



TransGrid

Environmental Scoping Report

EnergyConnect (NSW – Eastern Section)

September 2020

Executive Summary

Overview and Background

TransGrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to north-west Victoria. Collectively, the proposed interconnector is known as EnergyConnect. EnergyConnect aims to reduce the cost of providing secure and reliable electricity transmission between NSW and SA in the near term, while facilitating the longer-term transition of the energy sector across the National Electricity Market (NEM) to low emission energy sources.

EnergyConnect has been identified as a priority transmission project in the NSW Transmission Infrastructure Strategy (DP&E 2018) and an Actionable Project in the 2020 Integrated System Plan (ISP) (AEMO, 2020), as it would link the SA and NSW energy markets and assisting in transporting energy from the South-West Energy Zone to major demand centres and is critical to address cost, security and reliability issues in the NEM.

TransGrid is the proponent and is responsible for obtaining environmental planning approvals for those components located in NSW. The NSW components of EnergyConnect will be assessed in stages.

This Environmental Scoping Report (ESR) refers to EnergyConnect (NSW – Eastern Section) (referred to as the proposal). TransGrid is currently seeking separate environmental planning approval for the remainder of EnergyConnect in NSW. Furthermore, environmental planning approvals under the relevant jurisdictions would be sought for the section of EnergyConnect that is located in SA (by ElectraNet) and for the section of EnergyConnect that is located in Victoria (by TransGrid in coordination with Ausnet Services).

EnergyConnect (NSW – Eastern Section)

The scope of the application made by TransGrid under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the basis for this ESR for the proposal includes:

- > Construction of about 540 kilometres of new double circuit transmission line (minimum 330 kV) and associated infrastructure between the Buronga substation and Wagga substation
- > Construction of a new substation about 170 kilometres west of Wagga Wagga (referred to as the Dinawan substation)
- > An expansion and upgrade to the existing Wagga 330 kV substation
- > Establishment and upgrade of access tracks and roads, as required
- > Other ancillary works required to facilitate the construction of the proposal e.g. laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps.

The proponent

NSW Electricity Networks Operations Pty Ltd as a trustee for NSW Electricity Operations Trust (referred to as TransGrid) is the operator and manager of the main high voltage transmission network in NSW and the Australian Capital Territory (ACT). Further information on TransGrid can be found at www.transgrid.com.au.

Proposal study area

As part of the early works for EnergyConnect, TransGrid have proceeded with preliminary investigations into transmission line corridor options, combining various corridor selection criteria together with a broad range of environmental, heritage, land use and social constraints and opportunities. This process initially identified a 10 kilometre wide preliminary alignment corridor within which more detailed environmental and social studies

and community and landholder engagement has been undertaken leading to development of the proposal study area. The proposal study area extends from Buronga substation to Wagga substation and generally comprises a one kilometre wide corridor with a broader section between Four Corners and Lockhart.

Preliminary environmental assessment

The proposal is subject to environmental assessment under Part 5 of the NSW EP&A Act. Under clause 14 of State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP), the proposal is State Significant Infrastructure (SSI). The proposal requires approval from the NSW Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act. In addition, the Minister has declared the proposal to be Critical State Significant Infrastructure (CSSI) under Schedule 5 (clause 15) of the SRD SEPP.

This ESR has been prepared to inform the preparation of Secretary's Environmental Assessment Requirements (SEARs) for an Environmental Impact Statement (EIS) for the proposal.

A preliminary environmental assessment was undertaken primarily at a desktop level, with the addition of limited ecological field survey, and determined that most environmental issues would require some level of assessment in the EIS. Key issues for the environmental planning and impact assessment of the proposal, identified on the basis that they are both most likely to occur and represent the greatest change to the existing environment, are as follows:

- > Biodiversity
- > Aboriginal heritage
- > Non-Aboriginal heritage
- > Land use and property
- > Landscape character and visual amenity
- > Surface water, groundwater and hydrology
- > Noise and vibration.

Other issues requiring assessment but considered less likely to result in significant impacts, either based on lower likelihood of occurrence or absence of likely receptors, are as follows:

- > Bushfire risk
- > Socio-economic
- > Electric and magnetic fields (EMF)
- > Air quality and greenhouse gas
- > Traffic and access
- > Soil and water quality
- > Waste management and resource use.

As part of the preparation of the EIS, additional assessments would be carried out in conjunction with further development of the proposal design. In assessing the proposal, the key focus would be avoidance and minimisation of impacts on the environment and local communities, where reasonable and feasible.

The assessment would also identify mitigation and management measures to minimise impacts on the environment during construction and operation of the proposal.

Glossary

Term/Acronym	Description
ACHAR	Aboriginal cultural heritage assessment report
ACHCRP	Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AHIMS	Aboriginal heritage information management system
ANO	Authorised Network Operator
AOBV	Area of Outstanding Biodiversity Value
APZ	Asset protection zone
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
BAM	Biodiversity Assessment Method
BDAR	Biodiversity Development Assessment Report
BFMC	Bushfire Management Committee
BFMP	Bush Fire Management Plan
CSEP	Community and Stakeholder Engagement Plan
CSSI	Critical State significant infrastructure
DAWE	Australian Department of Agriculture, Water and the Environment
DEE	(former) Australian Department of the Environment and Energy
DPI	Department of Primary Industry, be referred to as the Department of Planning, Industry and Environment from the 1 July 2019
DPIE	Department of Planning, Industry and Environment
EEC	Endangered ecological community
EIA	Environmental impact assessment
EIS	Environmental impact statement
EMF	Electric and magnetic fields

Term/Acronym	Description
EnergyConnect	An electrical interconnector of approximately 900 kilometres between the electricity grids of South Australia and New South Wales, with an added connection to north-west Victoria
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environmental protection licence
ESR	Environmental Scoping Report (this report)
FTE	Full time equivalent
GDE	Groundwater Dependent Ecosystem
HV	High Voltage
HVDC	high voltage direct current
IBRA	Interim Biogeographical Regionalisation of Australia
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ISP	Integrated System Plan
KFH	Key fish habitat
kV	kilovolt
LEP	Local environmental plan
LGA	Local government area
MNES	Matters of National Environmental Significance
NEM	National Electricity Market
NSW	New South Wales
OEH	(former) NSW Office of Environment and Heritage to be referred to as the Environment, Energy and Science Group of DPIE from the 1 July 2019
PCT	Plant Community Types
PMST	Protected Matter Search Tool
preliminary alignment corridor	a 10 kilometre wide corridor identified during the initial assessment of transmission line corridor options

Term/Acronym	Description
proposal study area	The study area for this Environmental Scoping Report, which extends from Buronga substation to Wagga substation and generally comprises a one kilometre wide corridor with a broader section between Four Corners and Lockhart.
RAP	Registered Aboriginal Parties
REZs	Renewable Energy Zones
RIT-T	Regulatory Investment Test for Transmission
SA	South Australia
SAII	serious and irreversible impacts
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State environmental planning policy
SHR	State heritage register
SRD	State regional development
SSI	State significant infrastructure
TEC	Threatened ecological community
the proposal	EnergyConnect (NSW – Eastern Section)
the Wagga substation	The existing Wagga 330 kilovolt substation at Wagga Wagga, NSW

Contents

Glossary	iv
1. Introduction.....	1
1.1 EnergyConnect	1
1.2 Overview of the Proposal	2
1.3 Report Terminology	3
1.4 The Proponent	5
1.5 Proposal Objectives.....	5
1.6 Purpose and Structure of the Report.....	5
1.7 Limitations.....	6
2. Strategic Context and Justification	7
2.1 Existing Transmission Network	7
2.2 Strategic Planning Context	9
2.3 Need for EnergyConnect	14
2.4 Need for the Proposal.....	14
2.5 Key Benefits of EnergyConnect	15
2.6 EnergyConnect Options	15
2.7 Corridor and Site Selection for the Proposal	17
3. The Proposal	28
3.1 Proposal Study Area	28
3.2 Proposal Context and Location	28
3.3 Key Components of the Proposal.....	29
3.4 Proposal Timeframes	31
3.5 Construction of the Proposal	31
3.6 Pre-Commissioning, Commissioning and Operation	32
4. Planning and Assessment Process	34
4.1 Permissibility	34
4.2 NSW Environmental Planning Legislation and Approvals	34
4.3 Commonwealth Legislation	40
5. Engagement	43
5.1 Introduction	43
5.2 Engagement Considerations and Principles	43
5.3 Stakeholders	44
5.4 Opportunities for Participation	46
5.5 Summary of Feedback Received	50
5.6 How Feedback has been Used	51
5.7 Future Engagement.....	52

6.	Identification of Key Assessment Issues	53
6.1	Approach to Identification of Key Assessment Issues	53
6.2	Initial Environmental Risk Assessment	53
6.3	Identification of Key Environmental Issues	53
7.	Preliminary Environmental Assessment	55
7.1	Biodiversity	55
7.2	Aboriginal Heritage	67
7.3	Non-Aboriginal Heritage	68
7.4	Land Use and Property	73
7.5	Landscape Character and Visual Amenity	83
7.6	Surface Water, Groundwater and Hydrology	84
7.7	Noise and Vibration	85
8.	Other Issues	87
8.1	Bushfire Risk.....	87
8.2	Socio-Economic.....	87
8.3	Electromagnetic Fields	88
8.4	Air Quality and Greenhouse Gas	89
8.5	Traffic and Access	90
8.6	Soil and Water Quality	91
8.7	Waste Management and Resource Use	93
9.	Conclusions	95
10.	References	96
	Appendix A Preliminary Biodiversity Assessment	97
	Appendix B Preliminary Desktop Cultural Heritage Assessment Report	98

List of Tables

Table 2-1	Environmental Constraints and Opportunities.....	20
Table 3-1	Summary of Key Components of the Proposal.....	29
Table 4-1	Environmental Planning Instruments of Potential Relevance to the Proposal.....	37
Table 4-2	Other Typical Planning Related Legislation of Potential Relevance to the Proposal	39
Table 4-3	MNES under the EPBC Act	41
Table 5-1	Stakeholder groups for the proposal	44
Table 5-2	Engagement Activities	46
Table 5-3	Engagement Participation for the Proposal.....	50
Table 5-4	Feedback Themes	51
Table 7-1	Non-Aboriginal Heritage Items within the proposal study area	68
Table 7-2	Key land uses within and surrounding the proposal study area.....	74

List of Figures

Figure 1-1 Overview of EnergyConnect.....	2
Figure 1-2 Locality and Proposal Study Area	4
Figure 2-1 TransGrid's Electricity Network Map (source: TransGrid, 2019a)	8
Figure 2-2 Projects outlined in the 2020 ISP (AEMO, 2020)	10
Figure 2-3 Identified candidate REZs within the NEM (AEMO, 2020).....	11
Figure 2-4 NSW Priority Transmission Projects (DP&E, 2018)	13
Figure 2-5 Overview of the Options (and Variations) Assessed (source: ElectraNet, 2019)	16
Figure 2-6 Corridor Selection Process.....	18
Figure 2-7 Overview of the identified corridor alignment options considered	22
Figure 2-8 Proposal study area with respect to identified constraints and opportunities	24
Figure 3-1 Indicative Concept Design for the Transmission Line Structures	30
Figure 4-1 Assessment and Approval Process for the Proposal.....	36
Figure 7-1 Ecology Values of the Proposal Study Area	58
Figure 7-2 Non-Aboriginal Heritage Items within the Proposal Study Area	69
Figure 7-3 Land Use in the Proposal Study Area	75
Figure 7-4 Land zoning in the proposal study area	79

1. Introduction

1.1 EnergyConnect

TransGrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to north-west Victoria. Collectively, the proposed interconnector is known as EnergyConnect. EnergyConnect aims to reduce the cost of providing secure and reliable electricity transmission between NSW and SA in the near term, while facilitating the longer-term transition of the energy sector across the National Electricity Market (NEM) to low emission energy sources.

EnergyConnect has been identified as a priority transmission project in the NSW Transmission Infrastructure Strategy (DP&E 2018), and an Actionable Project in the 2020 Integrated System Plan (ISP) (AEMO, 2020), as it would link the SA and NSW energy markets and assisting in transporting energy from the South-West Energy Zone to major demand centres and is critical to address cost, security and reliability issues in the NEM.

EnergyConnect comprises several sections (shown on Figure 1-1), being:

- > NSW sections including:
 - Eastern section (the subject of this Environmental Scoping Report (ESR)), which would extend from the existing Buronga substation to the Wagga 330 kV substation (the Wagga substation)
 - Western section, which would extend from:
 - The SA/NSW border (near Chowilla in SA) to the Buronga substation
 - Buronga substation to the NSW/Victoria border at Monak (near Red Cliffs in Victoria)
- > Victorian section, which would extend from the NSW/Victoria border to the Red Cliffs substation
- > SA section, which would extend from Robertstown to the SA/NSW border.

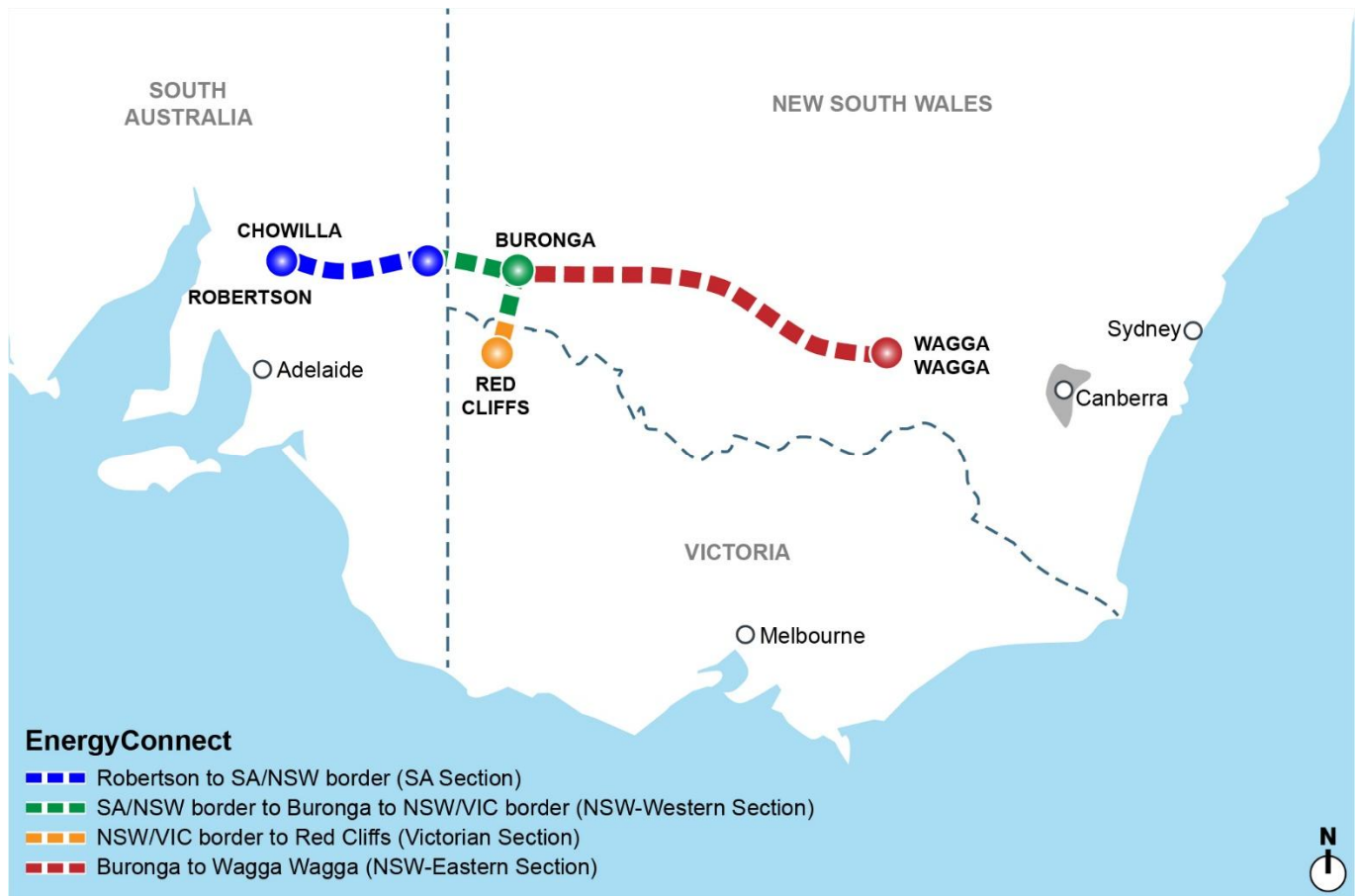


Figure 1-1 Overview of EnergyConnect

1.2 Overview of the Proposal

This ESR refers to EnergyConnect (NSW – Eastern Section) (referred to as the proposal). TransGrid are progressing separate environmental planning approvals for the remainder of EnergyConnect in NSW. Furthermore, separate environmental planning approvals under the relevant jurisdictions would be sought for the sections of EnergyConnect that are located in SA and Victoria.

The proposal is subject to environmental assessment under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Under clause 14 of State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP), the proposal is State Significant Infrastructure (SSI). The proposal requires approval from the NSW Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act. In addition, the Minister has declared the proposal to be Critical State Significant Infrastructure (CSSI) under Schedule 5 (clause 15) of the SRD SEPP.

It is expected that construction of the proposal would commence in 2022 and take about three years to complete. It is anticipated that the proposal would be operational in late 2024.

The key components of the proposal include:

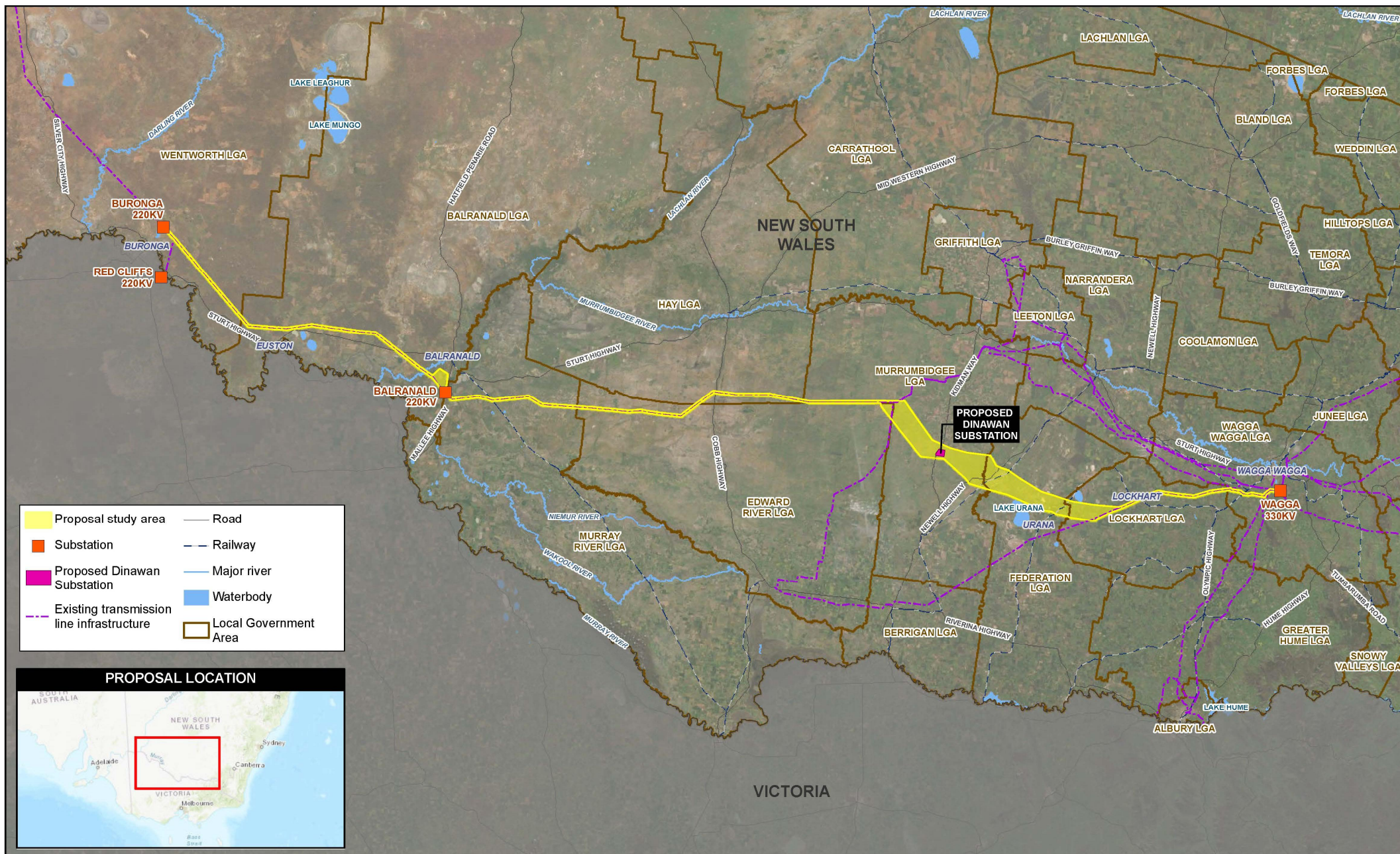
- > Construction of about 540 kilometres of new double circuit transmission lines (minimum 330 kV) and associated infrastructure between the Buronga substation and Wagga substation
- > Construction of a new substation about 170 kilometres west of Wagga Wagga (referred to as the Dinawan substation)
- > An expansion and upgrade to the existing Wagga 330 kV substation
- > Establishment and upgrade of access tracks and roads, as required
- > Other ancillary works required to facilitate the construction of the proposal e.g. laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps.

Further details of the key infrastructure components of the proposal are provided in Chapter 3.

1.3 Report Terminology

The following terms are discussed throughout this ESR and are defined as:

- > EnergyConnect: An interconnector of about 900 kilometres between the power grids of SA and NSW, with an added connection to north-west Victoria.
- > The proposal: EnergyConnect (NSW – Eastern Section).
- > Preliminary alignment corridor: a 10 kilometre wide corridor identified during the initial assessment of transmission line corridor options which is generally based on desktop assessments only (further details are described in Section 2.7).
- > Proposal study area: The study area for this ESR which extends from Buronga to Wagga Wagga and generally comprises a one kilometre wide corridor with a broader section between Four Corners and Lockhart. The majority of ancillary activities associated with the proposal (including brake and winch sites, crane pads, site compounds and equipment laydown areas) would be undertaken within this corridor. Additional locations that may be required for specific uses (such as access tracks and accommodation camps), which would be identified during design development as required. The proposal study area is shown in Figure 1-2.
- > Transmission line easement: an area surrounding and including the transmission lines which is a legal 'right of way' and allows for ongoing access and maintenance of the lines and will be acquired from landholders. The easement width will be up to 80 metres wide.



1.4 The Proponent

The proposal is proposed to be undertaken by NSW Electricity Networks Operations Pty Ltd as a trustee for NSW Electricity Operations Trust (referred to as TransGrid). TransGrid is the operator and manager of the main high voltage transmission network in NSW and the Australian Capital Territory (ACT) and is the Authorised Network Operator (ANO) for the purpose of an electricity transmission or distribution network under the provisions of the *Electricity Network Assets (Authorised Transactions) Act 2015*.

TransGrid's network enables more than three million homes and businesses to access a safe, reliable and affordable supply of electricity. Comprising more than 100 substations and more than 13,000 kilometres of high voltage transmission lines, underground cables, and interconnections with Queensland and Victoria. The network is instrumental to the electricity system and, therefore, the economy and facilitates energy trading across the National Electricity Market (NEM). Further information on TransGrid can be found at www.transgrid.com.au.

1.5 Proposal Objectives

The primary objective for the proposal is to reduce the cost of providing secure electricity transmission between NSW and SA in the near term and facilitate the longer-term transition of the energy sector across the NEM to low emission energy generation sources.

More specifically, the proposal aims to:

- > Lower power prices
- > Improve energy security
- > Increase economic activity
- > Support the transition to a lower carbon emission energy system
- > Support a greater mix of renewable energy in the NEM.

1.6 Purpose and Structure of the Report

This ESR has been prepared and finalised on behalf of TransGrid. The purpose of this report is to describe the proposal and present the preliminary environmental assessment of the potential environmental issues that would be covered as part of an Environmental Impact Statement (EIS) for the proposal.

This report is intended to provide sufficient information to allow for the preparation of Secretary Environmental Assessment Requirements (SEARs) to guide the preparation of an EIS for the proposal in accordance with the EP&A Act and the requirements of clause 192 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), which apply to applications seeking approval of the NSW Minister for Planning and Public Spaces to carry out state significant infrastructure.

The information and recommendations in this ESR would be used to further inform the options investigations and ongoing design process for the proposal with an aim to avoid or minimise environmental, economic and social impacts wherever possible.

The structure and content of this report is as follows:

- > Chapter 1 – Introduction: Outlines the background and need for the proposal, and the purpose of this report.
- > Chapter 2 – Strategic Context, Need and Justification: Provides an overview of the strategic and regulatory context for the proposal, the wider EnergyConnect and the anticipated benefits of the proposal. An overview of the options assessment that lead to the preferred option is also presented.
- > Chapter 3 – The Proposal: Provides an outline of the key features of the proposal.
- > Chapter 4 – Planning and Legislation: Provides an overview of the relevant statutory approvals framework for the proposal, including applicable legislation and planning policies.
- > Chapter 5 – Stakeholder and Community Consultation: Provides an overview of the stakeholder engagement and consultation activities that have been undertaken to date with regards to the proposal. An overview of the proposed future consultation activities is also provided.
- > Chapter 6 – Identification of Key Environmental Assessment Issues: Provides the approach to the assessment and identification of key assessment issues.
- > Chapter 7 – Preliminary Environmental Assessment: Provides a preliminary assessment of the potential key environmental impacts associated with the proposal.
- > Chapter 8 – Other Environmental Issues: Provides a preliminary assessment of the other potential environmental impacts associated with the proposal.
- > Chapter 9 – Summary and Conclusions: Outlines the key conclusions of this report.
- > Chapter 10 – References: Identifies the key reports and documents used to generate this report.

Appendices to this report includes:

- > Appendix A – *Preliminary Biodiversity Assessment* (WSP, 2020)
- > Appendix B – *Preliminary Desktop Cultural Heritage Assessment* (Navin Officer, 2020).

1.7 Limitations

The information presented in this ESR has been based on preliminary desktop biodiversity and heritage studies (provided in Appendices A and B), with limited field verification along some sections of the proposal. The remaining assessments have been prepared based on preliminary desktop review and assessment of published data including relevant databases, reports and other available literature.

More detailed investigations of potential environmental issues, including field inspections, are proposed be undertaken during the preparation of the EIS for the proposal.

2. Strategic Context and Justification

2.1 Existing Transmission Network

The National Electricity Market (NEM) incorporates around 40,000 kilometres of transmission lines and cables across Queensland, NSW, ACT, Victoria, SA and Tasmania.

The NEM involves wholesale electricity generation, which is transported via high-voltage transmission lines from generators to large industrial energy users and to distribution networks in each region, which deliver energy to homes and businesses.

The transport of electricity from generators to consumers is facilitated through a 'pool', or spot market, where the output from all generators is aggregated and scheduled at five-minute intervals to meet demand. The Australian Energy Market Operator (AEMO) manages the market through procedures including the National Electricity Rules.

TransGrid operates and manages the high voltage electricity transmission network in NSW and the ACT. The network connects more than three million homes, businesses and communities to a safe, reliable and affordable supply of electricity.

The existing transmission network (refer to Figure 2-1) was established to transport electricity primarily from generators in fossil-fuel rich areas to load centres, such as residential or industrial areas. As the supply mix evolves, transmission networks will need to be reconfigured to connect regions with high-quality renewable energy resources to load centres, and incorporate dispatchable capacity, including energy storage, to firm intermittent supplies.

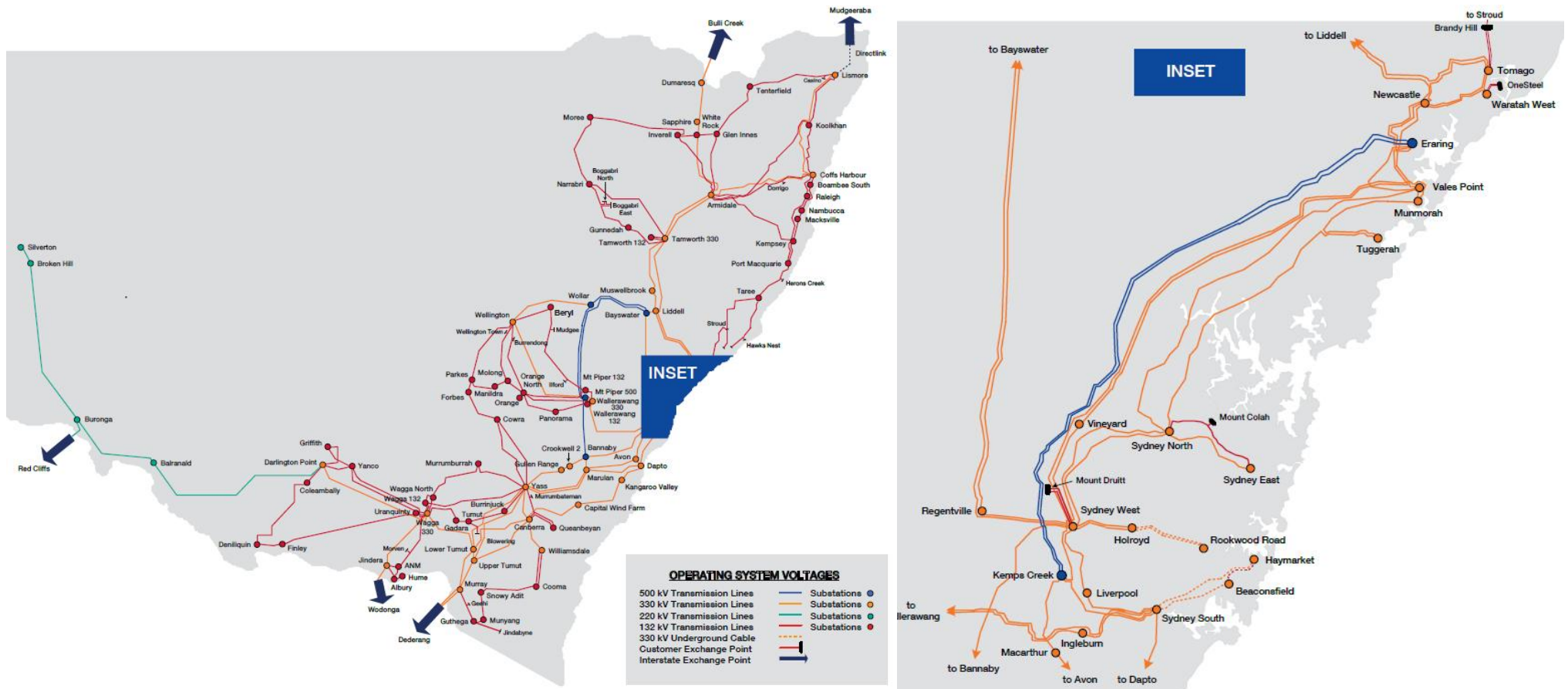


Figure 2-1 TransGrid's Electricity Network Map (source: TransGrid, 2019a)

2.2 Strategic Planning Context

Australia's power system is experiencing its largest transformation since it was established. The forecast retirement of existing generation, in conjunction with significant reductions in the cost of new sources of generation, is driving the transition to the energy system of the future. Electricity consumption in NSW has increased consistently in recent years and is forecast to continue to increase over the next ten years.

2.2.1 Integrated System Plan

Responding to a recommendation in the 2018 Independent Review into the Future Security of the NEM (Finkel Review), in July 2018 AEMO released the first Integrated System Plan (ISP) to deliver a strategic infrastructure development plan, based on sound engineering and economics, which can facilitate an orderly energy system transition under a range of scenarios. An updated ISP, which builds on the initial 2018 ISP, was released in July 2020 by the AEMO (referred to as the 2020 ISP) (AEMO, 2020).

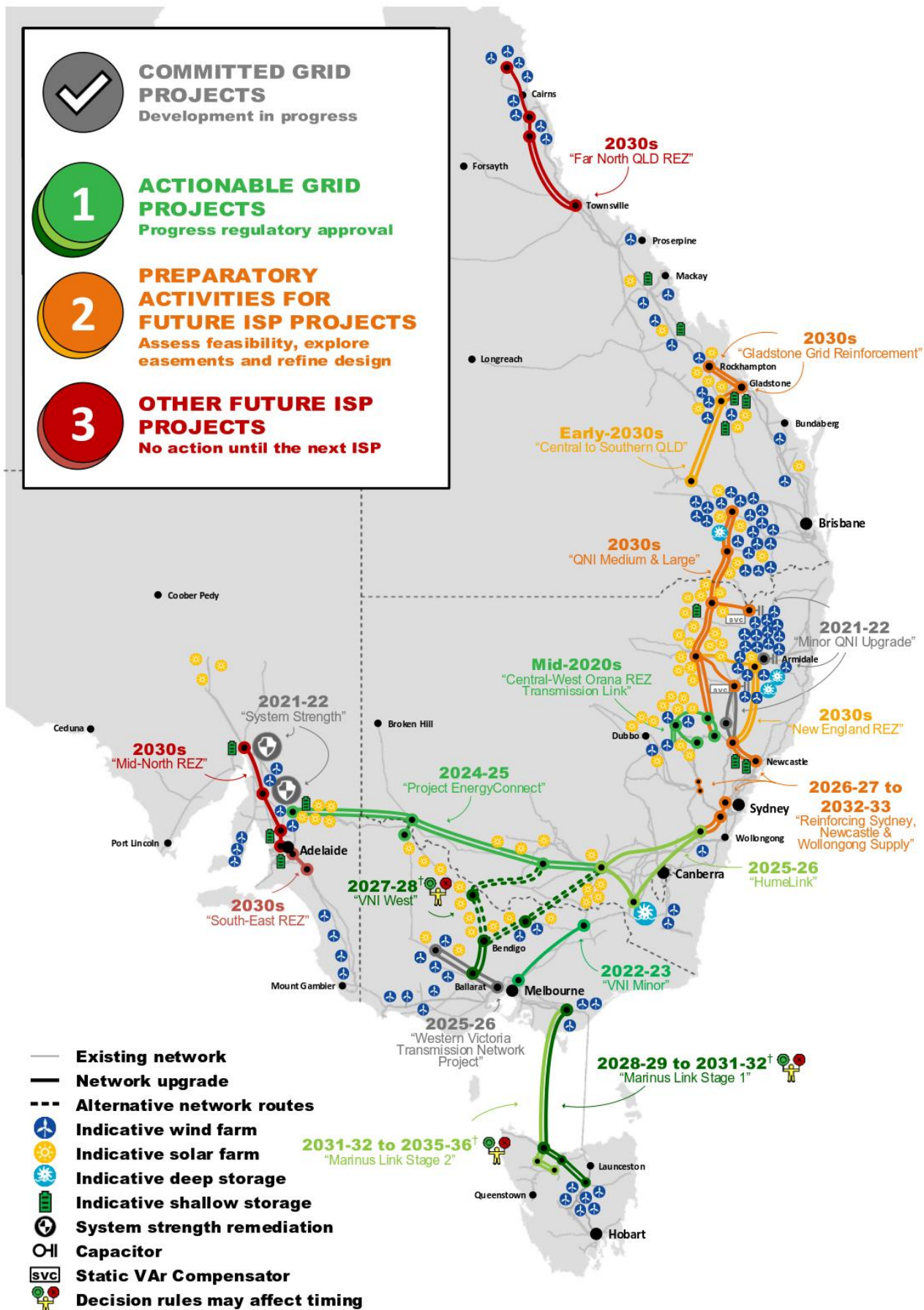
Both the 2018 and 2020 ISPs expect a significant transition of the NEM over the next two decades from one dominated by coal-fired generation to one of diverse renewable and distributed energy generation, supported by energy storage and network solutions. As outlined in the 2020 ISP, the pace of development in new renewable and distributed energy generation to date has been even faster than anticipated in the 2018 ISP.

The 2020 ISP estimated that timely and efficient transmission investment as proposed in the ISP could deliver a net benefit across the NEM of \$11 billion.

A new interconnector between SA and NSW (EnergyConnect) is identified as an immediate priority project in the 2018 ISP and an Actionable project in the 2020 ISPs. This is because it is expected to deliver positive net market benefits and support the energy market transition to a lower carbon emissions future as soon as it can be built.

EnergyConnect would also complement several additional major inter-regional interconnectors that have been identified as priority 'Committed' or 'Actionable' projects in the 2020 ISP (refer to Figure 2-2). Together, these interconnectors would augment the national transmission grid and address cost, security and reliability issues. These complementary projects include (but are not limited to) interconnectors between Queensland and NSW (QNI Minor), Victoria and NSW (VNI Minor and VNI West) as well as the augmentation of the Southern NSW network (HumeLink) to access Snowy Hydro's existing and future generation capacity. The interconnector projects proposed include a combination of 330 kV and 500 kV transmission systems.

The 2020 ISP also identifies several Renewable Energy Zones (REZs) (refer to Figure 2-3), which are areas in the NEM where clusters of large-scale renewable energy can be developed. The locations of these REZs has influenced the location and timing of the projects identified in the 2020 ISP for development, as targeted grid augmentation is required to unlock the potential of the REZs. EnergyConnect is expected to increase the transfer capacity between South Australia and New South Wales by 750 MW and result in a network capability improvement for the Riverland REZ of 800 megawatts (MW), the Murray River REZ of 600 MW and the South-west NSW REZ of 380 MW.



† The timing of these actionable projects is dependent on decision rules.

All dates are indicative, and on a financial year basis. For example, 2023-24 represents the financial year ending June 2024.

Figure 2-2 Projects outlined in the 2020 ISP (AEMO, 2020)

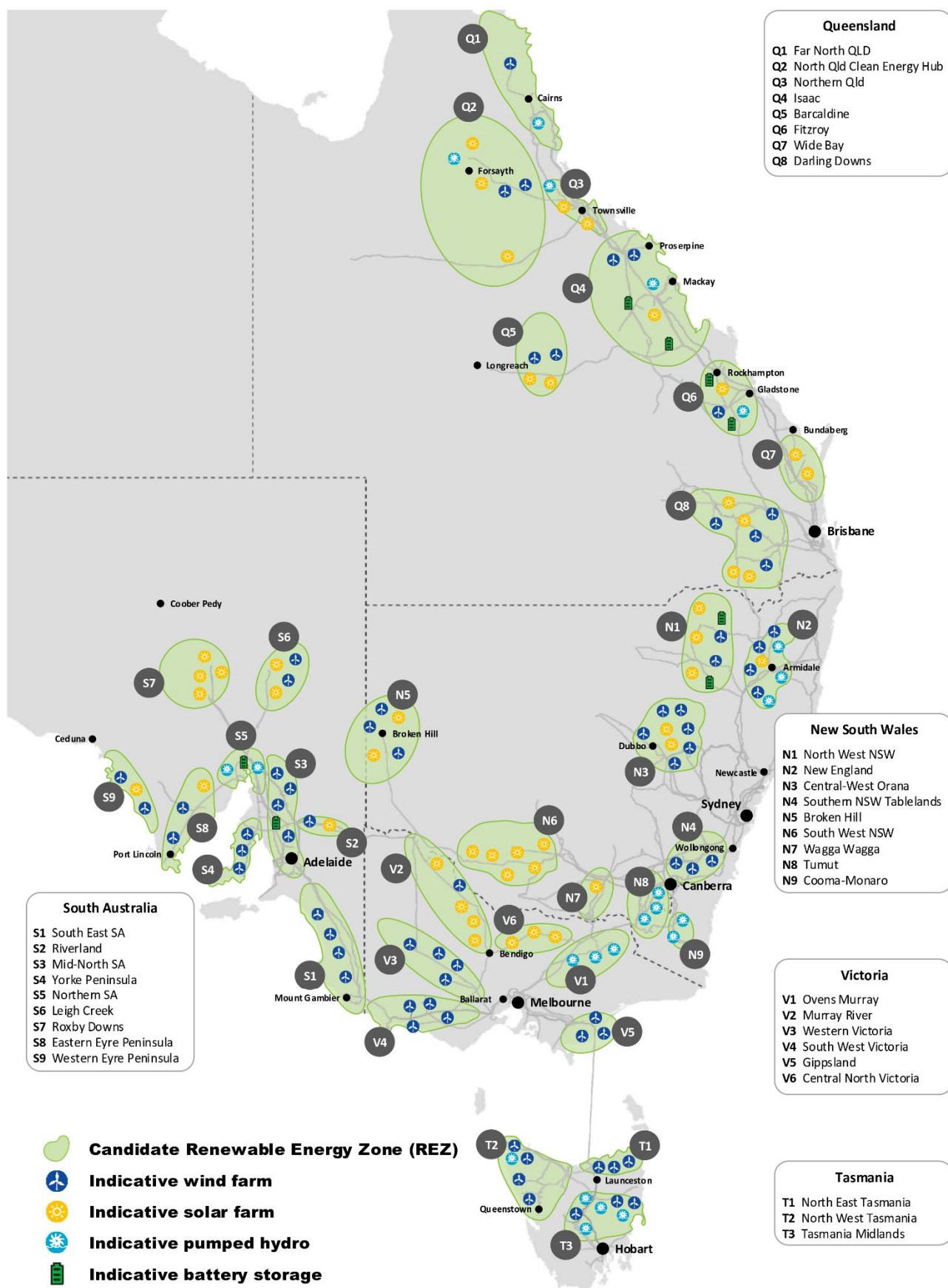


Figure 2-3 Identified candidate REZs within the NEM (AEMO, 2020)

2.2.2 NSW Transmission Infrastructure Strategy

The NSW Transmission Infrastructure Strategy (NSW Department of Planning and Environment (DP&E), 2018) is the NSW Government's plan to unlock private sector investment in priority transmission infrastructure projects, which can deliver least-cost energy to customers through to 2040 and beyond. The Strategy forms part of the Government's broader plan to make energy more affordable, secure investment in new generation sources and network infrastructure, and ensure new technologies deliver benefits for consumers. Building on existing programs to reduce household and business energy bills and secure energy supplies, the Strategy aims to:

- > Boost interconnection with Victoria, SA and Queensland, and unlock more power from the Snowy Hydro Scheme
- > Increase NSW's energy capacity by prioritising Energy Zones in the Central West, South West and New England regions of NSW, which will become a driving force to deliver affordable energy into the future
- > Work with other states and regulators to streamline regulation and improve conditions for investment. By increasing transmission capacity and low-cost generation, NSW will support an orderly transition of the energy sector over the next two decades.

NSW already has a substantial investment pipeline of new wind, solar, gas and generator upgrade projects that have received or are seeking planning approval, driving the energy transformation across the state. As traditional generators retire, these new projects will provide the cheapest available energy to supply households, businesses, schools and essential services. The existing network will continue to play an important role. However, it only has enough capacity to connect around one in 20 of these projects.

EnergyConnect is one of four priority transmission projects identified in the strategy to be accelerated to access existing and committed low-cost energy supplies in other regions within the NEM. These priority projects are intended to meet energy needs prior to the retirement of existing coal-fired generation in NSW.

The strategy also identifies several Energy Zones (refer to Figure 2-4), which are areas with high energy potential where planned transmission infrastructure upgrades could allow multiple generation projects to connect to the network at lower cost. AEMO forecasts these Energy Zones will provide the bulk of the state's future energy supply, with up to 17,700 megawatts (MW) of new generation projects expected to connect to the grid. This could support an average of up to 2,000 construction jobs each year and inject up to \$23 billion in investment into regional NSW. Historically, new energy projects have typically been built alongside the existing network. However, as the existing transmission network becomes constrained, Energy Zones will require transmission projects, such as EnergyConnect, to unlock energy resources in new regions of the state.

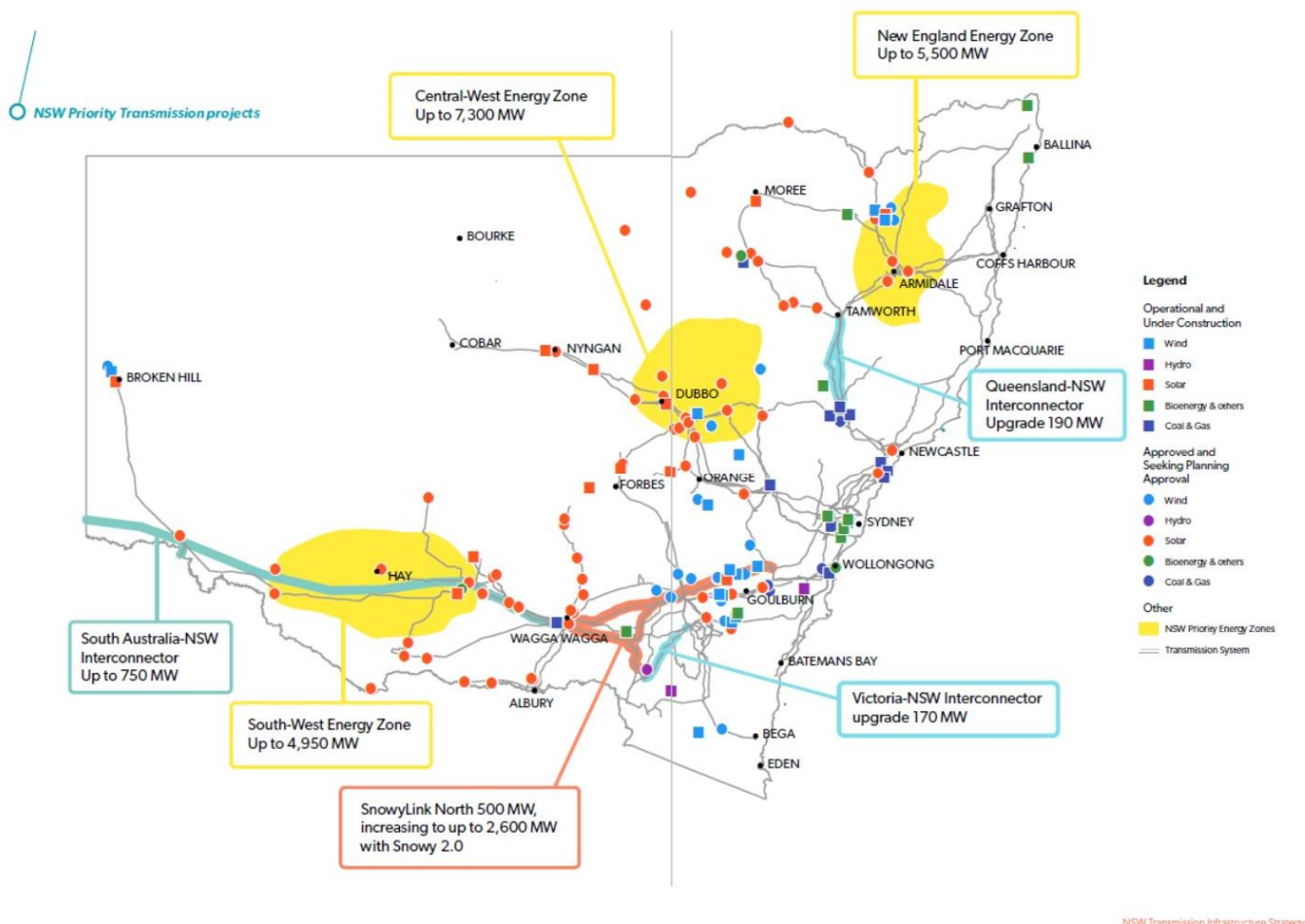


Figure 2-4 NSW Priority Transmission Projects (DP&E, 2018)

2.2.3 Commonwealth Policy Context

At the Paris Climate Conference COP21 (COP21) agreement was reached ‘to achieve a balance between anthropogenic (human induced) emissions by sources and removals by sinks of greenhouse gases in the second half of this century’.

On 10 November 2016, Australia ratified the Paris Agreement and the Doha Amendment to the Kyoto Protocol, representing the Australian Government commitment to action on climate change.

In 2017, the Government reviewed its climate change policies to ensure they remain effective in achieving Australia’s 2030 target and Paris Agreement commitments. A final report was released on 19 December 2017 which generally indicated the Government’s policies were on course to meet Australia’s international climate change commitments.

EnergyConnect is consistent with the Commonwealth Government’s climate change initiatives and facilitates the continued expansion of renewable energy generation by facilitating the longer-term transition of the energy sector across the NEM to low-emission energy sources.

2.3 Need for EnergyConnect

Australia's energy markets are undergoing rapid change as the sector transitions to generating lower carbon emissions, with a greater uptake of renewable generation and emerging technologies. These changes have brought with them a number of challenges, including:

- > A reliance on high-cost gas plant in SA to meet peak demand in certain conditions
- > Increased variability of demand and supply due to growth of intermittent renewable generation, both at grid-scale and due to household rooftop solar panels.

This, in turn, has led to periods of high wholesale electricity prices in SA and a reduction in contract market liquidity fuelling affordability concerns for customers. In addition, the SA region is seen as continually vulnerable to extreme weather events and system disturbances.

The progressive retirement of around half of the NSW coal fleet by 2035 (or sooner) means that alternative low-emission supply sources will be required to fill this gap whilst meeting Australia's carbon emissions reduction commitments.

A new interconnector between SA and NSW is needed to:

- > Lower dispatch costs, initially in SA, through increased access to supply options across regions
- > Facilitate the transition to a lower carbon emissions future in the NEM and the adoption of new technologies by improving access to high quality renewable resources across all regions
- > Enhance the security of electricity supply in SA.

The added connection to Red Cliffs in north-west Victoria would also substantially increase the generator connection capacity and enable the development of solar generation around Red Cliffs Terminal Station in the Murray River Renewable Energy Zone. This power can then be exported to SA and NSW via EnergyConnect.

By expanding, and in the case of SA and NSW establishing power transfer capability between regions, interconnectors enable the efficient sharing of generation resources between regions in the NEM and can encourage more efficient investment in low-cost generation sources, allowing overall demand and system reliability requirements to be met at lowest cost.

A new interconnector would put downward pressure on wholesale market electricity costs in SA, as soon as it can be built, by enabling electricity demand in SA to be met using low-cost generating capacity that currently exists on the east coast of Australia. This would have a substantive impact in reducing the total dispatch costs in SA, providing an overall market benefit.

In the longer term, an enhanced ability to import low-cost power from NSW, including significant high-quality renewables, provides market benefits by enabling supply in NSW to be met at a lower overall cost as existing coal-fired plant retires. This is particularly the case for the new interconnection between SA and NSW, as NSW is forecast by AEMO to experience the greatest retirement of coal plant after 2030 and would otherwise rely on higher-cost sources of generation to fill the resulting supply gap.

Allowing for a greater sharing of resources across regions will help smooth demand and supply fluctuations, and in particular reduce reliance on increasingly expensive gas generation, reducing price volatility and trading risk.

2.4 Need for the Proposal

The proposal is an essential component of EnergyConnect as it would connect the EnergyConnect (NSW – Western Section) to Wagga Wagga via the South-West Energy Zone (refer to Figure 2-4). This would provide increased generator connection capacity near the South-West Energy Zone to encourage the development of new renewable energy projects, which would be capable of generating up to 4,950 MW. It would also provide further benefits by connecting EnergyConnect to other sections of the transmission network at Wagga Wagga, increasing the reliability and power transfer capacity within the NEM.

2.5 Key Benefits of EnergyConnect

TransGrid and ElectraNet have investigated interconnector and network support options aimed at reducing the cost of providing secure and reliable electricity in the near term, while facilitating the longer-term transition across the NEM to low-emission energy sources.

Economic cost-benefit analysis prepared as part of the Regulatory Investment Test for Transmission (RIT-T) process for the Australian Energy Regulator (AER) shows that the new interconnector is expected to:

- > Deliver net market benefits of approximately \$900 million over 21 years (in present value terms) including wholesale market fuel cost savings in excess of \$100 million per year as soon as it is energised (primarily from avoided expensive gas-fired generation in SA)
- > Provide diverse low-cost renewable generation sources to help service NSW demand going forward, particularly as existing coal-fired generators retire
- > Avoid substantial capital costs associated with enabling greater integration of renewables in the NEM
- > Generate sufficient benefits to recover the project capital costs within nine years of completion
- > Reduce annual residential bills and small business customer bills in SA and NSW
- > Deliver flow on economic benefits to the wider economy totalling over \$6 billion across SA and NSW (in present value terms)
- > Generate over 200 regional jobs in SA and over 800 regional jobs in NSW during construction, and create around 250 and 700 ongoing jobs in SA and NSW, respectively
- > Improve the ability of parties to obtain hedging contracts in SA and help relieve the tight liquidity in hedging markets currently.

With regard to job creation, over the period 2021 to 2040, it is projected that approximately 18,800 employee years of full time equivalent (FTE) direct and indirect jobs would be created (Acil Allen, 2019).

As indicated in Section 2.2, Australia's COP21 commitment to reduce carbon emissions has substantial implications for the future operation of the NEM. Meeting this commitment will lead to further replacement of some of Australia's emissions-intensive generators with lower-emission alternatives, such as renewable energy sources (ElectraNet, 2019). EnergyConnect would allow renewable energy trade between NSW, SA and Victoria to assist in meeting national carbon emission and renewable energy targets at lowest long-run cost.

2.6 EnergyConnect Options

Four main options were identified to address the need for greater sharing of energy sources across the NEM. The options consisted of both a predominantly SA 'no-interconnector' option (consisting of both network and non-network components) as well as options involving new interconnectors to each of the three neighbouring states. These options were investigated as part of the Project EnergyConnect RIT(T) assessment process. The options investigated as described are shown in Figure 2-5 and are as follows:

- > No interconnector:
 - Option A: Non-Interconnector. Consisting of a range of network support initiatives.
- > An interconnector to Queensland:
 - Option B: A 400 kV high voltage direct current (HVDC) line between north SA and Queensland. The indicative route would be between Davenport in SA, crossing into NSW and connecting with the Queensland network at Western Downs. This path would be around 1,450 kilometres long. This option is assumed to provide 700MW of transfer capacity.
- > NSW interconnector options:
 - Option C.3: A 330 kV line (alternating current) between Robertstown in mid-north SA and Wagga Wagga in NSW, via Buronga, plus a 220 kV line between Buronga and Red Cliffs, in Victoria. The indicative route would be approximately 916 kilometres in length. This option is assumed to provide 800MW of transfer capacity.

- Option C.3ii: A 330 kV line between Robertstown in mid-north SA and Wagga Wagga in NSW, via Buronga, Red Cliffs, Kerang and Darlington Point. This option is a variant of the above 330 kV option that increases interconnection between Robertstown SA and Wagga Wagga in NSW via Buronga, but which is also routed via Kerang in Victoria and Darlington Point in NSW. The indicative route runs approximately 1,016 kilometres in length. This option is assumed to provide 800 MW of transfer capacity.
- Option C.3iii: A variant of Option 3, which uses a HVDC link for the Robertstown – Darlington Point portion.
- > An interconnector to Victoria:
 - Option D: A 275 kV line from Tungkillo in SA to Horsham and Ararat in Victoria. This option uses a connection from Tungkillo to Horsham to strengthen SA's connection to the east coast by providing an increase in export and import capability. The indicative route runs approximately 510 kilometres in length. This option is assumed to provide 650 MW of transfer capacity.

The RIT-T assessment concluded that of all options considered, a new 330 kV interconnector between Robertstown in mid-north SA and Wagga Wagga in NSW, via Buronga and with an augmentation between Buronga and Red Cliffs (referred to as Option C.3), is expected to deliver the highest net market benefits and is therefore the current preferred option. The proposal is one of the sections of Option C.3, which would connect to the western section of EnergyConnect within NSW (refer to Figure 1-1). All other portions would be dealt with as part of separate environmental planning approvals under the relevant jurisdictions.



Figure 2-5 Overview of the Options (and Variations) Assessed (source: ElectraNet, 2019)

2.7 Corridor and Site Selection for the Proposal

The identification of the EnergyConnect proposal study area has been based on the analysis of extensive geospatial data as well as some preliminary environmental survey and stakeholder engagement.

2.7.1 Alignment Corridor Selection Methodology

While the most cost-effective option for linear infrastructure projects is to take a straight-line approach from point to point, this option is not generally feasible due to a range of environmental, social, land use and engineering constraints.

The environmental and social constraints affecting linear projects can be categorised into the following hierarchy:

- > No-Go - Areas where the transmission line cannot be located.
- > Avoid - Areas that are to be avoided wherever possible.
- > Minimise - Areas where impacts should be minimised and mitigated.
- > Opportunities - Areas that improve / benefit the proposal outcomes.

A comprehensive analysis of constraints was undertaken to inform the corridor selection process through corridor identification workshops involving specialists from environmental, land access, community engagement, GIS/spatial analysis and engineering/design disciplines.

The corridor selection process is summarised in Figure 2-6.

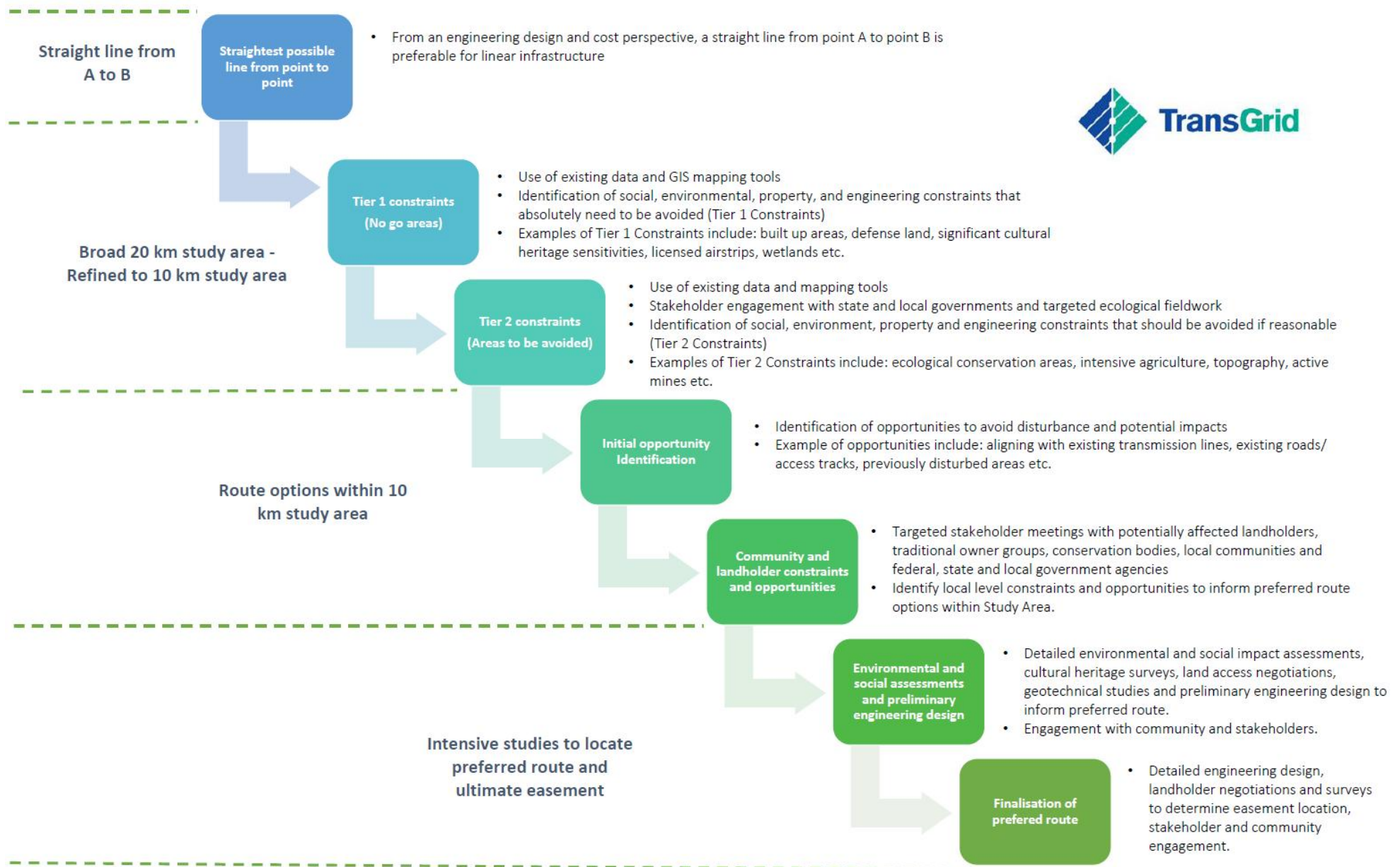


Figure 2-6 Corridor Selection Process

2.7.1.1 Key Objectives and Selection Criteria

The following key objectives and selection criteria were established for the transmission line corridor options investigations:

- > Broadly acceptable to stakeholders, balancing the various environmental and social aspects with engineering limitations and project cost
- > Meet all regulatory obligations relevant under State and Commonwealth legislation
- > Avoid areas of particular environmental sensitivity and restricted access where planning approvals and access are considered unlikely
- > Avoid (if reasonable) or minimise impacts on areas of particular environmental sensitivity and where environmental planning approvals are potentially complex
- > Preference to follow areas of existing disturbance (e.g. utility easements, roads, tracks, fence lines and cadastral boundaries) and target narrow crossing points of waterways and flood out areas (and their associated riparian habitats)
- > Maximise buffer distances to dwellings, inhabited areas and other sensitive land uses
- > Cost effective and provide best value for money
- > Ease of construction using current and available technology
- > Accessible and able to be safely maintained.

Further, the selection criteria identified for each constraint have been informed by engagement and the incorporation of feedback to ensure what is important to stakeholders and community is recognised in the methodology used. The engagement undertaken includes:

- > Engagement with local and regional communities
- > Targeted engagement with key stakeholders including local government, State and Federal government agencies, landholders, Traditional Owners groups and other directly affected parties.

To ensure a robust and structured approach, feedback has been recorded in a systematic manner and incorporated into the selection methodology (see Section 5 Consultation).

A range of primary constraints and opportunities (refer to Table 2-1) were identified and considered during the identification of the preliminary alignment corridor and selection of the proposal study area.

Table 2-1 Environmental Constraints and Opportunities

Tier 1 Constraints (No-Go)	Tier 2 Constraints (avoid)	Tier 3 Constraints (minimise and mitigate)	Opportunities (Areas that improve / benefit the proposal outcomes)
<ul style="list-style-type: none"> > Areas of particular environmental sensitivity and for which environmental approvals are considered unachievable (e.g. Ramsar wetlands and water sources for migratory birds, World Heritage Places, declared wilderness areas, areas subject to international conservation agreements). > Land types predicted to retain particular indigenous heritage sensitivity. > Lands that carry particular safety and security concerns (e.g. Commonwealth Defence lands). > Land use types that carry public safety and amenity concerns (e.g. built up areas, townships, villages, schools and hospitals, designated urban, residential or neighbourhood zonings). > Areas with particular engineering and constructability challenges (e.g. large water bodies). > Lands surrounding other incompatible land uses (e.g. licensed aerodromes). 	<ul style="list-style-type: none"> > Areas of environmental sensitivity and for which environmental approvals are considered complex (e.g. EPBC MNES, wetlands and other high value habitats for migratory, threatened and vulnerable species listed under State and Commonwealth legislation, ecological conservation areas including national park estate, reserves, biosphere and wilderness protection areas). > Lands subject to 'exclusive use' Native Title determinations. > Other incompatible land uses (e.g. intensive agricultural/horticultural activity, viticulture, mining, minerals extraction, wind farms, solar farms). > Areas with engineering and constructability challenges that will significantly increase construction costs (e.g. slopes greater than 15 degrees). > Areas of known naturally occurring asbestos. 	<ul style="list-style-type: none"> > Other EPBC MNES (e.g. migratory flyways, known records listed species). > Known habitat for records of threatened species and ecological communities listed under State and Commonwealth legislation. > Large, contiguous/intact areas of moderate or better quality vegetation. > Groundwater Dependant Ecosystems (GDE) and persistent water bodies. > Key Fish Habitat. > Known/recorded sites and places of Aboriginal and Non-Aboriginal heritage significance. > Main channels of rivers and tributaries. > Flood out areas around major watercourses. > Groundwater recharge areas. > Homesteads and other infrastructure. 	<ul style="list-style-type: none"> > Areas of existing and permanent disturbance (e.g. existing roads and tracks, utility easements, fence lines, cadastral boundaries, biosphere, degraded grazing lands). > Narrow sections of major watercourses or areas with existing crossings/access (including bridges) across the permanent/semi-permanent watercourses.

2.7.1.2 Identification of Preliminary Alignment Corridors

Several high-level initial corridor options were identified for EnergyConnect (NSW – Eastern Section). These options included (refer to Figure 2-7):

- > Duplication of the existing alignment – consisting of a new HV transmission line running parallel to existing HV transmission lines between the Buronga substation and Wagga substations, via the Darlington Point substation
- > A series of northern corridor options – consisting of potential alignment options to the north of the existing Buronga-Balranald-Darlington Point transmission lines. Four main northern options were considered, each providing a connection to the Darlington Point substation
- > series of southern corridor options consisting of potential alignment options paralleling existing HV transmission lines eastwards from the Buronga substation to a location generally south of Hay, which then continued directly to the Wagga substation without providing a connection to Darlington Point substation.

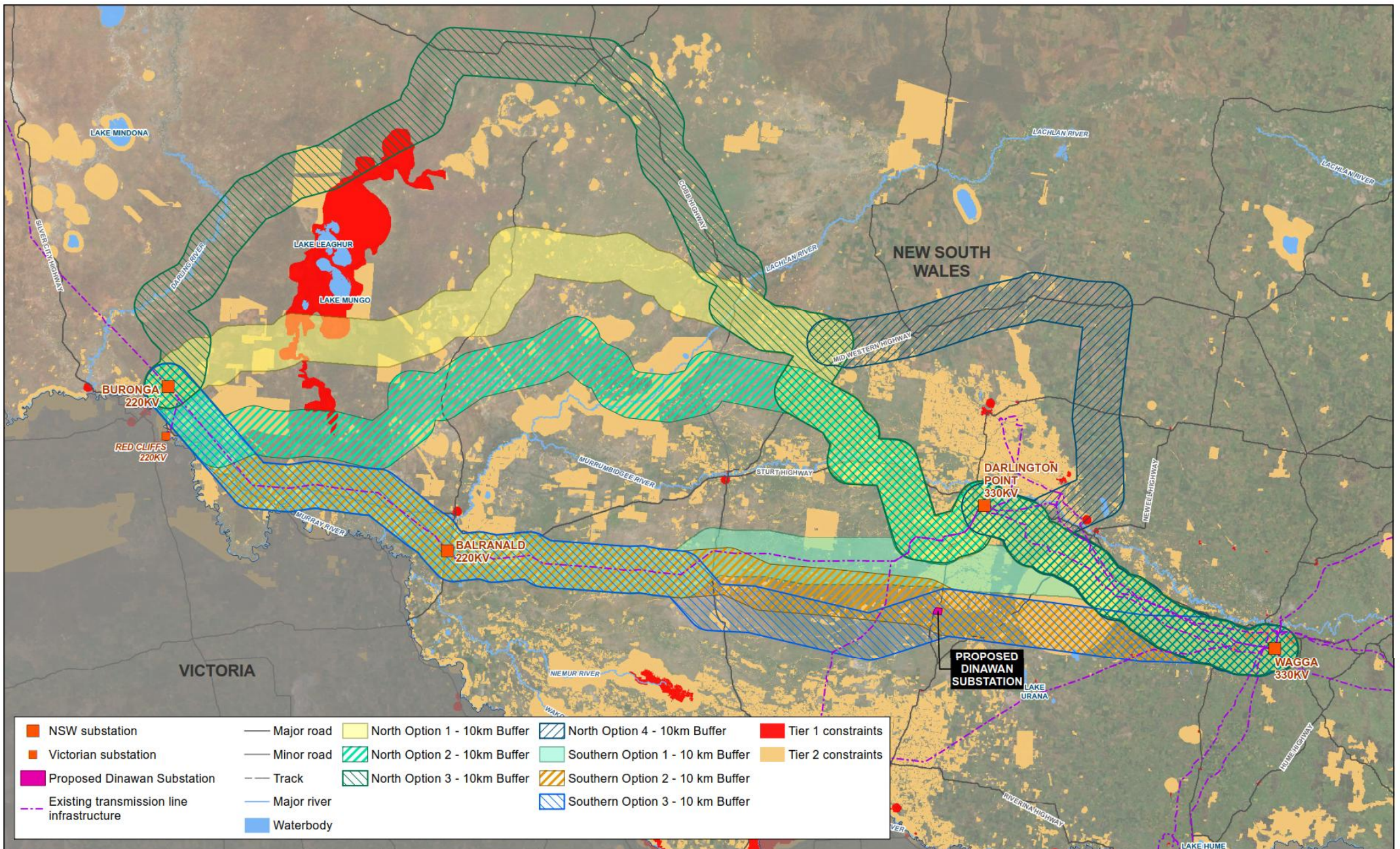
These options were subject to a high-level multi-criteria assessment consistent with the Tier 1 and Tier 2 constraints which were used to assess the corridor options between Buronga and Wagga Wagga. Additional constraints were also considered for this assessment given the complexity of the region including:

- > Ecology – including potential impacts to threatened ecological communities (TECs) (non-serious and irreversible impacts (SAIL)), large, contiguous/intact areas of moderate or better-quality woodland vegetation, and potential Key Fish Habitat
- > Heritage – including potential impacts to recorded Aboriginal heritage sites or areas of potential Aboriginal cultural significance
- > Floodplain hydrology – including identification of main channels of rivers and tributaries (tier 4-6 streams) and flood-prone land
- > Land use and property – including identification of existing homesteads/dwelling structures.

