significant development project pathways, however the approval authority must take those impacts into consideration and determine whether there are any additional and appropriate measures that will minimise those impacts if approval is to be granted. However, if Part 4 development is not State Significant Development, the consent authority must refuse to grant consent if it is likely to have serious and irreversible impacts on SAII entities.

The following potential SAII entities may occur in the Project area:

Threatened Ecological Communities

- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (associated with PCT 511, 281, 437)
- *Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions* (associated with PCT 202).

Threatened species

- *Anthochaera phrygia* (Regent Honeyeater)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Indigofera efoliata* (Leafless Indigo)
- *Lathamus discolor* (Swift Parrot)
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat).

Of these SAII entities, the most notable risk is associated with the potential impact to the *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* TEC in areas of low condition PCT 511 (grassland paddock) as it covers most of the indicative design. This BC Act listing is very broad and is easily met even in poor condition vegetation (refer to **Section 3.1.5**), however at this preliminary stage and without detailed assessment, consistency of the PCT with the TEC cannot be confirmed. If the grassland meets the BC Act listing, it will have to be assessed as a SAII entity.

3.1.13 Prescribed impacts

The assessment of 'prescribed impacts' provides for other potential impacts to species and their habitat that are not directly related to vegetation. Section 6.1 of the *Biodiversity Conservation Regulation 2017* outlines the list of environmental features that must be considered for prescribed impacts, these are:

a) habitat of threatened species or ecological communities including:
   i. karst, caves, crevices, cliffs, and other geological features of significance, or
   ii. rocks, or
   iii. human made structures, or
   iv. non-native vegetation
b) areas connecting threatened species habitat, such as movement corridors
c) water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence resulting from underground mining)
d) wind turbine strikes on protected animals
e) vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

Potential impacts of the above features must be considered in the detailed biodiversity assessment.

3.1.14 Land categorisations

The *Local Land Services Act 2013* (LLS Act) categorises land to determine native vegetation management options for landholders. It assists in identifying where approval is required for impact to vegetation on rural lands. The current mapping is provided in the Transitional Native Vegetation Regulatory Map (DPE, 2022h), however, many areas have not yet been published. During the transitional period until the full map is published, land categories are to be determined in accordance with the definitions in the LLS Act. The categories of mapping are summarised as follows:

- **Category 1 - exempt land**: native vegetation clearing is allowed without approval from Local Land Services.
- **Category 2 - regulated land**: authorisation may be required from Local Land Services for native vegetation clearing. This may include clearing under the Land Management (Native Vegetation) Code 2018. Landholders also have a range of allowable clearing activities available to them for use without approval from Local Land Services.
- **Category 2 – vulnerable regulated land:** land mapped as steep or highly erodible lands, protected riparian land or special category land. Use of the Land Management (Native Vegetation) Code 2018 and allowable clearing activities are restricted in these areas.
- **Category 2 – sensitive regulated land**: land mapped as environmentally sensitive. Clearing under the Land Management (Native Vegetation) Code 2018 is not permitted in these areas, although there is a limited list of allowable clearing activities available.
- **Excluded land**: land managed outside the land management framework. Other clearing controls may exist in these areas.

Some of the Project area is mapped as 'Category 2 – Vulnerable Regulated Land'. This is the same extent as that mapped on the Biodiversity Values Map (refer to **Section 3.1.11**) along Sandy Creek and Spring Creek (**Figure 3-3**). The remainder of the Project area is currently unmapped, and as such, an assessment against the criteria has been undertaken to identify the best-fit categorisation. The preferred approach is to first

identify whether the criteria for Category 2 - Regulated Land can be met, prior to assessing against Category 1 - Exempt Land, as sometimes criteria under both can be met.

Due to the possibility that much of the Project site contains derived native grassland, albeit with a history of cropping and grazing, the vegetation across the Project area is considered (at this preliminary stage) to be conservation significant woodland or derived grasslands (potentially associated with a TEC). As such, the majority of the Project area (outside of the areas mapped as Category 2-Vulnerable Regulated Land, non-native vegetation, tracks and farm dams) are considered to be Category 2 - Regulated Land and therefore an assessment under the NSW Biodiversity Offset Scheme (BOS) is required.

All other areas of non-native vegetation (existing tracks, farm dams) are likely to be considered Category 1 - Exempt Land and are exempt from assessment under the BOS. Further assessment is required to confidently identify and map the extent of Category 1 - Exempt Land. **Table 3-3** below outlines the justification for the Category 2 - Regulated Land classification as set out in Section 60I of the LLS Act.

3.1.15 Matters of national environmental significance

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places which are collectively known as Matters of National Environmental Significance (MNES). There are no world heritage places or wetlands of international importance within proximity of the Project area.

The results of desktop review identified the following MNES that have potential to occur, or may have suitable habitat, within ten kilometres of the Project area:

- Six TECs
- 15 threatened terrestrial fauna species
- 11 threatened flora species
- Four threatened fish species
- Ten listed migratory species (of which some are also threatened species).

The full list of species is provided in **Appendix A**.

During the detailed assessment, the above list would be refined with TECs, and species possibly being excluded as more data is collected about the biodiversity values in the Project area (habitat characteristics). For example, although the database searches identified six potential EPBC listed TECs, it is likely that only one (*White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*) is present (refer to **Section 3.1.5**).

Table 3-3: Justification for Category 2 - Regulated Land classification

Criteria	Justification	Criteria met
The land was not cleared of native vegetation as of 1 January 1990, or the land was unlawfully cleared of native vegetation after 1 January 1990.	The Project area has been used for agricultural land uses since before 1990. It is assumed all cleared areas have been so since before 1990.	No
Contains native vegetation that was grown or preserved with the assistance of public funds (other than funds for forestry purposes), or	No.	No
The land is eligible for designation as Category 2-vulnerable regulated land, or	Parts of the Project area are mapped as Category 2- Vulnerable Regulated Land, these are excluded from this assessment. This assessment considered all other areas of the Project area.	No
The land is subject to a private land conservation agreement under the *Biodiversity Conservation Act 2016*, or	The land is not subject to an existing conservation agreement.	No
The land is subject to be set aside under a requirement made in accordance with a land management (native vegetation) code under this Part, or	The land is not identified as a set aside area under the *Land Management (Native Vegetation) Code 2018.*	No
The land contains grasslands that are not low conservation value grasslands, or	The majority of the Project area is on derived native grasslands (PCT 511). Although these grasslands are in poor condition and have been subject to extensive cropping and grazing, they contain some native species and are likely derived from historical box gum woodlands. As such, it is possible the derived grasslands may be associated with the critically endangered TEC 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland'. The BC Act criteria for the TEC is broad and can include highly degraded patches of derived grasslands that would respond to assisted natural regeneration (removal of cropping and stock). Additionally, under Section 7 of the *Land Management (Native Vegetation) Code 2018*, no clearing of critically endangered TEC can be undertaken on Category 2-regulated land. As such, all grassland paddocks (PCT 511) are categorised as Category 2 - Regulated Land.	Yes
The land is or was subject to a requirement to take remedial action to restore or protect the biodiversity values of the land under this Part or the BC Act or under the *Native Vegetation Act 2003* or the *National Parks and Wildlife Act 1974*, or	No.	No

Criteria	Justification	Criteria met
The land is subject to an approved conservation measure that was the basis for other land being biodiversity certified under Part 8 of the BC Act or under any Act repealed by that Act, or	No.	No.
The land is an offset under a property vegetation plan under *the Native Vegetation Act 2003* or is a set aside under a Ministerial order under Division 3 of Part 6 of the *Native Vegetation Regulation 2013*, or	No.	No.
The land is in the coastal wetlands and littoral rainforests area of the coastal zone referred to in the *Coastal Management Act 2016*, or	There are no coastal wetlands or proximity areas within the Project area.	No.
The land is identified as koala habitat (of a kind prescribed by the regulations) in a plan of management made under *State Environmental Planning Policy No 44—Koala Habitat Protection*, or	There is no Koala Plan of Management applicable to the Project area.	No
The land is a declared Ramsar wetland within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* of the Commonwealth, or	The closest RAMSAR wetland is the Macquarie Marshes about 150 kilometres away.	No
The land has (subject to the regulations) been mapped by the Environment Agency Head as land containing critically endangered species of plants under the *Biodiversity Conservation Act 2016*, or	No threatened plants are mapped in the Project area.	No
The land has been mapped by the Environment Agency Head as land containing a critically endangered ecological community under the *Biodiversity Conservation Act 2016*, or	There are several areas of mapped PCT 277, 281, 437, 511 and 796 within the Project area (DPIE, 2015) which area associated with the TEC 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland'.	Yes
The land is of a kind prescribed by the regulations as Category 2-regulated land.	No.	No.

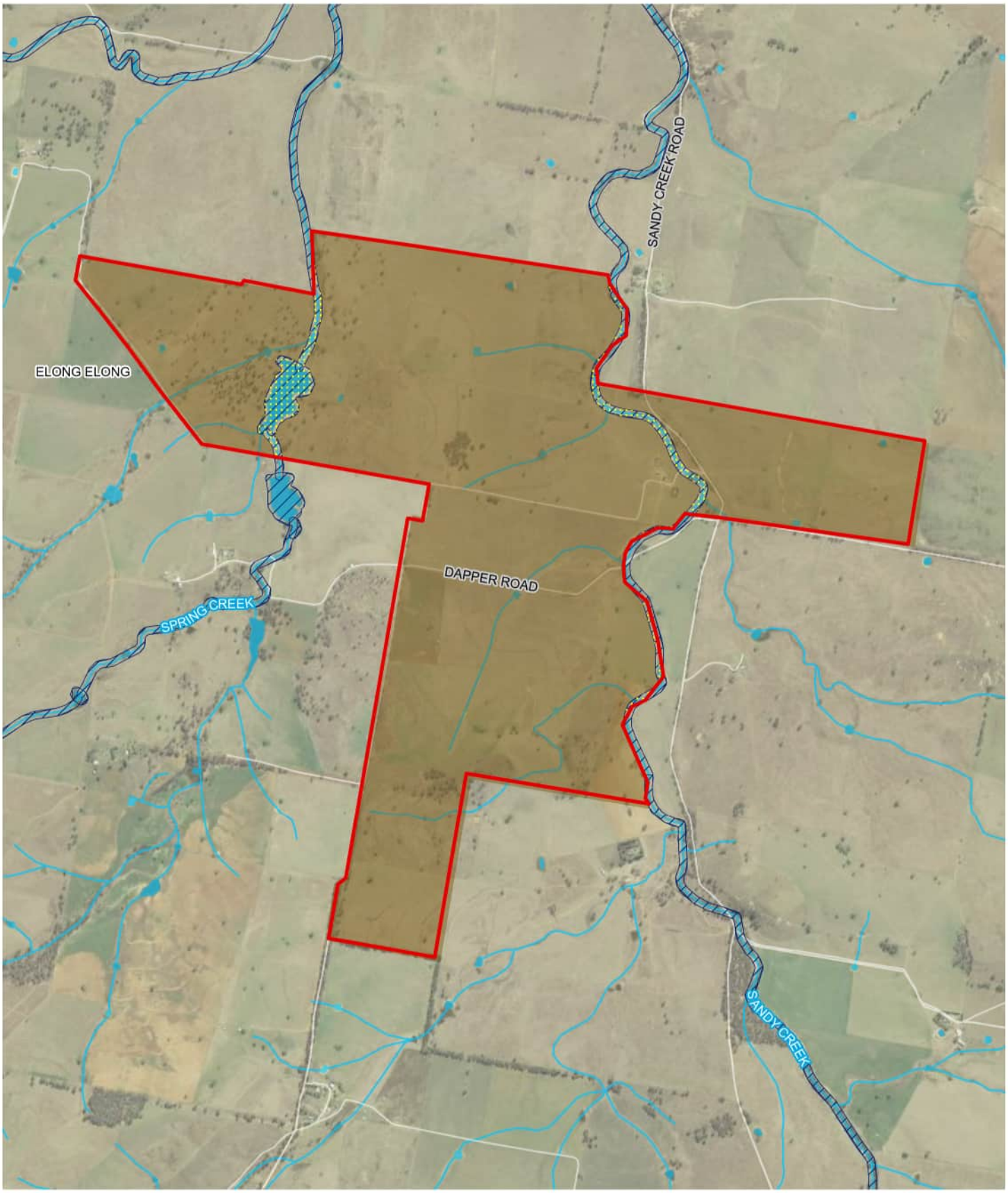

Figure 3-3 Biodiversity Values Map and land category mapping

4.0 Evaluation of preliminary indicative design

The indicative design covers about three quarters of the Project area with an array of solar panels (refer to **Figure 1-1**). In consideration of the potential biodiversity constraints outlined in **Section 3,** the current indicative design is considered suitable to avoid and minimise impacts to biodiversity, riparian habitat and offset obligations.

The following features are considered favourable to avoid and minimise biodiversity impacts:

- Restrict direct impacts (clearing and excavations) to areas of low condition vegetation, preferably PCT 511 – low (refer to **Figure 3-1**) and Category 1 land (to be determined)
- Avoid vegetation that is likely to meet TEC condition thresholds (PCT 202, 281, 437) (refer to **Figure 3-1**)
- Avoid impacts to moderate condition vegetation and areas of woodland (PCT 202, 281, 78, 468, 437) (refer to **Figure 3-1**)
- Avoid riparian areas, particularly areas within the Biodiversity Values Map and Category 2 – Vulnerable Regulated Land (refer to **Figure 3-3**)
- Plan access tracks and construction laydown areas in areas of Category 1 – Exempt land (Non-native vegetation and existing tracks).

5.0 Future assessment

5.1 NSW Biodiversity Offset Scheme

The NSW BOS is the framework for offsetting unavoidable impacts on biodiversity from development with biodiversity gains through landholder stewardship agreements.

As the BOS applies to this Project, where native vegetation is impacted there will be an offset obligation. The degree of this obligation is determined through targeted surveys and preparation of a Biodiversity Development Assessment Report (BDAR). A key part of developing the BDAR is providing detail of the avoidance approaches undertaken through planning and design to avoid impacts, thus avoiding offsets as much as possible. Demonstrating avoidance is important in gaining project approvals and can considerably minimise project offset costs.

5.1.1 Requirement of a BDAR

As the proposal would trigger the BOS and require the preparation of a BDAR. A BDAR must be prepared by a person accredited (under Section 6.10 of the BC Act) to apply the Biodiversity Assessment Method (BAM). The BAM is an assessment process that provides a consistent method for the assessment of biodiversity, including assessing certain impacts on threatened species and threatened ecological communities, their habitats, and impacts on biodiversity values. A BDAR provides guidance on how a proponent can avoid and minimise potential biodiversity impacts and identifies the number and class of biodiversity credits that need to be offset.

5.1.2 Survey effort and timing of BDAR

The outcomes of **Section 3** have been utilised to estimate the scope of the survey effort needed to fully assess the Project area consistent with the BAM. **Table 5-1** provides the estimated survey effort requirements for the BDAR based on the likely PCTs and possible threatened species within the Project area. The required survey timing of potential candidate species is provided in **Appendix C**. This estimate is indicative only, the actual number and timing of targeted species surveys may change as more data is collected about the biodiversity value of the Project area.

Table 5-1: Estimated survey effort for BDAR

Type of assessment	Approximate survey effort*	Timing
Vegetation integrity	About 25-35 BAM plots	All year
Terrestrial and aquatic habitat survey	3 days (diurnal)	All year
Targeted species surveys: birds (breeding)	5 days (diurnal, nocturnal)	Winter (Jun-Aug)
Targeted species surveys: flora, reptiles, birds (breeding)	10-15 days (diurnal)	Spring (Sept-Oct)
Targeted species surveys: flora, reptiles, arboreal mammals, microbats, birds (breeding)	10-15 days (diurnal, nocturnal)	Summer (Nov-Jan)

*this estimate provides for days required undertaking fields surveys, consideration of travel, expenses and incidentals are not considered.

5.1.3 Biodiversity offsets

The number of biodiversity offset credits generated (both ecosystem credits and species credits) depends on a range of factors, including:

- Landscape context

- The extent of each PCT being removed or disturbed
- The extent of species polygons or number of individuals (of flora species) for each species credit species being removed or disturbed
- The vegetation integrity of PCTs being removed or disturbed
- The loss of threatened fauna habitat assessed as a prescribed impact (human structures and non-native vegetation)
- Whether impacts comprise total removal or partial disturbance of values (clearance of canopy but retention of a native understorey within parts of the project).

Accurate calculation of impacts and hence the credit requirements would be completed as part of the BDAR.

5.1.4 Available offsets and retirement options

There are several ways that proponents can meet their offset obligation, and these are governed by a set of offset rules established through the *Biodiversity Conservation Regulation 2017*, and are summarised as follows:

- Preferred option: Retiring credits based on the like-for-like rules or variation rules (where applicable) by purchasing credits from the open market – this is only feasible if required biodiversity credits are available for purchase on the market and can be the most cost effective option
- Making a payment to the Biodiversity Conservation Fund (BCF) (managed by the Biodiversity Conservation Trust - BCT) calculated using the offset payments calculator
- Funding a biodiversity conservation action, such as generating credits through establishment of a Biodiversity Stewardship Agreement (BSA), that benefits the threatened entity impacted by the development. The action must be listed in the Ancillary rules: Biodiversity conservation actions and meet the other requirements set out by these rules.

For large projects requiring retirement of a large number of credits, proponents may opt to establishing their own offsets, or entering into agreements with landowners to establish offsets on their behalf, which tends to be more cost effective then payment in the Fund.

Options would be investigated as the Project progresses and the total number of offset credits required is known.

5.1.5 Current market availability

The BOS public registers support the operation of the biodiversity credit market by helping to connect credit buyers and sellers and increase market transparency. **Table 5-2** provides an indication of the availability of suitable credits in the current open market based on the likely PCTs in the Project area.

Ecosystem credits for vegetation communities can generally be offset from any IBRA sub-region within 100 kilometres of the Project area, as such the IBRA sub-regions of Talbragar Valley, Inland Slopes, Pilliga, Liverpool Range, Kerrabee, Wollemi, Capertee Valley, Capertee Uplands, Hill End, Inland Slopes, Bogan-Macquarie, and Castlereagh-Barwon were used in the search. The results indicate that direct impacts to PCTs 511, 281, 437 and 468 would be most easily offset by buying and retiring credits from the open market, however credit supply would change with time.

Table 5-2: Suitable offset credit demand

PCT IDs	Like for like options/ Trading group	Credit supply*
511, 281, 437	*White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highland* (numerous PCTs)	2,365
202	*Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions* This includes PCT's: 201, 202, 1384	Nil
78	*Inland Riverine Forests* - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	Nil
468	*Western Slopes Dry Sclerophyll Forests* - < 50% cleared group (including Tier 4 or higher threat status).	362

*This is indicative only and represents the available credits at the time of the report preparation. Actual credit availability will change.

5.1.6 Estimation of offsetting credit prices

When taking the option to offset by making a payment to the BCF, offset values are calculated using the offset payments calculator. Offset credits are set to a market price per credit. In brief, this price is multiplied by the number of credits to generate the total cost for offsetting by a payment to the BCF. The number of credits required is generally based on the condition of the vegetation and the extent of clearing. The cost of credits can change with fluctuations in the open market.

Table 5-3 provides the current price per credit for the likely PCTs in the Project area (refer to **Figure 5-1**). As the true estimation of credits cannot be generated at this stage of the assessment, an estimation of the number credits per hectare at benchmark (the best condition vegetation) which gives an indication of the 'worst-case scenario' cost has been provided as a proxy. The vegetation in the Project area is unlikely to meet benchmark condition (especially grassland paddock areas and previous land use) and the number of credits generated would likely be considerably lower. The number of credits required would be generated during the detailed assessment.

Table 5-3: Biodiversity credits, biodiversity risk rating and relative offset cost per credit

Biodiversity Value	No. of credits per ha at Benchmark (worst-case scenario)	Price / credit ($)
PCT 78	75	$8,188.19
PCT 202	378	$19,993.57
PCT 281	837	$8,532.95
PCT 437	Unknown	$7,000.00*
PCT468	39	$2,638.80
PCT 511	62	$7,519.83

*Based on recent credit sales at time of report preparation.

As evident in **Table 5-3**, indicative offset costs for impacts to benchmark condition PCTs 202 and 281 are the highest, PCTs 78, 427 and 511 are moderate, and PCT 468 is the lowest. This advice is given for the purposes of avoidance in early stage planning and design.

Additionally, administration fees are charged by the BCT for the method of offsetting by making a payment to the Biodiversity Conservation Fund, and in many cases, this may be more costly than the alternative methods.

5.2 Matters of national environmental significance

Under the EPBC Act, an action requires approval from the Australian Government Environment Minister if the action has, will have, or is likely to have, a significant impact on a MNES. Based on the existing information, there are several MNES that may require consideration in whether the proposal would have a significant impact (refer to **Section 3.1.5** for all possible MNES in the Project area).

To determine if the proposal would have a significant impact on MNES, a self-assessment must be undertaken for all relevant threatened and migratory entities in accordance with the EPBC Act Significant Impact Guideline (DoE, 2013).

The key risk under the indicative design is the potential impact to low condition PCT 511 which is associated with the Commonwealth TEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. If this vegetation zone is consistent with the federal listing of the TEC (which is considered unlikely) it may result in a significant impact, thus require an EPBC Act referral. Risk of a significant impact on other PCTs and threatened species is also possible, however considering the aversion of woodland areas in the indicative design, this risk is considered low.

Detailed assessment of the Project area, the vegetation integrity, species composition and habitat features are required prior to determining whether an EPBC Act referral is necessary.

