TransGrid

Environmental Scoping Report

EnergyConnect (NSW – Western Section)

May 2020

Executive Summary

Overview and Background

TransGrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity distributor in South Australia (SA)) are currently investigating the proposed construction and operation of a new electrical interconnector and network support options between NSW and SA, with an added connection to north-west Victoria. The interconnector is aimed at reducing 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 involves constructing a high voltage electricity interconnector of approximately 900 kilometres (km) between the power grids of SA (starting at Robertstown) and NSW (finishing in Wagga Wagga), known collectively as EnergyConnect. EnergyConnect has been identified as a priority transmission project in the NSW Transmission Infrastructure Strategy (DP&E 2018), linking the SA and NSW energy markets and assisting in transporting energy from the South-West Energy Zone to major demand centres.

TransGrid is the proponent and is responsible for obtaining environmental planning approvals for those components located in NSW. The NSW components of EnergyConnect are anticipated to be assessed and approved in stages, starting with the western section.

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

It is noted that a scoping report was previously been prepared and lodged for the section between the SA/NSW border to Buronga, with SEARs issued in December 2019 (reference SSI 10040). Since lodgement of that report, an upgrade to the existing transmission line between Buronga and the NSW/Victoria border near Red Cliffs has been identified as having substantial benefits when combined with the section between the SA/NSW border to Buronga. This is because it would provide additional generator connection capacity to enable the development of solar generation in north-west Victoria, which can then be exported to SA and NSW via EnergyConnect. As such, to better meet the overall strategic needs of EnergyConnect, the proposal has been altered to incorporate this additional section. The previous scoping report has been withdrawn to allow for the lodgement of this revised ESR.

EnergyConnect (NSW – Western 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:

- About 135km of new 330kV double circuit transmission line and associated infrastructure between the SA/NSW border in the vicinity of Chowilla and the existing Buronga substation
- An upgrade to the existing 220kV transmission line between the Buronga substation and the NSW/Victoria border at Monak, near Red Cliffs
- An expansion and upgrade of the existing Buronga substation from an operating capacity of 220kV to 330kV
- 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), enabling more than three million homes and businesses to access a safe, reliable and affordable supply of electricity. Its system transports electricity from sources of generation including wind, coal, solar, gas and hydro to large industrial customers and to the distribution networks which deliver it to homes and businesses. Comprising over 100 substations and more than 13,000km of high voltage transmission lines, cables, and interconnections with Queensland and Victoria, the network is instrumental to the electricity system and economy and facilitates energy trading across the National Electricity Market. Further information on TransGrid can be found at www.transgrid.com.au.

Proposal study area

As part of the early works for EnergyConnect, TransGrid and ElectraNet 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 10km 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 comprises a one km wide corridor between the SA/NSW border near Chowilla and Buronga and a 200m wide corridor between Buronga and the NSW/Victoria border at Monak, near Red Cliffs.

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 some ecological field studies, 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
- Bushfire risk
- Socio-economic
- Surface water and hydrology.

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:

- Electro Magnetic Fields (EMF)
- Air quality and greenhouse gas
- Noise and vibration
- Traffic and access
- Soils 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
DPI&E	Department of Planning, Industry and Environment
DRP	Darling Riverine Plains
EEC	Endangered ecological community
EIA	Environmental impact assessment
EIS	Environmental impact statement
EMF	Electro Magnetic Fields

Term/Acronym	Description
EnergyConnect	An electrical interconnector of approximately 900km between the power grids of South Australia and New South Wales, with an added connection to north-west Victoria
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environmental protection licence
FTE	Full time equivalent
GDE	Ground water dependent ecosystem
HVDC	high voltage direct current
IBRA	Interim Biogeographical Regionalisation of Australia
ICNIRP	International Commission on Non-Ionizing Radiation Protection
KFH	Key fish habitat
LALC	Local Aboriginal Land Council
LEP	Local environmental Plan
LGA	Local government area
MDD	Murray Darling Depression
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 10km corridor identified during the initial assessment of transmission line corridor options
proposal study area	The study area for this Environmental Scoping Report, which comprises a one km wide corridor between the SA/NSW border near Chowilla and Buronga and a 200m wide corridor between Buronga and the NSW/Victoria border at Monak, near Red Cliffs
RAP	Registered Aboriginal Parties
REZ	Renewable Energy Zones

Term/Acronym	Description
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 – Western Section)

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1. Introduction

1.1 EnergyConnect

TransGrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity distributor in South Australia (SA)) are currently investigating the proposed construction and operation of a new electrical interconnector and network support options between NSW and SA, with an added connection to north-west Victoria.

The interconnector is aimed at reducing 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 involves constructing a new high voltage electricity interconnector approximately 900km long between the power grids of SA (starting at Robertstown) and NSW (finishing in Wagga Wagga). Collectively, the proposed interconnector is known as EnergyConnect (refer to Figure 1-1).

EnergyConnect has been identified as a priority transmission project 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.

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

- NSW sections including:
  - Western section (the subject of this Environmental Scoping Report (ESR)), which would extend from:
    - The SA/NSW border (near Chowilla in SA) to Buronga
    - Buronga to the NSW/Victoria border at Monak (near Red Cliffs in Victoria)
  - Eastern section, which would extend from Buronga to Wagga Wagga
- Victorian section, which would extend from the NSW/Victoria border to Red Cliffs
- 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 – Western Section) (referred to as the proposal). TransGrid will seek subsequent and 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 2021 and take around one year to complete. It is anticipated that the energisation of the proposal would occur in 2022.