Based on the consideration of the various corridor options, it was determined that a southern corridor option without a connection to Darlington Point substation would provide the best overall outcome for the proposal. This was because this option had:

- > No direct impacts to Tier 1 constraints
- > A shorter overall alignment compared to the more northern corridor options
- > An opportunity to follow existing transmission lines for a substantial portion of the alignment in addition to various major roads, tracks, fence lines and cadastral boundaries that typically trend in an east/west alignment. This included co-location of the proposal parallel to sections of the existing Buronga to Balranald, Balranald to Darlington Point, Finley to Uranquinty and Darlington Point to Wagga Wagga transmission lines. These existing features were considered to offer some reduction in the extent of impacts arising from transmission line construction and operations maintenance
- > Substantially reduced impacts on existing irrigated horticultural areas (particularly the Coleambally Irrigation Scheme)
- > Less technical and engineering constraints compared to the northern corridor options due to the complexity required to provide a connection with the existing Darlington Point substation.

Further details regarding the various options assessments undertaken would be provided as part of the EIS prepared for the proposal.



2.7.2 Substation Site Selection

Based on the preferred option to provide a southern corridor alignment between Buronga substation and Wagga substation that avoided a connection into Darlington Point substation, an additional substation site was required to be identified along the southern corridor alignment. The additional substation is required to meet transmission network and systems safety requirements, allow greater connectivity in the region and increase the feasibility of future connections for other ISP priority projects including VNI West.

A site selection process was undertaken to identify potential substation site locations based on a range of criteria including:

- > An appropriate location approximately 150 to 175 kilometres west of the existing Wagga substation
- > Located close to existing transport access (e.g. sealed roads) and the southern corridor option
- > Consideration of potential environmental and social constraints and opportunities (refer to Table 2-1).

Based on the assessment criteria identified, a suitable area for a new substation was identified around 170 kilometres west of Wagga Wagga near the Kidman Way (shown in Figure 1-2). This substation has been named the 'Dinawan' substation. Dinawan is the local Wiradjuri word for Emu.

The final footprint of the proposed substation site would be within the proposal study area and confirmed in the EIS. Further discussion regarding the options assessment for the substation works would also be provided in the EIS.

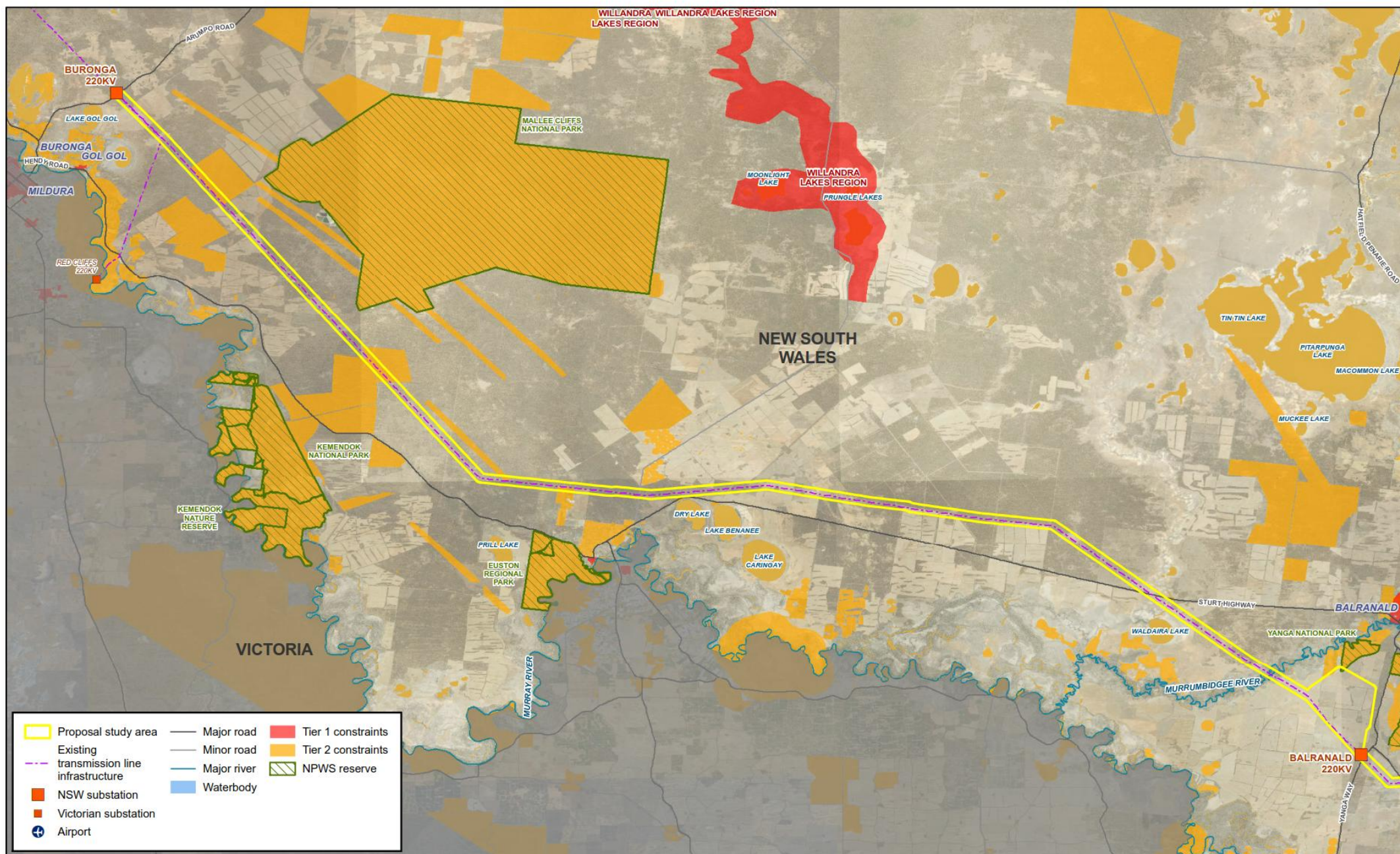
2.7.3 Refinement of the Preferred Corridor

Following identification of the preferred corridor option and a suitable area for the proposed Dinawan substation, TransGrid continued to refine the broad corridor to develop a proposal study area, which was used as the basis for the assessment in this ESR.

The corridor refinement process involved:

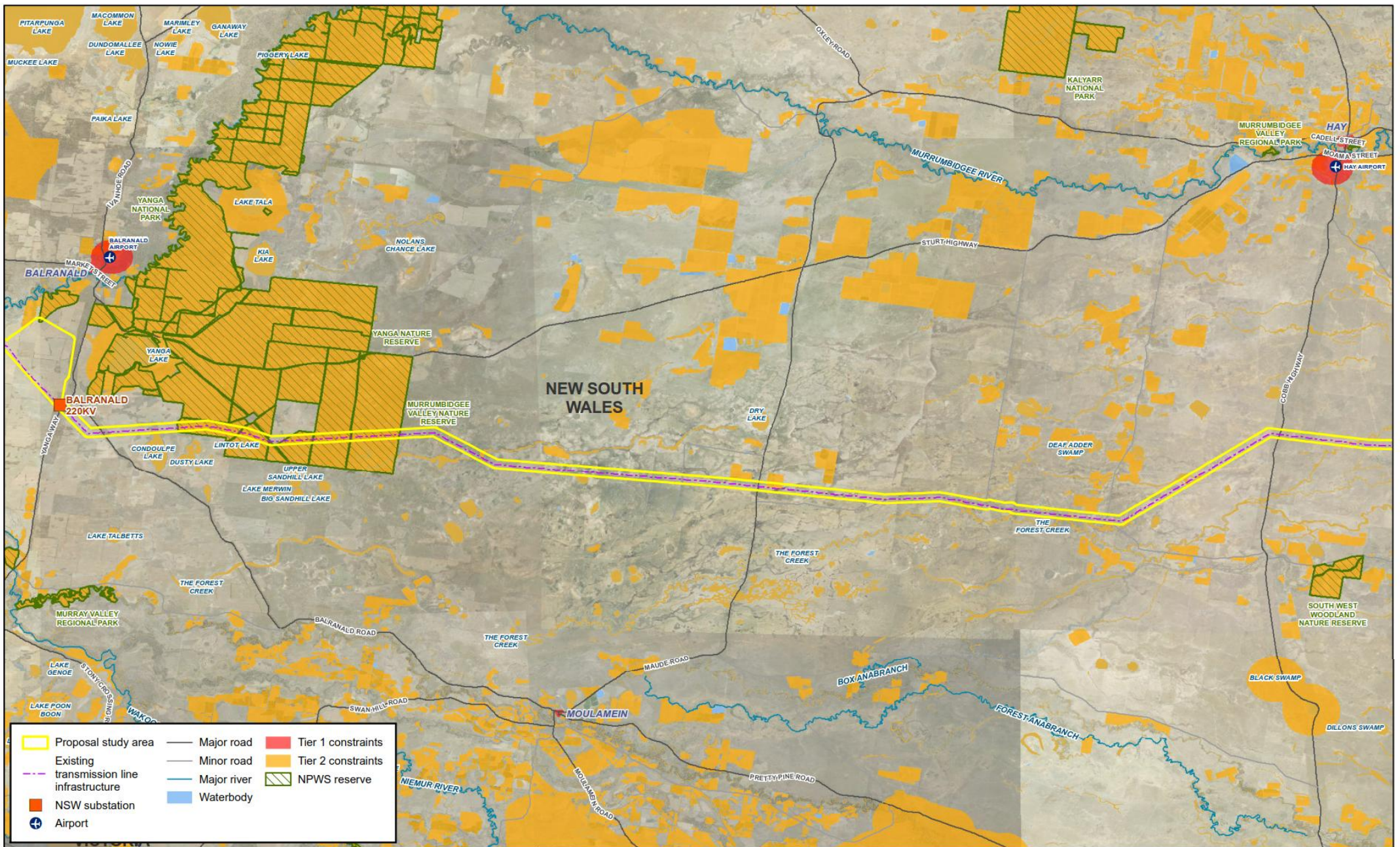
- > Further consideration of key environmental constraints (the overall proposal study area in relation to the surrounding Tier 1 and 2 constraints is shown in Figure 2-8)
- > Direct engagement with several potentially affected stakeholders and landholders to:
 - Collect feedback on the methodology used to identify the preliminary alignment corridor including the section criteria and tiered constraints/opportunities (landscape level)
 - Collect additional information on constraints and opportunities (at a local property level)
 - Seek preferences as to where new transmission infrastructure may be located
- > Reviewing opportunities to reduce potential impacts at a local level including use of:
 - existing utility easements
 - roads and access tracks
 - cleared fence lines and cadastral boundaries
 - areas of degraded vegetation
 - narrow sections of waterways and their associated flood zones.

As a result of the above process, the preliminary corridor between Buronga and Wagga Wagga has been largely refined to a narrower one kilometre wide corridor within which the proposed transmission line and associated easement would be located. However, the process for refinement for the section of the proposal between Four Corners and Lockhart, within which the Dinawan substation would be located, is currently ongoing due to the complex nature of this section, high number of constraints and ongoing engagement with landholders in the area. As a result, the proposal study area for this section is broader and would continue to be refined through community engagement and field validation of key environmental constraints in accordance with the process described above. Further information on the options assessment process and the refined proposal study area would be provided in the EIS.



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 2-8a
Tier 1 and 2 constraints



Map:
PS117658_SCPE_018_A3_Constraints

Date: 20/08/2020

Author: Robert.Suansri

Approved by: - E.Taylor

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase,

© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

1:400,000

Coordinate system: GCS GDA 1994

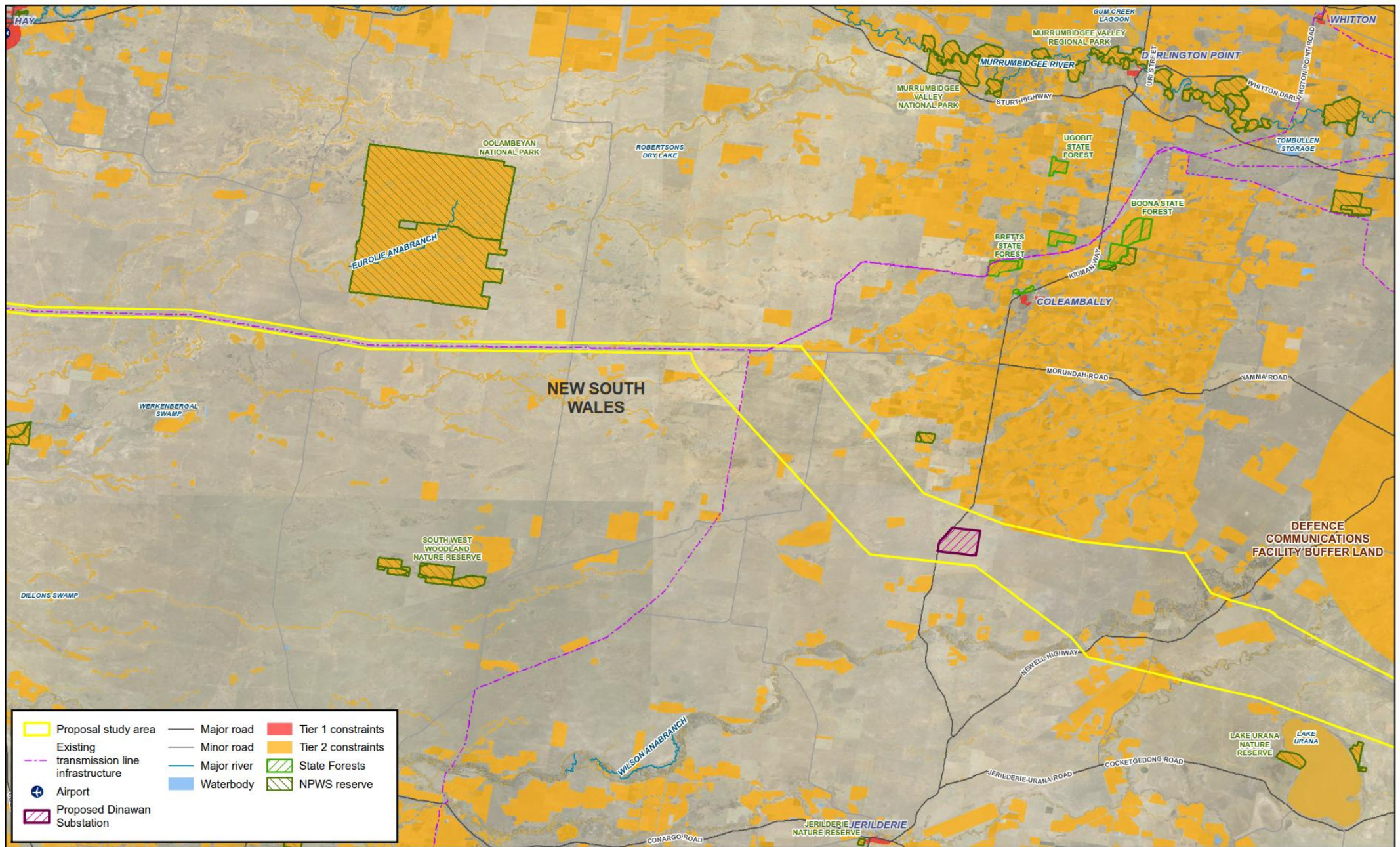
Scale ratio correct when printed at A3



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 2-8b
Tier 1 and 2 constraints

www.wsp.com



Proposal study area	Major road	Tier 1 constraints
Existing transmission line infrastructure	Minor road	Tier 2 constraints
Airport	Major river	State Forests
Proposed Dinawan Substation	Waterbody	NPWS reserve

Map: PS117658_SCPE_018_A3_Constraints	Author: Robert Suansri
Date: 20/08/2020	Approved by: - E. Taylor

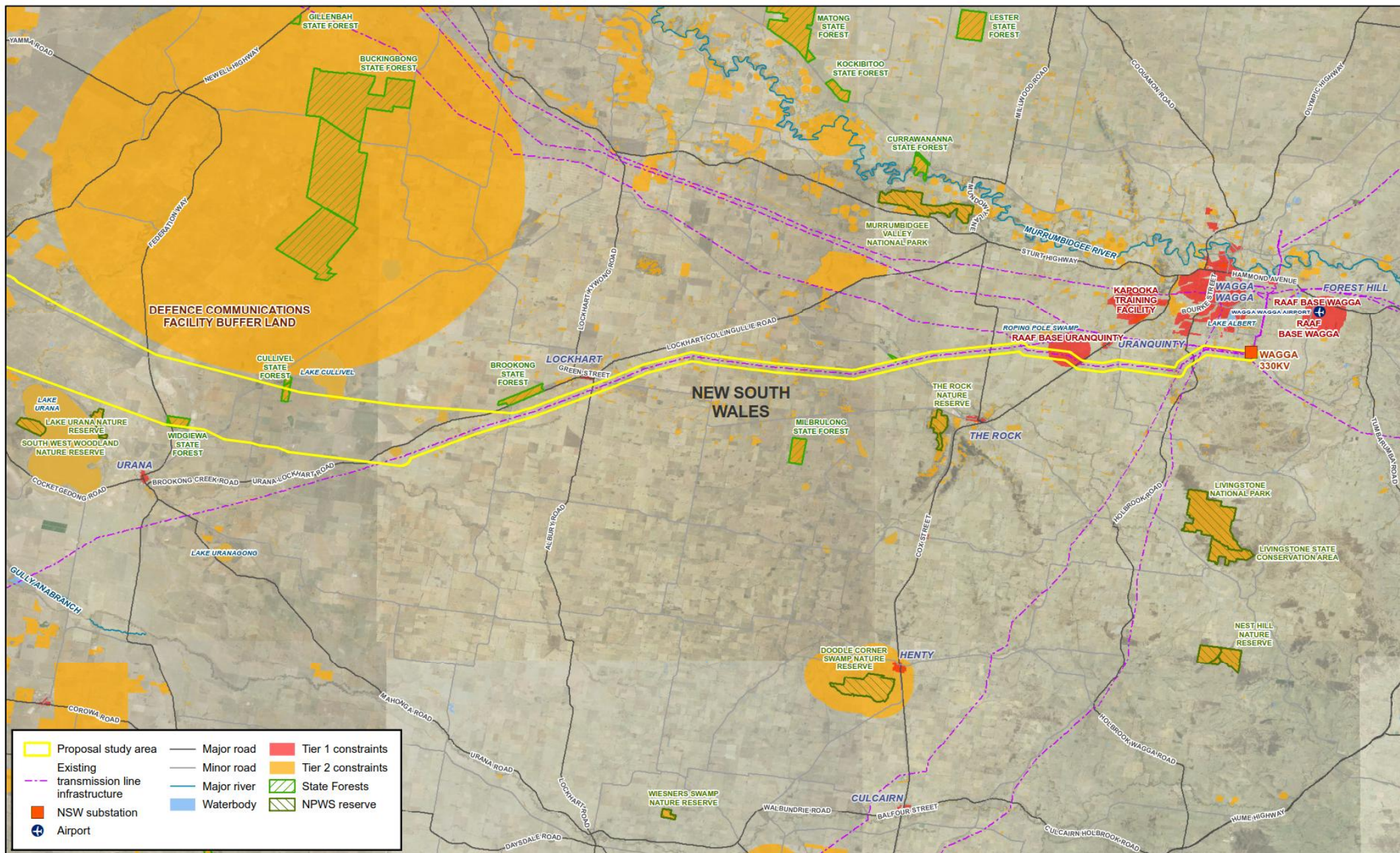
1:400,000

Coordinate system: GCS GDA 1994
Scale ratio correct when printed at A3



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 2-8c
 Tier 1 and 2 constraints



Map:
PS117658_SCPE_018_A3_Constraints

Date: 20/08/2020

Author: Robert Suansri

Approved by: - E. Taylor



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase,

© WSP Australia Pty Limited (WSP). Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCS1 Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF WSP Australia Pty Limited.

C:\Users\suananr\WSP\0365\Project EnergyConnect - General\04_Production\Maps\04_ScopingStudies\Eastern\PS117658_SCPE_018_A3_Constraints.mxd

Scale: 1:400,000

Coordinate system: GCS GDA 1994

Scale ratio correct when printed at A3



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 2-8d
Tier 1 and 2 constraints

3. The Proposal

The proposal would involve the construction and operation of new transmission lines between the existing Buronga and Wagga substations, a new substation about 170 kilometres west of Wagga Wagga, an upgrade and expansion of the existing Wagga substation and other ancillary works to facilitate construction of the proposal.

3.1 Proposal Study Area

The proposal study area for this ESR is shown in Figure 1-2. It extends from the Buronga substation to the Wagga substation and generally comprises a one kilometre wide corridor, with a broader section between Four Corners and Lockhart, within which the proposal would be located. The proposal study area was derived from the corridor identification process summarised in Section 2.7.

The ancillary activities associated with the proposal (including brake and winch sites, crane pads, site compounds and equipment laydown areas) would generally be undertaken within this proposal study area. Additional locations that may be required for specific uses (such as access tracks and accommodation camps) would be identified during design development and assessed as part of the EIS.

3.2 Proposal Context and Location

The proposal would be located in regional western NSW and traverse around 540 kilometres from Buronga to Wagga Wagga. The proposal is located within the Wentworth, Balranald, Murray River, Edward River, Hay, Murrumbidgee, Federation, Lockhart and Wagga Wagga LGAs. An overview of the proposal's regional context is provided in Figure 1-2.

The nearest regional population centre to the proposal is Wagga Wagga, which is located about 7.5 kilometres north of the eastern end of the proposal study area. Smaller towns near the proposal study area include Buronga (10 kilometres south-west), Euston (three kilometres south), Balranald (seven kilometres north-east), Urana (five kilometres south) and Lockhart (500 meters north).

The proposal would traverse three main bioregions, being the Murray Darling Depression, Riverina bioregion and South Western Slopes (DPIE, 2016). While each of these regions present generally distinct characteristics, the proposal would typically traverse areas of rural land, and land that has been developed primarily for agricultural uses including sheep grazing for wool and meat, cattle grazing and cereal cropping. Other land uses within and surrounding the proposal study area include farm buildings and infrastructure, roads and road reserves, broad acre rural residential development, drainage channels for irrigation and existing transmission line easements.

However, while large areas have been cleared and disturbed for the identified agricultural activities, the proposal study area also contains several areas of remnant vegetation. Where possible during route refinement, the proposal would be located parallel with existing transmission lines or road corridors for large sections of the alignment, which would provide an already disturbed or 'brownfield' site and reduce potential fragmentation.

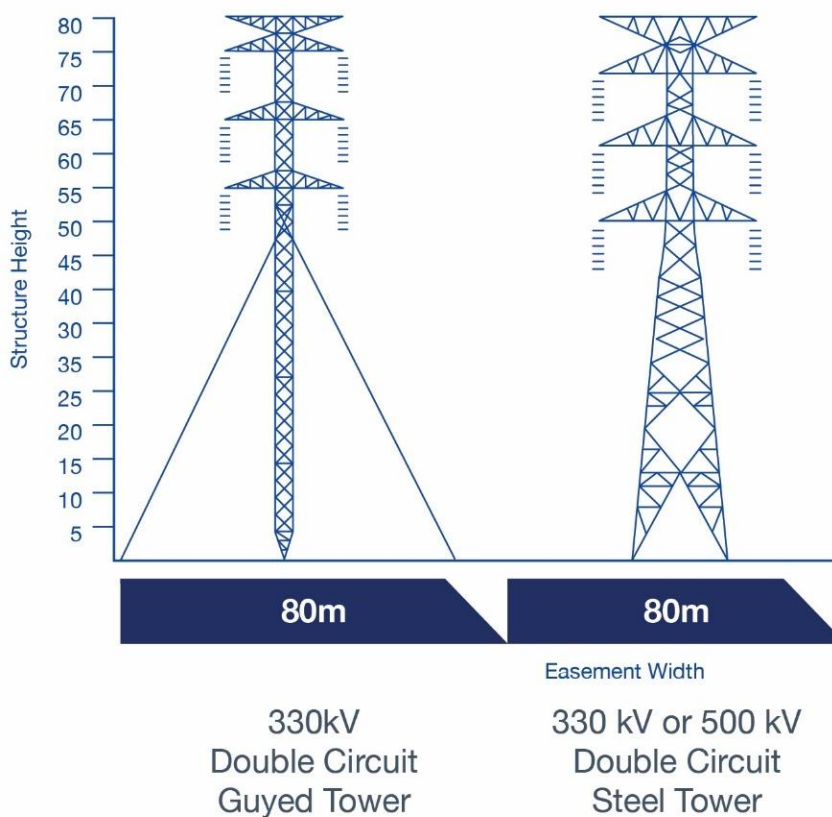
3.3 Key Components of the Proposal

The key components of the proposal are summarised in Table 3-1.

Table 3-1 Summary of Key Components of the Proposal

Component	Description
Transmission lines	<p>A new double-circuit transmission line (minimum 330 kV with potential up to 500 kV for some sections) would be constructed from the Buronga substation eastwards towards the Wagga 330 kV substation. The nominal distance would be about 540 kilometres. The transmission line would be supported on a series of transmission line structures up to 80 metres in height and spaced between 300 and 600 metres apart.</p> <p>Depending on a range of factors such as distance between each transmission line, ground conditions and the need to minimise impacts on existing environmental conditions and land uses, a range of different structure types are being considered. These include:</p> <ul style="list-style-type: none"> > Free standing steel lattice structures > Guyed steel lattice structures. <p>Indicative configurations of the potential transmission line structures that may be used as part of the proposal are shown in Figure 3-1. The type and arrangement of the structures would be refined during detailed design.</p> <p>The footings of each structure would require an area of up to 60 metres by 80 metres for guyed structures, however the area required would be smaller for free standing structure types. Additional disturbance at each structure site to facilitate structure assembly and stringing may be required.</p>
Transmission line easements	<p>The transmission lines would be located within an easement about 80 metres wide, which provides a right of access to construct, maintain and operate the transmission line and other operational assets. The easement also identifies the zone of initial vegetation clearance and on-going vegetation management to ensure safe electrical clearances during the operation of the lines.</p>
Substation works	<p>A new substation between Buronga and Wagga Wagga, referred to as the Dinawan substation would be constructed east of the Kidman Way, approximately 170 kilometres west of Wagga Wagga. The construction of the Dinawan substation would require up to 36 hectares.</p> <p>An upgrade and expansion to the existing Wagga 330 kV substation would also be required to connect the new transmission line to the network.</p> <p>The proposal would also require minor substation works to connect the new transmission line to the existing Buronga substation on Arumpo Road.</p>
Access	<p>Access to each structure and the substation sites would be required during construction and operation. Wherever possible, existing roads, tracks and other existing disturbed areas would be used to minimise vegetation clearing. In areas where there are no existing roads or tracks, suitable access would be constructed.</p>

Component	Description
Ancillary sites	Various ancillary sites would be required during the construction of the new transmission lines and substation works, including staging/laydown, concrete batching and workforce accommodation. Staging and laydown areas would be required along the transmission alignment for the temporary storage of materials, plant and equipment required to construct the various elements of the proposal. A helipad and helicopter support facilities may also be required. These areas would be preferentially located on existing disturbed land not subject to inundation and a reasonable distance from watercourses and drainage lines. The location of ancillary sites will be refined during detailed design.
Earthworks (including blasting)	<p>Earthworks would be required for various purposes within the proposal study area including:</p> <ul style="list-style-type: none"> > Bulk earthworks for the new Dinawan substation and Wagga substation upgrade and expansion > Foundation preparation at each transmission line structure > Some earthworks where suitable access to transmission line structures and ancillary sites does not already exist. <p>The extent of earthworks required for the proposal will be refined during detailed design. Where subsurface rock is encountered during the excavation of structure or substation footings, blasting may be required.</p>



Note: figure not to scale and represents indicative maximum heights and widths

Figure 3-1 Indicative Concept Design for the Transmission Line Structures

3.4 Proposal Timeframes

Construction of the proposal would commence in 2022, subject to NSW Government and Commonwealth planning approvals. Once construction has commenced, the proposal is estimated to take about three years to construct. The proposal is expected to be commissioned/energised (i.e. become operational) in late 2024. This program is indicative and is based on the current design and preliminary construction staging. The program would continue to be refined and would be further considered as part of the EIS.

3.5 Construction of the Proposal

Construction activities would be generally undertaken within the identified proposal study area (refer to Figure 1-2). Ancillary sites, in particular large centralised staging and accommodation facilities, may be located outside this proposal study area. Construction works for the proposal would typically include the following components of work:

- > Site establishment works, which may include (but not be limited to):
 - Establishment of construction site(s), access tracks and service relocations
 - Vegetation clearance.
- > Civil works associated with the proposed transmission lines, which would include (but not be limited to):
 - Construction of access tracks to accommodate safe access of construction machinery and materials to each transmission line structure site
 - Earthworks and establishment of construction pads for each transmission line structure
 - Construction of footings and foundation works for the new transmission line structures including boring and/or excavation, steel fabrication works and concrete pours
 - Erection of the new transmission line structure using crane(s) and or helicopter(s)
 - Stringing of the conductors and overhead earth wires and optical ground wire
 - Installation of earthing conductors.
- > Civil and building works associated with the substation works, which would generally include (but not be limited to):
 - Earthworks and slab construction
 - Electrical fit out with new substation equipment
 - Testing and commissioning of the new substation equipment.

Earthworks associated with the proposal may require blasting. This would be subject to further ground condition investigations and identified as part of the EIS.

In total, construction of the proposal is expected to require approximately 600 construction workers. However, the construction workforce at any one time would vary depending on the stage of construction and associated activities.

3.5.1 Construction Plant and Equipment

An indicative list of construction plant and equipment likely to be required for the key construction elements is provided below. Not all the equipment identified below would be required for all phases of the proposed construction of the substation and transmission lines.

- > Air compressors
- > Backhoes
- > Bob cats
- > Bulldozers
- > Drill and blast units and associated support plant/equipment
- > Concrete agitator
- > Concrete pump
- > Cranes (various sizes up to 200 tonnes)
- > Crawler crane with grab attachments
- > Dumper trucks
- > Elevated work platform
- > Excavators (various sizes)
- > Explosives for blasting
- > Flatbed Hi-ab truck
- > Fuel trucks
- > Generators
- > Graders
- > Helicopter and associated support plant/equipment
- > Piling rig
- > Pneumatic jackhammers
- > Rigid tippers
- > 10–15 and 12–15 tonne rollers
- > Semi-trailers
- > Tilt tray trucks
- > Trenchers
- > Transport trucks
- > Watercarts

3.5.2 Construction Hours

It is proposed that the works would generally be undertaken across a seven day work week between 7 am and 7 pm, during both standard and non-standard construction hours. As the details of construction methodology and proposal needs are developed, these hours will be refined for certain activities and addressed in the EIS.

Accommodation camps would be operated 24 hours a day, seven days a week.

3.5.3 Construction Traffic

Construction vehicle movements would comprise vehicles transporting equipment, waste, materials and spoil, as well as worker's vehicles. Larger volumes of heavy vehicles would occur during the main civil construction works associated with the construction of the Dinawan substation and Wagga substation upgrade and expansion. Non-standard or oversized loads could also be required for the substation works and transportation of transmission line structure materials.

The haulage (transit) routes for proposal related vehicle trips would use much of the surrounding road network between Buronga and Wagga Wagga and beyond to main shipping ports (i.e. in Sydney, Melbourne or Adelaide). Haulage routes would be confirmed as part of the EIS process.

3.6 Pre-Commissioning, Commissioning and Operation

3.6.1 Pre-Commissioning and Commissioning Phases

Prior to energisation of the proposal, a series of pre-commissioning activities would be conducted. This would include testing the new transmission line and expanded substation components. Key activities that would be undertaken during the pre-commissioning phase would include:

- > Point to point testing of substation and transmission line equipment
- > Earthing testing
- > High voltage testing
- > High voltage equipment operational checks

- > Protection, control, and metering system testing.

3.6.2 Operation Phase

The substations and transmission lines would be inspected by field staff and contractors on a regular basis, with other operational activities occurring in the event of an emergency (as required). Likely maintenance activities would include:

- > Regular inspection (ground and aerial) and maintenance of electrical equipment and easements
- > General building, asset protection zone and landscaping maintenance
- > Fire detection system inspection and maintenance
- > Stormwater maintenance.

Further discussion of the proposed pre-commissioning, commissioning and operational activities associated with the proposal will be provided in the EIS.

4. Planning and Assessment Process

Environmental planning approval for the proposal will be required in accordance with EP&A Act. A referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is also proposed to be submitted. It is assumed that the proposal would be likely to be considered a controlled action and would therefore require Commonwealth assessment and approval under the EPBC Act.

4.1 Permissibility

The proposal is permissible without development consent under clause 41 of State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) being 'development for the purpose of an electricity transmission or distribution network, carried out by, or on behalf of, an electricity supply authority or public authority without consent on any land'.

The proposal is characterised as an electricity transmission network under the Infrastructure SEPP which defines an 'electricity transmission or distribution network' to include:

- > Above or below ground electricity transmission or distribution lines (and related bridges, cables, conductors, conduits, poles, towers, trenches, tunnels, ventilation and access structures)
- > Above or below ground electricity kiosks or electricity substations, feeder pillars or transformer housing, substation yards or substation buildings.

TransGrid is defined as an electricity supply authority under clause 40 of the Infrastructure SEPP being both an energy services corporation under the *Energy Services Corporations Act 1995* and also a transmission operator under the *Electricity Supply Act 1995*. Therefore, the proposed electricity transmission and distribution works is permissible without consent pursuant to clause 41 of the Infrastructure SEPP.

4.2 NSW Environmental Planning Legislation and Approvals

The EP&A Act and the EP&A Regulation are the primary pieces of legislation regulating land use planning and development assessment in NSW. This legislation is supported by a range of environmental planning instruments including State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs).

Section 5.13 of the EP&A Act provides for the declaration of State Significant Infrastructure (SSI) and Critical State Significant Infrastructure (CSSI), while Part 5.2 of the EP&A Act establishes the assessment and approval regime for SSI and CSSI.

The requirements of Clause 192 of the EP&A Regulation for applications seeking approval of the Minister for Planning and Public Spaces to carry out SSI are also addressed in the following sections.

4.2.1 NSW State Significant Infrastructure

TransGrid, as the proponent, has formed the view that the proposal is likely to significantly affect the environment (as a result of potential impacts including, but not limited to, biodiversity, Aboriginal heritage, land use and visual impacts) and therefore requires the preparation of an EIS under Part 5, Division 5.2 of the EP&A Act.

The proposal has been declared to be SSI and CSSI under sections 5.12 (4) and 5.13 of the EP&A Act respectively. Schedule 5 of *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) has been amended to include the project as CSSI under clause 15.

On this basis, the proposal is to be assessed as CSSI and subject to Division 5.2 of the EP&A Act. Development consent (under Part 4 of the EP&A Act) from the relevant councils is not required.

4.2.2 Planning Approval Process under Part 5.1 of the EP&A Act

Following the receipt of the SEARs, TransGrid would prepare and publicly exhibit an EIS in accordance with the SEARs and the requirements of the EP&A Regulation (as per section 5.16 of the EP&A Act).

The NSW Department of Planning, Industry and Environment (DPIE) would place the EIS on public exhibition for a minimum of 30 days (as per section 5.17 of the EP&A Act). During the exhibition period, government agencies, proposal stakeholders and the community would be able to review the EIS and would have an opportunity to make a written submission to the DPIE for consideration in its assessment of the proposal.

At the completion of the public exhibition period, the DPIE would collate and provide TransGrid with a copy of all submissions received during the exhibition period. After reviewing the submissions, TransGrid would prepare a submissions report for the proposal that responds to the relevant issues raised. If changes are required as a result of the issues raised or to minimise environmental impact, an amendment report or preferred infrastructure report may also be required. If this is required, TransGrid would prepare the report to address the changes to the design to minimise impacts and submit this for review to the DPIE. This report may be available for public review.

A summary of the overall assessment and approval process for the proposal is shown in Figure 4-1.

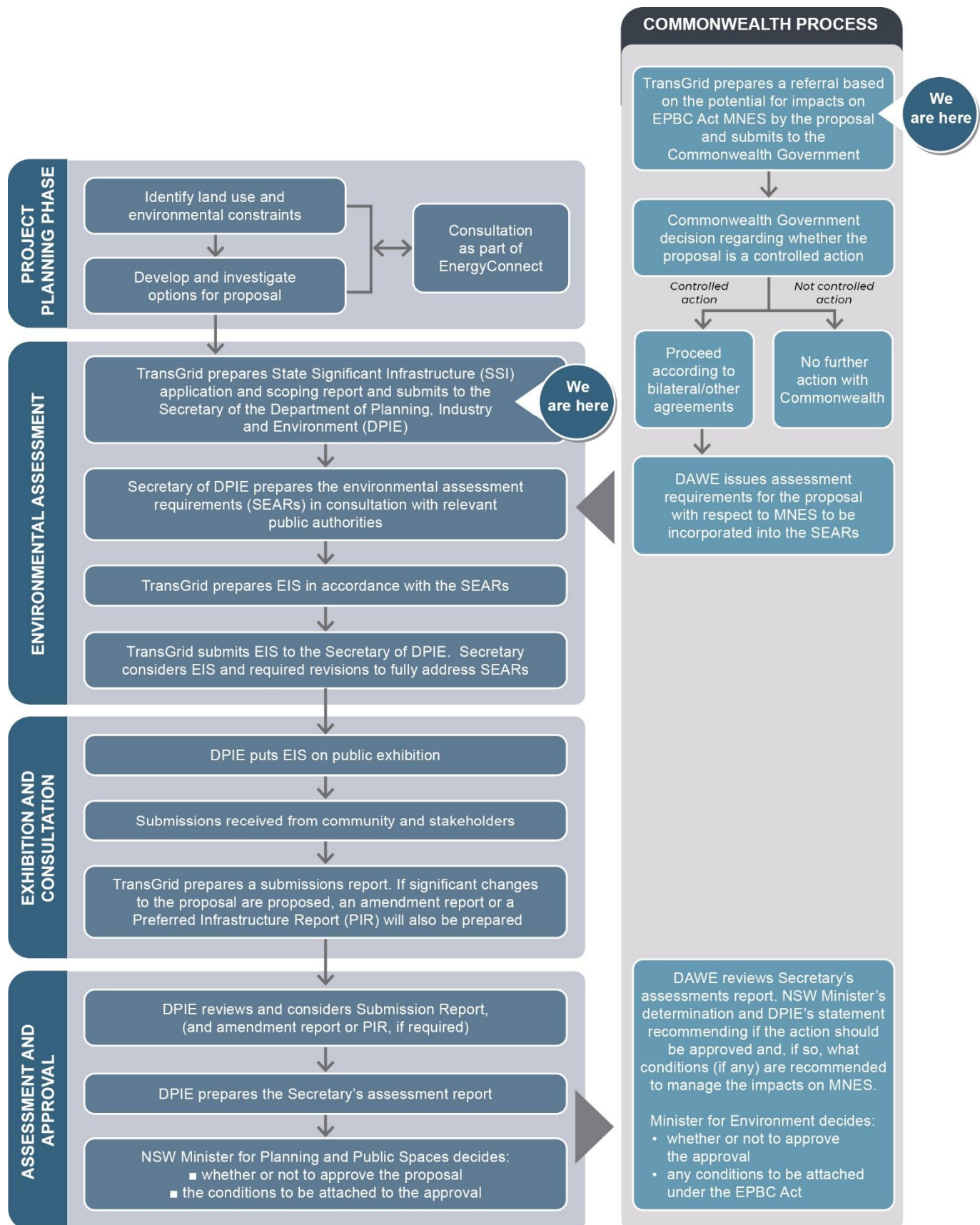


Figure 4-1 Assessment and Approval Process for the Proposal

4.2.3 NSW Environmental Planning Instruments

Section 5.22 of the EP&A Act provides that environmental planning instruments (EPIs, such as LEPs and SEPPs) do not apply to SSI and CSSI projects. Notwithstanding, the key environmental planning instruments have been considered with respect to the proposal for consistency. These instruments are discussed in Table 4-1.

Table 4-1 Environmental Planning Instruments of Potential Relevance to the Proposal

Environmental planning instruments	Relationship to EnergyConnect
<i>State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP)</i>	<p>This SEPP identifies development that is State significant development (SSD), SSI and CSSI.</p> <p>The proposal has been declared as CSSI, by Ministerial order, under section 5.13 of the EP&A Act. Schedule 5 of the SRD SEPP has been amended to include the proposal as CSSI.</p>
<i>State Environmental Planning Policy (Koala Habitat Protection 2019)</i>	<p>This SEPP aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline. The policy applies to a number of LGAs across NSW, including the Wentworth, Murray River, Edward River, Federation, Lockhart and Wagga Wagga LGA's.</p> <p>While the requirements of this SEPP would not apply to the proposal (as it would not be subject to council consent), TransGrid would consider the relevant criteria and koala plans of management as part of the EIS process and biodiversity impact assessment for the proposal.</p>
<i>State Environmental Planning Policy No. 55 – Remediation of Land</i>	<p>This SEPP provides a State-wide approach to the remediation of contaminated land for the purpose of minimising the risk of harm to the health of humans and the environment. In accordance with Clause 7(1) of SEPP 55, a consent authority must not consent to the carrying out of development on any land unless:</p> <ul style="list-style-type: none"> > It has considered whether the land is contaminated > If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or would be suitable, after remediation) for the purpose for which the development is proposed to be carried out > If the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land would be remediated before the land is used for that purpose. <p>A Phase 1 contamination investigation would be undertaken in accordance with the <i>Managing Land Contamination Planning Guidelines SEPP 55–Remediation of Land</i> (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) to inform the design of the proposal and EIS process.</p>

Environmental planning instruments	Relationship to EnergyConnect
<i>State Environmental Planning Policy (Primary Production and Rural Development) 2019</i>	<p>This SEPP aims to facilitate the orderly economic use and development of land for primary production and reduce land use conflict and sterilisation of rural land by balancing primary production, residential development and the protection of native vegetation, biodiversity and water resources. The SEPP is also intended to identify land which has been declared to be State Significant agricultural land (currently no land identified by the SEPP).</p> <p>As the proposal would likely impact on areas of primary production and agriculture, the provisions of this SEPP would be further considered as part of the EIS process for the proposal.</p>

4.2.4 Local Environmental Plans

The proposal would cross a number of local government areas (LGA) including:

- > Wentworth Shire Council
- > Balranald Shire Council
- > Murray River Council
- > Edward River Council
- > Hay Shire Council
- > Murrumbidgee Shire Council
- > Federation Council
- > Lockhart Shire Council
- > Wagga Wagga City Council.

Each LGA is regulated by a Local Environmental Plan (LEP) which guides development in the individual LGA. As discussed above in Section 4.2.3, Section 5.22 of the EP&A Act provides that environmental planning instruments (such as LEPs) do not, with some exceptions, apply to State significant infrastructure projects. Notwithstanding this, the LEPs have been considered and will continue to be considered through the EIS process for consistency specifically in relation to land zoning, heritage listings and flooding.

4.2.5 Other NSW Environmental Planning Approvals

4.2.5.1 Approvals or Authorisations that are Not Required or Cannot be Refused

In accordance with Section 5.23 of the EP&A Act some planning legislation does not apply to CSSI or must be applied consistently with an approved CSSI project.

Approvals of potential relevance to the proposal include:

- > Permits under Sections 201, 205 and 219 of the *Fisheries Management Act 1994* (FM Act)
- > Approvals under Part 4, or an excavation permit under Section 139 of the *Heritage Act 1977*
- > Aboriginal heritage impact permits under Section 90 of the NP&W Act
- > Various approvals under the *Water Management Act 2000*, including water use approvals under Section 89, water management work approvals under Section 90, and activity approvals (other than aquifer interference approvals) under Section 91.

Section 5.23 of the EP&A Act also specifies directions, orders or notices that cannot be made or given so as to prevent or interfere with the carrying out of approved CSSI. Of relevance to the proposal would be:

- > An interim protection order (within the meaning of the NP&W Act or the *Biodiversity Conservation Act 2016*)
- > An order under Division 1 (Stop work orders) of Part 6A of the NP&W Act or Division 7 (Stop work orders) of Part 7A of the FM Act
- > An environment protection notice under Chapter 4 of the *Protection of the Environment Operations Act 1997* (PoEO Act)
- > An order under section 124 of the *Local Government Act 1993*.

Section 5.24 of the EP&A Act identifies approvals or authorisations that cannot be refused if they are necessary for carrying out approved SSI and are substantially consistent with the Part 5.2 approval, including:

- > Environment protection licences (EPLs) under Chapter 3 of the PoEO Act
- > Consent (Road Occupancy Licence) under Section 138 of the *Roads Act 1993* from the relevant roads authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a road.

With respect to EPLs, Schedule 1 of the PoEO Act does not define electrical transmissions lines or substations as a scheduled activity requiring an EPL. However, there is the potential for an EPL to be required for certain construction activities, depending on the methodology and volumes involved. The requirement for an EPL would be confirmed in the EIS, following refinement of the construction methodology.

With respect to Road Occupancy Licences, the proposal would potentially require temporary/partial closure of classified and unclassified roads for the construction of the proposal. TransGrid is a private entity and would therefore require consent to undertake work on roads under clause 5(1) of Schedule 2 of the *Roads Act 1993*. The contractor would be responsible for this.

4.2.5.2 Other NSW Legislation

Table 4-2 discusses other NSW legislation that would be, or may be, applicable to the proposal regardless of the proposal being declared CSSI. The applicability would be confirmed in the EIS.

Table 4-2 Other Typical Planning Related Legislation of Potential Relevance to the Proposal

Legislation	Requirement
<i>National Parks and Wildlife Act 1974</i>	In general terms, for a use to be authorised to occur on land reserved under the NP&W Act, it needs to be consistent with the object of the Act and with any plan of management for the reserve. The proposal study area contains three areas of land reserved under the NP&W Act, the Southern Mallee Protected Area, Yanga National Park and Murrumbidgee Valley Reserve (formerly Yanga State Conservation Area). As such, the necessary easements and property agreements would be identified under the relevant provisions of the NP&W Act.
<i>Water Management Act 2000</i>	The NSW <i>Aquifer Interference Policy</i> (Department of Primary Industries, 2012) documents the NSW Government's intention to implement the requirement for approval of 'aquifer interference activities' under the <i>Water Management Act 2000</i> . The proposal may intercept groundwater during construction of transmission structure foundations, which would typically involve installation of piles to depths of 15 to 20 metres below ground level but could be deeper depending on the geology. However, it is not expected that this activity would result in the extraction of groundwater. The potential for aquifer interference activities would be confirmed as part of the ongoing design development including the final alignment details, construction methodology, transmission line structure locations and depth of groundwater.
<i>Contaminated Land Management Act 1997</i>	This Act outlines the circumstances in which notification of the NSW Environment Protection Authority (EPA) is required in relation to the contamination of land. This may become relevant during construction and / or operation of the proposal and would be discussed in greater detail in the EIS.
<i>Crown Lands Management Act 2016 and Crown Land Legislation Amendment Act 2017</i>	These Acts set out the requirements for ownership, use and management of Crown Land. This includes the permissions and authorisations needed when planning the development of activities on Crown Land as well as the process for the acquisition of Crown Land.

Legislation	Requirement
	The proposal study area includes areas of Crown Land. Any impacts to Crown Land would be discussed in greater detail in the EIS.
<i>Biodiversity Conservation Act 2016</i>	<p>This Act aims to conserve threatened species, populations and ecological communities through ensuring appropriate assessment, management and regulation of actions that may damage critical or other habitat for a listed threatened species, or may otherwise significantly affect a threatened species, population or ecological community.</p> <p>The EIS for the proposal would include an assessment of biodiversity impacts (refer to section 7.1).</p>
<i>Noxious Weeds Act 1993</i>	This Act would apply to the control of all noxious weeds encountered during the construction of the proposal. As discussed above, the EIS for the proposal would include an assessment of biodiversity impacts (refer to section 7.1).
<i>Native Title (NSW) Act 1994</i>	<p>This Act provides for native title in relation to land or waters. The <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> (DECCW 2010a) stipulates that where relevant, consultation must be conducted with Native title holders or registered native title claimants in accordance with the <i>Native Title Act 1994</i>.</p> <p>The EIS for the proposal would include an assessment of native title and Aboriginal heritage impacts (refer to section 7.2).</p>
<i>Heritage Act 1977</i>	<p>The Heritage Council must be notified if a relic is uncovered during construction and if it is reasonable to believe that the Heritage Council is unaware of the location of the relic. The Heritage Council must also be notified if an item listed on a Government Agency's Section 170 Heritage Register is demolished.</p> <p>The EIS for the proposal would include an assessment of potential heritage impacts (refer to section 7.3).</p>
<i>Waste Avoidance and Resource Recovery Act 2001</i>	<p>This Act encourages the most efficient use of resources in order to reduce environmental harm.</p> <p>Waste and resource impacts associated with the proposal would be considered as part of the EIS.</p>

4.3 Commonwealth Legislation

The EPBC Act requires referral to the Commonwealth Minister for the Environment and Energy for any actions that are likely to have a significant impact on the following:

- > Matters of National Environmental Significance (MNES)
- > An action by the Commonwealth or a Commonwealth agency which has, will have or is likely to have a significant impact on the environment
- > An action which has, will have or is likely to have a significant impact on the environment on Commonwealth land, no matter where it is to be carried out.

TransGrid is not a Commonwealth agency and a preliminary assessment of the proposal indicates no Commonwealth land would be affected.

As discussed in the sub-sections below, there is potential for the proposal to have an impact on MNES, being a listed threatened species or ecological community.

4.3.1 Matters of National Environmental Significance

A search of the EPBC Act Protected Matter Search Tool (PMST) for the proposal study area was conducted in July 2020 to identify potential MNES that may trigger the need for referral of the action to the Australian Department of Agriculture, Water and the Environment (DAWE). This has been supplemented by the results of a Preliminary Biodiversity Assessment (refer to Appendix A). A summary of the potential MNES within the proposal study area is presented in Table 4-3.

Table 4-3 MNES under the EPBC Act

MNES	Matters within the proposal study area
World heritage properties	None
National heritage places	None
Wetlands of international importance	None
Great Barrier Reef Marine Park	None
Commonwealth listed threatened species and ecological communities	<p>The results of likelihood of occurrence assessments have identified 19 EPBC listed threatened flora species and 26 threatened fauna species with a moderate or higher likelihood of occurrence within the proposal study area (refer to Appendix A). Of these, three threatened fauna species have already been recorded within the proposal study area during preliminary field surveys: Regent Parrot, Superb Parrot and Corben's Long-eared Bat.</p> <p>Based on preliminary field verification surveys and broad scale state vegetation mapping, four EPBC Act listed Threatened Ecological Communities (TECs) are considered as likely to occur within the proposal study area:</p> <ul style="list-style-type: none"> > Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions – Endangered > Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – Endangered > Weeping Myall Woodlands - Endangered > White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered. <p>In addition, a further two candidate TECs were identified from database searches being:</p> <ul style="list-style-type: none"> > Natural Grasslands of the Murray Valley Plains, and > Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains have been considered.
Commonwealth listed migratory species	The results of likelihood of occurrence assessments identified that 17 migratory species have a moderate or higher likelihood of occurrence within the proposal study area (see Appendix A).
Nuclear action	The proposal would not result in any nuclear action nor would any nuclear activity need to be undertaken.
Commonwealth marine area	None

Based on the current proposal study area extent, the proposed design for the proposal and understanding of site conditions, it is anticipated that the proposal could potentially result in significant impacts on Commonwealth listed threatened species and ecological communities.

An EPBC Act referral will be submitted to the DAWE (at the same time as this report) to consider whether the proposal would be considered to be a controlled action. The DAWE will then determine if the proposal is considered to be a 'controlled' action on the basis of potential impacts to the listed threatened species. If determined to be controlled, then a bilateral assessment process would be requested for the proposal.

4.3.2 Native Title Act 1993

The main objective of the Commonwealth *Native Title Act 1993* is to recognise and protect native title. Section 8 states that the *Native Title Act 1993* is not intended to affect the operation of any law of a State or a Territory that is capable of operating concurrently with the Act. The *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a) stipulates that where relevant, consultation must be conducted with Native title holders or registered native title claimants.

The proposal does not intersect any determined Native Title lands, however there are some portions of the Barkandji Traditional Owners #8 (Part A) native title area (determined) nearby.

5. Engagement

5.1 Introduction

TransGrid is committed to an engagement process that is proactive, transparent and shows a genuine desire to work with our stakeholders. TransGrid recognises that a two-way feedback process is the key to understanding the needs and views of stakeholders and communities that are directly and indirectly affected by its operations. Throughout the development of the proposal, TransGrid will engage with affected and interested parties so that project planning is informed by input from stakeholders and communities in line with both regulatory requirements and TransGrid internal policies and standards.

Engagement during the development of the ESR has been focused on developing feasible route options through direct dialogue with the relevant landholders, local government, Traditional Owners groups and other key stakeholders.

5.2 Engagement Considerations and Principles

TransGrid has based its approach to engagement on a structured process to ensure consistent, targeted and meaningful engagement. A Community and Stakeholder Engagement Plan (CSEP) was developed in broad alignment with the *Draft Environmental Impact Assessment Guidance Series: Community Guide to EIA* (DPEa, 2017) to establish an appropriate framework for EnergyConnect (including the proposal), which will be tailored further as the approvals process and associated requirements are defined.

To ensure alignment with leading practice, in addition to the *Draft Environmental Impact Assessment Guidance Series* a range of TransGrid and industry standards and guidelines for community and stakeholder engagement were also considered including:

- > TransGrid *Stakeholder Engagement Charter* (2015)
- > TransGrid *Landholder Easement and Compensation Guide* (2019)
- > International Association for Public Participation (IAP2) *Quality Assurance Standard* (IAP2, 2015)
- > Clean Energy Council *Community Engagement Guidelines* (CEC, 2018).

TransGrid recognises the importance of early and effective engagement with communities and stakeholders and is committed to the following:

- > Undertaking a structured, transparent and meaningful approach to working with stakeholders who are directly and indirectly affected by EnergyConnect (including the proposal)
- > Tailoring engagement and communications to consider different stakeholder needs and expectations, particularly for directly affected stakeholders
- > Enabling stakeholder participation into the route selection process in a manner that is clear and transparent and ensures stakeholders understand how their feedback will be utilised / influence the process
- > Providing stakeholders with opportunities to participate and providing sufficient and timely information to enable them to provide informed feedback
- > Providing stakeholders with information on how their feedback has been utilised in the decision-making process.

5.3 Stakeholders

TransGrid has identified relevant stakeholders across the proposal study area. Table 5-1 provides an initial list of stakeholder groups who have been/will be engaged with in relation to EnergyConnect and specifically for this proposal. The focus is on stakeholders relevant to the scope of the CSEP. This will assist in ensuring the engagement and communications approach considers the broader EnergyConnect context and appropriately manages stakeholder and reputational risks from the outset of engagement and communications activities.

Table 5-1 Stakeholder groups for the proposal

Stakeholder Group	Description
Government – Political Representatives State and Federal	<ul style="list-style-type: none"> > Premier of NSW, the Hon Gladys Berejiklian MP > NSW Minister for Energy and Environment, the Hon Matthew Kean MP > Federal Minister for Energy and Emissions Reduction, the Hon Angus Taylor MP
Energy Regulator / Operator	<ul style="list-style-type: none"> > Australian Energy Market Operator (AEMO) > Australian Energy Regulator (AEC) > Australian Energy Market Commission > Energy Security Board
Local Federal Members	<ul style="list-style-type: none"> > Member for Riverina, the Hon Michael McCormack MP, Deputy Prime Minister and Minister for Infrastructure, Transport and Regional Development > Member for Farrer, the Hon Sussan Ley MP, Minister for the Environment
Local State Members	<ul style="list-style-type: none"> > Member for Albury, Justin Clancy MP > Member for Murray, Helen Dalton MP > Member for Wagga Wagga, Joe McGirr MP
Local government – Elected Officials and Executive Staff	<p>Local Government areas within or nearby the proposal study area include:</p> <ul style="list-style-type: none"> > Balranald Shire Council > Edward River Council > Griffith Shire Council > Hay Shire Council > Lockhart Shire Council > Murray River Council > Murrumbidgee Council > Federation Council > Narrandera Shire Council > Wagga Wagga City Council > Wentworth Shire Council. > Riverina and Murray Joint Organisation (RAMJO)

Stakeholder Group	Description
Government – Departmental and Agency	<ul style="list-style-type: none"> > Australian Department of Defence > Australian Department of Agriculture, Water and the Environment > Australian Department of Educations, Skills & Employment > Australian Department of Industry, Science, Energy and Resources > NSW Department of Planning, Industry and Environment (DPIE); and its divisions: <ul style="list-style-type: none"> – NSW Crown Lands – NSW Environment, Energy and Science – NSW National Parks and Wildlife > Department of Premier and Cabinet NSW > Transport for NSW's division Property Acquisition NSW > NSW Department of Customer Service (DCS), and its division SafeWork NSW > Infrastructure NSW > Infrastructure Australia > National Indigenous Australians Agency > Aboriginal Affairs NSW > Regional Development Australia – Riverina and Murray
Major developments	<ul style="list-style-type: none"> > Major developments (existing, under approval and future) that may be impacted by EnergyConnect (including the proposal).
Directly impacted landholders	<ul style="list-style-type: none"> > Landholders within the corridor, including: <ul style="list-style-type: none"> – Owners – Occupiers – Leaseholders – And other interest holders in the corridor
Traditional Owners and other Aboriginal Groups	<ul style="list-style-type: none"> > NSW Aboriginal Land Council > NTSCORP > NSW Indigenous Chamber of Commerce > Balranald Local Aboriginal Land Council > Cummeragunja Local Aboriginal Land Council > Deniliquin Local Aboriginal Land Council > Hay Local Aboriginal Land Council > Griffith Local Aboriginal Land Council > Leeton Local Aboriginal Land Council > Narrandera Local Aboriginal Land Council > Riverina-Murray Regional Alliance > Wakool Indigenous Corporation > Wagga Wagga Local Aboriginal Land Council

Stakeholder Group	Description
Local land users, community and suppliers	<ul style="list-style-type: none"> > Local land users e.g. irrigators, farmers near the proposal study area that are not considered directly impacted or adjacent landholders. > Local communities and suppliers within Council areas.
Other Suppliers	<ul style="list-style-type: none"> > NSW and Australian suppliers
Industry Groups	<ul style="list-style-type: none"> > NSW Farmers Association > National Farmers' Federation > NSW Irrigators' Council > Clean Energy Council > Industry Capability Network
Interest Groups	<ul style="list-style-type: none"> > Local progress associations, issue-specific interest groups
Media	<ul style="list-style-type: none"> > Local, State and National media including: <ul style="list-style-type: none"> – ABC Radio Riverina – WIN News Riverina – PRIME7 News Wagga – The Daily Advertiser – The Area News – The Irrigator (Leeton) – The Border Mail – The Riverine Grazier
General Public	<ul style="list-style-type: none"> > General members of the public who may take an interest in EnergyConnect (including the proposal)

5.4 Opportunities for Participation

A wide-ranging engagement program was developed to consider the range of stakeholders who may be potentially impact by or interested in EnergyConnect and the proposal. Table 5-2 outlines the range of engagement opportunities provided to date.

Table 5-2 Engagement Activities

Activity/consultation method	Summary
Toll free community enquiry number	A dedicated toll-free telephone number (1800 49 06 66) has been created to receive and respond to enquiries from the community and interested stakeholders.
Email address	A dedicated email address (pec@transgrid.com.au) has been created to receive and respond to enquiries from the community and interested stakeholders.
EnergyConnect website	The EnergyConnect website (transgrid.com.au/energyconnect) provides information on the proposal background and need, proposal milestones and timelines, and links to get involved. During route selection, information and opportunities have been provided to enable stakeholder participation in the route selection process, including an interactive map.

Activity/consultation method	Summary
Online interactive map	A digital engagement tool that allows stakeholders to provide comments on opportunities and constraints for the proposed route across a number of topics (environment, social, existing and future land use, visual amenity etc). This is a transparent tool that displays the comments provided.
E-newsletter	The EnergyConnect e-newsletter is available for the public to sign up and keeps the community informed on latest information regarding the proposal.
Stakeholder briefings	Briefings and presentations have been conducted with relevant local councils and key industry stakeholders. The briefings have included presentations and discussions on the need for EnergyConnect, any upcoming planning issues that all parties should be aware of, how stakeholders would like to be engaged, and any other topics of interest. Workshops have also been held with councils to secure their feedback into the route selection process.
One-on-one meetings	Face to face meetings occurred with potentially affected landholders within the preliminary alignment corridor from Buronga to Wagga Wagga, and all landholders affected by the refined proposal study area. These meetings have focused on securing landholder input into the route selection process and have focused on understanding their properties, current or future land use, and their views regarding potential constraints and opportunities. This feedback was captured on holding maps and recorded in TransGrid's stakeholder management system.
Media and advertisements	<p>35 print advertisements were run in local newspapers to promote the proposal and opportunities for engagement. This included advertisements in:</p> <ul style="list-style-type: none"> > The Daily Advertiser > The Area News > The Border Mail > The Irrigator > The Riverine Grazier. <p>Print advertisements placed in 11 newspapers in mid-August requesting registration of Aboriginal stakeholders interested in EnergyConnect (including the proposal).</p> <p>Local media stories have also been run in regard to TransGrid's Community Partnerships Program.</p>
Factsheets	<p>Five factsheets have been developed for EnergyConnect, which have been utilised at community drop-in sessions and are available online. The development of these factsheets supplement existing TransGrid factsheets and align with the current stage of the proposal and address frequent stakeholder queries. There is a particular focus on the themes provided in the stakeholder feedback as is evident in the topics represented in Table 5-4. As the proposal progresses, additional factsheets would be developed.</p> <p>EnergyConnect (general information): explains EnergyConnect (including the proposal) and context. The focus is to provide stakeholders with a general understanding of the proposal along with the potential benefits, a visual of the proposed route and how stakeholders could participate in EnergyConnect.</p> <p>Route selection: illustrates the route selection methodology with background information on EnergyConnect. It explains regional constraints and opportunities,</p>

Activity/consultation method	Summary
	<p>route refinement investigation and local considerations being taken into account in defining the route.</p> <p>Land access: provides an overview of preliminary field studies and the process undertaken to access private property. It explains the types of activities proposed and TransGrid's commitment to working with landowners to minimise the impact of these activities.</p> <p>Ecology surveys: illustrates the process undertaken to identify existing animal and plant species within the local area and what landholders can expect from this process. It outlines how the ecology assessments are done and the focus of the surveys whether it be flora, fauna or aquatic.</p> <p>Geotechnical investigations: outlines the process undertaken to understand local ground conditions and what landholders can expect from this process. It provides an overview of what geotechnical investigations are and illustrates examples of some that may be conducted on site including borehole drilling and cone penetration tests.</p>
Feedback form/Online Survey	<p>Hardcopy feedback forms were made available at each drop-in session as well as online on the EnergyConnect website. The purpose was to secure both general stakeholder feedback regarding the proposal and more specific feedback on the route selection process.</p>
Community drop-in sessions	<p>Eight community information sessions were held to provide information regarding the proposal:</p> <ul style="list-style-type: none"> > Euston/Robinvale, NSW/Vic border on 13 March 2020 > Moulamein, NSW on 15 March 2020 > Balranald, NSW on 17 July 2020 > Hay, NSW on 18 July 2020 > Urana, NSW on 19 July 2020 > Coleambally, NSW on 24 July 2020 > Lockhart, NSW on 25 July 2020 > Wagga Wagga, NSW on 26 July 2020 <p>The sessions lasted for between three and five hours and were focused on providing general proposal information, information regarding route selection and enabling stakeholder feedback generally and more specifically regarding route selection.</p> <p>Information sessions were promoted in newspaper advertisements (25), Facebook posts (20), public noticeboards (22), letterbox flyers (220) and digital circulation (website and email distribution lists).</p>

Activity/consultation method	Summary
Social media	<p>Community focused social media pages including local Council Facebook pages and those for local community groups have promoted engagement activities. These activities have included information sessions and online engagement channels such as an interactive map, the community information line and EnergyConnect email address. The focus of the posts has been to increase general awareness of the proposal and opportunities for stakeholders to participate.</p> <p>In total 20 Facebook posts have been shared to reach 28,900 people regarding the community drop-in sessions, online resources and participation options.</p>
Community hubs	<p>A digital display was set up at the Midway Centre at Buronga to provide an introduction to EnergyConnect and encourage interested parties to visit the interactive feedback tool to find out more and provide their feedback. At this stage of the proposal the focus is on enabling stakeholders to provide their feedback into route selection and comment on EnergyConnect more generally.</p>

5.4.1 Participation

Approximately 2,000 engagement activities have been undertaken since November 2018 for the proposal, ranging from community drop-in sessions and council briefings to face-to-face meetings with directly affected landowners, phone calls and direct correspondence via email.

Consultation was carried out with the following NSW Government agencies:

- > DPIE consulted on planning approvals process. Divisions within DPIE also engaged were:
 - Environment Energy and Science (EES) consulted in regard to biodiversity
 - NSW Crown Lands consulted regarding easement / property acquisition matters on Crown Land
 - NSW National Parks and Wildlife consulted regarding access to State Conservation Areas
- > Department of Premier and Cabinet (formerly Heritage office in OEH) for heritage matters
- > Department of Regional NSW's Local Land Services consulted on land management and local environmental matters, with Forestry Corporation NSW (FCNSW) engaged regarding property access to lands managed by FCNSW.
- > TransGrid has engaged with Property Acquisition NSW regarding the proposal.

Consultation was also carried out with a number of Australian Government agencies, including engagements on biodiversity and environmental approvals (Department of Agriculture, Water and the Environment), design constraints (Department of Defence), and matters of employment (Department of Education, Skills & Employment).

Energy regulators, such as AEMO and AER, and other key stakeholders were engaged by TransGrid in a regulatory consultation process, focusing on project investment and meeting future energy needs of TransGrid's customers.

Table 5-3 outlines the range and number of activities undertaken (as of July 2020) and the stakeholder involved.

Table 5-3 Engagement Participation for the Proposal

Engagement Activity	Quantity	Stakeholder Group
Phone Calls (Incoming/Outgoing)	334	<ul style="list-style-type: none"> > Landholders > Indigenous groups > Local government > Community members
Emails (Incoming/Outgoing)	876	<ul style="list-style-type: none"> > Landholders > Indigenous groups > Local, State & Federal government > Community members
Meetings	242	<ul style="list-style-type: none"> > All Local Government bodies as listed in Table 5-1 > State Government > Local MPs > Landholders > Indigenous groups.
Letters	202	<ul style="list-style-type: none"> > Landholders > Indigenous groups.
Drop in sessions	Eight sessions: <ul style="list-style-type: none"> > 13 March 2020 (Euston/Robinvale) > 15 March 2020 (Moulamein) > 17 July 2020 (Balranald) > 18 July 2020 (Hay) > 19 July 2020 (Urana) > 24 July 2020 (Coleambally) > 25 July 2020 (Lockhart) > 26 July 2020 (Wagga Wagga) 	<ul style="list-style-type: none"> > Landholders > Community
Interactive Map	157 comments	<ul style="list-style-type: none"> > Community > Landholders
Media advertisements	35 advertisements	<ul style="list-style-type: none"> > Community > Community groups
Survey online/hardcopy	One response	<ul style="list-style-type: none"> > Community > Landholders

5.5 Summary of Feedback Received

Stakeholders have provided a variety of feedback across numerous themes. Table 5-4 provides an overview of the feedback received by theme, the frequency that feedback within the theme was received and a high-level overview of the feedback focus, since November 2018.