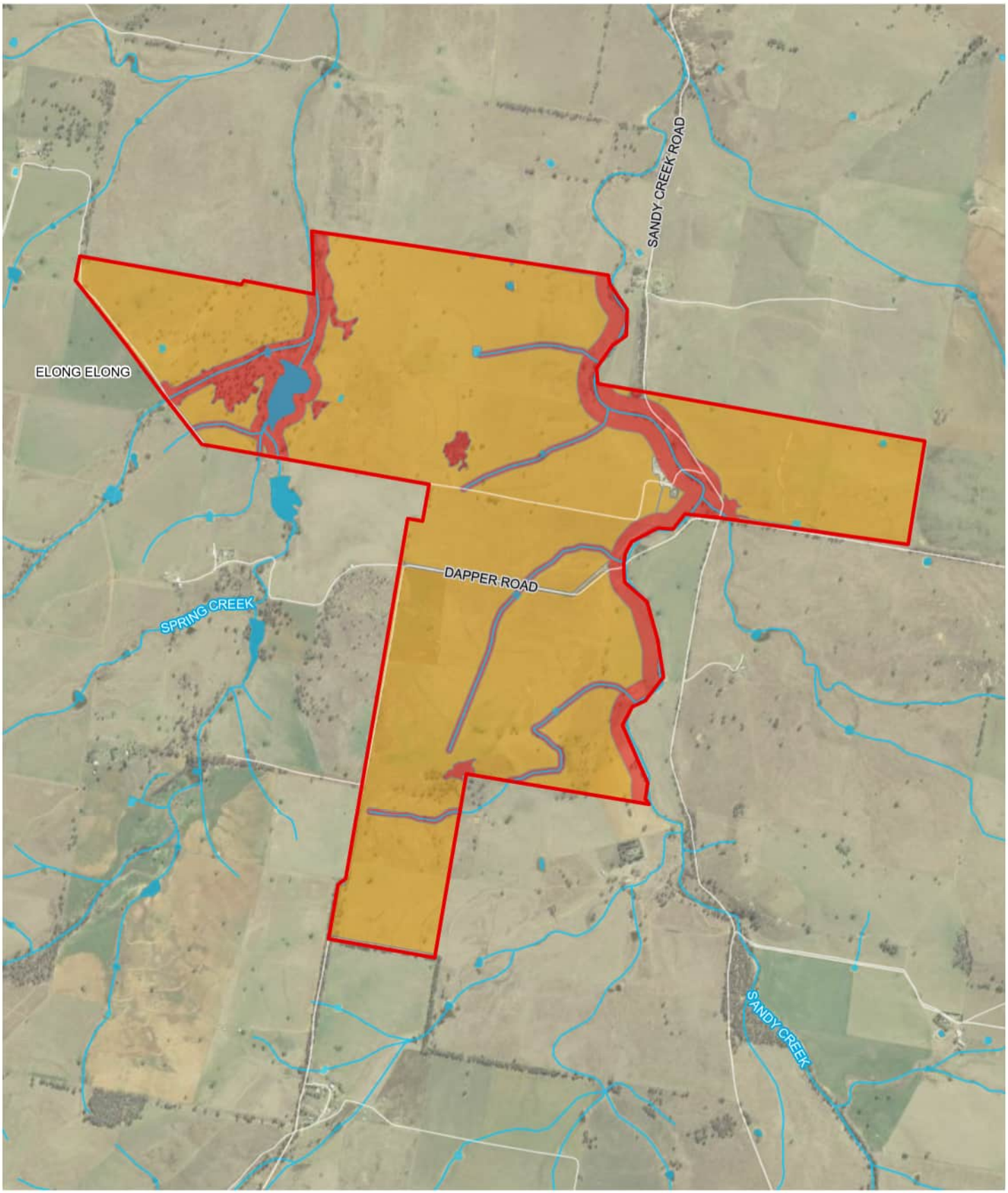

Figure 5-1 Indicative ecosystem offset cost constraints

6.0 Recommendations

Recommendations for progression of the proposal are as follows:

- Early engagement of an accredited assessor to undertake the detailed assessment and prepare the BDAR. This will avoid project delays and enable required winter targeted surveys to be completed in the relevant timeframe. It will also provide required vegetation data to inform the presence of TECs and the possible requirement of a EPBC Act referral
- Early and continued consultation with the BCD of the NSW Department of Planning and Environment (DPE) regarding the biodiversity constraints, ideal survey approaches and timing. This aims to avoid project delays and late questions from BCD at the late assessment and approvals phases
- Early design development and refinement and ongoing communication between the biodiversity team, design team and client. Once biodiversity surveys are complete and offsets are calculated for approval, there is little flexibility to change the design to reduce the project offset obligation and avoidance is best done at the planning and design stage and will be informed by further targeted species surveys
- Consider offset options and credit availability throughout design development. The current indicative design is located in an area with considerable available offset credits, however if the design changes and other vegetation required offsetting (PCT 202, 78), meeting credit obligations could delay the proposal and/or increase offsetting costs. Offsetting options should be considered throughout the planning process as credit supply and demand can change with time
- Typically, the NSW planning approval will require that biodiversity offsets are met prior to construction commencing. Therefore, development of an offset strategy early in the project planning is recommended and may include a combination of actions, such as:
  - Sourcing credits for sale and retiring these through direct negotiation with credit owners
  - Paying into the BCF
  - Progressing Stewardship Site Agreements on suitable properties to generate credits, or a combination of these.

7.0 Conclusion

The Project area contains various biodiversity constraints relating to the landscape features, vegetation communities and the potential for threatened species to be present. The current indicative design is located in the most suitable location to avoid and minimise biodiversity impacts and offset obligations, as it is on low condition vegetation which has been subject to historical disturbance.

A summary of the key constraints within the Project area are summarised below, and should be considered in terms of direct and potential indirect impacts:

- Likely occurrence of two critically endangered TECs, with one listed under the BC Act and one under both the BC Act and EPBC Act
- Potential occurrence of 78 threatened species (including 56 terrestrial fauna species, 17 flora species and 5 fish species) and ten migratory species (some of which are also threatened species) listed under the BC Act and/or EPBC Act
- Riparian areas (including drainage lines), Groundwater Dependant Ecosystems, Key Fish Habitat and potential threatened fish habitat
- Locally significant fauna habitat, including hollow bearing trees and patches of woodland for fauna refuge and connectivity to larger areas of vegetation
- Offset obligations for unavoidable biodiversity impacts.

The proposal would require assessment under the NSW BOS by the preparation of a BDAR. Seasonal survey requirements for the BDAR would likely be required in winter, spring, and summer.

A EPBC Act referral may be required for potential impacts to MNES, however further assessment is required to determine if significant impacts on MNES are likely.

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Appendix A Threatened Ecological Communities and species database search results

Table A-1: Possible threatened ecological communities in the Project area

BC Act Name	EPBC Act Name	BC Act	EPBC Act	Source
N/A	Poplar Box Grassy Woodland on Alluvial Plains	-	E	EPBC
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	E	E	EPBC, BioNet
Native Vegetation on Cracking Clay Soils of the Liverpool Plains	Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	-	CE	EPBC, BioNet
Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions	Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	E	E	EPBC, BioNet
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	CE	EPBC, BioNet
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	Weeping Myall Woodlands	E	E	EPBC, BioNet
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	N/A	E		BioNet

EPBC = EPBC Protected Matters Search Tool (PMST) (DAWE, 2022a) /BAM-C= Biodiversity Assessment Method Calculator tool (DPE, 2022c) / BioNet= NSW BioNet Atlas (DPE, 2022g)

Table A-2: Possible threatened flora species with Project area

Scientific Name	Common Name	Taxa	BC Act	FM Act	EPBC Act	Source	Species credit type under BAM-C
Actitis hypoleucos	Common Sandpiper	Bird	P		C,J,K	EPBC	
Anseranas semipalmata	Magpie Goose	Bird	V,P			BAM-C	Ecosystem
Anthochaera phrygia	Regent Honeyeater	Bird	E4A,P		CE	BioNet, EPBC, BAM-C	Candidate, Ecosystem
Aprasia parapulchella	Pink-tailed Legless Lizard	Reptile	V,P		V	BAM-C	Candidate
Aprasia parapulchella	Pink-tailed Worm-lizard, Pink-tailed Legless Lizard	Reptile	V		V	EPBC	
Apus pacificus	Fork-tailed Swift	Bird	P		C,J,K,M	EPBC	
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Bird	V,P			BioNet, BAM-C	Ecosystem
Botaurus poiciloptilus	Australasian Bittern	Bird	E1		E	EPBC	
Burhinus grallarius	Bush Stone-curlew	Bird	E1,P			BAM-C	Candidate
Calidris acuminata	Sharp-tailed Sandpiper	Bird	P		C,J,K,M	EPBC	
Calidris ferruginea	Curlew Sandpiper	Bird			CE,M	EPBC	
Calidris melanotos	Pectoral Sandpiper	Bird			M	EPBC	
Callocephalon fimbriatum	Gang-gang Cockatoo	Bird	V,P,3		E	EPBC	
Calyptorhynchus lathami	Glossy Black-Cockatoo	Bird	V,P,2			BioNet, BAM-C	Candidate, Ecosystem
Cercartetus nanus	Eastern Pygmy-possum	Mammal	V,P			BAM-C	Candidate
Chalinolobus dwyeri	Large-eared Pied Bat	Mammal	V,P		V	BioNet, EPBC	
Chalinolobus picatus	Little Pied Bat	Mammal	V,P			BioNet, BAM-C	Ecosystem

Scientific Name	Common Name	Taxa	BC Act	FM Act	EPBC Act	Source	Species credit type under BAM-C
Chthonicola sagittata	Speckled Warbler	Bird	V,P			BioNet, BAM-C	Ecosystem
Circus assimilis	Spotted Harrier	Bird	V,P			BioNet, BAM-C	Ecosystem
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Bird	V,P			BioNet, BAM-C	Ecosystem
Daphoenositta chrysoptera	Varied Sittella	Bird	V,P			BioNet, BAM-C	Ecosystem
Dasyurus maculatus	Spotted-tailed Quoll	Mammal	V,P		E	EPBC, BAM-C	Ecosystem
Delma impar	Striped Legless Lizard, Striped Snake-lizard	Reptile	V		V	EPBC	
Ephippiorhynchus asiaticus	Black-necked Stork	Bird	E			BAM-C	Ecosystem
Epthianura albifrons	White-fronted Chat	Bird	V,P			BioNet	
Falco hypoleucos	Grey Falcon	Bird	E1,P,2		V	EPBC	
Falco subniger	Black Falcon	Bird	V,P			BAM-C	Ecosystem
Galaxias rostratus	Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow	Fish		CE	CE	EPBC	
Gallinago hardwickii	Latham's Snipe	Bird	P		J,K,M	EPBC	
Glossopsitta pusilla	Little Lorikeet	Bird	V,P			BAM-C	
Grantiella picta	Painted Honeyeater	Bird	V,P		V	EPBC	Ecosystem
Grus rubicunda	Brolga	Bird	V,P			BAM-C	Ecosystem
Haliaeetus leucogaster	White-bellied Sea-Eagle	Bird	V,P			BAM-C	Candidate, Ecosystem
Hamirostra melanosternon	Black-breasted Buzzard	Bird	V,P,3			BAM-C	Candidate, Ecosystem
Hieraaetus morphnoides	Little Eagle	Bird	V,P			BioNet, BAM-C	Candidate, Ecosystem
Hirundapus caudacutus	White-throated Needletail	Bird	P		V,C,J,K,M	EPBC, BAM-C	

Scientific Name	Common Name	Taxa	BC Act	FM Act	EPBC Act	Source	Species credit type under BAM-C
Hoplocephalus bitorquatus	Pale-headed Snake	Reptile	V			BAM-C	Candidate
Lathamus discolor	Swift Parrot	Bird	E1,P,3		CE	EPBC, BAM-C	Candidate, Ecosystem
Leipoa ocellata	Malleefowl	Bird	E1,P		V	EPBC, BAM-C	
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Bird	V,P,2			BAM-C	Candidate, Ecosystem
Lophoictinia isura	Square-tailed Kite	Bird	V,P,3			BAM-C	Candidate, Ecosystem
Maccullochella macquariensis	Trout Cod	Fish			E	EPBC	
Maccullochella peelii	Murray Cod	Fish			V	EPBC	
Macquaria australasica	Macquarie Perch	Fish			E	EPBC	
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Bird	V,P			BioNet, BAM-C	Ecosystem
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Bird	V,P			BAM-C	Ecosystem
Miniopterus orianae oceanensis	Large Bent-winged Bat	Mammal	V,P			BioNet, BAM-C	Candidate, Ecosystem
Mogurnda adspersa	Southern Purple Spotted Gudgeon	Fish		E		FM Act	
Motacilla flava	Yellow Wagtail	Bird			M	EPBC	
Myiagra cyanoleuca	Satin Flycatcher	Bird			M	EPBC	
Neophema pulchella	Turquoise Parrot	Bird	V,P,3			BioNet, BAM-C	Ecosystem
Ninox connivens	Barking Owl	Bird	V,P,3			BioNet, BAM-C	Candidate, Ecosystem
Ninox strenua	Powerful Owl	Bird	V,P,3			BioNet, BAM-C	Candidate, Ecosystem
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Bird			CE	EPBC	
Nyctophilus corbeni	Corben's Long-eared Bat	Mammal	V,P		V	EPBC, BAM-C	Ecosystem

Scientific Name	Common Name	Taxa	BC Act	FM Act	EPBC Act	Source	Species credit type under BAM-C
Pachycephala inornata	Gilbert's Whistler	Bird	V,P			BAM-C	Ecosystem
Petaurus norfolcensis	Squirrel Glider	Mammal	V,P			BAM-C	Candidate
Petroica boodang	Scarlet Robin	Bird	V,P			BioNet, BAM-C	Ecosystem
Petroica phoenicea	Flame Robin	Bird	V,P			BAM-C	Ecosystem
Phascolarctos cinereus	Koala	Mammal	V,P		E	EPBC, BAM-C	Candidate, Ecosystem
Polytelis swainsonii	Superb Parrot	Bird	V,P,3		V	EPBC, BAM-C	Candidate, Ecosystem
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Bird	V,P			BioNet, BAM-C	Ecosystem
Pteropus poliocephalus	Grey-headed Flying-fox	Mammal	V,P		V	EPBC, BAM-C	Candidate, Ecosystem
Rhipidura rufifrons	Rufous Fantail	Bird			M	EPBC	
Rostratula australis	Australian Painted Snipe	Bird	E1,P		E	EPBC, BAM-C	Ecosystem
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Mammal	V,P			BioNet, BAM-C	Ecosystem
Stagonopleura guttata	Diamond Firetail	Bird	V,P			BioNet, BAM-C	Ecosystem
Stictonetta naevosa	Freckled Duck	Bird	V,P			BAM-C	Ecosystem
Tyto novaehollandiae	Masked Owl	Bird	V,P,3			BAM-C	Candidate, Ecosystem

P: Protected, V: Vulnerable, E: Endangered (EPBC), E1: Endangered (BC), E2: Endangered Population, CE: Critically Endangered, K: KAMBA, J: JAMBA, R: ROKAMBA, M: Migratory, 2: Category 2 sensitive species, 3: Category 3 sensitive species or suitable habitat / EPBC = EPBC Protected Matters Search Tool (PMST) (DAWE, 2022a) / BAM-C= Biodiversity Assessment Method Calculator tool (DPE, 2022c) / BioNet= NSW BioNet Atlas (DPE, 2022g)

Table A-3: Possible threatened flora species with Project area

Scientific Name	Common Name	Taxa	BC Act	EPBC Act	Source	Species credit type under BAM-C
Acacia ausfeldii	Ausfeld's Wattle	Flora	V		BAM-C	Candidate
Commersonia procumbens		Flora	V	V	EPBC, BAM-C	Candidate
Dichanthium setosum	Bluegrass	Flora	V	V	EPBC, BAM-C	Candidate
Diuris tricolor	Pine Donkey Orchid	Flora	V,P,2		BAM-C	Candidate
Euphrasia arguta		Flora	E4A	CE	EPBC	
Homoranthus darwinioides	Fairy Bells	Flora	V	V	BioNet, EPBC, BAM-C	Candidate
Indigofera efoliata	Leafless Indigo	Flora	E1,3	V	BAM-C	Candidate
Lepidium aschersonii	Spiny Peppercress	Flora	V	V	EPBC	
Lepidium monoplocoides	Winged Pepper-cress	Flora	E	E	EPBC	
Pomaderris queenslandica	Scant Pomaderris	Flora	E1		BAM-C	Candidate
Prasophyllum petilum	Tarengo Leek Orchid	Flora	E1,P,2	E	EPBC	
Swainsona recta	Small Purple-pea	Flora	E1	E	EPBC	
Swainsona sericea	Silky Swainson-pea	Flora	V		BAM-C	Candidate
Tylophora linearis		Flora	V	E	BAM-C	Candidate
Zieria ingramii	Keith's Zieria	Flora	V	E	BioNet, EPBC, BAM-C	Candidate
Prasophyllum sp. Wybong (C.Phelps ORG 5269)	a leek-orchid	Flora		CE	EPBC	
Tylophora lineari		Flora	V	E	EPBC	

P: Protected, V: Vulnerable, E: Endangered (EPBC), E1: Endangered (BC), E2: Endangered Population, CE: Critically Endangered, K: KAMBA, J: JAMBA, R: ROKAMBA, M: Migratory, 2: Category 2 sensitive species, 3: Category 3 sensitive species or suitable habitat/ EPBC = EPBC Protected Matters Search Tool (PMST) (DAWE, 2022a) / BAM-C= Biodiversity Assessment Method Calculator tool (DPE, 2022c) / BioNet= NSW BioNet Atlas (DPE, 2022g)

Appendix B Incidental fauna observations

Table B-1: Incidental fauna observations

Scientific Name	Common Name	Exotic	BC Status	EPBC Status
Acridotheres tristis	Common Myna	*		
Cacatua galerita	Sulphur-crested Cockatoo		P	
Chenonetta jubata	Australian Wood Duck		P	
Cincloramphus cruralis	Brown Songlark		P	
Coracina novaehollandiae	Black-faced Cuckoo-shrike		P	
Corcorax melanorhamphos	White-winged Chough		P	
Corvus coronoides	Australian Raven		P	
Cracticus nigrogularis	Pied Butcherbird		P	
Crinia signifera	Common Eastern Froglet		P	
Dacelo novaeguineae	Laughing Kookaburra		P	
Dendrocygna eytoni	Plumed Whistling-Duck		P	
Egretta novaehollandiae	White-faced Heron		P	
Elanus scriptus	Letter-winged Kite		P	
Eolophus roseicapilla	Galah		P	
Fulica atra	Eurasian Coot		P	
Grallina cyanoleuca	Magpie-lark		P	
Gymnorhina tibicen	Australian Magpie		P	
Haliastur sphenurus	Whistling Kite		P	
Hirundo neoxena	Welcome Swallow		P	
Macropus giganteus	Eastern Grey Kangaroo		P	
Malurus cyaneus	Superb Fairy-wren		P	
Manorina melanocephala	Noisy Miner		P	
Ocyphaps lophotes	Crested Pigeon		P	
Oryctolagus cuniculus	Rabbit	*		
Passer domesticus	House Sparrow	*		
Platycercus eximius	Eastern Rosella		P	
Psephotus haematonotus	Red-rumped Parrot		P	
Rhipidura leucophrys	Willie Wagtail		P	
Stizoptera bichenovii	Double-barred Finch		P	
Strepera graculina	Pied Currawong		P	
Struthidea cinerea	Apostlebird		P	
Synoicus ypsilophora	Brown Quail		P	
Tachybaptus novaehollandiae	Australasian Grebe		P	
Trichoglossus haematodus	Rainbow Lorikeet		P	
Vulpes vulpes	Fox	*		
Zosterops lateralis	Silvereye		P	

P: Protected

Appendix C Species with specific seasonal survey timing requirements

Table C-1: Threatened species seasonal survey requirements

Scientific Name	Common Name	Taxa	Class of Credit	Jan	Feb	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
Acacia ausfeldii	Ausfeld's Wattle	Shrubs	Species	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No
Aprasia parapulchella	Pink-tailed Legless Lizard	Reptiles	Species	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
Burhinus grallarius	Bush Stone-curlew	Birds	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Callocephalon fimbriatum	Gang-gang Cockatoo	Birds	Species/ Ecosystem	Yes	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Calyptorhynchus lathami	Glossy Black-Cockatoo	Birds	Species/ Ecosystem	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Cercartetus nanus	Eastern Pygmy-possum	Marsupials	Species	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes
Chalinolobus dwyeri	Large-eared Pied Bat	Bats	Species	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes
Commersonia procumbens	Commersonia procumbens	Shrubs	Species	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Delma impar	Striped Legless Lizard	Reptiles	Species	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Dichanthium setosum	Bluegrass	Herbs and Forbs	Species	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes
Diuris tricolor	Pine Donkey Orchid	Orchids	Species	No	No	No	No	No	No	No	No	Yes	Yes	No	No
Euphrasia arguta		Herbs and Forbs	Species	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	Yes

Scientific Name	Common Name	Taxa	Class of Credit	Jan	Feb	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
Haliaeetus leucogaster	White-bellied Sea Eagle	Birds	Species/ Ecosystem	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Hamirostra melanosternon	Black-breasted Buzzard	Birds	Species/ Ecosystem	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No
Homoranthus darwinioides		Shrubs	Species	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hoplocephalus bitorquatus	Pale-headed Snake	Reptiles	Species	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	Yes
Indigofera efoliata	Leafless Indigo	Shrubs	Species	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No
Lepidium aschersonii	Spiny Peppercress	Herbs and Forbs	Species	Yes	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes
Lepidium monoplocoides	Winged Peppercress	Herbs and Forbs	Species	Yes	Yes	No	No	No	No	No	No	No	No	Yes	Yes
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Birds	Species/ Ecosystem	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Lophoictinia isura	Square-tailed Kite	Birds	Species/ Ecosystem	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Miniopterus orianae oceanensis	Large Bent-winged Bat	Bats	Species/ Ecosystem	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes
Ninox connivens	Barking Owl	Birds	Species/ Ecosystem	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ninox strenua	Powerful Owl	Birds	Species/ Ecosystem	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Petaurus norfolcensis	Squirrel Glider	Marsupials	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Scientific Name	Common Name	Taxa	Class of Credit	Jan	Feb	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
Phascolarctos cinereus	Koala	Marsupials	Species/ Ecosystem	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Polytelis swainsonii	Superb Parrot	Birds	Species/ Ecosystem	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No
Pomaderris queenslandica	Scant Pomaderris	Shrubs	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prasophyllum petilum	Tarengo Leek Orchid	Orchids	Species	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Pteropus poliocephalus	Grey-headed Flying-fox	Bats	Species/ Ecosystem	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Swainsona recta	Small Purple-pea	Herbs and Forbs	Species	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No
Swainsona sericea	Silky Swainson-pea	Herbs and Forbs	Species	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No
Tylophora linearis		Epiphytes and Climbers	Species	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes
Tyto novaehollandiae	Masked Owl	Birds	Species/ Ecosystem	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Zieria ingramii	Keith's Zieria	Shrubs	Species	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes

Appendix B2. Targeted Species Surveys Spring 2022

Dapper Solar Farm - Targeted Species Surveys Spring 2022

Origin Energy

Dapper Solar Farm
9 November 2022

Dapper Solar Farm - Targeted Species Surveys Spring 2022

Client name:	Origin Energy		
Project name:	Dapper Solar Farm		
Revision no:	v1	**Project no:**	IS419500
Date:	9 November 2022	**Project manager:**	Chelayne Whyte,
		Prepared by:	Kirsty Raines
		File name:	Dapper Solar Farm Targeted Species Surveys Spring 2022_DRAFT_v1

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
V1	9/11/22	For client review	K. Raines	C Thompson	C Thompson	C Whyte

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Contents

Appendices

1. Introduction

Origin proposes to develop the Dapper Solar Farm, a large scale solar photovoltaic (PV) generation facility with a battery energy storage system (BESS) and associated infrastructure (the Project). The Project is located in the suburbs of Dunedoo and Goolma, about 30 kilometres south west of the township of Dunedoo and about 60 kilometres east of the city of Dubbo in the Central West region of NSW.

The Project area is located on the rural property of 'Dapper' which is on the boundary of the Dubbo and Warrumbungle Local Government Areas (LGA). The Project area covers about 730 hectares over several lots. The indicative footprint for the solar arrays is currently limited to about 554 hectares, inclusive of the proposed substation (Figure A-1).

1.1 Report purpose and scope

To support the future progress of a Biodiversity Development Assessment Report (BDAR) for the Project, several tasks relating to biodiversity assessment have been undertaken, including:

- Early consultation with NSW Department of Planning and Environment (DPE) Biodiversity Conservation Science (BCS) division.
- Targeted species surveys for candidate species (species credit species) that have survey requirements restricted to the Spring period (September- October) to avoid potential delays in the project program.
- Vegetation Integrity (VI) plots to inform vegetation mapping and the land categorisation assessment.

Jacobs

2. Methods

2.1 Preliminary consultation with NSW DPE Biodiversity Conservation and Science (BCS)

Preliminary consultation with the DPE approval agency (BCS) was undertaken to ensure the Project assessment process and approval stages are efficient and to potentially reduce future time delays and unexpected variations to the Project. The North West BCS office was contacted via email and phone on 23 September 2022 regarding various Project specific questions relating to our proposed approach.