The key components of the proposal include:

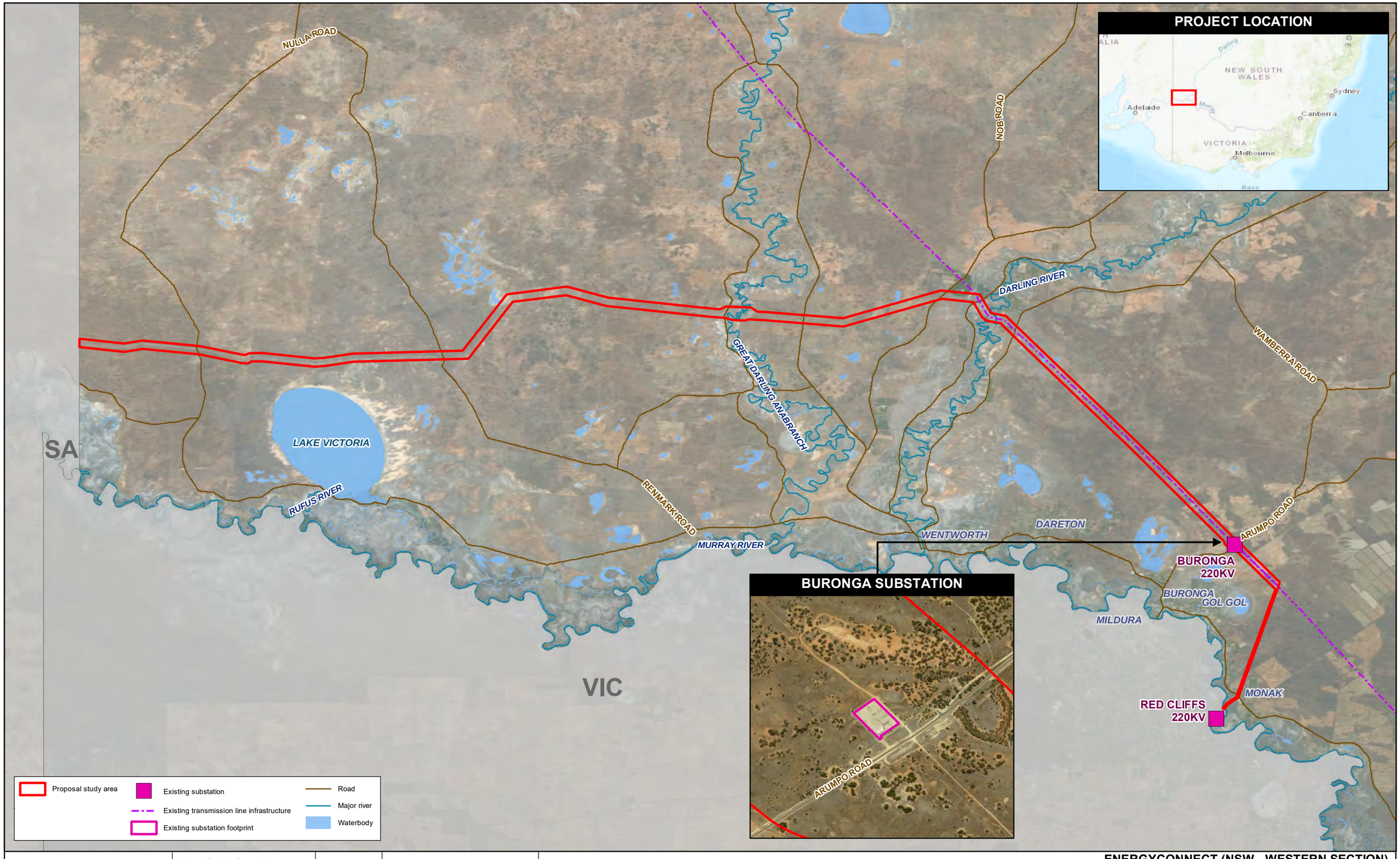
- About 135km of new 330kV double circuit transmission line and associated infrastructure between the SA/NSW border in the vicinity of Chowilla and the existing Buronga substation
- An upgrade to the existing 220kV transmission line between the existing Buronga substation and the NSW/Victoria border at Monak, near Red Cliffs
- An expansion and upgrade of the existing Buronga substation from an operating capacity of 220kV to 330kV
- 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 900km between the power grids of SA and NSW, with an added connection to north-west Victoria.
- **The proposal:** EnergyConnect (NSW – Western Section).
- **Preliminary alignment corridor:** a 10km 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 typically comprises a one km wide corridor between the SA/NSW border near Chowilla and Buronga and a 200m wide corridor between Buronga and the NSW/Victoria border at Monak, near Red Cliffs. This is within the preliminary alignment corridor. 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 80m wide.



Map: PS117658_SCPE_008_A2	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

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Coordinate system: GCS GDA 1994

Scale ratio correct when printed at A3

Source: Esri, DigitalGlobe, 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,

ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

Figure 1-2
Locality and proposal study area

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 13,000km 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.

It is noted that a scoping report was previously been prepared and lodged for the section between the SA/NSW border to Buronga, with SEARs issued in December 2019 (reference SSI 10040). Since lodgement of that report, an upgrade to the existing transmission line between Buronga and the NSW/Victoria border near Red Cliffs has been identified as having substantial benefits when combined with the section between the SA/NSW border to Buronga. As such, to better meet the overall strategic needs of EnergyConnect, the proposal has been altered to incorporate this additional section and the previous scoping report has been withdrawn, which has led to this revised ESR.