Table 5-4 Feedback Themes

Theme	Frequency	Focus of feedback
Acquisition (easement and property)	232	Pending agreement and alignment: requirement for easement. What having an easement involves. Property values and allowances for compensation.
Corridor selection methodology/proposed alignment	143	Opportunities for alignment, preferences for alignment, known and unknown constraints.
Property Access	95	Landowner requirements to access properties for planning processes (geotechnical investigations, environmental assessment).
Land use and property	89	Current and future land use planning, existing farm infrastructure, biosecurity matters.
Aboriginal heritage	88	Identification and protection of heritage items.
EnergyConnect	71	Seeking clarity on the proposal, scope of works, benefits
Construction impacts	68	Access to property for construction, potential impacts arising during construction (Noise, dust, work hours, behaviour, parking and traffic, safety etc). Expectations regarding compensation resulting from impacts during construction work.
Consultation process	66	Understanding consultation process in the context of project development, ensuring due diligence on addressing stakeholder concern.
Structure design	48	Size and shape of proposed structures; interaction with other utilities.
Socio-economic	47	Economic impacts and benefits of construction on towns, job and supplier opportunities.
Biodiversity	38	Vegetation identification and potential impacts to native vegetation.
Project justification	28	Understanding the need for the proposal, how it will be assessed and approved.
Landscape character and visual amenity	25	Impact of structures on sightlines, particularly in greenfield areas; impact on property value if visual amenity reduced.
EMF	12	Concerns about EMF in proximity to residences.

Feedback specifically from Local Governments has ranged from broad project information to issue specific detail relevant to that Local Government Area. Feedback to date has been largely positive with recognition of the local proposal benefits to employment and economic activity not only through the proposed proposal but potential renewable energy generation developments in the future. More detailed feedback throughout the consultation process to date has included the following topics:

- > Route alignment and local environmental and social constraints and considerations
- > Easement acquisition process and potential impacts to land use including agricultural operations

- > Road, waste and water management throughout construction
- > Community and Indigenous consultation, initiatives and partnership program
- > Opportunities for improved communications and connectivity for local residents.

5.6 How Feedback has been Used

In combination with the engineering, environmental, land use and social studies, the feedback received has enabled the narrowing of the preliminary alignment corridors to the proposal study area.

At a general level, feedback from non-landholder stakeholders was used to test existing assumptions regarding Tier 1, Tier 2 and Tier 3 constraints. Feedback regarding potential opportunities to minimise disturbance was used to assist in identifying potential areas where existing infrastructure is located, or disturbance has occurred.

At a directly-affected landholder level, more specific and targeted feedback was secured. Holding maps were drafted and used to record feedback from landholders so that landholders could identify opportunities and constraints specific to their properties. This information was then used to refine the alignment, both on specific properties and through the corridor more generally.

5.7 Future Engagement

Engagement will continue on specific issues and opportunities relevant to the proposal to inform the preparation of the EIS, as well as engagement regarding EnergyConnect more broadly. The next stage of community and stakeholder engagement will build on relationships established through early engagement activities and will complement formal consultation required under planning regulations, including activities that may be stipulated in the SEARs.

The following community and stakeholder engagement mechanisms and activities will continue to occur during the preparation of the EIS, either in person or via digital platforms:

- > One-on-one meetings
- > Stakeholder briefings
- > Community information sessions
- > Stakeholder and community group presentations and briefings
- > EnergyConnect toll-free community information number
- > EnergyConnect email address
- > EnergyConnect webpage
- > Interactive EnergyConnect map focused on collecting stakeholder feedback on the proposed route
- > Communications materials (newsletters, letters and factsheets)
- > E-Newsletter
- > Media and advertisements
- > Social media.

All stakeholder engagement will continue to be collected and recorded in a structured and formal manner, through the use of TransGrid's internal database. Engagement approaches will be evaluated and reviewed on a quarterly basis to ensure these are providing adequate participation opportunities and responding to stakeholder needs and expectations.

6. Identification of Key Assessment Issues

TransGrid recognises the need to carefully consider potential impacts on the environment and local communities, and to minimise these impacts wherever reasonable and feasible to do so. In taking this approach, the benefits of the proposal can be realised with the least net cost to the environment and the public.

6.1 Approach to Identification of Key Assessment Issues

An initial review (including desktop assessment and mapping from information currently available) of potential issues for consideration in the EIS has been undertaken with the aim of determining the likely level of assessment required to adequately and appropriately address each issue. In undertaking the initial review, consideration has been given to the significance of each potential environmental impact and also to the likely level of stakeholder interest in each issue. Inclusion of stakeholder perceptions of potential environmental impacts is considered an important part of determining the level of assessment that would be applied given that key stakeholder concerns may not necessarily align with a purely technical analysis of environmental risks. By combining the likely significance of each environmental impact with the expected level of stakeholder interest or concern, an assessment has been made of whether each issue is key to the assessment of the proposal, and whether a detailed specialist investigation or desktop analysis would be appropriate. Where a high level of stakeholder interest is expected, the potential environmental impact has been considered a key issue requiring detailed assessment irrespective of the outcomes of environmental mapping and review.

6.2 Initial Environmental Risk Assessment

The preliminary environmental risk assessment for the proposal has included consideration of the likelihood of an environmental impact occurring and the unmitigated consequence of that impact. It is noted that mitigation measures may or may not be available to treat each relevant risk.

6.3 Identification of Key Environmental Issues

Based on the review, data available and mapping undertaken so far, a series of key and non-key issues for the environmental planning and impact assessment of the proposal have been identified and are summarised below. These issues are considered in further detail in Chapter 7 and Chapter 8 of this ESR, respectively.

For each of the issues an assessment of the significance of the issue has been made based on the knowledge and understanding of the issue, which considered both the assessment of environmental significance and assumed level of stakeholder interest. Based on this, issues were categorised as to whether they represented a key issue or a more general issue.

These environmental assessment categorisations would be reviewed and updated where relevant as more detailed environmental investigations are undertaken to inform the preparation of the EIS for the proposal.

6.3.1 Summary of Environmental Issues

Key issues for the environmental planning and impact assessment of the proposal, identified on the basis that they are both most likely to occur and represent the greatest change to the existing environment, are as follows:

- > Biodiversity
- > Aboriginal heritage
- > Non-Aboriginal heritage
- > Land use and property
- > Landscape character and visual amenity
- > Surface water, groundwater and hydrology
- > Noise and vibration.

Other issues requiring assessment but considered less likely to result in significant impacts, either based on a lower likelihood of occurrence or the absence of potential receivers, are as follows:

- > Bushfire risk
- > Socio-economic
- > Electric and magnetic fields (EMF)
- > Air quality and greenhouse gas
- > Traffic and access
- > Soil and water quality
- > Waste management and resource use.

7. Preliminary Environmental Assessment

This chapter considers the key environmental assessment issues for the proposal, describing the general features of the existing environment, detailing how each issue is potentially impacted and specifying the assessment methodology for further assessment. For the purposes of this ESR, the proposal study area was used for the preliminary environmental assessment. As the process for refinement for the broader section of the proposal study area between Four Corners and Lockhart is ongoing, the results of this preliminary assessment would be used to avoid or minimise potential environmental impacts through design. The methods of assessment proposed in this report would be reviewed and confirmed upon receipt of the SEARs for the proposal.

7.1 Biodiversity

This section provides a summary of a preliminary biodiversity assessment that has been prepared by WSP based on background database searches, literature review and limited field surveys (provided in Appendix A). WSP is continuing to undertake field surveys in 2020 and 2021, including targeted threatened flora and fauna surveys with consideration of Commonwealth survey requirements (if the proposal is considered a controlled action).

7.1.1 Existing Environment

7.1.1.1 Native Vegetation

The proposal study area has been identified to traverse a diverse range of native vegetation types including the following broad vegetation formations:

- > grassy woodlands
- > grasslands
- > dry sclerophyll forests (shrubby sub-formation)
- > freshwater wetlands
- > forested wetlands
- > saline wetlands
- > semi-arid woodlands (grassy and shrubby sub-formations)
- > arid shrublands (acacia and chenopod sub-formations)

Based on a combination of broad scale vegetation mapping and limited field validation, these six vegetation formations are identified to contain a total of 54 native Plant Community Types (PCTs). Several of the PCTs mapped within the proposal study area are threatened ecological communities (TECs) listed under the BC Act and/or EPBC Act including (refer to Table 3.1 in Appendix A).

A total of seven threatened ecological communities listed under the BC Act have been identified as potentially occurring within the proposal study area based on their alliance to native vegetation recorded either through field verification or broad scale mapping. These seven communities are considered candidate threatened ecological communities and include:

- > *Acacia loderi* Shrublands
- > *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions
- > *Allocasuarina luehmannii* Woodland in the Riverina and Murray Darling Depression Bioregions
- > Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- > Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions
- > Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion

- > White Box Yellow Box Blakely's Red Gum Woodland.

Ongoing field surveys will be required to confirm and assess the extent of potential and recorded TECs within the proposal study area.

Based on preliminary field verification surveys and broad scale state vegetation mapping, a four candidate TECs listed under the EPBC Act are considered likely to occur:

- > Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions - Endangered
- > Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia - Endangered
- > Weeping Myall Woodlands - Endangered
- > White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered.

In addition, a further two candidate TECs which are both listed as critically endangered on the EPBC Act were identified from database searches being:

- > Natural Grasslands of the Murray Valley Plains, and
- > Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains have been considered.

7.1.1.2 Threatened Flora

Given the biologically diverse environment, likelihood of occurrence assessments identified that 37 threatened flora species listed under the BC Act, have a moderate or higher likelihood of occurrence within the proposal study area. Of the threatened flora species identified with potential to occur within proposal study area, the following are also 'serious and irreversible impact' (SAIL) entities under the BC Act:

- > *Dodonaea stenozyga*
- > *Caladenia arenaria* (Sand-hill Spider Orchid),
- > *Diuris* sp. Oaklands, D. L. Jones 5380 (Oaklands Diuris),
- > *Casuarina obesa* (Swamp She-oak),
- > *Grevillea ilicifolia* subsp. *ilicifolia* (Holly-leaf Grevillea),
- > *Lasiopetalum behrii* (Pink Velvet Bush),
- > *Pilularia novae-hollandiae* (Austral Pillwort), and
- > *Pimelea serpyllifolia* subsp. *serpyllifolia* (Thyme Rice-Flower).

Nineteen (19) threatened flora species listed under the EPBC Act are predicted to have a moderate or high likelihood of occurrence within the proposal study area.

7.1.1.3 Threatened and Migratory Fauna

The results of likelihood of occurrence assessments identified that 73 threatened fauna species listed under the BC Act are predicted to have a moderate or high likelihood of occurrence within the proposal study area.

Of the threatened fauna species identified with potential to occur within proposal study area, the following are also SAIL entities under the BC Act:

- > Black-eared Miner
- > Curlew Sandpiper
- > Plains-wanderer
- > Red-lored Whistler
- > Regent Honeyeater
- > Striated Grasswren
- > Swift Parrot
- > Eastern Bent-wing Bat.

Preliminary field investigations have identified eight threatened fauna species listed under the BC Act within the proposal study area, being:

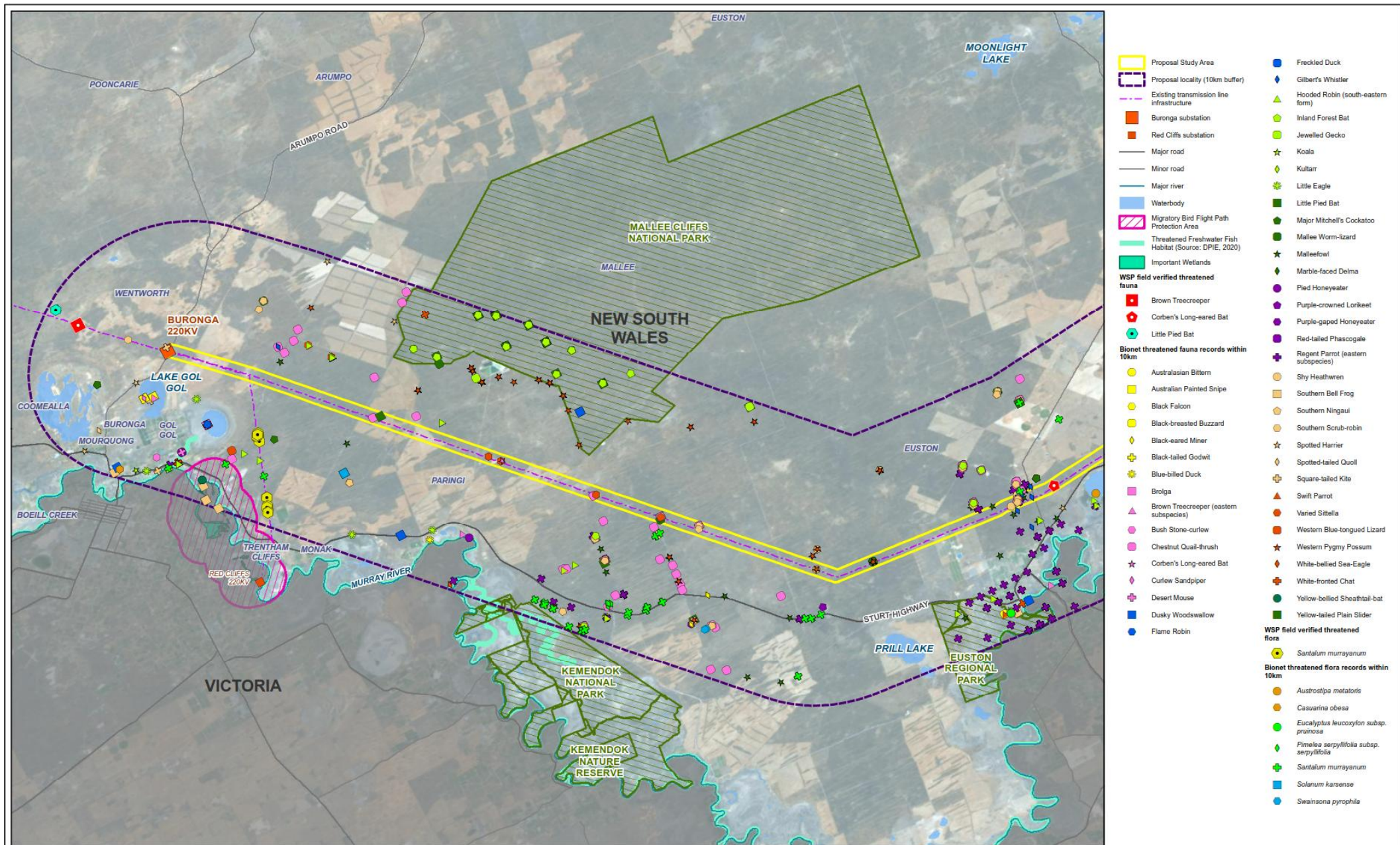
- > Chestnut Quail-thrush
- > Dusky Woodswallow
- > Grey-crowned Babbler
- > Regent Parrot
- > Superb Parrot
- > White-bellied Sea-Eagle
- > Corben's Long-eared Bat
- > Inland Forest Bat.

In addition, 26 threatened fauna species and 46 migratory and marine bird species listed under the EPBC Act are predicted have a moderate or higher likelihood of occurrence within the proposal study area.

7.1.1.4 Fish

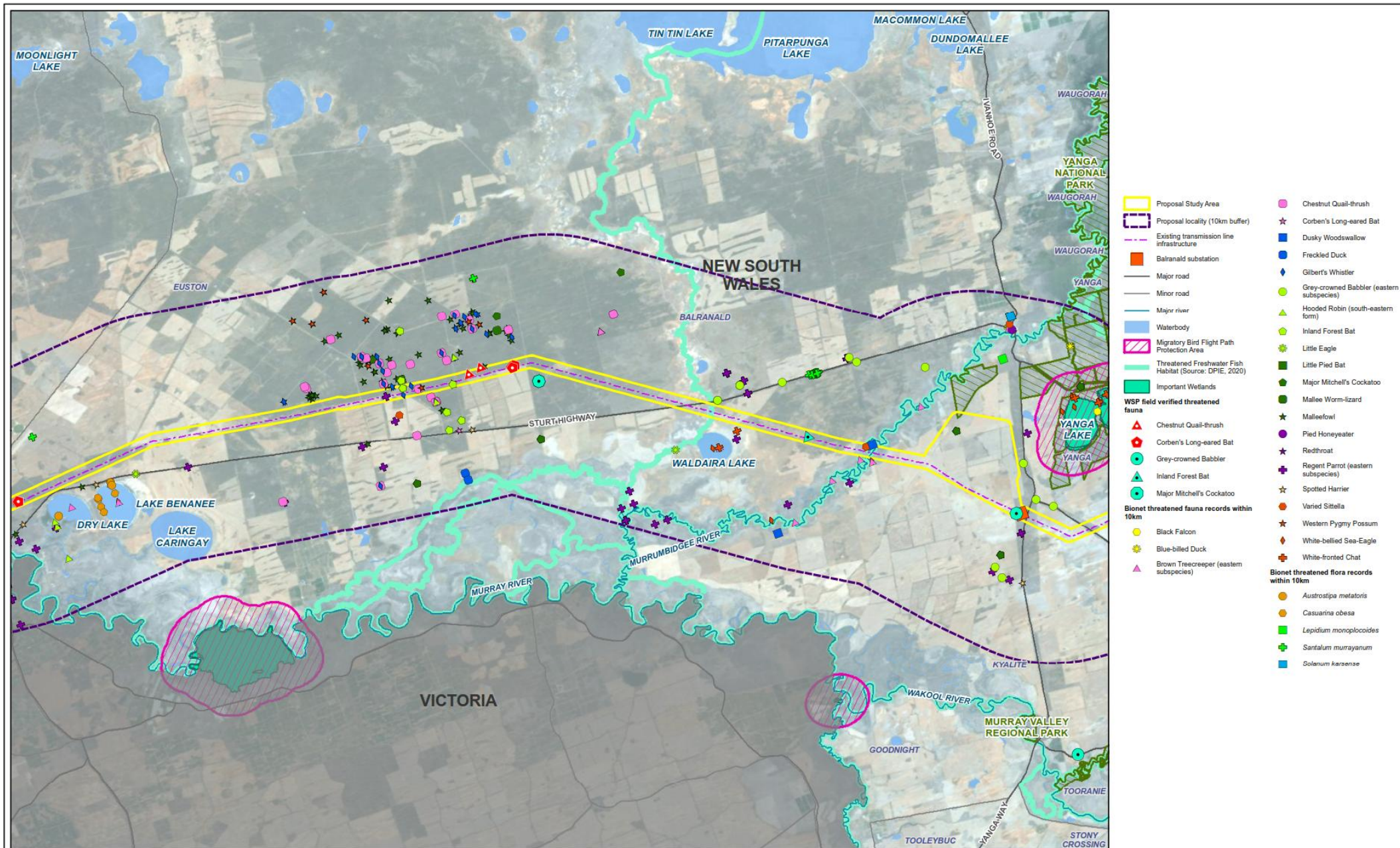
Areas of mapped key fish habitat have been considered to provide moderate likelihood of occurrence for four threatened fish species. These are as follows:

- > Murray Cod (*Maccullochella peelii*) – listed as vulnerable on the EPBC Act
- > Murray Hardyhead (*Craterocephalus fluviatilis*) – listed as Endangered on the EPBC Act and Critically endangered on the FM Act
- > Silver Perch (*Bidyanus bidyanus*) – listed as Endangered on the EPBC Act and Vulnerable on the FM Act
- > Trout Cod (*Maccullochella macquariensis*) – listed as endangered on the EPBC Act and the FM Act



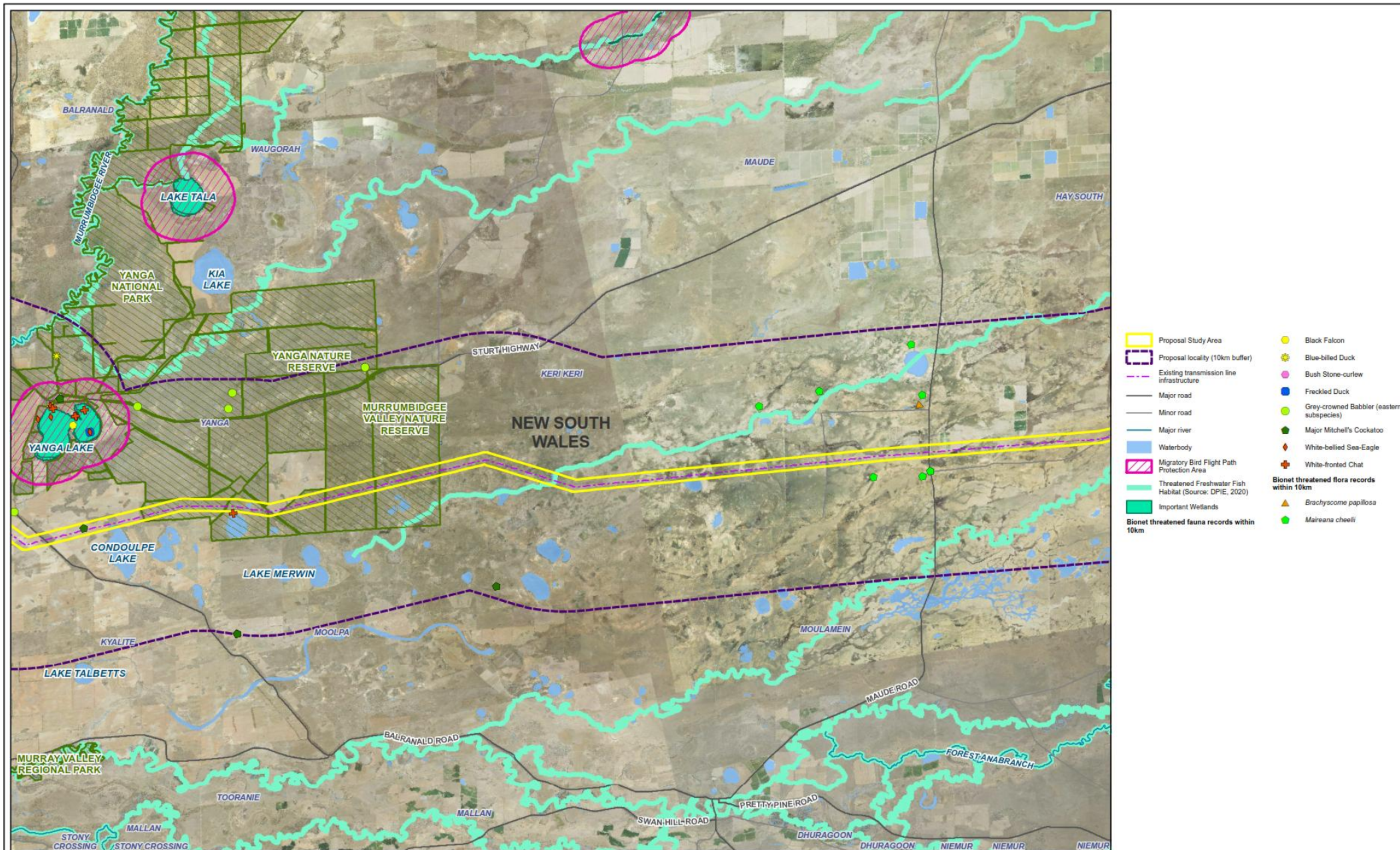
ENERGYCONNECT (NSW - EASTERN SECTION)

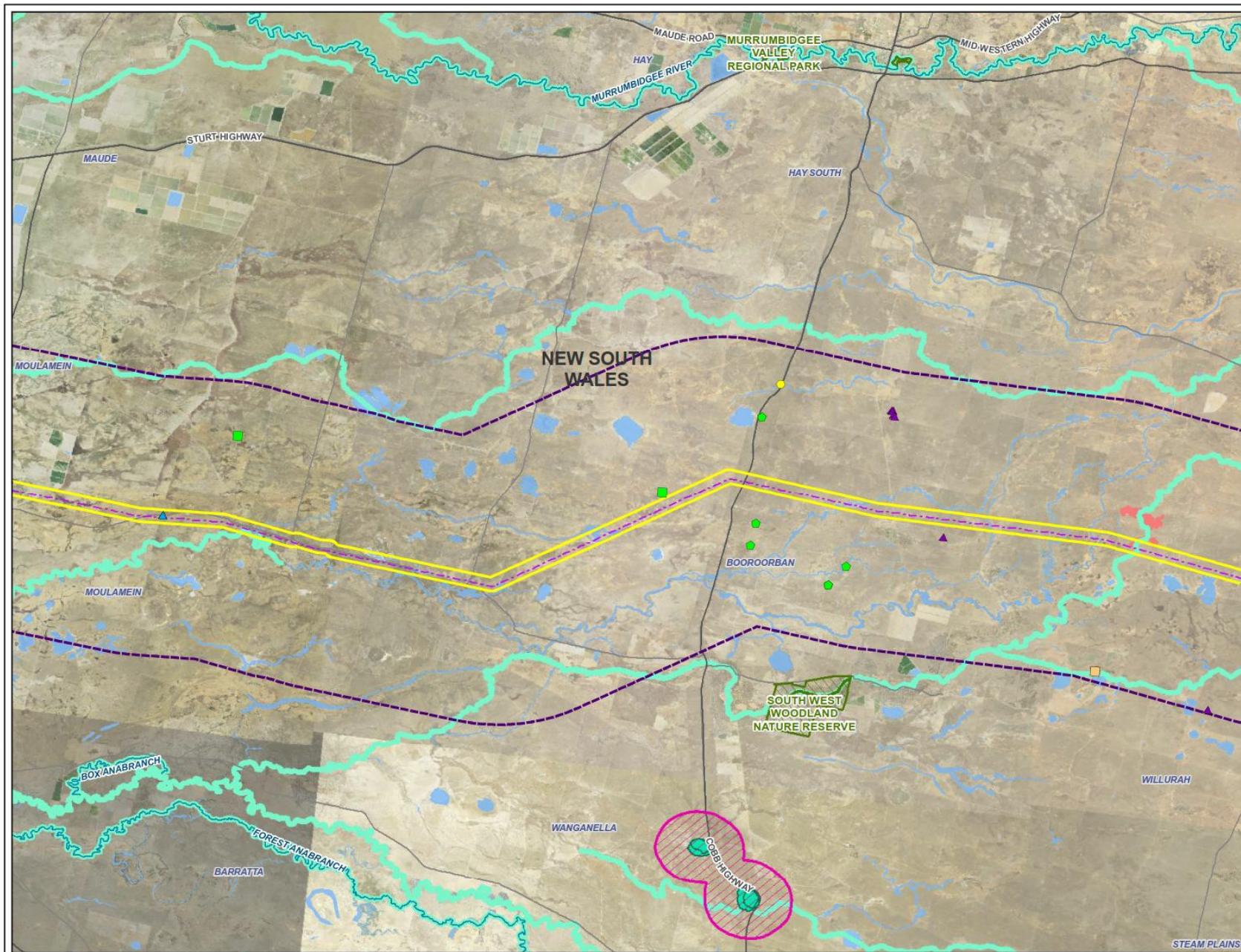
Figure 7-1a
Ecological values of the proposal study area



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-1b
Ecological values of the proposal study area





- Proposal Study Area
- Proposal locality (10km buffer)
- Existing transmission line infrastructure
- Major road
- Minor road
- Major river
- Waterbody
- ▨ Migratory Bird Flight Path Protection Area
- Threatened Freshwater Fish Habitat (Source: DPIE, 2020)
- Important Wetlands
- TECs listed under the EPBC Act**
- Weeping Myall Woodlands - Endangered
- Bionet threatened flora records within 10km**
- Black Falcon
- ▲ Plains-wanderer
- Southern Bell Frog
- *Lepidium monophloecoides*
- *Maireana cheelii*
- ▲ *Swainsona murrayana*
- Bionet threatened fauna records within 10km**

Map:
PS117658 SCPE_022_A2_ecoValues
Date: 18/08/2020

Author: Robert.Suansri
Approved by: - E.Taylor

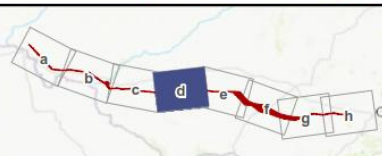


0 5 10
km
1:300,000
Coordinate system: GCS GDA 1994
Scale ratio correct when printed at A3

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; MetroMap; NSWSS

© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCS Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

C:\Users\suansri\WSP\0365\Project EnergyConnect - General\04_Production\Map\04_ScopingStudies\Eastern\PS117658_SCPE_022_A2_ecoValues.mxd



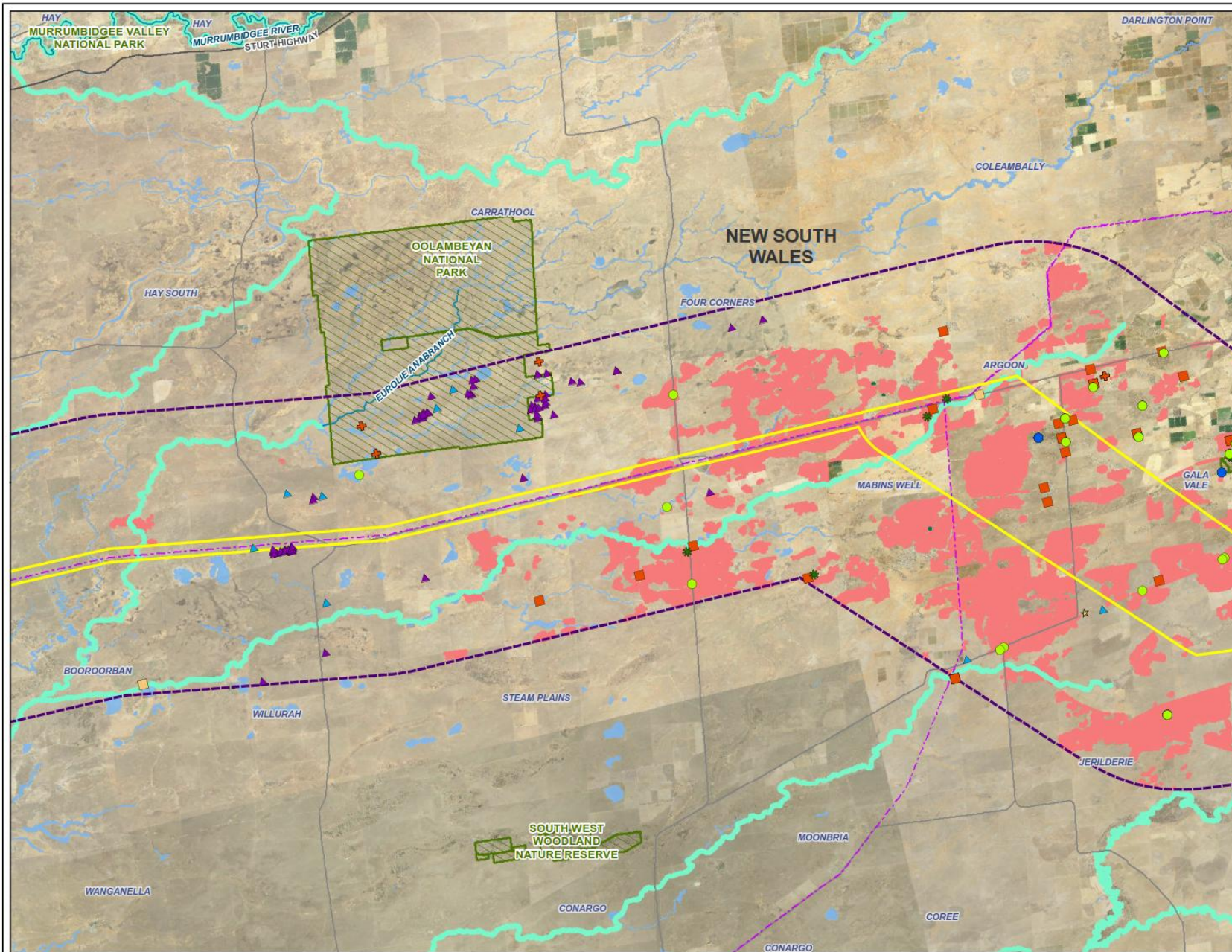
Transgrid

wsp

ENERGYCONNECT (NSW - EASTERN SECTION)

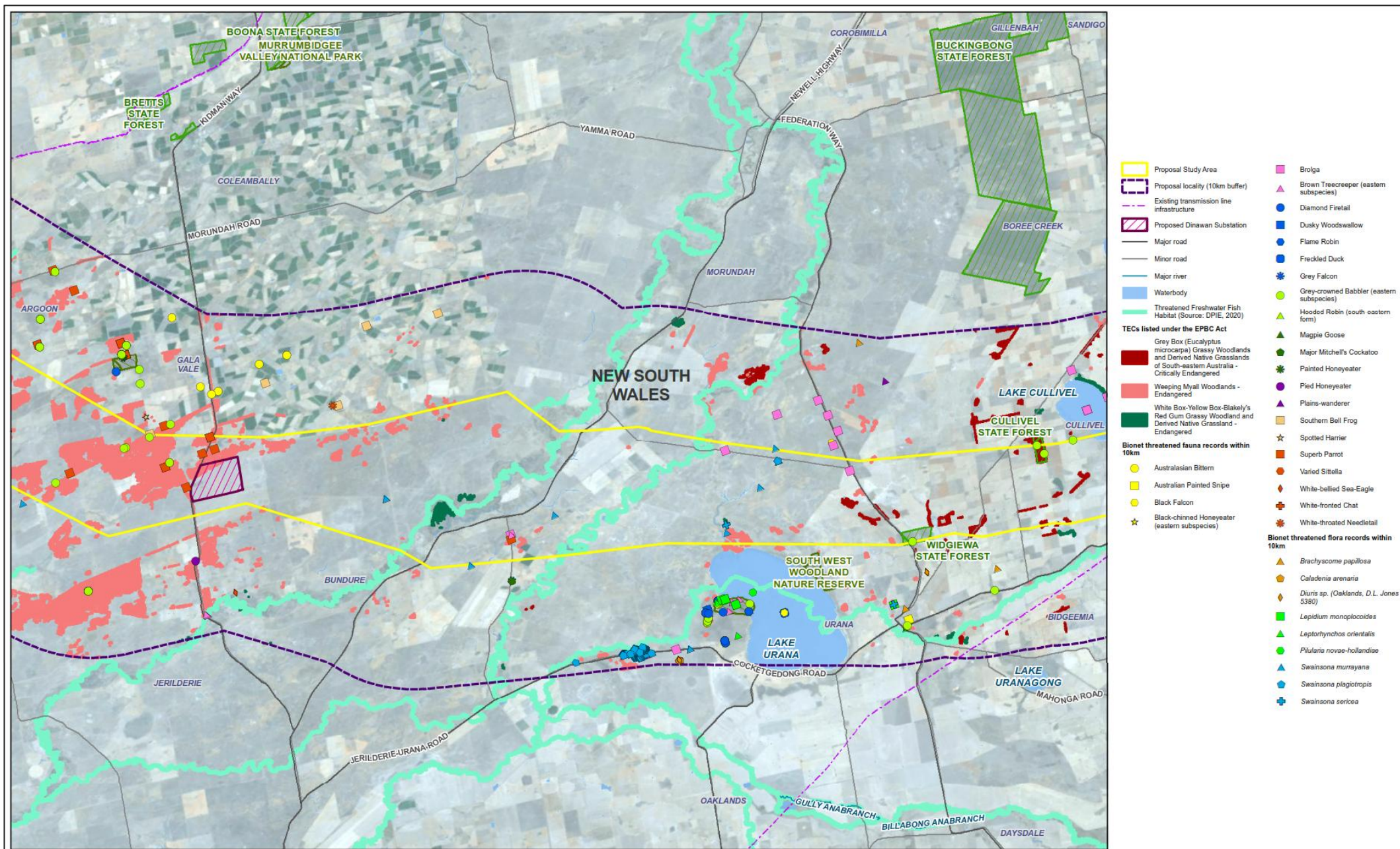
Figure 7-1d
Ecological values of the proposal study area

www.wsp.com



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-1e
Ecological values of the proposal study area



Map: PS117658_SCPE_022_A2_ecoValues

Date: 18/08/2020

Author: Robert Suansri

Approved by: E. Taylor

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; MetroMap: NSWSS

© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

Scale ratio correct when printed at A3

Coordinate system: GCS GDA 1994

Scale ratio correct when printed at A3

Transgrid

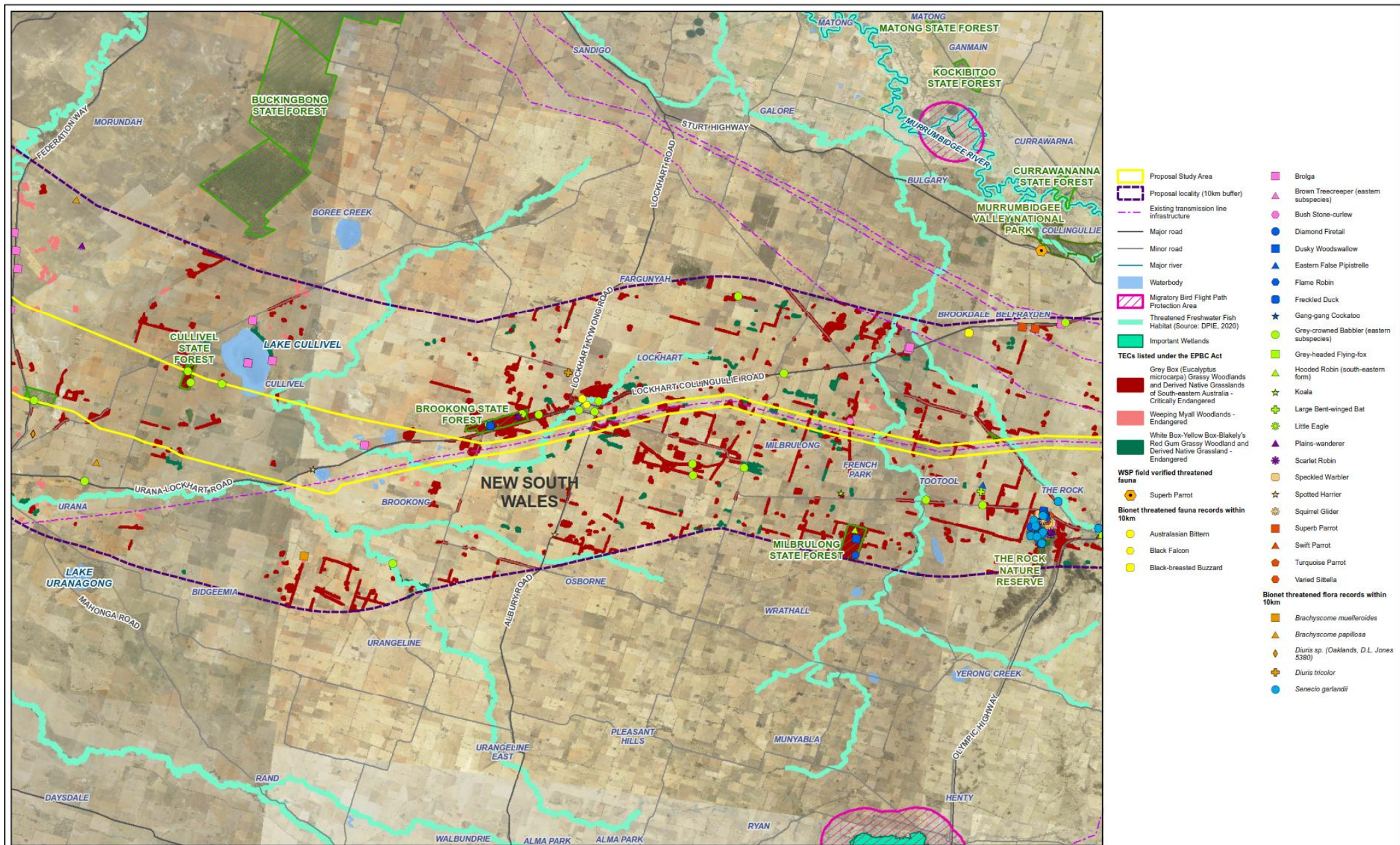
ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-1f

Ecological values of the proposal study area

wsp

www.wsp.com



Map:
PS117658_SCPE_022_A2_ecoValues

Author: Robert.Suansri

Date: 18/08/2020

Approved by: - E.Taylor



Scale ratio correct when printed at A3

Coordinate system: GCS GDA 1994

Scale ratio correct when printed at A3

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; MetroMap: NSWSS

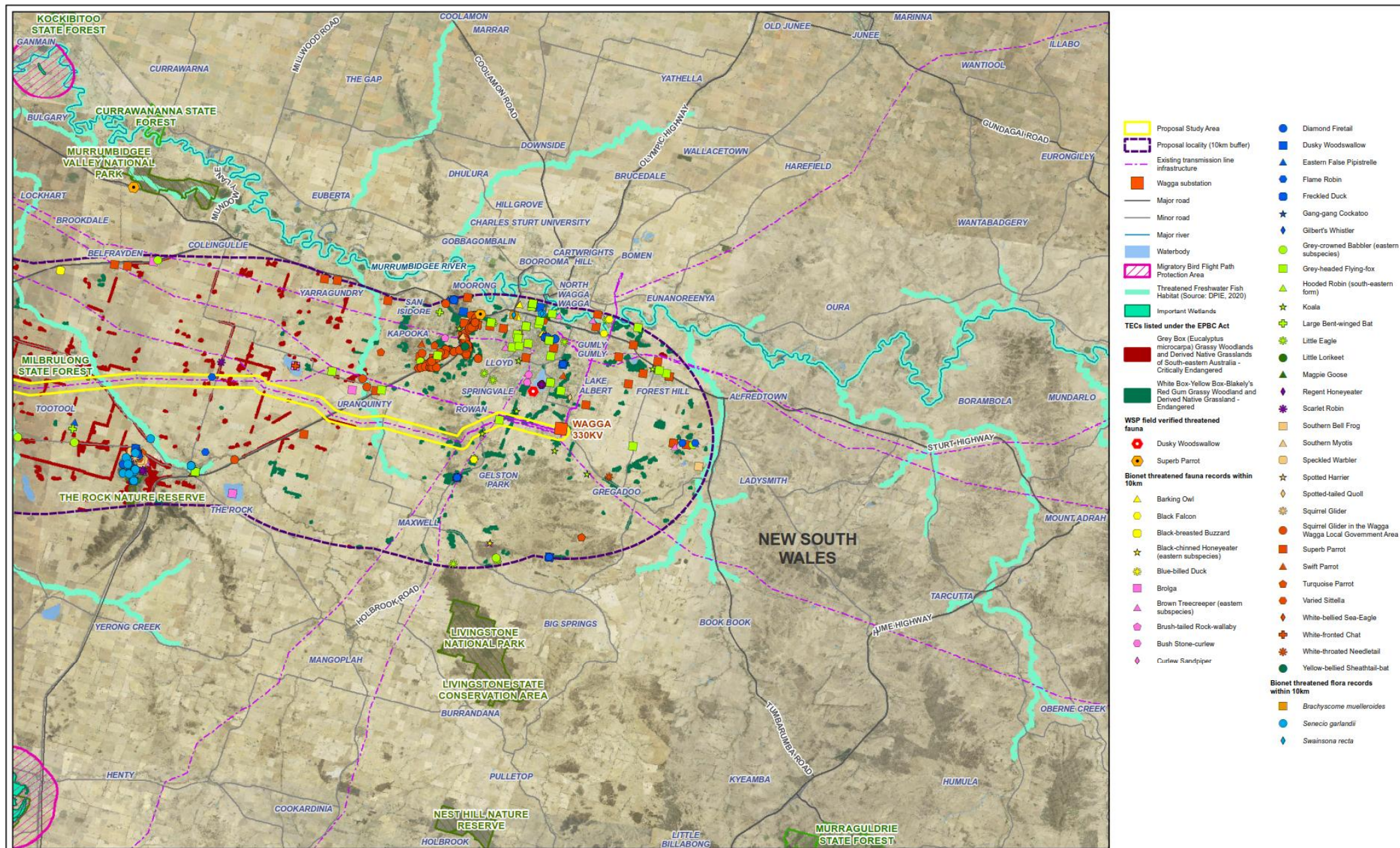
© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCS1 Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.



wsp

ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-1g
Ecological values of the proposal study area



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-1h
Ecological values of the proposal study area

Map:
PS117658_SCPE_022_A2_ecoValues
Date: 18/08/2020

Author: Robert Suansri
Approved by: - E. Taylor



Scale: 1:300,000
Coordinate system: GCS GDA 1994
Scale ratio correct when printed at A3



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; MetroMap; NSWSS
© WSP Australia Pty Limited (WSP). Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCBI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

7.1.2 Issues for Consideration

As summarised in this section, and detailed in Appendix A, a number of threatened flora and fauna species, TECs, important habitat values and notable features occur, or have the potential to occur, within the proposal study area. The primary ecological concerns with the proposal relate to clearing of native vegetation, associated impacts on habitat for listed threatened species, populations and communities, including potentially MNES.

The key ecological constraints are outlined in Figure 7-1 and include:

- > Areas of TEC listed under the EPBC Act
- > Riparian areas and buffer zones
- > Threatened flora and fauna species.

The proposal study area encompasses areas of native vegetation in good to poor condition. In addition to determining the ecological values of the proposal study area in greater detail, field survey efforts would also seek to identify areas of vegetation in good condition so that avoidance strategies can be developed. Further, areas of existing disturbance such as utility easements, roads and tracks, fence lines would be identified as potential opportunities for the co-location of the transmission line, structures, access tracks and laydown/staging areas. While some impacts to native vegetation and habitat for threatened species are anticipated, opportunities to avoid and minimise impacts wherever possible would be considered during the EIS. As the proposal has been declared SSI, all impacts to threatened species would be required to be offset.

7.1.3 Method of Assessment

Biodiversity impacts, and opportunities for avoidance or mitigation, would be a key consideration in the assessment. Assessments undertaken during the EIS phase would be based on the Biodiversity Assessment Method (BAM) and field work will be guided by the following documents:

- > DPIE BAM
- > Commonwealth EPBC 1.1 Significant Impact Guidelines - Matters of National Environmental Significance Commonwealth Department of the Environment survey guidelines for nationally threatened species, where relevant
- > Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (working draft)
- > Threatened species survey and assessment guidelines: field survey methods for fauna – amphibians
- > NSW Guide to Surveying Threatened Plants.

The EIS would identify mitigation and management measures proposed to reduce the biodiversity impacts.

A biodiversity development assessment report (BDAR) would be prepared as part of the EIS, which would further identify and clarify the potential significance of biodiversity impacts and identify the proposal biodiversity offset obligations. Potential measures would be identified to minimise any adverse effects and inform further detailed design with the aim of minimising the overall amount of vegetation required to be removed. Potential biodiversity impacts in relation to threatened fauna and flora are considered to be a key issue for the proposal.

As the proposal has been declared SSI and CSSI, it is proposed to be assessed in accordance with the BAM under the framework of the BC Act. All impacts to native vegetation would be required to be offset in accordance with NSW Biodiversity Offsets Scheme. Avoidance and minimisation must be demonstrated at an early stage and this preliminary assessment can be used as a guide to commence this process and as supporting evidence that avoidance has been considered. Key to minimising impacts to native vegetation would be designing the proposal to avoid the important biodiversity values, while being as short as practicable. Wherever practicable, the location of access tracks and compounds would aim to avoid the most valuable vegetation types and habitats.

A referral under the EPBC Act will be submitted for the proposal's potential impact on MNES at the same time as this ESR.

7.2 Aboriginal Heritage

This section presents a summary of a Preliminary Desktop Cultural Heritage Assessment that has been undertaken for the proposal by Navin Officer Heritage Consultants and is attached as Appendix B. The Preliminary Desktop Cultural Heritage Assessment was primarily based on desktop data with limited field verification and provides the heritage context for the proposal. Additional field surveys and consultation would be undertaken as part of the EIS.

7.2.1 Existing Environment

A search of Aboriginal objects, sites and places registered on Aboriginal Heritage Information Management System (AHIMS) was carried out and identified 57 previously recorded sites within the proposal study area (Department of Environment and Heritage, 2020). In addition, two previously unrecorded Aboriginal site features were recorded within the proposal study area during inspection for preliminary geotechnical works for the proposal. These recordings are currently being processed for submission to the AHIMS database. Overall, the number of Aboriginal sites is considered low, given the approximate 540 kilometre length of the proposal study area.

The site types that are most likely to occur in the proposal study area are artefact scatters, isolated finds, modified/scarred trees, and hearths. Other site types that may occur in the proposal study area are mound sites, freshwater middens and burials. The most archaeologically sensitive topographic contexts in the proposal study area are elevated ground adjacent to water sources, lunettes, sand bodies and sand sheets within valley floor contexts, and the margins of lakes and river terraces.

The proposal study area does not intersect any determined Native Title lands nor any registered or lodged claims (as of July 2020).

7.2.2 Issues for Consideration

The proposal has the potential to impact on known and previously unrecorded Aboriginal items. The mechanisms by which these impacts could occur include surface disturbance and excavations associated with ground disturbance activities, including the construction of access tracks, work compounds, transmission line structures, substation works and ancillary activities.

Any active Native Title Claim which affects the proposal would need to be considered during the EIS phase, with consultation undertaken with relevant Aboriginal representatives.

7.2.3 Method of Assessment

Further Aboriginal cultural heritage assessments including archaeological surveys would be undertaken as part of the EIS to ensure that Aboriginal cultural heritage values are properly identified, assessed and avoided where possible.

An Aboriginal cultural heritage assessment report (ACHAR) would be required in accordance with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (DECCW, 2011) and *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW DECCW 2010b).

Formal Aboriginal community consultation would allow accurate and effective identification of Aboriginal cultural values and knowledge holders associated with the proposal study area. The consultation would follow the process outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010a).

7.3 Non-Aboriginal Heritage

This section presents a summary of a Preliminary Desktop Cultural Heritage Assessment that has been undertaken for the proposal by Navin Officer Heritage Consultants and is attached as Appendix B.

7.3.1 Existing Environment

Searches were undertaken in July 2020 of the following heritage registers and schedules:

- > World Heritage List
- > The National Heritage List (Department of Environment and Energy)
- > The Commonwealth Heritage List (Department of Environment and Energy)
- > The State Heritage Register (NSW Heritage Branch, Office of Environment and Heritage)
- > Section 170 Heritage and Conservation Registers
- > Heritage schedules from the Wagga Wagga, Federation, Lockhart, Murrumbidgee, Edward River (including former Cobar and Deniliquin LGAs), Hay, Murray River (including former Wakool LGA), Balranald and Wentworth LEPs.

Three non-Aboriginal heritage listed sites have been identified within the proposal study area, the Liquid Explosives Store, Rowan dwelling and Brookong Cemetery, as outlined in Table 7-1. These sites are listed on the Local Environmental Plans (LEPs) of their respective councils. The Liquid Explosives Store is listed as having State heritage significance, while Brookong Cemetery and Rowan dwelling are listed as having local heritage significance. Several other non-Aboriginal heritage listed sites are located nearby the proposal study area, which are generally built heritage associated with farming and agriculture (shown on Figure 7-2). No items of Commonwealth or World Heritage value were identified within the proposal study area.

Table 7-1 Non-Aboriginal Heritage Items within the proposal study area

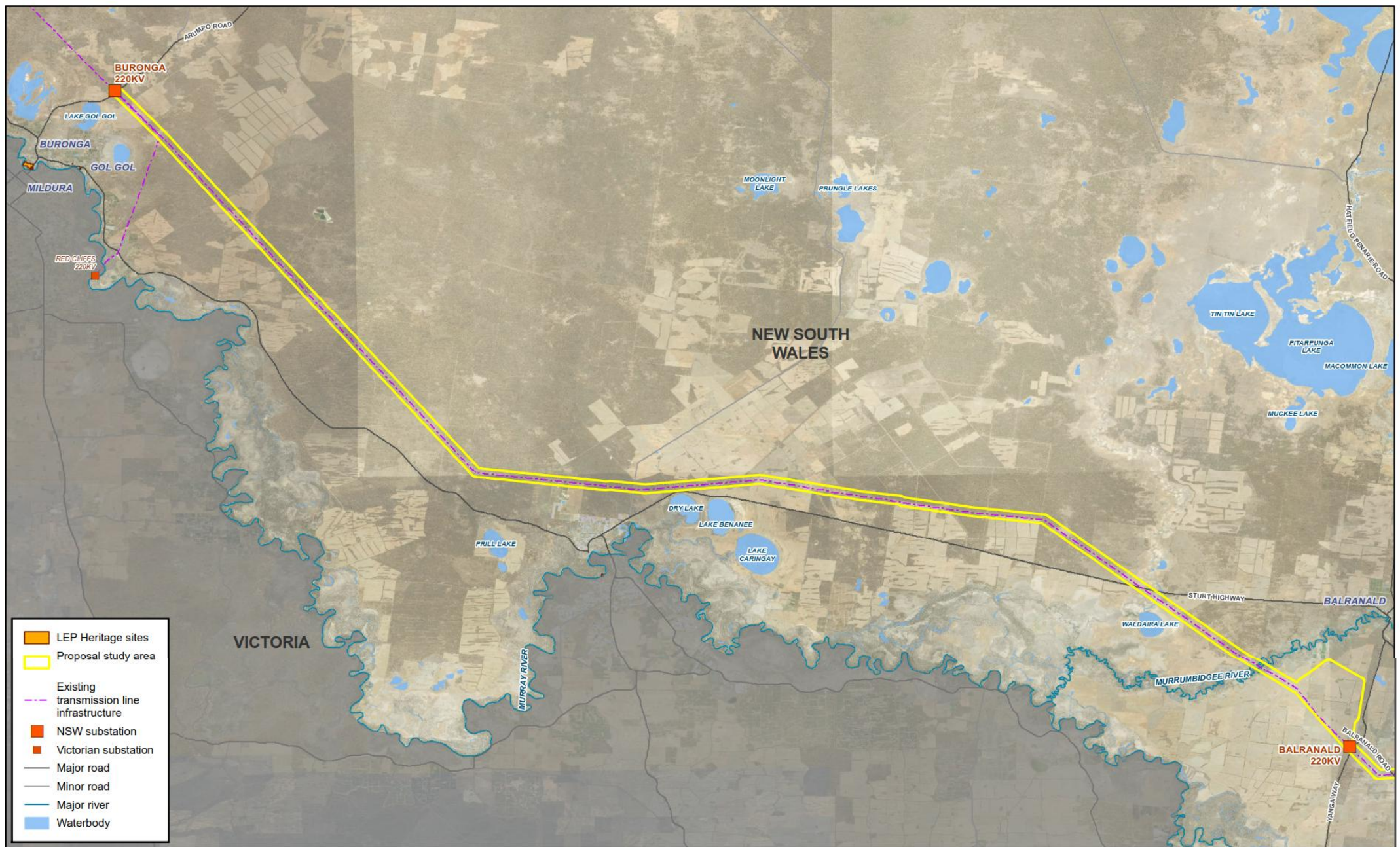
Item name	Locality	List	Reference	Significance
Liquid Explosives Store	Uranquinty	Wagga Wagga LEP	I287	State
Rowan dwelling	Rowan	Wagga Wagga LEP	I189	Local
Brookong Cemetery	Brookong	Lockhart LEP	I1	Local

7.3.2 Issues for Consideration

As identified in Table 7-1, there are two listed non-Aboriginal heritage items located within the proposal study area. There is also the potential for unrecorded historic sites and features of heritage significance to occur within the proposal study area, which would most likely be associated with previous farming, agriculture or transportation activities or old historic non-Aboriginal graves. As such, the proposal has the potential to impact on known and previously unrecorded non-Aboriginal heritage items. The mechanisms by which these impacts could occur include surface disturbance and excavations associated with the construction of access tracks, work compounds, transmission line structures, substation extension and ancillary activities. However, impacts to these identified non-Aboriginal heritage sites and artefacts would be avoided through design refinement (including through siting of towers and access tracks) where possible.

7.3.3 Method of Assessment

A non-Aboriginal heritage assessment would be undertaken as part of the EIS and would include the consideration of potential impacts on the values, settings and integrity of heritage areas and items and archaeological resources in the proposal study area. The assessment would be undertaken in accordance with principles of the *Australian International Council on Monuments and Sites Charter for Places of Cultural Significance* (also known as the Burra Charter, Australian ICOMOS 2013) and the *NSW Heritage Manual* (Heritage Office 1996 and 2006).



Map:
PS117658_SCP_E 019_A3_HER_pg1-3

Author: Robert.Suansri

Date: 20/08/2020

Approved by: - Z.McLaughlin

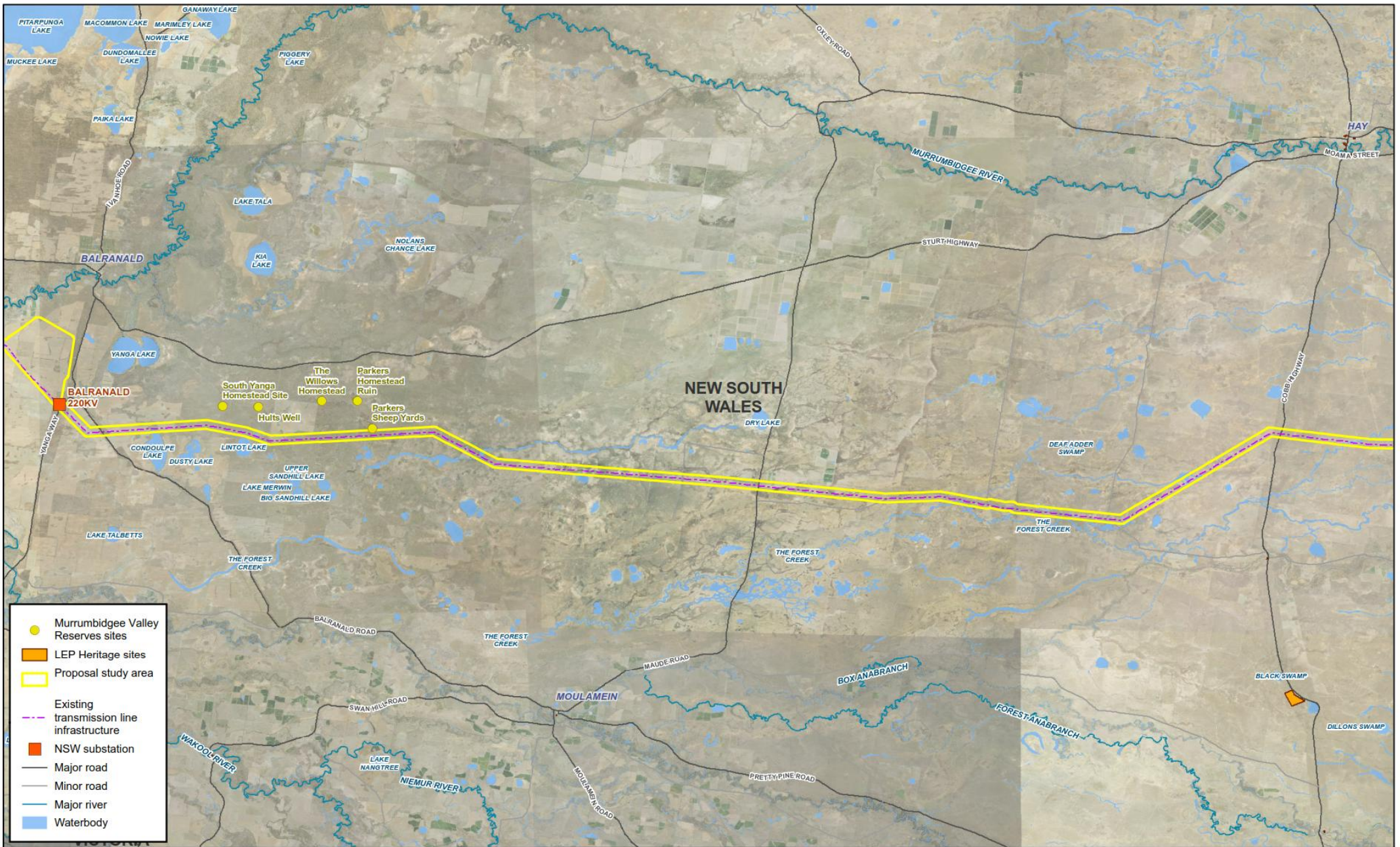


0 5 10 15
1:400,000
Coordinate system: GCS GDA 1994
Scale ratio correct when printed at A3



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-2a
Non-Aboriginal heritage items within or
surrounding the proposal study area



Map:
PS117658_SCPE_019_A3_HER_pg1-3

Author: Robert.Suansri



Date: 20/08/2020

Approved by: - Z.McLaughlin

0 5 10 km

1:400,000
Coordinate system: GCS GDA 1994
Scale ratio correct when printed at A3

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase,

© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCS1 Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

C:\Users\suansri\WSP\Q365\Project_EnergyConnect - General\04_Production\Map\04_ScopingStudies\Eastern\PS117658_SCPE_019_A3_HER_pg1-3.mxd

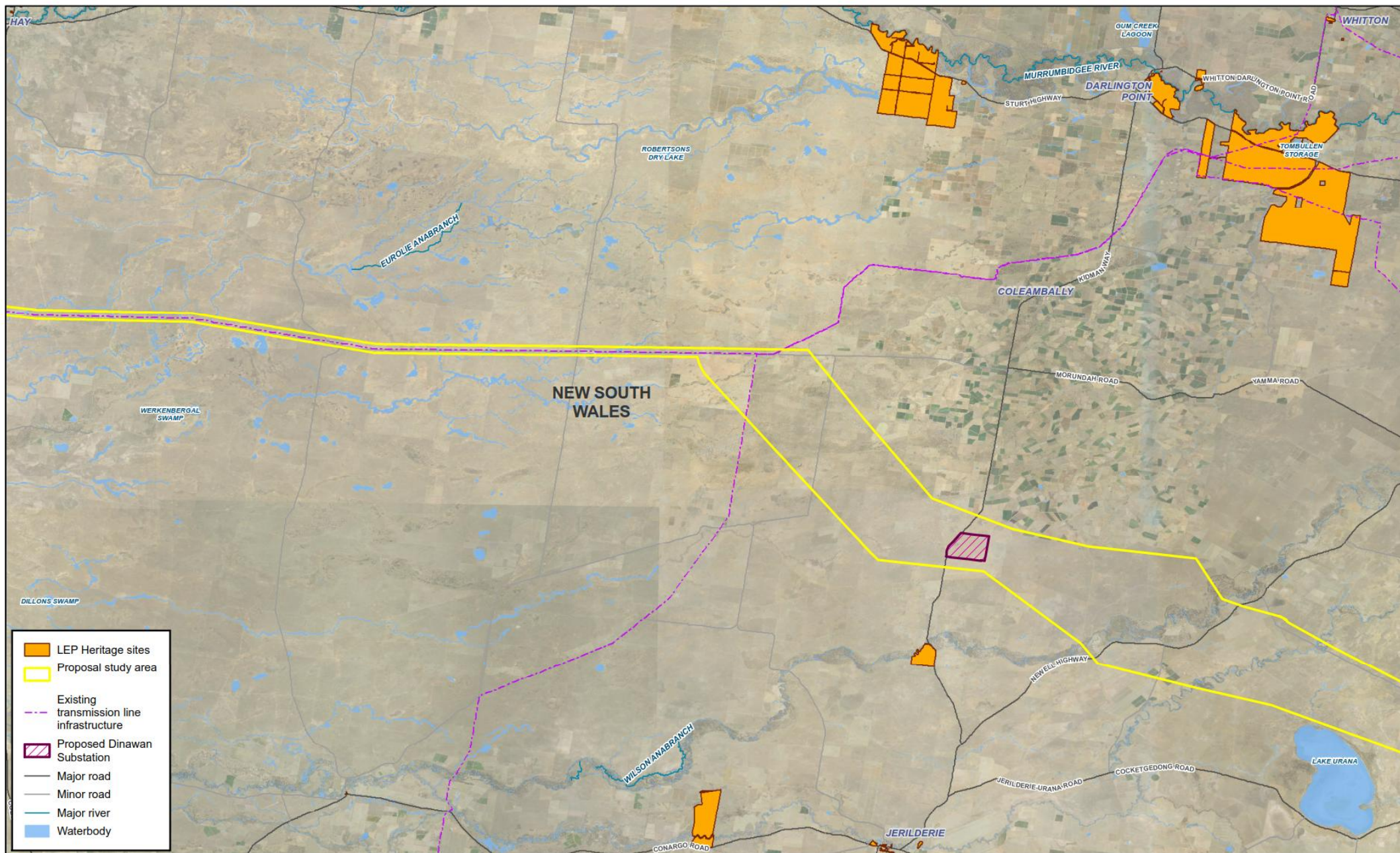
Transgrid



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-2b
Non-Aboriginal heritage items within or surrounding the proposal study area

www.wsp.com



Map: PS117658_SCP_E 019_A3_HER_pg1-3	Author: Robert.Suansri		 1:400,000 Coordinate system: GCS GDA 1994 Scale ratio correct when printed at A3			ENERGYCONNECT (NSW - EASTERN SECTION)	Figure 7-2c Non-Aboriginal heritage items within or surrounding the proposal study area
Date: 20/08/2020	Approved by: - Z.McLaughlin						

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
 Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, WSP Australia Pty Limited (WSP). Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCS1 Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

Transgrid

www.wsp.com

7.4 Land Use and Property

7.4.1 Existing Environment

The proposal is located within the LGAs of Wentworth, Balranald, Murray River, Edward River, Hay, Murrumbidgee, Federation, Lockhart and Wagga Wagga. The nearest major town is Wagga Wagga located about 7.5 kilometres north of the eastern end of the proposal study area. Smaller towns near the proposal study area include Buronga about 10 kilometres south-west, Euston about three kilometres south, Balranald about seven kilometres north-east, Urana about 3.5 kilometres south and Lockhart about 500 meters north of the proposal study area.

Land use within the proposal study area is predominantly zoned as RU1 Primary Production. Other land zonings in the proposal study area include:

- | | |
|---|----------------------------|
| > RU2 Rural Landscape | > IN1 General Industrial |
| > RU3 Forestry | > SP1 Special Activity |
| > RU5 Village | > SP2 Infrastructure |
| > E1 National Parks and Nature Reserves | > W1 Natural Waterways |
| > E2 Environmental Conservation | > W2 Recreation Waterways. |
| > E3 Environmental Management | |
| > R5 Large Lot Residential | |

Land tenure in the proposal study area is predominantly freehold, with some areas of Crown land including road reserves, rail corridors and travelling stock reserves. There are also Commonwealth landholdings nearby including land owned by the Department of Defence and two lots of unknown use:

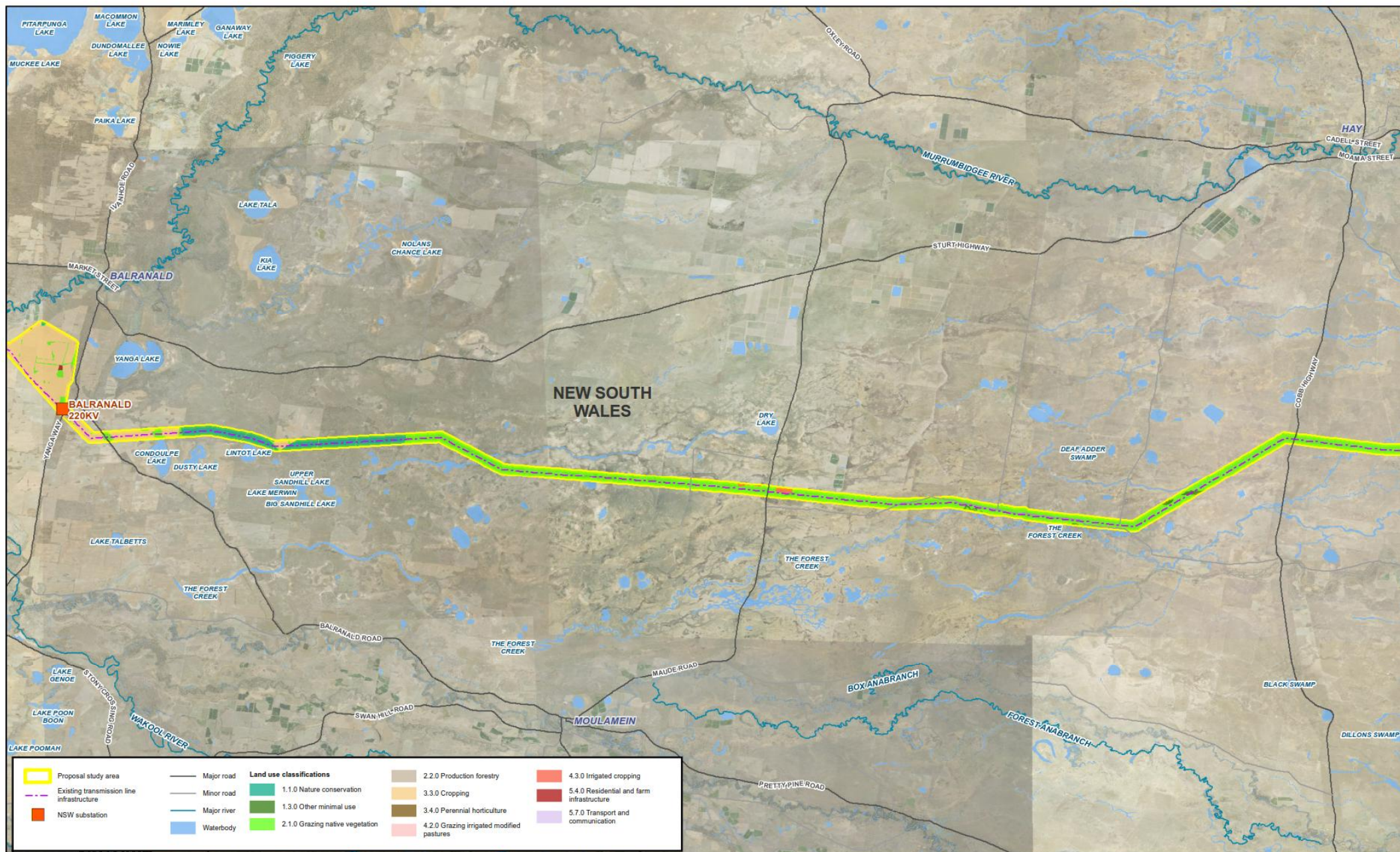
- > Lot 3 DP845635
- > Lot 1 DP845636.