2.2 Targeted species surveys

The candidate species (species credit species) targeted in this survey were derived from the outcomes of the Preliminary Biodiversity Constraints Assessment (Jacobs, 2022) previously undertaken for the Project. The targeted species surveys included the following components:

- Threatened flora surveys
- Breeding bird nest tree/ Hollow bearing tree surveys (required for dual credit species).
- Threatened reptile habitat assessment and mapping survey.

Surveys were conducted over five days in October 2022 (5 - 7th, 9-10th October). Ground conditions were generally wet, with some waterlogged areas and some localised flooding, particularly on roads. Surveys were conducted to the west of Spring Creek.

Weather conditions were generally overcast with heavy rain falling during the survey period. Weather conditions recorded from the nearby Dunedoo weather station on the survey dates are provided in Table 2-1 (BOM, 2022). Additionally, on the 8th of October, in which work was postponed due to poor conditions, 26.8mm of rain fell (refer to Section 2.4).

Table 2-1 Weather conditions during surveys (BOM, 2022)

Date	Minimum temperature (°C)	Maximum temperature (°C)	Rainfall (mm)	Windspeed (km/h) and direction at 9am*
5/10/2022	11.2	14.2	1.0	4, SE
6/10/2022	11.5	17.4	12.7	4, SE
7/10/2022	10.9	17.5	1.2	4, N
9/10/2022	7.5	18.4	18.9	17, WSW
10/10/2022	5.5	21.9	0	17, SE

*windspeed at 9am as bird surveys were conducted in the mornings (refer to Section 2.2.2).

The work was undertaken by appropriately qualified and experienced ecologists. The roles and qualifications of the personnel are provided in Table 2-2.

Table 2-2 Personnel roles and qualifications

Name	Position	Tasks Performed	Relevant Qualifications
Chris Thomson	Principal Ecologist, BAM Accredited Assessor (BAAS18058)	Technical review.	Graduate Certificate in Natural Resources Bachelor of Applied Science (Environmental Management)
Kirsty Raines	Ecologist, BAM Accredited Assessor (BAAS22013)	Targeted flora transects, breeding bird nest tree/ Hollow bearing tree surveys, threatened reptile habitat assessment, BAM plot surveys, report preparation.	Master of Environmental Science and Management Bachelor of Zoology (Animal Ecology)
Emma Weatherstone	Ecologist	Targeted flora transects, breeding bird nest tree/ Hollow bearing tree surveys, threatened reptile habitat assessment, BAM plot surveys.	Bachelor of Environmental Science (Wildlife and Conservation Biology)
Emma Mathews	Ecologist	Targeted flora transects, breeding bird nest tree/ Hollow bearing tree surveys, threatened reptile habitat assessment, BAM plot surveys.	Bachelor of Science (Honours in Genetics and Evolution) Bachelor of Science (Zoology and Ecology)
Joshua Sheridan	Ecologist	Targeted flora transects, breeding bird nest tree/ Hollow bearing tree surveys, threatened reptile habitat assessment, BAM plot surveys.	Bachelor of Science (Ecology & Biotechnology)

2.2.1 Threatened flora surveys

Targeted surveys were undertaken for several candidate species in the relevant associated PCTs, as previously mapped in the Preliminary Biodiversity Constraints Assessment (Jacobs, 2022). These species are listed in Table 2-3.

Table 2-3 Candidate species targeted for threatened flora surveys

Scientific name	Common name	Survey months	Associated PCTs*
Acacia ausfeldii	Ausfeld's Wattle	Aug-Oct	202, 281
Commersonia procumben	-	Aug-May	202, 281, 437, 511
Diuris tricolor	Pine Donkey Orchid	Sept-Oct	202, 281, 437, 511
Indigofera efoliata	Leafless Indigo	Sept-Oct	468
Pomaderris queenslandica	Scant Pomaderris	All year	78, 202, 281, 437, 468, 511
Tylophora linearis		Oct-May	78, 202, 281, 437, 468, 511
Swainsona recta	Small Purple-pea	Sept-Nov	202
Swainsona sericea	Silky Swainson-pea	Sept-Nov	202, 281, 437, 468, 511

*as previously mapped in the Preliminary Biodiversity Constraints Assessment (Jacobs, 2022).

For all areas except PCT 511 (which has mostly been re-mapped as 'exotic pasture/cropped lands', refer to Section 3.2 and Figure A-4), the surveys generally comprised 10m wide walked transects conducted in accordance with 'Survey Guidelines for Australia's Threatened Orchids' (DoE, 2013) and 'Surveying threatened plants and their habitats' (DPIE, 2020c).

It was initially proposed that large areas (over 50ha) of PCT 511 would be surveyed by a two-phase grid-based systematic survey approach in accordance with 'Surveying threatened plants and their habitats' (DPIE, 2020c). However, this was not undertaken due to poor conditions (refer to Section 2.4), and consequently, the change of scope to undertake VI plots and progress the land categorisation assessment (refer to Section 2.3). Thus, targeted flora survey effort was focused on the 10m transect survey method in woodland areas as these targeted more candidate species.

Threatened species reference populations

Reference populations were visited prior to surveys commencing for *Diuris tricolor* and *Acacia ausfeldii*. Survey of these reference populations provided insight into the current stages of flowering of the species and physical attributes of the local populations. The locations of these reference populations were determined via desktop data (DPE, 2022c), consultation with local ecologists and BCS staff. The exact locations of the reference populations are not included in this report to protect the species.

2.2.2 Breeding bird, nest tree and hollow bearing tree surveys

Targeted bird surveys, mapping of nest trees and hollow bearing trees was undertaken in suitable breeding habitat, where accessible. This aimed to determine if the targeted breeding bird species were present within the Project area and if there is suitable breeding habitat present. The targeted candidate species for breeding bird nest tree and hollow bearing tree surveys are listing in Table 2-4. The methodologies for these surveys are provided in the following sections.

Table 2-4 Targeted candidate species for breeding bird nest tree and hollow bearing tree surveys

Scientific name	Common name	Survey months (breeding)	Breeding buffer
Hieraaetus morphnoides	Little Eagle	Aug-Oct	300 m breeding buffer
Hamirostra melanosternon	Black-breasted Buzzard	Sept-Nov	No breeding buffer
Polytelis swainsonii	Superb Parrot	Sept-Nov	200 m breeding buffer
Lophoictinia isura	Square-tailed Kite	Sept-Jan	300 m breeding buffer
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Sept-Dec	200 m breeding buffer
Haliaeetus leucogaster	White-bellied Sea-Eagle	July-Dec	300-500 m breeding buffer

Targeted diurnal bird surveys

Targeted threatened bird surveys were undertaken for the species listed in Table 2-4 in accordance with the 'Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft)' (DEC, 2004). Surveys generally comprised area searches in suitable habitat (about 20-min/hectare) for about 60 person hours.

As part of this, to meet the Commonwealth requirements for the Superb Parrot, surveys were undertaken between 7-10am over five days in areas of suitable breeding habitat. Surveys were in accordance with 'Survey guidelines for Australia's threatened birds' (DEWHA, 2010). Suitable breeding habitat for the Superb Parrot was defined as preferred tree species with hollows greater than 5cm in diameter, over 4m above ground or trees with a DBH over 29cm (DPE, 2022g).

All other incidental bird observations were recorded.

Nest tree and hollow bearing tree surveys

Potential nest trees within the Project area (to the east of Spring Creek), or those that were outside of the Project area but within a designated breeding buffer, were surveyed where accessible, or visually with binoculars at a distance. The details collected for each nest tree and hollow are listed in Table 2-5.

Table 2-5 Details collected for nest trees and hollow bearing trees

Breeding bird nest tree	Hollow bearing tree
Size (diameter) of nest, classified as follows: • Small: 1-19cm • Medium: 20-49cm • Large: 50-100cm • Very large: >100cm	Size of hollow, classified as follows: • Small: 5-9cm • Medium: 10-19cm • Large: 20-40cm • Very Large >40cm
Height of nest	Tree species
Type of nest (ie. stick, clay, ground/ie. bower, burrow)	Tree diameter at breast height (DBH)
Activity and species (if observed)	Aspect of hollow
Species of tree	Height of hollow
	Comment of shape/ suitability (ie. spout, vertical)
	Activity and species (if observed)

2.2.3 Threatened reptile habitat assessment and mapping survey

A survey of Pink-tailed Legless Lizard (*Aprasia parapulchella*) habitat was undertaken concurrently to the threatened flora surveys and breeding bird nest tree/ hollow bearing tree surveys. This was undertaken to identify if potential species habitat was present and inform future targeted surveys.

Rapid surveys were undertaken at approximately 250m intervals with potential habitat being classified into three quality classes adapted from Osborne & Wong (2013):

- High - suitable rocky areas primarily dominated by *Themeda triandra* (Kangaroo Grass) supporting a moderate to high diversity of native forbs and characterised by a moderate to high density of partially embedded rocks. Exotic annual species may be present.
- Moderate quality – suitable rocky areas primarily dominated by other native grasses, and native forbs and characterised by a moderate to high density of partially embedded rocks. Exotic annual species may be present.
- Low quality habitat - suitable rocky areas that have been subject to high levels of disturbance in the recent past. These areas may show disturbance to the soil layer or dominated by exotic pasture grasses, and perennial weeds.

2.3 Vegetation Integrity (VI) plots and land categorisation assessment

Eleven VI plots were conducted across the Project area in accordance with the Biodiversity Assessment Method (BAM) (DPIE, 2020a). These plots were positioned in poor condition pasture (areas previously mapped as PCT 511) to provide quantitative data of vegetation integrity and to inform the land categorisation assessment. Under the BAM, plot-based assessment is not required for non-native vegetation and in Category 1 – Exempt Land, however the BAM states that "verification through field assessment to identify areas of 'non-native' vegetation is a strong justification for their removal from the assessment" (DPIE, 2020b), as such, this approach has been taken.

During the Preliminary Biodiversity Constraints Assessment (Jacobs, 2022), these areas of poor condition pasture were mapped as PCT 511 to provide a conservative approach to vegetation mapping and, as such, potentially avoid missing targeted candidate species that required survey. The vegetation mapping across the Project area was updated based on the outcomes of the VI plots and other observations.

2.4 Limitations

Due to poor weather conditions, surveys were restricted to five days in October 2022 (5 - 7th, 9-10th October). Work was suspended partially on the 7th and 9th of October and entirely on the 8th of October due to poor and dangerous weather conditions. The Project area was difficult to access due to high rainfall events and floodwaters, with many access roads flooded. As such, accessibility via vehicle and on foot was limited. Fieldwork was considerably slowed due to the significantly greater distances that had to be traversed on foot. Consequently, much of the Project area was unable to be surveyed in the planned manner.

Due to the lack of plot-based data for native PCTs, mapping of vegetation is not accurate. As such, the locations requiring targeted survey may change as the assessment develops. Locations planned for survey were based on the preliminary information in the Preliminary Biodiversity Constraints Assessment (Jacobs, 2022). However, the final list of required species may change due to various factors including updates to the BAM-Calculator, changes to listings and future habitat assessments. During the detailed assessment (ie. BDAR), this list will require review and a comprehensive likelihood of occurrence assessment will be undertaken to confirm the required targeted species surveys.

Parts of the land categorisation assessment are based on verbal information regarding the Project area. Details of the property deed are being sourced to verify these factors (eg. lack of land conservation agreements).

The conclusions of this report are based upon currently available data and preliminary field surveys. They are indicative of the environmental conditions of the Project area at the time of the assessment. It should be recognised that site conditions, including the presence of threatened species and vegetation composition can change with time.

3. Results

3.1 Preliminary consultation with NSW DPE Biodiversity Conservation and Science (BCS)

The outcomes of the consultation with BCS are summarised in Table 3-1. The full email correspondence provided in Appendix B.

Table 3-1 Summary of outcomes of consultation with BCS

Date	Type	Summary of outcome
23 September 2022	Email	Jacobs to BCS North Western Biodiversity and Conservation Team outlining the purpose of overall consultation, a summary of the planned Spring surveys and four questions regarding future assessment. In summary, the four questions pertained to: 1. Request for details on a reference population of *Diuris tricolor* and contact details for the accountable officer or species specialist. 2. Request for advice regarding the timing of the future VI assessment in consideration of large infestations of the weed *Verbena bonariensis*. 3. Request for advice regarding the assessment and mapping of Category 1 - Exempt Land. 4. Request for further recommendations of species that BCS would like included in the future assessment. The proposed methodology for the Spring surveys was provided.
23 September 2022	Phone	Ben Ellis (BCS) to Jacobs. Call to discuss the email. All aspects of the email were discussed, including: • The status of the project to date and the current relationship between Jacobs, Origin and BCS. • Further options for communication and engagement including possible meetings and on-site visits. • Regarding Question 1: promise to seek further information on the local *Diuris tricolor* reference population. • Regarding Question 2: discussion of the approach to manage this issue including the locations of VI plots, timing to avoid stochastic events, and provision of justification and explanation in the BDAR. • Regarding Question 3: Discussion regarding the status of the draft land categorisation map and that it is not endorsed by the Commonwealth, as such, Matter of National Environmental Significance (MNES) must also be considered in Category 1 - Exempt Land, and assessment of vegetation may be required if MNES are at risk of impact.

Date	Type	Summary of outcome
		• Regarding Question 4: Jacobs is to provide the preliminary list of species identified in the Preliminary Biodiversity Constraints Assessment. BCS to engage with internal experts to identify any other species that may be required for assessment.
23 September 2022	Email	Ben Ellis (BCS) to Jacobs. Formalising outcomes of phone discussion and providing additional details including: • Locations of the local *Diuris tricolor* reference population. • An excerpt of the BCS recommended land categorisation assessment.
26 September 2022	Email	Jacobs to Ben Ellis (BCS). Email providing the preliminary list of threatened species being considered for further assessment as identified in the Preliminary Biodiversity Constraints Assessment.

3.1.1 Threatened flora surveys

Prior to the commencements of the targeted surveys, inspections of the *Diuris tricolor* and *Acacia ausfeldii* reference populations were undertaken. These inspections identified that both species were in flower during the survey period and justify the site surveys were conducted with appropriate timing.

No threatened flora species were identified within the Project area from the targeted surveys. The walked transect survey effort are shown in Figure A-2.

3.1.2 Breeding bird, nest tree and hollow bearing tree surveys

No targeted bird species were recorded during the surveys. The timing and duration of the targeted bird surveys are considered sufficient for the species, however conditions were unfavourable due to the rainfall and moderate winds. Galahs were observed nesting in a *Eucalyptus camaldulensis* along Sandy Creek in the north-east of the Project area. The full list of recorded bird species is provided in Appendix C.

Fourteen stick nests were recorded within the Project area. These were generally small (10cm) to large nests (40cm) with the largest recorded at about 50cm wide. These stick nests are relatively small and none of the recorded nests are considered large enough to have been constructed by the target raptor species.

Given the predominantly cleared agricultural landscape, large mature trees occur in low density and are sparse. Fifty-three hollow bearing trees were recorded, all of which were in eucalypt tree species. Usable hollows varied in size from small (5cm) to large (40cm). Two very large (80cm) hollows were recorded, however they were upward facing and relatively exposed. Suitable hollow bearing tree habitat is present for the Superb Parrot and Major Mitchell's Cockatoo, however no birds of either species were recorded.

The Project area to the east of Spring Creek is not considered to be breeding habitat for any of the target species. Comments on the suitability of breeding habitat for each of the targeted species is provided in Table 3-2.

Table 3-2 Comments on presence of suitable breeding habitat for the targeted candidate species

Species	Breeding survey period	Candidate species breeding habitat requirement	Comment
Little Eagle	Aug-Oct	Breeding habitat is live (occasionally dead) large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy.	Suitable nest trees are present; however, all stick nests observed were smaller than the criteria and that the target species was not confirmed from the inspections of the stick nests. Also add no pairs were observed.
Black-breasted Buzzard	Sept-Oct	Land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts. The species is known to breed in sites with cropping, but also requires retained vegetation. Nests are generally over 1m wide.	Suitable nest trees are present within riparian areas; however all stick nests observed were smaller than the criteria and that the target species was not confirmed from the inspections of the stick nests. Also add no pairs were observed.
Superb Parrot	Sept-Oct	Living and dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta.* Breeding habitat can be identified by the presence of habitat features and observed nest OR two or more birds seen on site.	Suitable hollow bearing trees are present; however the target species was not recorded during species surveys.
Square-tailed Kite	Sept-Jan	Breeding habitat is live large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy. Nests are generally over 1m wide.	Suitable nest trees are present; however, all stick nests observed were smaller than the criteria and that the target species was not confirmed from the inspections of the stick nests. Also add no pairs were observed.
Major Mitchell's Cockatoo	Sept-Dec	Living or dead tree with hollows greater than 10cm diameter. Signs of breeding including: begging birds of any age or sex; or lone individuals of the species identified during the breeding season (August to November); or an occupied nest.	Suitable tree hollows are present; however the target species was not recorded during species surveys.
White-bellied Sea-Eagle	Jul-Dec	Breeding habitat is live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and	Suitable nest trees are present within riparian areas; however all stick nests observed were

Species	Breeding survey period	Candidate species breeding habitat requirement	Comment
		coastlines AND the presence of a very large stick nest (1.2 -1.5 m wide and 0.5 to 1.8 m deep) within tree canopy; or an adult with nest material; or adults observed duetting within breeding period.	smaller than the criteria and that the target species was not confirmed from the inspections of the stick nests. Also add no pairs were observed.

3.1.3 Threatened reptile habitat assessment and mapping survey

One small area (about 0.8ha) of low quality rocky habitat was observed in the south of the Project area. This area is on a gentle (about 10°) south facing slope with several exposed rocks ranging from about 1 to 150cm in diameter. The ground cover is dominated with exotic pasture grasses (*Hordeum leporinum, Lolium perenne, Bromus hordeaceus*) with few low density native forbs (ie. *Calotis lappulacea, Asperula conferta, Goodenia sp*.). Additionally, as the area is under a canopy of eucalypts (*E. albens, E. microcarpa*) is not considered ideal habitat as the Pink-tailed Legless Lizard prefers areas with open or very sparse canopies. Photos of the potential habitat are shown in Photo 3-1.

On the basis of suitable habitat being present, targeted surveys for the Pink-tailed Legless Lizard should be undertaken in this identified potential habitat during the optimum prescribed survey period (i.e. September to May).

The location of this potential habitat is shown in Figure A-3. All other surveyed areas did not possess suitable exposed rocky habitat to support the species, and as such are not mapped.

Photo 3-1 low quality rocky habitat

3.2 Vegetation Integrity Plots and land categorisation assessment

3.2.1 Vegetation Integrity Plots

Eleven VI plots were conducted across the Project area in poor condition pasture. Ten of these plots were determined to be 'exotic pasture/cropped lands' (ie. non-native vegetation) due to the lack of, or very low abundance and density, of native species. Further details of the exotic pasture/cropped lands vegetation is provided in the following section.

One plot was of higher vegetation integrity and was assigned to a suitable PCT. A summary of the VI plots are provided in Table 3-3. The complete VI plot data is provided in Appendix D.

Table 3-3 Summary of VI plots

PCT ID	PCT Name	Condition class	Plot ID number	Indicative VI score*
-	Exotic pasture/cropped lands (non-native vegetation)	Non-native	1	4
			2	3.6
			4	6.8

PCT ID	PCT Name	Condition class	Plot ID number	Indicative VI score*
			5	3.3
			6	1
			7	1.5
			8	2.5
			9	7.3
			10	1.1
			11	12.4
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Mod	3	41

*The VI score for the Exotic pasture/cropped lands (non-native vegetation) is compared to the previously mapped areas of 'PCT 511'. Each plot was assigned a separate' zone' so the VI scores generated for each plot could be compared. All 'zones' assumed a patch size of 100ha and an area of 1ha.

Exotic pasture/cropped lands

The areas of 'exotic pasture/cropped lands' are generally open pastures dominated by exotic grasses and forbs and are currently, or have been historically, subject to cropping and sewing of pasture species for grazing. Common exotic pasture species that have likely been planted to 'improve' the pasture include *Cerastium glomeratum* (Mouse-ear Chickweed), *Plantago lanceolata* (Lamb's Tongues), *Hordeum leporinum* (Barley Grass), *Lolium perenne* (Perennial Ryegrass) and *Bromus hordeaceus* (Soft Brome). Weed species are prevalent, with common species including *Marrubium vulgare* (White Horehound) and *Verbena bonariensis* (Purpletop).

Of the ten VI plots conducted in this vegetation, two had no native species (Plots # 7, 8) and eight had about 2-5% native cover (ie. *Einadia nutans* (Climbing Saltbush), *Calotis lappulacea* (Yellow Burr-daisy)). Although some native species may have been present, this vegetation is not consistent with any local or regional native PCT and performs little ecological function. The indicative VI scores for these plots were between 1 to 12.4 (averaging 4.8) of the benchmark for PCT 511 (refer to Table 3-3). In accordance with the BAM Stage 1 (DPIE, 2020b), PCTs that are associated with CEECs (ie. if these areas remained to be mapped at PCT 511) and have VI scores below 15 should be zoned separately and do not require an offset in the form of ecosystem credits.

As such, this vegetation is of low value and provides little species habitat, except for foraging areas for predatory birds and some reptiles. There are scattered native paddock trees within these areas, typically at 30 to 200m apart.


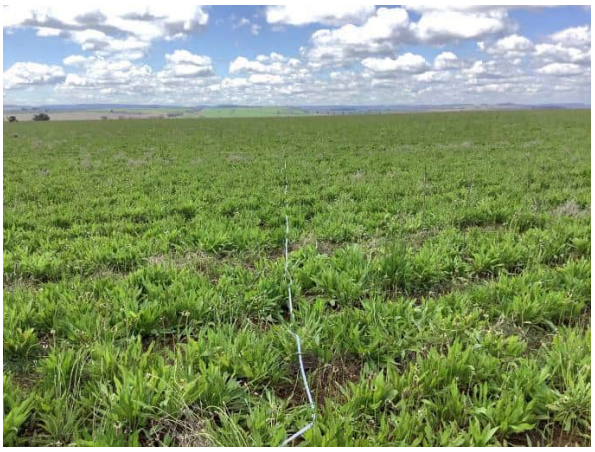

Photo 3-2 Left: VI Plot 7; Right: Plot 8


Photo 3-3 Left: VI Plot 1; Right: VI Plot 2.

3.2.2 Land categorisations

The *Local Land Services Act 2013* (LLS Act) categorises land to determine native vegetation management options for landholders. It assists in identifying where approval is required for impact to vegetation on rural lands. The current mapping is provided in the Transitional Native Vegetation Regulatory Map (DPE, 2022h) and the Draft Native Vegetation Regulatory Map (DPE, 2022a), however, many areas have not yet been published. During the transitional period until the full map is published, land categories are to be determined in accordance with the definitions in the LLS Act. The categories of mapping are summarised as follows:

- **Category 1 - Exempt Land**: native vegetation clearing is allowed without approval from Local Land Services.
- **Category 2 - Regulated Land**: authorisation may be required from Local Land Services for native vegetation clearing. This may include clearing under the Land Management (Native Vegetation) Code 2018. Landholders also have a range of allowable clearing activities available to them for use without approval from Local Land Services.

- **Category 2 – Vulnerable Regulated Land:** land mapped as steep or highly erodible lands, protected riparian land or special category land. Use of the Land Management (Native Vegetation) Code 2018 and allowable clearing activities are restricted in these areas.
- **Category 2 – Sensitive Regulated Land**: land mapped as environmentally sensitive. Clearing under the Land Management (Native Vegetation) Code 2018 is not permitted in these areas, although there is a limited list of allowable clearing activities available.
- **Excluded land**: land managed outside the land management framework. Other clearing controls may exist in these areas.