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 biodiversity and heritage studies (including limited field verification along some sections of the proposal) that have been completed to date. 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 Markets (NEM) incorporates around 40,000km 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.

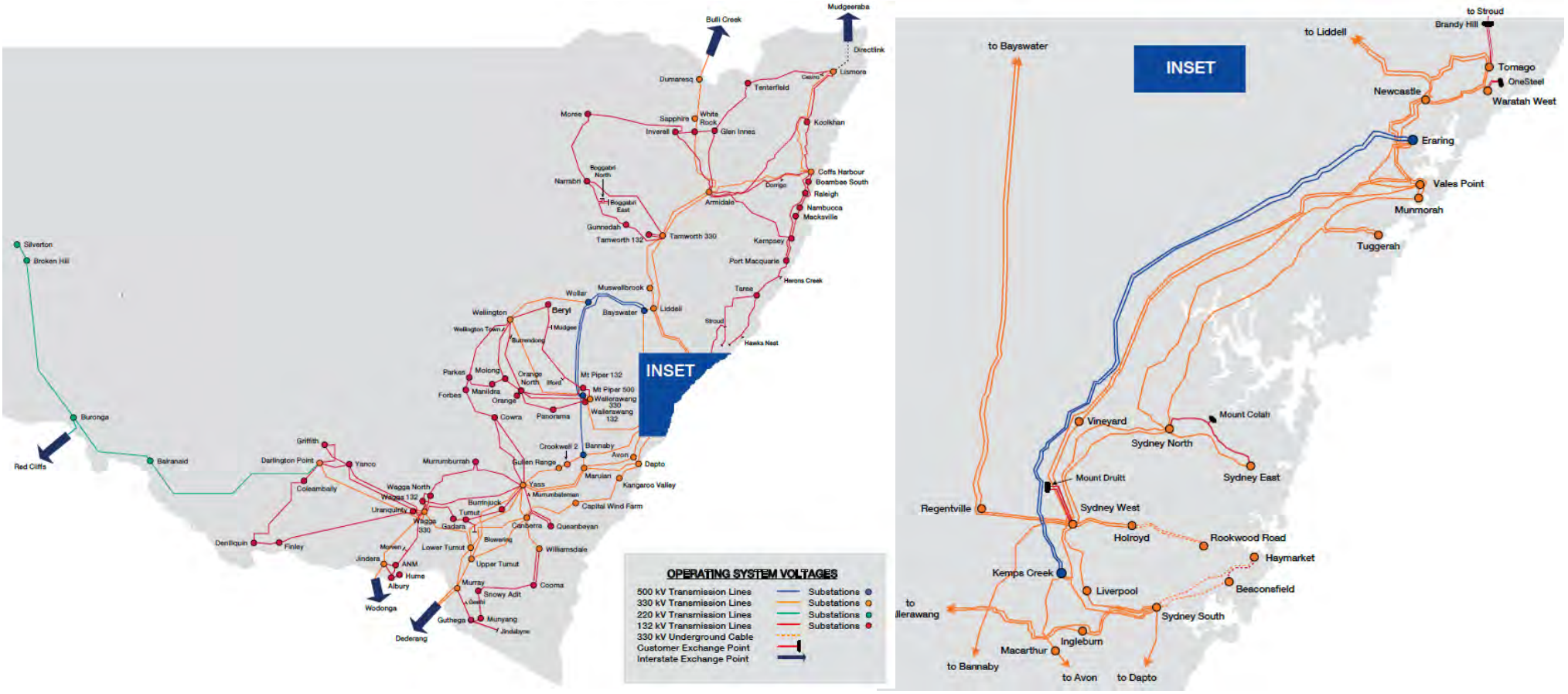

Figure 2-1 TransGrid's Electricity Network Map (source: TransGrid, 2019)

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 (TransGrid, 2018).

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 is currently being prepared by the AEMO, with a draft of the 2020 ISP released for comment in December 2019.

Both the 2018 and Draft 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. To date, the pace of development in new renewable and distributed energy generation has been even faster than anticipated in the current 2018 ISP.

A new interconnector between SA and NSW (EnergyConnect) is identified as an immediate priority project in both the 2018 and Draft 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 proposed as priority projects in the 2020 ISP. Together, these interconnectors would augment the national transmission grid and address cost, security and reliability issues. These complementary projects include interconnectors between Queensland and NSW (QNI Upgrade), Victoria and NSW (VNI Upgrade) as well as the Snowy Mountains within NSW (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.

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.

In July 2018, AEMO's ISP estimated that greater transmission investment and connection between states could deliver a net benefit across the NEM of $1.2 billion.

The strategy also identifies three Energy Zones (refer to Figure 2-2). These 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 17,700MW 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 to unlock energy resources in new regions of the state.