Table 7-2 and Figure 7-3 outline the key land uses within and surrounding the proposal study area. Figure 7-4 shows the land zoning in the proposal study area.

Table 7-2 Key land uses within and surrounding the proposal study area

Key land uses	Relevance to proposal study area
Agriculture	The majority of the proposal study area comprises agricultural land including irrigated cropping, dryland cropping and dryland grazing. This land is typically used for sheep grazing for wool and meat, cattle grazing and cereal cropping. Several travelling stock routes also exist within the proposal study area.
Transport infrastructure	The proposal study area crosses a number of key roads including Sturt Highway, Cobb Highway, Newell Highway and Olympic Highway. Four existing railway lines also traverse the proposal study area (refer to section 8.5.1).
Electrical infrastructure	The proposal study area includes three existing substations, the Buronga 220 kV substation, Balranald 220 kV substation and Wagga Wagga 330 kV substation, and several existing transmission lines between 132 kV and 330 kV in voltage.
Protected environments	<p>Key protected environments within the proposal study area include:</p> <ul style="list-style-type: none"> > Yanga National Park, which is located south of Sturt Highway > Four State Forests: Widgiewa State Forest, Cullivel State Forest, Brookong State Forest and Bilbrulong State Forest > Other conservation areas including Murrumbidgee Valley Reserve (formerly Yanga State Conservation Area), South West Woodland within the study area near Lake Urana and Southern Mallee Private Reserve spanning various locations between Buronga and Lake Benanee.
Rivers and waterways	Several rivers and other waterways are present within the proposal study area, which are largely associated with the broader Murray River, Darling River and Murrumbidgee River systems and their major tributaries.
Other key land uses	<p>Other key land uses within or surrounding adjacent the proposal study area includes:</p> <ul style="list-style-type: none"> > RAAF Base Uranquinty certified aerodrome > Defence land including Kapooka Training Facility four kilometres north and RAAF Base Wagga five kilometres north-east of the proposal study area > Current mining tenements, which are typically located towards the western end of the proposal study area > Defence communication buffer zone located around 10 kilometres to the north of Lake Urana.





Map:
PS117658_SCPE_020_A3_LandUse

Author: Robert Suansri



Date: 19/08/2020

Approved by: - Z.McLaughlin



1:400,000
Coordinate system: GCS GDA 1994

Scale ratio correct when printed at A3

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

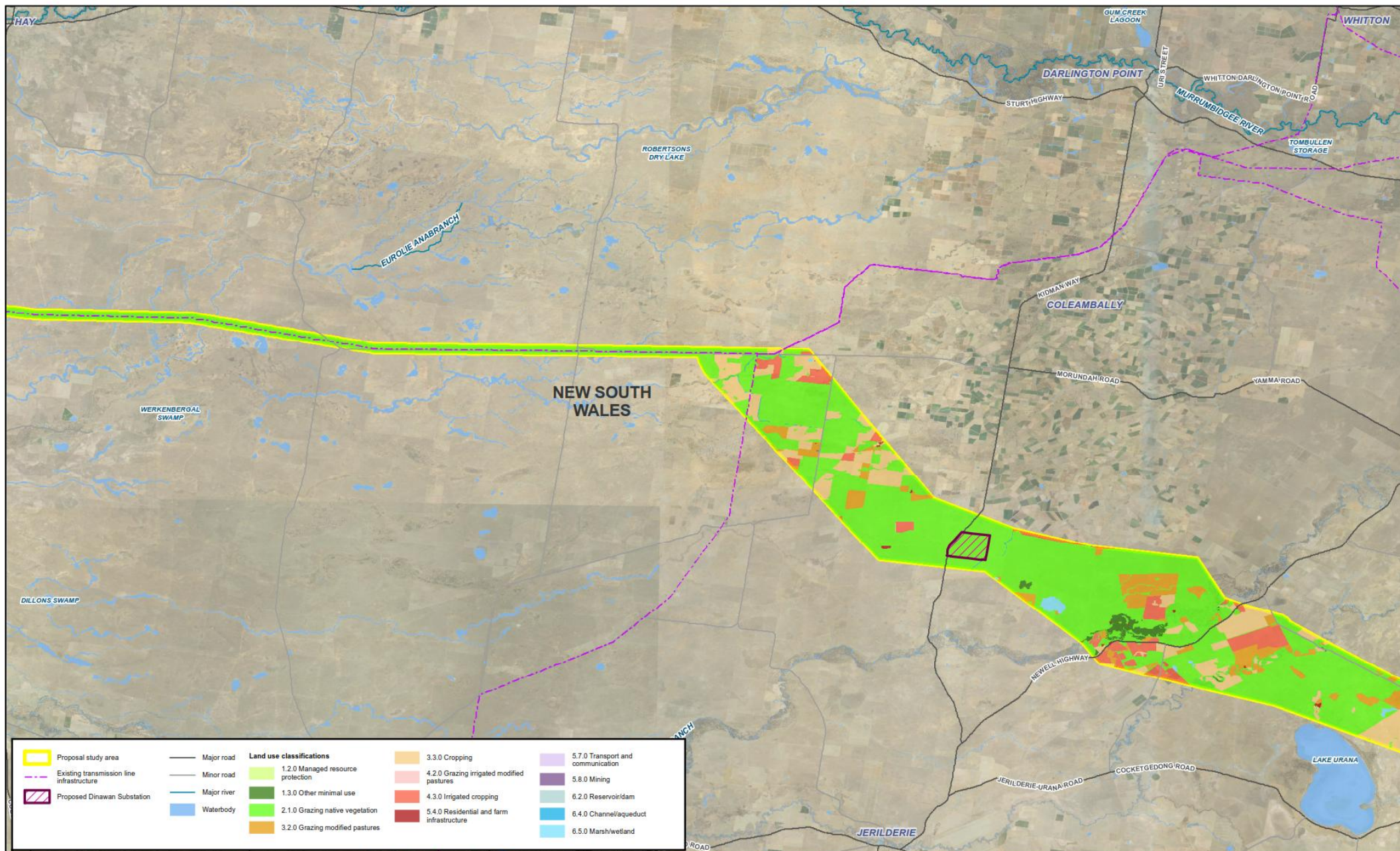
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase,

© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCII Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.



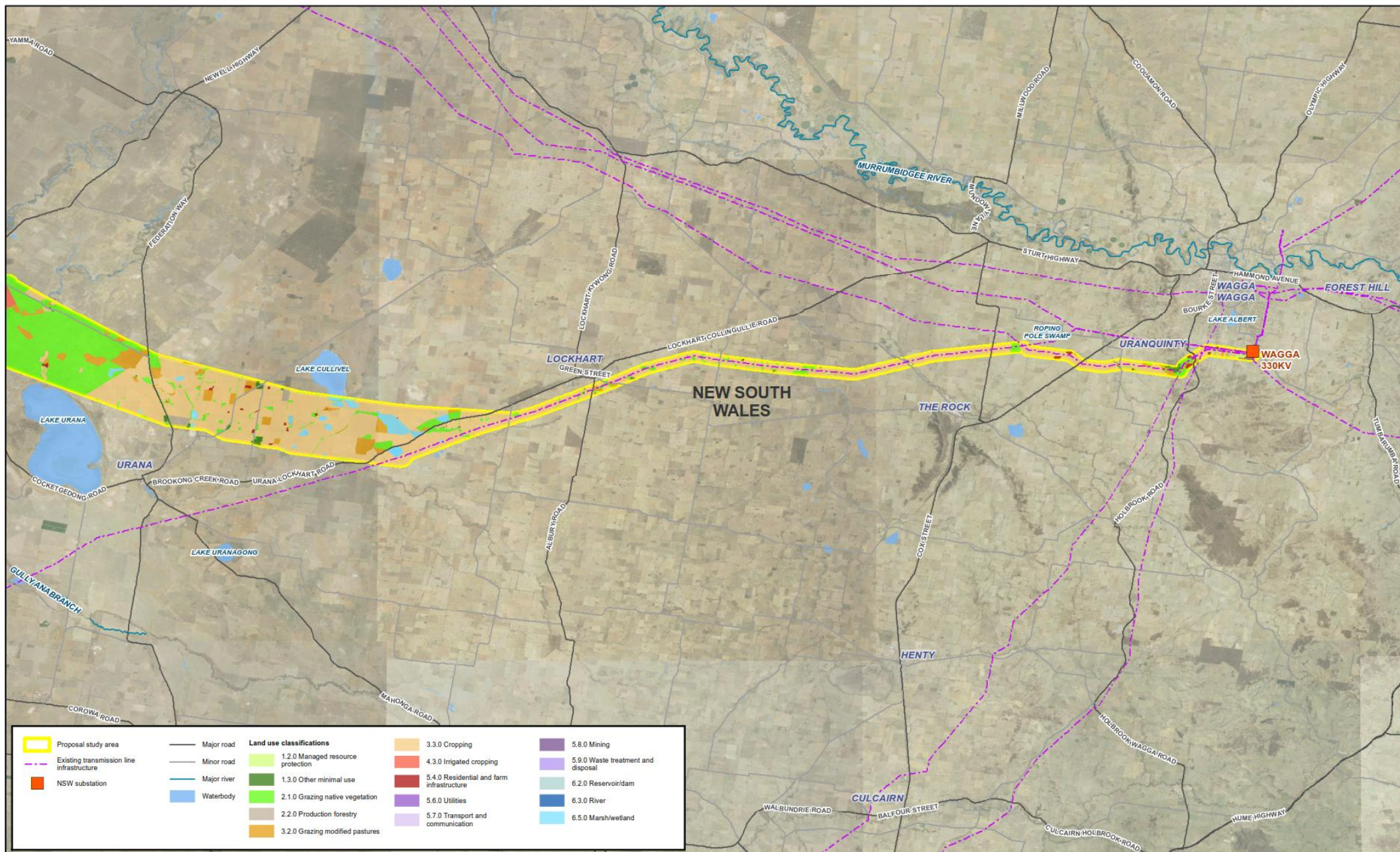
ENERGYCONNECT (NSW - EASTERN SECTION)

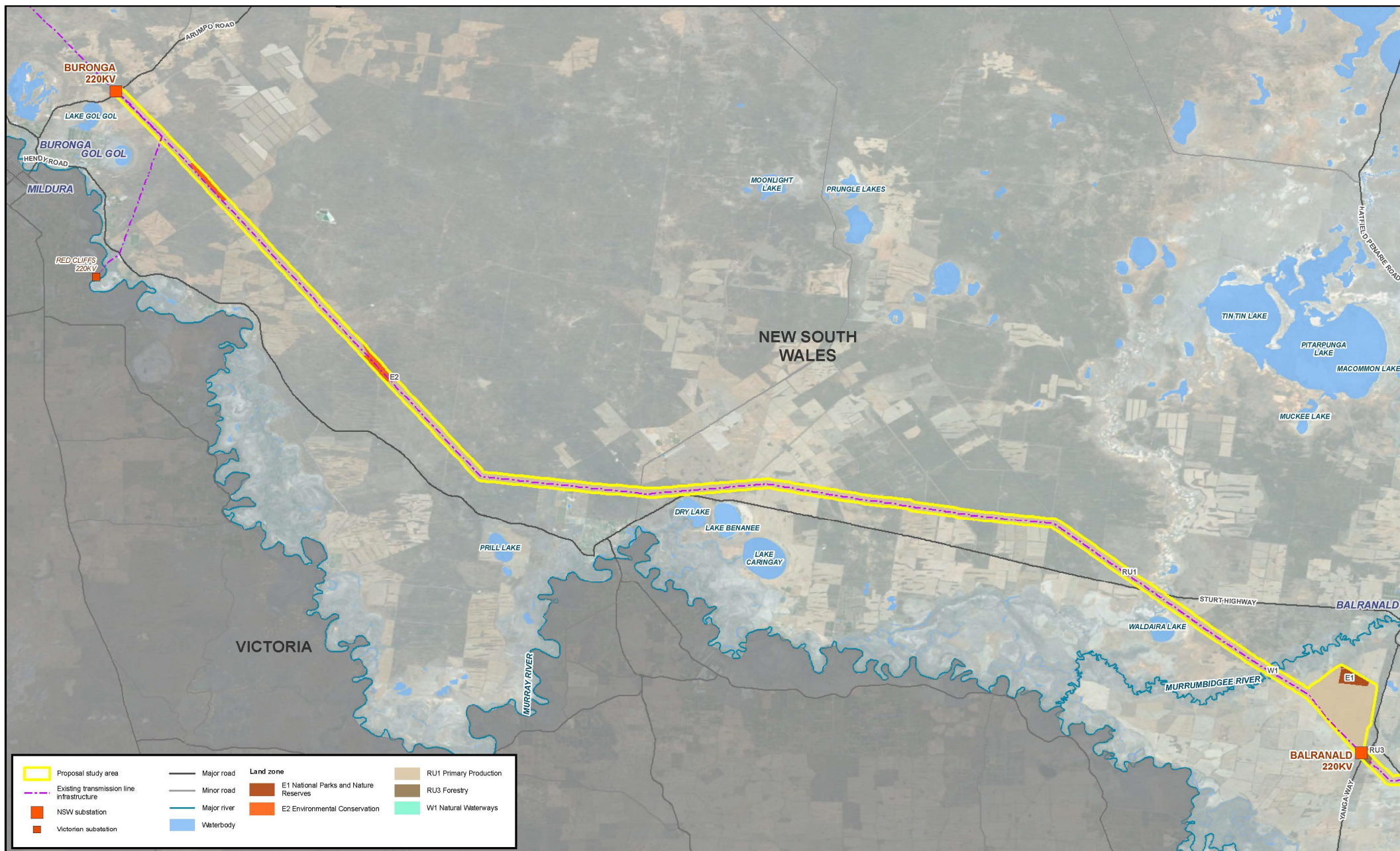
Figure 7-3b
Land use in the proposal study area



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-3c
Land use in the proposal study area





Map:
PS117658 SCPE_024_A3_LZN

Author: Robert.Suansri



0 5 10 15
1:400,000
Coordinate system: GCS GDA 1994
Scale ratio correct when printed at A3

Source: Esri, Mapbox, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase,

© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSC Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

C:\Users\suansri\WSP\0365\Project EnergyConnect - General\54_Production\Maps\04_ScopingStudies\Eastern\PS117658_SCPE_024_A3_LZN.mxd

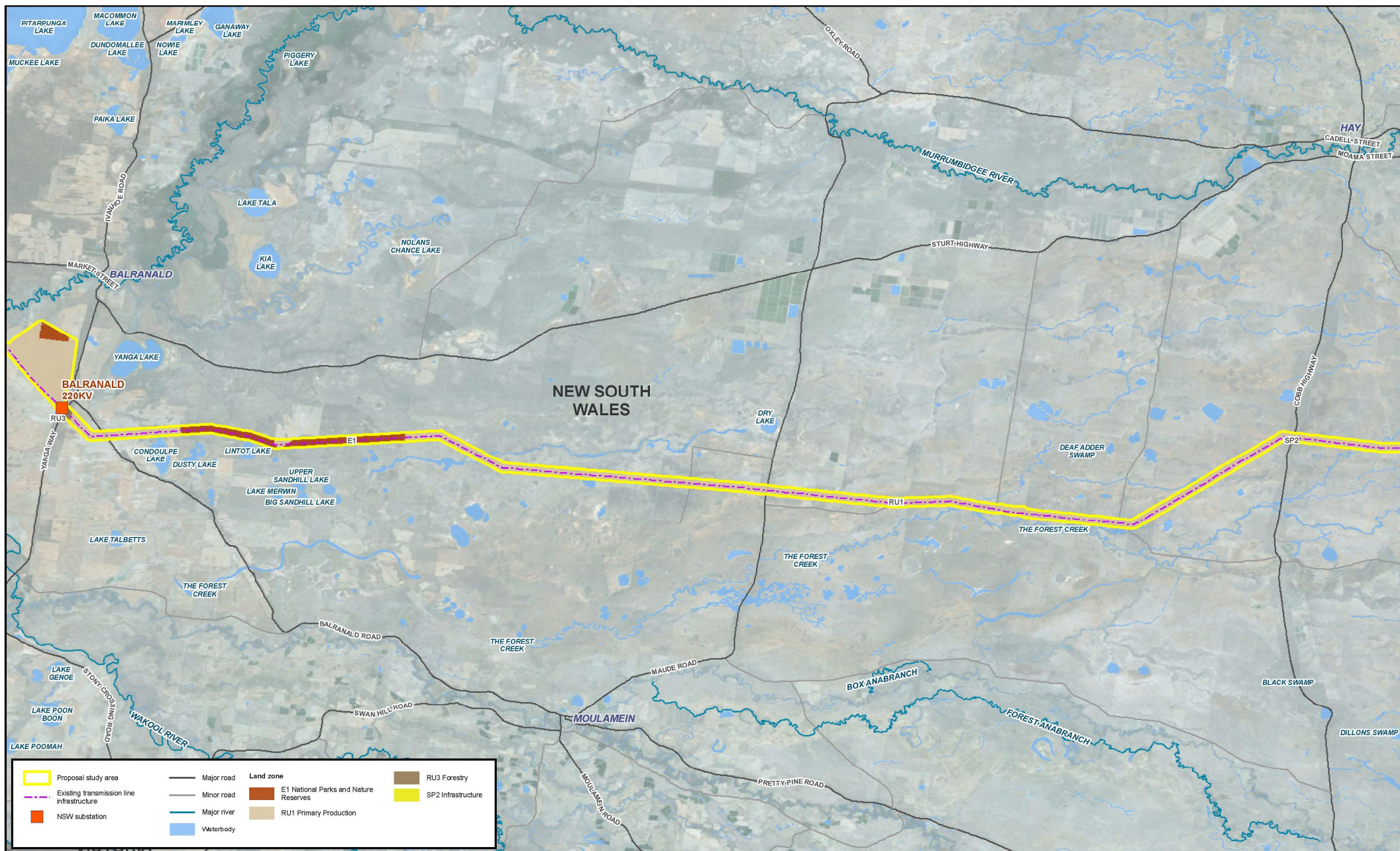
Transgrid

ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-4a
Land zoning in the proposal study area



www.wsp.com



Map: PS117658 SCPE 024 A3 LZN	Author: Robert.Suansri		 1:400,000 Coordinate system: GCS GDA 1994 Scale ratio correct when printed at A3			ENERGYCONNECT (NSW - EASTERN SECTION)
Date: 6/09/2020	Approved by: - Z. McLaughlin					

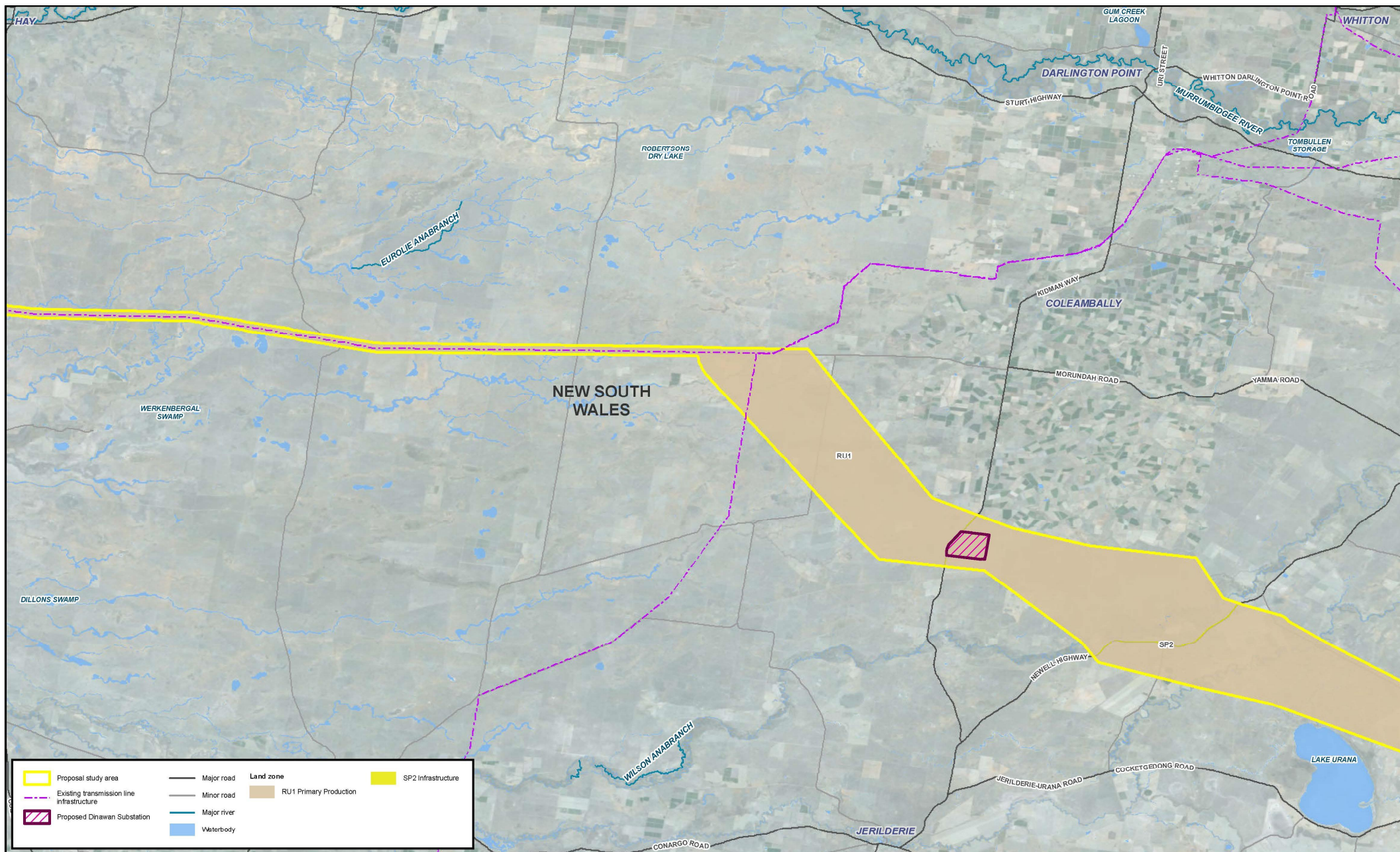
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
 Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, WSP Australia Pty Limited (WSP)
 Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCS1 Certified Quality System to ISO 9001 - APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

C:\Users\suansri\WSP\0365\Project EnergyConnect - General\Shared\Production\Maps\04_ScopingStudies\Eastem\PS117658_SCPE_024_A3_LZN.mxd

Transgrid

www.wsp.com

Figure 7-4b
Land zoning in the proposal study area



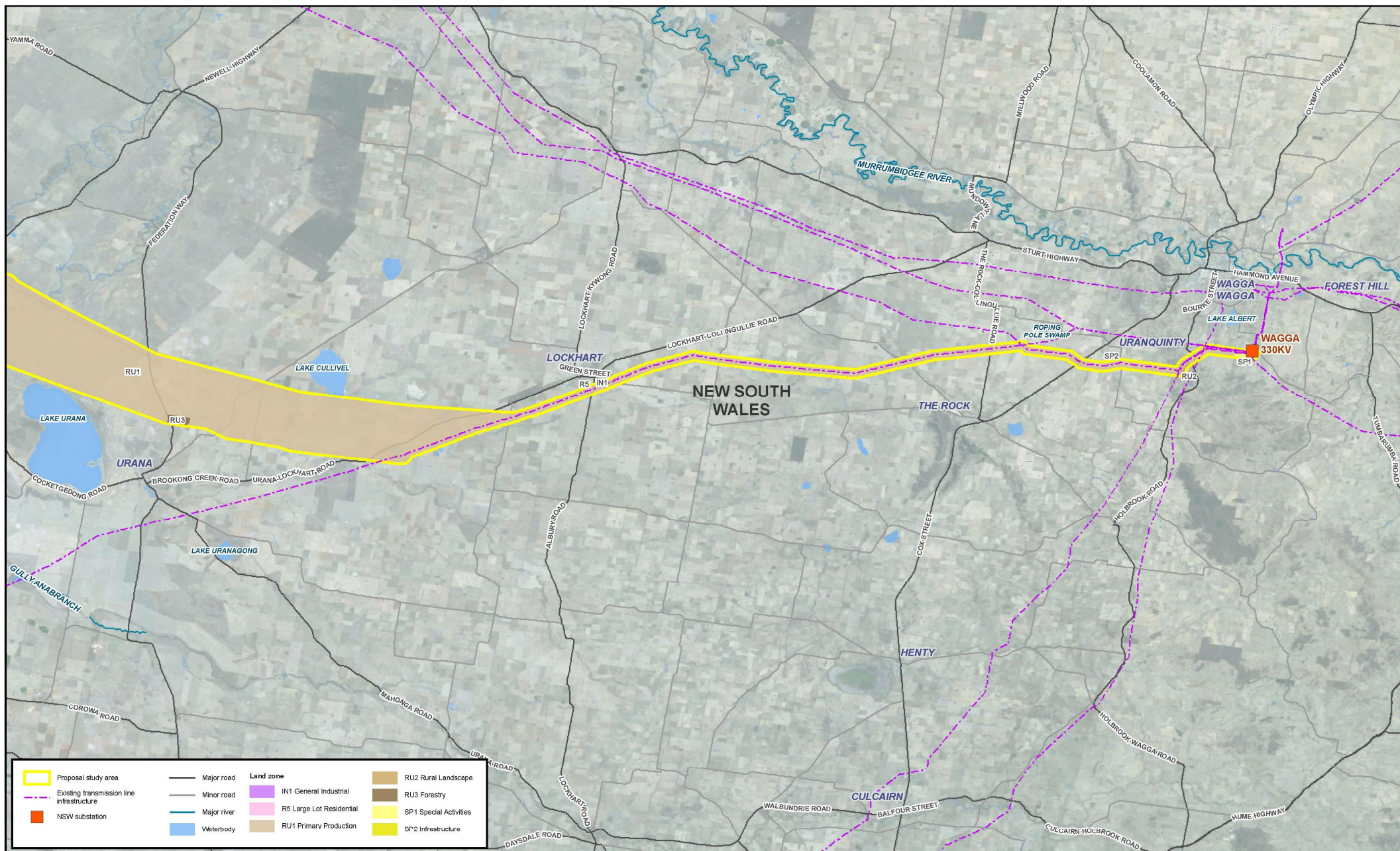
Map: PS117658 SCPE 024 A3 LZN	Author: Robert.Suansri					ENERGYCONNECT (NSW - EASTERN SECTION)
Date: 6/09/2020	Approved by: - Z. McLaughlin					
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, WSP Australia Pty Limited (WSP)			Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001 - APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.			

© Users\suansri\WSP 0365\Project EnergyConnect - General\5_Shared\4_Production\Maps\04_ScopingStudies\Eastern\PS117658_SCPE_024_A3_LZN.mxd

Transgrid

www.wsp.com

Figure 7-4c
Land zoning in the proposal study area



Map: PS117658 SCPE 024 A3 LZN	Author: Robert.Suansri				
Date: 6/09/2020	Approved by: - Z. McLaughlin				

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
 Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, WSP Australia Pty Limited (WSP)
 Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSC Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 7-4d
Land zoning in the proposal study area

Transgrid

www.wsp.com

7.4.2 Issues for Consideration

The proposed final location and footprints of permanent and temporary sites developed as part of the proposal would be confirmed and assessed as part of the EIS.

During construction, the proposal has the potential for temporary land use and property impacts such as interruptions to seasonal cropping and harvesting activities (where construction sites are proposed), biosecurity risks and some temporary restrictions to access and use of portions of properties.

Once the final transmission line easement has been determined, the new easements for the proposed transmission lines would be acquired by TransGrid (on behalf of the NSW government's Electricity Transmission Ministerial Holding Corporation). The exact land acquisition requirements and potential impacts to landholders would be determined during detailed design. In addition to the easement for the transmission line, freehold land would need to be acquired for the proposed substation works. As such, the proposal has the potential to impact on existing land uses, including agricultural operations. This may include some limitations on agricultural activities in and around the transmission line easement (such as restrictions on tall crops or activities which require harvesting).

7.4.3 Method of Assessment

Land use and property would be considered as part of the EIS with a particular focus on potential impacts of the proposal on existing agricultural operations. The assessment would take into consideration feedback received from landholders.

7.5 Landscape Character and Visual Amenity

7.5.1 Existing Environment

Much of the land within the proposal study area and the visual catchment is used for agricultural purposes including broad acre cropping and grazing. The landscape is predominantly flat and comprises a mixture of vegetation including broad acre cropping, finer grained high value horticultural plantings and native bushland. Existing transmission lines with structures typically between 25 and 30 metres in height and existing substations at Buronga, Balranald and Wagga Wagga are currently part of this visual landscape. Due to the flat topography, landscape views are generally vast. The majority of potential receivers within the proposal study area would be road users. Main roads and tourist routes within the proposal study area include the Silver City Highway, Sturt Highway, Cobb Highway, Newell Highway, and the Olympic Highway. The Yanga National Park and State Forests also contribute to the landscape character of the proposal study area.

There are no major or regional towns within the proposal study area, however there are several residential dwellings located within the proposal study area, particularly in the eastern portion. The nearest towns to the proposal study area are Lockhart (about 500 meters north), Euston (about three kilometres south) and Urana (about 5 kilometres south).

7.5.2 Issues for Consideration

As the landscape is relatively flat, the scale of the proposal would be visible for mid to long distances. The visual impacts of the proposal would therefore need to be considered during the EIS phase.

During construction, the presence of construction plant, vehicles and compound sites may result in short-term temporary visual impacts for sensitive receivers. The clearing of vegetation and ground disturbance during construction of the transmission lines (and easement), substations and access tracks have the potential to result in long-term localised visual impacts.

During operation, the proposal would introduce large steel lattice structures up to 80 metres in height and new substation infrastructure into the landscape. In this landscape, there is the potential for the structures to be visually noticeable from distances of several kilometres. The structures would have the potential to be visible beyond this distance, however they would not be as visually dominant. The exact location of each structure

would be identified during the detailed design phase, however, they would generally be placed approximately 300 to 600 metres apart along the alignment.

Where possible during design refinement, visual impacts would be minimised by locating the transmission line structures and substation sites as far as possible from sensitive receivers and viewing locations or parallel to existing transmission line infrastructure where the degree of landscape change would be less. However, there is a need to balance visual impact mitigation with avoidance of impacts on other environmental values.

7.5.3 Method of Assessment

The EIS would include an assessment of visual impacts during construction and operation, including a description of existing landscape character and potential sensitive receptors, and identification of measures to be used to minimise visual impacts.

7.6 Surface Water, Groundwater and Hydrology

7.6.1 Existing Environment

7.6.1.1 Surface water

Several rivers and other permanent and ephemeral waterways are present within the proposal study area, which are largely associated with the broader Murray River, Darling River and Murrumbidgee River systems and their major tributaries including the Lachlan, Goulburn, Barwon and Yanda Rivers. These waterways are shown in Figure 7-3. The proposal study area also intersects several natural surface water bodies, including Condoulpe Lake, Lake Cullivel, Lake Urana and watercourses that discharge into Dry Lake, Waldaira Lake and Dusty Lake.

Water bodies nearby the proposal study area include:

- > Dry Lake, which is located about 500 metres south
- > Lake Denanee, which is located about 1.2 kilometres south
- > Waldaira Lake, which is located about one kilometre south-west
- > Yanga Lake, which is located about four kilometres east.

The proposal study area is located within the catchment of several water sharing plans: the *Murrumbidgee Unregulated River Water Sources 2012*, the *Murrumbidgee Alluvial Water Sources 2020* and the *Murray Darling Basin Porous Rock Groundwater Sources 2020*.

Part of the proposal study area is located within land mapped as a flood planning area under the *Urana Local Environmental Plan 2011*.

There is limited water availability within the proposal study area as the region is currently drought affected.

7.6.1.2 Groundwater

A search of the Bureau of Meteorology's Australia Groundwater Explorer on 6 March 2020, indicated the groundwater level across the proposal study area is variable from one to 40 metres below ground level (Bureau of Meteorology, 2020a).

Groundwater dependent ecosystems (GDEs) are ecosystems that are dependent on groundwater for survival. A GDE may rely on the surface or subsurface presence of groundwater for survival or as a supplementary source of water. A search of the Atlas of GDE's for the proposal study area identified several terrestrial GDE's that rely on the subsurface expression of groundwater and have a high likelihood of occurrence (Bureau of Meteorology, 2020b). Terrestrial GDEs which are likely to occur within the study area are river base flows, floodplains and riparian vegetation associated with the Murrumbidgee, River, Sandy Creek, Boree Creek, Bullenbong Creek and Yanga Creek. Additionally, there is a high likelihood of aquatic GDEs being present within the proposal study area where it crosses watercourses.

7.6.2 Issues for Consideration

Water use and access to water during construction for activities such as concrete batching, dust suppression and minor uses including toilets for workers, could potentially be an issue for the proposal due to the water scarcity issues which are ongoing in this region given recent drought conditions. As such, it is expected that the community would be highly sensitive to any impacts on local water supplies. Water sources and the amount of water to be used for the proposal would form part of the consideration of the EIS.

Potential causes of water quality impacts would be associated with erosion and sedimentation associated with vegetation clearing and earthworks for benching, brake and winch sites, access tracks and structure footings.

Erosion and sedimentation, if uncontrolled, would have the potential to increase the amount of sediment and organic matter entering nearby waterways. This has the potential to increase turbidity and result in a decline in the water quality of these waterways. Without the implementation of mitigation measures there is a potential for sediment to be mobilised where work is carried out at or near waterways.

It is expected that watercourse crossing works, where required, would involve the placement of rock on the bed of the watercourse to enable access of heavy vehicles hauling plant and equipment between the structure locations during construction. It is assumed that a number of the waterway crossings would be retained for operation of the proposal. The placement of rock within the watercourse has the potential to alter stream flows, these impacts would need to be considered during the EIS phase.

Surface water impacts from the proposal would potentially be associated with increases in non-permeable surfaces, increasing surface water run-off. This would be primarily associated with the proposed substation works and the transmission tower structure footings. The impacts of the proposal are anticipated to be manageable though the application of standard environmental management measures.

Potential impacts on flooding relate to structures and infrastructure (such as the substation works) creating obstructions. No structures would be located within major water sources, however they may be located within floodplains. Structures would be designed to not impede flood flows.

In the event that groundwater is encountered during the construction works (e.g. during the boring for the installation of new structures or substation works), minor temporary dewatering may be required. The impacts of dewatering on groundwater would be considered as part of the EIS.

7.6.3 Method of Assessment

Impacts of the proposal on water supply and use during construction as well as surface water quality, flooding and groundwater would be considered during the EIS phase. The EIS also would identify mitigation measures to be applied to works to manage potential impacts. The EIS will also consider the proposal's operation impacts related to managing and maintaining access tracks and waterway crossing. The source of water to be used during construction would also be determined during the EIS phase.

7.7 Noise and Vibration

7.7.1 Existing Environment

The existing environment is anticipated to generally experience low background noise levels consistent with the rural character of the area. The nearest towns are Lockhart about 500 meters north, Euston about three kilometres south and Urana about five kilometres south of the proposal study area with several residential dwellings scattered throughout the proposal study area, particularly in the eastern portion near Wagga Wagga.

Existing noise conditions in the proposal study area are expected to be influenced by environmental noise (e.g. wildlife calls, wind-blown vegetation), agricultural machinery and vehicles travelling on the road and rail network within the proposal study area. The existing substations at Buronga, Balranald and Wagga Wagga are also considered to be local noise sources.

7.7.2 Issues for Consideration

The proposal would generate noise and vibration throughout the construction phase due to various activities including operation of heavy vehicles, helicopters (if required), vegetation clearing, bulk earthworks and excavations, and the construction of access tracks, stringing of the lines, road upgrades and increased traffic volumes. For most of the proposal study area, these activities would not be expected to cause significant noise and vibration impacts due to the short duration of work at each location and distance from sensitive receivers (noting that construction of the Dinawan substation and upgrade to the existing Wagga substation would result in both construction noise in the area immediately surrounding the substation sites for a longer duration of time). Works at the transmission structure locations would be likely to have a minor and temporary nuisance noise impact on the closest sensitive receivers. No vibration impacts are expected from the proposal due to the distance from sensitive receivers. This would be confirmed during the noise and vibration assessment once the preferred alignment is refined.

During operation, the new transmission lines and substation have the potential to introduce some additional noise sources to their localities. However, the proposal is not anticipated to contribute to a significant noise impacts on surrounding receivers as the proposal would be designed to comply with standards or to incorporate consideration of mitigation, where required. The resultant potential noise impact from these would be confirmed following detailed design of the proposal at these locations. Potential vibration impacts during operation are anticipated to be minimal from the transmission lines and the substation facilities.

7.7.3 Method of Assessment

A noise and vibration impact assessment would be prepared as part of the EIS, which would identify and consider potential noise and vibration impacts associated with the proposal during construction and operation. Recommendations for mitigation measures to avoid or minimise noise and vibration impacts wherever reasonable and feasible would be identified.

8. Other Issues

8.1 Bushfire Risk

8.1.1 Existing Environment

The proposal study area is located within the Lower Western, Riverina, Murrumbidgee Irrigation Area and Mid Murray Bushfire Management Zones. Their respective Bush Fire Management Plans (BFMPs) identify community assets at risk and set out five-year programs of coordinated multi-agency treatments to reduce the risk of bushfire to those assets. The BFMPs indicate that the bushfire season in the area typically runs from October to March each year. This period is subject to revision by the relevant Bushfire Management Committee according to prevailing and predicted weather conditions.

Temperature variation across these zones is distinct with summer temperatures exceeding forty degrees Celsius and cool to mild winters with frosts occurring on a regular basis. High temperatures combined with thunderstorm activity through the bushfire season can initiate significant fire events. However, in recent years prolonged drought conditions have caused a reduction in the fuel loads across the landscape.

The bushfire risk within the proposal study area would vary due to the different vegetation conditions that have been identified and extent of development at any one point along the alignment.

8.1.2 Issues for Consideration

The density of vegetation across the proposal study area is highly variable, with heavily grazed paddocks, cultivation, open woodland, riparian zones and open shrub land each presenting a distinct bushfire risk.

Bushfires pose an ever-present risk to life, property and the environment. Bushfires can be caused by a variety of factors, including lightning strikes, sparks from farm machinery and incinerators, vehicle crashes, and electrical incidents such as fallen power lines. In addition, hot works undertaken as part of the construction of the proposal could potentially start a fire, such as sparks from plant or equipment.

TransGrid's risk approach to asset management assumes that every transmission line has the potential to be impacted by fire, or to initiate fire, including bushfire. The design, operation and maintenance of the proposal would consider vegetation management within the transmission line easement, and asset protection zones around the substations.

8.1.3 Method of Assessment

TransGrid's risk approach to asset management is to minimise the likelihood that an asset would initiate a fire, irrespective of the location of that asset. Bushfire risk would be considered as part of the development of the EIS to determine the potential risk from and to the proposal.

8.2 Socio-Economic

8.2.1 Existing Environment

As described in section 4.2.4, the proposal is located across several LGAs. The population of Wagga Wagga LGA is around 62,000 people whereas the other eight LGAs have a total population of around 52,000 people. The proposal study area has an average of 0.6 people per square kilometre.

The largest industries of employment across the proposal study area are agriculture, tourism, grocery stores and local government. The unemployment rate in the Wagga Wagga LGA in 2016 was 5.5 per cent, and across the remainder of the study area averaged 4.72 per cent, which was lower than the regional NSW unemployment rate (6.3 per cent).

Given the remoteness of the proposal study area, there is limited access to existing infrastructure, including road, rail, gas, electricity, water and sewerage services.

8.2.2 Issues for Consideration

As a result of the proposal, a significant amount of expenditure will be spent within the local, regional and NSW economies during the construction phase over a relatively short period of time. The expenditure for the NSW portion of EnergyConnect is estimated to be over \$1 billion. In addition, the construction phase would generate about 1,650 employee years (direct and indirect) in the NSW region during the construction period. Opportunities for local employment generation would also be considered in the preparation of the EIS and proposal delivery.

Substantive negative impacts to the local community and most local businesses are unlikely as a result of the proposal, given the remoteness of the location of the proposal.

The distance of the construction works from towns of sufficient size to support the required workforce would require the establishment of multiple temporary workers camps along the route to allow the safe and accessible accommodation of workers and support staff. This provision would limit the pressure on local accommodation and services in the smaller towns.

When fully completed, EnergyConnect would facilitate enhanced security and reliability of energy supply with associated social and economic benefits to consumers across the NEM in SA and NSW. Key benefits of the overall project would include:

- > Improvement of security and continuity of energy supply to NSW and the NEM during periods of maximum hourly and daily demand
- > Reduce reliance of high cost gas plants in SA
- > Unlock renewable generation development en-route and allows great market access
- > Creation of additional capacity of 235MW in a heightened period with energy security being a critical issue for NSW and Australia
- > Opportunities for local construction employment and additional spend to boost local business.

Construction activities that interact with publicly assessable areas (i.e. along public roads) could potentially result in adverse hazards and risks to public safety if not managed appropriately. As described in Section 7.4, consideration of the proposal's potential impact on agriculture would be considered during the EIS phase.

8.2.3 Method of Assessment

An assessment of the potential social impacts and benefits of the proposal would be included in the EIS. The assessment would include potential social impacts on both a broader regional and local scale, and consideration of the ability of local social infrastructure to accommodate the construction workforce.

8.3 Electromagnetic Fields

8.3.1 Existing Environment

Electromagnetic fields (EMF) are part of the natural environment and electric fields are present in the atmosphere while static magnetic fields are created by the earth's core. EMF is also produced wherever electricity or electrical equipment is in use. Transmission lines, electrical wiring, household appliances and electrical equipment all produce power frequency EMF. An electric field is produced every time voltage runs through a wire. The higher the voltage, the stronger the electric field. Electric fields are strongest closest to the wires and their level reduces quickly with distance.

Magnetic fields are produced by the flow of an electric current through a wire. The higher the current, the greater the magnetic field. Like electric fields, magnetic fields are highest closest to the wire and their level reduces quickly with distance. Together, the electric and magnetic fields are referred to as EMF.

For a transmission line, the strength of the electric field varies generally with the operating voltage of the line (measured in volts), while the magnetic field strength is related to the current flowing in the line (measured in amps). The current flowing in the line is dependent upon the load or power flow and would vary with consumer demand (which varies on a daily and seasonal basis). The EMF strengths at ground level below the conductors, are also dependent on the height of the wires above the ground and their geometric arrangements as supported by the transmission structures.

Parts of the proposal study area contain existing high voltage transmission lines (up to 330 kV), low-voltage distribution lines and substations of varying operating capacities, which are all current sources of EMF.

8.3.2 Issues for Consideration

The scientific literature on EMF exposure is extensive, complex and inconclusive. In addressing the question of adverse health effects expert advice on EMF from competent health authorities in Australia and from around the world is relied upon. This includes the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), which is the Federal Government agency responsible for providing health assessments and recommendations to the Government on matters relating to EMF. ARPANSA has adopted the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for limiting exposure to EMF, published in 2010.

The proposal would introduce new high voltage transmission lines and substation infrastructure between Buronga and Wagga Wagga, which would result in additional increases to electric and magnetic fields in the local area. However, the proposed transmission lines would be designed and built to ensure that exposure levels are within the limits recommended by the ICNIRP Guidelines (2010).

8.3.3 Scope for Further Assessment

Potential impacts of EMF from the proposal would be considered as part of the EIS. This would include consideration of potential health risks for adjacent residents resulting from EMF associated with the development of new high voltage transmission lines and substation infrastructure.

8.4 Air Quality and Greenhouse Gas

8.4.1 Existing Environment

Ambient air quality within the proposal study area would be characteristic of a rural area and is affected by a number of factors including topography, prevailing meteorological conditions and local and regional sources of potential air pollution.

Existing sources of air pollution within the proposal study area are limited, consisting primarily of dust and vehicle/machinery exhaust emissions associated with agricultural practices and transport along the major roads within the proposal study area. The region surrounding the proposal study area is sparsely populated, with most of the land comprised of rural properties and agricultural land.

8.4.2 Issues for Consideration

During construction, local air quality within the proposal study area may be temporarily affected by particulate (dust) and exhaust emissions from activities such as earthworks. The main sensitive receivers for air quality impacts during construction would be residences within 100 metres from construction works. For most of the proposal study area, any air quality impacts from construction are expected to be minor and short term due to the relatively small scale of construction works required at each transmission line structure location, distance from sensitive receivers, and the progressive nature of the construction works. However, the construction of the Dinawan substation and upgrade to the existing Wagga substation would result in potential localised air quality impacts for a longer duration of time.

Gaseous emissions associated with the combustion of fuel and combustion-related pollutants from construction plant and machinery would be manageable through the effective implementation of appropriate environmental management measures.

The use of construction equipment and manufacture of materials for use in the proposal would consume resources associated with greenhouse gas emissions.

During operation, the proposal is not anticipated to generate a substantial amount of additional air quality or greenhouse gas impacts. A minor amount of greenhouse gases would be anticipated due to the operation of machinery for maintenance activities, however these impacts are anticipated to be minimal.

The proposal would be unlikely to have a significant impact on local air quality. Construction and operational air quality impacts would be manageable through the application of standard environmental management measures. Overall, air quality and greenhouse gases are not considered to be key issues for the proposal.

8.4.3 Method of Assessment

The EIS would include an assessment of air quality impacts during construction and recommend mitigation and management measures to reduce construction emissions and associated impacts, where reasonable and feasible.

As the proposal would be unlikely to generate significant air quality impacts during operation, an operational air quality impact assessment is not proposed.

8.5 Traffic and Access

8.5.1 Existing Environment

The road network within the proposal study area includes several major roads including the Sturt Highway, Cobb Highway, Newell Highway and Olympic Highway and a large number of local and private rural roads with varying speed limits. The major roads are shown on Figure 1-2.

Four existing railway lines also traverse the proposal study area:

- > Moama-Balranald line, which crosses south of the Sturt Highway. This line runs from Balranald to Barnes Junction where it meets the Deniliquin line. Primary traffic on this line is rice and wheat with trains only running as far Moulamein.
- > Narrandera-Tocumwal line, which crosses south of the Newell Highway and is no longer operational
- > Main Southern line, which runs generally alongside the Olympic Highway. This railway extends from Central station to Albury and then onto Melbourne. Much of the NSW freight traffic utilises this line as well as passenger trains
- > Rock-Oaklands line, which crosses east of Urana-Morundah Road and again east of the Albury-Lockhart Road. This line is partly-closed (mainly used for grain haulage) and is a branch of the Main South line at The Roc. It heads in a south-westerly direction through the towns of Boree Creek and Urana, terminating at Oaklands.

8.5.2 Issues for Consideration

Construction traffic associated with the proposal would include heavy and light vehicles associated with:

- > The delivery of new structures, wires and cables, concrete and gravel and other construction materials
- > The delivery of construction equipment as well as large equipment to be installed at the substations such as transformers, reactors and pre-fabricated buildings
- > The movement and/or removal of spoil and waste materials
- > Construction workers driving to and from the construction work sites and camps each day.

This may result in an increase in local and regional traffic using the surrounding existing road network during the construction of the proposal, including over-size and non-standard loads. Estimates of truck and vehicle

movements would depend on the adopted construction methodology and staging plans and would be described as part of the EIS.

There may be some temporary disruptions to traffic movements along roads within the proposal study area during the stringing works above the road corridor. Whilst road access may be required, impacts on traffic would be temporary in nature and would be unlikely to cause considerable disruptions to other road users.

Existing access tracks to sections of the proposal may be inadequate for the delivery of some material, plant and equipment or ongoing maintenance access requirements during operation. As part of the proposal, some access tracks therefore need to be upgraded or alternatives constructed.

Helicopters may be used for the delivery of some equipment and materials as well as for stringing of the transmission lines in certain areas. The coordination of this would be done in consultation with local landholders and the Civil Aviation Safety Authority (CASA) to minimise any potential air traffic conflicts, as required.

Access to existing properties is not anticipated to be substantially affected by the construction and operation of the proposal, however some minor impacts may occur where new or realigned access tracks are required. The location of any required access tracks would be identified as part of the EIS process and any proposed temporary or permanent changes would be developed in consultation with the relevant land owners.

During operation of the proposal, traffic and transport impacts are expected to be minimal and would typically be limited to occasional vehicle travel by maintenance staff.

8.5.3 Method of Assessment

The EIS would include an assessment of traffic and access impacts during construction and operation, including a description of existing road network, assessment of construction and operational traffic impacts, need for additional access roads and connection to the road network and identification of measures to be used to minimise traffic and access impacts. The traffic assessment would consider the movements of large equipment and large components as well as spoil and waste on the local and wider road network. The EIS would also consider management measures for traffic impacts on the road network.

8.6 Soil and Water Quality

8.6.1 Existing Environment

8.6.1.1 Soil

The proposal study area lies within the Murray Darling Depression, Riverina, and South Western Slopes bioregions. The geology of the proposed alignment varies across each bioregion.

The western part of the proposal study area is located within the Murray Darling Depression bioregion. This bioregion is located mainly on the Woorinen Formation which consists of unconsolidated red-brown medium to fine silty sand, red calcareous silty clay, sandy clay and clay pellet aggregates (DPIE, 2019).

The central section of the proposal study area is located within the Riverina bioregion, which covers the alluvial fans of the Lachlan, Murrumbidgee and Murray Rivers. This bioregion is dominated by river channels, floodplains, backplains, swamps, lakes and lunettes that are all of Quaternary age. Sandy soils and more saline heavy grey and brown clays towards the outer perimeter of the floodplains on the higher rarely flooded terraces are typically present (DPIE, 2016).

The eastern part of the proposal study area near Wagga Wagga is within the South Western Slopes bioregion. This bioregion is underlain by a very wide range of rock types including granite landscapes, sedimentary and volcanic rocks such as shale, phyllite or slate and limited areas of Tertiary basalt. The overall pattern of soils in these landscapes is one where shallow, stony soils are found on the tops of ridges and hills. Alluvial sands and loams are more common than clays in most parts of the landscape (DPIE, 2016).

The proposal study area encompasses many different land uses, however for the majority of the area it is anticipated that existing on-site contamination risks would be minimal. A search of the NSW contaminated land record for the Wentworth, Balranald, Murray River, Edward River, Hay, Murrumbidgee, Federation, Lockhart and Wagga Wagga LGAs identified no known contaminated sites within the proposal study area (NSW EPA, 2020). However, there is potential for localised contamination which is not currently identified on the register, including localised soil contamination from unregistered landfill, storage of agricultural chemicals, or sheep and cattle dips which are potential sources of arsenic and pesticide contamination.

There are no areas within the proposal study area mapped as likely to contain naturally occurring asbestos. The closest mapped naturally occurring asbestos is about 40 kilometres east of Wagga Wagga (NSW Trade & Investment, 2015).

Most of the proposal study area is mapped as having an extremely low probability or low probability of acid sulfate soils as per the CSIRO Acid Sulfate Soil Risk Mapping. However, there are several small areas with high probability of occurrence of acid sulfate soils, which are generally located where the land is at a lower elevation to the surrounding landscape or in places with a higher recurrence of water ponding (Douglas Partners, 2020).

8.6.1.2 Water quality

As discussed in section 7.6, several rivers and natural surface water bodies are present within the proposal study area. Water quality within the proposal study area is expected to be influenced by existing agricultural operations with substances such as pesticides, herbicides, fertilisers and sedimentation of waterways which may affect water quality.

8.6.2 Issues for Consideration

8.6.2.1 Soils

The main impacts on soils from the proposal would generally be from excavation works during construction. Soil disturbance activities may lead to erosion and sediment transfer offsite, which may result in potential sedimentation of surrounding land and drainage lines.

Where possible, spoil generated would be used on site to provide the required levels. Some excavated material may also be suitable for reuse for elements such as access tracks. This would be determined during the detailed design of the proposal. There may be excess spoil which is not suitable for reuse which will need to be disposed of offsite to an appropriately licenced facility.

The proposed substation works are expected to require substantial volumes of fill to achieve the required design specifications. Depending on the final detailed design and site levels, some fill may need to be imported to site to assist with achieving required levels on new access tracks.

Contamination may occur from hydrocarbon spills from the operation of plant, equipment and vehicles during construction. While it is anticipated that existing on-site contamination risks would be minimal, there is the potential that former land uses such as sheep and cattle dips or buried asbestos materials may be encountered.

During the operation of the new and upgraded substations as part of the proposal, there would be potential to release contaminants into the environment from hydrocarbon leaks / spills from machinery and oil filled equipment (such as the substation transformers). The final design would include oil spill containment systems in accordance with the legislation and standards.

8.6.2.2 Water Quality

Water quality impacts have the potential to occur during construction if fuel or chemical spills from construction activities enter waterways. If not managed appropriately, the introduction of pollutants could result in the following impacts to the water quality of the local waterways:

- > Changes to pH, electrical conductivity, dissolved oxygen and temperature
- > Reduced light penetration due to increased turbidity
- > Increased sediment load, organic matter and turbidity of water
- > Increase in gross pollutants
- > Introduction of toxic pollutants such as construction fuels, oils and grease and chemicals.

Potential erosion and sedimentation impacts may result from ground disturbance during construction activities, vegetation removal, and during storm events.

The establishment of access tracks may require crossing of various natural waterways. Many of these access tracks would need to be maintained during the operational stage of the proposal.

8.6.3 Method of Assessment

Geotechnical investigations would be undertaken to inform the design of the proposal and identify any necessary management measures for soil types encountered. The EIS would consider the risk of encountering contaminated soils during construction of the proposal. This would include a review of the site history, identification of current or historical contaminating activities and the potential for site sampling to confirm contamination or risks.

The EIS would also consider the potential impacts to water features and site run-off and identify mitigation measures to be applied to works to manage these potential impacts. The EIS will also consider the proposal's operational impacts related to managing and maintaining access tracks as well as substation related risks such as hydrocarbon leaks / spills from the transformers.

8.7 Waste Management and Resource Use

8.7.1 Existing Environment

The proposal study area is remote with limited access to waste management facilities. The eastern end of the proposal study area encompasses the Gregadoo Waste Management Centre. The Lockhart Community Recycling Centre is about 200 metres north of the proposal study area near the town of Lockhart.

8.7.2 Issues for Consideration

8.7.2.1 Waste Management

The construction of the proposal would result in a range of typical waste materials including:

- > Spoil from excavation and access track works
- > Surplus construction materials
- > Vegetation
- > General domestic waste from construction and maintenance personnel
- > Waste from construction compounds and workers camp/s.

Waste anticipated to be generated by the operation of the proposal would include general domestic waste from operation and maintenance personnel and minor levels of waste from maintenance activities (such as the replacement of fittings, equipment etc). The disposal of waste generated during the construction and operation of the proposal is not anticipated to result in significant adverse environmental impacts as removal of waste generated would be managed through the application of standard environmental management measures which would be identified as part of the EIS.

8.7.2.2 Resource Use

Resources used during the construction and operation of the proposal would include:

- > Water (construction and operational phases)
- > Electricity (construction and operational phases)
- > Fuel (construction and operational phases)
- > Concrete (primarily construction phase)
- > Steel (primarily construction phase).

While the proposal would result in some increased demand on local and regional resources, it would be unlikely that the proposal alone would result in any resource becoming scarce or in short supply.

8.7.3 Method of Assessment

The EIS would identify potential waste streams associated with construction and operation of the proposal and would include standard management practices compliant with the *Waste Avoidance and Resource Recovery Act 2001* and other relevant policies and guidelines.

9. Conclusions

The proposal is subject to assessment under Division 5.2 of the *Environmental Planning & Assessment Act 1979* and as such, this document supports an application seeking the SEARs for the EIS. In addition, the proposal has been declared CSSI under Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011*.

The key environmental assessment issues identified for the proposal, which would be assessed in more detail during the preparation of the EIS are:

- > Biodiversity
- > Aboriginal heritage
- > Non-Aboriginal heritage
- > Land use and property
- > Landscape character and visual amenity
- > Surface water, groundwater and hydrology
- > Noise and vibration.

Other issues requiring assessment but considered less likely to result in significant impacts, either based on lower likelihood of occurrence or absence of likely receptors, are as follows:

- > Bushfire risk
- > Socio-economic
- > EMF
- > Air quality and greenhouse gas
- > Traffic and access
- > Soil and water quality
- > Waste management and resource use.

As part of the preparation of the EIS, further assessment would be carried out in conjunction with the further development of the proposal design. In assessing the proposal, the key focus would be avoidance and minimisation of impacts on the environment and local communities, where reasonable and feasible, when taking into consideration engineering constraints and cost implications.

The assessment would identify mitigation and management measures to minimise impacts on the environment.

Consultation with affected property owners, stakeholders and the local community would continue throughout the EIS assessment, design and construction phases.

10. References

- Acil Allen, 2019. South Australia New South Wales Interconnector – Updated Analysis Of Potential Impact On Electricity Prices And Assessment Of Broader Economic Benefits.
- AEMO, 2018. Integrated System Plan.
- AEMO, 2020. Integrated System Plan.
- Bureau of Meteorology, 2020a. Australia Groundwater Explorer
- Bureau of Meteorology, 2020b. Atlas of Groundwater dependent ecosystems
- CEC, 2018. Clean Energy Council Community Engagement Guidelines
- DECCW, 2010a. Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010.
- DECCW, 2010b. Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW. Sydney: NSW Government.
- DECCW, 2011. Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW.
- Department of Environment and Heritage, 2020. Aboriginal Heritage Information Management System.
- Department of Planning and Environment, 2018 NSW Transmission Infrastructure Strategy.
- Department of Primary Industries, 2012. NSW Aquifer Interference Policy
- Douglas Partners, 2020. Acid Sulphate Soils and Naturally Occurring Asbestos Desktop Study Project EnergyConnect.
- DPE, 2017a. Draft Environmental Impact Assessment Guidance Series: Community Guide to EIA.
- DPIE, 2016. Bioregions of NSW.
- DPIE, 2019. eSpade NSW Soil and Land Information.
- ElectraNet, 2019. SA Energy Transformation RIT-T Project Assessment Conclusions Report.
- Heritage Office, 1996 and 2006. NSW Heritage Manual.
- IAP2, 2015. International Association for Public Participation (IAP2) Quality Assurance Standard
- ICOMOS, 2013. The Australian International Council on Monuments and Sites, Charter for Places of Cultural Significance (also known as the Burra Charter, Australian).
- International Commissioning on Non-Ionizing Radiation Protection (ICNIRP). 2010. Guidelines for limiting exposure to time-varying electric and magnetic fields (1Hz – 100kHz).
- NSW EPA, 2020. Contaminated Land Register.
- NSW Trade & Investment, 2015. Naturally Occurring Asbestos Map.
- TransGrid, 2015. Stakeholder Engagement Charter.
- TransGrid, 2019a. NSW Transmission Annual Planning Report 2019.
- TransGrid 2019b. Landholder Easement and Compensation Guide.

TRANSGRID

PRELIMINARY BIODIVERSITY ASSESSMENT

ENERGYCONNECT (NSW - EASTERN
SECTION)

AUGUST 2020



Question today *Imagine tomorrow* Create for the future

Preliminary Biodiversity Assessment EnergyConnect (NSW - Eastern Section)

TransGrid

WSP

Level 3, 51-55 Bolton St

Newcastle NSW 2300

PO Box 1162




Newcastle NSW 2300

Tel: +61 2 4929 8300

Fax: +61 2 4929 8382

wsp.com

REV	DATE	DETAILS
001	17/07/20	For TransGrid review
002	28/07/20	Updated for TransGrid review
003	20/08/20	Final

	NAME	DATE	SIGNATURE
Prepared by:	Clementine Watson	20/08/20	
Reviewed by:	Debbie Landenberger	20/08/20	
Approved by:	Toby Lambert	20/08/20	

This document may contain confidential and legally privileged information, neither of which are intended to be waived, and must be used only for its intended purpose. Any unauthorised copying, dissemination or use in any form or by any means other than by the addressee, is strictly prohibited. If you have received this document in error or by any means other than as authorised addressee, please notify us immediately and we will arrange for its return to us.



TABLE OF CONTENTS

GLOSSARY	V
ABBREVIATIONS	VIII
EXECUTIVE SUMMARY	IX
1 INTRODUCTION	1
1.1 BACKGROUND.....	1
1.2 OVERVIEW OF THE PROPOSAL	2
1.3 KEY TERMS.....	2
1.4 PURPOSE OF THE REPORT	2
2 METHODS	4
2.1 PERSONNEL	4
2.2 NOMENCLATURE	4
2.3 DATABASE AND LITERATURE REVIEW.....	5
3 EXISTING ENVIRONMENT	14
3.1 PLANT COMMUNITY TYPES.....	14
4 STATE LISTED THREATENED BIODIVERSITY	22
4.1 THREATENED ECOLOGICAL COMMUNITIES	22
4.2 THREATENED SPECIES	34
4.3 THREATENED AQUATIC SPECIES	35
4.4 FM ACT LISTED ENDANGERED ECOLOGICAL COMMUNITIES	36
4.5 NATIONAL PARKS, CONSERVATION AREAS AND STATE FORESTS	36
5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE	38
5.1 THREATENED ECOLOGICAL COMMUNITIES	38
5.2 THREATENED FLORA	40
5.3 THREATENED FAUNA	40
5.4 MIGRATORY BIRD SPECIES	40
5.5 WORLD AND NATIONAL HERITAGE.....	41

5.6	WETLANDS OF NATIONAL AND INTERNATIONAL IMPORTANCE.....	41
5.7	NATIONALLY IMPORTANT WETLANDS	41
5.8	RAMSAR WETLANDS	41
6	BIODIVERSITY CONSTRAINTS	42
7	FUTURE APPROACH.....	43
7.1	APPLICATION FOR NATIVE VEGETATION REGULATORY CATEGORY 1 MAPPED LAND EXEMPTION.....	43
7.2	NATIVE VEGETATION ASSESSMENT.....	43
7.3	THREATENED SPECIES SURVEYS.....	43
7.4	PRELIMINARY RECOMMENDATIONS FOR AVOIDANCE	44
8	CONCLUSION.....	45
9	LIMITATIONS	47
9.1	SCOPE OF SERVICES	47
9.2	RELIANCE ON DATA	47
9.3	ENVIRONMENTAL CONCLUSIONS	47
9.4	REPORT FOR BENEFIT OF CLIENT	47
9.5	OTHER LIMITATIONS.....	48
	REFERENCES.....	49

LIST OF TABLES

TABLE 2.1	CONTRIBUTORS AND THEIR ROLES.....	4
TABLE 2.2	DATABASE SEARCHES UNDERTAKEN	5
TABLE 2.3	LIKELIHOOD OF OCCURRENCE CRITERIA FOR THREATENED SPECIES AND POPULATIONS	7
TABLE 2.4	SURVEY SUMMARY WITHIN THE PROPOSAL STUDY AREA	8
TABLE 3.1	OVERVIEW OF NATIVE PLANT COMMUNITY TYPES WITHIN THE PROPOSAL STUDY AREA	15
TABLE 4.1	THREATENED ECOLOGICAL COMMUNITIES LISTED UNDER THE BC ACT AND ASSOCIATED PCTS	23

TABLE 4.2	THREATENED BC ACT FAUNA SPECIES RECORDED WITHIN THE PROPOSAL STUDY AREA DURING WSP TARGETED SURVEYS.....	35
TABLE 4.3	THREATENED AQUATIC SPECIES WITH MODERATE OR HIGHER LIKELIHOOD OF OCCURRENCE.....	36
TABLE 5.1	THREATENED ECOLOGICAL COMMUNITIES LISTED UNDER THE EPBC ACT AND ASSOCIATED PCTS.....	39
TABLE 5.2	THREATENED EPBC ACT FAUNA SPECIES RECORDED WITHIN THE PROPOSAL STUDY AREA DURING WSP TARGETED SURVEYS.....	40

LIST OF FIGURES

FIGURE 1.1	OVERVIEW OF ENERGYCONNECT	1
FIGURE 2.1	SCHEMATIC DIAGRAM ILLUSTRATING THE LAYOUT OF THE NESTED 20 X 50 M, 20 X 20 M AND 1 X 1 M SUB-QUADRATS USED FOR THE ASSESSMENT OF CONDITION ATTRIBUTES AT EACH SITE	9
FIGURE 4.1	ECOLOGICAL VALUES WITHIN PROPOSAL STUDY AREA	26

LIST OF APPENDICES

APPENDIX A	THREATENED FLORA LIKELIHOOD OF OCCURRENCE
APPENDIX B	THREATENED FAUNA LIKELIHOOD OF OCCURRENCE

GLOSSARY

Avoid	measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity. Refer to the BAM for operational guidance.
BioNet Atlas	the OEH database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the TSC Act) and some fish.
BioNet Vegetation Classification	the master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by OEH and available at www.environment.nsw.gov.au/research/Visclassification.htm .
Broad condition state	areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
BAM Credit Calculator	the computer program that provides decision support to assessors and proponents by applying the BAM, in particular by using the data required to be entered and the equations in Appendix 6 and Appendix 9 to calculate the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development site	an area of land that is subject to a proposed development application, application for approval.
Ecosystem credits	a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development site.
Habitat	an area or areas occupied, or periodically or occasionally occupied, by a species or ecological community, including any biotic or abiotic component.
High threat weed	plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	a living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground. Trees must be examined from all angles.
IBRA region	a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.
IBRA subregion	a subregion of a bioregion identified under the IBRA system.
Landscape attributes	in relation to a development site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site.

Local population	the population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Locality	a 20 kilometre radius surrounding the proposal in which threatened species database searches were conducted.
Minimise	a process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of development on biodiversity values.
Mitchell landscape	landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Patch size	<p>an area of intact native vegetation that:</p> <ul style="list-style-type: none"> a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or $\leq 30\text{m}$ for non-woody ecosystems). <p>Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site.</p>
Plant community type (PCT)	NSW plant community type identified using the PCT classification system.
Proposal	EnergyConnect (NSW – Eastern section)
Species credits	the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates.
Proposal study area	Typically, a one-kilometre wide corridor between Buronga substation and Wagga substation (with a broader section between Four Corners and Lockhart) to allow for ongoing design refinement.
Preliminary development footprint	<p>The term development footprint is typically used for the area of land that is to be directly impacted on by the construction and operation of a proposed development, including access roads, and areas used to store construction materials. This also includes the clearing footprint of the project.</p> <p>As the development footprint for the proposal is not yet finalised and will be refined in the EIS, a preliminary development footprint has been developed based on an indicative design, construction methodology and proposal study area to inform a preliminary assessment of impacts.</p>
Threatened ecological community	means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act.
Threatened species	critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.
Vegetation class	a level of classification of vegetation communities defined in Keith (2004). There are 99 vegetation classes in NSW.

Vegetation formation a broad level of vegetation classification as defined in Keith (2004). There are 16 vegetation formations and sub-formations in NSW.

Vegetation integrity the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.