Some of the Project area is mapped as 'Category 2 – Vulnerable Regulated Land'. This is the same extent as that mapped on the Biodiversity Values Map along Sandy Creek and Spring Creek (Figure A-5). The remainder of the Project area is currently unmapped, and as such, an assessment against the criteria has been undertaken to identify the best-fit categorisation. The preferred approach is to first identify whether the criteria for Category 2 - Regulated Land can be met, prior to assessing against Category 1 - Exempt Land, as sometimes criteria under both can be met. No section of the Project area is currently mapped on the Draft Native Vegetation Regulatory Map (DPE, 2022a).

The following sections provide detailed justification for the land categorisation of Category 2- Regulated Land and Category 1 – Exempt Land, respectively. In summary, parts of the Project area are consistent with the following categorisation:

- **Category 2- Vulnerable Regulated Land**: mapped on the Transitional Native Vegetation Regulatory Map (DPE, 2022h). This generally comprises the riparian areas of Sandy Creek and Spring Creek.
- **Category 2- Regulated Land**: This generally comprises the areas of woodland vegetation within the Project area, and grassland areas that have potential for being critically endangered ecological communities (CEECs).
- **Category 1 – Exempt Land**: All areas that are not classified as Category 2- Vulnerable Regulated Land or Category 2- Regulated Land. This generally comprises all areas of exotic pasture/cropped lands.

The VI plots provide quantitative data to support the categorisation assessment. Therefore, this assessment has advanced on that undertaken as part of the Preliminary Biodiversity Constraints Assessment (Jacobs, 2022) as new information is available. Additionally, the outcomes of the preliminary consultation with BCS clarified various aspects of the approach.

As stated in the consultation with BCS, prior to the BDAR being submitted to the consent authority, the accredited assessor should submit a proposed land categorisation method to the BCS North West Planning team for endorsement (refer to Appendix B). Considering this level of assessment has been completed to date, it is recommended this be submitted to BCS at the start of preparation of the BDAR to avoid project delays.

Category 2 - Regulated Land

The justification for the Category 2 - Regulated Land, as set out in Section 60I of the LLS Act, is provided in Table 3-4. The assessment generally concludes that the following areas should be mapped as Category 2 - Regulated Land:

- Native woodland (ie. PCTs 78, 202, 267, 281).
- Area mapped as PCT 511 under State mapping (DPE, 2022d), as it is associated with the CEEC White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

This generally comprises the northern paddock between Spring Creek and Sandy Creek (refer to Figure A-5 and Figure A-8).

However, with further assessment, the area mapped as PCT 511 (as described above) may be able to be categorised as Category 1 - Exempt Land. The only criteria restricting this is that it is previously mapped as PCT 511. As clarified in the consultation with BCS, "in areas which have the potential to contain CEECs, native grasslands or habitat for a critically endangered species of plant, land categorisation assessments should be supported by evidence from a site-based floristic assessment to demonstrate presence or absence" (refer to Appendix B). As such, if plot-based assessments are undertaken in this area which determine that the vegetation does not meet the CEEC listing, then it could be re-mapped as Category 1 - Exempt Land. This is also supported by recent aerial imagery showing cropping on the land and the 2017 NSW Land Use Mapping dataset (DPE, 2020) indicating it is "cropping" land. As such, it is likely that the area would meet the criteria for Category 1 - Exempt Land once assessed. Plot based assessments were not undertaken in this area during the October 2022 surveys due to inaccessibility.

The extent of all land categorisations are shown in Figure A-5.

Table 3-4 Justification for Category 2 - Regulated Land under section 60I of the LLS Act

Criteria	Justification	Criteria met
Land is to be designated as Category 2 - Regulated Land if the Environment Agency Head reasonably believes that:		
The land was not cleared of native vegetation as of 1 January 1990, or the land was unlawfully cleared of native vegetation after 1 January 1990.	Land clearing since 1990 was assessed based on the spatial dataset 'State-wide Landcover and Tree Survey (SLATS) LANDSAT Woody Vegetation Change - NSW 1988 – 2010' (DPE, 2012). This data describes the areas and type of woody vegetation change (loss) based on the analysis of multi-date Landsat imagery covering NSW. This source does not indicate any woody vegetation clearing within the Project area between 1988 and 2010 (Figure A-7). As such, there is evidence that the land was cleared prior to 1990.	No
Contains native vegetation that was grown or preserved with the assistance of public funds (other than funds for forestry purposes), or	There are no records to indicate of native vegetation being grown or preserved on the land with the assistance of public funds (ie. property vegetation plan, conservation property vegetation plan or an incentive property vegetation plan BioBanking agreements).	No
The land is eligible for designation as Category 2-vulnerable regulated land, or	Parts of the Project area are mapped as Category 2-Vulnerable Regulated Land, these are excluded from this assessment (Refer to Figure A-5). This generally comprises the waterways and riparian vegetation of Sandy Creek and Spring Creek (Figure A-5).	Partially
The land is subject to a private land conservation agreement under the *Biodiversity Conservation Act 2016*, or	The Project area is not subject to an existing conservation agreement.	No

Criteria	Justification	Criteria met
The land is subject to be set aside under a requirement made in accordance with a land management (native vegetation) code under this Part, or	The land is not identified as a set aside area under the *Land Management (Native Vegetation) Code 2018.*	No
The land contains grasslands that are not low conservation value grasslands, or	Eleven VI plots were conducted to provide quantitative data of vegetation integrity and thus identify if the grasslands are of 'low conservation value'. One of the plots was identified to be moderate condition derived grasslands with potential to be associated with threatened ecological communities. As such, this area (and others that were not surveyed) not considered to be 'low conservation value grasslands'. The remaining ten VI plots were identified as 'exotic pasture/cropped lands (non-native vegetation)' with VI score averaging 4.8 (of PCT 511). The data for these plots is provided in Appendix D. The majority of the Project area is identified as "cropping" in the 2017 NSW Land Use Mapping datasets (DPE, 2020). The 2017 NSW Land Use Mapping is shown in Figure A-6. Recent aerial imagery and observations during field surveys have also demonstrated cropping activities across much of the Project area. Considering this evidence, the areas of exotic pasture/cropped lands are considered 'low conservation value grasslands'. To avoid confusion, it should be noted that in the Preliminary Biodiversity Constraints Assessment (Jacobs, 2022) much of the Project area was mapped as derived native grasslands (ie. PCT 511). This was mapped to provide a conservative approach to vegetation mapping and, as such, potentially avoid missing targeted candidate species that required survey. At this time, no VI plots had been undertaken, and as such, the land could not be confidently excluded as native derived grasslands possible associated with CEECs. This approach was further taken at the time as section 7 of the *Land Management (Native Vegetation) Code 2018*, states that no clearing of CEECs can be undertaken on Category 2 - Regulated Land. As such, at the time all grassland paddocks (ie. PCT 511) were categorised as Category 2 - Regulated Land. Under the current more detailed assessments, these areas have been re-mapped as Category-1 Exempt Land.	Partially

Criteria	Justification	Criteria met
The land is or was subject to a requirement to take remedial action to restore or protect the biodiversity values of the land under this Part or the *Biodiversity Conservation Act 2016* or under the *Native Vegetation Act 2003* or the *National Parks and Wildlife Act 1974*, or	There are no records to indicate remedial action has been taken under this legislation.	No
The land is subject to an approved conservation measure that was the basis for other land being biodiversity certified under Part 8 of the *Biodiversity Conservation Act 2016* or under any Act repealed by that Act, or	The Project area, and no adjacent areas are biodiversity certified lands.	No.
The land is an offset under a property vegetation plan under *the Native Vegetation Act 2003* or is a set aside under a Ministerial order under Division 3 of Part 6 of the *Native Vegetation Regulation 2013*, or	The Project area is not subject to a property vegetation plan.	No.
The land is in the coastal wetlands and littoral rainforests area of the coastal zone referred to in the *Coastal Management Act 2016*, or	There are no coastal wetlands or proximity areas within the Project area.	No.
The land is identified as koala habitat (of a kind prescribed by the regulations) in a plan of management made under *State Environmental Planning Policy No 44—Koala Habitat Protection*, or	There is no Koala Plan of Management applicable to the Project area (ie. Dubbo or Warrumbungle LGAs). For the assessment of Koalas and their habitat under the BAM, the suitable methodology, 'Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide' (DPE, 2022b), and the relevant State Environmental Planning Policy (SEPP) must be observed. As such, woodland areas of the Project area may be considered Koala habitat following suitable field assessment. Suitable habitat that must be surveyed includes PCTs "associated with Koala, and areas with a minimum of one koala use tree present, for the relevant region" (DPE, 2022b). As such, areas of open grasslands (particularly	No

Criteria	Justification	Criteria met
	areas of non-native vegetation) cannot be considered suitable habitat. The Project area to the east of Spring Creek is within the Warrumbungle LGA and zoned as RU1 Primary Production. As such, the *State Environmental Planning Policy* (Koala Habitat Protection) 2020 (Koala SEPP 2020) applies* to this section of the Project Area. Although the land to the west of Spring Creek is within Dubbo LGA, it is 'adjoining land in the same ownership, and area of more than 1 hectare' and as such the Koala SEPP 2020 applies to the entire Project area (refer to clause 7 of the Koala SEPP 2020). Considering these factors, all areas that contain native woodland (ie. potential Koala habitat) should be mapped as Category 2 - Regulated Land p[ending the outcomes of the targeted Koala surveys.	
The land is a declared Ramsar wetland within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* of the Commonwealth, or	The closest RAMSAR wetland is the Macquarie Marshes about 150 kilometres away.	No
The land has (subject to the regulations) been mapped by the Environment Agency Head as land containing critically endangered species of plants under the *Biodiversity Conservation Act 2016*, or	No threatened plants are mapped in the Project area. No threatened flora have been recorded within the Project area during targeted surveys to date.	No
The land has been mapped by the Environment Agency Head as land containing a critically endangered ecological community under the *Biodiversity Conservation Act 2016*, or	Parts of the Project area have been mapped as PCT 281, 437, 468, 511 and 796, by the Environment Agency Head (DPIE, 2015), and are associated with the TEC 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland'. Field surveys to date have identified the woodland areas as likely being consistent with the CEEC 'White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland' and therefore should be considered Category 2 - Regulated Land. However, the areas mapped as PCT 511 (DPIE, 2015) (northern paddock, between Spring Creek and Sandy Creek) have potential to be of low condition, dominated by exotic species and/or used as cropping land, and therefore possibly Category -1 Exempt Land. This area is also identified as "cropping" in the 2017 NSW Land Use Mapping datasets (DPE, 2020). As such, further plot-based field assessment is required in this northern paddock to provide evidence if this area is	Partially

Criteria	Justification	Criteria met
	consistent with a CEEC, or it can be further classified as Category 1 - Exempt Land.	
The land is of a kind prescribed by the regulations as Category 2-regulated land.	Section 113 of the *Local Land Services Regulation 2014* states several additional criteria of land that should be designated as Category 2 - Regulated Land. Due to the extensive nature of these criteria, they have been provided in Appendix E. The only criteria considered relevant for discussion is as follows: "(1g) the land contains low conservation grasslands beneath the canopy or drip line of woody vegetation (being woody vegetation that satisfies the criteria for classification of the land as Category 2 - Regulated Land)" There are various area of woody vegetation within the Project area. Where the woody vegetation meets the criteria for CEECs and/or has a percent foliage cover that is as least 25% of the benchmark for tree cover, the vegetation has been mapped as a native vegetation community, and is therefore is considered Category 2 – Regulated land. In other areas, where there are scattered native or exotic trees are within the exotic pasture/cropped lands, these trees (wood vegetation) are not consistent with the criteria for Category 2 - Regulated Land (refer to above sections). As such, these scattered native trees can be classified as Category 1 - Exempt Land.	Partially

*Note: The *State Environmental Planning Policy (Koala Habitat Protection) 2021* applies to most other parts of NSW, however the Koala SEPP 2020 applies to the Project area due to the combination of the LGA and land zoning.

Category 1 - Exempt Land

The justification for Category 1 - Exempt Land under the criteria in section 60H of the LLS Act is provided in Table 3-5. As several areas have been excluded due to already being classified as Category 2 – Vulnerable Land or Regulated Land, this assessment only considered the remaining suitable areas. The assessment generally concludes that Category 1 – Exempt Land includes areas of mapped 'exotic pasture/cropped land' and 'exotic vegetation' (refer to Figure A-4 and Figure A-5).

The extent of all land categorisations are shown in Figure A-5.

As mentioned above, the northern paddock between Spring Creek and Sandy Creek has been historically mapped as PCT 511 and Category 2 - Regulated Land, however it would likely be able to be re-classified to Category1 - Exempt Land with further plot-based field assessment.

A BDAR does not need to assess the impacts of any clearing of native vegetation and direct loss of habitat on land classified as Category 1 – Exempt Land, however assessment of other 'prescribed impacts' under clause 6.1 of the NSW *Biodiversity Conservation Regulation 2017* is required. Additionally, consideration of impacts to MNES and their habitat must be undertaken.

Table 3-5 Justification for classifying Category 1 - Exempt Land under section 60H of the LLS Act

Criteria	Justification	Criteria met
The land was cleared of native vegetation as of 1 January 1990, or the land was lawfully cleared of native vegetation after 1 January 1990, or	Land clearing since 1990 was assessed based on the spatial dataset 'State-wide Landcover and Tree Survey (SLATS) LANDSAT Woody Vegetation Change - NSW 1988 – 2010' (DPE, 2012). This data describes the areas and type of woody vegetation change (loss) based on the analysis of multi-date Landsat imagery covering NSW. This source does not indicate any woody vegetation clearing within the Project area between 1988 and 2010 (Figure A-7). As such, there is evidence that the land was cleared prior to 1990.	Yes
The land contains low conservation value grasslands, or	Eleven VI plots were conducted to provide quantitative data of vegetation integrity and thus identify if the grasslands are of 'low conservation value'. Ten of these plots identified as 'exotic pasture/cropped lands (non-native vegetation)' with either no native vegetation cover (2 plots) or about 2-5% native vegetation cover. The average VI score (in comparison to PCT 511) was 4.8. These VI scores are below the threshold for requiring ecosystem offsetting (a VI score of >15 for PCT 511). The data for these plots are provided in Appendix D. The majority of the Project area is identified as "cropping" in the 2017 NSW Land Use Mapping datasets (DPE, 2020). This dataset assigns land use classes based on activities that have occurred in the last 5-10 years that may be part of a rotational practice. Time-series LANDSAT information is used in conjunction with more recent Satellite Imagery to determine whether grasslands have been disturbed or subject to ongoing land management activities over the past 30 years. The 2017 NSW Land Use Mapping is shown in Figure A-6. Recent aerial imagery and observations during field surveys have also demonstrated cropping activities across much of the Project area. Considering this evidence, the grassland areas (exotic pasture/cropped lands) are considered 'low conservation value'.	Yes
The land contains native vegetation that was identified as regrowth in a property vegetation plan referred to in section 9 (2) (b) of the *Native Vegetation Act 2003*, or	A search of the *Native Vegetation Act 2003* public register was completed on 27 October 2022 (DPE, 2022e). This comprised searching the locations of regrowth vegetation listed in the Public Register Property Vegetation Plans (PVPs) from 2005 to 30 September 2015 (Central West Catchment Management Authority only) and the Public Register PVPs from 1 October 2015 to 24 August 2017 (North West Local Land Service Area only). No area identified as regrowth in these registers are within the Project area. As such, this clause is not applicable.	No
The land is of a kind prescribed by the regulations as category 1-exempt land, or	Section 109 and 116 of the *Local Land Services Regulation 2014* states several additional grounds on which land can be categorised as Category 1 – Exempt Land. In summary, these include: • If the land was unlawfully cleared since 1 January 1990, then the land was subsequently lawfully cleared after the vegetation had	No

Criteria	Justification	Criteria met
	regrown, since 1 January 1990, and the landholder has requested re-categorisation of the land on the basis of that lawful clearing. • If the land was subject to a private native forestry plan approved under Part 5B of the Act or under Part 5C of the *Forestry Act 2012* before its repeal, but has been subsequently excised from that plan by a variation of that plan or that plan has ceased to have effect, and the land had been cleared of native vegetation when the plan was made. • If the land is only low conservation value groundcover (not being grasslands). None of these additional grounds apply to the Project area. As such, this clause is not applicable.	
The land is biodiversity certified under Part 8 of the *Biodiversity Conservation Act 2016* or under any Act repealed by that Act	A search of the Biodiversity Certification Register was conducted on 27 October 2022 (DPE, 2022f). No biodiversity certified land is within the Project area. As such, this clause is not applicable.	No

4. Conclusion and recommendations

This report provides the outcomes of various tasks that have been undertaken to support the future progress of a BDAR. Preliminary consultation with the BCS has provided local information on survey requirements and initiated a relationship with the regulatory body which in Jacobs experience is an important step in gaining BDAR approval.

In summary, the outcomes of the targeted surveys are as follows:

- No targeted threatened flora species were identified within the surveyed areas. In these areas the targeted candidate species can confirmed absent.
- Several hollow bearing trees and stick nests were identified within the Project area, however none are considered suitable breeding habitat for the targeted species as they are incorrect sizes and/or the species was not also recorded within the Project area. As such, in the surveyed areas, breeding habitat for the target candidate bird species can be confirmed absent.
- A small area of low quality habitat for the Pink-tailed Legless Lizard (*Aprasia parapulchella*) was identified in the south of the Project area. Suitable targeted species surveys for the species should be undertaken in this area during future survey periods (September to May).

Informed by the VI plots, the land categorisation assessment has been progressed and locations of regulated and exempt land have been identified. A such, assessment of direct impacts of clearing native vegetation and direct habitat loss can be excluded from the BDAR in areas identified as Category 1 – Exempt Land (following endorsement from BCS). However, assessment of other 'prescribed impacts' and scattered trees are still required in the BDAR.

Recommendations for progression of the Project are as follows:

- Early engagement of an accredited assessor to undertake the BDAR. This will enable the complete assessment of vegetation integrity and confirm presence of TECs, requirements of further targeted surveys, as well as the possible requirement of a EPBC Act referral.
- Suitable targeted species surveys for the Pink-tailed Legless Lizard should be undertaken in the area of potential habitat during future survey periods (September to May).
- Suitable targeted species surveys for other candidate species that were outside the current survey period and may utilise hollows and stick nests (ie. forest owls in Autumn-Winter) still should be survey for.
- Consider the use of the streamlined assessment module for scattered trees in the preparation of the BDAR. This could be used in conjunction with the full BAM (for areas that required detailed assessment) to assess the scattered paddock trees in areas of Category 1 – Exempt Land.
- Conduct further VI plots in the northern paddock between Spring Creek and Sandy Creek to determine if the area can be re-categorised to Category 1 – Exempt Land (refer to the location in Figure A-5).
- Submit the proposed land categorisation methodology and assessment to the BCS North West Planning team for endorsement. It is recommended that this is completed early in the preparation of the BDAR as to ensure the consent authority agrees with the proposed locations for detailed (ie. full BAM assessments) and brief assessments (ie. assessment of 'prescribed impacts' only).

- Continue consultation with the BCS throughout the preparation of the BDAR. This would limit project delays and support the assessment and approval in later stages.