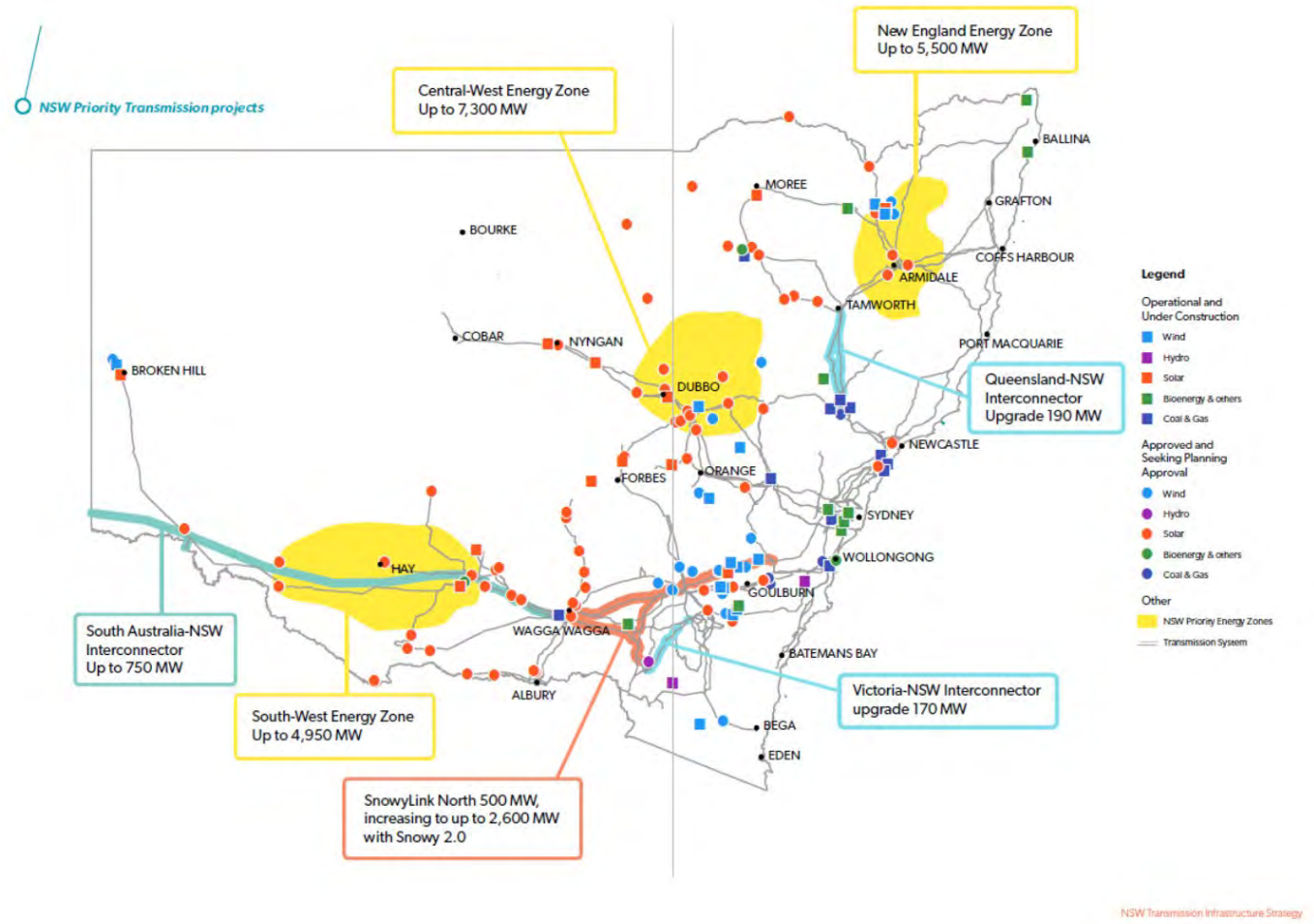

Figure 2-2 NSW Priority Transmission Projects (DP&E, 2018)

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 PV.

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

EnergyConnect is required to complete the missing link between the SA and NSW transmission networks, connecting the outreaches of the state networks at Chowilla in SA and Buronga in NSW. The upgrade to the existing transmission line between Buronga and Red Cliffs would also enhance the capacity of the network to provide electricity between NSW and Victoria.

This connection would relieve system constraints and allow for NSW, SA and Victorian consumers to benefit from significant amounts of low-cost, large-scale solar generation in south-west NSW. The proposal is an essential component of EnergyConnect.

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 2-3 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 400kV 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 1,450km long. This option is assumed to provide 700MW of transfer capacity.
- **NSW interconnector options:**
  - Option C.3: A 330kV line (alternating current) between Robertstown in mid-north SA and Wagga Wagga in NSW, via Buronga, plus a 220kV line between Buronga and Red Cliffs, in Victoria. The indicative route would be approximately 916km in length. This option is assumed to provide 800MW of transfer capacity.
  - Option C.3ii: A 330kV 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 330kV 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 1,016km in length. This option is assumed to provide 800MW 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 275kV 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 510km in length. This option is assumed to provide 650MW of transfer capacity.

The RIT-T assessment concluded that of all options considered, a new 330kV 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 the SA, eastern NSW and Victorian sections of EnergyConnect (refer to Figure 1-1) within NSW. All other portions would be dealt with as part of separate environmental planning approvals under the relevant jurisdictions.

Figure 2-3 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, preliminary environmental survey and stakeholder engagement undertaken between November 2018 and February 2020.

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 been categorised into the following hierarchy:

2.7.1.1 Hierarchy of Constraints

- 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 2-4.