ABBREVIATIONS

BAM	Biodiversity Assessment Methodology, as required for assessment under the <i>Biodiversity Conservation Act 2016</i> (BC Act) which commenced on 25 August 2017
BC Act	<i>Biodiversity Conservation Act 2016</i> (NSW) regulated by the NSW Government Environment, Energy and Science (ESS) (previously Office of Environment and Heritage)
BDAR	Biodiversity Development Assessment Report
DPIE	The NSW Department of Planning, Industry and Environment
DoAWE	Department of Agriculture, Water and the Environment. The department develops and implements national policy, programs and legislation to protect and conserve Australia's natural environment and cultural heritage and administers the EPBC Act. The Commonwealth Department of Agriculture, Water and the Environment was previously known as: <ul style="list-style-type: none">— Department of the Environment and Energy (DoEE)— Department of the Environment (DoE)— Department of Sustainability, Environment, Water, Population and Communities (SEWPAC)— Department of the Environment, Water, Heritage and the Arts (DEWHA).— Department of Environment and Heritage (DEH).— Department of the Environment and Water Resources (DEWR).
EEC	Endangered ecological community
EES	Office of Environment, Energy and Science (previously OEH). The department develops and implements state policy, programs and legislation to protect and conserve NSW's natural environment and cultural heritage and administers the BC Act. Is part of the NSW DPIE.
EIA	Environmental impact assessment
EIS	Environmental impact statement
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matter/s of National Environmental Significance (MNES) protected by a provision of Part 3 of the EPBC Act.
NSW	New South Wales
OEH	Office of Environment and Heritage
PCT	NSW plant community type (PCT) identified using the BioNet Vegetation Classification system.
TEC	Threatened ecological community

EXECUTIVE SUMMARY

TransGrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to north-west Victoria.

The current preferred option involves constructing a new high voltage electricity interconnector approximately 900 kilometres long between the power grids of SA (starting at Robertstown) and NSW (finishing in Wagga Wagga) with an added connection to north-west Victoria (Red Cliffs). Collectively, the proposed interconnector is known as EnergyConnect.

TransGrid is responsible for obtaining environmental planning approvals for the components located in NSW. The NSW components of EnergyConnect will be assessed in stages, starting with the western section, and then the eastern section. The EnergyConnect (NSW - Eastern Section) is the subject of this report and extends from Buronga to Wagga Wagga (referred to collectively as ‘the proposal’).

The proposal traverses a diverse range of native vegetation formations ranging from arid shrublands and semi-arid woodlands in the west to grassy woodlands in the east. It also spans areas of forested wetlands, freshwater and saline wetlands along with native grasslands, dry sclerophyll forests, open waterbodies and partially to wholly cleared agricultural land.

Based on a combination of broad scale vegetation mapping and preliminary field investigations within the proposal study area, several of the native plant community types (PCTs) identified are considered to form seven potential Threatened Ecological Communities (TECs) listed under the *Biodiversity Conservation Act 2016* (BC Act) and four ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Nine threatened fauna species listed on the BC Act were recorded within the proposal study area during preliminary field investigations. Three of these species are also listed on the EPBC Act, the Regent Parrot, Superb Parrot and Corben’s Long-eared Bat. In addition, preliminary field investigations and database searches have identified the following species with a moderate or higher likelihood of occurrence within the proposal study area:

- 37 threatened flora species listed under the BC Act
- 20 threatened flora species listed under the EPBC Act
- 73 threatened fauna species listed under the BC Act
- 26 threatened fauna species listed under the EPBC Act.

Desktop investigations identified six aquatic species listed as threatened under the FM Act and the EPBC Act that have the potential to occur within the proposal study area, however only within waterways which would be avoided and protected from direct impacts by the proposal.

Two marine bird species have been recorded within the proposal study area during preliminary field investigations. Additionally, desktop assessment and likelihood assessment identified 22 migratory and/or marine bird species, listed under the EPBC Act, with moderate or higher potential to occur within the proposal study area.

Other important biodiversity values identified within the proposal study area include National Parks, Nature Reserves, Protected Areas, wetlands and key fish habitat areas.

A Referral under the EPBC Act to the Commonwealth will be submitted at the same time as this report, and a Controlled Action determination is considered likely based on the preliminary field investigation and desktop assessment. The controlled action is in respect to likely unavoidable impacts to the following threatened EPBC listed entities are considered to likely be significantly impacted by the proposal include the following:

- Grey Box Grassy Woodlands and derived native grasslands
- Weeping Myall Woodlands
- Plains-wanderer
- Regent Parrot
- Superb Parrot.

1 INTRODUCTION

1.1 BACKGROUND

TransGrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to north-west Victoria. Collectively, the proposed interconnector is known as EnergyConnect. EnergyConnect aims to reduce the cost of providing secure and reliable electricity transmission between NSW and SA in the near term, while facilitating the longer-term transition of the energy sector across the National Electricity Market (NEM) to low emission energy sources.

The current preferred option for EnergyConnect involves constructing a high voltage electricity interconnector approximately 900 kilometres long between the power grids of SA (starting at Robertson) and NSW (finishing in Wagga Wagga), with a connection line to Red Cliffs in Victoria (refer to Figure 1-1).

EnergyConnect has been identified as a priority transmission proposal in the NSW Transmission Infrastructure Strategy (DP&E 2018), linking the SA and NSW energy markets and to assist in transporting energy from the South-West Energy Zone to major demand centres.



Figure 1.1 Overview of EnergyConnect

1.2 OVERVIEW OF THE PROPOSAL

TransGrid is responsible for obtaining environmental planning approvals for the EnergyConnect components located in NSW. The NSW components of EnergyConnect will be assessed in stages. The EnergyConnect (Eastern Section) is the subject of this report and extends from Buronga to Wagga Wagga (referred to as ‘the proposal’).

For the other sections located in western NSW, SA and in Victoria, reporting and environmental planning approvals are being prepared, and sought separately, under the relevant jurisdictions.

The proposal would involve the construction and operation of new high voltage (HV) electricity transmission lines, infrastructure and ancillary works between the existing Buronga substation and Wagga 330 kV substation. The key components of the proposal include:

- construction of about 540 kilometres of new double circuit transmission lines (minimum 330 kV) and associated infrastructure between the existing Buronga and Wagga substations;
- construction of a new substation about 170 kilometres west of Wagga Wagga (referred to as the Dinawan substation);
- an expansion and upgrade to the existing Wagga 330kV substation;
- establishment and upgrade of access tracks and roads, as required; and
- other ancillary works required to facilitate the construction of the proposal e.g. laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps.

The new transmission line structures would be up to 80 metres in height and spaced between 300 and 600 metres apart along the line. The extent of earthworks required for the proposal would be refined during detailed design. It is expected that construction of the proposal would commence in 2022 and take up to three years to complete. It is anticipated that operation of the proposal would occur in late 2024.

1.3 KEY TERMS

The following terms are discussed throughout this Preliminary Biodiversity Assessment Report and are defined as:

- **EnergyConnect:** An interconnector of approximately 900 kilometres between the power grids of SA and NSW, with an added connection to north-west Victoria.
- **the proposal:** EnergyConnect (NSW – Eastern Section) i.e. the components of EnergyConnect from the existing Buronga substation to the Wagga substation.
- **proposal study area:** the proposal study area generally comprises a one-kilometre wide corridor between the Buronga substation and Wagga substation, with a broader section between Four Corners and Lockhart to allow for ongoing design refinement (refer Figure 3-1).
- **proposal locality:** A 20 kilometre radius surrounding the proposal in which threatened species database searches were conducted.

1.4 PURPOSE OF THE REPORT

This Preliminary Biodiversity Assessment (this report) has been prepared by WSP Australia Pty Ltd on behalf of TransGrid to inform the Environmental Scoping Report for the EnergyConnect (NSW – Eastern Section).

The purpose of this report is to present preliminary biodiversity findings within the proposal study area based on desktop assessment and preliminary field validation, including the biodiversity constraints requiring assessment and/or

consideration for the proposal under the relevant NSW and Commonwealth legislation (including matters of national environmental significance (MNES)).

This report also identifies potential data gaps and seasonal survey requirements that pose potential issues that would likely need to be addressed as part of a Biodiversity Development Assessment Report (BDAR) that will be prepared to support an Environmental Impact Statement (EIS) for the proposal. The BDAR will be prepared in accordance with the Biodiversity Assessment Method 2017 (BAM) and *Biodiversity Conservation Act 2016* (BC Act). This BDAR will be informed by further field surveys that will be undertaken in 2020 and 2021.

2 METHODS

The following chapter outlines the methods used to compile known or predicted biodiversity values within the proposal study area. All work for this report was carried out under the appropriate licences, including a scientific licence as required under Part 2 of the BC Act (License Number: SL100630) and an Animal Research Authority (TRIM 18/195) issued by the Department of Primary Industries (Agriculture).

2.1 PERSONNEL

The contributors to the preparation of this report, their qualification and roles are provided below in Table 2.1.

Table 2.1 Contributors and their roles

Name	Qualifications	Role
Alex Cockerill	BSc (Hons), accredited BAM assessor BAAS17020	Principal Ecologist – technical review and field surveys
Toby Lambert	BEnvSc, accredited BAM assessor BAAS17046	Principal Ecologist – technical review
Debbie Landenberger	BSc (Hons) Accredited BAM assessor BAAS18187	Principal Ecologist – technical review
Mark Stables	BSc (Hons), accredited BAM assessor BAAS18097	Principal Ecologist – field surveys
Josie Stokes	BSc	Principal Ecologist – field surveys
Tanya Bangel	BSc (Hons), DipConsLdMgt accredited BAM assessor BAAS18076	Senior Ecologist – field surveys
Allan Richardson	BSc (Hons)	Senior Ecologist – field surveys
Julia Emerson	BSc, accredited BAM assessor BAAS18034	Ecologist – field surveys
Troy Jennings	BSc, Dip Wildlife Mgt	Ecologist – field surveys
Gavin Shelley	BEnvScMgt	Ecologist – field surveys
Clementine Watson	BEnvScMgt, accredited BAM assessor BAAS18164	Ecologist – report preparation
Trent Bowman	BSc (Hons), Masters of Science (Geoscience)	GIS Consultant – mapping and data management
Robert Suansri	BSc (GIS)	GIS Consultant – spatial data management and figure preparation

2.2 NOMENCLATURE

Names of vegetation communities used in this report are based on the Plant Community Type (PCT) used in the NSW BioNet Vegetation Classification Database (Office of Environment & Heritage, 2019a).

These names are cross-referenced with those used for threatened ecological communities listed under the BC Act and/or the EPBC Act. They are also cross-referenced with previous vegetation mapping (Office of Environment & Heritage, 2016a-c) using dominant species and structure of the community.

Names of plants used in this document follow PlantNet (Royal Botanic Gardens, 2019). Scientific names are used in this report for species of plant. The names of introduced species are denoted with an asterisk (*).

For threatened species of plants, the names used in the BioNet Atlas of NSW Wildlife (Office of Environment & Heritage, 2019b) are also provided where these differ from the names used in the PlantNet database.

Names of vertebrate fauna follow the Australian Faunal Directory maintained by the Department of Environment and Energy (2019a). Common names are used in the report for species of animal. Both common and scientific names are provided in appendices.

For threatened species of animals, the names used in the BioNet Atlas of NSW Wildlife and NSW Department Primary Industries (Office of Environment & Heritage, 2019b) are provided.

2.3 DATABASE AND LITERATURE REVIEW

2.3.1 DATABASE SEARCHES

The aim of the database searches was to identify threatened flora and fauna species, populations and ecological communities, Commonwealth listed Migratory species or critical habitat recorded previously or predicted to occur near the proposal study area.

This allowed for known habitat characteristics of to be compared with those present within the proposal study area to determine the likelihood of occurrence of each species or populations. These results informed the identification of appropriate field survey effort and the groups likely to occur.

Records of threatened species, populations and ecological communities known or predicted to occur in the locality of the proposal study area were obtained from a range of databases as detailed in Table 2.2.

Table 2.2 Database searches undertaken

DATABASE	SEARCH DATE	AREA SEARCHED	REFERENCE
Bionet Atlas of NSW Wildlife	29/05/2019, 18/03/2020, and 08/07/2020	20km search around the proposal study area	(Office of Environment & Heritage 2019b) (Office of Environment Energy and Science, 2020b)
Atlas of Living Australia	29/05/2019, 18/03/2020 and 08/07/2020	Locality search around the proposal study area	(Atlas of living Australia 2019) (Atlas of Living Australia., 2020)
Protected Matters Search Tool	16/05/2019, 18/03/2020 and 08/07/2020	20km search around the proposal study area	(Department of the Environment and Energy 2019b) Department of Agriculture, Water and the Environment (2020)
NSW Department of Primary Industries Critical Habitat register	29/05/2019 and 18/03/2020	Search of the register	(Department of Primary Industries 2019b) (Department of Environment and Energy, 2020b)
NSW Office of Environment and Heritage Critical Habitat register	29/05/2019 and 18/03/2020	Search of the register	(Office of Environment and Heritage 2019c) (Office of Environment Energy and Science, 2020a)

2.3.2 LITERATURE AND SPATIAL DATA REVIEW

The background research included analysis of the following information sources:

- Aerial photographic imagery (Land and Property Information, 2019a)
- NSW Mitchell Landscapes (Land and Property Information, 2019b)
- Interim Biogeographic Regionalisation of Australia (IBRA version 7.0) (Department of Environment & Energy 2016)
- Atlas of Groundwater Dependent Ecosystems (GDE) (Australian Bureau of Meteorology 2019)
- Directory of Important Wetlands of Australia (Department of Environment & Energy 2019b)
- Register of Declared Areas of Outstanding Biodiversity Value – Critical habitat declarations in NSW (Office of Environment & Heritage 2019c)
- State Vegetation Type Map: Riverina Region Version v1.2 – VIS_ID 4469 (Office of Environment & Heritage 2016b)
- State Vegetation Type Map: Central West/Lachlan Region Version v1.3 – VIS_ID 4468 (Office of Environment & Heritage 2016c)
- State Vegetation Type Map: Western Region Version v1.0 – VIS_ID 4492 (Office of Environment & Heritage 2016d)
- BioNet Threatened Species Profile Database (Office of Environment & Heritage 2019b)
- Species Profiles and Threats Database (Department of the Environment and Energy 2019b)
- Atlas of Living Australia – interactive map search (Atlas of living Australia 2019).

A review of project specific documentation including:

- Project EnergyConnect - EPBC Act Protected Matters Significant Impact Assessment - SA / NSW Border to Buronga, Draft (Jacobs, 2019a).
- Preliminary Ecological Constraints Assessment prepared for ElectraNET and TransGrid. (Jacobs 2019b)
- Preliminary Biodiversity Assessment, EnergyConnect (NSW - western section) prepared for TransGrid (WSP, 2020).

2.4 LIKELIHOOD OF OCCURRENCE ASSESSMENT

An assessment was completed to assess the likelihood of occurrence of each threatened species, population and community (threatened biodiversity) identified with the potential to occur in the proposal study area. All threatened biodiversity identified during background research were considered (see Section 2.3). Preliminary field surveys and habitat assessments were also utilised to inform the likelihood of occurrence assessment. Assessments were also based on the habitat profile for the species and other habitat information in the Threatened Species Profile Database (Office of Environment and Heritage, 2019b) and the Species Profile and Threats Database (Department of the Environment and Energy, 2019b). The assessment also included consideration of the dates and locations of nearby records and information about species populations in the locality. The assessment results are summarised in sections 4 and 5 and are provided in full in Appendix A and Appendix B.

For this study, the likelihood of occurrence of threatened and migratory species and populations was determined based on the criteria shown in Table 2.3 below.

Table 2.3 Likelihood of occurrence criteria for threatened species and populations

Classification	Definition
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowing resources), has been recorded recently within the locality (20 km) and is known or likely to maintain resident populations in the study area. Also, includes known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present within the proposal study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependant (i.e. for breeding or important life cycle periods such as winter flowing resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the proposal study area and has not been recorded recently in the locality (20 km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local areas, meaning that the species is not dependant (i.e. for breeding or important life cycle periods such as winter flowing resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specially targeted by surveys and not recorded.
None	Suitable habitat is absent from study area

2.5 NATIVE VEGETATION REGULATORY ASSESSMENT

In accordance with section 6.8 (3) of the BC Act, the BAM is to exclude the assessment of impacts of any clearing of native vegetation and loss of habitat on Category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013*), other than any impacts prescribed by the regulations under section 6.3.

Category 1-exempt land has not currently been mapped for use in NSW and as such native vegetation regulatory mapping has been determined based on an analysis of the following datasets:

- Historical and current land use component - NSW Land use 2013 (<https://data.nsw.gov.au/data/dataset/nsw-landuse-Office of Environment and Heritage 20183>). This dataset is used to classify areas as either cleared/highly disturbed, impacted affected areas of native vegetation and undisturbed or protected areas of native vegetation; and
- Detectable woody vegetation clearing component - NSW Woody Vegetation Extent 2011 (<https://datasets.seed.nsw.gov.au/dataset/nsw-woody-vegetation-extent-2011c0569>). This dataset is used to identify areas of extant remnant vegetation and cleared lands/non-woody vegetation.

The native vegetation regulatory Category 1-exempt land within the proposal study area will be identified and mapped through desktop modelling and will need an application to NSW Office Environment, Energy and Science (NSW EES) for the identification of Category 1 land to be excluded from the BAM.

2.6 FIELD SURVEY

Multiple survey sessions have been conducted within the proposal study area, with the main focus to field validate native vegetation communities as well as fauna habitats. WSP has been engaged to complete more detailed surveys for other sections of EnergyConnect, and these have currently been conducted mainly within the EnergyConnect (NSW – Western Section), and then between the areas of Buronga to Balranald Which is relevant to this proposal. Due to the close proximity of the Western Section to the Eastern Section proposal study area, some of the field survey data collected for that section is considered relevant and referred to in this report. Where there has been limited accessibility in sections, broadscale mapping and desktop assessment has been relied on for this report. Overall, substantially more targeted field survey will be occurring in 2020 and into 2021 by WSP to inform the future EIS for the proposal.

Table 2.4 summarises the field surveys that have been completed so far within the proposal study area.

Table 2.4 Survey summary within the proposal study area

SURVEY DATES	LOCATION	SURVEY TYPE
18 May – 3 June 2019	Buronga to Wagga Wagga (preliminary surveys part of options selection and only portions of the proposal study area)	Rapid data points Targeted threatened flora surveys Vegetation mapping
25 November - 5 December 2019	SA/NSW border to Wagga Wagga (EnergyConnect NSW Western and Eastern sections)	Rapid data points BAM plots Targeted threatened flora surveys Vegetation mapping Habitat assessments Targeted amphibian surveys Targeted bird surveys Targeted bat surveys (harp trapping and Anabats) Camera trapping installation
10 – 20 February 2020	Buronga to Balranald (portions of the proposal study area)	Rapid data points Vegetation mapping BAM Plots Targeted threatened flora surveys Habitat assessments Targeted bat surveys (harp trapping and Anabats) Targeted amphibian surveys Nest box installation Camera trapping

A description of each survey method is described below.

2.6.1 VEGETATION SURVEYS

2.6.1.1 RAPID DATA POINTS

Rapid data points (RDPs) recorded the following:

- dominant exotic and native plant species present
- percent cover of native groundcover
- photograph of each location
- assessment of vegetation against threatened ecological community Scientific Determinations and EPBC Act condition thresholds
- threatened flora and/or fauna species identified
- other opportunistic fauna sightings including any significant fauna habitat resources (such as tree hollow, rock piles and cracks and fissures present in wooden poles).

2.6.1.2 VEGETATION MAPPING

Vegetation within the proposal study area had been previously mapped at the regional scale by broad-scale vegetation mapping.

Field validation (ground-truthing) of the existing vegetation classifications undertaken by regional vegetation mapping was completed to confirm the vegetation structure, dominant canopy species, native diversity, condition and presence of threatened ecological communities. Field data was compared and analysed against the regional vegetation mapping (State Vegetation Types, Riverina Region Version v1.2, Central West/Lachlan Region Version v1.3 – VIS_ID 4468 and Western Region Version v1.0 – VIS_ID 4492, Office of Environment & Heritage 2016b, 2016c, 2016d) key diagnostic species to confirm each vegetation type.

Field verification of the vegetation type, class and formation was used to identify vegetation zones and conditions in accordance with the BAM and NSW BioNet Vegetation Classification Database (Office of Environment & Heritage, 2019).

2.6.1.3 BAM VEGETATION INTEGRITY PLOTS

Quantitative (quadrat/transect) vegetation integrity surveys (Figure 2.1 (Office of Environment & Heritage, 2017)) were undertaken in accordance with BAM and methodology described below

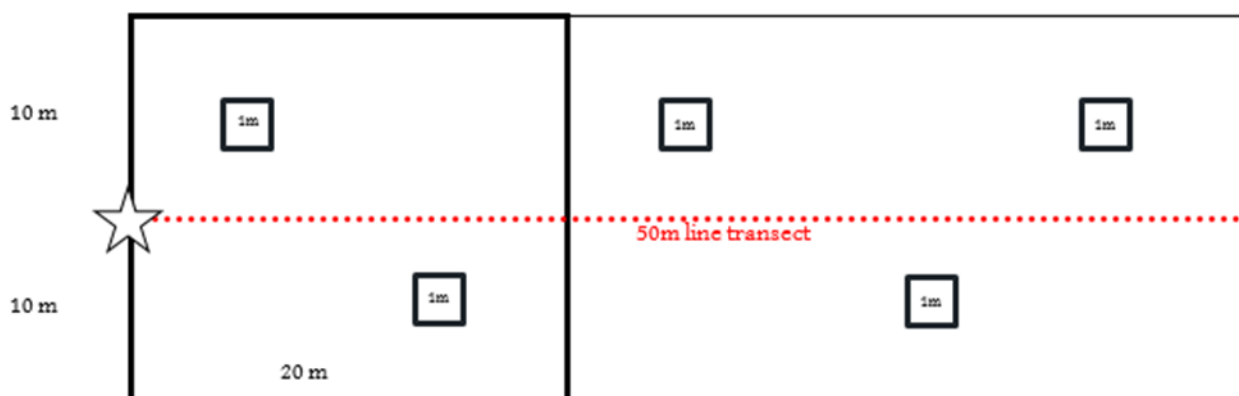


Figure 2.1 Schematic diagram illustrating the layout of the nested 20 x 50 m, 20 x 20 m and 1 x 1 m sub-quadrats used for the assessment of condition attributes at each site

The following site attributes were recorded at each site:

- **Location** (easting – northing grid type MGA 94, Zone 56).
- **Vegetation structure and dominant species and vegetation condition.** Vegetation structure was recorded through estimates of percentage foliage cover, average height and height range for each vegetation layer.
- **Native and exotic species richness** (within a 400 m² quadrat): This consisted of recording all species by systematically walking through each 20 x 20 m quadrat. The cover and abundance (percentage of area of quadrat covered) of each species was estimated. The growth form, stratum/layer and whether each species was native/exotic/high threat weed was also recorded.
- **Number of trees with hollows** (1,000 m² quadrat): This was the frequency of hollows within living and dead trees within each 50 x 20 m quadrat. A hollow was only recorded if (a) the entrance could be seen: (b) the estimated entrance width was at least 5 cm across: (c) the hollow appeared to have depth: (d) the hollow was at least 1 m above the ground and the (e) the centre of the tree was located within the sampled quadrat.
- **Number of large trees and stem size diversity** (1,000 m² quadrat): tree stem size diversity was calculated by measuring the diameter at breast height (DBH) (i.e. 1.3 m from the ground) of all living trees (>5 cm DBH) within each 50 x 20 m quadrat. For multi-stemmed living trees, only the largest stem was included in the count. Number of large trees was determined by comparing living tree stem DBH against the PCTs benchmarks.
- **Total length of fallen logs** (1,000 m² quadrat): This was the cumulative total of logs within each 50 x 20 m quadrat with a diameter of at least 10 cm and a length of at least 0.5 m.
- **Litter cover:** This comprised estimating the average percentage groundcover of litter (i.e. leaves, seeds, twigs, branchlets and branches with a diameter <10 cm which is detached from a living plant) from within five 1 x 1 m sub-plots spaced evenly either side of the 50 m central transect.
- **Evaluation of regeneration:** This was estimated as the presence/absence of overstorey species present at the site that was regenerating (i.e. saplings with a diameter at breast height ≤5 cm).

2.6.1.4 VEGETATION CONDITION

The overall condition of vegetation was assessed through general observation and analysis of Rapid Data Point floristic data. The quality of vegetation was assessed using parameters including community structure, native and exotic species diversity, native versus exotic species abundance, evidence of physical disturbance, and plant health.

Three categories were used to describe the condition of vegetation communities:

- **Good:** Vegetation still retains the species complement and structural characteristics of the pre-European equivalent. Such vegetation has usually changed very little over time and displays resilience to weed invasion due to intact groundcover, shrub and canopy layers.
- **Moderate:** Vegetation generally still retains much of its structural integrity but has been disturbed and has lost some component of its original species complement. Weed invasion can be significant in such remnants; this category includes derived shrublands and grasslands which are likely to be capable of natural regeneration to near-natural condition in the absence of on-going human disturbance and with minimal intervention.
- **Poor:** Vegetation that has lost most of its species and is significantly modified structurally. Often such areas have a discontinuous canopy of the original tree cover, with very few shrubs. Exotic species, such as introduced pasture grasses or weeds, replace much of the indigenous ground cover. Environmental weeds are often co dominant with the original indigenous species. This category includes vegetation that is unlikely to be capable of natural regeneration to near-natural condition without substantial and ongoing intervention such as weed control, seeding and revegetation

2.6.2 TARGETED FLORA SURVEYS

Targeted threatened flora surveys have included several methods - a description of each is described below.

Due to the large-scale of the proposal and drought conditions within the proposal study area, a systematic approach was taken, and three distinct survey techniques were used. Additional surveys in 2020 and 2021 will continue to add to the coverage of the proposal study area to enable detailed assessment.

2.6.2.1 RANDOM MEANDER

Random meander transects were completed in accordance with the technique described by Cropper (1993) whereby the recorder walks in a meandering pattern throughout the site. Attributes recorded during random meander transects included variation in species composition and vegetation structure, the presence or absence of threatened or priority weed species of plant and boundaries between vegetation communities.

2.6.2.2 PARALLEL FIELD TRANSVERSES

Parallel field transverses were used in vegetation types which were considered the most suitable habitat for non-drought affected threatened species. This involved two senior botanists walking on a fixed bearing at 30 metres apart, covering 60 metres each side of the centreline of the proposal study area that allowed for a total coverage of a 120-metre corridor. This approach was applied to PCT 171 - Spinifex linear dune Mallee mainly of the Murray Darling Depression Bioregion which provided the most likely habitat to detect woody persistent threatened species that could be reliably surveyed during extreme drought conditions. Based on this rationale, all patches of this vegetation type were subject to this technique and searched along a grid of parallel field transverses.

2.6.2.3 REPRESENTATIVE PARALLEL FIELD TRAVERSES

Representative sampling of one-kilometre sections of the centreline of the proposal study area was undertaken in vegetation types which habitat considered moderately suitable for non-drought affected threatened species. This approach was considered appropriate given parallel field transverses across all areas of associated habitat within the centreline of the proposal study area was impractical. This involved two senior botanists walking on a fixed bearing at 30 metres apart, covering 60 metres each side of the centreline of the proposal study area that allowed for a total coverage of a 120-metre corridor for one-kilometre representative sections.

Vegetation types subject to this technique included:

- PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
- PCT 170 - Chenopod sandplain Mallee woodland/shrubland of the arid and semi-arid (warm) zones
- PCT 172 - Deep sand Mallee of irregular dune fields of the semi-arid (warm) zone

For vegetation types considered unlikely to provide habitat for non-drought affected threatened species, representative sampling of 500 metre sections of other vegetation types were undertaken using the same method.

2.6.3 TARGETED FAUNA SURVEYS

2.6.3.1 TARGETED BIRD SURVEYS

Targeted bird surveys were completed using the standard 20 minute search within a 2 hectare area methodology as described by Threatened birds – Survey Guidelines for Australia's Threatened Birds (Department of the Environment Water Heritage and the Arts, 2010b). Surveys were generally completed in areas considered to have habitat for predicted threatened bird species. As far as practicable, bird surveys were completed during periods of high bird activity predominately, early morning or late afternoon, and optimum season. All birds were identified to the species level, either through direct observation or identification of calls.

2.6.3.2 TARGETED BAT SURVEYS

HARP TRAPPING

Harp trapping has been completed within some sections of the proposal study area. The harp-traps were generally set at the edge of an ecotone to maximise trapping success and harp-traps were checked every hour, commencing one hour after dusk. Captured bats were identified to species level, sexed, measured and weighed. Bats were released immediately after processing during the night. Reference calls were taken for some species on their release after processing.

For Commonwealth listed microbats considered likely to occur (e.g. Corben's Long-eared Bat) the intent of the '*Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*' (Department of Environment Water Heritage and the Arts, 2010) was followed.

As the proposal study area exceeds 50 hectares, the recommended 20 trap nights over five (5) traps nights could not be completely achieved for Corben's Long-eared Bat. In accordance with the survey guidelines for Corben's Long-eared on large projects with landscape complexity harp-traps and Anabats were distributed strategically to provide good representation within the major habitat types. Harp-trapping surveys were undertaken on warm nights within the optimum seasonal requirements (October-April).

ANABAT BAT DETECTION

Passive ultrasonic bat detection was used with up to three Anabat Express (Titley Scientific) units deployed at each survey location within the proposal study area for the entire night (a minimum of six hours) starting at dusk for two nights. This was to record and identify the echolocation calls of microchiropteran bats foraging within and adjacent to the proposal study area. Anabat Express units were placed where bat activity was expected to be higher, based on potential foraging and/or roosting habitats being present.

The ZCA files (full night zero crossing analysis) recorded using the Anabat Express detectors were converted to zc sequence files using Anabat Insight (version 9.1) for analysis and to add metadata (e.g. species label, site identification etc). Calls were identified using zero-crossing analysis in both Analook W (version 4.9) and Anabat Insight (version 9.1) by visually comparing the time-frequency graph and call characteristics (e.g. characteristic frequency and call shape) with reference calls and/or species call descriptions from available reference material.

The Bat calls of NSW: Region based guide to the echolocation calls of microchiropteran bats (Pennay, Law, & Reinhold, 2004) was used to assist call analysis. Call identification was also assisted by consulting distribution information for potential species (Churchill, 2008; Pennay et al., 2011; Van Dyke et al., 2013) and records from the Atlas of NSW Wildlife (OEH, 2019c).

During roost watches and spotlighting surveys, an EchoMeter Touch (Wildlife Acoustics, USA) was used to actively record calls of emerging and foraging microbats as well as reference calls for some species. Calls were identified using zero-crossing analysis and full-spectrum in Anabat Insight (version 9.1).

2.6.3.3 TARGETED AMPHIBIAN SURVEYS

Survey methodologies used to target potential threatened amphibians within the proposal study area included the following;

- systematic diurnal habitat search, identifying appropriate potential habitat for night surveys (one hour per stratification unit)
- nocturnal surveys within identified potential habitat i.e. damp and watery sites (30 minutes on two separate nights)
- nocturnal watercourse searches (two hours per 200 metres of water body edge)
- nocturnal Call playback survey methodologies were also used where appropriate habitat was identified.

Survey methodologies used were in accordance with the *Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians* (Department of Environment and Climate Change, 2009) (Department of the Environment Water Heritage and the Arts, 2010a).

Due to limitations to some private property and chronic drought conditions, targeted surveys for threatened frog species were unable to be undertaken in accordance with Commonwealth survey guidelines in most locations. Instead opportunistic surveys were undertaken around farm dams and waterways.

2.6.3.4 SPOTLIGHTING

Spotlighting surveys were completed on foot by four ecologists, targeting arboreal, flying and large ground-dwelling mammals, as well as nocturnal birds, reptiles and amphibians. At least one-person hour of survey effort was completed per site.

2.6.3.5 OPPORTUNISTIC RECORDING OF FAUNA SPECIES AND EVIDENCE OF FAUNA ACTIVITY

Opportunistic sightings of animals were recorded during field surveys. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows etc., was also noted. This provided indirect information on animal presence and activity.

During these surveys, a hand-held GPS was used to record the locations of:

- hollow-bearing trees
- aquatic habitat
- rock outcrops.

2.6.3.6 FAUNA HABITAT ASSESSMENT

Fauna habitat assessments were completed to assess the likelihood of species of animal occurring in the proposal study area. Habitat assessments included the assessment and identification of habitat features through targeted meander surveys at specific span locations, structures and access tracks where works are proposed.

Opportunistic recordings of species were made through incidental sightings, aural recognition of calls and observations of indirect evidence of species presence (such as feeding signs, scratchings, nests/dreys, whitewash, owl pellets, burrows and scats). This provided supplementary information on faunal species presence.

Fauna habitats were assessed generally by examining characteristics such as the structure and floristics of the canopy, understorey and ground vegetation, the structure and composition of the litter layer, and other habitat attributes important for feeding, shelter roosting and breeding. The following criteria were used to evaluate habitat values:

- **Good:** a full range of fauna habitat components are usually present (for example, old growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact.
- **Moderate:** some fauna habitat components are missing (for example, old-growth trees and fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
- **Poor:** many fauna habitat elements in low quality remnants have been lost, including old growth trees (for example, due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive past clearing.

3 EXISTING ENVIRONMENT

An overview of the existing environment has been undertaken based on a combination of broad scale State vegetation mapping, threatened species database searches, literature review and interim field survey results.

3.1 PLANT COMMUNITY TYPES

The proposal study area has been identified to traverse a diverse range of native vegetation types including 10 broad NSW vegetation formations, being:

- grassy woodlands
- grasslands
- dry sclerophyll forests (shrubby sub-formation)
- freshwater wetlands
- forested wetlands
- saline wetlands
- semi-arid woodlands (grassy sub-formation)
- semi-arid woodlands (shrubby sub-formation)
- arid shrublands (acacia sub-formation)
- arid shrublands (chenopod sub-formation).

Based on a combination of broad scale vegetation mapping and limited field validation these 10 vegetation formations are identified to contain a total of 54 native PCTs. An overview of each PCT, its associated vegetation formation, class, threat status, estimated historical percentage cleared (previously in the area) is presented in Table 3.1. Note that as surveys in 2020 and 2021 progress, detailed PCT mapping and impact calculations can be completed for the entire proposal study area.

Table 3.1 Overview of native plant community types within the proposal study area

VEGETATION TYPE	VEGETATION CLASS	BC ACT ¹	EPBC ACT ²	FM ACT ³	% CLEARED	RECORDED WITHIN PROPOSAL STUDY AREA
Grassy woodlands						
PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt	Floodplain Transition Woodlands	-	-		65	Present
PCT 74 - Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion ⁵		Endangered / SAI	Critically Endangered		73	Present
PCT 80 - Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion ⁶		Endangered	Endangered		83	Present
PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone ⁶					73	Present
PCT 266 - White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion ⁵	Western Slopes Grassy Woodlands	Endangered / SAI	Critically Endangered		94	Present
PCT 276 - Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion ⁵					90	Present
PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion ⁵					94	Present

VEGETATION TYPE	VEGETATION CLASS	BC ACT ¹	EPBC ACT ²	FM ACT ³	% CLEARED	RECORDED WITHIN PROPOSAL STUDY AREA
Grasslands						
PCT 44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Riverine Plain Grasslands	-	-		73	Present
PCT 45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion		-	-		60	Present
PCT 46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Riverine Plain Grasslands	-	-		20	Present
PCT 250 - Derived tussock grassland of the central western plains and lower slopes of NSW	Western Slopes Grasslands	-	-		0	Present
Dry Sclerophyll Forests (Shrubby sub-formation)						
PCT 346 - White Box - Blakely's Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion	Western Slopes Dry Sclerophyll Forests	-	-		60	Present
Freshwater wetlands						
PCT 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Shrublands	-	-		63	Present
PCT 24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains		-	-		20	Present
PCT 53 - Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluvial plains and floodplains		-	-		67	Present
PCT 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains		-	-		28	Present

VEGETATION TYPE	VEGETATION CLASS	BC ACT ¹	EPBC ACT ²	FM ACT ³	% CLEARED	RECORDED WITHIN PROPOSAL STUDY AREA
PCT47 - Swamp grassland wetland of the Riverine Plain	Inland Floodplain Swamps	-	-		50	Present
PCT182 Cumbungi rushland wetland of shallow semi-permanent water bodies and inland watercourses		-	-		25	Present
Forested wetlands						
PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.	Inland Riverine Forests	-	-	Endangered	40	Present
PCT 7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	Inland Riverine Forests	-	-	Endangered	15	Present
PCT 8 River Red Gum - Warrego Grass - Couch Grass riparian tall woodland wetland of the semi-arid (warm) climate zone (Riverina Bioregion and Murray Darling Depression Bioregion)		-	-		17	Present
PCT 9 - River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion		-	-		66	Present
PCT 10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)		-	-		43	Present
PCT 11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)		-	-		42	Present
PCT 249 - River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW		-	-		50	Present

VEGETATION TYPE	VEGETATION CLASS	BC ACT ¹	EPBC ACT ²	FM ACT ³	% CLEARED	RECORDED WITHIN PROPOSAL STUDY AREA
Saline wetlands						
PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone	Inland Saline Lakes	-	-		36	Present
PCT 166 - Disturbed annual saltbush forbland on clay plains and inundation zones mainly of south western NSW		-	-		34	Present
Semi-arid Woodlands (Grassy sub-formation)						
PCT 13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands	-	-	Endangered	57	Present
PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)		-	-	Endangered	50	Present -
PCT 16 - Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)		-	-	Endangered	50	Present
PCT 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion ⁷	Riverine Plain Woodlands	Endangered	Endangered		90	Present
Semi-arid Woodlands (Shrubby sub-formation)						
PCT 19 - Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains ⁸	Riverine Sandhill Woodlands	Endangered	-		70	Present
PCT 20 - Buloke - Moonah - Black Box open woodland on sandy rises of semi arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) ⁹		Endangered	Endangered		88	Present -

VEGETATION TYPE	VEGETATION CLASS	BC ACT ¹	EPBC ACT ²	FM ACT ³	% CLEARED	RECORDED WITHIN PROPOSAL STUDY AREA
PCT 21 - Slender Cypress Pine - Sugarwood - Western Rosewood open woodland on sandy rises mainly in the Riverina Bioregion and Murray Darling Depression Bioregion ⁸		Endangered	-		80	Present
PCT 23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones			-		71	Present
PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone ⁹		Endangered	-		73	Present
PCT 57 - Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion ¹⁰	Semi-arid Sand Plain Woodlands	Endangered	-		43	Present
PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion ¹⁰		Endangered	-		50	Present
PCT 252 - Sugarwood open woodland of the inland plains mainly Murray Darling Depression Bioregion		-	-		50	Present
PCT 75 - Yellow Box - White Cypress Pine grassy woodland on deep sandy-loam alluvial soils of the eastern Riverina Bioregion and western NSW South Western Slopes Bioregion ⁵	Riverine Sandhill Woodlands	Endangered	-		92	Present
PCT 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Sand Plain Mallee Woodlands	-	-		41	Present
PCT 171 - Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Dune Mallee Woodlands	-	-		19	Present
PCT172 - Deep sand mallee of irregular dunefields of the semi-arid (warm) zone		-	-		1	Present
PCT 185 - Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	Inland Rocky Hill Woodlands	-	-		20	Present

VEGETATION TYPE	VEGETATION CLASS	BC ACT ¹	EPBC ACT ²	FM ACT ³	% CLEARED	RECORDED WITHIN PROPOSAL STUDY AREA
PCT 319 - Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Inland Rocky Hill Woodlands	-	-		60	Present
Arid Shrublands (Acacia sub-formation)						
PCT 143 - Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes ⁹	Sand Plain Mulga Shrublands	Endangered	-		30	Present
PCT 229 - Derived mixed shrubland on loamy-clay soils in the Cobar Penepplain Bioregion	North-west Plain Shrublands	-	-		0	Present
Arid Shrublands (Chenopod sub-formation)						
PCT 157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Riverine Chenopod Shrublands	-	-		60	Present
PCT 159 - Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)		-	-		92	Present
PCT 163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones		-	-		26	Present
PCT 216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion		-	-		0	Present
PCT 236 - Derived Giant Redburr low shrubland on alluvial plains of the semi-arid (warm) climate zone		-	-		0	Present
PCT 153 - Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones ⁹	Aeolian Chenopod Shrublands	Endangered	-		40	Present

- 1) Endangered, and SAII = Serious and Irreversible Impact under the *Biodiversity Conservation Act* (BC Act)
- 2) Endangered and Critically Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act).
- 3) Endangered = potential to be an Endangered Ecological Aquatic Community under the *Fisheries Management Act* (FM Act)
- 4) Recorded by either WSP field verification or using broad scale mapping (Office of Environment and Heritage, 2016b, 2016c, 2016d).

- 5) Listed as White Box Yellow Box Blakely's Red Gum Woodland under the BC Act (Endangered) and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland under the EPBC Act (Critically Endangered).
- 6) Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South and Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions under the EPBC Act (Endangered)
- 7) Listed as Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions under the BC Act (Endangered) and Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions under the EPBC Act (Critically Endangered)
- 8) Listed as Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion under the BC Act (Endangered)
- 9) Listed as *Acacia loderi* shrublands under the BC Act (Endangered)
- 10) Listed as *Allocasuarina luehmannii* Woodland in the Riverina and Murray Darling Depression Bioregions under the BC Act (Endangered) and *Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions under the EPBC Act (Endangered)

4 STATE LISTED THREATENED BIODIVERSITY

An overview of threatened biodiversity entities listed under the BC Act are presented below, including those candidate entities identified under the BC Act for Serious and Irreversible Impacts (SAII). SAI entities are threatened biodiversity considered to be most at risk of extinction and any assessment of proposed State Significant Infrastructure with SAI impacts requires specific consideration of any additional and appropriate measures that will minimise those impacts prior to approval.

4.1 THREATENED ECOLOGICAL COMMUNITIES

A total of seven threatened ecological communities listed under the BC Act have been identified as potentially occurring within the proposal study area based on their alliance to native vegetation recorded either through field verification or broad scale mapping. These seven communities are considered candidate threatened ecological communities and include:

- *Acacia loderi* Shrublands
- *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions
- *Allocasuarina luehmannii* Woodland in the Riverina and Murray Darling Depression Bioregions
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions
- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion
- White Box Yellow Box Blakely's Red Gum Woodland.

An overview of each threatened ecological community, its threat status, associated PCTs within the proposal study area is presented in Table 4.1. These TEC's have either recorded during preliminary field surveys or have predicted via broad scale mapping in areas where access has been restricted can be seen in Figure 4.1. The planned additional and ongoing 2020 and 2021 field surveys will be required to analyse, understand, confirm and assess the full extent of all potential and recorded TEC's within the proposal study area.

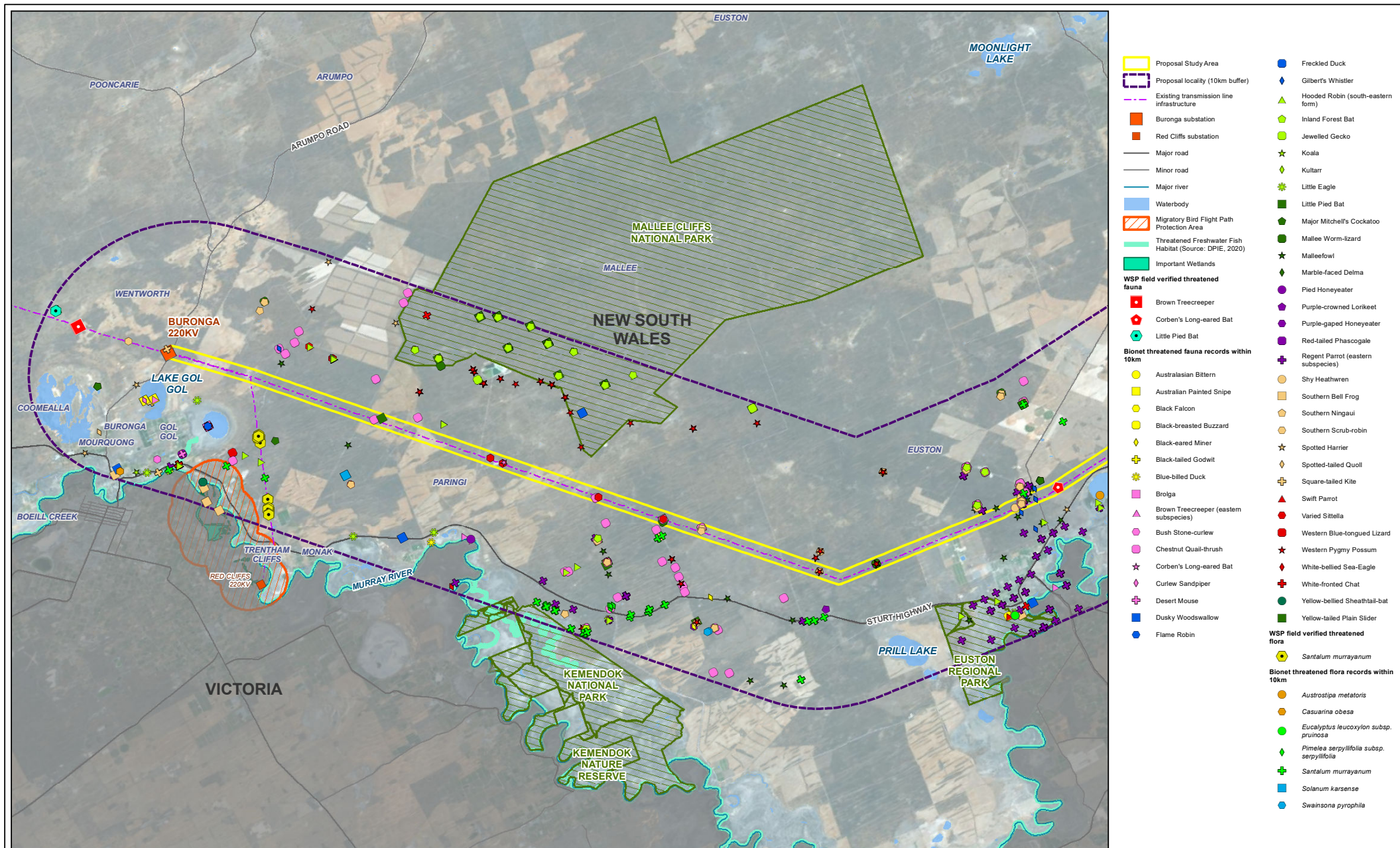
Table 4.1 Threatened ecological communities listed under the BC Act and associated PCTs

THREATENED ECOLOGICAL COMMUNITY	BC ACT ¹	ASSOCIATED PLANT COMMUNITY TYPE	RECORDED WITHIN THE PROPOSAL STUDY AREA
<i>Acacia loderi</i> Shrublands	Endangered	<p>Many PCTs align to this TEC, however upon field inspection it was apparent that many did not meet the description or condition thresholds of the prescribed TEC.</p> <p>The community generally occurs as scattered patches within broader vegetation types for example it is often interspersed by woodlands of Belah (<i>Casuarina pauper</i>), Rosewood (<i>Alectryon oleifolius</i>) or Leopardwood (<i>Flindersia maculosa</i>). The occurrence of this community has been assessed for the purposes of this study to include the following within the proposal study area;</p> <ul style="list-style-type: none"> • PCT 57 - Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion • PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion. <p>May also align to:</p> <ul style="list-style-type: none"> • PCT 143 - Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland on semi-arid and arid sandplains and dunes • PCT 153 - Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones 	Potential (survey required to confirm)
<i>Acacia melvillei</i> Shrubland in the Riverina and Murray-Darling Depression bioregions	Endangered	<p>May align with several PCTs but within the proposal study area most likely will align to:</p> <ul style="list-style-type: none"> • PCT 23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones. 	Potential (survey required to confirm)
<i>Allocasuarina luehmannii</i> Woodland in the Riverina and Murray Darling Depression Bioregions	Endangered / SAI	Aligns to one PCT recorded within the proposal study area; PCT 20 - Buloke - Moonah - Black Box open woodland on sandy rises of semi arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).	Recorded

THREATENED ECOLOGICAL COMMUNITY	BC ACT ¹	ASSOCIATED PLANT COMMUNITY TYPE	RECORDED WITHIN THE PROPOSAL STUDY AREA
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions	Endangered	Aligns to multiple PCTs recorded within the proposal study area including: <ul style="list-style-type: none"> PCT 80 - Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone. 	Recorded
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	Endangered	Aligns to one PCT recorded within the proposal study area; PCT 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion.	Recorded
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion	Endangered	Aligns with the following PCTs recorded within the proposal study area: <ul style="list-style-type: none"> PCT 19 - Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone. May also align to: <ul style="list-style-type: none"> PCT 75 - Yellow Box - White Cypress Pine grassy woodland on deep sandy-loam alluvial soils of the eastern Riverina Bioregion and western NSW South Western Slopes Bioregion. PCT 21 Slender Cypress Pine - Sugarwood - Western Rosewood open woodland on sandy rises mainly in the Riverina Bioregion and Murray Darling Depression Bioregion 	Recorded

THREATENED ECOLOGICAL COMMUNITY	BC ACT ¹	ASSOCIATED PLANT COMMUNITY TYPE	RECORDED WITHIN THE PROPOSAL STUDY AREA
White Box Yellow Box Blakely's Red Gum Woodland	Endangered / SAI	<p>Aligns with the following PCTs recorded within the proposal study area:</p> <ul style="list-style-type: none"> • PCT 74 - Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion • PCT 266 - White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion • PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion <p>May also align to:</p> <ul style="list-style-type: none"> • PCT 75 - Yellow Box - White Cypress Pine grassy woodland on deep sandy-loam alluvial soils of the eastern Riverina Bioregion and western NSW South Western Slopes Bioregion. 	Recorded

1) Endangered, and SAI = Serious and Irreversible Impact under the Biodiversity Conservation Act (BC Act)



Map: PS117658 EPBC 001 A3 ecoValues
 Date: 18/08/2020

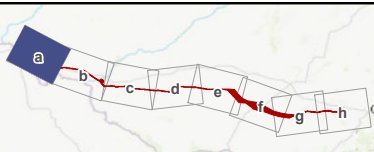
Author: Robert.Suansri
 Approved by: - E.Taylor



0 5 10 km
 1:300,000
 Coordinate system: GCS GDA 1994
 Scale ratio correct when printed at A3

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community, MetroMap, NSWSS

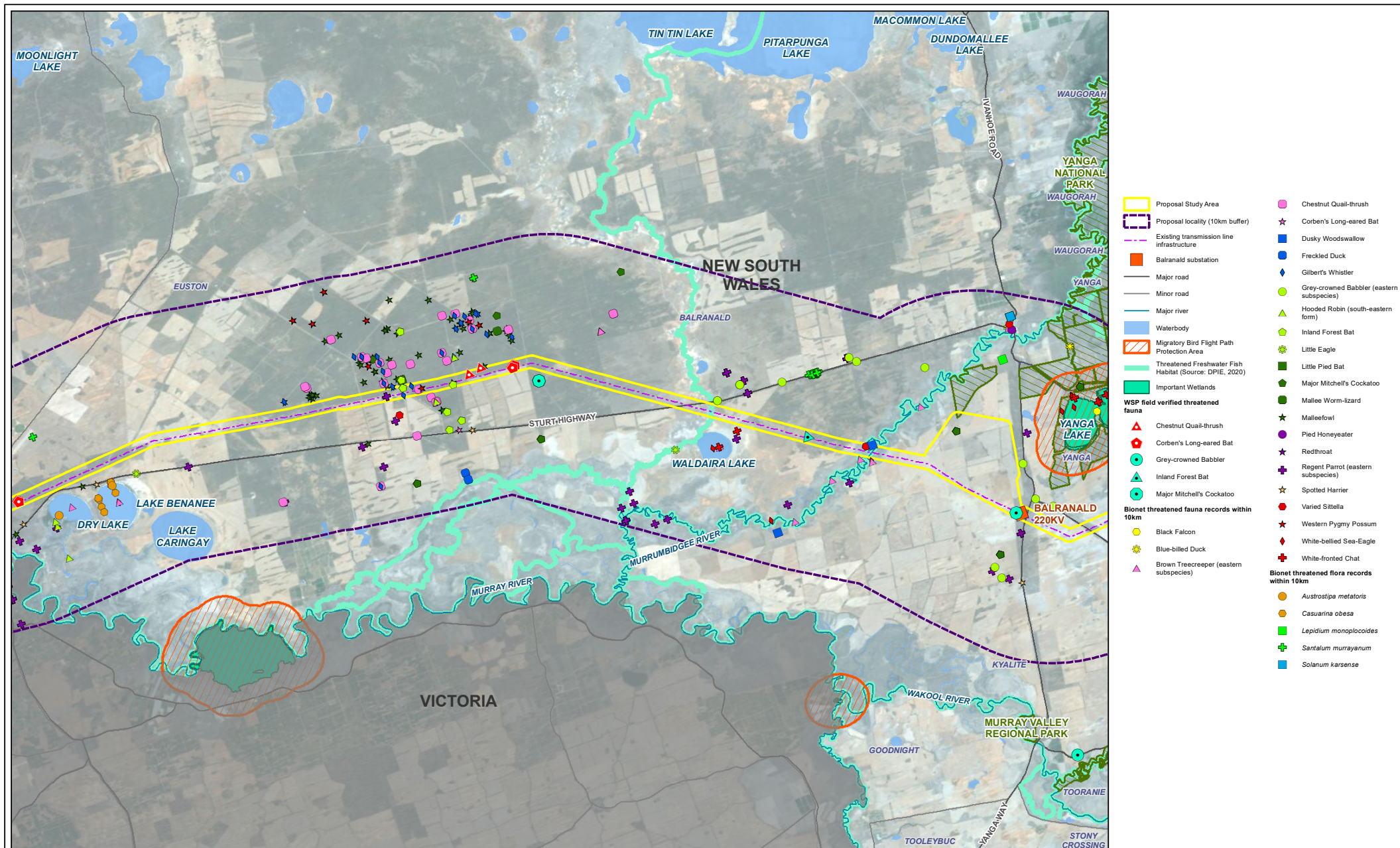
© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NC31 Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

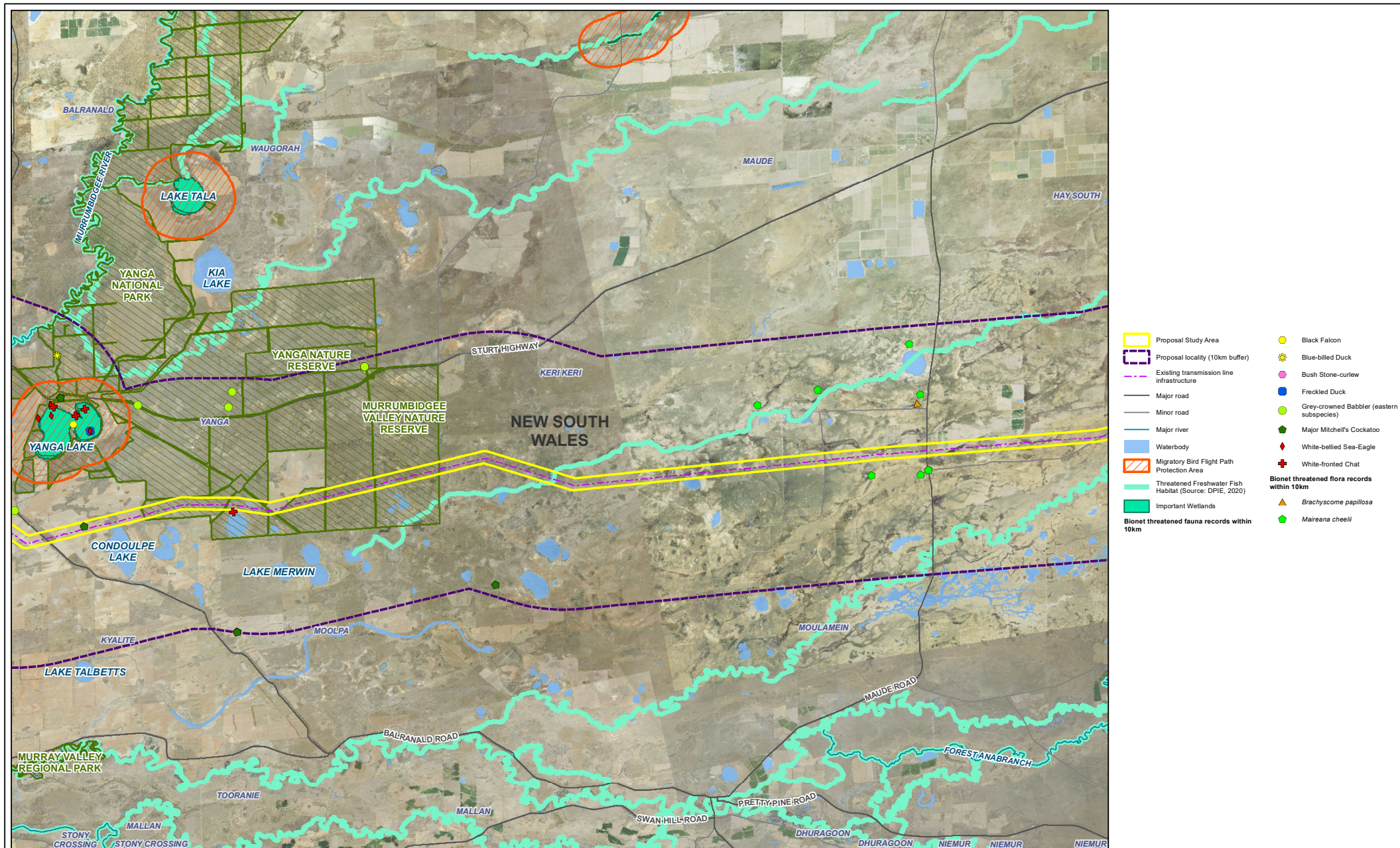


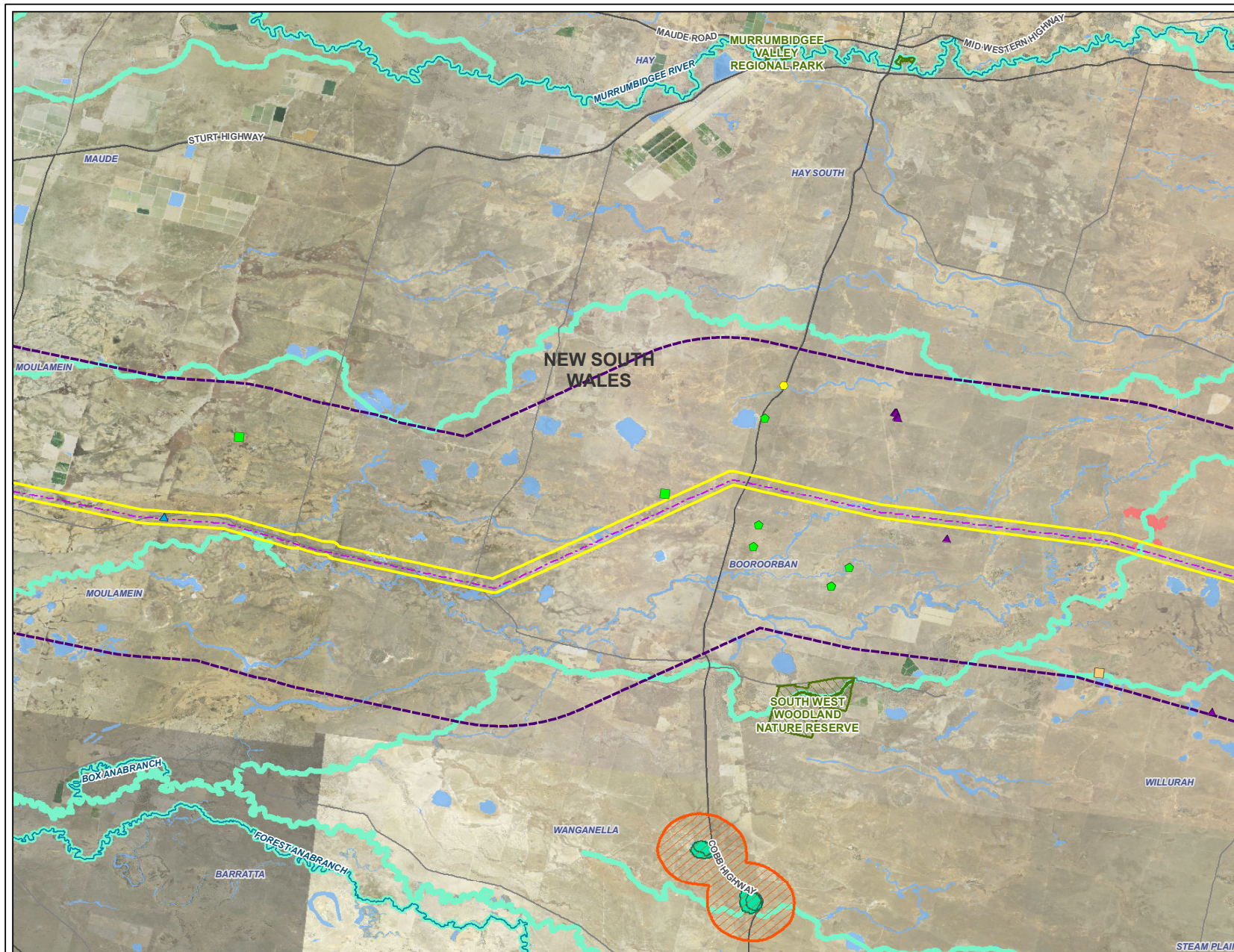
wsp

ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 4-1a
 Ecological values of the proposal study area







- Proposal Study Area
- Proposal locality (10km buffer)
- Existing transmission line infrastructure
- Major road
- Minor road
- Major river
- Waterbody
- Migratory Bird Flight Path Protection Area
- Threatened Freshwater Fish Habitat (Source: DPIE, 2020)
- Important Wetlands
- Black Falcon
- ▲ Plains-wanderer
- Southern Bell Frog
- *Lepidium monoplacoides*
- ◆ *Maireana cheelii*
- ▲ *Swainsona murrayana*
- Bionet threatened flora records within 10km**
- TECs listed under the EPBC Act**
- Weeping Myall Woodlands - Endangered
- Bionet threatened fauna records within 10km**

Map:
PS117658 EPBC 001 A3 ecoValues

Date: 18/08/2020

Author: Robert.Suansri

Approved by: - E.Taylor



0 5 10 km

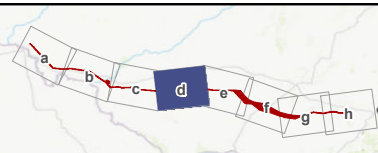
1:300,000

Coordinate system: GCS GDA 1994

Scale ratio correct when printed at A3

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community, MetroMap, NSWSS

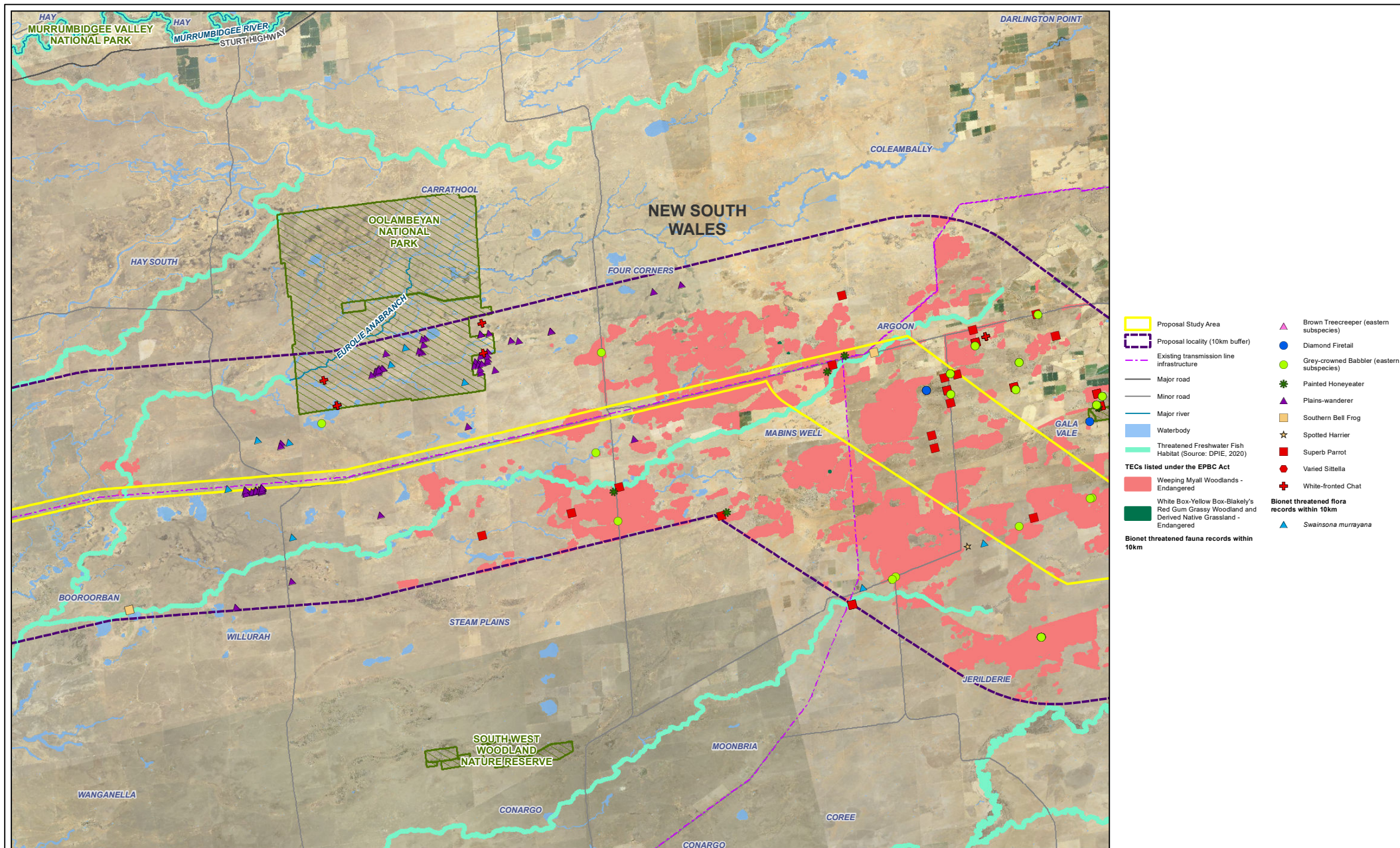
© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCS1 Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.