Jacobs

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Appendix A. Figures

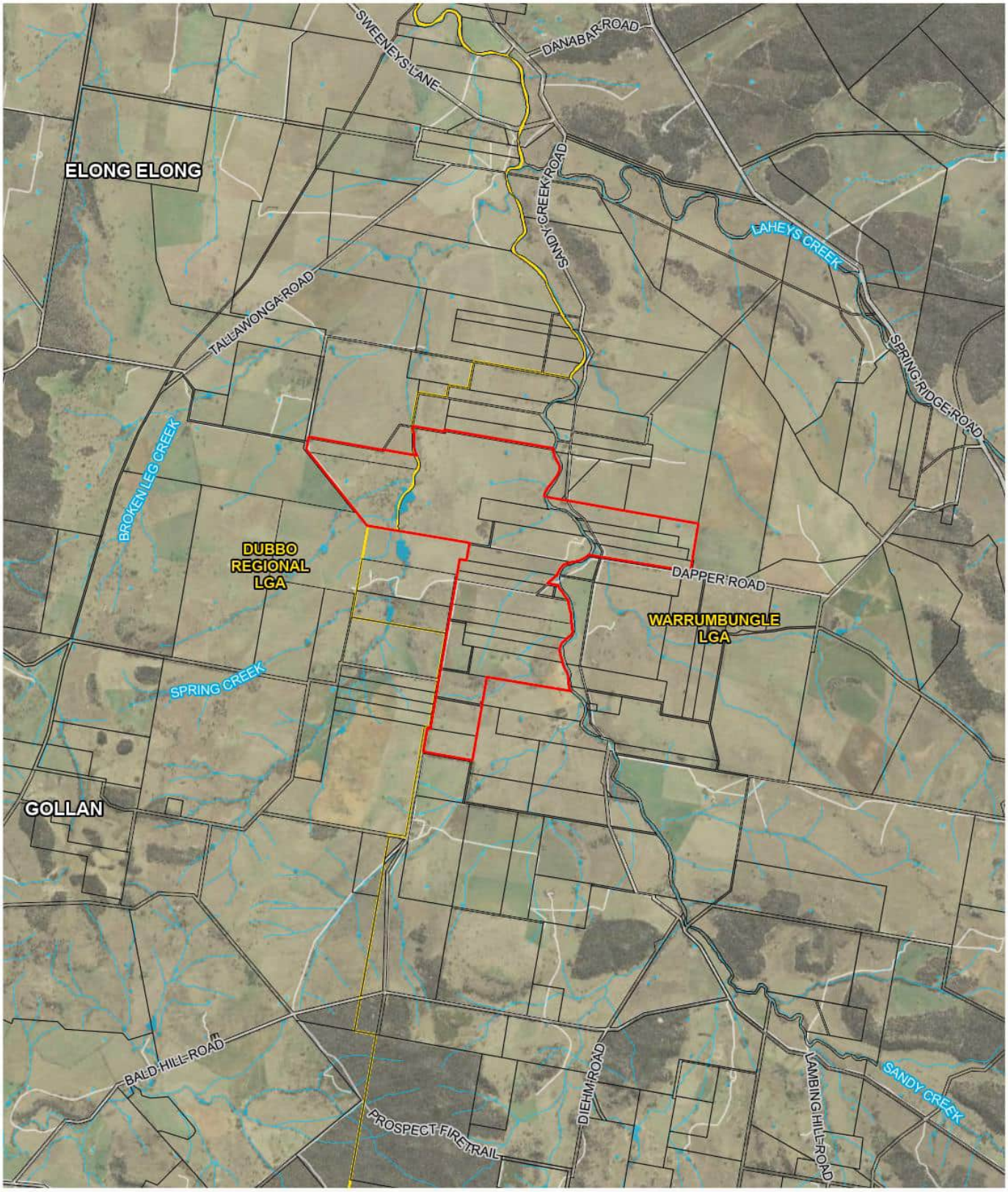


Figure A-1 Project area and local context

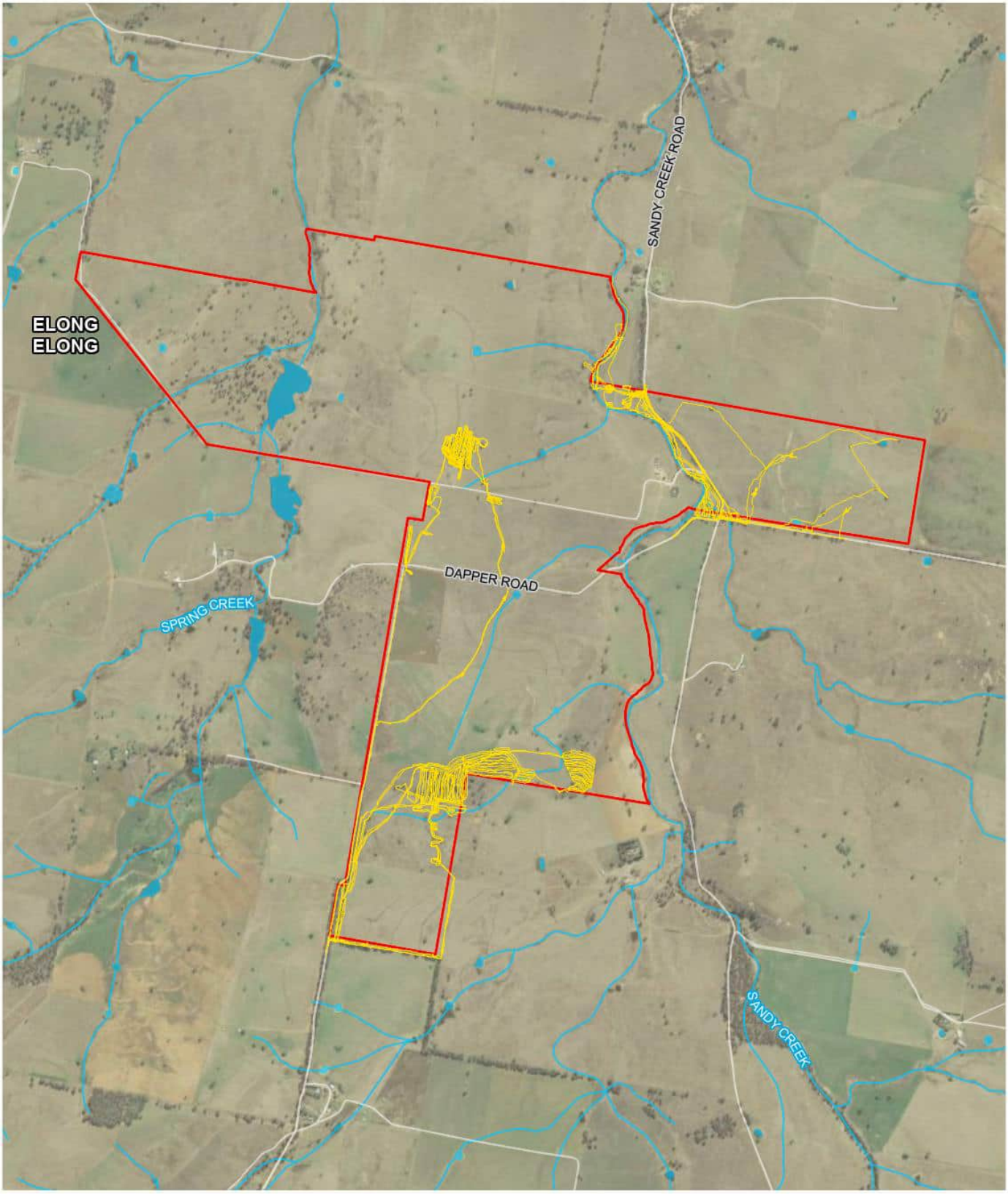


Figure A-2 Flora targeted transect survey effort

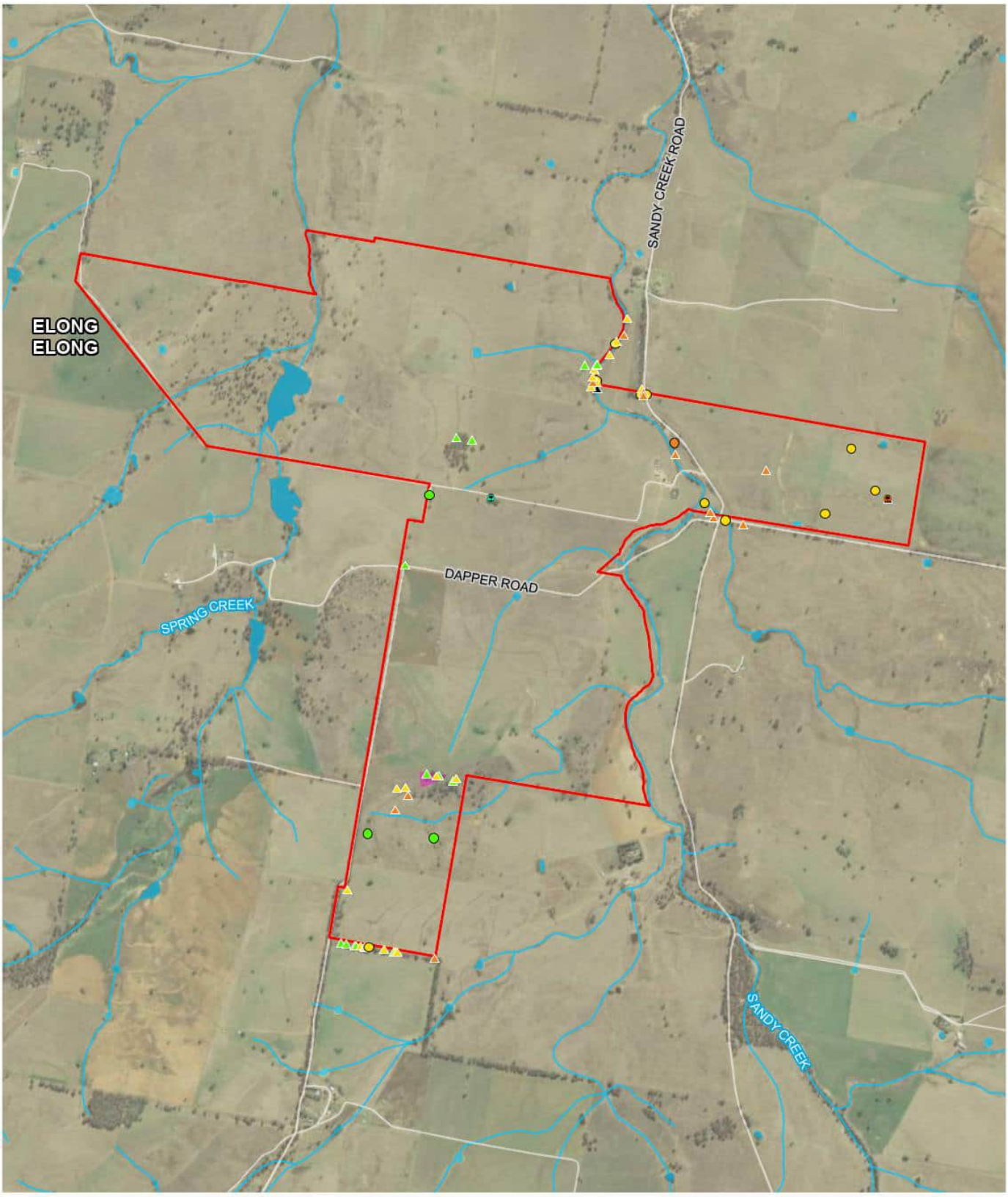
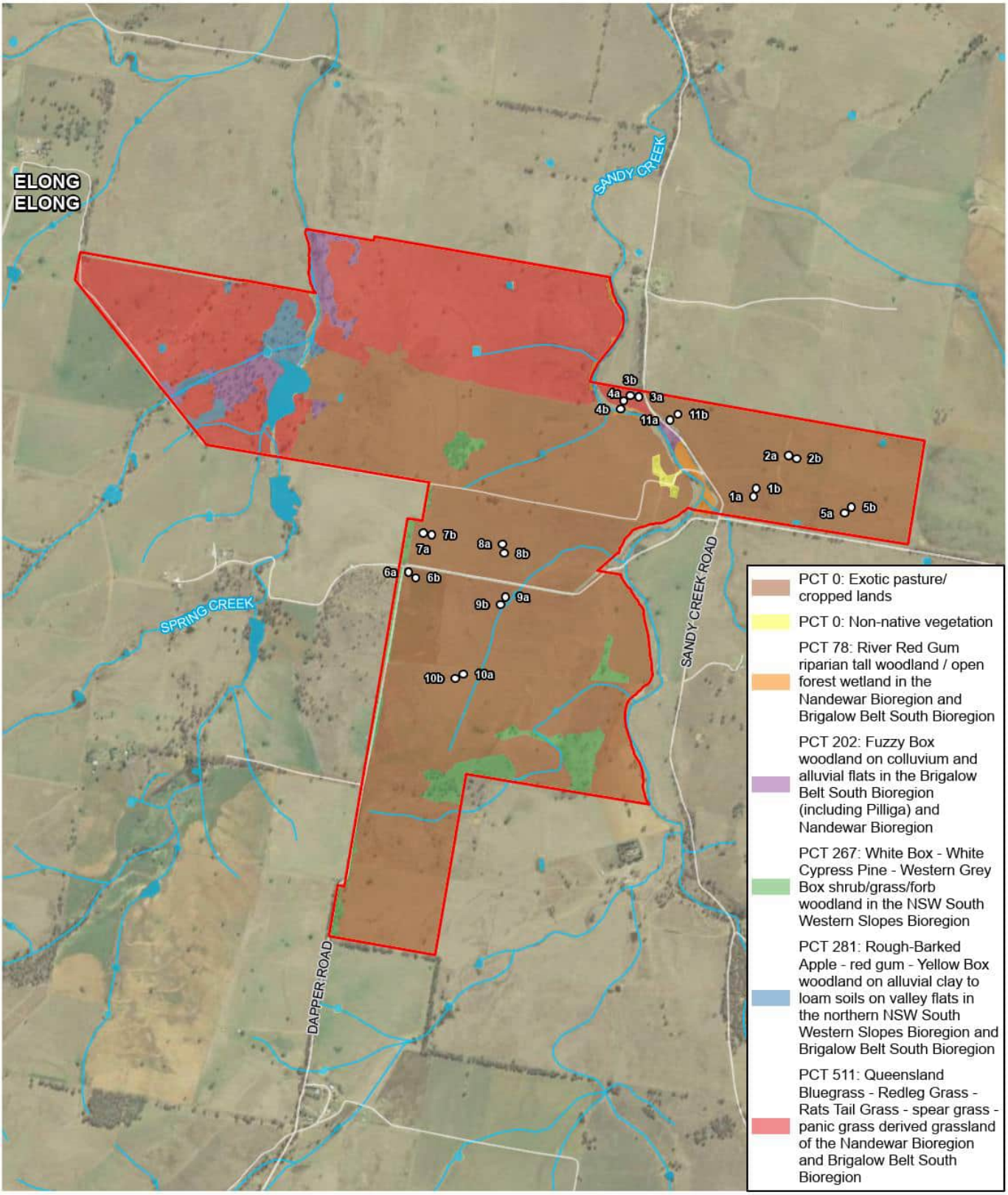


Figure A-3 Nest tree, hollow bearing tree and Pink-tailed Legless Lizard Habitat



Project area

VI plots

Road

Waterway

Waterbody

In reference to the VI plots, 'a' is the start and 'b' is the end of the plot
The area to the West of Spring Creek has not been subject to ground based surveys due to inaccessibility

0 400 800 m

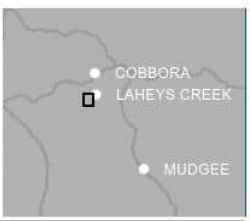
1:30,000 at A4

GDA 1994 MGA Zone 55

N

Data sources

Jacobs 2022
Origin 2022
Department of Planning and Environment 2022
© Department of Customer Service 2020



Date: 2/11/2022 Path: \\aus\jobs\91\GIS\Proj\NSW_IS419500_Dapper_Solar_Farm\Apps\IS419500_BIODIVERSITY.aprx
Created by - RT | QA by - KD

Figure A-4 Vegetation integrity plots and updated vegetation mapping

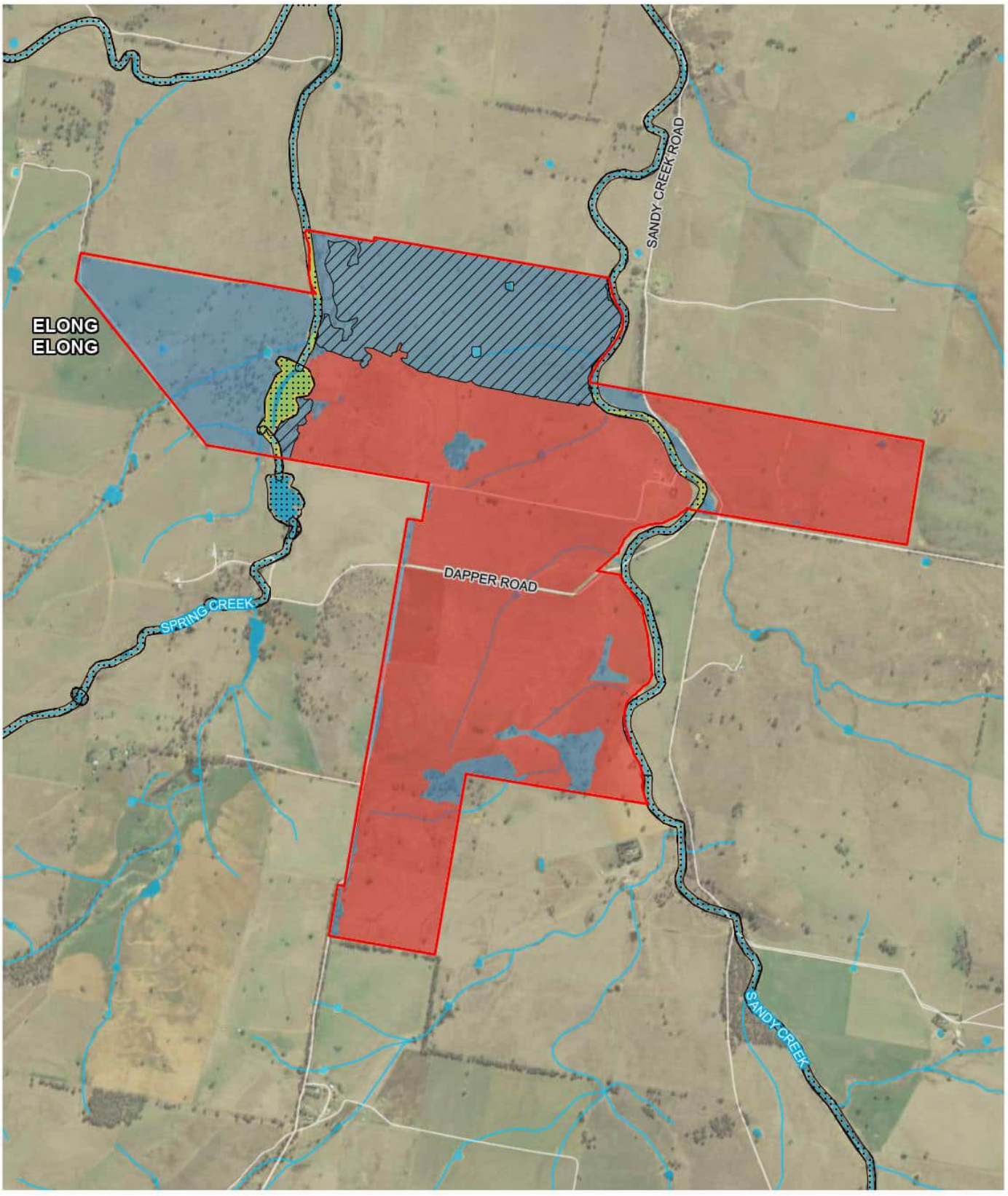


Figure A-5 Land categorisation mapping

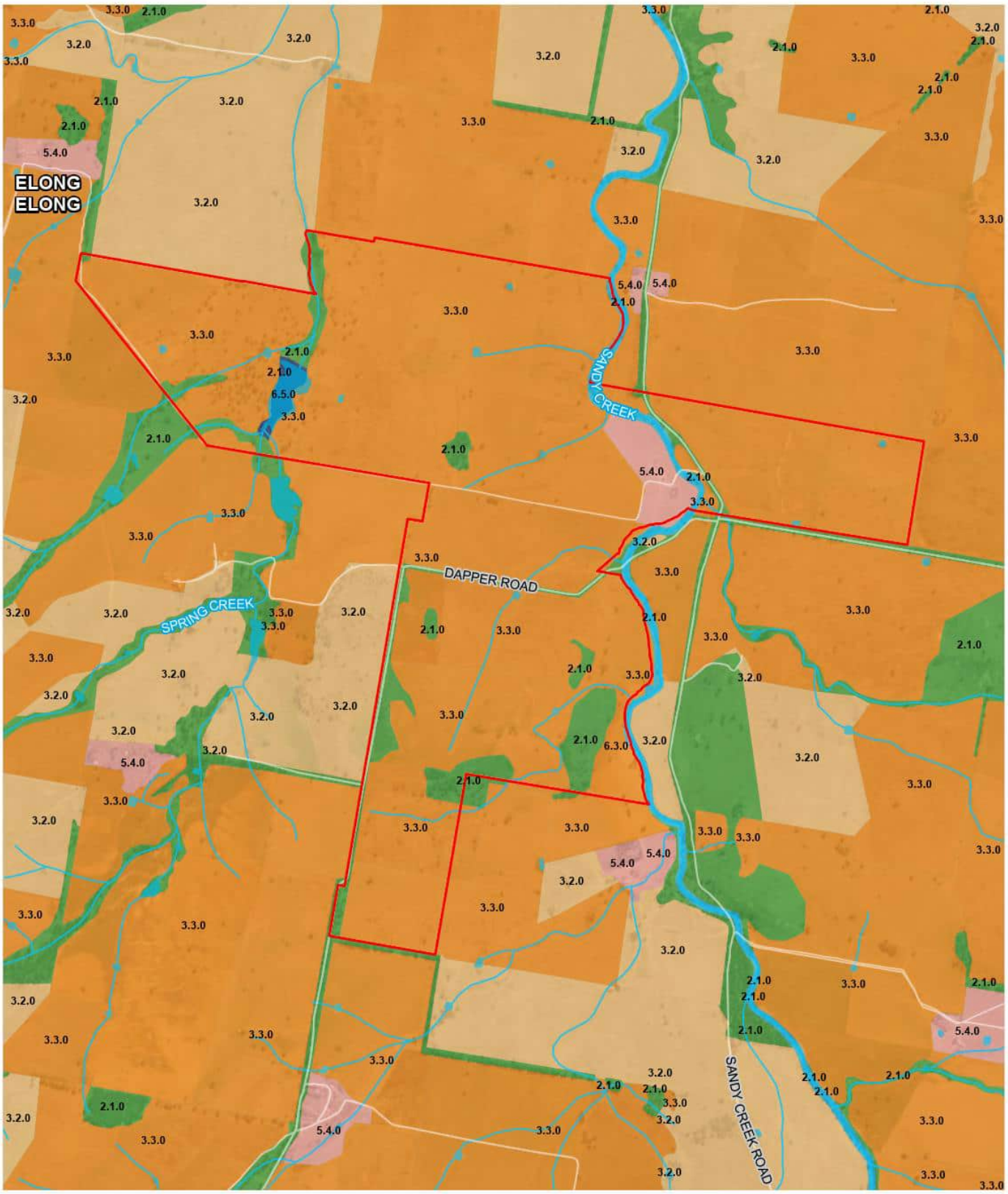
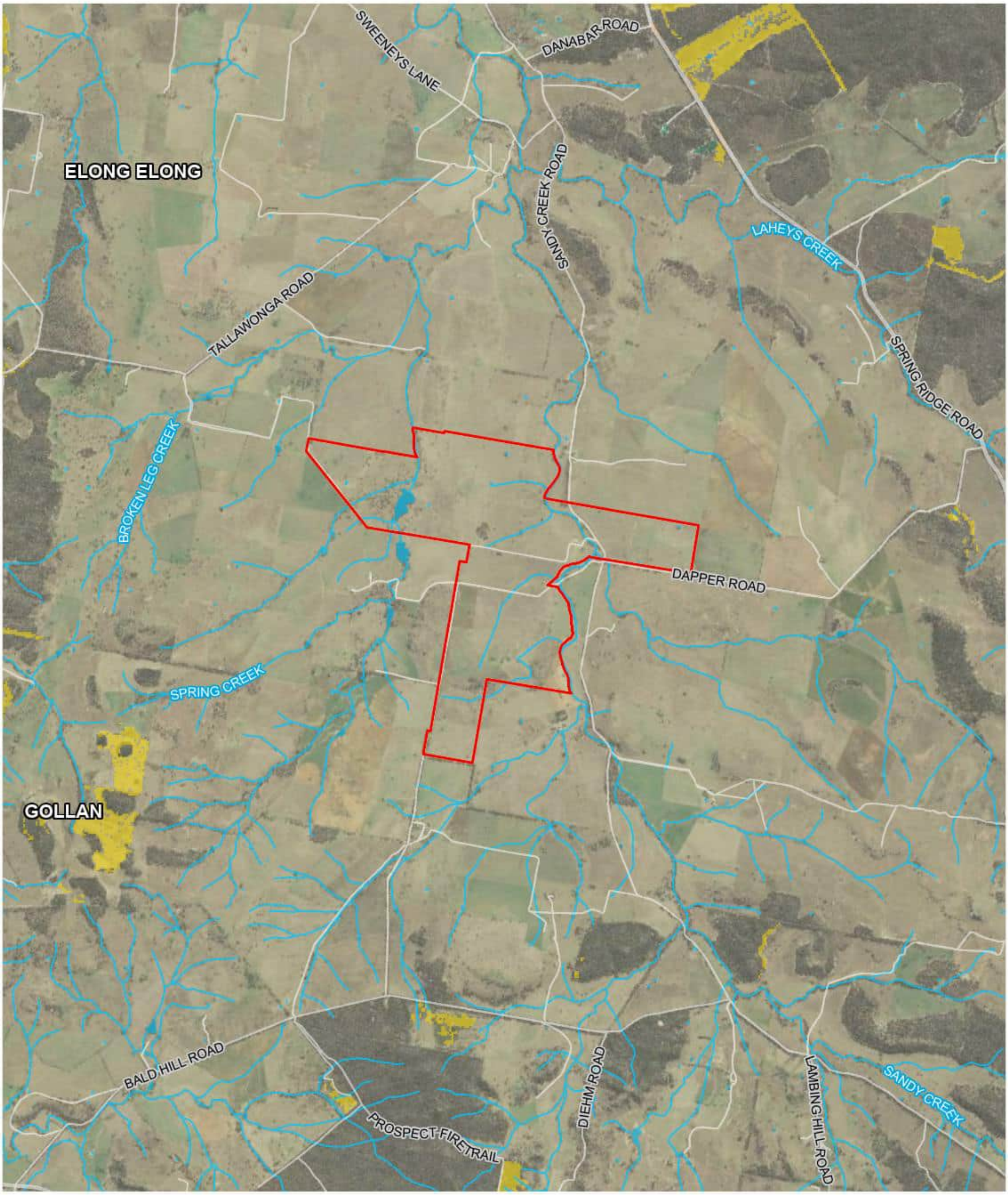


Figure A-6 NSW land use (2017)