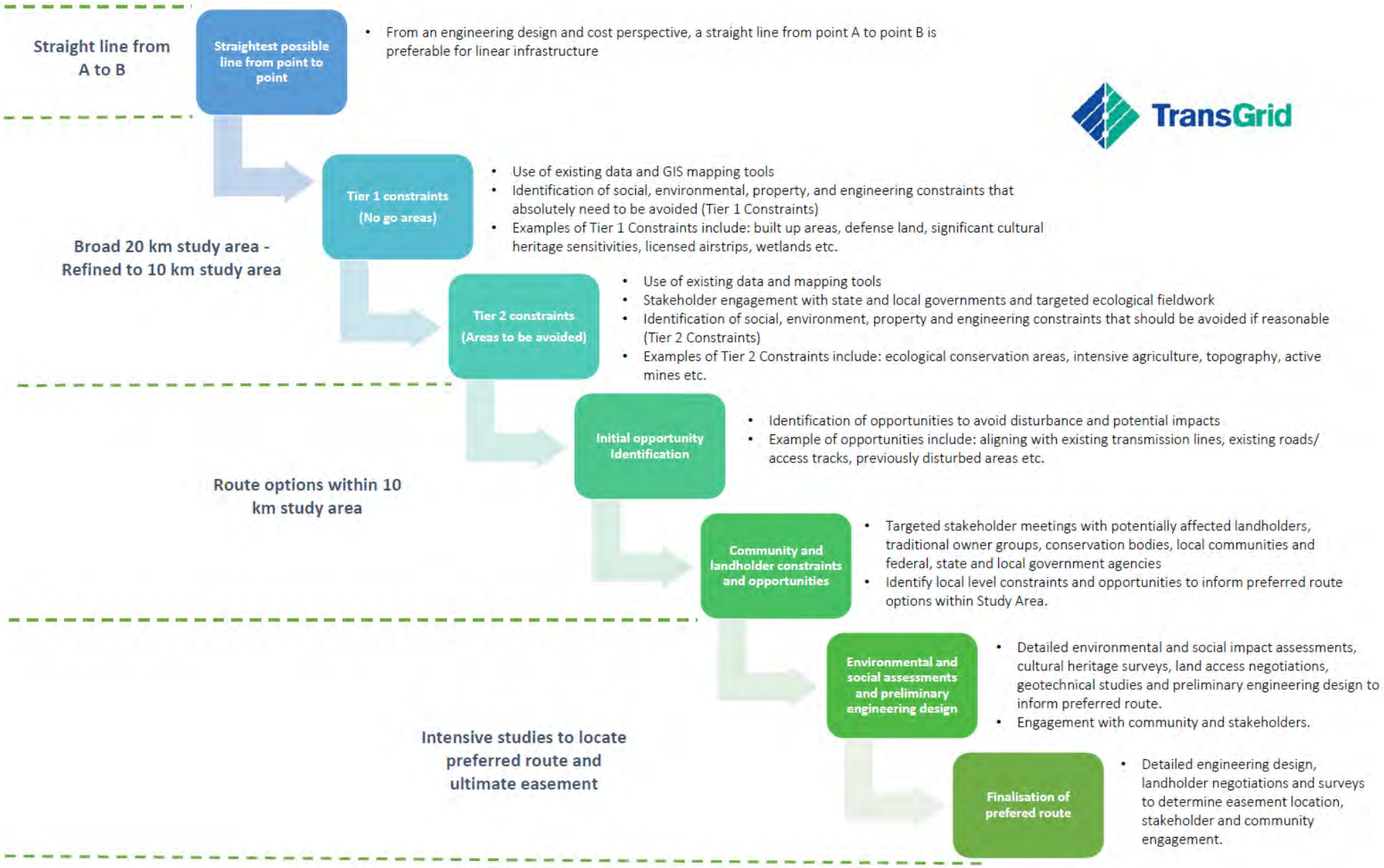

Figure 2-4 Corridor Selection Process

2.7.1.2 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 e.g. around the Darling River and Great Darling Anabranch)
- 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 was 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 and Figure 2-5) were identified and considered during the identification of the preliminary alignment corridor.

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)
> 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 (e.g. lunettes surrounding Lake Victoria). > 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).	> 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.	> 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 Darling River and Anabranch. > Groundwater recharge areas. > Homesteads and other infrastructure.	> 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 the Darling River and Anabranch and flood out zones (NSW). > Target areas with existing crossings/access (including bridges) across the permanent/semi-permanent watercourses (NSW).

PINE CAMP

ANABRANCH SOUTH

RUFUS

LAKE VICTORIA

PINE CAMP ROAD

NULLA ROAD

RENMARK ROAD

SA

VIC

Proposal study area
Tier 1 constraints
Tier 2 constraints
Road
River/creek
Waterbody
Cadastre

Map: PS117658_SCPE_001_A3	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

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Coordinate system: GDA 1994 MGA Zone 54

Scale ratio correct when printed at A3

a b c Mildura

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

ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

Figure 2-5a
Tier 1 and 2 constraints

PARA
PARA
NOB ROAD
HIGH DARLING ROAD
LOW DARLING ROAD
POONCARIE
TOORA LAKE
ELLERSLIE
ANABRANCH SOUTH
POONCARIE ROAD
WENTWORTH
SILVER CITY HIGHWAY
MILPARA ROAD
FLETCHERS LAKE
HOLLAND LAKE
POMONA
COOMEALLA
DARETON
CURLWAA

Proposal study area
Tier 1 constraints
Tier 2 constraints
Existing transmission line infrastructure
Road
River/creek
Waterbody
Cadastre

Map: PS117658_SCPE_001_A3
Author: Robert.Suansri
Date: 15/04/2020
Approved by: - Z.McLaughlin