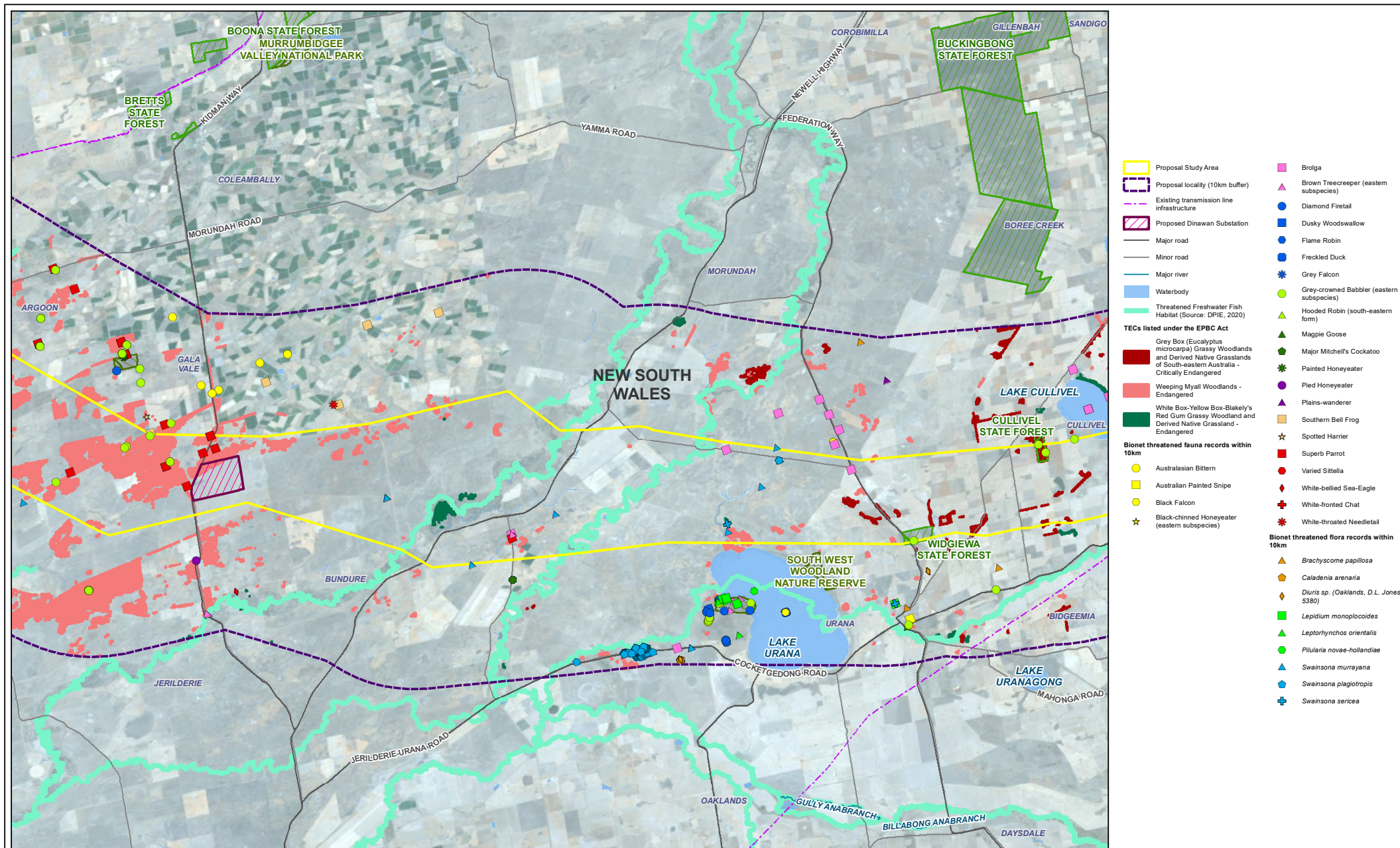


wsp

ENERGYCONNECT (NSW - EASTERN SECTION)

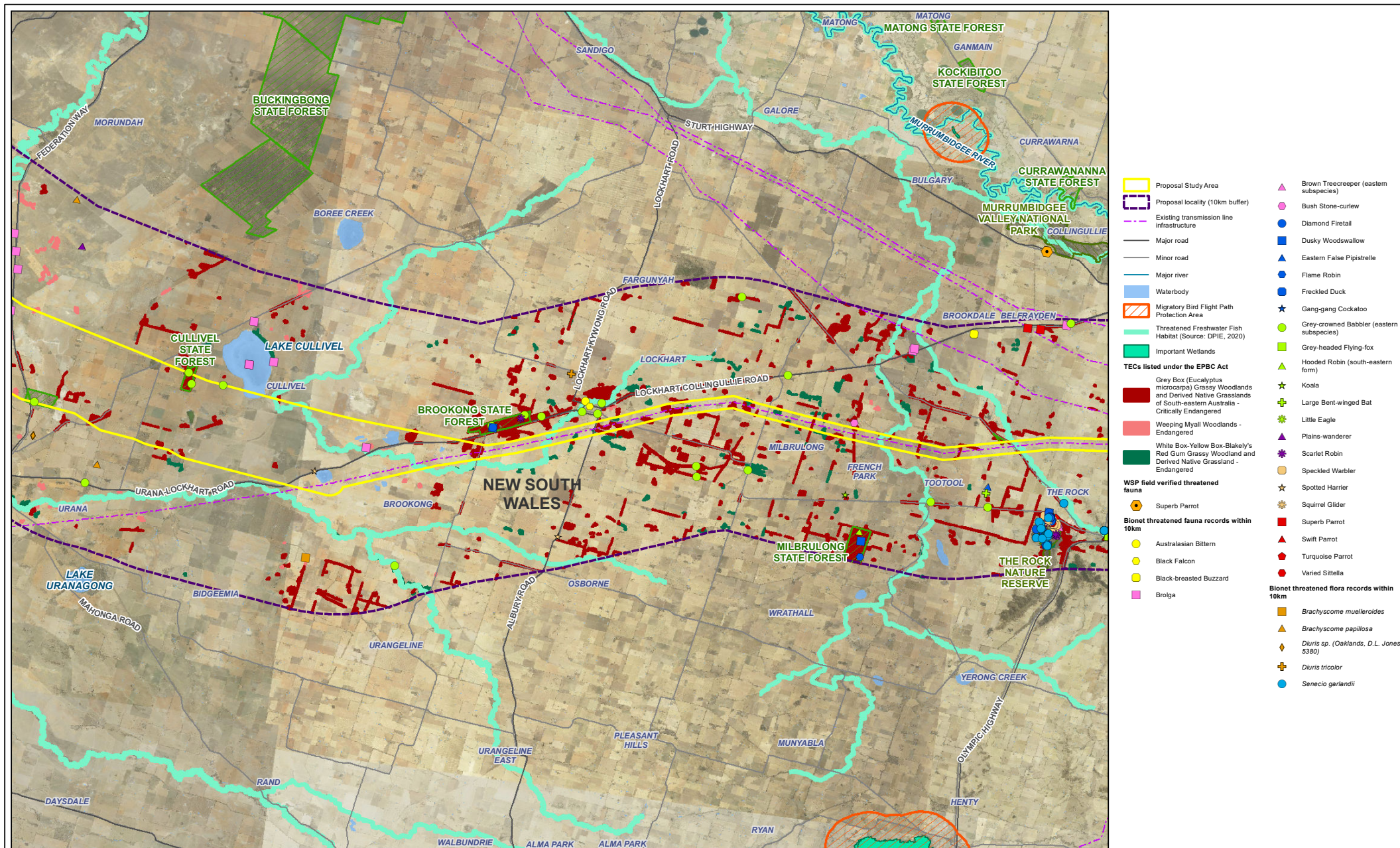
Figure 4-1d
Ecological values of the proposal study area

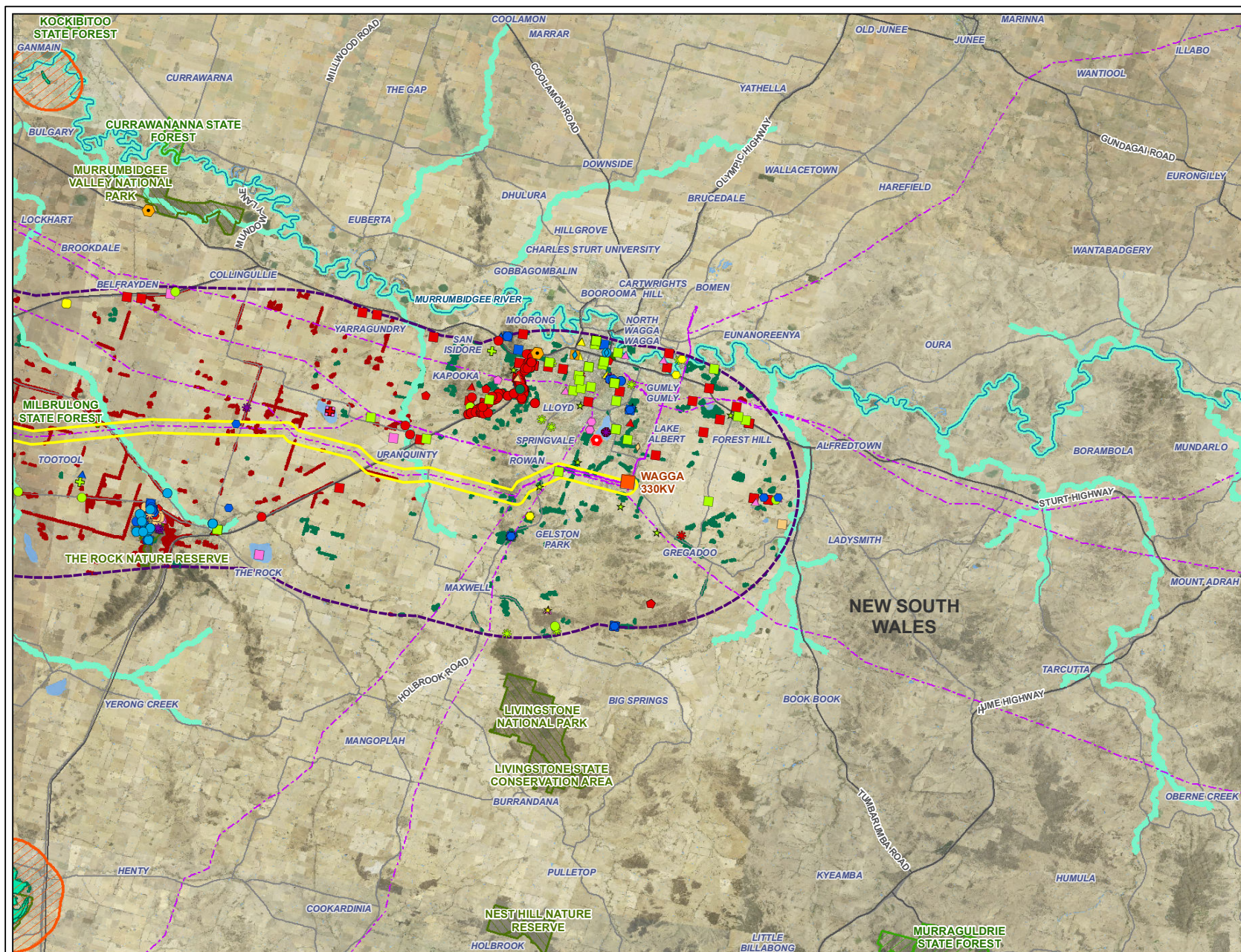




ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 4-1f
Ecological values of the proposal study area





- Legend**
- Proposal Study Area
 - Proposal locality (10km buffer)
 - Existing transmission line infrastructure
 - Wagga substation
 - Major road
 - Minor road
 - Waterbody
 - Migratory Bird Flight Path Protection Area
 - Threatened Freshwater Fish Habitat (Source: DPIE, 2020)
 - Important Wetlands
- TECs listed under the EPBC Act**
- Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia - Critically Endangered
 - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - Endangered
- WSP field verified threatened fauna**
- Dusky Woodswallow
 - Superb Parrot
- Bionet threatened fauna records within 10km**
- Barking Owl
 - Black Falcon
 - Black-breasted Buzzard
 - Black-chinned Honeyeater (eastern subspecies)
 - Blue-billed Duck
 - Brolga
 - Brown Treecreeper (eastern subspecies)
 - Brush-tailed Rock-wallaby
 - Bush Stone-curlew
 - Curlew Sandpiper
 - Diamond Firetail
 - Dusky Woodswallow
 - Eastern False Pipitrelle
 - Flame Robin
 - Freckled Duck
 - Gang-gang Cockatoo
 - Gilbert's Whistler
 - Grey-crowned Babbler (eastern subspecies)
 - Grey-headed Flying-fox
 - Hooded Robin (south-eastern form)
 - Koala
 - Large Bent-winged Bat
 - Little Eagle
 - Little Lorikeet
 - Maggie Goose
 - Regent Honeyeater
 - Scarlet Robin
 - Southern Bell Frog
 - Southern Myotis
 - Speckled Warbler
 - Spotted Harrier
 - Spotted-tailed Quoll
 - Squirrel Glider
 - Squirrel Glider in the Wagga Wagga Local Government Area
 - Superb Parrot
 - Swift Parrot
 - Turquoise Parrot
 - Varied Sittella
 - White-bellied Sea-Eagle
 - White-fronted Chat
 - White-throated Needle-tail
 - Yellow-bellied Sheath-tail-bat
- Bionet threatened flora records within 10km**
- Brachyscome muelleroides
 - Senecio garlandii
 - Swainsona recta

Map:
PS117658 EPBC 001 A3 ecoValues

Author: Robert.Suansri

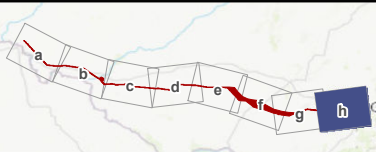


0 5 10
km
1:300,000
Coordinate system: GCS GDA 1994
Scale ratio correct when printed at A3

Date: 18/08/2020
Approved by: - E.Taylor

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community, MetroMap, NSWSS

© WSP Australia Pty Limited (WSP) Copyright in the drawings, information and data recorded is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF © WSP Australia Pty Limited.



ENERGYCONNECT (NSW - EASTERN SECTION)

Figure 4-1h
Ecological values of the proposal study area

4.2 THREATENED SPECIES

An overview of the likelihood of occurrence assessment for threatened flora and fauna species listed under the BC Act, that are predicted or known to occur within the proposal study area, are presented below.

4.2.1 THREATENED FLORA SPECIES

Database searches have identified a total of 74 threatened flora species that are predicted or known to occur within the proposal locality.

The results of likelihood of occurrence assessments identified that 37 threatened flora species listed under the BC Act, have a moderate or higher likelihood of occurrence within the proposal study area (see Appendix A for further detail). At the time of this report, WSP has not records of any threatened flora species within the proposal study area during the preliminary field investigations.

4.2.1.1 SAII ENTITIES

The following threatened flora species identified to have moderate or higher likelihood of occurrence within the proposal study area, are also SAII entities under the BC Act;

- *Dodonaea stenozyga*
- *Caladenia arenaria* (Sand-hill Spider Orchid),
- *Diuris* sp. Oaklands, D. L. Jones 5380 (Oaklands Diuris),
- *Casuarina obesa* (Swamp She-oak),
- *Grevillea ilicifolia* subsp. *ilicifolia* (Holly-leaf Grevillea),
- *Lasiopetalum behrii* (Pink Velvet Bush),
- *Pilularia novae-hollandiae* (Austral Pillwort), and
- *Pimelea serpyllifolia* subsp. *serpyllifolia* (Thyme Rice-Flower).

4.2.2 THREATENED FAUNA SPECIES

Database searches have identified a total of 137 threatened fauna species that are predicted or known to occur within the proposal locality.

The results of likelihood of occurrence assessments identified that 73 threatened fauna species with a moderate or higher likelihood of occurrence within the proposal study area (see Appendix B for further detail).

At the time of this report, WSP has recorded nine of these threatened fauna species during surveys within the proposal study area (Table 4.2 and Figure 4.1).

Table 4.2 Threatened BC Act fauna species recorded within the proposal study area during WSP targeted surveys

COMMON NAME	SPECIES NAME	BC ACT ¹	EPBC ACT ²	RECORDED ³
Chestnut Quail-thrush	<i>Cincoloma castanotum</i>	V	-	O
Dusky Woodswallow	<i>Artamus cyanopterus cyanopterus</i>	V	-	O
Grey-crowned Babbler	<i>Pomatostomus temporalis temporalis</i>	V	-	O
Major Mitchell's Cockatoo	<i>Lophochroa leadbeateri</i>	V	-	O
Regent Parrot	<i>Polytelis anthopeplus monarchoides</i>	E	V	O
Superb Parrot	<i>Polytelis swainsonii</i>	V	V	O
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V	-	O
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	V	T
Inland Forest Bat	<i>Vespadelus baverstocki</i>	V	-	T

1) V = Vulnerable, E = Endangered, under the BC Act

2) V = Vulnerable, E = Endangered, under the Commonwealth EPBC Act.

3) O= recorded via observation, T= recorded via Harp trapping.

The majority of threatened birds species were recorded opportunistically, and two threatened microbat species were recorded via Harp trapping within the proposal study area (Figure 4.1).

4.2.2.1 SAI ENTITIES

Of the threatened fauna species identified with potential to occur within proposal study area, the following are SAI entities under the BC Act:

- Black-eared Miner,
- Curlew Sandpiper,
- Plains-wanderer,
- Red-lored Whistler,
- Regent Honeyeater,
- Striated Grasswren,
- Swift Parrot, and
- Eastern Bent-wing Bat.

4.3 THREATENED AQUATIC SPECIES

Within the proposal study area threatened aquatic habitat occurs in the form of fresh and saline wetlands, rivers and creeks that contain mapped key fish habitats (Strahler 4/5th Order streams) and other open water bodies such as agricultural dams, irrigation canals, road table drains and low depressions that periodical pond water.

Waterways within the proposal locality, specifically the Murray and Murrumbidgee Rivers, are considered to provide key fish habitat. There DPI mapping of Threatened Freshwater Fish Distribution, demonstrates a number of threatened fish species are considered to have known distributions within the waterways running through the proposal locality (DPI, 2020)

The threatened fish species identified by this mapping, and preliminary database investigation, considered to have moderate likelihood of occurrence within the proposal locality, are the six species identified in Table 4.3 below. The areas identified as Threatened Freshwater Fish habitat within the proposal locality and can also be seen in Figure 4.1.

Table 4.3 Threatened aquatic species with moderate or higher likelihood of occurrence

COMMON NAME	SPECIES NAME	FM ACT	BC ACT	EPBC ACT
Silver Perch	<i>Bidyanus bidyanus</i>	V	-	CE
Murray Hardyhead	<i>Craterocephalus fluviatilis</i>	CE	-	E
Flathead Galaxias	<i>Galaxius rostratus</i>	CE	-	CE
Murray Cod	<i>Maccullochella peelii</i>	-	-	V
Trout Cod	<i>Maccullochella macquariensis</i>	E	-	E
Macquarie Perch	<i>Macquaria australasica</i>	E	-	E

Impacts from the proposal on aquatic habitats, particularly mapped key fish habitats (Strahler 4/5th Order streams) are considered likely to be low as the infrastructure would span over these habitat features. Avoiding and minimising impacts on aquatic habitats will be a priority of detailed design and any residual indirect impacts will be subject to appropriate project specific mitigation measures.

4.4 FM ACT LISTED ENDANGERED ECOLOGICAL COMMUNITIES

The following Endangered Ecological communities listed under the FM Act have potential to occur within the proposal study area: Lowland Darling River aquatic ecological community and Lowland Murray River aquatic ecological community.

A total of six PCTs recorded within the proposal study area (PCT 5, 7, 9, 13, 15 and 16) could potentially form these EECs. As a minimum the proposal would impact on the Lowland Darling River aquatic ecological community, as it crosses the Murrumbidgee River, multiple creeks and their tributaries. If the alignment occurs in proximity to or vegetation associated with the Murray and its tributaries, it has potential to impact on the Lower Murray River aquatic ecological community. These EECs would likely align with PCTs mentioned above, and possibly wetlands which occur on the floodplains of these river systems. This would need to be verified through the planned field surveys.

4.5 NATIONAL PARKS, CONSERVATION AREAS AND STATE FORESTS

Within the proposal study area and broader proposal locality, important biodiversity values are known to occur within a range of conservation areas including National Parks, Nature Reserves, State conservation areas, State Forest and other protected areas. Impacts are likely in a small number of reserves, including Yanga National Park, Murrumbidgee Valley Reserve (formerly Yanga State Conservation Area), and Southern Mallee Protected Area. An overview of recorded conservation areas is provided below.

4.5.1 NSW NATIONAL PARKS

One NSW National Parks is within the proposal study area, Yanga National Park. Other National Parks that occur within a 10-kilometre radius of the proposal study area include:

- Mallee Cliffs National Park
- Oolambeyan National Park
- Kemendok National Park

4.5.2 OTHER PROTECTED AREAS

One state conservation area is within the proposal study area, Murrumbidgee Valley Reserve (formerly Yanga State Conservation Area) as shown on Figure 4.1. A small area parcel of Southern Mallee Protected Area (adjacent to Mallee Cliffs National Park) is also within the proposal study area. A range of other protected area have also been recorded within a 10-kilometre radius of the proposal locality and are listed below.

- Euston Regional Park
- The Rock Nature reserve
- South West Woodland Nature Reserve
- Murrumbidgee Valley State Conservation Area
- Lambert Island Nature Conservation Reserve.

4.5.3 NSW STATE FORESTS

The following NSW State Forests are within the proposal study area; Widgiewa State Forest and Cullivel State Forest.

Other NSW State Forests that occur within a 10-kilometre radius of the proposal study area:

- Brookong State Forst
- Milbrulong State Forest.

5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

5.1 THREATENED ECOLOGICAL COMMUNITIES

Based on preliminary field verification surveys and broad scale state vegetation mapping a total of four candidate threatened ecological communities listed under the EPBC Act were considered likely to occur. These are:

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions - Endangered
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia - Endangered
- Weeping Myall Woodlands - Endangered
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered.

An overview of each candidate threatened ecological community, its threat status, associated PCTs and location within each east west portion of the proposal study area is presented in Table 5.1.

In addition, a further two candidate threatened ecological communities which are both listed as critically endangered on the EPBC Act were identified from database searches being:

- Natural Grasslands of the Murray Valley Plains, and
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains have been considered.

The predicted distribution is mostly to the south of the proposal study area (Department of Sustainability, Environment, Water, Population and Communities, 2012). No patches of the Natural Grasslands of the Murray Valley Plains were recorded during limited field verification however PCT 44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion was recorded and may align with this critically endangered ecological community. No patches of Seasonal Herbaceous Wetlands (Freshwater) of the temperate Lowland Plains were recorded during preliminary field surveys or are predicted to be impacted. Both these communities cannot be totally dismissed based on preliminary desktop assessment and should be subject to further detailed assessment.

Of the likely candidate threatened ecological communities listed above, preliminary field verification positively identified three of these TECs including; Grey Box Grassy Woodlands, Weeping Myall Woodlands and White Box Yellow Box-Blakely's Red Gum Grassy Woodlands within the proposal study area. The occurrence of Buloke Woodlands within the proposal study area is based on broad scale State vegetation mapping (Office of Environment & Heritage 2016b) (Office of Environment & Heritage 2016c). These likely candidate TECs can be seen in Figure 4.1.

Most of the field verified patches of Weeping Myall Woodlands sampled met the conservation listing advice condition class criteria for this ecological community.

Grey Box and White Box woodlands occur throughout a highly modified agricultural landscape between Balranald and Wagga Wagga. Many of these patches have been subject to historic and ongoing agricultural practises and will unlikely met condition thresholds criteria for the ecological community listings. Limited sampling of road reserve areas identified patches that met these condition thresholds and it is likely that patches occurring in Travelling Stock Routes, riparian areas and conservation reserve may also form part of these communities.

Further detailed field surveys in 2020 and 2021 will be required to understand the full extent of all candidate and potential EPBC Act threatened ecological communities within the proposal study area.

Table 5.1 Threatened ecological communities listed under the EPBC Act and associated PCTs

THREATENED ECOLOGICAL COMMUNITY	EPBC ACT ¹	ASSOCIATED PLANT COMMUNITY TYPE	RECORDED WITHIN THE PROPOSAL STUDY AREA
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	PCT 20 - Buloke - Moonah - Black Box open woodland on sandy rises of semi arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Potential (survey required to confirm)
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	PCT 80 - Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	Recorded
Weeping Myall Woodlands	Endangered	PCT 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Recorded
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	PCT 74 - Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion PCT 266 - White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Recorded

1) Endangered and Critically Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act).

5.2 THREATENED FLORA

Database searches have identified a total of 36 threatened flora species, listed under the EPBC Act, that are predicted or known to occur within the proposal locality.

The results of likelihood of occurrence assessments have identified a total of 20 threatened flora species to have a moderate or higher likelihood of occurrence within the proposal study area (see Appendix A for further detail).

5.3 THREATENED FAUNA

Database searches have identified a total of 49 threatened fauna species, listed under the EPBC Act, that are predicted or known to occur within the proposal locality.

The results of likelihood of occurrence assessments have identified a total of 26 threatened fauna species to have a moderate or higher likelihood of occurrence within the proposal study area (see Appendix B for further detail).

Of these, three threatened fauna species listed under the EPBC Act have already been recorded within the proposal study area during field surveys (Table 5.2)

Table 5.2 Threatened EPBC Act fauna species recorded within the proposal study area during WSP targeted surveys

COMMON NAME	SCIENTIFIC NAME	BC ACT STATUS	EPBC ACT STATUS
Regent Parrot	<i>Polytelis anthopeplus monarchoides</i>	E	V
Superb Parrot	<i>Polytelis swainsonii</i>	V	V
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	V

5.4 MIGRATORY BIRD SPECIES

Database searches have identified a total of 19 migratory species listed under the EPBC Act, that are predicted or known to occur within the proposal locality.

The results of the likelihood of occurrence assessments identified an additional 17 migratory species listed under the EPBC Act, with moderate or higher potential to occur within the proposal study area (see Appendix B for further detail). Listed Marine Species.

The PMST search identified 29 listed marine bird species as occurring, possibly occurring or likely to occur within the proposal locality. Two were recorded within the proposal study area during preliminary field surveys, being:

- Rainbow Bee-eater
- White-bellied Sea-eagle.

Listed Marine Species under the EPBC Act are only afforded protection in Commonwealth Marine areas including water, air and seabed that are NOT in state or territory waters, hence discussion of these species is not relevant to this proposal location.

5.5 WORLD AND NATIONAL HERITAGE

No World Heritage Properties or National Heritage Places are located within or nearby the proposal study area.

5.6 WETLANDS OF NATIONAL AND INTERNATIONAL IMPORTANCE

Wetlands are important habitat for a diverse range of animals including waterbirds, amphibians, invertebrates and fish species as well as aquatic and water loving plants such as sedges and rushes. Tree species such as River Red Gum also rely on these environments. Wetlands are important provide strategic refuge during drought and frequently support threatened species. Most of the migratory bird species listed under international convention agreements with Australia may be found in these wetlands.

5.7 NATIONALLY IMPORTANT WETLANDS

No nationally important wetlands are within 10 kilometres of the proposal study area the proposal study area. However, there are nationally important wetlands nearby:

- Tala Lake and Yanya Lake, near Balranald;
 - Black Swamp and Coopers Swamp near Wanganella:
-

5.8 RAMSAR WETLANDS

Four RAMSAR wetlands or Wetlands of International importance were identified by database searches. No RAMSAR wetlands or Wetlands of International importance are within 10 kilometres of the proposal study area:

However, there is one located approximately 20 kilometres south of the proposal study area, Hattah-kulkyne Lakes.

6 BIODIVERSITY CONSTRAINTS

Biodiversity values identified as known, predicted or likely to occur within the proposal study area have been assigned to a three-tier biodiversity constraint hierarchy. These biodiversity values have been mapped (Figure 4.1) based on desktop assessment and preliminary field surveys. This hierarchy has been developed to assist with addressing the principle of avoid and minimise as required under section 8 of the BAM. Biodiversity constraints ranking have been based on the following criteria:

TIER 1 BIODIVERSITY CONSTRAINT – AREAS TO AVOID

Tier 1 biodiversity constraints are areas of very high environmental sensitivity, with environmental approvals considered unlikely or unachievable. Tier 1 constraints are:

- Ramsar Wetlands; and
- World Heritage Areas.

TIER 2 BIODIVERSITY CONSTRAINT – AREAS TO BE AVOIDED IF REASONABLE, OR MINIMISE IMPACT

Tier 2 biodiversity constraints are areas of high environmental sensitivity, with environmental approvals considered complex and require additional triggers for biodiversity offsets and demonstration of avoid and minimising impacts on such biodiversity values. Tier 2 biodiversity constraints are:

- National Parks, ecological conservation areas (including flora reserves, state conservation areas, Biodiversity Stewardship Sites, Biobanks; wilderness protection areas);
- Threatened ecological communities listed under the EPBC Act;
- Threatened ecological communities listed under the BC Act as SAI entities; and
- Other important wetlands and water sources for migratory birds protected by international agreements.

TIER 3 BIODIVERSITY CONSTRAINT – AREAS TO AVOID TO MINIMISE IMPACT

Tier 3 biodiversity constraints are areas of high environmental sensitivity, with environmental approvals considered complex and uncertain. Avoiding and minimising impact recommended as biodiversity offsets will apply to unavoidable impacts that in some cases would require significant, expensive and perhaps unattainable offsets obligations. Tier 3 biodiversity constraints are:

- Threatened species (flora/fauna) - other non-SAI threatened species listed under the BC Act and EPBC Act;
- Large, contiguous/intact areas of moderate or better-quality woodland vegetation (only patch sizes of > 5 hectares) (only within three kilometres of existing alignment);
- Threatened ecological communities listed under the BC Act (non-SAI);
- Key fish habitat (most permanent and semi-permanent freshwater habitats including Strahler 4/5 order streams);
- Riparian corridors (Strahler 4/6 order streams) that require a 40 meter riparian buffer on these features as outlined under Table 14 of the BAM.

7 FUTURE APPROACH

7.1 APPLICATION FOR NATIVE VEGETATION REGULATORY CATEGORY 1 MAPPED LAND EXEMPTION

In accordance with section 6.8 (3) of the BC Act, the BAM is to exclude the assessment of impacts of any clearing of native vegetation and loss of habitat on Category 1-exempt land (within the meaning of Part 5A of the Local Land Services Act 2013), other than any impacts prescribed by the regulations under section 6.3.

Category 1-exempt land has not currently been mapped for use in NSW and as such an application to the Biodiversity and Conservation Division of the NSW Department of Planning, Industry and Environment (DPIE) for the identification of Category 1 land to be excluded from the BAM in accordance with the Native vegetation regulatory map: method statement (2017) will be prepared. The confirmation of these lands is critical in the identification of the reduced survey areas for the BAM.

A preliminary assessment of the potential Category 1 land within the proposal study area has been completed using native vegetation regulatory mapping and analysis of the following datasets:

- Historical and current land use component - NSW Landuse 2013 (<https://data.nsw.gov.au/data/dataset/nsw-landuse-2013>). This dataset was used to classify areas as either cleared/highly disturbed, impacted areas of native vegetation and undisturbed or protected areas of native vegetation; and
- Detectable woody vegetation clearing component - NSW Woody Vegetation Extent 2011 (<https://datasets.seed.nsw.gov.au/dataset/nsw-woody-vegetation-extent-2011c0569>). This dataset was used to identify areas of extant remnant vegetation and cleared lands/non-woody vegetation.

This preliminary analysis has identified substantial areas within the proposal study area are likely to be excluded from the BAM.

This preliminary assessment will require further refinement with high resolution aerial photographic interpretation, latest satellite imagery and/or field verification.

Following the refinement, the proposed Category 1-exempt land will be provided to the Biodiversity and Conservation Division of DPIE for confirmation.

7.2 NATIVE VEGETATION ASSESSMENT

Detailed native vegetation survey and mapping will be required in to be undertaken in accordance with section 5 of the BAM and Commonwealth requirements. This will include stratifying the vegetation types and broad condition states to define vegetation zones that will be sampled using vegetation integrity survey plots in accordance with section 5.3.4 of the BAM. These native vegetation surveys will determine the vegetation integrity scores for each vegetation zone that will run the BAM Credit Calculator and inform impacts and potential biodiversity offset requirements.

7.3 THREATENED SPECIES SURVEYS

Further to what has been completed, threatened flora and fauna surveys will be required for species credit species listed under the BAM within sections of the proposal study area that have yet been surveyed. Targeted surveys will also be undertaken with due consideration of Commonwealth survey requirements. WSP is currently completing further survey within the proposal study area and these will continue throughout 2020 and 2021. Ongoing consultation regarding seasonal survey requirements and preliminary survey findings between WSP and TransGrid is occurring. These surveys will address section 6 of the BAM and Commonwealth survey requirements and will consider each species individual

seasonality requirements, including through the BAM Credit Calculator or directly from the Threatened Biodiversity Data Collection.

The targeted flora surveys will continue to be undertaken in accordance with the NSW Guide to Surveying Threatened Plants (Office of Environment & Heritage 2016) and any Commonwealth requirements, incorporating random meander searches and/or parallel traverses undertaken for candidate species within their known or potential habitat.

Targeted fauna surveys will continue to be undertaken in accordance with the State and Commonwealth fauna survey guidelines for candidate species within their known or potential habitat.

- Further survey to identify, define and calculate the extent of the threatened ecological communities within the proposal study area.
- Continue detailed seasonal surveys for threatened flora species to identify presence and extent of any recorded populations.
- Further detailed targeted surveys should be considered where threatened species such as Corben's Long-eared Bat (*Nyctophilus corbeni*), Superb Parrot and Regent Parrot were recorded, or where Plains-wanderer have records and mapped important areas to gain a better understanding of their population dynamics and habitat use with the proposal study area.

7.4 PRELIMINARY RECOMMENDATIONS FOR AVOIDANCE

Based on preliminary field surveys and desktop assessment within the proposal study area, the following ecological values will be avoided during design refinement for the proposal, where possible, to minimise ecological impacts:

- intact Weeping Myall Woodland and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia. These two EECs are likely to be fragmented, occur in small patches with few intact patches remaining.
- areas that have been identified with threatened ecological communities under both BC Act and EPBC Act
- all threatened flora species recorded
- intact woodland and hollow bearing trees associated with Riverina region
- Plains-wanderer primary habitat areas (semi-arid, grassland habitat east of the Murrumbidgee) which have been mapped as important areas by EES (2020b)
- intact Mallee Low Woodland, Box Gum Woodland and Weeping Myall Woodland to minimise impacts on threatened microbats, the Regent Parrot and other fauna species, and minimise offset obligations
- agricultural table drains, drainage lines and swamps which provide breeding and foraging habitat for the Southern Bell Frog
- the Office of Environment, Energy and Science Saving Our Species site at Coleambally which is currently being managed for the conservation of the Southern Bell Frog.

8 CONCLUSION

The proposal study area has been identified to traverse a diverse range of native vegetation formations ranging from arid shrublands and semi-arid woodlands in the west to grassy woodlands in the east. It also spans areas of forested wetlands, freshwater and saline wetlands along with native grasslands, dry sclerophyll forests, open waterbodies and partially to wholly cleared agricultural land.

Based on a combination of broad scale vegetation mapping and preliminary field investigations within the proposal study area, several of the native PCTs identified are considered to be form potential TECs. These PCTs are considered to potentially form seven threatened ecological communities listed under the BC Act and four ecological communities listed under the EPBC Act.

The proposal has been identified to have potential impacts on the following threatened ecological communities listed under the BC Act:

- *Acacia loderi* Shrublands (potential to occur, not yet recorded during surveys)
- *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions (potential to occur, not yet recorded during surveys)
- *Allocasuarina luehmannii* Woodland in the Riverina and Murray Darling Depression Bioregions (SAII) (recorded within proposal study area)
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (recorded within proposal study area)
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (recorded within proposal study area)
- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion (recorded within proposal study area)
- White Box Yellow Box Blakely's Red Gum Woodland (SAII) (recorded within proposal study area).

A total of four threatened ecological communities listed under the EPBC Act could be impacted by the proposal and have been recorded during preliminary surveys;

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions - Endangered
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia - Endangered
- Weeping Myall Woodlands - Endangered
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered.

Nine threatened fauna species listed on the BC Act were recorded within the proposal study area during preliminary field investigations. Three of these species are also listed on the EPBC Act, the Regent Parrot, Superb Parrot and Corben's Long-eared Bat. In addition, preliminary field investigations and database searches have identified the following species with a moderate or higher likelihood of occurrence within the proposal study area:

- 37 threatened flora species listed under the BC Act
- 20 threatened flora species listed under the EPBC Act
- 73 threatened fauna species listed under the BC Act
- 26 threatened fauna species listed under the EPBC Act.

Desktop investigations identified six aquatic species listed as threatened under the FM Act and the EPBC Act that have the potential to occur within the proposal study area, however only within waterways which would be predominately avoided and protected by the project.

Desktop assessment identified an additional 17 migratory bird species, listed under the EPBC Act, with moderate or higher potential to occur within the study area. Of these two migratory marine bird species were recorded within the proposal study area.

Other important biodiversity values identified within the study area include National Parks, Nature Reserves, Protected Areas, wetlands and key fish habitat areas.

The majority of National Parks within the proposal study area are likely to be avoided although small areas of reserve estate associated with the Southern Mallee Protected Area, Yanga National Park, and Murrumbidgee Valley Reserve (formerly Yanga State Conservation Area) may be impacted.

A Biodiversity Development Assessment Report (BDAR) will be prepared as part of the EIS for the proposal, which would further identify and clarify the potential significance of biodiversity impacts associated with the proposal. The BDAR will be prepared in accordance with BC Act and BAM. Further targeted detailed threatened species seasonal surveys will be undertaken in 2020 and 2021 to ensure compliance with the BAM along with vegetation integrity plot based native vegetation surveys. Potential measures would be identified within the EIS to avoid and minimise any adverse biodiversity effects and further design refinement would reduce the overall amount of vegetation required to be removed.

A Referral under the EPBC Act to the Commonwealth will be submitted, and a Controlled Action decision is considered highly likely, particularly in respect to likely unavoidable impacts to the following threatened EPBC listed entities are considered to likely be significantly impacted by the proposal include the following:

- Grey Box Grassy Woodlands and derived native grasslands
- Weeping Myall Woodlands
- Plains-wanderer
- Regent Parrot
- Superb Parrot.

9 LIMITATIONS

9.1 SCOPE OF SERVICES

This biodiversity impact assessment report (the report) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

9.2 RELIANCE ON DATA

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

9.3 ENVIRONMENTAL CONCLUSIONS

In accordance with the scope of services, WSP has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

On all sites, varying degrees of non-uniformity of the vertical and horizontal soil or groundwater conditions are encountered. Hence no monitoring, common testing or sampling technique can eliminate the possibility that monitoring or testing results/samples are not totally representative of soil and/or groundwater conditions encountered. The conclusions are based upon the data and the environmental field monitoring and/or testing and are therefore merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of contaminants or emissions. Also, it should be recognised that site conditions, including the extent and concentration of contaminants, can change with time.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

9.4 REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the client (and no other party) but may be relied upon by determining authorities for consideration. WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Except as provided below parties other than the client should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

9.5 OTHER LIMITATIONS

WSP will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to or ownership of the properties, buildings and structures referred to in the report nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.

REFERENCES

- Atlas of Living Australia (2019). Spatial Portal. From <https://spatial.ala.org.au/>
- Atlas of Living Australia. (2020). Atlas of Living Australia Database.
- Australian Bureau of Meteorology (2019). Atlas of Groundwater Dependent Ecosystems (GDE)
- Cogger, H. G. (2000). Reptiles and Amphibians of Australia. Sydney: Reed Books.
- Cropper, S. C. (1993). Management of Endangered Plants. Melbourne: CSIRO Australia.
- Department of Environment and Climate Change (2007) Threatened Species Assessment Guidelines: The assessment of significance <https://www.environment.nsw.gov.au/resources/threatenedspecies/tsaguide07393.pdf>
- Department of environment and climate change 2009. Threatened species survey and assessment guidelines: field survey methods for fauna - amphibians. Department of environment and climate change.
- Department of Environment and Climate Change. (2009). Threatened species survey and assessment guidelines: field survey methods for fauna - Amphibians. Department of Environment and Climate Change Retrieved from <http://www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf>.
- Department of Environment and Conservation (2004). Threatened biodiversity survey and assessment: Guidelines for developments and activities (working draft).
- Department of Environment Water Heritage and the Arts. (2010). Survey guidelines for Australia's threatened bats - Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999. Retrieved from
- Department of Planning & Environment (2018). State Environmental Planning Policy (Coastal Management) 2018 – Coastal Wetlands.
- Department of Primary Industries (2019a). Priority weed listings for the Greater Sydney region
- Department of Primary Industries (2019b) Threatened Species Lists <https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current>
- Department of Primary Industries (DPI) (2013). Policy and Guidelines for Fish Habitat Conservation and Management. Department of Primary Industries. Accessed at <http://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/fish-habitat-conservation>
- Department of Sustainability, Environment, Water, Population and Communities (2012). Natural Grasslands of the Murray Valley Plains “indicative distribution map”. Produced by the Environmental Resources Information Network on behalf of Australian Government Department of Sustainability, Environment, Water, Population and Communities, August 2012.
- Department of the Environment and Energy (2016). An Interim Biogeographic Regionalisation of Australia (IBRA) - Version 7. Canberra, Department of the Environment and Energy.
- Department of the Environment and Energy (2019a). Protected Matters Search Tool.
- Department of Agriculture, Water and the Environment. (2020a). Protected Matters Search Tool. Retrieved from <https://www.environment.gov.au/epbc/protected-matters-search-tool>
- Department of Environment and Energy. (2020b). Register of Critical Habitat. Retrieved from <https://www.environment.gov.au/cgi-bin/sprat/public/publicregisterofcriticalhabitat.pl>

- Department of the Environment and Energy (2019b). Directory of Important Wetlands of Australia (DIWA) from <http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf>.
- Department of the Environment and Energy (2019c). Species Profiles and Threats Database. Online resource. Department of Sustainability, Environment, Water, Population and Communities. <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- Department of the environment water heritage and the arts 2010. Survey guidelines for australia's threatened frogs - guidelines for detecting frogs listed as threatened under the *environment protection and biodiversity conservation act 1999*. In: department of the environment, w., heritage and the arts (ed.). Department of the environment, water, heritage and the arts.
- Department of the Environment Water Heritage and the Arts. (2010a). Survey guidelines for Australia's threatened frogs - guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment, Water, Heritage and the Arts.
- Department of the Environment Water Heritage and the Arts. (2010b). Survey guidelines for Australia's threatened birds - Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999. Retrieved from Canberra:
- Department of the Environment. (2016). Murray Cod (*Maccullochella peelii*) in Species Profile and Threats Database. Species Profile and Threats Database. Retrieved from http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66633
- Department of the environment. 2016. *Murray cod (maccullochella peelii) in species profile and threats database* [online]. Canberra: department of the environment. Available: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66633 [accessed].
- Land and Property Information (2019a). Aerial photographic imagery.
- Land and Property Information (2019b). NSW Mitchell Landscapes.
- Office of Environment & Heritage. (2017). Biodiversity Assessment Methodology. Retrieved from Sydney:
- Office of Environment & Heritage. (2019). BioNet Vegetation Classification 2.1. Retrieved from <http://www.environment.nsw.gov.au/research/Visclassification.htm>
- Office of environment & heritage. 2019. *Bionet vegetation classification 2.1* [online]. Available: <http://www.environment.nsw.gov.au/research/visclassification.htm> [accessed 2019]
- Office of Environment and Heritage (2016a). NSW Guide to surveying threatened plants. State of NSW and Office of Environment and Heritage
- Office of Environment and Heritage (2016b). State Vegetation Type Map: Riverina Region Version v1.2 – VIS_ID 4469
- Office of Environment and Heritage (2016c). State Vegetation Type Map: Central West/Lachlan Region Version v1.3 – VIS_ID 4468
- Office of Environment and Heritage (2016d). Western Region Version v1.0 – VIS_ID 4492
- Office of Environment and Heritage (2017). "Biodiversity Assessment Method."
- Office of Environment and Heritage (2019a) NSW BioNet Vegetation Classification Database from <http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx>
- Office of Environment and Heritage (2019b). "BioNet the Atlas of NSW Wildlife Database Search." from http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx .

- Office of Environment and Heritage (2019c) Threatened Species Profile Database. Accessed via the licenced bionet site. <http://www.bionet.nsw.gov.au/>
- Office of Environment Energy and Science. (2020a, 6 January 2020). Areas of Outstanding Biodiversity Value register. Retrieved from <https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/areas-of-outstanding-biodiversity-value/area-of-outstanding-biodiversity-value-register>
- Office of Environment Energy and Science (2020b) Threatened Species Profile Database. Accessed via the licenced bionet site. <http://www.bionet.nsw.gov.au/>
- Pennay, M., Law, B., & Reinhold, L. (2004). Bat calls of NSW. Region based guide to the echolocation calls of microchiropteran bats. Retrieved from Sydney:
- Royal Botanic Gardens and Domain Trust (2019). PlantNET - The Plant Information Network System of The Royal Botanic Gardens and Domain Trust, Sydney, Australia. From <http://plantnet.rbgsyd.nsw.gov.au>
- Stralberg, D., et al. (2009). "Re-Shuffling of Species with Climate Disruption: A No-Analog Future for California Birds?" PLoS ONE 4(9): e6825.
- Thackway, R. and I. D. Cresswell (1995). An Interim Biogeographic Regionalisation of Australia. Canberra, Australian Nature Conservation Agency.

APPENDIX A

THREATENED FLORA LIKELIHOOD OF OCCURRENCE

A1.1 THREATENED FLORA LIKELIHOOD OF OCCURRENCE

Table A.1 Threatened flora likelihood of occurrence

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Acacia acanthoclada</i>	Harrow Wattle	E	-	No	0	Grows in mallee communities on ridges and dunes and very occasionally on rocky outcrops; generally, grows in deep, loose, sandy soil. Associated vegetation types within the study area: PCT 170; 171.	Professional opinion	Moderate. Associated habitat present (PCT 170; 171) although no records occur within 50 km of the proposal.
<i>Acacia carneorum</i>	Purple-wood Wattle	V	V	No	0	Grows in grassland and woodland in red, sandy soil; also found in Mulga communities on sand dunes, level sandy sites and alluvial accumulations along watercourses; recorded from inland semi-arid Acacia and Casuarina shrublands and woodlands. Associated vegetation types within the study area: PCT 58.	Professional opinion	Moderate. Associated habitat present (PCT 58) although no records occur within 100 km of the proposal.
<i>Acacia currani</i>	Curly-bark Wattle	V	V	No	0	Grows in Acacia shrubland and mallee. Prefers acidic, skeletal soils in rocky habitats and occupies specialised habitats comprising rocky ridges and deeply weathered sandstone. No associated vegetation types recorded within the study area.	Professional opinion	Low. No associated habitat recorded.
<i>Acacia notabilis</i>	Mallee golden Wattle	E	-	No	0	Grows in mallee communities and open woodland on stony and rocky hills; soils types include brown lateritic loam, red clay-loam, shallow stony sands and red silty gravely sand. Associated vegetation types within the study area: PCT 170.	Professional opinion	Low. Whilst associated habitat occurs in the form of PCT 170, the only record from the locality is about 12 km to the south at Red Cliff Scenic Reserve where the species is considered planted.
<i>Acacia phasmoides</i>	Phantom Wattle	V	V	No	0	Grows in shrubby woodland on sandy, granitic soil near creeks or in rocky crevices. No associated vegetation types recorded within the study area.	Professional opinion	Low. No associated habitat recorded.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Ammobium craspedioides</i>	Yass Daisy	V	V	No	4	Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. Associated vegetation types within the study area: PCT 266; 277.	BioNet; PMST	Moderate. Associated habitat present (PCT 266; 277) although all records within the locality occur from Livingstone National Park (about 15 km south of Wagga 330 STS).
<i>Amphibromus fluitans</i>	Floating Swamp Wallaby-grass	V	V	No	2	<i>Amphibromus fluitans</i> grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. Habitats in south western NSW include swamp margins in mud, dam and tank beds in hard clay and in semi-dry mud of lagoons with <i>Potamogeton</i> and <i>Chamaeraphis</i> species. Associated vegetation types within the study area: PCT 17; 160.	BioNet; PMST	Moderate. Two records of this species (NSW-406628-1995) occur near Grong Grong River Road, Grong Grong (about 20 km north of the proposal).
<i>Atriplex acutiloba</i>	-	EX	-	No	0	Little known. Found in arid areas in western NSW and South Australia. In NSW, it is considered likely to occur in similar habitat to <i>Atriplex velutinella</i> which grows in sandy or saline areas.	Professional opinion	Low. No associated habitat recorded.
<i>Atriplex infrequens</i>	A Saltbush	V	V	No	0	<i>Atriplex infrequens</i> is associated with broad drainage tracts, clay flats and possibly occasionally inundated habitats. Very little ecological information is available for this species so its critical habitat components can only be speculated as relatively undisturbed and ungrazed drainage lines and flats. Associated vegetation types within the study area: PCT 17; 24; 139; 157; 159; 160; 163; 165; 166; 170; 216.	Professional opinion PMST	Moderate. Associated vegetation types occur within the proposal study area.
<i>Austrostipa metatoris</i>	A spear-grass	V	V	No	29	Grows in sandy areas of the Murray Valley; habitats include sandhills, sandridges, undulating plains and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils. Associated vegetation types within the study area: PCT 7; 19; 28; 70; 170.	BioNet; PMST	Moderate. Associated vegetation types occur within the proposal study area; PCT 7; 19; 28; 170. There are ALA records within the locality of the proposal study area south of Balranald near Kyalite road.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Austrostipa nullanulla</i>	A spear-grass	E	-	Yes	0	Within the Murray Mallee it is restricted to gypseous lunettes and copiarises and at Nulla Station it grows on the margins of relict lakes, on the crests and sides of lunettes above old lake floors. In South Australia is thought to occupy gypseous soils on the outskirts of salt lakes across the north of the state. In all cases, gypsum is a major constituent of the soils in the habitat. No associated vegetation types recorded within the study area.	Professional opinion	Low. No associated habitat recorded.
<i>Austrostipa wakoolica</i>	A spear-grass	E	E	No	41	Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. Associated vegetation types within the study area: PCT 17; 26; 70; 74; 76; 80; 237; 250.	BioNet; PMST	Moderate. Potential habitat in PCTs 17; 26; 70; 74; 76; 80; 237; 250 occurs within the proposal study area.
<i>Brachyscome muelleroides</i>	Claypan Daisy	V	V	No	63	Grows in damp areas on the margins of claypans in moist grassland with <i>Pycnosorus globosus</i> , <i>Agrostis avenacea</i> and <i>Austrodanthonia duttoniana</i> . Also, recorded from the margins of lagoons in mud or water, and in association with <i>Calotis anthemoides</i> . The Claypan Daisy occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Associated vegetation types within the study area: PCT 44; 45; 46.	BioNet; PMST	Moderate. The Claypan Daisy is predicted to occur in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. (ESS, 2020) The closest records are near Urana, and Buckingbong State Forest (ESS, 2020)

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Brachyscome papillosa</i>	Mossgiel Daisy	V	V	No	75	Recorded primarily in clay soils on Bladder Saltbush (<i>Atriplex vesicaria</i>) and Leafless Bluebush (<i>Maireana aphylla</i>) plains, but also in grassland and in Inland Grey Box (<i>Eucalyptus microcarpa</i>) - Cypress Pine (<i>Callitris</i> spp.) woodland. Associated vegetation types within the study area: PCT 13; 16; 24; 44; 45; 46; 76; 80; 157; 159; 160; 163; 164; 165; 216; 237.	BioNet; PMST	<p>Moderate.</p> <p>Known distribution from Jerilderie area, the Hay Plain (Maude and Oxley) and around Darlington Point (ESS, 2020).</p> <p>There are no records for this species within the proposal study area, all records are to the north of Sturt Highway, located to within and around Yanga National Park (ESS, 2020)</p> <p>Potential habitat within PCT 13; 16; 24; 44; 45; 46; 76, 80 157; 159; 160; 163; 164; 165; 216, 237.</p>
<i>Caesia parviflora</i> var. <i>minor</i>	Pale Grass-lily	E	-	No	0	Found in damp places in open forest on sandstone. This variety occurs uncommonly in Tasmania, southern Victoria and south-east South Australia with an outlying population in NSW, in Barcoongere State Forest, between Grafton and Coffs Harbour. This variety may be more common than currently known, as Pale Grass-lilies are often not identified to variety level. No associated vegetation types recorded within the study area.	Professional opinion	<p>Low.</p> <p>No associated habitat recorded.</p> <p>Although will be targeted during broader threatened species searches within woodland habitats.</p>
<i>Caladenia arenaria</i>	Sand-hill Spider Orchid	E	E	Yes	1119	Occurs in woodland with sandy soil, especially that dominated by White Cypress Pine (<i>Callitris glaucophylla</i>). Associated vegetation types within the study area: PCT 28; 75; 76; 80.	BioNet; PMST	<p>Moderate.</p> <p>Sand-hill Spider Orchid is restricted to the Riverina in NSW and only occurs in five locations between Urana and Narranderra that are severely fragmented (ESS, 2020). There are no records within proposed study area.</p>

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Caladenia concolor</i>	Crimson Spider Orchid	E	V	Yes	0	Habitat is regrowth woodland on granite ridge country that has retained a high diversity of plant species, including other orchids. Known populations in NSW occur at Bethungra, Burrinjuck and near Albury. No associated vegetation types recorded within the study area.	Professional opinion	Low. No associated habitat recorded. Although will be targeted during broader threatened species searches (Sept – Oct) within woodland habitats.
<i>Caladenia tensa</i>	Greencomb Spider-orchid	-	E	No	0	The rigid spider-orchid occurs in <i>Callitris</i> spp. (cypress pine), <i>Eucalyptus leucoxylon</i> (yellow gum) woodland and <i>Melaleuca uncinata</i> (broombush) mallee on Tertiary and Quaternary aeolian sandy loams in the Murray-Darling Depression bioregion. PCT association unknown.	PMST	Low. No associated habitat recorded.
<i>Caladenia xanthochila</i>	Yellow-lip Spider-orchid	-	E	No	0	The yellow-lip spider-orchid occurs in Shallow Sands Woodland and Alluvial Terraces Herb-rich Woodland Ecological Vegetation Classes on Quaternary alluvial or wind deposits in the Murray-Darling Depression bioregion	PMST	Low. No associated habitat recorded.
<i>Calotis moorei</i>	A burr-daisy	E	E	Yes	1	The species grows in sandy soil and appears to be associated with Acacia woodlands and chenopod shrublands. Associated vegetation types within the study area: PCT 23; 157; 170.	BioNet	Low. An old record at Zara Station near Deniliquin. Potential habitat occurs in the form of PCT 23; 157; 170.
<i>Casuarina obesa</i>	Swamp She-oak	E	-	Yes	10	Requires moist, slightly saline soils. Potential habitats include shorelines of permanent, ephemeral or relict lakes. These systems may be freshwater or saline-influenced judging by the present distribution of the species. Associated vegetation types within the study area: PCT 11; 13; 15.	BioNet	Moderate. A population of <i>Casuarina obesa</i> is known at Lake Benanee. Records near Buronga. Associated vegetation types occur within the proposal study area. PCT 11; 13; 15.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Codonocarpus pyramidalis</i>	-	EX	V	No	0	Slender Bell-fruit grows on the crests and slopes of low ridges, hills and along creeks in loamy sand or sandy clay loam. Slender Bell-fruit occurs in the Northern Lofty Ranges, Flinders Ranges and eastern regions of South Australia. Specimens were collected along the Darling River early in the 20th century (1920s), but it is now considered to be extinct within NSW.	Professional opinion	Low. No associated habitat recorded.
<i>Commersonia procumbens</i>	-	V	V	No	0	Grows in sandy sites, often along roadsides. Endemic to NSW, mainly confined to the Dubbo-Mendooran-Gilgandra region, but also in the Pilliga and Nymagee areas. Recent collections made from the Upper Hunter region, and additional populations found in Goonoo SCA in response to the 2007 fires. Associated vegetation types within the study area: PCT 70.	Professional opinion	Low. The study area is generally outside the known distribution of this species in NSW. Potential habitat occurs in the form of PCT 70 although considered unlikely to occur.
<i>Convolvulus tedmoorei</i>	Bindweed	E	-	No	1	<i>Convolvulus tedmoorei</i> is a perennial forb. It is known to grow in self-mulching grey clay soils on the floodplains of the Darling and Murrumbidgee Rivers. Associated vegetation types within the study area: PCT 17; 24; 26; 44; 45; 46; 157; 159; 160 163; 164; 165; 216.	BioNet	Moderate. An historic record of this species occurs to the west of Darlington Point (CANB 324508.2, 1969). Associated vegetation types occur within proposal study area.
<i>Cratystylis conocephala</i>	Bluebush Daisy	E	-	No	0	Bluebush Daisy grows in mallee with areas of Belah (<i>Casuarina pauper</i>) on calcareous red soil. NSW populations are invariably found in Belah-Rosewood woodland or on the edge of sandplain mallee in calcareous soils. Associated vegetation types within the study area: PCT 58; 170; 171.	Professional opinion	Moderate. Associated vegetation types occur within proposal study area. PCT 58; 170; 171.
<i>Cullen parvum</i>	Small Scurf-pea	E	-	No	7	In known populations in Victoria and NSW, plants are found in grassland, River Red Gum (<i>Eucalyptus camaldulensis</i>) Woodland or Box-Gum Woodland, sometimes on grazed land and usually on table drains or adjacent to drainage lines or watercourses, in areas with rainfall of between 450 and 700 mm. Associated vegetation types within the study area: PCT 5; 7; 9; 74; 276; 277.	BioNet	Moderate. Recent records from the Wagga Wagga area. Associated vegetation types occur within proposal study area. PCT 5; 7; 9; 74; 276; 277.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Distichlis distichophylla</i>	Australian Saltgrass	E	-	No	0	A coloniser of damp saline soils; found at the edges of salt marshes and on low dunes. In its limited NSW range it grows only in coastal situations, except for one existing population at Lake Cargelligo in south western NSW. Associated vegetation types within the study area: PCT 166.	Professional opinion	Low. Unlikely to occur although surveys will be conducted in PCT 166 when conducting broader summer surveys.
<i>Diuris pedunculata</i>	Small Snake Orchid	E	E	No	0	The Small Snake Orchid grows on grassy slopes or flats. Confined to north east NSW although misidentified records occur in southern NSW. No associated habitat recorded within the study area.	Professional opinion	Low. No associated habitat recorded.
<i>Diuris</i> sp. (Oaklands, D. L. Jones 5380)	Oaklands Diuris	E	-	Yes	0	Grows in White Cypress Pine (<i>Callitris glaucophylla</i>) Woodland, either among dense grasses in flat areas with associated eucalypts, or amongst sparse grasses and forbs on low sandhills. Currently known only from the Oaklands-Urana region of southern NSW. Associated vegetation types within the study area: PCT 75; 80.	Professional opinion	Moderate. Records from the Oaklands / Urana area. Associated vegetation types occur within proposal study area. PCT 75; 80.
<i>Diuris tricolor</i>	Pine Donkey Orchid	V	-	No	394	The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (<i>Callitris</i> spp.). It is found in sandy soils, either on flats or small rises. Also, recorded from a red earth soil in a Bimble Box community in western NSW. Associated vegetation types within the study area: PCT 70; 75; 76; 80; 237.	BioNet	Moderate. Records from the locality. Associated vegetation types occur within proposal study area. PCT 70; 75; 76; 80; 237.
<i>Dodonea sinuolata</i> subsp. <i>acrodentata</i>	A Hopbush	E	-	Yes	0	Grows on stony ridges and sandy 'jump-ups' in arid and semi-arid areas. Substrates are commonly stony red sandy-loams with limonite and quartzite pebbles. In NSW, known from only two locations south-west plains: one near Hillston, and another north of Ivanhoe. Associated vegetation types within the study area: PCT 58.	Professional opinion	Low. Whilst associated habitat occurs in the form of PCT 58, based on the restricted distribution of this species it is considered unlikely to occur within the proposal study area.
<i>Dodonea stenozyga</i>	Desert Hopbush	CE	-	Yes	0	A shrub of semi-arid mallee scrub or open eucalypt woodland, usually on sandy soil. Presumed extinct in NSW (with the only record from the Darling River prior to 1859) until recorded in 1998 from Nanya Station, north west of Wentworth in far south western NSW. Associated vegetation types within the study area: PCT 170; 171.	Professional opinion	Moderate Potential habitat occurs within the study area.. PCT 170; 171.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Dysphania plantaginella</i>	-	E	-	Yes	0	Grows in sandy areas, either coastal or on the margin of waterholes and inland salt lakes. Also, grows in disturbed sites, including the strandline of previous water levels on the side of the gypsum mine at Marlow Station, among old rabbit warrens, on roadsides and even in the middle of tracks on red sandy soils. Interstate habitats include river banks, moist edges of a saline lake, dry river beds, flood channels and open depression on sandplains. Associated vegetation types within the study area: PCT 17; 24; 160; 166.	Professional opinion	Low. No associated habitat recorded.
<i>Eleocharis obicis</i>	Spike-Rush	V	V	No	456	Grows in ephemeral wet situations such as roadside mitre drains and depressions, usually in low-lying grasslands. Found near Condobolin and Hay, as well as being known from an old collection from the Barrier Range near Broken Hill. Associated vegetation types within the study area: PCT 10; 11; 13; 17; 24; 26; 44; 45; 46; 74; 76; 157; 159; 160 163; 164; 216; 237.	BioNet, PMST	Moderate. Potential habitat occurs within the study area.
<i>Eriocaulon australasicum</i>	Austral Pipewort	E	E	Yes	1	Known from very few collections, with the type habitat described as “wet places along the Murray towards junction of Murrumbidgee”. In populations near Braidwood and in the Pilliga, it grows in mud in ephemeral water bodies. Associated vegetation type within the study area: PCT 238.	BioNet	Low. No associated habitat recorded.
<i>Erodiohyllum elderi</i>	Koonamore Daisy	E	-	Yes	0	Grows in flat open areas on sandy calcareous soils. In central Australia, it grows mainly on alluvial floodplains. Commonly recorded from Mulga shrubland with chenopods in SA and WA. Soils include red sand, brown clay, texture-contrast soil on a scalded floodplain, and red loam to sandy loam with quartz. No associated habitat recorded within the study area.	Professional opinion	Low. No associated habitat recorded.
<i>Eucalyptus leucoxylon</i> subsp. <i>pruinosa</i>	Yellow Gum	V	-	No	16	<i>Eucalyptus leucoxylon</i> subsp. <i>pruinosa</i> is a tree species which, in New South Wales, occurs at the bases of sandy rises and on loamy clay flats on the floodplains of the Murray River and its tributaries in the Riverina Bioregion. Associated vegetation types within the study area: PCT 11; 13; 15; 16; 19; 20; 237.	BioNet	Moderate. Associated vegetation types occur within the proposal study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Grevillea iaspicula</i>	Wee Jasper Grevillea	CE	E	Yes	0	Grows on rocky limestone outcrops and around sink holes and cave entrances. Associated vegetation type within the study area: PCT 266.	Professional opinion	Low. No associated habitat recorded.
<i>Grevillea ilicifolia</i> subsp. <i>ilicifolia</i>	Holly-leaf Grevillea	CE	-	Yes	4	In New South Wales <i>Grevillea ilicifolia</i> subsp. <i>ilicifolia</i> has been recorded from shrubby mallee communities. Associated vegetation type within the study area: PCT 171.	BioNet	Moderate Associated vegetation types occur within the proposal study area
<i>Kippistia suaedifolia</i>	Fleshy Minuria	E	-	No	0	Grows around saline lakes and depressions, often in association with gypsum. Rare in NSW, recorded only from a restricted area on a loamy and highly gypseous soil. Associated vegetation type within the study area: PCT 166.	Professional opinion	Low. Not known to occur within the locality and limited potential habitat.
<i>Lasiopetalum behrii</i>	Pink Velvet Bush	CE	-	Yes	0	Grows in mallee and red dune and swale country. Pink Velvet Bush is known in NSW from a single record made in 1997 on leasehold land to the south east of Poongahie in the far south western plains. The species is common in mallee areas of north western Victoria, with an outlier in the whipstick mallee near Bendigo. It is also widespread in south eastern South Australia. Associated vegetation types within the study area: PCT 170; 171.	Professional opinion	Moderate. Associated vegetation types occur within the proposal study area.
<i>Lepidium aschersonii</i>	Spiny Peppergrass	V	V	No	3	Found on ridges of gilgai clays dominated by Brigalow (<i>Acacia harpophylla</i>), Belah (<i>Casuarina cristata</i>), Buloke (<i>Allocasuarina luehmannii</i>) and Grey Box (<i>Eucalyptus microcarpa</i>). In the south, has been recorded growing in Bull Mallee (<i>Eucalyptus behriana</i>). Often the understorey is dominated by introduced plants. The species grows as a component of the ground flora, in grey loamy clays. Vegetation structure varies from open to dense, with sparse grassy understorey and occasional heavy litter. Associated vegetation types within the study area: PCT 26; 74; 76; 237.	BioNet	Moderate. Potential habitat occurs within the study area.. PCT 26; 74; 76; 237.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Lepidium monoplocoides</i>	Winged Peppergrass	E	E	No	47	Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm. Predominant vegetation is usually an open woodland dominated by <i>Allocasuarina luehmannii</i> (Bullock) and/or eucalypts, particularly <i>Eucalyptus largiflorens</i> (Black Box) or <i>Eucalyptus populnea</i> (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. Associated vegetation types within the study area: PCT 13; 15; 16; 24; 26; 45; 46; 74; 80; 159; 160; 163; 170; 216; 237.	BioNet, PMST	Moderate. Four historical (over 90 years old) ALA records occur between Mildura and Buronga. There are no OEH records within the Proposal study area. Potential habitat occurs within the proposal study area; PCT 13; 15; 16; 24; 26; 45; 46; 159; 160; 163; 170; 216, 237.
<i>Leptorhynchos orientalis</i>	Lanky Buttons	E	-	No	108	Grows in woodland or grassland, sometimes on the margins of swamps. Communities include a Bimble Box plain in red-brown soil, dense <i>Acacia pendula</i> woodland with herbaceous understorey on red clay to clay-loam, open grassland areas on red soils, and red clay plains at the edge of a Canegrass swamp. Associated vegetation types within the study area: PCT 24; 26; 44; 45; 46.	BioNet	Moderate. Associated vegetation types occur within the proposal study area. PCT 24; 26; 44; 45; 46; 47.
<i>Leptorhynchos waitzia</i>	Button Immortelle	E	-	Yes	0	Grows on sandy or loamy soils, often in intermittently flooded areas and salt flats. Found in Kinchega NP on an open Bluebush plain with scattered chenopods. Only known in NSW from early records in the Darling River region and a more recent collection from Kinchega National Park. Associated vegetation types within the study area: PCT 166; 170.	Professional opinion	Low. Whilst associated habitat occurs in the form of PCT 166; 170, based on the restricted distribution of this species it is considered unlikely to occur within the proposal study area.
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	Hoary Sunray	-	E	No	1	Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils. No associated habitat recorded within the study area.	BioNet	Low. No associated habitat recorded.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Maireana cheelii</i>	Chariot Wheels	V	V	No	58	Usually found on heavier, grey clay soils with <i>Atriplex vesicaria</i> (Bladder Saltbush). Recorded on the Hay Plain in <i>Atriplex vesicaria</i> , <i>Maireana aphylla</i> and <i>Acacia homalophylla</i> shrublands. Soils include heavy brown to red-brown clay-loams, hard cracking red clay, other heavy texture-contrast soils. Associated vegetation types within the study area: PCT 26; 44; 46, 157; 164.	BioNet, PMST	High Potential habitat occurs within the proposal study area. This species has been recorded near the study area at the intersection of Maude Road and Booroorban – Tchelery Road. Also, recorded from numerous locations across the Hay Plain.
<i>Maireana lanosa</i>	Woolly Bluebush	EX	-	No	0	<i>Maireana lanosa</i> is found in red sand or loam on saline flats or floodplains. This species is presumed extinct in NSW.	Professional opinion	Low. Targeted during broader threatened species searches.
<i>Monotaxis macrophylla</i>	-	E	-	No	0	There is a great diversity in the associated vegetation within NSW (less though in Queensland), encompassing coastal heath, arid shrubland, forests and montane heath from almost sea level to 1300 m altitude. No associated habitat recorded within the study area.	Professional opinion	Low. No associated habitat recorded.
<i>Pilularia novae-hollandiae</i>	Austral Pillwort	E	-	Yes	17	Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. Most of the records from the Albury-Urana area are from table drains on the sides of roads. Associated vegetation types within the study area: PCT 9; 13; 26; 45; 74; 237; 238.	BioNet	Moderate. Potential habitat occurs within the study area; PCT 9; 13; 26; 45; 237; 238 Flowers between Oct and Dec.
<i>Pimelea serpyllifolia</i> subsp. <i>serpyllifolia</i>	Thyme Rice-Flower	E	-	Yes	10	Grows in scrub and woodland on calcareous soils. Often found in sandy red soils supporting mallee scrub. Associated vegetation types within the study area: PCT 170; 171.	BioNet	Moderate. Associated vegetation types occur within the proposal study area. PCT 170; 171.
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	-	E	No	0	The Tarengo Leek Orchid occurs on relatively fertile soils in grassy woodland or natural grassland. Associated vegetation types within the study area: PCT 276; 277.	PMST	Moderate. No records in the locality. Potential habitat within PCT 276; 277 in the proposal study area

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Prasophyllum validum</i>	Sturdy Leek-orchid	E	E	No	0	The Sturdy Leek-orchid tends to grow in drier woodland habitats, generally with a low sparse understorey. <i>Prasophyllum validum</i> occurs across inland Victoria and in South Australia in the Flinders Ranges. The species is not known from NSW.	PMST	Low. The study area occurs outside the known distribution of this species and no associated habitat recorded.
<i>Pterostylis cheraphila</i>	Floodplain Rustyhood	-	V	No	0	<i>Pterostylis cheraphila</i> is endemic to western Victoria, centred around Dimboola and Murtoa. It grows in open <i>Eucalyptus largiflorens</i> / <i>Eucalyptus leucoxylon</i> woodland with a sparse grassy understorey, on seasonally inundated, heavy, grey-black clay soils.	PMST	Low. The study area occurs outside the known distribution of this species and no associated habitat recorded.
<i>Pterostylis cobarensis</i>	Cobar Rustyhood	V	-	No	0	Habitats are eucalypt woodlands, open mallee or Callitris shrublands on low stony ridges and slopes in skeletal sandy-loam soils. Associated vegetation types within the study area: PCT 170; 171.	Professional opinion	Low. The proposal study area occurs outside the known distribution of this species.
<i>Ptilotus extenuatus</i>	-	EX	-	No	2	<i>Ptilotus extenuatus</i> was regarded as a rare species many years ago. Just four widely scattered collections of the species have been made- two in NSW and two in the far south of Queensland. The species is now presumed to be extinct. The habitat of <i>Ptilotus extenuatus</i> is unknown; however, one specimen label records the soil as 'grey silty clay' while another says 'light sandy soil'. No associated habitat recorded within the study area.	BioNet	Low. No associated habitat recorded.
<i>Pultenaea humilis</i>	Dwarf bush pea	V	-	Yes	0	<i>Pultenaea humilis</i> is found in isolated remnants of native woodland and forest communities that occur in extensively cleared agricultural landscapes. Occurs on a variety of soils ranging from sandy loams to clays. No associated habitat recorded within the study area.	Professional opinion	Low. No associated habitat recorded.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Santalum murrayanum</i>	Bitter Quandong	E	-	No	100	Usually grows in mallee communities. Generally, grows in gravely and sandy loam soils on dunes, in open woodland and tall shrubland. Recorded in sand in spinifex-shrub steppe. NSW populations found in mallee habitats on soft linear dune-crests, with deep and well-drained calcareous earths or red and brown sands, loamy sands or clay-loams. Associated species include <i>Eucalyptus socialis</i> and <i>Pimelea microcephala</i> . Many of the NSW records occur within the vicinity of the Sturt Highway (between Dareton and Balranald) within proximity to the study area. Associated vegetation types within the study area: PCT 170,171.	BioNet	Moderate. Known to occur in the locality. Associated habitat PCT 170; 171.
<i>Sclerolaena napiformis</i>	Turnip Copperburr	E	E	No	185	Confined to remnant grassland habitats on clay-loam soils. Grows on level plains in tussock grassland of <i>Austrostipa nodosa</i> and <i>Chloris truncata</i> , in grey cracking clay to red-brown loamy clay. Known from only a few small populations in remnant grassland in the southern Riverina of NSW and north-central Victoria. NSW populations are confined to the area between Jerilderie and Moama on travelling stock routes and road reserves. Associated vegetation types within the study area: PCT 26; 44; 46.	BioNet, PMST	Moderate. Potential habitat occurs within the study area. PCT 26; 44; 46.
<i>Senecio behrianus</i>	Stiff Groundsel	EX	E	No	0	Presumed extinct, although historic populations were recorded to grow on poorly-drained sedimentary grey clays or sandy clays on or close to floodplains, and on basalt-derived grey cracking clays in periodically flooded depressions. A common feature seems to be that habitats are seasonally inundated, and hydrological regime is probably an important aspect of habitat, although the optimal timing and extent of flooding are unknown.	Professional opinion	Low. Although will be targeted during broader threatened species searches.
<i>Senecio garlandii</i>	Woolly Ragwort	V	-	No	43	Woolly Ragwort occurs on sheltered slopes of rocky outcrops. Associated vegetation type within the study area: PCT 346.	BioNet	Moderate. Known to occur in the locality. Associated vegetation types occur within the proposal study area. PCT 346.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Solanum karsense</i>	Menindee Nightshade	V	V	No	20	Grows in occasionally flooded depressions with heavy soil, including level river floodplains of grey clay with Black Box and Old Man Saltbush, and open treeless plains with solonized brown soils. Habitats are generally lake beds or floodplains of heavy grey clays with a highly self-mulching surface. Also found on sandy floodplains and ridges and in calcareous soils, red sands, red-brown earths and loamy soils. Associated vegetation types within the study area: PCT 13; 15; 16; 17; 24; 160; 166.	BioNet, PMST	Moderate There are historic records in the locality at Balranald and Buronga (ESS, 2020). Potential habitat occurs within the proposal study area PCT 13; 15; 16; 17; 24; 160; 166.
<i>Stenopetalum velutinum</i>	Velvet Thread-petal	EX	-	No	1	<i>Stenopetalum velutinum</i> is strongly associated with buffel grass cover and sandy soils. The species is currently distributed in Queensland, Western Australia, South Australia, and the Northern Territory. It is presumed extinct in NSW.	BioNet	Low. An historic record of this species was recorded near Wanganella in 1903 (NSW90014). The occurrence of this species is considered unlikely.
<i>Swainsona adenophylla</i>	Violet Darling Pea	E	-	Yes	1	Flowering period is June to September (or summer after good rains). Recorded in the Menindee area growing on sandy soil in a year of high winter rainfall. Most Swainsona species are erratic in occurrence, carpeting the landscape after significant rain in areas of low and irregular rainfall. Associated vegetation types within the study area: PCT 11; 13; 15.	Professional opinion	Low. No records in the locality. A single historic record of this species occurs west of Wagga Wagga near Brookdale (HO:HO78373, 1963) Associated habitat PCT 11; 13; 15.
<i>Swainsona colutoides</i>	Bladder Vetch	E	-	No	0	Grows on sandy flats or skeletal hillside soils in mallee woodland. Plants are usually found in large numbers in areas of previous controlled burns and wildfires. Occurs in the south western corner of NSW, with several populations all located within Tarawi Nature Reserve. Associated vegetation types within the study area: PCT 170,171.	Professional opinion	Moderate. Associated vegetation types occur within the proposal study area. PCT 170; 171.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Swainsona flavicarinata</i>	Yellow-keeled Swainsona	E	-	Yes	0	Grows in deep red sand, recorded from a roadside on a treeless plain in NSW. In central Australia, the species grows in Mulga communities on red earths and on stony soils supporting Bladder Saltbush. Also found on sandy plains and ridges, in grassland, and in watercourses and floodplains near creeks or rock holes. Not common in NSW, having an outlier population in the Broken Hill-Menindee district in the far western plains. More common in the southern parts of the NT and inland SA. Associated vegetation types within the study area: PCT 157; 165; 166.	Professional opinion	Low. Not known from the locality with the closest record being from the Broken Hill-Menindee area. Considered unlikely to occur.
<i>Swainsona murrayana</i>	Slender Darling Pea	V	V	No	193	The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated. Associated vegetation types within the study area: PCT 15; 16; 23; 26; 28; 44; 45; 46; 76; 80; 157; 163; 165; 216; 237.	BioNet, PMST	High. Historic record and current observation of this species within the proposal study area on the Hay Plain. Associated habitat present in the form of: PCT 15; 16; 23; 26; 28; 44; 45; 46; 57; 76; 80; 163; 165; 216, 237/.
<i>Swainsona plagiotropis</i>	Red Darling Pea	V	V	No	1353	Grows on flat grassland and in heavy red soil, often on roadsides and especially in table drains. Soils are derived from quaternary sediments and are usually red-brown clay-loams. The species is absent from black low-lying soils. Recorded from roadsides, rail reserves, stock routes and areas of lightly grazed unimproved pasture comprising <i>Austrodanthonia</i> sp., <i>Enteropogon acicularis</i> and <i>Austrostipa</i> grassland communities. Associated vegetation types within the study area: PCT 26; 44; 45; 46; 165.	BioNet	Moderate. Associated vegetation types occur within the proposal study area. PCT 26; 44; 45; 46; 165.
<i>Swainsona pyrophila</i>	Yellow Swainson-pea	V	V	No	7	Grows in mallee scrub on sandy or loamy soil, usually found only after fire. Sites include cleared and burnt mallee scrub on red loam to sand, previously burnt <i>Eucalyptus dumosa</i> mallee, disturbed woodland in sheltered aspects, a bulldozed firebreak adjacent to wheat paddocks, roadsides, claypans and at the edge of fire ash. Associated vegetation types within the study area: PCT 170; 171.	BioNet, PMST	Moderate. Associated vegetation types occur within the proposal study area. PCT 170; 171.