Project area

Agricultural Activity

Infrastructure

n/a

Road

Waterway

Waterbody

0 1 2 km

1:65,000 at A4

GDA 1994 MGA Zone 55

As there is no mapping within the Project area, this source indicates that no woody vegetation clearing has occurred in the Project area between 1988 and 2010

Data sources

Jacobs 2022
Origin 2022
Department of Planning and Environment 2022
© Department of Customer Service 2020

Figure A-7 State-wide Landcover and Tree Survey (SLATS) LANDSAT Woody Vegetation Change - NSW 1988 - 2010

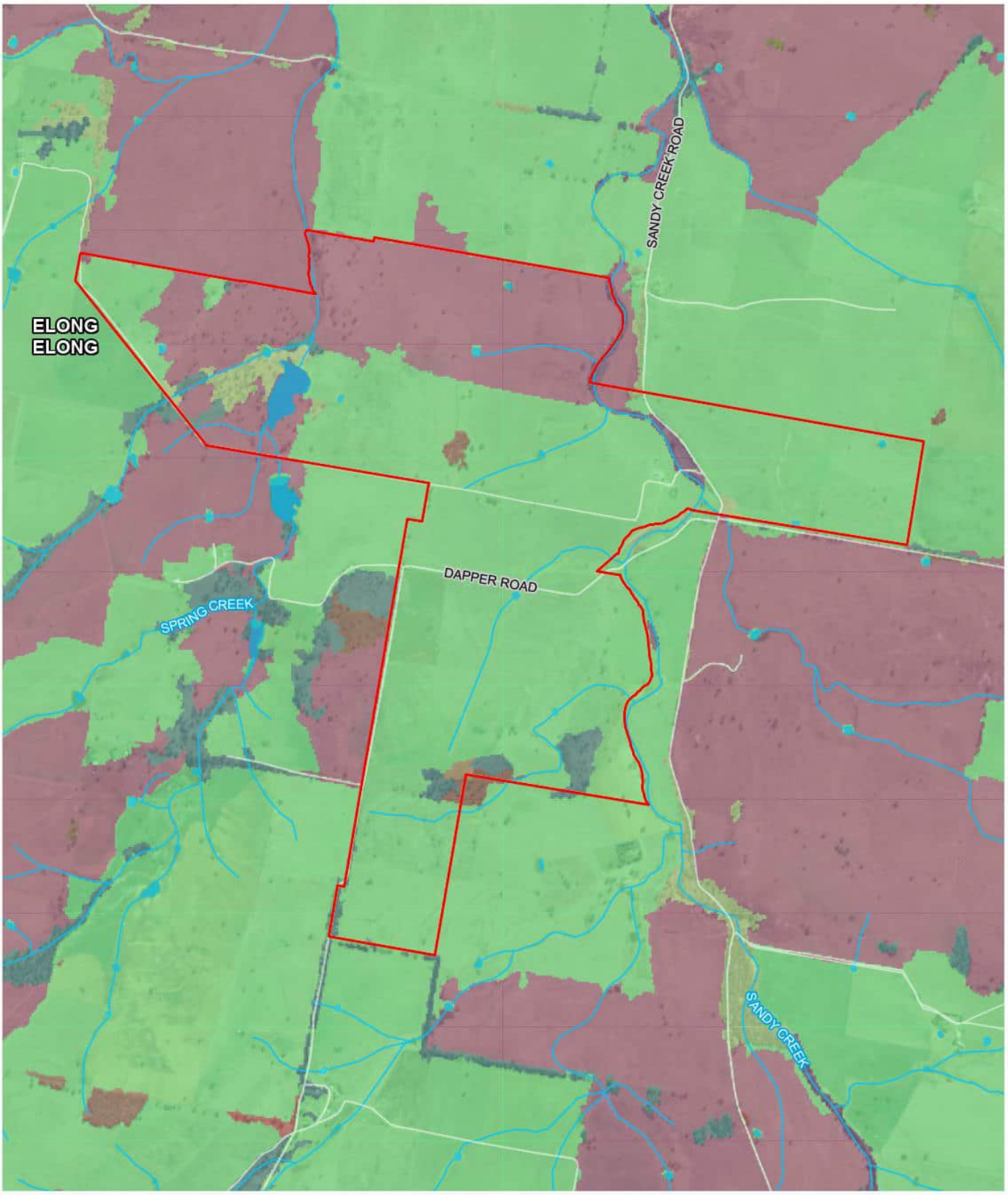


Figure A-8 Existing state vegetation type

Appendix B. Preliminary consultation with NSW DPE Biodiversity Conservation and Science (BCS)

Raines, Kirsty

From: Raines, Kirsty
Sent: Monday, 26 September 2022 9:31 AM
To: Turley, Ed; Fakraufon, Leroi
Cc: Whyte, Chelayne; Thomson, Christopher N
Subject: FW: FOR ACTION : BCD requesting early advice for Dapper Solar Farm Project - Kirsty Raines | Jacobs | Ecologist

Hi Ed and Leroi,

Please see below the responses from Ben Ellis (from BCSs) in red. Following our phone conversation on Friday, I have added some more details in green.

It would be good to set up a meeting with BCS and discuss the project in more detail once Origin has engaged the contractor to prepare the BDAR. Engaging them throughout the process is important to avoid any unforeseen delay and develop the best assessment.
Let me know if you have any questions.

Kind regards,

Kirsty Raines | Jacobs | Ecologist
NSW BAM Accredited Assessor (BAAS22013)
W:+61 (02) 9928 2100 | M: 0407 300 180 | Kirsty.Raines@jacobs.com
Level 7, 177 Pacific Highway North Sydney, NSW 2060 | Australia

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From: Ben Ellis <Ben.Ellis@environment.nsw.gov.au>
Sent: Friday, 23 September 2022 2:02 PM
To: Raines, Kirsty <Kirsty.Raines@jacobs.com>
Subject: [EXTERNAL] RE: FOR ACTION : BCD requesting early advice for Dapper Solar Farm Project - Kirsty Raines | Jacobs | Ecologist

Hi Kristy,

Thanks for the chat just now.

As a follow up to our more detailed discussion on your questions please see the response below. Feel free to give me a call if you need any clarification.

1) Can the BCD provide any of the below details on *Diuris tricolor.* A response regarding this species is more urgent as we are planning surveys in early October:
    a. We have sought information from local ecologists on a reference population near Dubbo which will be inspected prior to fieldwork. Any other details of nearby reference sites would be appreciated- the specific location descriptions and siting notes are withheld for this species on Bionet.
    b. Details of the DPE accountable officer or species specialist who may have details on the this seasons flower timing in the local area.

BCS provided the specific location and noted that the species is already in flower.
Species location details redacted at the request of BCS. They requested the details are only to be held by Jacobs ecologists due to high sensitivity of the species at this location.

2) In relation to the timing of the Vegetation Integrity Assessment, we understand late spring/summer is best due to the flowering of many grass species, however the site is considerably infested with *Verbena bonariensis* which is likely to be in flower at this time. BAM plot assessments are currently indicatively planned for Nov-Jan. Moreover, we have received verbal information that the site has been burnt in the past year to reduce the weed prevalence. This is not considered to be major and not triggering the BAM severe burning guidelines. Further information regarding the burn is being sought. Does the BCD have concerns with surveys being undertaken during peak flowering time of *Verbena bonariensis*¸ or following burning in the past 6 months?

The BAM does not prescribe a set survey window for undertaking VI condition assessments. It is an assessors role to justify that the plots undertaken are representative and have not been undertaken during a time which may marginalise a vegetation zones composition, structure and functional attributes. If a stochastic or chonic event such as a bushfire or drought conditions has reduced the condition values of a vegetation zone (or the assessors ability to detect such vales), an assessor should consider applying More Appropriate Local Data (MALD), using benchmark values or duplicating plots from areas which have not been marginalised but are of equivalent or greater value.
I will make further observations of this next week to help plan suitable timing for plot based surveys based on current conditions and expected future weather. The locations of plots within the site can be selected to help create a more informative representation of the site and weed prevalence. This is the responsibility of the BAM accredited assessor to selected these locations and provide suitable justification and explanation within the BDAR to describe the vegetation and any constraints (ie. weed prevalence, timing, fire history etc). Further information could be sought from the BAM helpdesk.

3) In relation to Category 1 land, much of the site is un-mapped in the NVR Map. Much of these areas are currently mapped as PCT 511, as such, it is possible the derived grasslands may be associated with the critically endangered TEC 'White Box Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland'. The BC Act criteria for the TEC is broad and can include highly degraded patches of derived grasslands that would respond to assisted natural regeneration (removal of cropping and stock). Consequently, at this preliminary stage, these areas are considered to likely be 'Category 2 - Regulated Land classification' as it is possible that "The land contains grasslands that are not low conservation value grasslands, or" "The land has been mapped by the Environment Agency Head as land containing a critically endangered ecological community under the Biodiversity Conservation Act 2016". Nevertheless, following further ground-truthing and the VI assessment, it is possible that some areas may be excluded due to being exotic (ie. cropping). Additionally, areas of suitable tracks will be excluded as Category 1 exempt land. Once these areas are ground-truthed, Jacobs, plans to submit the proposed land categorisation and methodology to the BCD for endorsement prior to submission of the BDAR. Any further recommendations from the BCD on this are welcome.

See extract of BCS's recommended Land Categorisation assessment method below
It is noted that the LSS Act is not endorsed by the Commonwealth government (as the BC Act is regarding the application of the BAM). As such, even if an area can be considered Cat 1 exempt land, it need to be considered against commonwealth TECs and threatened species and their habitat. If it has potential to impact MNES, it should not be excluded from assessment as Cat 1 land.
BCS does not know when the complete land categorisation map will be released. It is likely that when it is released, it would still be recommended that the same process is applied to the land to justify the map and the suitable application of the BAM.

Mapping of category 1 land should start during the early stages of the VI assessment (ie. plot based vegetation surveys). It would be ideal for this process to start during the early stages of the BDAR preparation (ie. Nov- Jan) to help inform the BDAR and other design elements such as access track locations, construction laydown, substations.

4) During the constraints assessment, an indicative list of possible candidate species were generated. These are provided in Appendix A of the attachment. Does the BCD have any further recommendations for species that should be included in the assessment?

I will get in touch with our species experts from SoS to provide comment and get back to you. Currently a fair few of our officers are away on leave for school holidays, so this may take a week or two to get a comprehensive response from all officers.

The preliminary list of threatened species (Appendix A in the constraints assessment) has been provided to BCS for reference).

Category 1 – exempt land

Clearing of native vegetation on land that meets the definition of Category 1 - Exempt Land (as defined under the Local Land Services Act 2013 (LLS Act)) does not require assessment or offsetting under the Biodiversity Conservation Act 2016. Prescribed impacts as outlined in chapter 6 of the Biodiversity Assessment Method (2020) must still be considered on Category 1 - Exempt Land. In addition, potential impacts to Matters of National Environmental Significance under the Environment Protection and Biodiversity Conservation Act 1999 on Category 1 – exempt land must be considered.

Section 60F of the LLS Act provides the transitional arrangements that are in place until a comprehensive NVR Map is published. During the 'transitional period' assessors can make a reasonable approximation of land categorisation for unpublished layers, in consultation with the landholder.

Where a reasonable approximation is required, it is recommended that:

- assessors first identify whether land meets criteria for Category 2 - Regulated Land, prior to Category 1 - Exempt Land.
    - In some circumstances, land may meet multiple map criteria i.e. criteria for Category 2 - Regulated Land, AND Category 1 - Exempt Land
    - In most circumstances' Category 2 - Regulated Land criteria will determine the categorisation of the land, rather than Category 1 - Exempt Land criteria.

Section 60I of the LLS Act and cl.113 of the LLS Regulation defines the criteria in which land can be classified as Category 2 Regulated Land, this includes land which:

- was not cleared of native vegetation as at 1 January 1990;
- was unlawfully cleared of native vegetation after 1 January 1990 and 25 August 2017;
- contains native vegetation that was grown or preserved with the assistance of public funds (other than funds for forestry purposes);
- contains grasslands that are not low conservation grasslands (or low conservation value grassland beneath the canopy or drip line of woody vegetation satisfying the criteria for Category 2);
- is (or was previously) subject to a private native forestry plan approved under Part 5B of the LLS Act
- is subject to a private land conservation agreement;
- is a 'set aside' under a Land Management (Native Vegetation) Code;
- is an offset under a property vegetation plan or a set aside under the former native vegetation laws;
- is subject to an approved conservation measure that was the basis for other land being biocertified;
- is required to be set aside for nature conservation, revegetation or as an offset under an EP&A Act consent or approval
- is identified as coastal wetlands or littoral rainforest;

- is identified as koala habitat;
- is a declared Ramsar wetland; or
- is mapped as containing Critically Endangered species of plants or a Critically Endangered Ecological Community (CEEC)
- is a Travelling Stock Route (outside of the Western Division)

In areas which have the potential to contain CEECs, native grasslands or habitat for a Critically Endangered species of plant, land categorisation assessments should be supported by evidence from a site-based floristic assessment to demonstrate presence or absence.

Where an assessor identifies land that does not meet the criteria for Category 2 Vulnerable Regulated Land or Category 2 - Sensitive Regulated land, the assessor should then assess whether or not the land meets the definition of Category 1 – Exempt Land.

Where the assessor identifies land as Category 1 – Exempt Land it must be adequately demonstrated that the identified land meets the criteria as set out in section 60H of the LLS Act. Multiple pieces of evidence should be used to demonstrate a Category 1 – Exempt Land designation. This might include:

- Publicly available data sets on the SEED data portal, such as:
    - Land use mapping – used to identify and map existing and historical agricultural land use in NSW – see the 2017 landuse map
    - Woody vegetation extent – used to identify and map native vegetation extent
    - State-wide Landcover and Tree Survey (SLATS) clearing for NSW – used to identify detectable clearing events since January 1990 – available here
- Published information on the Native Vegetation Regulatory Map, including Category 2-Sensitive Regulated, Category 2-Vulnerable Regulated, and Excluded Land - available here
    - Site-based information and records, including current and historical high-resolution aerial photography
    - current and historical photographs of the subject land
    - historical land management records maintained by the landowner
    - vegetation survey data collected on the subject land
    - documentation demonstrating history of authorised clearing and/or development.

The published Native Vegetation regulatory map: method statement should be reviewed to determine how the datasets can be best interrogated to support any identification of Category 1 – Exempt Land.

Where there is uncertainty or datasets/information are conflicting, a precautionary approach should be applied and the land should be categorised as Category 2 – Regulated Land.

Where Category 1 – Exempt Land is likely to be present on a development site, early engagement with BCS is encouraged. Prior to the Biodiversity Development Assessment Report being submitted to the consent authority, the accredited assessor should submit a proposed land categorisation method to the BCS North West Planning team at rog.nw@environment.nsw.gov.au for endorsement.

Kind Regards

Ben Ellis
A/ Senior Team Leader Planning North West
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The *Winter edition* of the DPIE NW Environment quarterly newsletter. Please *subscribe here* to receive future editions.

From: Raines, Kirsty <Kirsty.Raines@jacobs.com>
Sent: Friday, 23 September 2022 11:02 AM
To: OEH ROD North West Mailbox <northwest@environment.nsw.gov.au>
Cc: Whyte, Chelayne <Chelayne.Whyte@jacobs.com>; Fakraufon, Leroi <Leroi.Fakraufon@originenergy.com.au>; Turley, Ed <Edward.Turley@upstream.originenergy.com.au>
Subject: BCD requesting early advice for Dapper Solar Farm Project

Dear North Western Biodiversity and Conservation Team,

I write in pursual of advice prior to the provision of SEARs for the proposed Dapper Solar Farm Project.

Jacobs has been engaged by Origin Energy to undertake the scoping report and preliminary constraints assessment for the proposed Dapper Solar Farm located about 35km south west of Dunedoo. Dapper Solar Farm is a proposed 250-300MW solar and battery development project on a 720 hectare land parcel within the Central-West Orana region Renewable Energy Zone (REZ). The scoping report (including an ecological constraints assessment) are expected to be submitted early to mid October 2022.

At this early stage of the project, I wish to engage with the BCD to seek local technical advice regarding the application of the BAM and develop a relationship between the department and proponent. I appreciate that any specific SEARs issued by the Department for the Dapper Solar Farm will supersede any advice provided during this correspondence.

To support the progress of this project and avoid delays, we are conducting various targeted species surveys in the Sept/Oct 2022 period. These will be conducted in accordance with the relevant NSW and Commonwealth guidelines to inform the future BDAR. These planned surveys are summarised as follows:
- Threatened flora surveys including *Acacia ausfeldii, Diuris tricolor, Indigofera efoliata, Swainsona recta, Swainsona sericea*.
- Breeding bird nest tree/ Hollow bearing tree surveys including Little Eagle *Hieraaetus morphnoides* (300 m breeding buffer), Black-breasted Buzzard *Hamirostra melanosternon* (no breeding buffer), Superb Parrot *Polytelis swainsonii* (200 m breeding buffer)
- Threatened reptile habitat assessment and mapping survey for the Pink-tailed Legless Lizard *Aprasia parapulchella.*

The proposed methodology for these Spring surveys are attached for reference.

Regarding these surveys and the future assessment of the site, I ask the following questions:

1) Can the BCD provide any of the below details on *Diuris tricolor.* A response regarding this species is more urgent as we are planning surveys in early October:
    a. We have sought information from local ecologists on a reference population near Dubbo which will be inspected prior to fieldwork. Any other details of nearby reference sites would be appreciated- the specific location descriptions and siting notes are withheld for this species on Bionet.
    b. Details of the DPE accountable officer or species specialist who may have details on the this seasons flower timing in the local area.
2) In relation to the timing of the Vegetation Integrity Assessment, we understand late spring/summer is best due to the flowering of many grass species, however the site is considerably infested with *Verbena bonariensis* which is likely to be in flower at this time. BAM plot assessments are currently indicatively planned for Nov-Jan. Moreover, we have received verbal information that the site has been burnt in the past year to reduce the weed prevalence. This is not considered to be major and not triggering the BAM severe burning guidelines. Further information regarding the burn is being sought. Does the BCD have concerns with surveys being undertaken during peak flowering time of *Verbena bonariensis*¸ or following burning in the past 6 months?
3) In relation to Category 1 land, much of the site is un-mapped in the NVR Map. Much of these areas are currently mapped as PCT 511, as such, it is possible the derived grasslands may be associated with the critically endangered TEC 'White Box Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland'. The BC Act criteria for the TEC is broad and can include highly degraded patches of derived

grasslands that would respond to assisted natural regeneration (removal of cropping and stock). Consequently, at this preliminary stage, these areas are considered to likely be 'Category 2 - Regulated Land classification' as it is possible that "The land contains grasslands that are not low conservation value grasslands, or" "The land has been mapped by the Environment Agency Head as land containing a critically endangered ecological community under the Biodiversity Conservation Act 2016". Nevertheless, following further ground-truthing and the VI assessment, it is possible that some areas may be excluded due to being exotic (ie. cropping). Additionally, areas of suitable tracks will be excluded as Category 1 exempt land. Once these areas are ground-truthed, Jacobs, plans to submit the proposed land categorisation and methodology to the BCD for endorsement prior to submission of the BDAR. Any further recommendations from the BCD on this are welcome.

4) During the constraints assessment, an indicative list of possible candidate species were generated. These are provided in Appendix A of the attachment. Does the BCD have any further recommendations for species that should be included in the assessment?

Any other information or recommendations are welcome based on your local knowledge.

The full biodiversity constraints assessment and scoping report is too large to be send by email, however when an officer is assigned I'll happily share a link once it is available on the Major Projects website.

Kind regards,

Kirsty Raines | Jacobs | Ecologist
NSW BAM Accredited Assessor (BAAS22013)
W:+61 (02) 9928 2100 | M: 0407 300 180 | Kirsty.Raines@jacobs.com
Level 7, 177 Pacific Highway North Sydney, NSW 2060 | Australia

Appendix C. Fauna observations

Table C-1 Fauna observations

Scientific Name	Common Name	Exotic	BC Status	EPBC Status	Observation type
Alisterus scapularis	Australian King-Parrot		P		O
Anthus novaeseelandiae	Australian Pipit		P		O
Cacatua galerita	Sulphur-crested Cockatoo		P		O
Chelodina longicollis	Eastern Snake-necked Turtle		P		O
Chenonetta jubata	Australian Wood Duck		P		O
Coracina novaehollandiae	Black-faced Cuckoo-shrike		P		O
Corcorax melanorhamphos	White-winged Chough		P		O
Corvus coronoides	Australian Raven		P		O
Cracticus nigrogularis	Pied Butcherbird		P		O
Crinia signifera	Common Eastern Froglet		P		H
Dacelo novaeguineae	Laughing Kookaburra		P		O
Egretta novaehollandiae	White-faced Heron		P		O
Elanus axillaris	Black-shouldered Kite		P		O
Eolophus roseicapilla	Galah		P		O
Falco cenchroides cenchroides	Nankeen Kestrel		P		O
Grallina cyanoleuca	Magpie-lark		P		O
Gymnorhina tibicen	Australian Magpie		P		O
Haliastur sphenurus	Whistling Kite		P		O
Hirundo neoxena	Welcome Swallow		P		O
Limnodynastes tasmaniensis	Spotted Grass Frog		P		H
Macropus giganteus	Eastern Grey Kangaroo		P		O
Malurus cyaneus	Superb Fairy-wren		P		O
Manorina melanocephala	Noisy Miner		P		O
Ocyphaps lophotes	Crested Pigeon		P		O
Oryctolagus cuniculus	Rabbit	*			O
Passer domesticus	House Sparrow	*			O
Platycercus eximius	Eastern Rosella		P		O
Pogona barbata	Bearded Dragon		P		O
Psephotus haematonotus	Red-rumped Parrot		P		O

Scientific Name	Common Name	Exotic	BC Status	EPBC Status	Observation type
Elapidae (family)	Brown Snake (King or Eastern, unconfirmed)		P		O
Rhipidura leucophrys	Willie Wagtail		P		O
Struthidea cinerea	Apostlebird		P		O
Synoicus ypsilophora	Brown Quail		P		O

P: Protected, O: Observed, H: Herd.

Appendix D. Vegetation Integrity Plot data

Table D-1 Breakdown of VI scores

PCT Name	PCT ID	Plot ID	Composition condition score	Structure condition Score	Function condition score	VI score
*Exotic pasture/cropped lands (non-native vegetation)	N/A	1	2.3	1.9	15	4
		2	3	0	15	3.6
		4	2.3	9.3	15	6.8
		5	2.9	0.8	15	3.3
		6	4.8	0	10.8	1
		7	0	0	3.5	1.5
		8	0	0	15	2.5
		9	4.8	5.5	15	7.3
		10	4.8	0	15	1.1
		11	15.1	8.4	15	12.4
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	281	3	53.7	73.1	17.5	41

*The VI score for the Exotic pasture/cropped lands (non-native vegetation) is compared to the previously mapped areas of 'PCT 511'. Each plot was assigned a separate' zone' so the VI scores generated for each plot could be compared. All 'zones' assumed a patch size of 100ha and an area of 1ha.