0 5 km
1:150,000
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Scale ratio correct when printed at A3

a b c Mildura

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

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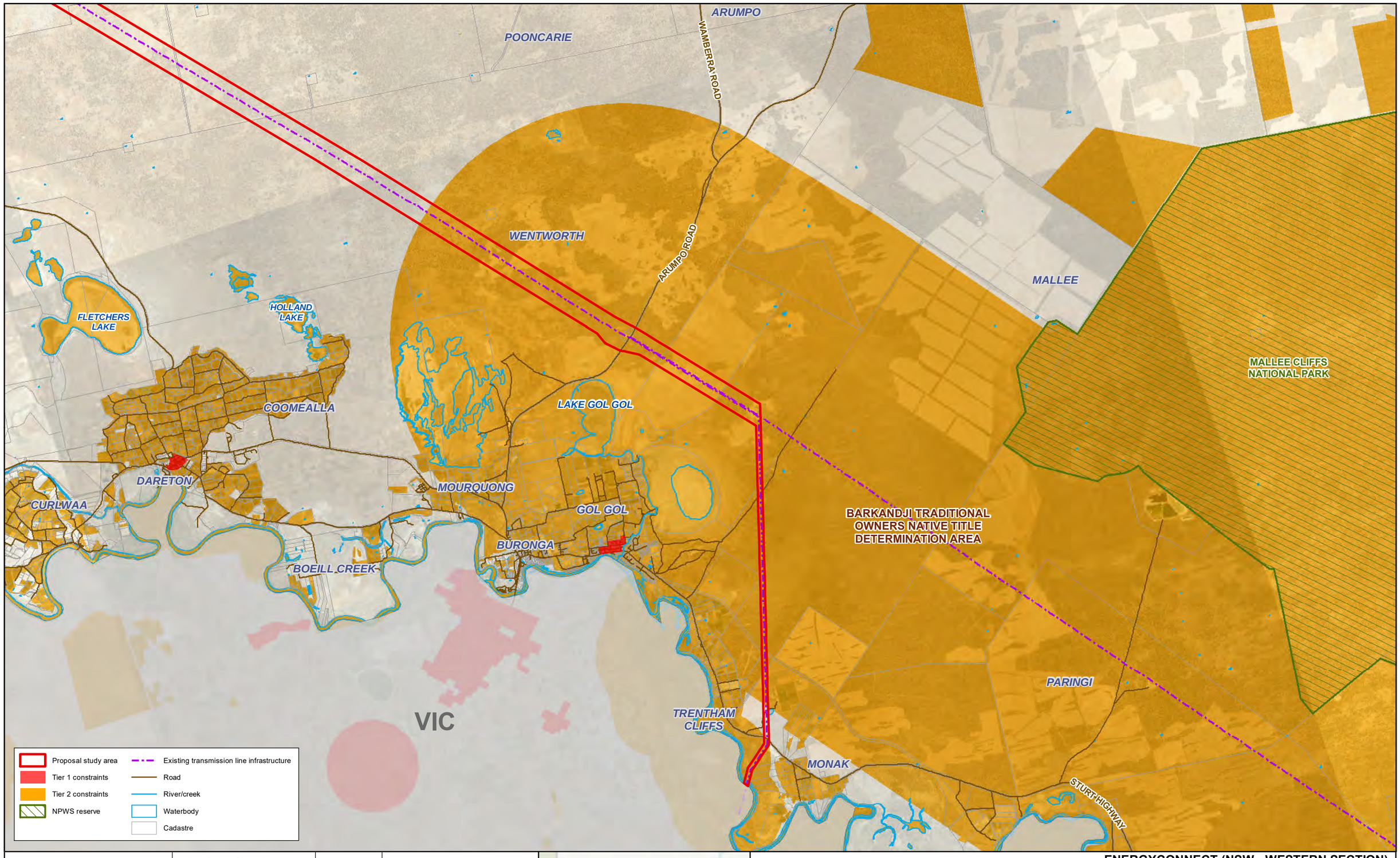
Transgrid

ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

Figure 2-5b
Tier 1 and 2 constraints



Map: PS117658_SCPE_001_A3	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

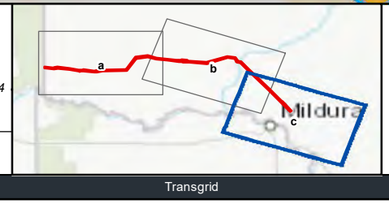
0 5 km

1:150,000

Coordinate system: GDA 1994 MGA Zone 54

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



ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

Figure 2-5c
Tier 1 and 2 constraints

2.7.1.3 Identification of the Preliminary Alignment Corridor and Proposal Study Area

Existing, publicly available geospatial datasets for the tiered constraints and opportunities listed in Table 2-1 together with the feedback received from early engagement activities were used to identify a 10km preliminary alignment corridor.

Further analysis of constraints and opportunities within the preliminary alignment corridor was augmented with field-based survey work to validate a number of assumptions made around extent and quality of key biodiversity features. Various opportunities identified at a local level were reviewed to significantly reduce environmental, social/land use and Aboriginal cultural heritage impacts within Tiers 2 and 3 and included use of existing utility easements, formed roads and informal access tracks, cleared fence lines and cadastral boundaries, areas of degraded vegetation and narrow sections of the Darling River and Anabranch and their associated flood zones.