SCIENTIFIC NAME	COMMON NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
<i>Swainsona recta</i>	Small Purple-pea	V	E	No	4	Grows in association with understorey dominants that include Kangaroo Grass <i>Themeda triandra</i> , poa tussocks <i>Poa</i> spp. and spear-grasses <i>Austrostipa</i> spp. Associated vegetation types within the study area.; 266; 276; 277.	BioNet, PMST	Moderate. Associated vegetation types occur within the proposal study area.; 266; 276; 277.
<i>Swainsona sericea</i>	Silky Swainson-pea	V	-	No	215	Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. PCT 23; 26; 44; 45; 46; 74; 76; 80; 237; 266; 276; 277.	BioNet	Moderate. Associated vegetation types occur within the proposal study area. PCT 23; 26; 44; 45; 46.
<i>Tecticornia flabelliformis</i>	Bead Glasswort	-	V	No	0	The Bead Glasswort <i>Tecticornia flabelliformis</i> is a poorly-known, small perennial shrub that is widely distributed across southern Australia, where it occurs in low-lying seasonally inundated clay and salt pans.	Professional opinion	Low. No associated habitat recorded. Not currently recorded from NSW. The nearest record to the proposal is from the NE corner of Murray – Sunset National Park in Victoria.
<i>Tylophora linearis</i>	Tylophora linearis	V	E	No	0	Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of <i>Eucalyptus fibrosa</i> , <i>Eucalyptus sideroxylon</i> , <i>Eucalyptus albens</i> , <i>Callitris endlicheri</i> , <i>Callitris glaucophylla</i> and <i>Allocasuarina luehmannii</i> .	PMST	Low. No associated habitat recorded.
<i>Wilsonia rotundifolia</i>	Round-leafed Wilsonia	E	-	No	1	Grows in mud in coastal saltmarsh and inland saline or brackish lake beds. No associated vegetation types recorded within the study area.	BioNet	Low. No associated habitat recorded.

1) V = Vulnerable, E = Endangered, CE = Critically Endangered, EX = Presumed Extinct under the BC Act

2) V = Vulnerable, E = Endangered under the Commonwealth EPBC Act.

3) Source; Professional opinion = ESS expert advice of predicted threatened species areas provided as spatial data, PMST = The Department of the Environment and Energy's EPBC Protected Matters Search Tool, BioNet = ESS's Bionet Atlas of NSW Wildlife

APPENDIX B

THREATENED FAUNA LIKELIHOOD OF OCCURRENCE

B1.1 THREATENED FAUNA LIKELIHOOD OF OCCURRENCE

Table B.1 Threatened fauna likelihood of occurrence

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
AMPHIBIANS								
Booroolong Frog	<i>Litoria booroolongensis</i>	E	E	No	0	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Associated vegetation types within the study area: PCT 346 and water bodies	Professional opinion	Moderate. Known to occur to the east of Wagga Wagga. Associated habitat, PCT 346 and water bodies, recorded.
Painted Burrowing Frog	<i>Neobatrachus pictus</i>	E	-	No	0	This species can occur in open grassland, mallee, woodland, farmland and cleared areas and are usually found in or around flooded areas after periods of heavy rainfall, including grassy marshes, lagoons, flooded claypans, temporary roadside pools, ditches, mallee swales and farm dams. Associated vegetation types within the study area: PCT 11, 13, 15, 16, 24, 58, 153, 157, 159, 163, 165, 170, 171, 181, 216, 238 and highly disturbed areas including road verges, table drains, road embankments, ploughed paddock.	Professional opinion	Moderate. Associated habitat PCT 11, 13, 15, 16, 24, 58, 153, 157, 159, 163, 165, 170, 171, 181, 216, 238 recorded.
Sloane's Froglet	<i>Crinia sloanei</i>	V	-	No	7	It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with most records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. Associated vegetation types within the study area: PCT 5; 74; 76; 80; 237, 276 and water bodies.	BioNet	Moderate. Scattered records within locality. Associated habitat in the form of water bodies recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Southern Bell Frog	<i>Litoria raniformis</i>	E	V	No	947	Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Associated vegetation types within the study area: PCT 7; 11; 13; 17; 24; 238 and water bodies.	BioNet, PMST	Moderate. Records within locality. Associated habitat PCT 7; 11; 13; 17; 24; 238 and water bodies recorded.
BIRDS								
Australasian Bittern	<i>Botaurus poiciloptilus</i>	E	E	n/a	203	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails.	BioNet, PMST	Moderate. Records occur within locality. Species may occur intermittently in freshwater wetlands recorded.
Australian Bustard	<i>Ardeotis australis</i>	E	-	No	15	Mainly inhabits tussock and hummock grasslands, though prefers tussock grasses to hummock grasses; also occurs in low shrublands and low open grassy woodlands; occasionally seen in pastoral and cropping country, golf courses and near dams.	BioNet	Moderate. Associated habitat recorded.
Australian Painted Snipe	<i>Rostratula australis</i>	E	E	N/a	43	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	BioNet, PMST	Moderate. Associated habitat recorded.
Barking Owl	<i>Ninox connivens</i>	V	-	No	31	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile riparian soils.	BioNet	Moderate. Associated foraging and breeding habitat recorded within the proposal study area

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Bar-tailed Godwit	<i>Limosa lapponica baueri</i>	-	VM	N/a	11	It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms.	BioNet, PMST	Moderate. May occur intermittently around saltlakes and wetlands. Targeted surveys not required as it is assumed present if within an 'important area'.
Northern Siberian Bar-tailed Godwit	<i>Limosa lapponica menzbieri</i>	-	CEM	N/a	0	The bar-tailed godwit (both subspecies combined) has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria. The bar-tailed godwit (northern Siberian) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats	PMST	Moderate. May occur intermittently around saltlakes and wetlands. Targeted surveys not required as it is assumed present if within an 'important area'.
Black Falcon	<i>Falco subniger</i>	V	-	n/a	172	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993). The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring.	BioNet	Moderate. Species is known to occur locally.
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	V	-	No	5	Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. Also hunts over grasslands and sparsely timbered woodlands. The species is known to breed in sites with cropping, but also requires retained vegetation.	BioNet	Moderate. Associated habitat recorded within proposal study area

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAIL	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	V	-	N/a	32	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>), Blakely's Red Gum (<i>E. blakelyi</i>) and Forest Red Gum (<i>E. tereticornis</i>).	BioNet	Low. Lack of suitable associated habitat.
Black-eared Miner	<i>Manorina melanotis</i>	CE	E	Yes	23	Birds are restricted to large tracts (30,000 hectares or greater) of mature, unfragmented mallee on the more fertile soils. Associated vegetation types within the study area: PCT 170 and 171.	BioNet, PMST	Moderate. Associated vegetation PCT 170 and PCT 171 recorded within the proposal study area.
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E1	-	N/a	1	Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. Forages in the many small wet habitats, within a large home range, that in total form an important resource.	BioNet	Moderate. Marginal secondary habitat. Rare occurrences cannot be discounted.
Black-tailed Godwit	<i>Limosa limosa</i>	V	M	No	76	Primarily a coastal species which is usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps.	BioNet	Moderate. May occur rarely in wetland habitats. Targeted surveys not required as it is assumed present if within an 'important area'.
Blue-billed Duck	<i>Oxyura australis</i>	V	-	N/a	213	The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. It will fly if disturbed, but prefers to dive if approached.	BioNet	Moderate. Though limited associated habitat recorded within the proposal study area, species may occur during migration movements and dispersal during the breeding season.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAIL	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Brolga	<i>Grus rubicunda</i>	V	-	N/a	184	Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged.	BioNet	Moderate. Known to occur within the locality.
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	V	-	N/a	1339	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	BioNet	Moderate. Frequently recorded within locality. Associated habitat recorded.
Bush Stone-curlew	<i>Burhinus grallarius</i>	E	-	No	100	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	BioNet	Moderate. Associated habitat recorded in riparian areas.
Caspian Tern	<i>Hydroprogne caspia</i>	-	M	N/a	197	The Caspian Tern is found in sheltered coastal embankments preferring sandy or muddy margins. Also found in near-coastal or inland terrestrial wetlands. It forages in open wetlands, preferring sheltered shallow water near the margins.	BioNet	Moderate. May occur intermittently in wetland habitats.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Cattle Egret	<i>Ardea ibis</i>	-	Ma	N/a	144	Widespread and common according to migration movements and breeding localities surveys. It has occasionally been seen in arid and semi-arid regions however this is extremely rare. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures. It has been recorded on earthen dam walls and ploughed fields. It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer.	BioNet	Moderate. Associated grassland habitat recorded within the proposal study area.
Chestnut Quail-thrush	<i>Cinlosoma castanotum</i>	-	V	N/a	184	Throughout its distribution it occurs in a wide range of arid and semi-arid habitats; mainly in the low shrubs and undergrowth of mallee scrub, but also in Acacia scrubs, dry sclerophyll woodland, heath, and native pine. However, in NSW it seems to occur almost exclusively in mallee habitats, with understorey dominated by spinifex, chenopods or other shrubs including Acacia species. Only rarely, such as in Cocoparra NP, is it recorded in other types of woodland, and in these areas a dense understorey may be a prerequisite.	BioNet	Recorded Associated habitat in the form of semi-arid woodlands (Mallee) recorded.
Common Greenshank	<i>Tringa nebularia</i>	-	M	N/a	287	Occurs in a range of inland and coastal environments. Inland, it occurs in both permanent and temporary wetlands, billabongs, swamps, lakes floodplains, sewage farms, saltworks ponds, flooded irrigated crops. On the coast, it occurs in sheltered estuaries and bays with extensive mudflats, mangrove swamps, muddy shallows of harbours and lagoons, occasionally rocky tidal ledges. It generally prefers wet and flooded mud and clay rather than sand.	BioNet	Moderate. May occur intermittently in wetland habitats.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAIL	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Common Sandpiper	<i>Actitis hypoleucos</i>	-	M	N/a	8	The Common Sandpiper frequents a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. It is mostly encountered along muddy margins or rocky shores and rarely on mudflats. It has been recorded in estuaries and deltas of streams, banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves.	BioNet	Moderate. May occur intermittently in wetland habitats.
Curlew Sandpiper	<i>Calidris ferruginea</i>	E	CE	Yes	124	This species generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. Associated vegetation types within the study area: PCT 24, 47, 238 and waterbodies.	BioNet, PMST	Moderate. May occur intermittently in wetland habitats. Targeted surveys not required as it is assumed present if within an 'important area'.
Diamond Firetail	<i>Stagonopleura guttata</i>	V	-	N/a	313	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities.	BioNet	Moderate. Known to occur within locality and utilise Mallee and grassland communities.
Dusky Woodswallow	<i>Artamus cyanopterus cyanopterus</i>	V	-	N/a	306	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	BioNet	Recorded Known to occur within locality

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Eastern Curlew	<i>Numenius madagascarensis</i>	-	CEM		0	It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts.	PMST	Low. Lack of suitable associated habitat.
Eastern Osprey	<i>Pandion cristatus</i>	V	-	No	1	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes.	BioNet	Low. Lack of suitable associated habitat.
Flame Robin	<i>Petroica phoenicea</i>	V	-	N/a	222	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys.	BioNet	Moderate. Known to occur within locality and utilise Box-Gum Woodlands communities.
Fork-tailed Swift	<i>Apus pacificus</i>	-	M	N/a	16	Breeds in the northern hemisphere, wintering south to Australia. It is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground. It mostly occurs over inland plains but sometimes above foothills or in coastal areas over cliffs, beaches, islands and well out to sea. It also occurs over towns and cities. It mostly occurs over dry and/or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh, grassland, spinifex sandplains, farmland and sand-dunes. It sometimes occurs above forests. It probably roosts aerially, but has occasionally been observed to land.	BioNet	Moderate. May occur in aerial habitats over the proposal study area on a seasonal basis.
Freckled Duck	<i>Stictonetta naevosa</i>	V	-	N/a	331	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	BioNet	Moderate. Known to occur within locality and may utilise in wetland habitats.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V	-	No	6	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.	BioNet	Moderate. Proposal study area is on the fringe of this species distribution. May utilise Box-Gum woodland vegetation.
Gilbert's Whistler	<i>Pachycephala inornata</i>	V	-	N/a	115	The Gilbert's Whistler occurs in a range of habitats within NSW, though the shared feature appears to be a dense shrub layer. It is widely recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests, though at this stage it is only known to use this habitat along the Murray, Edwards and Wakool Rivers. Within the mallee the species is often found in association with an understorey of spinifex and low shrubs including wattles, hakeas, sennas and hop-bushes. In woodland habitats, the understorey comprises dense patches of shrubs, particularly thickets of regrowth Callitris pine. Parasitic 'cherries' (<i>Exocarpus</i> species) appear to be an important habitat component in Belah and Red Gum communities, though in the latter case other dense shrubs, such as <i>Lignum</i> and wattles, are also utilised.	BioNet	Moderate. Known to occur within locality. Associated Mallee and Cypress Pine and River Red Gum communities recorded within the proposal study area.
Glossy Black-Cockatoo	<i>Calyptrorhynchus lathamii</i>	V	-	No	117	Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, <i>Allocasuarina diminuta</i> , and <i>A. gymnathera</i> . Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (<i>Casuarina cristata</i>).	BioNet	Moderate. Known to occur within locality, and potential habitat; PCT 58 - Black Oak - Western Rosewood was recorded within the proposal study area.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Glossy Black-Cockatoo, Riverina population	<i>Calyptrorhynchus lathamii</i>	E	-		92	This population now occurs west of longitude 146° 40' E, within Cobar, Carrathool, Narrandera and Leeton local government areas. The population is largely restricted to hills and low ridges where suitable stands of its food plant Drooping Sheoak (<i>Allocasuarina verticillata</i>) remain.	BioNet	Moderate. Though stands of Drooping Sheoak (<i>Allocasuarina verticillata</i>) are unlikely to occur. Potential habitat; PCT 58 - Black Oak - Western Rosewood was recorded within the proposal study area. The Local Government Areas in which this population is recognised fall within the proposal study area.
Glossy Ibis	<i>Plegadis falcinellus</i>	-	M	N/a	1608	It feeds in very shallow water and nests in freshwater or brackish wetlands with tall dense stands of emergent vegetation (e.g. reeds or rushes) and low trees or bushes. It shows a preference for marshes at the edges of lakes and rivers, as well as lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and irrigated cultivation.	BioNet	Moderate. Known to occur within locality and may utilise in wetland habitats.
Great Knot	<i>Calidris tenuirostris</i>	V	CEM	Yes	2	Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	BioNet	Low. Lack of suitable associated habitat.
Grey Falcon	<i>Falco hypoleucos</i>	E	-	N/a	16	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.	BioNet	Moderate. Associated habitat recorded within the proposal study area.
Grey Plover	<i>Pluvialis squatarola</i>	-	M	3		Grey Plovers is a migratory species, breeding in the Northern Hemisphere and flying south for the boreal winter. This species usually forage on large areas of exposed mudflats and beaches of sheltered coastal shores such as inlets, estuaries and lagoons. They also occasionally feed in pasture and at the muddy margins of inland wetlands such as lakes, swamps and bores.	BioNet	Low. Lack of suitable associated habitat. Rare occurrences during migration cannot be discounted.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V	-	N/a	1187	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions.	BioNet	Recorded Associated habitat recorded within the proposal study area.
Gull-billed Tern	<i>Gelochelidon nilotica</i>	-	M	N/a	242	Prefer shallow, often ephemeral, terrestrial wetlands, either fresh or saline, especially lakes, swamps and lagoons, particularly those with mudflats; sometimes on inundated ground, including salt pans, clay pans and saltmarsh or watercourses and associated floodplains.	BioNet	Moderate. May occur intermittently in wetland habitats
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	V	-	N/a	295	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	BioNet	Moderate Associated habitats including Mallee and Arid Shrublands recorded within the proposal study area.
Latham's Snipe	<i>Gallinago hardwickii</i>	-	M	N/a	85	Occurs in freshwater or brackish wetlands generally near protective vegetation cover. This species feeds on small invertebrates, seeds and vegetation. It migrates to the northern hemisphere to breed.	BioNet	Moderate. May occur intermittently in wetland habitats.
Little Curlew	<i>Numenius minutus</i>	-	M	N/a	1	On passage the species shows a preference for foraging and resting in swampy meadows near lakes and along river valleys. It overwinters on dry inland grassland, bare cultivation, dry mudflats and coastal plains of black soil with scattered shallow pools of freshwater, swamps, lakes or flooded ground.	BioNet	Moderate. May occur intermittently in wetland habitats.
Little Eagle	<i>Hieraaetus morphnoides</i>	V	-	No	263	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	BioNet	Moderate. Associated habitat recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	-	N/a	10	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	BioNet	Moderate. Associated woodland and riparian habitat recorded.
Little Stint	<i>Calidris minuta</i>	-	Ma	N/a	1	Little Stint is migratory a shorebird species.	BioNet	Moderate. May occur intermittently in wetland habitats.
Long-toed Stint	<i>Calidris subminuta</i>	-	M	N/a	23	The Long-toed Stint is a migratory summer visitor to Australia, but uncommon in the east. This species occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds.	BioNet	Moderate. May occur intermittently in wetland habitats.
Magpie Goose	<i>Anseranas semipalmata</i>	V	-		68	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes.	BioNet	Moderate. May occur intermittently in wetland habitats.
Major Mitchell's Cockatoo	<i>Lophochroa leadbeateri</i>	V	-	No	312	Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines.	BioNet	Moderate. Associated habitat including Saltbush, Arid Shrubland and Cypress Pine communities recorded.
Mallee Emu-wren	<i>Stipiturus mallee</i>	-	E	N/a	4	The mallee emu-wren is found in the mallee country on the South Australian and Victorian border. It occurs in areas of spinifex sometimes with an overstorey of mallee woodland. It prefers dense stands (hummocks) of long unburnt spinifex.	BioNet	Moderate. Associated habitat including Mallee woodland communities recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Malleefowl	<i>Leipoa ocellata</i>	E	V	N/a	196	Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species.	BioNet, PMST	High Associated Mallee communities, species records throughout proposal locality.
Marsh Sandpiper	<i>Tringa stagnatilis</i>	-	M	N/a	409	Occurs in coastal and inland wetlands (salt or fresh water), estuarine and mangrove mudflats, beaches, shallow or swamps, lakes, billabongs, temporary floodwaters, sewage farms and saltworks ponds.	BioNet	Moderate. May occur intermittently in wetland habitats.
Masked Owl	<i>Tyto novaehollandiae</i>	V	-		4	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. Living or dead trees with hollows greater than 20cm diameter required for breeding.	BioNet	Moderate May intermittently utilise habitat along Murray riparian habitats
Night Parrot	<i>Pezoporus occidentalis</i>	X	E	N/a	0	The distribution of the Night Parrot has not been well documented, but it is known to be restricted to arid and semi-arid Australia. This species is presumed to be extinct in NSW.	PMST	Low. Lack of suitable associated habitat.
Pacific Golden Plover	<i>Pluvialis fulva</i>	-	M	N/a	18	Prefers sandy, muddy or rocky shores, estuaries and lagoons, reefs, saltmarsh, and or short grass in paddocks and crops. The species is usually coastal, including offshore islands; rarely far inland. Often observed on beaches and mudflats, sandflats and occasionally rock shelves, or where these substrates intermingle; harbours, estuaries and lagoons.	BioNet	Low. Lack of suitable associated habitat. May occur intermittently during migration.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Painted Honeyeater	<i>Grantiella picta</i>	V	V	N/a	169	Inhabits Boree/ Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> .	BioNet, PMST	Moderate. Associated Weeping Myall habitats recorded.
Pectoral Sandpiper	<i>Calidris melanotos</i>	-	M	N/a	86	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species frequents coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. It is usually found in coastal or near coastal habitat but occasionally further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. It has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.	BioNet	Moderate. May occur intermittently in wetland habitats
Pied Honeyeater	<i>Certhionyx variegatus</i>	V	-	N/a	42	Inhabits wattle shrub, primarily Mulga (<i>Acacia aneura</i>), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering; feeds on nectar, predominantly from various species of emu-bushes (<i>Eremophila spp.</i>); also from mistletoes and various other shrubs (e.g. <i>Grevillea spp.</i>); also eats saltbush fruit, berries, seed, flowers and insects.	BioNet	Moderate. Associated habitats, including Mallee and River Red Gum woodlands recorded.
Plains-wanderer	<i>Pedionomus torquatus</i>	E	CE	Yes	1357	Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. Habitat structure appears to play a more important role than plant species composition. Preferred habitat of the Plains-wanderer typically comprises 50% bare ground, 10% fallen litter, and 40% herbs, forbs and grasses. Associated vegetation types within the study area: PCT 44 and 46.	BioNet, PMST	High Widely recorded and associated vegetation recorded. This is a dual credit species, mapped important areas are a species credit, these areas do not require survey. Mapped areas are primary habitat only.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAIL	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>	V	-	N/a	3	Distribution is centered around Victoria, South Australia and the South-East corner of Western Australia. Found in open forests and woodlands, particularly where there are large flowering eucalypts. Also recorded from mallee habitats. Feed primarily on nectar and pollen of flowering Eucalypts, including planted trees in urban areas.	BioNet	Moderate. Though associated vegetation was recorded. The proposal study area is on the fringe of the populations distribution. Rare occurrences during favourable conditions cannot be discounted.
Purple-gaped Honeyeater	<i>Lichenostomus cratitius</i>	V	-	N/a	2	Inhabits mallee heathlands and less commonly in associated mallee with a more open understorey (such as Spinifex associations). Is also occasionally recorded in River Red Gums bordering waterways. Associated vegetation types within the study area: PCT 13, 170 and 171.	BioNet	Moderate. Associated habitats, Mallee, Black Box and River Red Gum Woodland communities, recorded.
Rainbow Bee-eater	<i>Merops ornatus</i>	-	Ma	N/a	698	Usually occur in open or lightly timbered areas, often near water. Breed in open areas with friable, often sandy soil, good visibility, convenient perches and often near wetlands. Nests in embankments including creeks, rivers and sand dunes. Insectivorous, most foraging is aerial, in clearings.	BioNet	Recorded Frequently recorded within locality. May utilise Forest Wetland communities and riparian habitats.
Red Knot	<i>Calidris canutus</i>	-	E	No	5	In NSW the Red Knot mainly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts. It is occasionally found on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms and is a rare visitor to terrestrial saline wetlands and freshwater swamps.	BioNet	Moderate. Mainly restricted to coastal environments. Rare occurrences cannot be discounted.
Red-lored Whistler	<i>Pachycephala rufogularis</i>	CE	V	Yes	0	Found in mallee woodland with a shrub layer, usually of Broombush and native pine such as Mallee Pine (<i>Callitris verrucosa</i>), with occasional patches of spinifex and emergent mallee, forming a relatively dispersed canopy. Associated vegetation types within the study area: PCT 171.	Professional Opinion	Moderate. Associated vegetation types recorded. Population is known to extend to Mildura.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Red-necked Stint	<i>Calidris ruficollis</i>	-	M	N/a	161	Mostly found in coastal areas, including sheltered inlets, bays lagoons and estuaries. They also occur in shallow wetlands near the coast or inland, including lakes, waterholes and dams. They forage in mudflats, shallow water, sandy open beaches, flooded paddocks and in samphire feeding along the edges. The species roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle.	BioNet	Moderate. May occur intermittently in wetland habitats.
Redthroat	<i>Pyrholaemus brunneus</i>	V	-	No	31	In NSW the species has been recorded mainly in chenopod shrublands including Old Man Saltbush, Black Bluebush and Dillon Bush shrublands. In other locations it is known from Canegrass and Lignum swamps and depressions, particularly on floodplains. Associated vegetation types within the study area: PCT 17, 24, 159 and 163.	BioNet	Moderate Associated habitats including Saltbush, Canegrass and Chenopod communities, recorded.
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE	Yes	10	The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	BioNet, PMST	Moderate. Local records occur and the proposal study area traverses suitable habitat.
Regent Parrot (eastern subspecies)	<i>Polytelis anthopeplus monarchoides</i>	E	V	No	799	The species nests within River Red Gum forests along the Murray, Wakool and lower Murrumbidgee Rivers, and possibly the Darling River downstream of Pooncarie. Typical nest trees are large, mature healthy trees with many spouts (though dead trees are used) and are usually located close to a watercourse.	BioNet, PMST	Recorded. Frequently recorded within locality. Associated habitat, forested wetlands vegetation communities, recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Ruddy Turnstone	<i>Arenaria interpres</i>	-	M	N/a	15	Occurs at beaches and coasts with exposed rock, stony or shell beaches, mudflats, exposed reefs and wave platforms.	BioNet	Low. Mainly restricted to coastal environments. Rare occurrences cannot be discounted.
Ruff	<i>Philomachus pugnax</i>	-	M	N/a	19	The Ruff is a rare but regular visitor to Australia, being recorded in all States and Territories. Though most NSW records come from the Sydney region, the species has also found around the Riverina, including Windouran Swamp, Wanganella, Fivebough Swamp and the Tullakool Saltworks. In Australia the Ruff is found on generally fresh, brackish or saline wetlands with exposed mudflats at the edges. It is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands	BioNet	Moderate. May occur intermittently in wetland habitats.
Rufous Fieldwren	<i>Calamanthus campestris</i>	V	-	N/a	1	Forages by working through the undergrowth and over the ground, cock-tailed and hopping, feeding on insects and seeds. Inhabits low shrublands, particularly saltbush and bluebush communities, and also areas around inland saline lakes.	BioNet	Moderate. Known to occur around Mildura. Associated habitats including Saltbush and Bluebush communities, recorded.
Scarlet Robin	<i>Petroica boodang</i>	V	-	N/a	88	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps.	BioNet	Low. General lack of suitable associated habitat.
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	-	M	N/a	512	Occurs in a variety of habitats: tidal mudflat, mangrove swamps, saltmarshes, shallow fresh, brackish, salt inland swamps and lakes; flooded and irrigated paddocks, sewage farms and commercial saltfields.	BioNet	Moderate. May occur intermittently in wetland habitats

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAIL	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Shy Heathwren	<i>Hylacola cautus</i>	V	-	N/a	64	Inhabits mallee woodlands with a relatively dense understorey of shrubs and heath plants. Feeds on the ground, almost entirely on insects (cockroaches, grasshoppers, bugs, lerps, beetles, weevils, caterpillars, moths, ants, spiders and insect eggs) and rarely on seeds, including those of saltbush.	BioNet	Moderate. Records within locality. Associated habitats, including Mallee woodlands and Saltbush communities, recorded.
Southern Scrub-robin	<i>Drymodes brunneopygia</i>	V	-	N/a	21	Inhabits mallee and acacia scrub, particularly with dense sub-shrubs in the understorey, including Broombush and other dry shrubs. Forages around the base of mallee trees and on the ground beneath shrubs for ground- and litter-dwelling invertebrates, with certain ant species dominating.	BioNet	Moderate. Records within locality. Associated habitats, including Mallee woodland communities, recorded.
Speckled Warbler	<i>Chthonicola sagittata</i>	V	-	N/a	387	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	BioNet	Moderate. Recorded within locality. Associated habitats, including forested wetlands recorded.
Spotted Harrier	<i>Circus assimilis</i>	V	-	N/a	164	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	BioNet	Moderate. Local records and the proposal study area traverses suitable habitat.
Square-tailed Kite	<i>Lophoictinia isura</i>	V	-	No	13	Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	BioNet	Moderate. Associated habitats recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAIL	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Striated Grasswren	<i>Amytornis striatus</i>	V	-	Yes	75	Confined to areas with mature spinifex (<i>Triodia irritans</i>), usually in association with mallee eucalypts and sandy soils. Associated vegetation types within the study area: PCT 171. Note: this species is difficult to survey, an expert report may be required to determine presence/absence.	BioNet	Moderate. Recorded within locality. Associated Spinifex Mallee habitat recorded.
Superb Parrot	<i>Polytelis swainsonii</i>	V	V	No	1340	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box.	BioNet, PMST	Recorded. Associated River Red Gum communities recorded.
Swift Parrot	<i>Lathamus discolor</i>	E	CE	Yes	35	Migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Forest Red Gum <i>E. tereticornis</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> .	BioNet, PMST	Moderate. Records within locality. Associated habitats, including River Red Gum riparian communities, recorded.
Turquoise Parrot	<i>Neophema pulchella</i>	V	-	N/a	78	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	BioNet	Low. Scattered records within locality. May occur intermittently to utilise marginal foraging habitats.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	-	N/a	208	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticated bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	BioNet	Moderate. Frequently recorded within locality, associated habitats recorded.
Whimbrel	<i>Numenius phaeopus</i>	-	M, Ma	N/a	1	The Whimbrel is a regular migrant to Australia and New Zealand, with a primarily coastal distribution. There are also scattered inland records of Whimbrels in all regions. It is found in all states but is more common in the north. The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats.	BioNet	Low. Lack of suitable associated habitat.
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V	Ma	No	366	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh.	BioNet	Recorded May occur intermittently in wetland habitats.
White-browed Treecreeper population in Carrathool local government area south of the Lachlan River and Griffith local government area	<i>Climacteris affinis</i>	E	-	No	36	This Endangered population is recognised within the Griffith and Carrathool local government area.	BioNet	Low. Proposal study area is outside of populations recognised distribution.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAIL	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
White-fronted Chat	<i>Epthianura albifrons</i>	V	-	N/a	326	In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas.	BioNet	Moderate. Frequently recorded within locality and the proposal study area traverses suitable habitat.
White-throated Needletail	<i>Hirundapus caudacutus</i>	-	V/M	N/a	17	In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. It is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps.	BioNet	Moderate. May occur in aerial habitats over the proposal study area on a seasonal basis.
White-winged Black Tern	<i>Chlidonias leucopterus</i>	-	M	N/a	5	In Australia, and elsewhere in their non-breeding range, the species mostly inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. It frequents tidal wetlands, such as harbours, bays, estuaries and lagoons, and their associated tidal sandflats and mudflats. Terrestrial wetlands, including swamps, lakes, billabongs, rivers, floodplains, reservoirs, saltworks, sewage ponds and outfalls are also inhabited. They rarely occur on inland wetlands in Australia	BioNet	Moderate. May occur intermittently in wetland habitats particularly, rivers and terrestrial wetlands.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Wood Sandpiper	<i>Tringa glareola</i>	-	M, Ma	N/a	309	The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially Melaleuca and River Red Gums <i>Eucalyptus camaldulensis</i> and often with fallen timber. They also frequent inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. They are also found at some small wetlands only when they are drying.	BioNet	Moderate. May occur intermittently in wetland habitats.
FISH								
Silver Perch Vulnerable – FM Act	<i>Bidyanus bidyanus</i>	-	CE	n/a	-	The most abundant remaining natural population occurs in the central Murray River downstream of Yarrawonga Weir as well as several of its anabranches and tributaries. The central Murray population is considered secure and self-sustaining. There have also been reports of self-sustaining populations in other rivers, including the MacIntyre and Macquarie Rivers in northern NSW and the Warrego River in Queensland, mostly from recreational anglers. Little is currently known about the status of these populations.	PMST	Moderate. The proposal study area traverses Local Government Areas that contain mapped key fish habitats (Strahler 4/5 Order streams)
Murray Hardyhead Critically Endangered – FM Act	<i>Craterocephalus fluviatilis</i>	-	E	n/a	-	Murray hardyhead live along the edges of slow-flowing lowland rivers, as well as in lakes, billabongs and backwaters. They are often found amongst aquatic weeds, in both fresh and quite saline waters. They were once widespread and abundant in the Murray and Murrumbidgee river systems in southern NSW and northern Victoria; however, they have suffered a serious population decline, and now seem to be limited to a few sites, mainly in northern Victoria. Since 2000, only one individual has been collected in extensive surveys in NSW.	PMST	Moderate. The proposal study area traverses Local Government Areas that contain mapped key fish habitats by DPI's key fish habitat mapping (Strahler 4/5 Order streams)

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Flathead Galaxias Critically Endangered FM Act	<i>Galaxius rostratus</i>	-	CE	n/a	-	Flathead Galaxias, also known as Murray jollytail are a small native fish that are known from the southern part of the Murray Darling Basin. They have been recorded in the Macquarie, Lachlan, Murrumbidgee and Murray Rivers in NSW. Despite extensive scientific sampling over the past 15 years there have been very few recorded sightings of Flathead Galaxias. They have not been recorded and are considered locally extinct in the lower Murray, Murrumbidgee, Macquarie and Lachlan Rivers. The species is now only known from the upper Murray River near Tintaldra and wetland areas near Howlong.	PMST	Moderate The proposal study area traverses Local Government Areas that contain mapped key fish habitats by DPI's key fish habitat mapping (Strahler 4/5 Order streams)
Murray Cod Not listed on FM Act	<i>Maccullochella peelii</i>	-	V	n/a	-	The Murray Cod was historically distributed throughout the Murray-Darling Basin (the Basin), which extends from southern Queensland, through New South Wales (NSW), the Australian Capital Territory (ACT) and Victoria to South Australia, except for the upper reaches of some tributaries. The species still occurs in most parts of this natural distribution, up to approximately 1000 m above sea level. It utilises a diverse range of habitats from clear rocky streams, such as those found in the upper western slopes of NSW (including the ACT), to slow-flowing, turbid lowland rivers and billabongs. Preferred microhabitat consists of complex structural features in streams such as large rocks, snags (pieces of large submerged woody debris), overhanging stream banks and vegetation, tree stumps, logs, branches and other woody structures. (Department of the Environment, 2016)	PMST	Moderate. The proposal study area traverses Local Government Areas that contain mapped key fish habitats (Strahler 4/5 Order streams)

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAIL	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Trout Cod Endangered FM Act	<i>Maccullochella macquariensis</i>	-	E	n/a	-	The Trout Cod is endemic to the southern Murray-Darling river system, including the Murrumbidgee and Murray Rivers, and the Macquarie River in central NSW. The species was once widespread and abundant in these areas but has undergone dramatic declines in its distribution and abundance over the past century. The last known reproducing population of Trout Cod is confined to the Murray River below Yarrawonga downstream to Tocumwal.	PMST	Moderate. The proposal study area traverses Local Government Areas that contain mapped key fish habitats by DPI's key fish habitat mapping (Strahler 4/5 Order streams)
Macquarie Perch Endangered – FM Act	<i>Macquaria australasica</i>	-	E	n/a	-	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury/Nepean and Shoalhaven catchments. Macquarie Perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Spawning occurs just above riffles (shallow running water).	PMST	Moderate. The proposal study area traverses Local Government Areas that contain mapped key fish habitats by DPI's key fish habitat mapping (Strahler 4/5 Order streams)
MAMMALS								
Kultarr	<i>Antechinomys laniger</i>	E	-	n/a	2	A terrestrial insectivore that inhabits open country, especially claypans among Acacia woodlands. Nocturnal, sheltering by day in hollow logs or tree-stumps, beneath saltbush and spinifex tussocks, in deep cracks in the soil and in the burrows of other animals. Widespread across arid and semi-arid NSW but present in very low numbers. Records typically derive from captures by domestic cats or are collected after falling into steep-sided holes. Recent records have come primarily from the Cobar and Brewarrina region.	Bionet	Low. Historic records exist within the locality. Although it is considered unlikely that this species persists its presence cannot be entirely discounted.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Desert Mouse	<i>Pseudomys desertor</i>	CE	-	Yes	1	Most records of the Desert Mouse come from sand dune or sand plain habitats dominated by Spinifex (<i>Triodia</i> spp.). Until recently, there have been no confirmed records of the Desert Mouse in NSW since 1857. In September 2008, a single male Desert Mouse was captured in a pitfall trap in Sturt National Park. Despite intensive surveys in this area over an extended period, the species was only found at the one location. The total number of mature individuals of the species is inferred to be extremely low in New South Wales. Note that this species is difficult to detect from survey, an expert report may be required to determine presence/absence.	Bionet	Low. One historic records exist within the locality. It is considered unlikely that this species persists, however its presence cannot be entirely discounted due to the Spinifex habitats in the locality.
Southern Ningau	<i>Ningaui yvonneae</i>	V	-	n/a	29	In NSW, most records are from the far south west, including the Scotia mallee (Tarawi Nature Reserve, Scotia Sanctuary and surrounding properties) and east of the Darling River (Mungo and Mallee Cliffs National Parks and many surrounding properties. Shelters in spinifex clumps, beneath logs, and in dense vegetation, but may also dig its own burrows. Closely tied to vegetation with spinifex clumps (in NSW mainly associated with mallee woodlands), though occasionally recorded in other habitats.	Bionet	Moderate. Historic records exist within the locality Although it is considered unlikely that this species persists its presence cannot be entirely discounted due to the Spinifex habitats in the locality.
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	E	n/a	3	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.	Bionet	Moderate. Few records for this species occur within the locality (nearest to Wagga Wagga)

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Brush-tailed Rock Wallaby	<i>Petrogale penicillata</i>	E	V	Yes	1	In NSW, they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night when foraging.	Bionet and Professional opinion	Low. One historic record exist within the locality. It is unlikely this species occurs due to known distribution and preferred habitat.
Western Pygmy Possum	<i>Cercartetus concinnus</i>	E	-	n/a	87	The Western Pygmy Possum occurs in temperate to arid woodlands across southern Australia. In NSW, it has been found in mallee shrubland either dominated by spinifex (<i>Triodia</i> spp.) or with an understorey of tea-tree (<i>Leptospermum</i> spp.) and also in Belah (<i>Casuarina pauper</i>) in a mixed woodland with a well-developed understorey of saltbush. In NSW, it was first trapped in Mallee Cliffs National Park in surveys in 1996. Trapping programs conducted since 1996 have captured this species at several sites in woodlands east of the Darling River, with many on Mallee Cliffs NP and surrounding properties and more scattered records to the north and east of this reserve. This species is dependent on hollows in falling and standing dead timber for breeding or shelter. It is capable of dispersing long distances (see Marrant & Petit 2012).	Bionet	Moderate. Numerous records within locality and the proposal study area traverses suitable habitat.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Red-tailed Phascogale	<i>Phascogale calura</i>	X	V	n/a	1	Extant populations of the Red-tailed Phascogale are restricted to remnants of native vegetation throughout the wheat belt of south western Western Australia. Prior to agricultural expansion in the 1800s, the Red-tailed Phascogale was widespread throughout Western Australia and extended eastward to the Murray Darling basin in NSW. It was previously found in most arid and semi-arid regions of Australia. However, it suffered a significant range contraction following European settlement and is now known to occur only in the central and southern wheatbelt areas of Western Australia an area which receives an annual rainfall of between 350 and 600 mm.	Bionet	Low. This species is presumed extinct in NSW.
Squirrel Glider	<i>Petaurus norfolcensis</i>	V	-	No	155	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Utilises remnants of various sizes, including small remnants and even small stands of trees within Travelling Stock Reserves, roadside reserves or private land. Often utilise linear remnant vegetation along roadsides or rivers and streams. Prefers mixed species stands with a shrub or Acacia midstorey. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	Bionet	High. The proposal study area traverses habitats where this species known distribution is mapped.
Squirrel Glider in the Wagga Wagga Local Government Area	<i>Petaurus norfolcensis</i>	E	-	No	152	The extent of the endangered population is legally defined by the boundaries of the Wagga Wagga LGA. The distribution of the Squirrel Glider and its known or potential habitats within, or linked across, this boundary is not well defined. However, potential habitat occurs at low densities and is patchily distributed on public lands (TSRs, NPWS reserves, Bush Heritage Trust reserves), private lands and roadside corridors with remnant vegetation.	Bionet	High. The proposal study area traverses habitats where this species known distribution is mapped.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Greater Glider	<i>Petauroides volans</i>	-	V	No	-	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria with an elevational range from sea level to 1200 m above sea level. The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The distribution may be patchy even in suitable habitat. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	PMST Professional Opinion	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAIL	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Koala	<i>Phascolarctos cinereus</i>	V	V	No	9	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. It was briefly historically abundant in the 1890s in the Bega District on the south coast of NSW, although not elsewhere, but it now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Some preferred species include Forest Red Gum, Grey Gum. In coastal areas, Tallowwood and Swamp Mahogany are important food species, while in inland areas White Box, Bimble Box and River Red Gum are favoured. Home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size.	Bionet PMST	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.
Grey-headed Flying-Fox	<i>Pteropus poliocephalus</i>	V	V	No	25	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Bionet PMST	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Little Pied Bat	<i>Chalinolobus picatus</i>	V	-	n/a	14	The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria and has been recorded in dry open forest, open woodland, Mulga woodlands, chenopod shrublands, Callitris forest and mallee. The species roosts and breeds in tree hollows, fissures or cracks, buildings, powerpoles, fenceposts, caves, cliff crevices, mine shafts and tunnels. Roost sites in caves are usually warm and dry but the species can tolerate roost temperatures of more than 40 degrees celsius.	Bionet	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.
Southern Myotis	<i>Myotis macropus</i>	V	-	No	4	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. They generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, road culverts, buildings, under bridges and in dense foliage.	Bionet Professional Opinion	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.
Eastern Bent-wing Bat	<i>Miniopterus schreibersii oceanensis</i>	V	-	Yes	3	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves.	Bionet Professional Opinion	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V	-	n/a	-	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. They generally roost in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	Professional Opinion	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Yellow-bellied Sheathtail-bat	<i>Saccolaimus flaviventris</i>	V	-	n/a	2	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes.	Bionet Professional Opinion	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.
Inland Forest Bat	<i>Vespadelus baverstocki</i>	V	-	n/a	1	This species roosts in tree hollows and abandoned buildings. The single young is carried by its mother until its weight affects her flight, and is then left in the roost at night. Roosts in tree hollows and abandoned buildings. It has been recorded from a variety of woodland formations, including mallee, mulga and River Red Gum. Colony size ranges from a few individuals to more than fifty. Females congregate to raise young. These bats fly rapidly and cover an extensive foraging area. In NSW it has been most regularly captured in the far south west, north from the Murray River to Menindee, and at least as far east as the Balranald-Ivanhoe Road. There is some evidence to suggest that this species also occurs in the central NSW mallee, centred on Nombinnie Nature Reserve, although there has been very little recent survey in this part of the state. There are relatively few records of any Vespadelus species in the north west of NSW and so whether this species does occur here is unknown. Some of the gaps in knowledge on the distribution of this and other bat species in western NSW probably reflects the lack of survey effort in most of this region.	Bionet Professional Opinion	Recorded . Trapped within River Red Gum Forest. The proposal study area occurs in habitats where this species known distribution is mapped.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	V	n/a	3	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bullock and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	PMST	Recorded. Trapped within Black Oak Woodland and Mallee Woodland.
REPTILES								
Bardick	<i>Echiopsis curta</i>	E	-	n/a		This species occurs in three regions, all in the semi-arid regions of southern Australia. These are in south western Western Australia, the Eyre Peninsula in South Australia and in the mallee regions of eastern South Australia, north western Victoria and south western NSW. There are three known records from NSW, a Museum specimen from the 'Balranald district' in 1974, a sighting north west of Balranald in 1983 and a 2006 capture during pitfall surveys on a property north east of Mildura.	Professional Opinion	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.
Mallee Worm-lizard	<i>Aprasia inaurita</i>	E	-	n/a	10	Occurs in semi-arid mallee woodlands, on red sands, between Balranald, Pooncarie and Mallee Cliffs National Park in south-west NSW. May be highly dependent on <i>Triodia scariosa</i> . Shelters in sand, leaf litter, insect nests and under mallee stumps.	Bionet	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Marble-faced Delma	<i>Cyclodomorphus melanops elongatus</i>	E	-		7	Typically found in temperate mallee woodlands or spinifex grasslands but also in chenopod shrublands, heathlands and buloke associated with mallee habitats or from eucalypt lined watercourses. The species occupies areas with a sandy substrate but may also utilise cracking red loam soils. Found in deep leaf litter, under rocks, logs, fallen timber or in grass clumps such as spinifex. They are considered to be terrestrial although they may climb into hummock grass and even sleep in the branches of small shrubs. They are generally active during the day but have been observed being active at night or around sunrise and sunset. They are active hunters and their main food consists of various types of insects and spiders.	Bionet	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.
Jewelled Gecko	<i>Strophurus elderi</i>	V	-	n/a	3	Jewelled Gecko are known only to occur in south-west NSW: north to Menindee, south to red gum and box woodlands on the Murray River, west to the South Australian-NSW border, and east to Hatfield. Within this region, Jewelled Gecko are restricted to Spinifex (<i>Triodia</i> spp.) habitats on red sand plains and dunes, from Spinifex grasslands to Acacia or mallee woodlands with a Spinifex understory.	Bionet	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.
Mallee Slender Blue-tongue Lizard	<i>Cyclodomorphus melanops elongatus</i>	E	-	n/a	2	The NSW range of this species extends north to Pooncarie, south to the Murray River, west to the South-Australian-NSW border and east to Mungo National Park. Within this region, habitat includes mallee communities with Spinifex (<i>Triodia</i> spp.) understory, on sandy or sandy/gravel plains, ridges and hillslopes.	Bionet	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Pink-tailed Worm-Lizard	<i>Apraisia parapulchella</i>	V	V	No	-	<p>The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>).</p> <p>Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks.</p> <p>Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites.</p>	Professional Opinion	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped
Striped Legless Lizard	<i>Delma impar</i>	V	V	No	-	<p>The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes, the Upper Hunter and possibly on the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma, Muswellbrook and Tumut areas. Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland.</p> <p>Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass <i>Themeda australis</i>, spear-grasses <i>Austrostipa</i> spp. and poa tussocks <i>Poa</i> spp., and occasionally wallaby grasses <i>Austrodanthonia</i> spp.</p> <p>Sometimes present in modified grasslands with a significant content of exotic grasses. Sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter.</p>	Professional Opinion	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	SAII	BIONET RECORD	ASSOCIATED HABITAT	SOURCE ³	LIKELIHOOD OF OCCURRENCE
Yellow-tailed plain slider	<i>Lerista xanthura</i>	V	-	No	6	Two disjunct populations are known to occur; in north-west NSW, and in the area between Broken Hill, Ivanhoe and Tarawi Nature Reserve. Habitat includes arid and semi-arid alluvial sand plains and sand dunes, with dry open woodland vegetation and a grassed understory, typically with Spinifex on red sand. Loose soils or sands beneath stones and logs are common hiding places for them.	Bionet	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.
Western Blue-tongued Lizard	<i>Tiliqua occipitalis</i>	V	-	n/a	2	Arid areas, often associated with mallee and spinifex. Found in a variety of xeric habitats, often in close association with mixed mallee/ <i>Triodia</i> communities(Cogger, 2000)(Cogger, 2000)(Cogger, 2000)(Cogger, 2000)(Cogger, 2000).	Bionet	Moderate. The proposal study area occurs in habitats where this species known distribution is mapped.

- 1) V = Vulnerable, E = Endangered, CE = Critically Endangered, EX = Presumed Extinct under the BC Act
- 2) V = Vulnerable, E = Endangered, M = Migratory, Ma – Migratory Marine species under the Commonwealth EPBC Act.
- 3) Source; Professional opinion = ESS expert advice of predicted threatened species areas provided as spatial data, PMST = The Department of the Environment and Energy's EPBC Protected Matters Search Tool, BioNet = ESS's Bionet Atlas of NSW Wildlife.

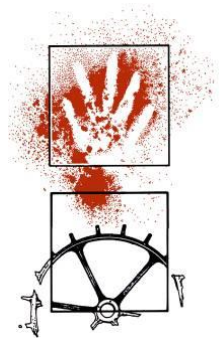


EnergyConnect

NSW – Eastern Section Buronga to Wagga Wagga

Public Version

August 2020



***Navin
Officer***

*heritage
consultants Pty Ltd*

acn: 092 901 605

*Number 4
Kingston Warehouse
71 Leichhardt St.
Kingston ACT 2604*

www.nohc.com.au

ph 02 6282 9415

fx 02 6282 9416

Document control

Project no.:	190106
Project client:	WSP Australia Pty. Ltd.
Project proponent	TransGrid
Document description:	Preliminary Desktop Cultural Heritage Assessment (Aboriginal & non-Aboriginal)
Project Manager:	Nicola Hayes
Authors:	Adrian Cressey & Nicola Hayes
Internal review:	Nicola Hayes
Document status:	Draft
Local Government Areas:	Wagga Wagga, Federation, Lockhart, Murrumbidgee, Edward River (encompassing former Cobar and Deniliquin LGAs), Hay, Murray River (including former Wakool LGA), Balranald and Wentworth

Document revision status

Author	Revision number	Internal review	Date issued
Adrian Cressey	V1	Nicola Hayes	17/07/2020
Nicola Hayes	V2	Client review	18/08/2020
Nicola Hayes	V2.2	Minor edits	20/08/2020

Copyright to this report rests with the client except for the following:

- The Navin Officer Heritage Consultants logo and business name (copyright to this rests with Navin Officer Heritage Consultants Pty Ltd);
- Generic content and formatting which is not specific to this project or its results (copyright to this material rests with Navin Officer Heritage Consultants Pty Ltd);
- Descriptive text and data relating to Aboriginal objects which must, by law, be provided to OEHL for its purposes and use;
- Information which, under Australian law, can be identified as belonging to Indigenous intellectual property; and
- Content which was sourced from and remains part of the public domain.

Cover photographs: NOHC photographs

EXECUTIVE SUMMARY

TransGrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to north-west Victoria. Collectively, the proposed interconnector is known as EnergyConnect.

This Preliminary Desktop Cultural Heritage Assessment refers to the EnergyConnect (NSW – Eastern Section), which includes the components of EnergyConnect from the existing Buronga substation to the Wagga substation (the proposal).

The key components of the proposal include:

- Construction of about 540 km of new double circuit transmission lines (minimum 330 kV) and associated infrastructure between Buronga substation and Wagga substation
- Construction of a new substation about 170 km west of Wagga Wagga (referred to as the Dinawan substation)
- An expansion and upgrade to the existing Wagga 330 kV substation
- Establishment and upgrade of access tracks and roads, as required
- Other ancillary works required to facilitate the construction of the proposal e.g. laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation.

The proposal study area generally comprises a one kilometre wide corridor from Buronga to Wagga Wagga with a broader section between Four Corners and Lockhart. This study provides a preliminary desktop heritage assessment of Aboriginal and non-Aboriginal heritage of a broad 10 km heritage study corridor which encompasses the proposal study area and some additional buffer areas around existing and proposed substation locations.

The proposal is subject to environmental assessment under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Under clause 14 of State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP), the proposal is State Significant Infrastructure (SSI). The proposal requires approval from the NSW Minister for Planning under Division 5.2 of the EP&A Act. In addition, the Minister has declared the proposal to be Critical SSI under Schedule 5 (clause 15) of the SRD SEPP. For the components of EnergyConnect that are located in South Australia (SA), Victoria, or other sections within New South Wales (NSW), environmental planning approvals would be sought separately under the relevant jurisdictions.

Aboriginal Heritage

A total of fifty-seven (57) Aboriginal heritage items/recordings are included on the OEH Aboriginal Heritage Information Management System (AHIMS) within the proposal study area.

A search of the AHIMS database for Aboriginal sites within a broader heritage study corridor was conducted in order to further investigate site typologies and site patterning across differing landscapes of the proposal study area. This search focussed on broadening the pool of AHIMS data along and outside of the proposal study area. A total of three hundred and eighty-seven (387) known Aboriginal sites occur within this search area, and encompassed the following archaeological site types/features:

- Artefacts (both isolated finds and artefact scatters)
- Aboriginal burials
- Earth mounds
- Hearths
- Modified trees
- Freshwater shell

- Non-human bone and organic material
- Habitation structures.

Many of these sites are associated with areas of Potential Archaeological Deposits (PADs), as well as features of cultural and historical importance to Aboriginal people, including but not limited to:

- Aboriginal ceremony and dreaming
- Aboriginal resource and gathering
- Conflict
- Waterholes.

It should be noted that many of the 387 sites display multiple archaeological and/or non-archaeological features within each recording.

Finally, there are twenty-two (22) *Restricted* Aboriginal heritage items/recordings listed within or nearby the heritage study corridor. As the location and nature of these sites are restricted, NOHC are currently liaising with OEH regarding the details of these sites.

Non-Aboriginal Heritage

Two (2) heritage listed sites have curtilages that are located entirely or partially within the proposal study area. These sites are listed on the Wagga and Lockhart Local Environmental Plans (LEPs). The Liquid Explosives Store (Wagga LEP) is listed as having State significance, and the Brookong Cemetery (Lockhart LEP) is of local significance. A further thirty one (31) heritage listed sites have curtilages that are located entirely or partially within the broader 10km heritage study corridor, and are either listed as locally significant on LEP's or listed as potential or Section 170 sites within the Murrumbidgee Valley Reserves. No Commonwealth listed items were found within the proposal study area or the heritage study corridor.

~ oOo ~

TABLE OF CONTENTS

1. INTRODUCTION.....	1
1.1 PROPOSAL DESCRIPTION.....	1
1.2 REPORT TERMINOLOGY	2
1.3 STUDY AIMS.....	2
1.4 RESTRICTED INFORMATION	2
1.4.1 Confidentiality	2
2 STUDY METHODOLOGY.....	4
2.1 CONTRIBUTORS	4
2.2 LITERATURE AND DATABASE REVIEW	4
2.3 GLOSSARY AND DEFINITIONS	4
2.3.1 Glossary.....	4
2.3.2 Aboriginal Heritage Recordings	6
2.3.3 Non-Aboriginal (Historical) Heritage Recordings	9
3 ABORIGINAL HERITAGE	10
3.1 ABORIGINAL HERITAGE RECORDINGS IN THE PROPOSAL STUDY AREA	10
3.2 ABORIGINAL HERITAGE RECORDINGS WITHIN HERITAGE STUDY CORRIDOR (10KM).....	10
3.3 ABORIGINAL SITE TYPES AND LOCATIONS.....	11
3.4 GAPS IN ARCHAEOLOGICAL ASSESSMENTS AND SURVEY PRIORITY	14
3.5 PATTERNS IN THE EXISTING DATA.....	14
4 NON-ABORIGINAL HERITAGE	15
4.1 HERITAGE LISTED ITEMS.....	15
4.2 PREDICTIVE HISTORICAL ARCHAEOLOGY STATEMENT	16
5 NATIVE TITLE.....	23
5.1 NATIVE TITLE ACT 1993	23
6 CONSTRAINTS AND KEY ISSUES.....	25
7 GAP ANALYSIS	26
7.1 ABORIGINAL HERITAGE	26
7.2 NON-ABORIGINAL HERITAGE.....	26
8 FURTHER INVESTIGATIONS	28
8.1 ABORIGINAL HERITAGE	28
8.2 NON-ABORIGINAL HERITAGE.....	28
9 REFERENCES	29
APPENDIX 1 AHIMS RECORDINGS WITHIN PROPOSAL STUDY AREA.....	30

Figures

Figure 1.1 Overview of the proposal study area and heritage study corridor.....	3
Figure 3.1 Aboriginal sites in relation to the proposal study area and heritage study corridor (Overview)	13
Figure 3.2 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)	13
Figure 3.3 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)	13
Figure 3.4 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)	13
Figure 3.5 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)	13
Figure 3.6 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)	13
Figure 3.7 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)	13
Figure 3.8 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)	13
Figure 3.9 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)	13
Figure 3.10 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)	13
Figure 4.1 Overview of historic sites relative to the proposal study area and heritage study corridor.	18
Figure 4.2 Historic sites relative to the proposal study area and heritage study corridor	19
Figure 4.3 Historic sites relative to the proposal study area and heritage study corridor	20
Figure 4.4 Historic sites relative to the proposal study area and heritage study corridor	21
Figure 4.5 Historic sites relative to the proposal study area and heritage study corridor	22
Figure 5.1 Lands where Native Title has been determined to exist in relation to the proposal study area and heritage study corridor.....	24
Table 4.1 Heritage listed items within the proposal study area (grey) and the heritage study corridor (white)	15



1. INTRODUCTION

1.1 Proposal Description

This Preliminary Desktop Cultural Heritage Assessment refers to the EnergyConnect (NSW – Eastern Section), which includes the components of EnergyConnect from the existing Buronga substation to the Wagga substation (the proposal). This report documents the results of a preliminary desktop cultural heritage assessment of Aboriginal and non-Aboriginal heritage. The report was commissioned by WSP Australia Pty Ltd on behalf of TransGrid.

The proposal is subject to environmental assessment under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Under clause 14 of State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP), the proposal is State Significant Infrastructure (SSI). The proposal requires approval from the NSW Minister for Planning under Division 5.2 of the EP&A Act. In addition, the Minister has declared the proposal to be Critical SSI under Schedule 5 (clause 15) of the SRD SEPP. For the components of EnergyConnect that are located in South Australia (SA), Victoria (VIC), or other sections within New South Wales (NSW), environmental planning approvals would be sought separately under the relevant jurisdictions.

The key components of the proposal include:

- Construction of about 540 km of new double circuit transmission lines (minimum 330 kV) and associated infrastructure between Buronga substation and Wagga substation
- Construction of a new substation about 170 km west of Wagga Wagga (referred to as the Dinawan substation)
- An expansion and upgrade to the existing Wagga 330 kV substation
- Establishment and upgrade of access tracks and roads, as required
- Other ancillary works required to facilitate the construction of the proposal e.g. laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation

It is expected that construction of the proposal would commence in 2022 and take about three years to complete. It is anticipated that the proposal would be operational in late 2024.

The proposal would typically traverse an east-west alignment across south western NSW between Buronga and Wagga Wagga, via the existing Balranald substation and a new 'Dinawan' substation south east of Four Corners. *Dinawan* is the local Wiradjuri word for Emu. The proposal study area generally comprises a one kilometre wide corridor from Buronga to Wagga Wagga with a broader section between Four Corners and Lockhart.

The proposal would traverse the Murray Darling Depression, Riverina, South Western Slopes bioregions. These regions present generally distinct characteristics including varying landforms, biodiversity and climates. The proposal would typically traverse areas of rural land and land that has been developed primarily for agricultural uses including irrigated cropping, dryland cropping and dryland grazing. While large areas have been cleared and disturbed for the identified agricultural activities, the proposal study area also contains areas of remnant vegetation as well as greenfield areas that are considered to have been subject to relatively low impact in the historic period. A number of National Parks and State Forests are within or adjacent to the proposal study area.

A large number of rivers, creeks, and lakes are also characteristic of the region, associated with the broader Murray and Murrumbidgee River systems and their major and minor tributaries. These rivers and waterways are located at varying intervals across the length of the proposal, and along with remnant hydrological features, represent significant landscape features associated with Aboriginal site locations.



1.2 Report Terminology

The following terms are discussed throughout this report and are defined as:

- **EnergyConnect:** an interconnector of about 900 km between the power grids of SA and NSW, with an added connection to north-west Victoria
- **The proposal:** EnergyConnect (NSW – Eastern Section), which includes the components of EnergyConnect between Buronga and Wagga substations (approximately 540km)
- **The proposal study area:** The proposal study area for this report typically comprises:
 - a one km wide corridor between the existing Buronga and Wagga substations
 - a broader corridor averaging 10km wide (ranging from 5 to 15km width) extending from Four Corners to west of Lockhart (refer to Figure 1.1).
- **Heritage study corridor:** In order to gather enough data for the preliminary predictive models for Aboriginal sites a 10km site search corridor has been developed – this is referred to as the heritage study corridor. This area is based on the proposal study area centreline between Buronga and Wagga substations (approximately 5km either side) (See Figure 1.1 for overview map).
- **Transmission line easement:** an area surrounding and including the transmission lines, which is a legal 'right of way' and allows for ongoing access and maintenance of the lines and will be acquired from landholders. The easement width would be up to 80 m wide.

1.3 Study Aims

This assessment aims to provide brief analysis of the gaps in the existing sites data, as well as identify future steps in the assessment of Aboriginal and non-Aboriginal heritage once the proposal design and corridor refinement has progressed.

1.4 Restricted Information

Information in this report relating to the exact location of Aboriginal sites should not be published or promoted in the public domain. The following images and report sections should be restricted in a public version of this document:

- Figures 3.1 through 3.15;
- All tabulated data in Appendix 1.

No information provided by Aboriginal stakeholders in this report has been specifically identified as requiring access restrictions due to its cultural sensitivity.

1.4.1 Confidentiality

No information in this report has been classified as confidential.