BAM Site Field Survey							
Project:	Dapper Solar	**Plot Identifier**	1	**Plot size**	20x50m	**Recorders**	EW, KR
Survey date:	7/10/2022		**Compass Orientation (head of 20x20 plot)**				15 deg
PCT:	0	**Name:**	Exotic pasture/cropped lands (Non-native vegetation)				
Condition:	Low	**TEC:**	N/A				
GPS Easting	6434798	**GPS Northing**	709779	**Datum**	GDA94	**Zone**	55
Landform			**Soils**			**Drainage & Slope**	
Morphology			**Soil Texture**	Silty clay		**Slope**	5 deg
LandF Element			**Soil Colour**	Browny red		**Aspect**	N
LandF Pattern			**Soil Depth**			**Drainage**	Waterlogged
Microrelief			**Geology**			**Watercourses**	500m from drainage line

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	3	o	
Cultivation	3	o	
Soil erosion	2	R	minor due to recent high water flows
Firewood	0	N/A	
Grazing	1	r	
Fire Damage	0	n/a	
Storm Damage	1	r	minor due to recent high water flows
Weediness	3	o	Dominated by purpletop
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information
Current land use
cattle grazing
Age class of trees (DBH range) , Condition of Vegetation, Hollows
n/a
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)
Dominated by purpletop and other exotics, recent flooding over land. Much of leaf litter appears to be recently detached from purpletop plants
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)
N/A

Dominant Species outside Plot	

FUNCTION

Function attributes for	1

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	2
	Grass & grasslike (GG)	1
	Fern (EG)	0
	Other (OG)	0
	TOTAL	3

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.2
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	0.5
	TOTAL 'HTE'	0

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	95%	83.60%	
	15m	60%		
	25m	90%		
	35m	98%		
	45m	75%		
Bare ground cover	5m	1%	7%	
	15m	3%		
	25m	4%		
	35m	0%		
	45m	25%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	1									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
malv parv	*Malva parviflora*	Small-flowered Mallo	Malvaceae	0.1	5	*		No		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	15	200	*		No		
cera glom	*Cerastium glomeratum*	Mouse-ear Chickweed	Caryophyllace	0.3	300	*		No		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.1	100	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	0.1	100	*		No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	3	300	*		No		
trif repe	*Trifolium repens*	White Clover	Fabaceae (Fab	0.2	20	*		No		
junc subs	*Juncus subsecundus*	Finger Rush	Juncaceae	0.3	30		Grass & grass	No		
modi caro	*Modiola caroliniana*	Red-flowered Mallow	Malvaceae	0.1	3	*		No		
arct cale	*Arctotheca calendula*	Capeweed	Asteraceae	0.1	15	*		No		
calo lapp	*Calotis lappulacea*	Yellow Burr-daisy	Asteraceae	0.1	2		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	1		Forb (FG)	No		

BAM Site Field Survey

Project:	Dapper Solar	**Plot Identifier**	2	**Plot size**	20x50m	**Recorders**	EW, KR
Survey date:	7/10/2022		**Compass Orientation (head of 20x20 plot)**				105 deg
PCT:	0	**Name:**	Exotic pasture/cropped lands (Non-native vegetation)				
Condition:	Low	**TEC:**	N/A				
GPS Easting	6435032	**GPS Northing**	709981	**Datum**	GDA94	**Zone**	55

Landform		**Soils**		**Drainage & Slope**	
Morphology		**Soil Texture**	Silty clay	**Slope**	0
LandF Element		**Soil Colour**	Dark brown	**Aspect**	0
LandF Pattern		**Soil Depth**		**Drainage**	Waterlogged
Microrelief		**Geology**		**Watercourses**	

Plot Disturbance

	Severity	**Age**	**Observational Evidence**
Clearing	3	o	
Cultivation	3	o	
Soil erosion	1	R	minor due to recent high water flows
Firewood	0	N/A	
Grazing	1	r	
Fire Damage	0	n/a	
Storm Damage	1	r	minor due to recent high water flows
Weediness	3	o	Dominated by purpletop
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

cattle grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

n/a

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Dominated exotic annual grasses and purpletop. Recent flooding over land. Raining at time of survey.

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

N/A

Dominant Species outside Plot

FUNCTION

Function attributes for	2

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0
	Grass & grasslike (GG)	0
	Fern (EG)	1
	Other (OG)	0
	TOTAL	1

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0
	Grass & grasslike (GG)	0
	Fern (EG)	0.1
	Other (OG)	0
	TOTAL Native	0.1
	TOTAL 'HTE'	0

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	10%	51.00%	
	15m	50%		
	25m	35%		
	35m	80%		
	45m	80%		
Bare ground cover	5m	50%	20%	
	15m	30%		
	25m	20%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for		2								
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
malv parv	*Malva parviflora*	Small-flowered Mallow	Malvaceae	0.1	10	*		No		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	5	40	*		No		
cera glom	*Cerastium glomeratum*	Mouse-ear Chickweed	Caryophyllace	0.1	10	*		No		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	5	500	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	4	400	*		No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	20	2000	*		No		
arct cale	*Arctotheca calendula*	Capeweed	Asteraceae	0.1	5	*		No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	20		Fern (EG)	No		
linu usit	*Linum usitatissimum*	Flax	Linaceae	0.1	1	*		No		
Marr vulg	*Marrubium vulgare*	White Horehound	Lamiaceae	0.1	22	*		No		
Plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	0.1	2	*		No		
Pare lati	*Parentucellia latifolia*	Red Bartsia	Scrophulariac	0.1	3	*		No		

BAM Site Field Survey

Project:	Dapper Solar	**Plot Identifier**	3	**Plot size**	20x50m	**Recorders**	KR, JS
Survey date:	9/10/2022		**Compass Orientation (head of 20x20 plot)**				85 deg
PCT:	281	**Name:**	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion				
Condition:	Mod	**TEC:**	Yes (BC Act), Likey (EPBC Act)				
GPS Easting	6435366	**GPS Northing**	709124	**Datum**	GDA94	**Zone**	55

Landform		**Soils**		**Drainage & Slope**	
Morphology		**Soil Texture**	Silty clay	**Slope**	0
LandF Element		**Soil Colour**	Brown, red	**Aspect**	0
LandF Pattern		**Soil Depth**		**Drainage**	about 100m west of creek
Microrelief		**Geology**		**Watercourses**	

Plot Disturbance

	Severity	**Age**	**Observational Evidence**
Clearing	2	o	
Cultivation	1	o	
Soil erosion	1	R	
Firewood	0	N/A	
Grazing	1	r	Cattle
Fire Damage	0	n/a	
Storm Damage	0	n/a	minor due to cattle movements
Weediness	1	o	
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

cattle grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

n/a

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Patch in mod/good condition, derived grassland.

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Meets listing for BC Act 'White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions' May meet listing for EPBC Act list 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland', however TEC assessment not undertaken at this stage.

Dominant Species outside Plot	

FUNCTION

Function attributes for	3

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	1
	Shrub (SG)	1
	Forb (FG)	9
	Grass & grasslike (GG)	4
	Fern (EG)	1
	Other (OG)	0
	TOTAL	16

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	4
	Shrub (SG)	0.5
	Forb (FG)	18.5
	Grass & grasslike (GG)	37
	Fern (EG)	0.1
	Other (OG)	0
	TOTAL Native	60.1
	TOTAL 'HTE'	0

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	8	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	50%	46.00%	
	15m	40%		
	25m	35%		
	35m	35%		
	45m	70%		
Bare ground cover	5m	0%	1%	
	15m	0%		
	25m	0%		
	35m	5%		
	45m	1%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	1%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	3									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
malv parv	*Malva parviflora*	Small-flowered Mallo	Malvaceae	1	20	*		No		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	2	20	*		No		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	10	1000	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	5	500	*		No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	10	1000	*		No		
Marr vulg	*Marrubium vulgare*	White Horehound	Lamiaceae	1	20	*		No		
Pare lati	*Parentucellia latifolia*	Red Bartsia	Scrophulariac	0.1	4	*		No		
euca mell	*Eucalyptus melliodora*	Yellow Box	Myrtaceae	4	0		Tree (TG)	No		
Fuma capr capr	*Fumaria capreolata subsp. c*	Climbing Fumitory	Fumariaceae	10	0.1	*		No		
Aust vert	*Austrostipa verticillata*	Slender Bamboo Gras	Poaceae	20	100		Grass & gras	No		
calo lapp	*Calotis lappulacea*	Yellow Burr-daisy	Asteraceae	8	200		Forb (FG)	No		
trif repe	*Trifolium repens*	White Clover	Fabaceae (Fa	2	50	*		No		
gera sola	*Geranium solanderi*	Native Geranium	Geraniaceae	2	30		Forb (FG)	No		
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	5	100		Grass & gras	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	5	50		Forb (FG)	No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	1	10		Forb (FG)	No		
calo cune	*Calotis cuneifolia*	Purple Burr-Daisy	Asteraceae	2	50		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	3	40	*		No		
acac irro	*Acacia irrorata*	Green Wattle	Fabaceae (Mi	0.5	3		Shrub (SG)	No		
bras junc	*Brassica juncea*	Indian Mustard	Brassicaceae	1	5	*		No		
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	10	100		Grass & gras	No		
hypo radi	*Hypochaeris radicata*	Catsear	Asteraceae	0.2	10	*		No		
cras sieb	*Crassula sieberiana*	Australian Stonecrop	Crassulaceae	0.2	20		Forb (FG)	No		
chry apic	*Chrysocephalum apiculatum*	Common Everlasting	Asteraceae	0.1	2		Forb (FG)	No		
aris	*Aristida spp.*	A Wiregrass	Poaceae	2	30		Grass & gras	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	4		Forb (FG)	No		
wahl lute	*Wahlenbergia luteola*	Bluebell	Campanulace	0.1	1		Forb (FG)	No		
Chei sieb	*Cheilanthes sieberi*	Rock Fern	Pteridaceae	0.1	3		Fern (EG)	No		

BAM Site Field Survey							
Project:	Dapper Solar	**Plot Identifier**	4	**Plot size**	20x50m	**Recorders**	KR, JS
Survey date:	9/10/2022		**Compass Orientation (head of 20x20 plot)**				195 deg
PCT:	511	**Name:**	Queensland Bluegrass - Redleg Grass - Rats Tail Grass - spear grass - panic grass derived grassland of the Nandewar Bioregion and Brigalow Belt South Bioregion				
Condition:	Low	**TEC:**					
GPS Easting	6435344	**GPS Northing**	709037	**Datum**	GDA94	**Zone**	55

Landform		**Soils**		**Drainage & Slope**	
Morphology		**Soil Texture**	Silty clay	**Slope**	0
LandF Element		**Soil Colour**	Brown	**Aspect**	0
LandF Pattern		**Soil Depth**		**Drainage**	Recent overland flows, flattened some vegetation
Microrelief		**Geology**		**Watercourses**	About 50m east of waterway

Plot Disturbance

	Severity	**Age**	**Observational Evidence**
Clearing	3	o	
Cultivation	2	o	Phalaris and other exotic grasses dominate
Soil erosion	1	R	Recent overland flows
Firewood	0	N/A	
Grazing	1	r	Cattle
Fire Damage	0	n/a	
Storm Damage	0	n/a	
Weediness	3	o	
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

cattle grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

n/a

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Recent overland flows from high creek levels. Highly degraded, many weeds.

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

N/A

Dominant Species outside Plot	

FUNCTION

Function attributes for	4

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	2
	Grass & grasslike (GG)	1
	Fern (EG)	0
	Other (OG)	0
	TOTAL	3

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	2.2
	Grass & grasslike (GG)	10
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	12.2
	TOTAL 'HTE'	0

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	60%	58.00%	
	15m	40%		
	25m	60%		
	35m	60%		
	45m	70%		
Bare ground cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	4									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	15	50	*		No		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.1	5	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	5	100	*		No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	15	1500	*		No		
Marr vulg	*Marrubium vulgare*	White Horehound	Lamiaceae	1	20	*		No		
calo lapp	*Calotis lappulacea*	Yellow Burr-daisy	Asteraceae	2	40		Forb (FG)	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.2	20		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.3	50	*		No		
phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	30	300	*		No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	2	50	*		No		
cera glom	*Cerastium glomeratum*	Mouse-ear Chickweed	Caryophyllace	2	20	*		No		
spor creb	*Sporobolus creber*	Slender Rat's Tail Gras	Poaceae	10	100		Grass & grass	No		
salv verb	*Salvia verbenaca*	Vervain	Lamiaceae	1	20	*		No		
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	0.1	2	*		No		

BAM Site Field Survey

Project:	Dapper Solar	**Plot Identifier**	5	**Plot size**	20x50m	**Recorders**	KR, JS
Survey date:	9/10/2022		**Compass Orientation (head of 20x20 plot)**				40 deg
PCT:	0	**Name:**	Exotic pasture/cropped lands (Non-native vegetation)				
Condition:	N/A	**TEC:**	N/A				
GPS Easting	6434703	**GPS Northing**	710300	**Datum**	GDA94	**Zone**	55

Landform		**Soils**		**Drainage & Slope**	
Morphology		**Soil Texture**	Silty clay	**Slope**	0
LandF Element		**Soil Colour**	Brown	**Aspect**	0
LandF Pattern		**Soil Depth**		**Drainage**	Recent overland flows, flattened some vegetation
Microrelief		**Geology**		**Watercourses**	About 200m northeast of farm dam

Plot Disturbance

	Severity	**Age**	**Observational Evidence**
Clearing	3	o	
Cultivation	2	o	Plantago and pasture grasses
Soil erosion	1	R	Recent overland flows
Firewood	0	N/A	
Grazing	1	r	Cattle
Fire Damage	0	n/a	
Storm Damage	0	n/a	
Weediness	3	o	Much plant material of purpletop has died down, as such, leaf litter is high.
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

cattle grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

n/a

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Recent overland flows from high creek levels. Highly degraded, many weeds.

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

N/A

Dominant Species outside Plot

FUNCTION

Function attributes for	5

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	1
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	3

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.1
	Grass & grasslike (GG)	4.1
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	4.2
	TOTAL 'HTE'	0.1

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	70%	75.60%	
	15m	73%		
	25m	80%		
	35m	80%		
	45m	75%		
Bare ground cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	5									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	15	100	*		No		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.2	5	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	1	100	*		No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	5	500	*		No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.2	15	*		No		
cera glom	*Cerastium glomeratum*	Mouse-ear Chickweed	Caryophyllace	0.2	1	*		No		
spor creb	*Sporobolus creber*	Slender Rat's Tail Gras	Poaceae	4	400		Grass & grass	No		
salv verb	*Salvia verbenaca*	Vervain	Lamiaceae	0.2	20	*		No		
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	0.1	2	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	2		Forb (FG)	No		
malv parv	*Malva parviflora*	Small-flowered Mallo	Malvaceae	0.2	15	*		No		
cart lana	*Carthamus lanatus*	Saffron Thistle	Asteraceae	0.1	1	*		HTE		
junc subs	*Juncus subsecundus*	Finger Rush	Juncaceae	0.1	1		Grass & grass	No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.1	1	*		No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

BAM Site Field Survey							
Project:	Dapper Solar	**Plot Identifier**	6	**Plot size**	20x50m	**Recorders**	KR, EW
Survey date:	10/10/2022		**Compass Orientation (head of 20x20 plot)**				120 deg
PCT:	0	**Name:**	Exotic pasture/cropped lands (Non-native vegetation)				
Condition:	Low	**TEC:**	N/A				
GPS Easting	6434366	**GPS Northing**	707808	**Datum**	GDA94	**Zone**	55

Landform		**Soils**			**Drainage & Slope**	
Morphology		**Soil Texture**	Silty clay		**Slope**	5 deg
LandF Element		**Soil Colour**	Brown, red		**Aspect**	south
LandF Pattern		**Soil Depth**			**Drainage**	wet, but not waterlogged
Microrelief		**Geology**			**Watercourses**	About 800m south-east of creek

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	3	o	
Cultivation	3	R	Medicago and Plantago, recently plowed and sown
Soil erosion	1	R	
Firewood	0	N/A	
Grazing	1	r	Cattle
Fire Damage	0	n/a	
Storm Damage	0	n/a	
Weediness	3	o	Dominated by Medicago and Plantago
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

cattle grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

n/a

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Highly weedy, dominated by Plantago. Rows can be seen due to plowing.

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

N/A

Dominant Species outside Plot

FUNCTION

Function attributes for	6

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	3
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	3

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.3
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	0.3
	TOTAL 'HTE'	0

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	3%	8.60%	
	15m	8%		
	25m	20%		
	35m	2%		
	45m	10%		
Bare ground cover	5m	65%	36%	
	15m	15%		
	25m	20%		
	35m	60%		
	45m	20%		
Cryptogam cover	5m	3%	3%	
	15m	5%		
	25m	3%		
	35m	1%		
	45m	1%		
Rock Cover	5m	2%	3%	
	15m	2%		
	25m	3%		
	35m	5%		
	45m	2%		

COMPOSITION & STRUCTURE

Species recorded for	6									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
cera glom	*Cerastium glomeratum*	Mouse-ear Chickweed	Caryophyllace	0.1	5	*		No		
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	20	2000	*		No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	100	*		No		
medi sati	*Medicago sativa*	Lucerne	Fabaceae (Fab	25	2500	*		No		
bras junc	*Brassica juncea*	Indian Mustard	Brassicaceae	2	200	*		No		
Orni sati	*Ornithopus sativus*	French Serradella	Fabaceae (Fab	2	200	*		No		
wahl	*Wahlenbergia spp.*	Bluebell	Campanulace	0.1	1		Forb (FG)	No		
calo lapp	*Calotis lappulacea*	Yellow Burr-daisy	Asteraceae	0.1	100		Forb (FG)	No		
euph drum	*Euphorbia drummondii*			0.1	1		Forb (FG)	No		
lepi bona	*Lepidium bonariense*	Argentine Peppercres	Brassicaceae	0.3	30	*		No		
Marr vulg	*Marrubium vulgare*	White Horehound	Lamiaceae	0.1	2	*		No		

BAM Site Field Survey							
Project:	Dapper Solar	**Plot Identifier**	7	**Plot size**	20x50m	**Recorders**	KR, EW
Survey date:	10/10/2022		**Compass Orientation (head of 20x20 plot)**				100 deg
PCT:	0	**Name:**	Exotic pasture/cropped lands (Non-native vegetation)				
Condition:	Low	**TEC:**	N/A				
GPS Easting	6434589	**GPS Northing**	707893	**Datum**	GDA94	**Zone**	55
Landform			**Soils**			**Drainage & Slope**	
Morphology			**Soil Texture**	Silty clay		**Slope**	0
LandF Element			**Soil Colour**	Brown, red		**Aspect**	0
LandF Pattern			**Soil Depth**			**Drainage**	wet, but not waterlogged
Microrelief			**Geology**			**Watercourses**	About 700m east of creek

Plot Disturbance

	Severity	Age	Observational Evidence
Clearing	3	o	
Cultivation	3	R	Plantago, recently plowed and sown
Soil erosion	1	R	
Firewood	0	N/A	
Grazing	1	r	Cattle
Fire Damage	0	n/a	
Storm Damage	0	n/a	
Weediness	3	o	Dominated by Plantago
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

cattle grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

n/a

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Highly weedy, dominated by Plantago. Rows can be seen due to plowing.

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

N/A

Dominant Species outside Plot

FUNCTION

Function attributes for	7

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	0

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	0
	TOTAL 'HTE'	0

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	5%	4.60%	
	15m	4%		
	25m	2%		
	35m	8%		
	45m	4%		
Bare ground cover	5m	45%	44%	
	15m	30%		
	25m	55%		
	35m	30%		
	45m	60%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	7									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
cera glom	*Cerastium glomeratum*	Mouse-ear Chickweed	Caryophyllace	0.1	2	*		No		
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	60	2000	*		No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	5	1000	*		No		
medi sati	*Medicago sativa*	Lucerne	Fabaceae (Fab	5	2000	*		No		
Lysi arve	*Lysimachia arvensis*	Scarlet Pimpernel	Myrsinaceae	0.2	500	*		No		
malv parv	*Malva parviflora*	Small-flowered Mallo	Malvaceae	1	200	*		No		
trif camp	*Trifolium campestre*	Hop Clover	Fabaceae (Fab	2	1000	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	5	2000	*		No		
hypo glab	*Hypochaeris glabra*	Smooth Catsear	Asteraceae	2	500	*		No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	5	2000	*		No		
modi caro	*Modiola caroliniana*	Red-flowered Mallow	Malvaceae	0.2	200	*		No		

BAM Site Field Survey							
Project:	Dapper Solar	**Plot Identifier**	8	**Plot size**	20x50m	**Recorders**	KR, EW
Survey date:	10/10/2022		**Compass Orientation (head of 20x20 plot)**				17 deg
PCT:	0	**Name:**	Exotic pasture/cropped lands (Non-native vegetation)				
Condition:	Low	**TEC:**	N/A				
GPS Easting	6434526	**GPS Northing**	708345	**Datum**	GDA94	**Zone**	55

Landform		**Soils**		**Drainage & Slope**	
Morphology		**Soil Texture**	Silty clay	**Slope**	0
LandF Element		**Soil Colour**	Brown, red	**Aspect**	0
LandF Pattern		**Soil Depth**		**Drainage**	wet, but not waterlogged
Microrelief		**Geology**		**Watercourses**	About 200m north of farm dam

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	3	o	
Cultivation	3	R	Plantago, recently plowed and sown
Soil erosion	1	R	
Firewood	0	N/A	
Grazing	1	r	Cattle
Fire Damage	0	n/a	
Storm Damage	0	n/a	
Weediness	3	o	Dominated by Plantago
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

cattle grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

n/a

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Highly weedy, dominated by Plantago. Rows can be seen due to plowing.