The primary opportunities that influenced the preliminary alignment corridor included:

> Existing transmission lines or substation infrastructure that can be utilised including the existing Buronga substation and the Broken Hill to Buronga and Buronga to Red Cliffs transmission lines
> Areas of existing and permanent disturbance (e.g. existing roads and tracks such as Renmark Road, utility easements, fence lines, cadastral boundaries, biosphere, degraded grazing lands)
> Narrow sections of the Darling River and Great Darling Anabranch River channels.

These existing features offered various opportunities for the co-location of transmission infrastructure and were understood to offer some reduction in the extent of impacts arising from transmission line construction and operations maintenance.

An extensive community engagement program was conducted between November 2018 and February 2020 to collect feedback on the priority issues for the area to test the preliminary alignment corridor and to inform its narrowing. The objectives of this targeted engagement were 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 (local property level) and current, near term and future development plans that may influence corridor refinement
> Discuss both general and specific views hosting new transmission infrastructure including seeking preferences as to where this may be located in context of the property level constraints and opportunities.

Feedback collected during this period of engagement as well as preliminary ecology and heritage surveys confirmed the underlying assumption that the avoidance/minimisation strategy together with consolidation of new infrastructure next to existing easements and the use of existing disturbances to reduce potential and actual environmental, land use and other impacts was a sensible approach to the identification of the preliminary alignment corridor. Further details of outcomes of the community engagement is provided in Chapter 5 of this ESR.

As a result of the above process, the preliminary alignment corridor has been refined to a narrower one km corridor for the section between the SA/NSW border and Buronga, within which the new transmission line and associated easement would be located. This corridor avoids a number of key environmental constraints and has been confirmed as suitable for further consideration and refinement through extensive landholder engagement. A 200 m wide corridor has also been identified for the proposal study area between Buronga and the NSW/Victoria border at Monak, near Red Cliffs, which surrounds the existing transmission line easement within this section (refer to Figure 2-5a to c).

This refined corridor is referred to as proposal study area, which was used as the basis for the assessment in this ESR (shown in Figure 1-2).

2.7.2 Substation Site Selection

The existing Buronga 220kV substation is located at 993 Arumpo Road in the Wentworth Shire Local Government Area (Wentworth LGA), refer to Figure 1-2.

The site is the existing marshalling point for TransGrid transmission lines and provides ancillary services for operation and maintenance activities. Due to the absence of constraints immediately surrounding the facility, it provides an ideal location for the addition of 330kV substation equipment as part of an expanded substation.

The expanded substation would require about 15ha of additional land, located generally within 500m of the existing substation facility. The general arrangement of the expanded substation would be finalised during detailed design.

Given the advantage of expanding the existing substation, no alternative locations for the proposed expanded substation have been considered.

3. The Proposal

The proposal would involve the construction and operation of new 330kV transmission lines between the SA/NSW border and Buronga, an upgrade and expansion of the existing Buronga substation from an operating capacity of 220kV to 330kV and an upgrade of the existing transmission lines between Buronga and the NSW/Victoria border.

3.1 Proposal Study Area

The proposal study area for this ESR is shown in Figure 1-2. It comprises a one km wide corridor between the SA/NSW border and Buronga and a 200 m wide corridor between Buronga and the NSW/Victoria border at Monak, within which the proposal would be located. The proposal study area was derived from the corridor identification process summarised in Chapter 2.

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 is located in regional western NSW within the Wentworth LGA, approximately 800km south-west of Sydney at its nearest extent. It would traverse around 160km and two main bioregions including the:

> Murray Darling Depression
> Darling Riverine Plains.

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.

There are no major population and service centres located within the proposal study area. Various towns including Wentworth, Dareton, Buronga, Mildura, Gol Gol, Monak and Red Cliffs are situated along the Darling and Murray Rivers to the south of the proposal study area near the NSW/Victoria border.
The proposal travels parallel to a section of Renmark Road and is expected to cross the Silver City Highway, Pooncarie Road, Arumpo Road, Sturt Highway and a number of other local roads and tracks. Two key waterways are present within the preliminary alignment corridor and proposal study area, the Darling River and the Great Darling Anabranch.

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	A new 330kV double-circuit transmission line would be constructed from the SA/NSW border in the vicinity of Chowilla eastwards towards the existing Buronga substation. The nominal distance would be about 135km. The transmission lines would enter NSW at Chowilla and just north of the Renmark Road, cross the Darling Anabranch and Darling River before turning southeast and running parallel to the existing TransGrid X2 220kV transmission line running from Buronga substation. The existing TransGrid X1 transmission 220kV line between Buronga and the NSW/Victoria border at Monak near Red Cliffs would also be upgraded to a 220kV double circuit transmission line. The transmission lines would be supported on a series of transmission line structures up to 80m in height and spaced between 300 to 600m apart. 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: > Free standing steel lattice structures > Guyed steel lattice structures > Free standing monopole structures. 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. The footings of each structure would require an area of up to 600 square metres (depending on the proposed structure type). Additional disturbance at each structure site to facilitate structure assembly and stringing may be required.
Transmission line easements	The transmission lines would be located within an easement about 80m 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.
Expansion of the Buronga substation	It is proposed that the existing Buronga 220kV substation on Arumpo Road is expanded to an operating capacity of 330kV. The expanded substation would be located generally within 500m of the existing substation facility.
Access	Access to each structure would be required during construction and, to a lesser extent, during operation and maintenance. 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.