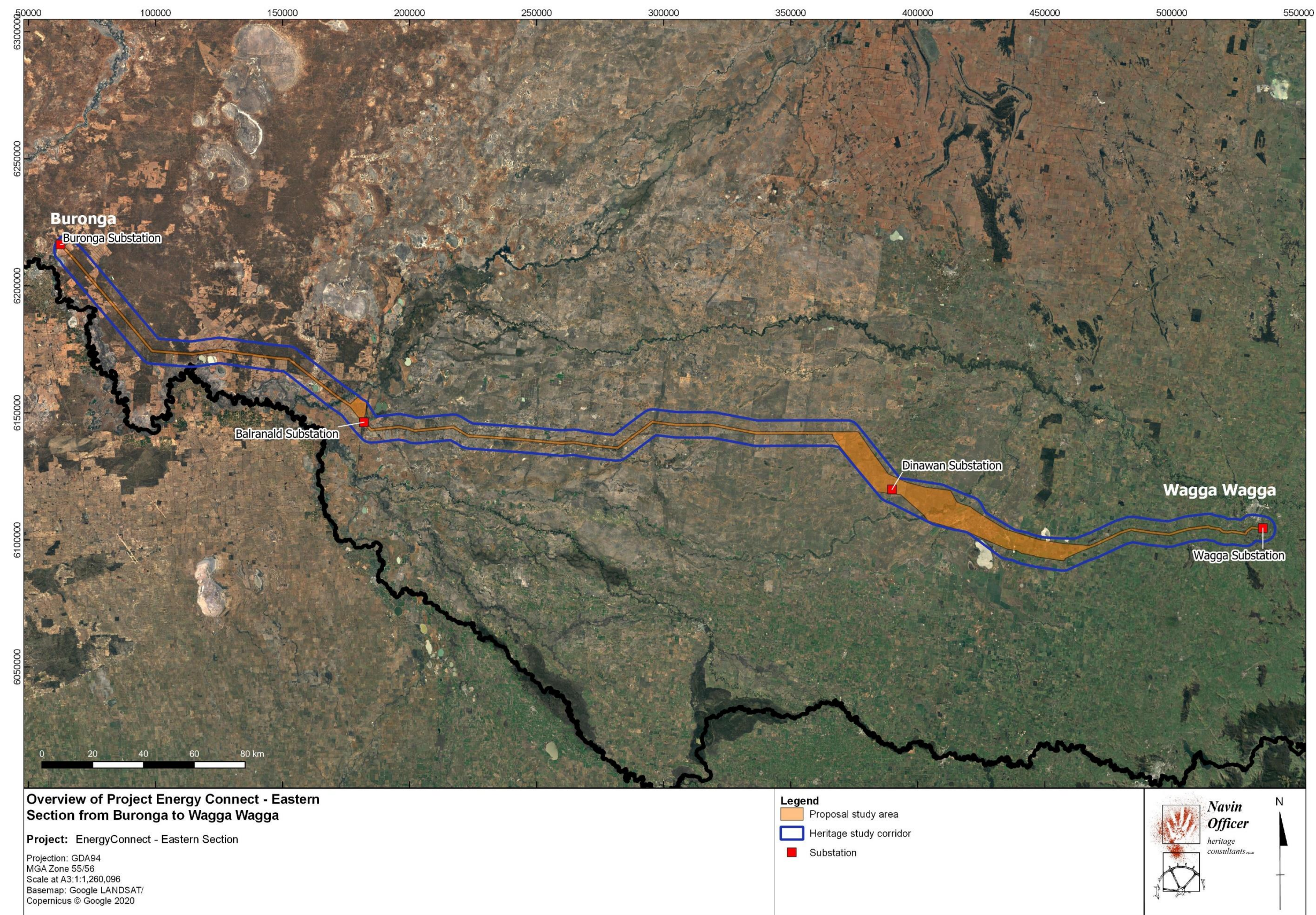


Figure 1.1 Overview of the proposal study area and heritage study corridor



2 STUDY METHODOLOGY

2.1 Contributors

This report was prepared by Adrian Cressey and Nicola Hayes. Adrian has a Bachelor Archaeological Practice with Honours from the Australian National University (ANU) and a Diploma in Environmental Science from the Canberra Institute of Technology (CIT). Nicola has a Bachelor of Arts and Science, as well as a Graduate Diploma in Archaeology from the ANU.

2.2 Literature and Database Review

A range of archaeological and historical data was reviewed for the proposal study area and the heritage study corridor. This literature and data review was used to determine if known Aboriginal and historical/non-Aboriginal sites were located within the area under investigation, to facilitate site prediction on the basis of known regional and local site patterns, and to place the area within an archaeological and heritage management context. The review of documentary sources included heritage registers and schedules, local histories, and archaeological reports.

Aboriginal literature sources included the Aboriginal Heritage Information Management System (AHIMS) maintained by the NSW Office of Environment and Heritage (OEH) and associated files and catalogue of archaeological reports. Sources of historical information included regional and local histories, heritage studies and theses; parish maps; and where available, other maps, such as portion plans. Searches were undertaken in July 2020 of the following statutory and non-statutory heritage registers and schedules:

- Statutory Listings:
 - : Aboriginal Heritage Information Management System (AHIMS) (NSW OEH);
 - : Atlas of Aboriginal Places (NSW OEH);
 - : World Heritage List;
 - : The National Heritage List (Dept of Environment and Energy);
 - : The Commonwealth Heritage List (Dept of Environment and Energy);
 - : The State Heritage Register (NSW Heritage Branch, Office of Environment and Heritage);
 - : Section 170 Heritage and Conservation Register(s); and
 - : Heritage Schedules from the Wagga Wagga, Federation, Lockhart, Murrumbidgee, Edward River (encompassing former Cobar and Deniliquin LGAs), Hay, Murray River (including former Wakool LGA), Balranald, and Wentworth Local Environmental Plans

2.3 Glossary and Definitions

2.3.1 Glossary

Aboriginal Object	means an object associated with Aboriginal people because of Aboriginal tradition (Heritage Act 2004).
Aboriginal Place	means a place associated with Aboriginal people because of Aboriginal tradition (Heritage Act 2004).
Aboriginal site	a place or location which relates to past or contemporary Aboriginal occupation. Sites can be divided into those identified from archaeological evidence (archaeological sites), and those related to intangible cultural values, such as revealed by oral tradition and lore,



Archaeological site	<p>or from the historical record. An Aboriginal site may have both archaeological and intangible values.</p> <p>a place or location with the confirmed presence of archaeological evidence of Aboriginal occupation, where the context of that evidence can be reliably related to the Aboriginal actions which produced the evidence.</p>
Artefact	<p>an object, normally portable, made or modified by human hand (see 'stone artefact').</p>
Artefact scatter	<p>a formerly used open site-type classification defined as two or more stone artefacts situated no more than a specified distance (such as 60m) away from any other included artefact. Typically, this category did not include isolated finds. The use of the term <i>scatter</i> was intended only to be descriptive and did not infer the original human behaviour which formed the site. The term <i>open camp site</i> has been used extensively in the past to describe open artefact scatters.</p>
Background discard/scatter	<p>there is no single concept for background discard or 'scatter', and therefore no agreed definition. The definitions in current use are based on the postulated nature of prehistoric activity, and often they are phrased in general terms and do not include quantitative criteria. Commonly agreed is that background discard occurs in the absence of 'focused' activity involving the production or discard of stone artefacts in a particular location. An example of unfocussed activity is occasional isolated discard of artefacts during travel along a route or pathway. Examples of 'focussed activity' are camping, knapping and heat-treating stone, cooking in a hearth, and processing food with stone tools.</p> <p>In practical terms, over a period of thousands of years an accumulation of 'unfocussed' discard may result in an archaeological concentration that may be identified as a 'site'. Definitions of background discard comprising only qualitative criteria do not specify the numbers (numerical flux) or 'density' of artefacts required to discriminate site areas from background discard.</p>
Isolated find	<p>a single stone artefact, not located within a rock shelter, and which occurs without any associated evidence of Aboriginal occupation within a specified radius, such as 60 metres (depending on which archaeological convention is used). Isolated finds may represent single discard events, be constituent components of background scatter, or be indicative of larger obscured, remnant and disturbed sites.</p>
Lithic assemblage (of stone)	<p>a collection of whole and fragmentary stone artefacts and manuports obtained from an archaeological site, either by collecting items scattered on the present ground surface (see lithic scatter) or by controlled excavation (see also 'stone artefact').</p>
NOHC	<p>Navin Officer Heritage Consultants</p>
Open camp site	<p>a formerly used site type classification defined as an open context stone artefact occurrence (or artefact scatter), containing two or more artefacts situated no more than a specified arbitrary distance (such as 60 metres) away from any other included artefact. The term <i>open camp site</i> was based on ethnographic modelling suggesting that most artefact occurrences resulted from activities at camp sites. However, in order to separate the description from the interpretation of field</p>



evidence, both open camp sites and isolated finds are now referred to as *artefact occurrences*.

Potential archaeological deposit (PAD) a discrete location or area, defined spatially either by geomorphological, disturbance or administrative criteria, within which there is a predicted likelihood that subsurface archaeological material is present, and that this material would warrant archaeological investigation in order to determine its scientific, cultural, or statutory value and status.

Heritage study corridor a 10km site search corridor used to develop a preliminary predictive model focussed on Aboriginal site locations. This area is based on the proposal study area centreline between the Buronga and Wagga substations (See Figure 1.2 for overview map)

2.3.2 Aboriginal Heritage Recordings

The archaeological survey aimed at identifying material evidence of Aboriginal occupation as revealed by surface artefacts and areas of archaeological potential un-associated with surface artefacts. Potential recordings fall into two broad categories: sites and potential archaeological deposits.

Sites

A site is defined as any material evidence of past Aboriginal activity that remains within a context or place which can be reliably related to that activity. Many Aboriginal archaeological sites are identified by the stone or shell artefacts situated on or in a sedimentary matrix, marks located on or in rock surfaces, scars on trees, stones placed in arrangements at ceremonial sites, human skeletal remains, earthen mounds and hearths. Some significant sites bear no visible artefacts but are natural features related to Aboriginal creation stories.

Frequently encountered site types within the region include stone artefact occurrences - including isolated finds and open artefact scatters, earth mounds and hearths, burial sites, freshwater middens, and scarred trees. Other sites common in south-eastern Australia but which are not common to this study area include: coastal middens, rock shelter sites - including occupation deposit and/or rock art, grinding groove sites. For the purposes of this section, only the methodologies used in the identification of these site types are outlined.

Stone Artefact Occurrences

Stone artefact occurrences are the most commonly recorded site type in Australia. They may consist of single artefacts - described as isolated finds; or as a distribution of more than one artefact – often described as an artefact scatter or 'open camp site' when recording surface artefacts, or as a subsurface artefact distribution when dealing with an archaeological deposit.

Where artefact incidence is very low, either in terms of areal distribution (artefacts per square metre) or density (artefacts per cubic metre), then the differentiation of the recording from background artefacts counts or *background scatter* may be an issue.

Isolated finds

An isolated find is a single stone artefact, not located within a rock shelter, and which occurs without any associated evidence of Aboriginal occupation within a radius of 60 metres. Isolated finds may be indicative of:

- Random loss or deliberate discard of a single artefact;
- The remnant of a now dispersed and disturbed artefact scatter; and
- An otherwise obscured or sub-surface artefact scatter.



Except in the case of the latter, isolated finds may be considered to be constituent components of the *background scatter* present within any particular landform.

The distance used to define an isolated artefact varies according to the survey objectives, the incidence of ground surface exposure, the extent of ground surface disturbance, and estimates of *background scatter* or *background discard* densities. In the absence of baseline information relating to background scatter densities, the defining distance for an isolated find must be based on methodological and visibility considerations. Given the varied incidence of ground surface exposure and deposit disturbance within the study area, and the lack of background baseline data, the specification of 60 metres is considered to be an effective parameter for surface survey methodologies. This distance provides a balance between detecting fine scale patterns of Aboriginal occupation and avoiding environmental biases caused by ground disturbance or high ground surface exposure rates. The 60 metre parameter has provided an effective separation of low density artefact occurrences in similar southeast Australian topographies outside of semi-arid landscapes.

Background scatter

Background scatter is a term used generally by archaeologists to refer to artefacts which cannot be usefully related to a place or focus of past activity (except for the net accumulation of single artefact losses).

There is no single concept for background discard or 'scatter', and therefore no agreed definition. The definitions in current use are based on the postulated nature of prehistoric activity, and often they are phrased in general terms and do not include quantitative criteria. Commonly agreed is that background discard occurs in the absence of 'focused' activity involving the production or discard of stone artefacts in a particular location. An example of unfocused activity is occasional isolated discard of artefacts during travel along a route or pathway. Examples of 'focused activity' are camping, knapping and heat-treating stone, cooking in a hearth, and processing food with stone tools. In practical terms, over a period of thousands of years an accumulation of 'unfocused' discard may result in an archaeological concentration that may be identified as a 'site'. Definitions of background discard comprising only qualitative criteria do not specify the numbers (numerical flux) or 'density' of artefacts required to discriminate site areas from background discard.

Artefact scatters

Artefacts situated within an open context are classed as an open artefact scatter (or 'open camp site') when two or more occur no more than 60 metres away from any other constituent artefact. The 60 metre specification relates back to the definition of an isolated find (*Refer above*). The use of the term *scatter* is intended only to be descriptive of the current archaeological evidence and does not infer the original human behaviour which formed the site. The term *open camp site* has been used extensively in the past to describe open artefact scatters. This was based on ethnographic modelling suggesting that most artefact occurrences resulted from activities at camp sites. However, in order to separate the description from the interpretation of field evidence, the terms *artefact scatter*, *artefact distribution* or *artefact occurrence* are now more extensively used. The latter two options can also be used to categorise artefacts occurring in sub-surface contexts.

Scarred/Modified Trees

Trees with scars of Aboriginal origin form the other major type of artefactual evidence. Each tree is normally considered to be a separate site. The identification of a scar as Aboriginal in origin is dependent on a set of inter-related interpretive criteria. The credibility of alternative causal explanations such as natural traumas and other types of human scarring must be tested for each scar.

A range of diagnostic criteria has been developed to assist in the identification of Aboriginal scarred trees. The following criteria are based on archaeological work conducted by Simmons (1977) and Beesley (1989), and the field manual for Aboriginal scarred trees developed by Long (2005):



1. The scar does not normally run to ground level: (scars resulting from fire, fungal attack or lightning nearly always reach ground level). However, ground termination does not necessarily discount an Aboriginal origin (some ethno-historical examples of canoe scars reach the ground);
- 1(a). If a scar extends to the ground, the sides of the original scar must be relatively parallel: (natural scars tend to be triangular in shape);
2. The scar is either approximately parallel sided or concave, and symmetrical: (few natural scars are likely to have these properties except fire scars which may be symmetrical but are wider at the base than their apex. Surveyors marks are typically triangular, and often adzed);
3. The scar should be reasonably regular in outline and regrowth: scars of natural origin tend to have irregular outlines and may have uneven regrowth;
4. The ends of the scar should be 'shaped', either squared off, or pointed (often as a result of regrowth): (a 'keyhole' profile with a 'tail' is suggestive of branch loss);
5. A scar which contains adze or axe marks on the original scar surface is likely to be the result of human scarring. Their morphology and distribution may lend support to an interpretation of an Aboriginal origin: (marks produced after the scarring event may need to be discounted);
6. The scar must date to the time of Aboriginal bark exploitation within its region: The traditional Aboriginal exploitation of bark probably ceased in most regions between 100 and 150 years ago. However, in some locations associated with Aboriginal settlement, the Aboriginal removal of bark may have continued to the present day or restarted as part of new cultural movements.
7. The tree must be endemic to the region: (and thus exclude historic plantings).

Field based identification of Aboriginal scars is based on surface evidence only and will not necessarily provide a definitive classification. In many cases the possibility of a natural origin cannot be ruled out, despite the presence of several diagnostic criteria or the balance of interpretation leaning toward an Aboriginal origin. For this reason, interpretations of an Aboriginal origin are qualified by the recorder's degree of certainty. The following categories were used:

- Aboriginal scar - This is a scar where an Aboriginal origin is considered the most likely. The scar conforms to all of the criteria and a natural origin is considered unlikely and improbable;
- Probable Aboriginal scar - This is a scar that conforms to all of the criteria and where an Aboriginal origin is considered to be the most likely. Despite this, a natural origin cannot be ruled out; and
- Possible Aboriginal scar - This is a scar which conforms to all or most of the criteria and where an Aboriginal origin cannot be reliably considered as more likely than alternative natural causes. The characteristics of this scar will also be consistent with a natural cause.

Earth Mounds

Earth mounds can result from a number of Aboriginal uses, in some areas of eastern Australian ceremonial rings (bora rings) are made by forming earth into shallow circular ridges and pathways. In the study area however, earth mounds have been recorded that are related to a variety of uses including food preparation and camping.

Burial sites and burial grounds

Burials within the region are generally found either in mound sites, or in elevated natural topographies consisting of soft, easily dug, sediments, such as aeolian sands or unconsolidated alluvial silts. They may occur in isolation or in groups and may also be associated with occupation site debris. Burials are generally only visible where there has been some disturbance of sub-surface sediments or where some erosional process has exposed them.



Potential Archaeological Deposits

A potential archaeological deposit, or PAD, is defined as any location where the potential for subsurface archaeological material is considered to be moderate or high, relative to the surrounding study area landscape. The potential for subsurface material to be present is assessed using criteria developed from the results of previous surveys and excavations relevant to the region. The boundaries of PADs are generally defined by the extent of particular micro-landforms known to have high correlations with archaeological material. A PAD may or may not be associated with surface artefacts. In the absence of artefacts, a location with potential will be recorded as a PAD. Where one or more surface artefacts occur on a sedimentary deposit, a PAD may also be identified where there is insufficient evidence to assess the nature and content of the underlying deposit. This situation is due mostly to poor ground surface visibility.

2.3.3 Non-Aboriginal (Historical) Heritage Recordings

Historical archaeology refers to the 'post-contact' period and includes domestic, commercial and industrial sites as well as most maritime sites. It is the study of the past using physical evidence in conjunction with historical sources. The three primary types of places or items that may form part of the historical archaeology context include:

- Below ground evidence, including building foundations, occupation deposits, features and artefacts; and above ground evidence, including buildings, works, industrial structures and relics that are intact or ruined;
- Areas of land that display evidence of human activity or occupation; and
- Shipwrecks, deposits and structures associated with maritime activities (not applicable to this study area).

Within these broad parameters, an historical archaeological site may include:

- Topographical features and evidence of past environments (that is, resident in pollens and diatoms);
- Evidence of site formation, evolution, redundancy and abandonment (that is, features and materials associated with land reclamation, sequences of structural development, demolition/deconstruction, and renewal);
- Evidence of function and activities according to historical theme/s represented (for example, an industrial site may contain diagnostic evidence of process, products and by-products);
- Evidence associated with domestic occupation including household items and consumables, ornaments, personal effects and toys;
- Evidence of diet including animal and fish bones, and plant residues;
- Evidence of pastimes and occupations including tools of trade and the often-fragmentary signatures of these activities and processes;
- Methods of waste disposal and sanitation, including the waste itself which may contain discarded elements from all classes of artefact as well as indicators of diet and pathology; and
- Any surviving physical evidence of the interplay between site environment and people.

The information found in historical archaeological sites is often part of a bigger picture which offers opportunities to compare and contrast results between sites. The most common comparisons are made at the local level, however, due to advances in research and the increasing sophistication and standardisation of methods of data collection, the capacity for wider reference (nationally and, occasionally, internationally) exists and places added emphasis on identification and conservation of historical archaeological resources.



3 ABORIGINAL HERITAGE

3.1 Aboriginal Heritage Recordings in the proposal study area

A total of fifty-seven (57) Aboriginal heritage items/recordings are included on the OEH Aboriginal Heritage Information Management System (AHIMS) within the proposal study area. Figure 3.1 shows an overview of the proposal study area with locations of the Aboriginal heritage recordings. All 57 AHIMS sites are listed in Appendix 1.

Furthermore, two (2) previously unrecorded Aboriginal sites were recorded during inspection for preliminary geotechnical works for the proposal. These sites were located within the proposal study area. These recordings are currently being processed for submission to the OEH AHIMS database. The number of Aboriginal sites is considered low, given the approximate 540km length of the proposal study area.

3.2 Aboriginal Heritage Recordings within Heritage Study Corridor (10km)

A search of the AHIMS database for Aboriginal sites within a broader heritage study corridor was conducted in order to further investigate site typologies and site patterning across differing landscapes the proposal study area. This search focussed on broadening the pool of AHIMS data along and outside of the proposal study area (See Figures 1.1 or 3.1 for an overview). A total of three hundred and eighty-seven (387) known Aboriginal sites occur within this search area, and encompassed the following archaeological site types/features:

- Artefacts (both isolated finds and artefact scatters)
- Aboriginal burials
- Earth mounds
- Hearths
- Modified trees
- Freshwater shell
- Non-human bone and organic material
- Habitation structures.

Many of these sites are associated with areas of Potential Archaeological Deposits (PADs), as well as features of cultural and historical importance to Aboriginal people, including but not limited to:

- Aboriginal ceremony and dreaming
- Aboriginal resource and gathering
- Conflict
- Waterholes.

It should be noted that many of the sites display multiple archaeological and/or non-archaeological features within each recording. As mentioned above, two previously unrecorded Aboriginal features were recorded during preliminary ground truthing for the proposal. All Aboriginal heritage recordings within the 10km site search corridor are shown in Figures 3.1-3.15.

Finally, there are twenty-two (22) *Restricted* Aboriginal heritage items/recordings listed within or nearby the heritage study corridor. As the location and nature of these sites are restricted, NOHC are currently liaising with OEH regarding the details of these sites.



3.3 Aboriginal Site Types and Locations

Based on the results and analytical conclusions of previous archaeological records and surveys in similar landscape contexts it is possible to predict the types and topographic contexts of sites which may occur in the study area. From this existing body of work, the following set of broad site location criteria have been summarised for the Proposal.

The occurrence and survival of archaeological sites is dependent on many factors including micro-topography and the degree of land surface disturbance. It should also be noted that for practical reasons, archaeological surveys tend to focus on environments identified as archaeologically sensitive on the basis of previous research and aided by effective ground visibility. As a result, predictive site location models can tend to reflect previous survey bias and to become self-perpetuating.

Artefact Scatters

Open artefact scatters are likely to be the most common site type encountered. They may occur almost anywhere that Aborigines have travelled and may be associated with hunting or gathering activities, domestic camps, or the manufacture and maintenance of stone tools. The spatial extent and density of artefacts represented in these scatters can vary dramatically. Within the general region of the transmission line, artefact scatters tend to be dominated by assemblages of quartz, with lesser percentages of other rock types such as silcrete, sandstone, quartzite and volcanics.

Previous survey results suggest that artefact scatters are most likely to occur in well drained elevated contexts within riparian zones, flood plains and adjacent to water sources. Level or gently sloping surfaces are typical site locations, with few sites recorded from moderate to high gradient contexts. Within the study corridor potential site locations include elevated banks, terraces and sand bodies associated with streamlines, flood channels, paleochannels, water holes, lagoons and wetland basins. Larger and denser sites are more likely to occur in association with stable sedimentary contexts adjacent to (past or present) permanent water sources, and major tributaries.

Modified trees

These sites may occur almost anywhere, and identification of scars as Aboriginal in origin can often remain problematical. The majority of the transmission line corridor has been cleared of native vegetation. However, the potential for scarred trees to survive within the corridor is moderate to high due to the retention of considerable numbers of mature native trees along fluvial corridors and as isolated shade trees on grazing land. Archaeological surveys centred within the surrounding region have typically identified relatively high frequencies of scarred trees (e.g. Djekic 1978; Crosby 1978,1979; Hiscock 1983; McIntyre 1987, Navin 1992, Officer 1994). Within the transmission line corridor scarred trees may occur anywhere mature native trees have survived.

Earth Mound Sites

Mound sites have been recorded in many areas of Australia and are typically associated with fluvial and lacustrine environs on the Quaternary sedimentary basin of the Murray-Darling Basin. Mound sites may be described as raised circular to oval accumulations of charcoal blackened soil. They have been interpreted as either deposits resulting from the steady accumulation of cooking and occupation debris or deliberate constructions which were later occupied.

Mound sites may contain various cultural materials such as stone, baked clay and faunal remains and occasionally human burials. The content and patterns of use evident in mound sites may vary according to environmental and cultural characteristics of a region. The identification of culturally formed mounds can be problematic since several other natural processes mimic their appearance (Klaver 1987). Some mound sites have been eroded by ploughing to the extent that only soil discolouration remains, with no outstanding relief.



Mounds which have been interpreted as earth ovens are generally 'located in damp soils, in proximity to water, at the same time staying above flood levels' (Klaver 1987:117). Within the transmission line corridor there is some potential for mound sites to occur along the margins of wetland basins and flood channels.

Burials

Burials within the region are generally found either in mound sites, or in elevated natural topographies consisting of soft, easily dug, sediments, such as aeolian sands or unconsolidated alluvial silts. They may occur in isolation or in groups, and may also be associated with occupation site debris. Burials are generally only visible where there has been some disturbance of sub-surface sediments or where some erosional process has exposed them.

Within the transmission line corridor burials may occur in sand bodies, in mound sites and on elevated fine sediment topographies on floodplains. It should be noted that the incidence of some isolated burials cannot be accurately predicted beyond the broad parameters of deposits with deep, fine sediments.

Freshwater Middens

Freshwater middens are defined as a concentration of artefactual debris that includes a significant percentage of freshwater shell (predominantly mussel shell *Velesunio sp.* or *Alathyria sp.*). They are usually the result of interim or base camp activity and are normally situated within riparian zones characterised by relatively permanent water.

Within the transmission line corridor freshwater middens may be associated with creeks, rivers, billabongs and prior stream channels. Midden material may be buried by overlying silt deposits.

Hearths

In archaeology, a hearth is a firepit or other fireplace feature. Hearths are common within the project area and are often made of fired clay balls and sometimes reflect multiple use.

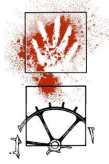
Isolated Finds

Isolated Finds are artefacts which occur without any associated evidence for prehistoric activity or occupation. They are defined as single artefacts located more than 60m from any other artefact. Isolated finds can occur anywhere in the landscape and may represent the random loss or deliberate discard of artefacts, or the remains of dispersed artefact scatters.

Other Site Types

More fragile/rare sites such as ceremonial bora rings, stone arrangements, habitation structures, and carved trees may also be present in the study corridor, as evidenced by these site types being present within 5km of the proposal at very low densities. Based on the cleared status of most of the transmission line corridor, and the likely agricultural practices which have occurred since white settlement (ploughing and levelling, trampling by stock, crop cultivation, construction of drainage canals, fences, roads and access tracks), the potential for these more fragile/rare sites to have survived in the corridor to the present day is considered low.

The site types which are most likely to occur in the proposal study area are artefact scatters, isolated finds, modified/scarred trees, and hearths. Other site types which may occur in the proposal corridor are mound sites, freshwater middens and burials. The most archaeologically sensitive topographic contexts in the corridor are elevated ground adjacent to water sources, lunettes, sand bodies and sand sheets within valley floor contexts, and the margins of lakes and river terraces.



The following figures have been redacted

Figure 3.1 Aboriginal sites in relation to the proposal study area and heritage study corridor (Overview)

Figure 3.2 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Figure 3.3 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Figure 3.4 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Figure 3.5 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Figure 3.6 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Figure 3.7 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Figure 3.8 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Figure 3.9 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Figure 3.10 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)



3.4 Gaps in Archaeological Assessments and Survey Priority

The spread of Aboriginal site locations along the length of the proposal suggests a lack of continuity in the archaeological assessment of the landscapes through portions of the heritage study corridor. This is broadly illustrated in Figure 3.1. Moving east-west along the proposal, the portions of the heritage study corridor that display an unexpected paucity (low density) of Aboriginal sites, given landform context and proximity to waterbodies, include:

- Section 1 - 120km section from north of Urana to east of Nyangay Creek, with only three AHIMS listed sites, and one site recently recorded by NOHC archaeologists during inspection for preliminary geotechnical works (See Figures 3.4-3.7). This section traverses Colombo and Yanco Creeks, and other smaller tributaries
- Section 2 – 50km section southwest of Hay with only one site, recently recorded by NOHC archaeologists during inspection for preliminary geotechnical works. (See Figure 3.8-3.9). This section abuts and traverses The Forest Creek and a number of other small tributaries.
- Section 3 – 25km section southwest and west of Balranald showing just five AHIMS listed sites (See Figure 3.11-3.12). This section traverses the Murrumbidgee River and Box Creek, which flows past Dry Lake and into Waldaira Lake.

The above described sections have landscape characteristics that would be expected, in a predictive Aboriginal site location model for the proposal study area, to have been a focus of Aboriginal occupation in the past. The paucity and/or low density of Aboriginal sites in these locations are most likely represent a lack of archaeological survey and assessment rather than a lack of sites.

3.5 Patterns in the Existing Data

A preliminary assessment of Aboriginal site types within the wider heritage study corridor shows broad differences in site patterning along the length of the proposal. Broadly site clustering occurs around existing and remnant bodies of water, with site density reducing significantly with increased distance from rivers, flood plain edges, and lakes, which is consistent with larger scale assessments within the Murrumbidgee area (see Pardoe & Martin 2001).

The vast majority of sites between Wagga Wagga (Figure 3.2) to Colombo Creek (Figure 3.5), are either modified/scarred trees or artefact recordings, whereas sites west of Colombo Creek are much more variable covering a range of site types often with multiple archaeological and/or cultural features within each AHIMS listing. These changes in site type seem to reflect the different bioregions, with site types becoming more complex and varied as the proposal alignment transitions from the South Western Slopes bioregion in the east, to the Riverina and Murray Darling Basin Depression bioregions in the central and western portions of the proposal study area. These bioregions reflect changes in topography, landscapes, soils, rainfall, and hydrology, resulting in varying vegetation, resources, and possibly settlement patterns.



4 NON-ABORIGINAL HERITAGE

4.1 Heritage Listed Items

Three (3) heritage listed sites have curtilages that are located entirely within (Liquid Explosives Store) or partially within (Rowan and Brookong Cemetery) the proposal study area. These sites are listed on the Wagga and Lockhart Local Environmental Plans (LEPs). The Liquid Explosives Store (Wagga LEP) is listed as having State significance, and the Brookong Cemetery (Lockhart LEP) and Rowan (Wagga LEP) are of local significance. A further thirty (30) heritage listed sites have curtilages that are located entirely or partially within the broader heritage study corridor, and are either listed as locally significant on LEPs or listed as potential or Section 170 sites within the Murrumbidgee Valley Reserves. The vast majority of historic sites are built heritage.

No Commonwealth listed items were found within the proposal study area or the heritage study corridor.

Table 4.1 lists heritage items that interact with either the proposal study area or the heritage study corridor. Figure 4.1 shows an overview of the proposal study area (only the largest sites are visible on the map), while Figures 4.2-4.6 show more focussed views of the site curtilages. Note – sites within the urban areas of Wagga Wagga are not shown.

Table 4.1 Heritage listed items within the proposal study area (grey) and the heritage study corridor (white)

Site Name	Item ID	Significance	Listing
Stone ruin	I71	Local	Wagga Wagga LEP
Ivydale	I72	Local	Wagga Wagga LEP
Ivydale Woolshed	I73	Local	Wagga Wagga LEP
Rowan	I189	Local	Wagga Wagga LEP
Old Calmsley	I284	Local	Wagga Wagga LEP
Wyadra grave site	I285	Local	Wagga Wagga LEP
Uranquinty Cemetery	I286	Local	Wagga Wagga LEP
Liquid Explosives Store	I287	State	Wagga Wagga LEP
Uranquinty Hotel	I289	Local	Wagga Wagga LEP
Uranquinty General Store	I290	Local	Wagga Wagga LEP
Uranquinty General Store Post Boxes	I291	Local	Wagga Wagga LEP
St Cuthbert's Church of England church	I292	Local	Wagga Wagga LEP
Trinity Lutheran Church	I293	Local	Wagga Wagga LEP
Ganawarra	I294	Local	Wagga Wagga LEP
Uranquinty Hall	I295	State	Wagga Wagga LEP
Uranquinty silos	I296	Local	Wagga Wagga LEP
Uranquinty School	I297	Local	Wagga Wagga LEP
Wise grave	I298	Local	Wagga Wagga LEP
Memorial Avenue	I304	Local	Wagga Wagga LEP
Lockhart Urban Conservation Area	C1	Local	Lockhart LEP
Brookong Cemetery	I1	Local	Lockhart LEP
Ashcroft Cemetery	I2	Local	Lockhart LEP
St Marys Catholic Church	I3	Local	Lockhart LEP
Showground	I4	Local	Lockhart LEP
Bethlehem Lutheran Cemetery	I5	Local	Lockhart LEP



Site Name	Item ID	Significance	Listing
Bethlehem Lutheran Church and Hall	I6	Local	Lockhart LEP
Bethlehem Lutheran Church and Hall	I7	Local	Lockhart LEP
Burial Ground (Aboriginal)	I7	Local	Balranald LEP
Hults Well; Willows Precinct	12049	Section 170	Yanga State Conservation Area (now Murrumbidgee Valley Reserves)
Parkers Sheep Yards; Willows Precinct	10626	Potential	Yanga State Conservation Area (now Murrumbidgee Valley Reserves)
The Willows Homestead; Willows Precinct	10625	Section 170	Yanga State Conservation Area (now Murrumbidgee Valley Reserves)
South Yanga Homestead Site; Yanga Precinct	10628	Potential	Yanga State Conservation Area (now Murrumbidgee Valley Reserves)
Parkers Homestead Ruin; Willows Precinct	10627	Potential	Yanga State Conservation Area (now Murrumbidgee Valley Reserves)

4.2 Predictive Historical Archaeology Statement

Unrecorded historic sites and features of heritage significance that may occur within the proposal study area include:

- Old historic non-Aboriginal graves;
- Old fence lines, such as post and rail fencing; these may occur along road easement boundaries and farmlands;
- Indications of field systems, such as drainage channels and ridge and furrow ploughlands; these are likely to survive in low lying agricultural ground, especially in areas that are now used for grazing, rather than cropping;
- Traces of agricultural and industrial processing or extractive sites, such as factories, and quarries; these may be found throughout agricultural lands on valley floors and adjacent low ranges;
- Archaeological sites, such as the occupation remains of former dwellings including homesteads, houses and huts; these will be distributed in close association with land settlement patterns, and correlated with favourable agricultural lands, trading nodes and transport corridors;
- Nineteenth-century structures, such as farm dwellings, outbuildings, selector's and timber-getters huts; these may survive as standing buildings, ruins or archaeological deposits and are most likely to survive on less developed rural properties, on early portion numbers, and in or near established farm building complexes;
- Standing buildings and structures; these will be focused along the early centres and corridors of occupation, industry, travel and transport;
- Sites associated with early roads; these will be closely associated with early cadastral road reserves, watershed ridgelines, and related to early river and creek crossing points;
- Transport and access routes, such as bridle paths, stock routes, and roads of varying forms and ages; these may survive as abandoned remnants adjacent to modern transport routes, or as alignments now followed by more modern or upgraded road and track infrastructure; and
- Railway sites, features and infrastructure; these will be focused along rail corridors;



- Former timber mills and associated infrastructure, such as timber pole structures, remains of machinery, tracks and tramways; these may survive within State forests, and in valley clearings adjacent to forest areas.

Structures of historical interest and heritage significance may be standing, ruined, buried, abandoned or still in use.

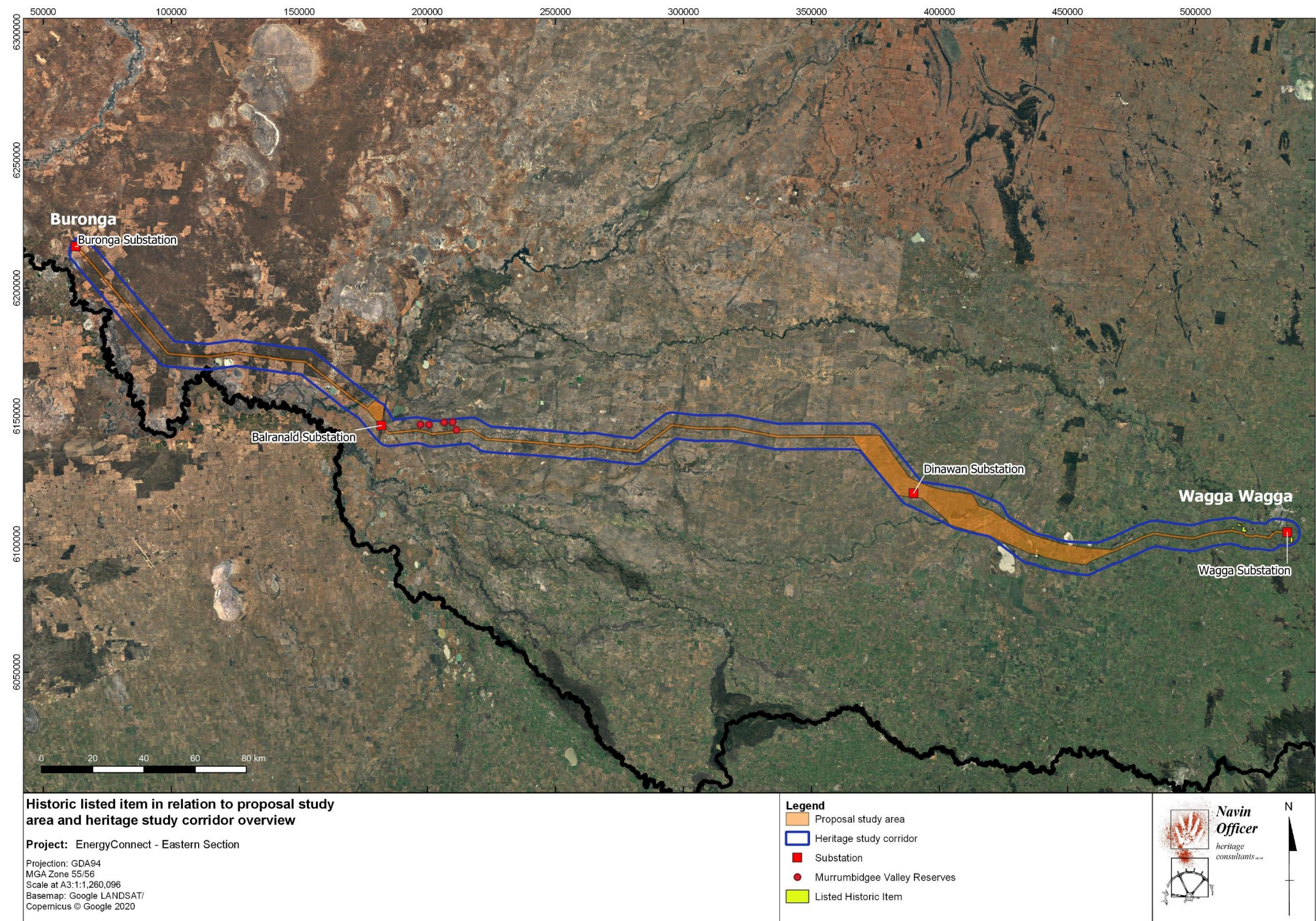
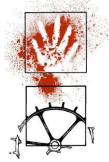


Figure 4.1 Overview of historic sites relative to the proposal study area and heritage study corridor

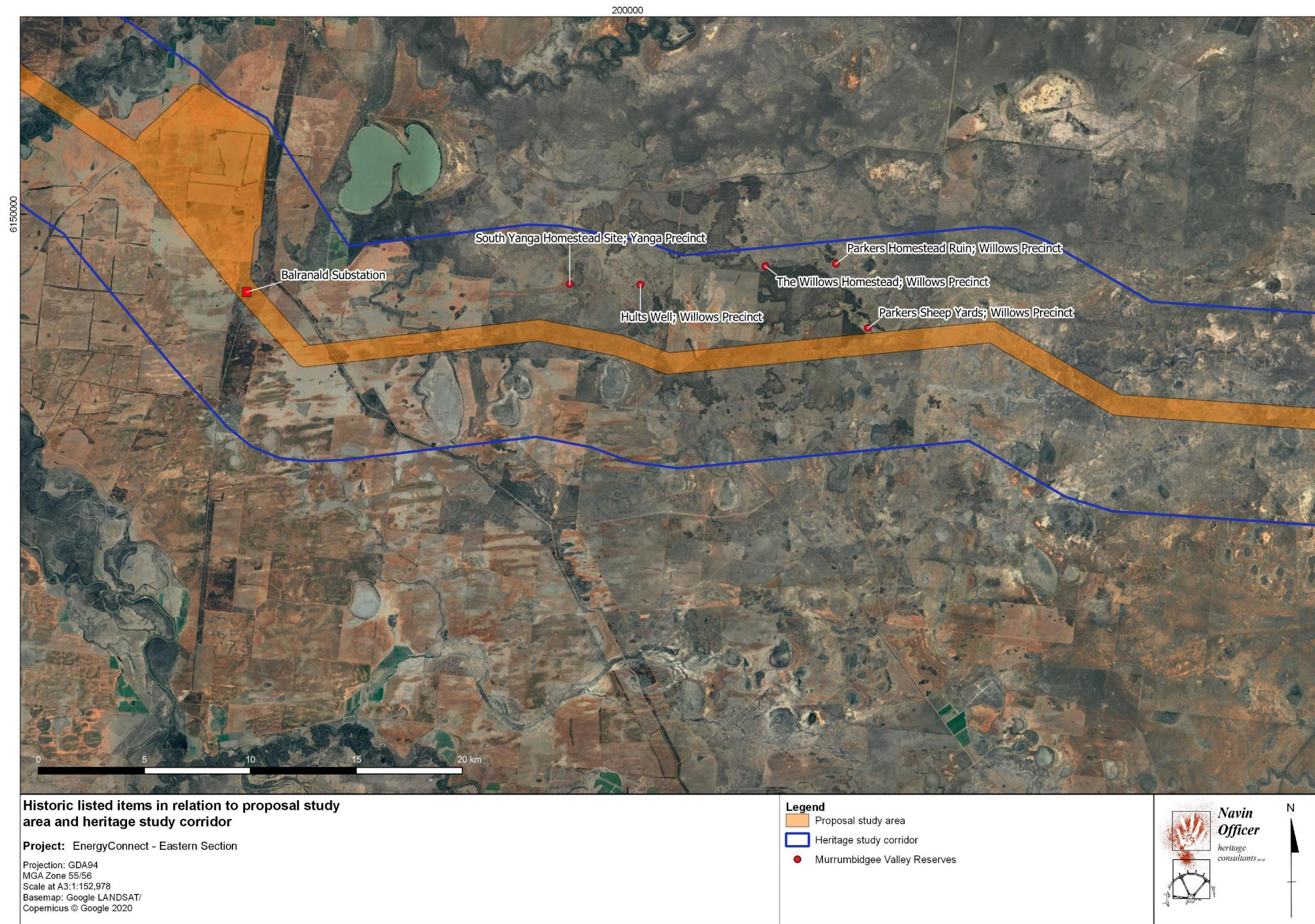


Figure 4.2 Historic sites relative to the proposal study area and heritage study corridor

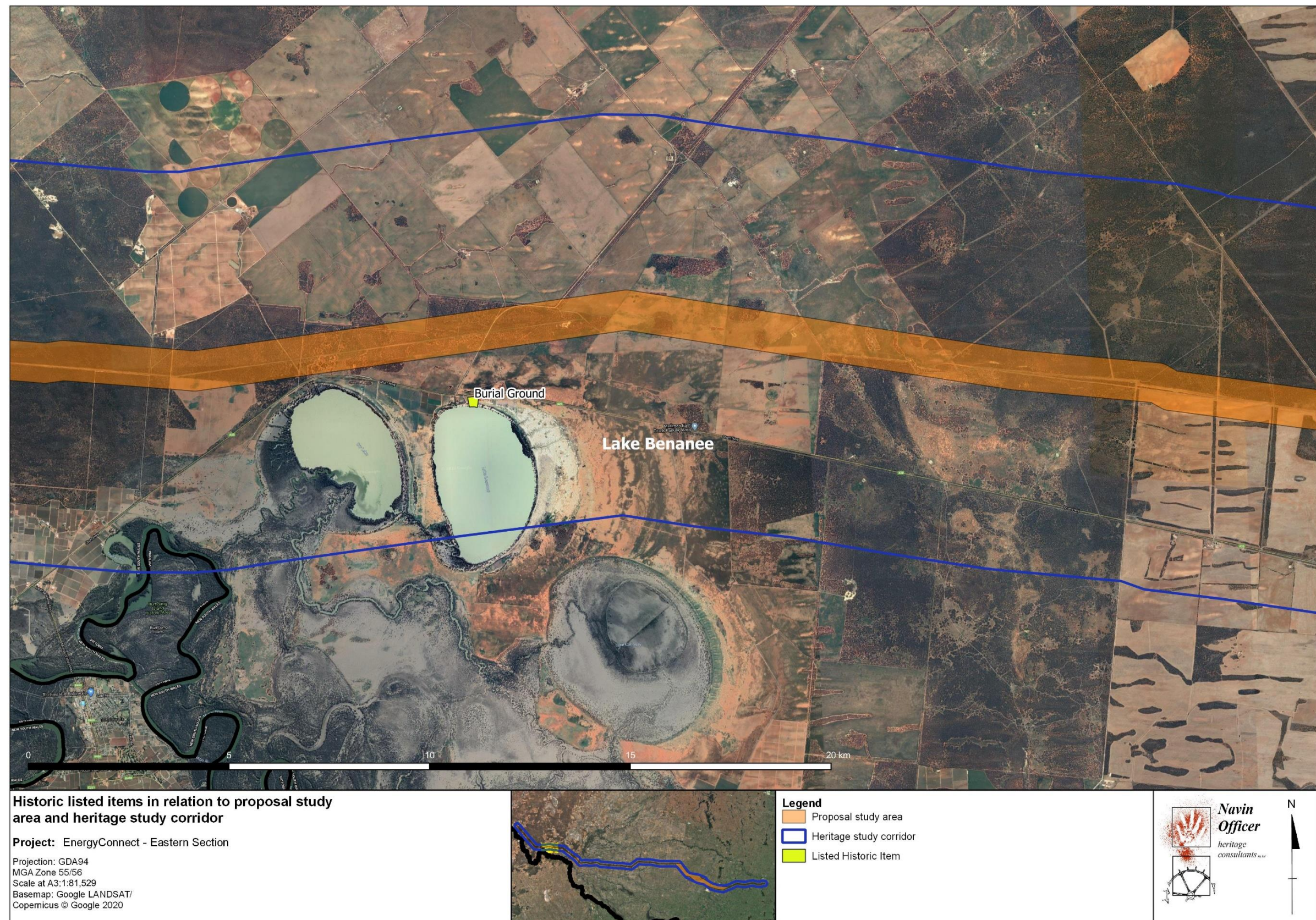


Figure 4.3 Historic sites relative to the proposal study area and heritage study corridor

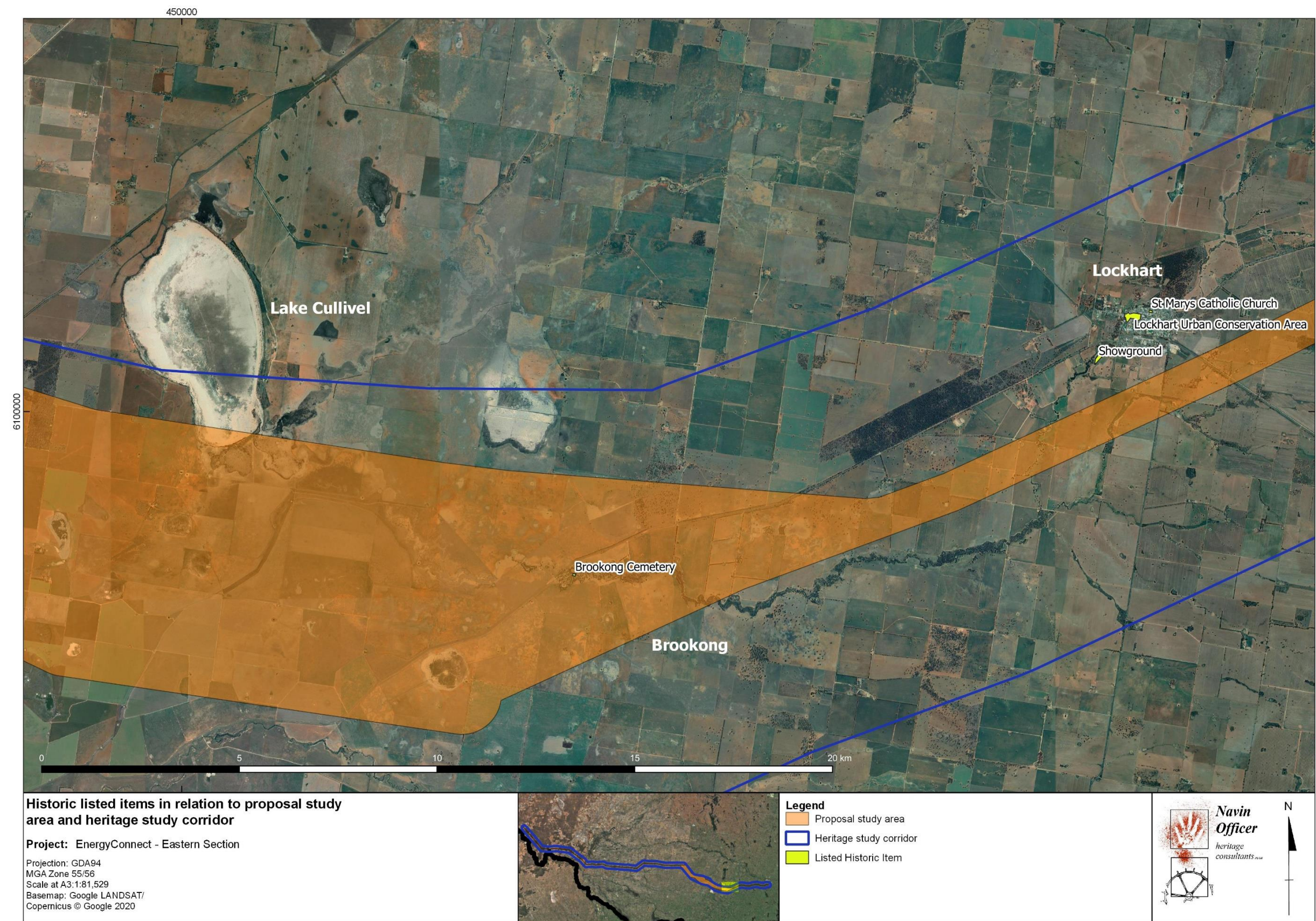


Figure 4.4 Historic sites relative to the proposal study area and heritage study corridor

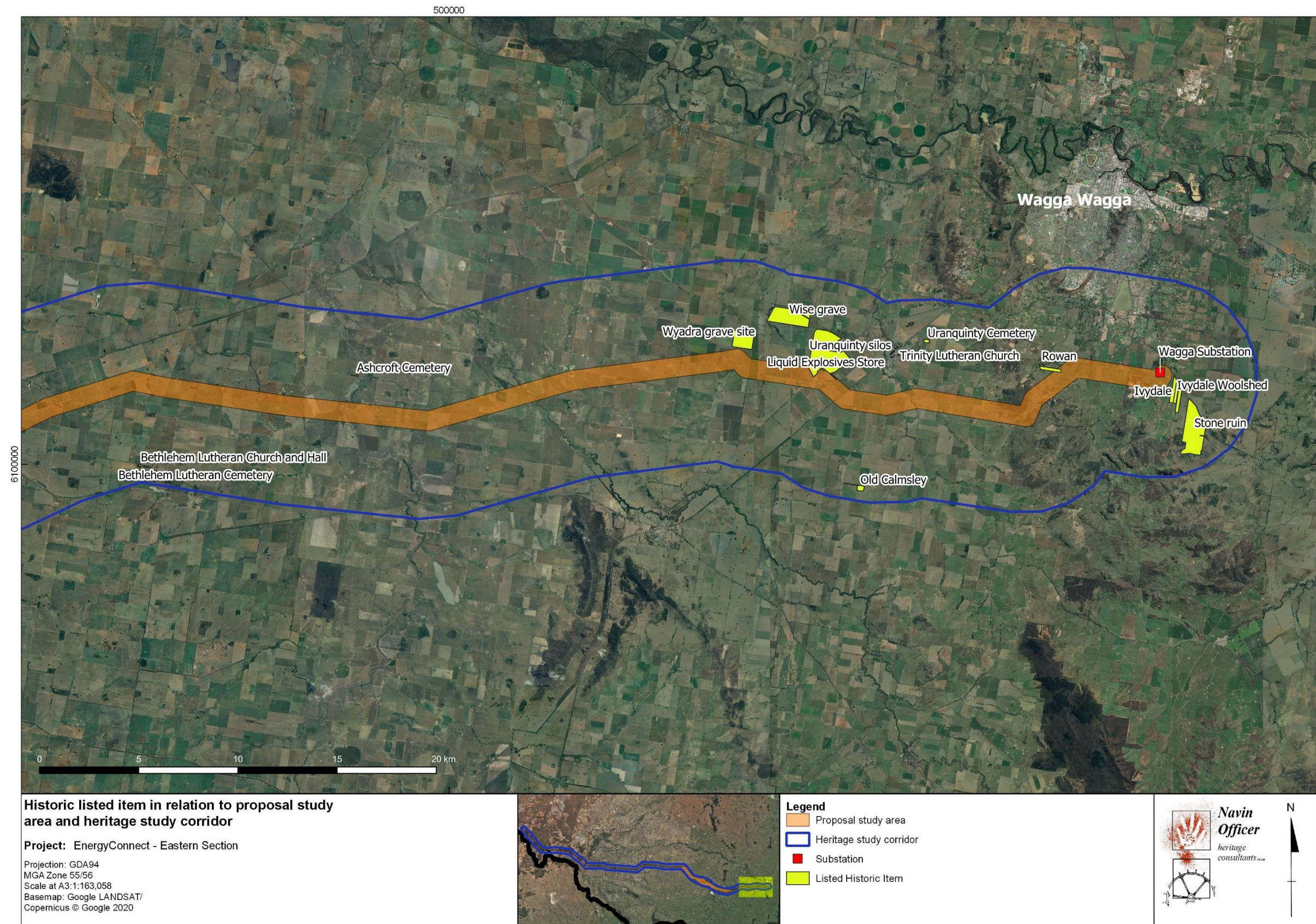


Figure 4.5 Historic sites relative to the proposal study area and heritage study corridor



5 NATIVE TITLE

5.1 Native Title Act 1993

The *Native Title Act 1993* (Commonwealth) (NTA) provides for the recognition and protection of native title where it may still exist. The NTA sets up a process for native title claims and compensation claims to be determined in the Federal Court, a determination of native title provides a declaration that native title continues to exist in the area. A successful compensation claim will provide compensation, monetary and other forms to native title holders whose native title was extinguished by inconsistent grant of interests in land after 1975 (the reason for after 1975 is this is the date the Racial Discrimination Act (Commonwealth) in Australia was enacted. Prior to this any extinguishment of native title does not provide a legal right to compensation.

One of the other main purposes of the NTA was to protect native title where it still exists, but in order to do this the Government realised that there would still be necessary works and other activity undertaken that will effect and impair native title. In order to do this legally the Government provided that any impairment of native title would be valid if according to the procedures set out in the NTA, and any effect on native title rights and interests would be converted to a right to compensation. This is called the future act regime (future means after the date the NTA came into effect in 1994).

It is important to remember that the NTA protects all native title, not only in areas where there is a registered native title claim or a determination of native title. If native title has not been extinguished and there is still connection by the native title holders to the land, then the processes outlined in the NTA must be followed. It is only for mining and certain other acts (like compulsory acquisition) that give rise to the right to negotiate, that a native title claim must be registered. The National Native Title Tribunal imposes the registration test.

Part of this future act regime also provides for Indigenous Land Use Agreements (ILUA). An ILUA is a special type of agreement between a native title group and the State or third parties about the use and management of land and waters. An ILUA allows for proposed works and other activities to validly affect native title. ILUAs can allow people to negotiate flexible, pragmatic agreements to suit their particular circumstances, all compensation for the impairing effects of native title must be included in the ILUA.

While there is no specific linkage in NSW between the heritage legislation and the NTA however the guidelines provided that "In the first instance 'traditional owners or custodians' are to be identified as native title holders, registered native title claimants, and Aboriginal Owners registered under the Aboriginal Land Rights Act 1983. Where native title has been determined to exist for an area, only the native title holders or the relevant prescribed body corporate need to be consulted under the NPW Regulations. Otherwise, as well as contacting native title claimants and Aboriginal Owners, the person or company is also required to seek input more broadly from a range of organisations, including the regional office of the OEH, the Local Aboriginal Land Council, Catchment Management Authorities, Native Title Services, and also to place a notice in the local newspaper" (DECCW2010)

The proposal study area does not intersect any determined Native Title lands. Nearby portions of Barkandji Traditional Owners #8 (Part A) native title area (determined) are within the heritage study corridor and are outlined in Figure 5.1. As of the 17/07/2020, there were no registered or lodged claims within the proposal study area or heritage study area.

In summary:

- Where native title has been **determined** consultation is required only with the native title holders
- Where a native title claim has been **registered and/ or lodged** but not yet determined the proponent must ensure that they involve the registered applicants in consultation regarding the cultural of the area in addition to any other Registered Aboriginal Parties for the project under the NSW OEH Consultation Guidelines.

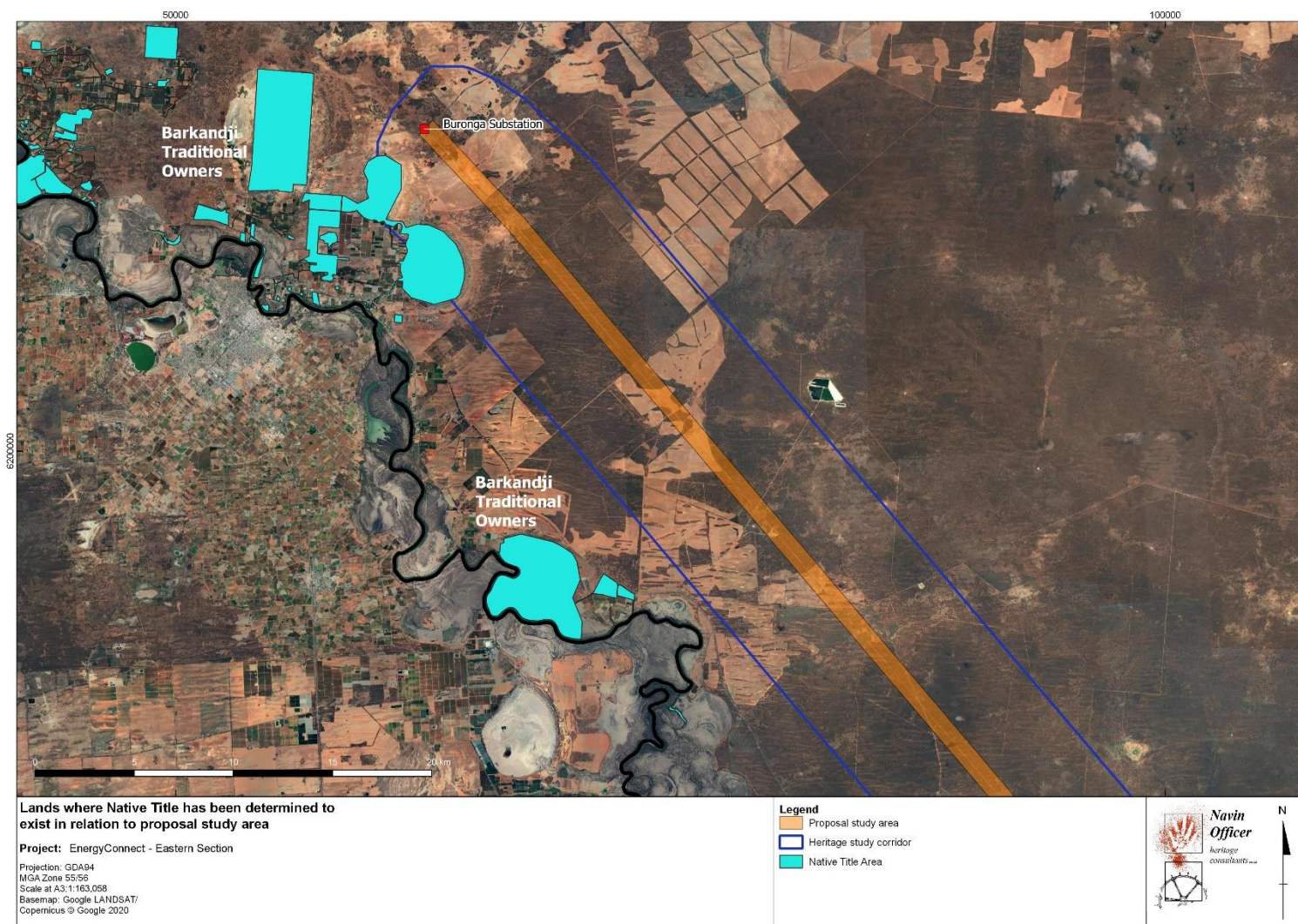


Figure 5.1 Lands where Native Title has been determined to exist in relation to the proposal study area and heritage study corridor



6 CONSTRAINTS AND KEY ISSUES

One constraint for the proposal in its current form is the patchiness of previous heritage surveys, both Aboriginal and non-Aboriginal, over the proposal study area. This is broadly the result of low levels of infrastructure development in the region. There are however, enough Aboriginal sites data in the broader heritage study corridor (10km site search) to develop a relatively robust predictive Aboriginal site location model across the length of the proposal.

Current data on the condition and status of previously identified Aboriginal sites within the proposal study area is required, and there is also a key need to identify any previously unrecorded Aboriginal sites. Early identification of Aboriginal sites, especially those of high archaeological significance and/or Aboriginal Cultural Values, would enable the implementation of better mitigation measures, that would in turn precipitate improved heritage outcomes for the proposal, as well as the local Aboriginal community and their culture.

Previously conducted assessment of non-Aboriginal heritage has focused on the built environment with specific focus on irrigation infrastructure of the 20th century. There has been little research into assessing non-Aboriginal archaeological sites and features and this is reflected in an absence of baseline information relating to this potential heritage resource. Future activities recommended for the cultural heritage assessment of the proposal are:

- To continue liaising with Environment Energy and Science (EES) Group of Heritage NSW regarding *Restricted* Aboriginal heritage items/recordings listed within or nearby this heritage study corridor, in order to identify where these sites are located in relation to the proposal study area;
- Analysis of high-resolution aerial imagery and updated topographic and contour mapping (when available) to further inform the development of the predictive model for Aboriginal site locations along the length of the proposal;
- Development of a field survey strategy for the effective assessment of impacts, and impact mitigation strategies;
- Conducting a program of consultation with Aboriginal community stakeholders, and Native title claimants, in order to address constraints arising from tangible and intangible cultural values; and
- Assessing the need for the conduct of subsurface archaeological investigation (test excavation) to evaluate the impacts of various route options. Test excavation can be costly and time consuming and not necessarily needed for the assessment of route options, however it is the only means by which predicted impact can be translated into known and quantifiable impact.



7 GAP ANALYSIS

This review has identified the following information gaps in the available baseline data, compiled listings and secondary sources.

7.1 Aboriginal heritage

- Only small proportions of the proposal study area have been the subject of systematic archaeological survey. Most of this survey has been associated with linear infrastructure and a small number of solar farm assessments. As a consequence, sites are mostly known from the areas of a small number of past development proposals. The location and distribution of known Aboriginal sites provides an unreliable baseline for the assessment of potential transmission line alignments, in cases where deviations from the existing transmission line are necessary.
- There is not sufficient archaeological baseline information sourced from the proposal study area to develop a predictive model of the surviving archaeological resource. The location of previously conducted surface survey and subsurface excavations has not tested a representative sample of all landform types or zones of likely sensitivity within the proposal study area. A predictive model can, however, be developed based on data yielded from the heritage study corridor.
- Aboriginal sites in and around the study area have been recorded from the mid-1970s through to 2020. The condition and status of Aboriginal sites can change very quickly over a short period or remain stable for long periods. The stability of Aboriginal archaeological sites is dependent on a number of factors including, but not limited to; position in the landscape, vegetation cover, and natural sedimentation processes, including degrading (erosion) and aggrading (accumulation) soil deposits. In the rural landscapes covered by much of the study area impacts from land use, such as disturbances caused by vehicle movements, stock treadage, cropping, and dam construction, can drastically accelerate the degradation destruction of sites. Relocating and updating the status of previously recorded Aboriginal sites within the study area will be a key component to assessing the overall impacts of the proposal, as well as developing impact mitigation strategies.
- There is limited information on the Aboriginal cultural values of the study area, as determined by relevant local Aboriginal community representatives. Where described, the views of representatives relate mostly to the limited archaeological site recordings, and to the separate study areas subject to impact.

7.2 Non-Aboriginal heritage

- Only small proportions of the proposal study area have been the subject of systematic archaeological survey. Most of this survey has been associated with linear infrastructure and a small number of solar farm assessments. As a consequence, sites are mostly known from the areas of a small number of past development proposals. Few non-Aboriginal archaeological sites have been identified as a result of these surveys. The lack of non-Aboriginal archaeological site recordings within the study area does not provide a reliable indication of the likely surviving archaeological resource.
- There is a small number of sites and places within the study area which have been placed on heritage schedules. The range and type of listed sites does not reflect the range of non-Aboriginal sites potentially occurring within the study area. Archaeological sites are notably absent.
- The focus of previously conducted heritage studies has been on the identification and review of the surviving built heritage. There have not been equivalent or systematic reviews of potential archaeological sites, or systematic evaluation of historically identifiable former residential or industrial locales.
- Little assessment and identification of 'heritage landscape' values has been conducted within the proposal study area. A systematic assessment of landscape values based on cultural



landscape criteria has not been conducted. Such an assessment would include features such as remnant native vegetation, old fence lines, tree plantings, aesthetic values, and the pattern of land tenure.



8 FURTHER INVESTIGATIONS

The following investigations are required to complete the compilation of an adequate information baseline for the project EIS assessment to ensure that cultural heritage values are properly identified, assessed and avoided where possible through design refinement.

8.1 Aboriginal heritage

1. Develop and refine a landscape-based predictive model of the archaeological resource of the proposal study area using relevant and comparable local and regional data, as well as high-resolution imagery of the proposal study area.
2. Map areas of relative predicted archaeological sensitivity across the proposal study area.
3. Initiate a program of Aboriginal consultation in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010, NSW Office of Environment and Heritage's (Dept of Environment, Climate Change and Water, 2010). The aims of the program are to identify relevant stakeholders, provide a means of communication and information exchange, and identify areas and sites of known cultural significance to the Aboriginal community.
4. Conduct desktop development and comparative evaluation of route alignment options based on predictive mapping and known baseline data.
5. Conduct archaeological field survey of route alignment(s), including re-inspection of known sites to clarify their location and condition. Survey to be conducted with the participation of Aboriginal stakeholder representatives.
6. Evaluate the necessity to conduct a program of archaeological test excavation in order to develop or identify a preferred or minimum impact route alignment.
7. Provide input where necessary into project team route and design refinement.

8.2 Non-Aboriginal heritage

1. Conduct a review of early aerial photography and recent hi-res imagery, to both assist in the identification of potential archaeological sites and surviving built structures or other previously unidentified features.
2. Conduct desktop development and comparative evaluation of route alignment options based on predictive mapping and known baseline data.
3. Conduct archaeological field survey of route alignment(s).
4. Provide input where necessary into project team route and design refinement.



9 REFERENCES

- Beesley, J. 1989 The Scarred Tree. Unpublished report to the Victoria Archaeological Survey, Melbourne.
- Crosby, E. 1978 A Site Survey in the Albury Area. Report to NSW NPWS.
- Crosby, E. 1979 Archaeological Survey for the Albury Wodonga Development Corporation.
- Djekic, A. 1978 An Archaeological Survey of the Wagga Wagga to Albury Transmission Line. Report to NSW NPWS.
- Hiscock, P. 1983 An Archaeological Survey of the Proposed 330kV Transmission Line, Wagga Wagga to Darlington Point. Report to the NSW Electricity Commission.
- Klaver, J. 1987 Old Ovens Are Soon Hot BA (Honours) Thesis Australian National University, Canberra.
- Lockhart Local Environmental Plan 2012. <https://www.legislation.nsw.gov.au/#/view/EPI/2012/676>
- Long, A. 2005 *Aboriginal Scarred Trees in New South Wales: A Field Manual*. Department of Environment and Conservation (NSW).
- McIntyre, S.R. 1987 Archaeological Survey of the Proposed Wagga – Darlington Point 330kV Transmission Line. Report by the Development Division, NSW Electricity Commission.
- Navin, K. 1992 Preliminary Archaeological Investigation of Proposed Expansion to Landfill Facility at Gregadoo, Wagga Wagga, NSW. Report to the GHD Group.
- NSW Office of Environment and Heritage 2010 *Aboriginal Cultural Heritage Consultation Requirements for Proponents* Department of Environment, Climate Change and Water (DECCW)
- Officer, K. 1994 Archaeological Survey of Proposed Extension to Boral Culcairn Quarry, NSW. Report to Boral Resources.
- Pardoe, C. & Martin, S. 2001. Murrumbidgee Province Aboriginal Cultural Heritage Study. A Report to NSW National Parks and Wildlife Service.
- Simmons, S. 1977 Hume Freeway - Seymour to Avenel Section; Archaeological Survey Report. Victoria Archaeological Survey, Ministry of Conservation, Melbourne.
- Wagga Wagga Local Environmental Plan 2010 <https://legislation.nsw.gov.au/#/view/EPI/2010/378>

~ oOo



APPENDIX 1

AHIMS RECORDINGS WITHIN PROPOSAL STUDY AREA



Redacted