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

N/A

Dominant Species outside Plot

FUNCTION

Function attributes for	8

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	0

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	0
	TOTAL 'HTE'	0.1

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	5%	31.00%	
	15m	50%		
	25m	10%		
	35m	80%		
	45m	10%		
Bare ground cover	5m	8%	8%	
	15m	5%		
	25m	5%		
	35m	1%		
	45m	20%		
Cryptogam cover	5m	0%	1%	
	15m	1%		
	25m	1%		
	35m	0%		
	45m	1%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	8									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	80	8000	*		No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	2	*		No		
medi sati	*Medicago sativa*	Lucerne	Fabaceae (Fab	0.2	200	*		No		
Lysi arve	*Lysimachia arvensis*	Scarlet Pimpernel	Myrsinaceae	0.1	20	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	2	200	*		No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	5	5000	*		No		
modi caro	*Modiola caroliniana*	Red-flowered Mallow	Malvaceae	0.1	100	*		No		
cart lana	*Carthamus lanatus*	Saffron Thistle	Asteraceae	0.1	2	*		HTE		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

BAM Site Field Survey							
Project:	Dapper Solar	**Plot Identifier**	9	**Plot size**	20x50m	**Recorders**	KR, EW
Survey date:	10/10/2022		**Compass Orientation (head of 20x20 plot)**				191 deg
PCT:	0	**Name:**	Exotic pasture/cropped lands (Non-native vegetation)				
Condition:	Low	**TEC:**	N/A				
GPS Easting	6434224	**GPS Northing**	708361	**Datum**	GDA94	**Zone**	55
Landform			**Soils**			**Drainage & Slope**	
Morphology			**Soil Texture**	Silty clay		**Slope**	0
LandF Element			**Soil Colour**	Brown, red		**Aspect**	0
LandF Pattern			**Soil Depth**			**Drainage**	wet, but not waterlogged
Microrelief			**Geology**			**Watercourses**	About 50m west of farm dam

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	3	o	
Cultivation	3	R	Plantago, recently plowed and sown
Soil erosion	1	R	
Firewood	0	N/A	
Grazing	1	r	Cattle
Fire Damage	0	n/a	
Storm Damage	0	n/a	
Weediness	3	o	Dominated by Plantago
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information
Current land use
cattle grazing
Age class of trees (DBH range) , Condition of Vegetation, Hollows
n/a
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)
Highly weedy, dominated by Plantago. Rows can be seen due to plowing.
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)
N/A

Dominant Species outside Plot	

FUNCTION

Function attributes for	9

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	3
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	3

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	3.4
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	3.4
	TOTAL 'HTE'	0

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	50%	37.00%	
	15m	35%		
	25m	15%		
	35m	45%		
	45m	40%		
Bare ground cover	5m	2%	5%	
	15m	2%		
	25m	8%		
	35m	2%		
	45m	10%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	9									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	15	1500	*		No		
medi sati	*Medicago sativa*	Lucerne	Fabaceae (Fab	3	1000	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	5	2000	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	20		Forb (FG)	No		
cich inty	*Cichorium intybus*	Chicory	Asteraceae	50	3000	*		No		
trif camp	*Trifolium campestre*	Hop Clover	Fabaceae (Fab	3	1000	*		No		
calo lapp	*Calotis lappulacea*	Yellow Burr-daisy	Asteraceae	3	70		Forb (FG)	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.3	20		Forb (FG)	No		
Marr vulg	*Marrubium vulgare*	White Horehound	Lamiaceae	2	30	*		No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.2	20	*		No		
rume cris	*Rumex crispus*	Curled Dock	Polygonaceae	1	50	*		No		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	1	20	*		No		

BAM Site Field Survey							
Project:	Dapper Solar	**Plot Identifier**	10	**Plot size**	20x50m	**Recorders**	KR, EW
Survey date:	10/10/2022		**Compass Orientation (head of 20x20 plot)**				191 deg
PCT:	0	**Name:**	Exotic pasture/cropped lands (Non-native vegetation)				
Condition:	Low	**TEC:**	N/A				
GPS Easting	6433783	**GPS Northing**	708121	**Datum**	GDA94	**Zone**	55

Landform		**Soils**		**Drainage & Slope**	
Morphology		**Soil Texture**	Silty clay	**Slope**	0
LandF Element		**Soil Colour**	Brown, red	**Aspect**	0
LandF Pattern		**Soil Depth**		**Drainage**	wet, but not waterlogged
Microrelief		**Geology**		**Watercourses**	About 500m south of farm dam

Plot Disturbance

	Severity	**Age**	**Observational Evidence**
Clearing	3	o	
Cultivation	2	R	
Soil erosion	0	N/A	
Firewood	0	N/A	
Grazing	1	r	Cattle
Fire Damage	0	n/a	
Storm Damage	1	R	
Weediness	3	o	Considerable dead material of purpletop and spear thistle result in higher leaf litter and lower vegetation cover scores
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

cattle grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

n/a

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Highly weedy.

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

N/A

Dominant Species outside Plot

FUNCTION

Function attributes for	10

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	3
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	3

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.3
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	0.3
	TOTAL 'HTE'	0

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	80%	72.00%	
	15m	50%		
	25m	80%		
	35m	60%		
	45m	90%		
Bare ground cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for		10								
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	1	50	*		No		
medi sati	*Medicago sativa*	Lucerne	Fabaceae (Fab	5	500	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	70	7000	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	5		Forb (FG)	No		
trif camp	*Trifolium campestre*	Hop Clover	Fabaceae (Fab	0.5	100	*		No		
calo lapp	*Calotis lappulacea*	Yellow Burr-daisy	Asteraceae	0.1	10		Forb (FG)	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	2		Forb (FG)	No		
Marr vulg	*Marrubium vulgare*	White Horehound	Lamiaceae	4	80	*		No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.2	20	*		No		
rume cris	*Rumex crispus*	Curled Dock	Polygonaceae	0.1	10	*		No		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	0.5	20	*		No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	8	40	*		No		
bras junc	*Brassica juncea*	Indian Mustard	Brassicaceae	2	50	*		No		
salv verb	*Salvia verbenaca*	Vervain	Lamiaceae	1	50	*		No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	5	500	*		No		
Hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	2	200	*		No		

BAM Site Field Survey							
Project:	Dapper Solar	**Plot Identifier**	11	**Plot size**	20x50m	**Recorders**	KR, EW
Survey date:	9/10/2022		**Compass Orientation (head of 20x20 plot)**				191 deg
PCT:	0	**Name:**	Exotic pasture/cropped lands (Non-native vegetation)				
Condition:	Low	**TEC:**	N/A				
GPS Easting	6435234	**GPS Northing**	709303	**Datum**	GDA94	**Zone**	55
Landform			**Soils**			**Drainage & Slope**	
Morphology			**Soil Texture**	Silty clay		**Slope**	0
LandF Element			**Soil Colour**	Dark brown		**Aspect**	0
LandF Pattern			**Soil Depth**			**Drainage**	wet, but not waterlogged
Microrelief			**Geology**			**Watercourses**	About 100m from creek

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	3	o	
Cultivation	2	R	
Soil erosion	0	N/A	
Firewood	0	N/A	
Grazing	1	r	Cattle
Fire Damage	0	n/a	
Storm Damage	1	R	
Weediness	3	o	
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information
Current land use
cattle grazing
Age class of trees (DBH range) , Condition of Vegetation, Hollows
n/a
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)
Highly weedy.
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)
N/A

Dominant Species outside Plot	

FUNCTION

Function attributes for	11

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	5
	Grass & grasslike (GG)	1
	Fern (EG)	0
	Other (OG)	0
	TOTAL	6

BAM Attribute (400m2 plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	4.8
	Grass & grasslike (GG)	0.2
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	5
	TOTAL 'HTE'	0

BAM Attribute (1000m2 plot) Tree Stem Counts

DBH (cm)	Stem count	Hollows
>80	0	0
50-79	0	0
30-49	0	0
20-29	0	0
10-19	0	0
5-9	0	0
<5	0	N/A
Length of logs (m)	0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	80%	72.00%	
	15m	50%		
	25m	80%		
	35m	60%		
	45m	90%		
Bare ground cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for		11								
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	10	200	*		No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	1	10		Forb (FG)	No		
junc effu	*Juncus effusus*		Juncaceae	30	400	*		No		
sene mada	*Senecio madagascariensis*	Fireweed	Asteraceae	0.1	10	*		No		
tara offi	*Taraxacum officinale*	Dandelion	Asteraceae	0.5	50	*		No		
Lysi arve	*Lysimachia arvensis*	Scarlet Pimpernel	Myrsinaceae	0.1	10	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiaceae	0.5	10		Forb (FG)	No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	7	300	*		No		
modi caro	*Modiola caroliniana*	Red-flowered Mallow	Malvaceae	1	100	*		No		
chon junc	*Chondrilla juncea*	Skeleton Weed	Asteraceae	10	400	*		No		
aust vert	*Austrostipa verticillata*	Slender Bamboo Grass	Poaceae	0.2	1		Grass & grasslike (GG)	No		
calo lapp	*Calotis lappulacea*	Yellow Burr-daisy	Asteraceae	3	150		Forb (FG)	No		
echi plan	*Echium plantagineum*	Patterson's Curse	Boraginaceae	0.1	2	*		No		
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	0.1	5	*		No		
trif	*Trifolium spp.*	A Clover	Fabaceae (Fab	0.2	100	*		No		
hypo glab	*Hypochaeris glabra*	Smooth Catsear	Asteraceae	8	400	*		No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	2	100	*		No		
aven fatu	*Avena fatua*	Wild Oats	Poaceae	7	300	*		No		
rume	*Rumex spp.*	Dock	Polygonaceae	0.2	50	*	Forb (FG)	No		
cony	*Conyza spp.*	A Fleabane	Asteraceae	0.1	10	*		No		
chry apic	*Chrysocephalum apiculatum*	Common Everlasting	Asteraceae	0.1	10		Forb (FG)	No		

Appendix E. Additional criteria for land categorised as Category 2 - Regulated Land

The following is an expert from Section 113 of the *Local Land Services Regulation 2014* relating the several additional criteria of land that to be designated Category 2-regulated land.

(1) Land is also to be designated as category 2 -regulated land if the Environment Agency Head reasonably believes that--

(a) the land is (or was previously) subject to a private native forestry plan approved under Part 5B of the *Local Land Services Act 2013*, to a private native forestry plan that was approved under Part 5C of the *Forestry Act 2012* before its repeal or to a property vegetation plan that was approved under the *Native Vegetation Act 2003* before its repeal and that authorised the clearing of native vegetation for the purposes of forestry operations, or

(b) the land is subject to a conservation agreement under the *National Parks and Wildlife Act 1974*, or

(c) the land was, immediately before the repeal of the *Native Vegetation Act 2003*, subject to a property vegetation plan under that Act that was described as a conservation property vegetation plan or an incentive property vegetation plan (being land that was required to be conserved or in respect of which public funding was provided to improve biodiversity), or

(d) the land was, immediately before the repeal of the *Native Vegetation Conservation Act 1997*, subject to a property agreement under that Act (being an agreement that has been registered), or

(e) the land was, immediately before the repeal of the *Nature Conservation Trust Act 2001*, subject to a Trust agreement under that Act, or

(f) the land contains native vegetation that is required to be retained under a condition of an authorisation that approves establishment operations for a plantation or proposed plantation under the *Plantations and Reafforestation Act 1999*, or

(g) the land contains low conservation grasslands beneath the canopy or drip line of woody vegetation (being woody vegetation that satisfies the criteria for classification of the land as category 2 -regulated land), or

(h) the land is in the Southern Mallee Planning Group Region and is subject to a lease under the *Western Lands Act 1901* whose conditions require the conservation of the land through the prohibition of grazing and active conservation management, or

(i) the land is, by a condition of a development consent or approval under the *Environmental Planning and Assessment Act 1979* that has been notified to the Environment Agency Head, required to be set aside for nature conservation, for re-vegetation of native vegetation or as a native vegetation offset, or

(j) the land is identified by the Environment Agency Head as containing old-growth forests, on the basis of—

(i) the mapping of old-growth forests for the purposes of the Comprehensive Regional Assessment under the National Forest Policy Statement (being the agreement between the Commonwealth, State and Territory governments made in 1992 and so described), but

(ii) excluding any land containing native vegetation that does not meet the criteria for old-growth forests published jointly from time to time by the Minister for Primary Industries and the Minister for the Environment (as determined in accordance with the procedure so published), or

(k) the land is identified by the Environment Agency Head as containing rainforests, on the basis of—

(i) the mapping of rainforests for the purposes of the Comprehensive Regional Assessment under the National Forest Policy Statement (being the agreement between the Commonwealth, State and Territory governments made in 1992 and so described), but

(ii) excluding any land containing native vegetation that does not meet the criteria for rainforests published jointly from time to time by the Minister for Primary Industries and the Minister for the Environment (as determined in accordance with the procedure so published), or

(l) the land is a travelling stock reserve (unless the land is located in the Western Division of the State).

(2) Land that is designated as category 2 -regulated land on the basis of its identification as containing old-growth forests or rainforests and the Environment Agency Head has determined under subclause (1) (j) (ii) or (k) (ii) that the land meets the relevant criteria at that time as old-growth forests or rainforests, the land is not subject to re-categorisation as a result only of a change in the relevant criteria published under subclause (1) (j) (ii) or (k) (ii). This subclause extends to the application of subclause (1) (j) or (k) under clause 108 and a designation of the land as category 2 -sensitive regulated land.
(3) Land is not subject to re-categorisation as a result only of a change in the relevant criteria published under subclause (1) (j) (ii) or (k) (ii) if the land was determined to contain old-growth forests or rainforests in accordance with either of the following—

(a) Private Native Forestry Code of Practice Guideline No 2: Protocol for re-evaluating old-growth forest on private property (published in August 2007 by the Department of Environment and Climate Change),

(b) Private Native Forestry Code of Practice Guideline No 3: Protocol for re-evaluating rainforest on private property (published in August 2007 by the Department of Environment and Climate Change).

This subclause extends to the application of subclause (1) (j) or (k) under clause 108 and a designation of the land as category 2 -sensitive regulated land.

Appendix C. AHIMS search results

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : Dapper solar

Client Service ID : 672855

Jacobs Group (Australia) Pty Ltd - North Sydney

Level 7 177 Pacific Highway
North Sydney New South Wales 2060

Attention: Ryan Taddeucci

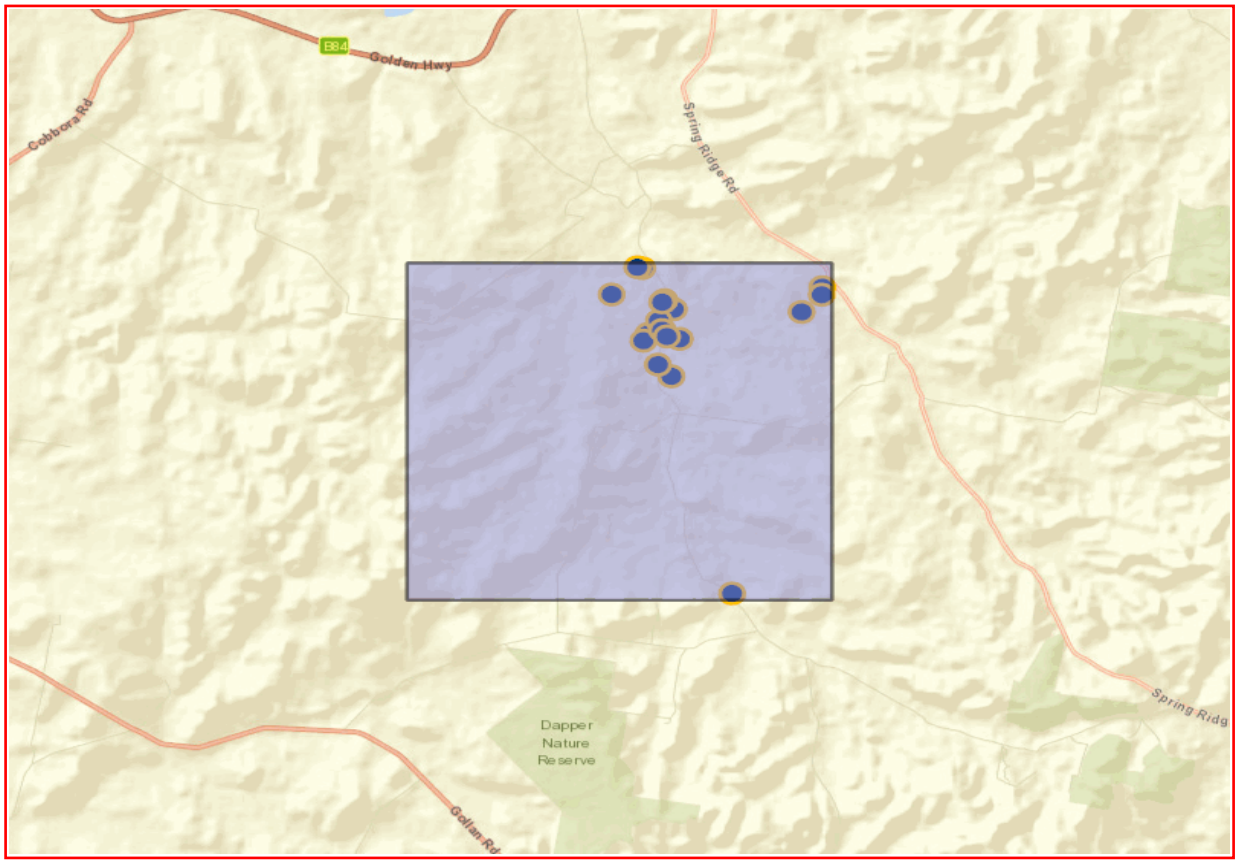
Email: ryan.taddeucci@jacobs.com

Date: 04 April 2022

Dear Sir or Madam:

AHIMS Web Service search for the following area at Datum :GDA, Zone : 55, Eastings : 703883.75 - 712731.4, Northings : 6430155.06 - 6438331.75 with a Buffer of 0 meters, conducted by Ryan Taddeucci on 04 April 2022.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

21	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Appendix D. SEIA scoping worksheet

	Social Impact Assessment (SIA) Worksheet	Project name: Dapper Solar Farm																		
																				Date: 02 September 2022
PROJECT ACTIVITIES	**CATEGORIES OF SOCIAL IMPACTS**	**POTENTIAL IMPACTS ON PEOPLE**		**PREVIOUS INVESTIGATION OF IMPACT**		**CUMULATIVE IMPACTS**		**ELEMENTS OF IMPACTS - Based on preliminary investigation**					**ASSESSMENT LEVEL FOR EACH IMPACT**				**PROJECT REFINEMENT**	**MITIGATION / ENHANCEMENT MEASURES**
Which **project activity / activities** could produce social impacts?	what **social impact categories** could be affected by the project activities	What impacts are likely, and what concerns/aspirations have people expressed about the impact? Summarise how each relevant stakeholder group might experience the impact.	Is the impact expected to be **positive or negative**	Has this impact previously been investigated (on this or other project/s)?	If "yes - this project," briefly describe the previous investigation. If "yes - other project," identify the other project and investigation	Will this impact combine with others from this project (think about when and where), and/or with impacts from other projects (cumulative)?	If yes, identify which other impacts and/or projects	Will the project activity (without mitigation or enhancement) cause a material social impact in terms of its: You can also consider the various magnitudes of these characteristics					Level of assessment for each social impact	What methods and data sources will be used to investigate this impact?			Has the project been refined in response to preliminary impact evaluation or stakeholder feedback?	What **mitigation / enhancement measures** are being considered?
								extent i.e. number of people potentially affected?	**duration** of expected impacts? (i.e. construction vs operational phase)	**intensity** of expected impacts i.e. scale or degree of change?	**sensitivity** or vulnerability of people potentially affected?	**level of concern/interest** of people potentially affected?		Secondary data	Primary Data - Consultation	Primary Data - Research		
Construction																		
Temporary use of land for construction support infrastructure (e.g., laydown areas)	livelihoods	Temporary disruption to the use of land for current farming activities	Negative	Yes - this project	Land used for construction would be on land owned by Origin	No	Not required	No	No	No	No	No	Not relevant	Not required	Not required	Not required	Not at the current stage	Directly affected properties have been acquired by Origin Energy.
Influx of non-local construction workers	community	Temporary changes to population and demography of towns and centres within commuting distance of the Project	Negative	Yes - other project	Various social impact assessment for energy and resource projects	No	Not required	No	No	No	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Further consultation will be carried out with stakeholders including local councils as part of the EIS
Influx of non-local construction workers	access	Increased demand for services and facilities from the construction workforce, affecting access to these services by local residents.	Negative	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	No	No	No	No	Unknown	Minor assessment of the impact	Required	Limited - if required (e.g. local council)	Not required	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan
Influx of non-local construction workers	surroundings	Impacts on low and fixed income households due to increased demand for housing by the non-local construction workforce.	Negative	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	Unknown	Unknown	Unknown	Yes	Yes	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan
Influx of non-local construction workers	way of life	Potential disruption to community cohesion, increased demand for services and temporary changes to local population and demography	Negative	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	No	No	No	Yes	Unknown	Standard assessment of the impact	Required	Targeted consultation	Potentially targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan
Construction activities including establishment of Project infrastructure, laydown areas and ancillary infrastructure	surroundings	Potential changes to landscape and visual amenity for near neighbours and local road users due to the presence of construction activities and infrastructure	Negative	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	No	No	Yes	No	No	Minor assessment of the impact	Required	Limited - if required (e.g. local council)	Not required	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the LVIA prepared for the EIS
Construction activities including establishment of Project infrastructure, laydown areas and ancillary infrastructure, and local road upgrades	way of life	Changes to local amenity for residential and sensitive receivers due to construction noise and traffic, potentially impacting on the use and enjoyment of properties	Negative	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	No	No	Yes	No	No	Minor assessment of the impact	Required	Limited - if required (e.g. local council)	Not required	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan
Use of local and regional roads for transport of solar panels and Project components	surroundings	Potential temporary disruptions and changes to increased road safety risks (perceived or actual) for local communities and road users due to increased construction vehicle movements	Negative	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	No	No	Unknown	No	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the traffic impact assessment prepared for the EIS.
Direct and indirect employment opportunities	livelihoods	Increased employment opportunities, support for improved income, skills development for local or regional workers	Positive	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	Yes	Yes	Unknown	Yes	Yes	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan
Increased business opportunities and economic activities in the region	livelihoods	Potential for increased trade for businesses including trades, hospitality, retail, accommodation sectors and improved business income as a result of the Proejct sourcing and procuring materials/labour locally	Positive	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	Yes	Yes	Unknown	No	Yes	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan

PROJECT ACTIVITIES	CATEGORIES OF SOCIAL IMPACTS	POTENTIAL IMPACTS ON PEOPLE		PREVIOUS INVESTIGATION OF IMPACT		CUMULATIVE IMPACTS		ELEMENTS OF IMPACTS - Based on preliminary investigation					ASSESSMENT LEVEL FOR EACH IMPACT				PROJECT REFINEMENT	MITIGATION / ENHANCEMENT MEASURES
Which **project activity / activities** could produce social impacts?	what **social impact categories** could be affected by the project activities	What impacts are likely, and what concerns/aspirations have people expressed about the impact? Summarise how each relevant stakeholder group might experience the impact.	Is the impact expected to be **positive or negative**	Has this impact previously been investigated (on this or other project/s)?	If "yes - this project," briefly describe the previous investigation. If "yes - other project," identify the other project and investigation	Will this impact combine with others from this project (think about when and where), and/or with impacts from other projects (cumulative)?	If yes, identify which other impacts and/or projects	Will the project activity (without mitigation or enhancement) cause a material social impact in terms of its: You can also consider the various magnitudes of these characteristics					Level of assessment for each social impact	What methods and data sources will be used to investigate this impact?			Has the project been refined in response to preliminary impact evaluation or stakeholder feedback?	What **mitigation / enhancement measures** are being considered?
								extent i.e. number of people potentially affected?	**duration** of expected impacts? (i.e. construction vs operational phase)	**intensity** of expected impacts i.e. scale or degree of change?	**sensitivity** or vulnerability of people potentially affected?	**level of concern/interest** of people potentially affected?		Secondary data	Primary Data - Consultation	Primary Data - Research		
Project planning, development and ongoing engagement or publishing of documents	health and wellbeing	Potential impacts on health and wellbeing due to increased stress and anxiety for nearby residents and adjacent receivers associated with the Project and potential impacts	Negative	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	No	Unknown	Unknown	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan
Operation																		
Upgrade to local roads and intersections	access	Improved access for nearby residents, communities and road users as a result of upgraded local roads	Positive	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	Yes	Yes	No	Yes	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan
Increased renewable energy generation and improved reliability/ security of electricity	livelihoods	Improved environmental outcomes and long term emission reduction as a result of the Project and in comparison to fossil fuel development Long term reduction in electricity prices for consumers and businesses	Positive	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	Unknown	Yes	No	No	Yes	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan
Land use and property changes	way of life	Potential impacts to adjacent or nearby properties values or operations as a result of land use changes and development of agrisolar for the Project	Negative	Yes - other project	Various social impact assessments for other solar farms	Unknown	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	Unknown	Unknown	Unknown	Yes	Yes	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan
Introduction of permanent infrastructure and cumulative energy development in the Renewable Energy Zone	community	Potential changes to sense of place and community as a result of the Project and other nearby development	Negative	Yes - other project	Various social impact assessments for other solar farms	Yes	Other energy projects such as Sandy Creek Solar Farm, Cobbora Solar Farm, Spicers Creek Wind Farm	Yes	Yes	Yes	Yes	Yes	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Not at the current stage	Mitigation and enhancement measures will be developed further as part of the EIS and could include a Community Engagement Management Plan, Local Procurement Policy or Workforce Participation Plan