Component	Description
Ancillary sites	Various ancillary sites will be required during the construction of the new transmission lines 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)	Earthworks would be required for various purposes at the substation and along the transmission line including: > Bulk earthworks for the expansion of the Buronga substation > Foundation preparation at each transmission line structure > Some earthworks where suitable access to transmission line structures and ancillary sites does not already exist. 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.

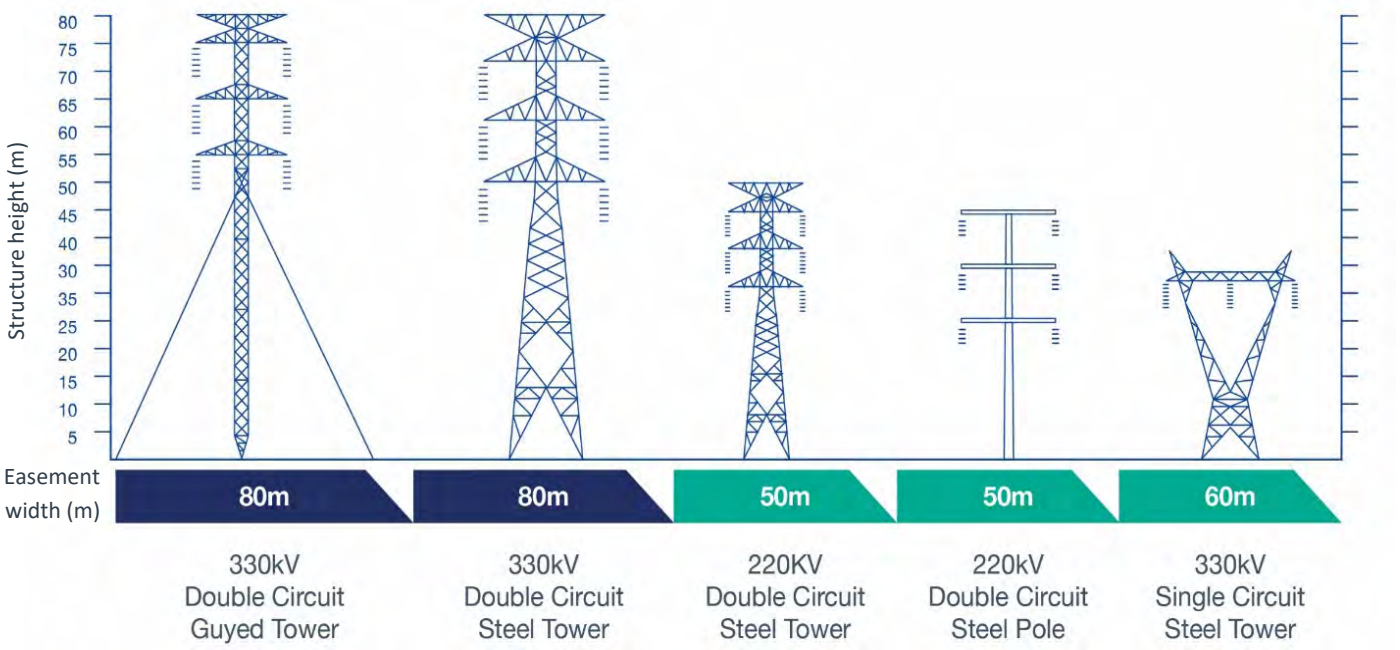


Figure 3-1 Indicative Concept Design for the Transmission Line Structures

Note: Structure height and easement width of 80m may vary on a case by case basis. Figure not to scale

3.4 Proposal Timeframes

Construction of the proposal would commence in 2021, subject to NSW Government and, if required, Commonwealth planning approvals. Once construction has commenced, the proposal is estimated to take approximately one year to construct. The proposal is expected to be commissioned/energised (i.e. become operational) in 2022. 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 OPGW
  - Installation of earthing conductors.
- Civil and building works associated with the upgrade of the Buronga substation to 330kV would generally include (but not be limited to):
  - Earthworks and slab construction at the existing substation site
  - 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.

The construction workforce would vary depending on the stage of construction and associated activities. During peak construction activities, the proposal could employ around 115 to 125 workers, with an average workforce anticipated to be around 25 to 35 workers (depending on the stage of construction works).

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 be undertaken across a seven day work week and during both standard and non-standard construction hours where necessary. As the details of construction methodology and proposal needs are developed, these hours will be refined for certain activities and addressed in the EIS.

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 upgrade and expansion of the Buronga substation. 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 the NSW/SA border and in particular Arumpo Road, Silver City Highway (B79/SR22), Fletchers Lake Road, Pooncarie Road (RR68), Pomona Rd/Low Darling Road, High Darling Road and The Renmark Road (RR68). 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 expanded substation 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
- 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

As stated above, Clause 41 of *State Environmental Planning Policy (Infrastructure) 2007* permits development for the purpose of an electricity transmission or distribution network to be carried out by, or on behalf of, a public authority without consent, provided that the project is not carried out on land reserved under the NSW *National Parks and Wildlife Act 1974* (NP&W Act). The proposal study area does not contain any land reserved under the NP&W Act. Therefore, the proposal can be assessed under Part 5 of the EP&A Act. Development consent (under Part 4 of the EP&A Act) from the relevant Council is not required.

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.

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 (DPI&E) 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 DPI&E for consideration in its assessment of the proposal.

At the completion of the public exhibition period, the DPI&E 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 DPI&E. 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.

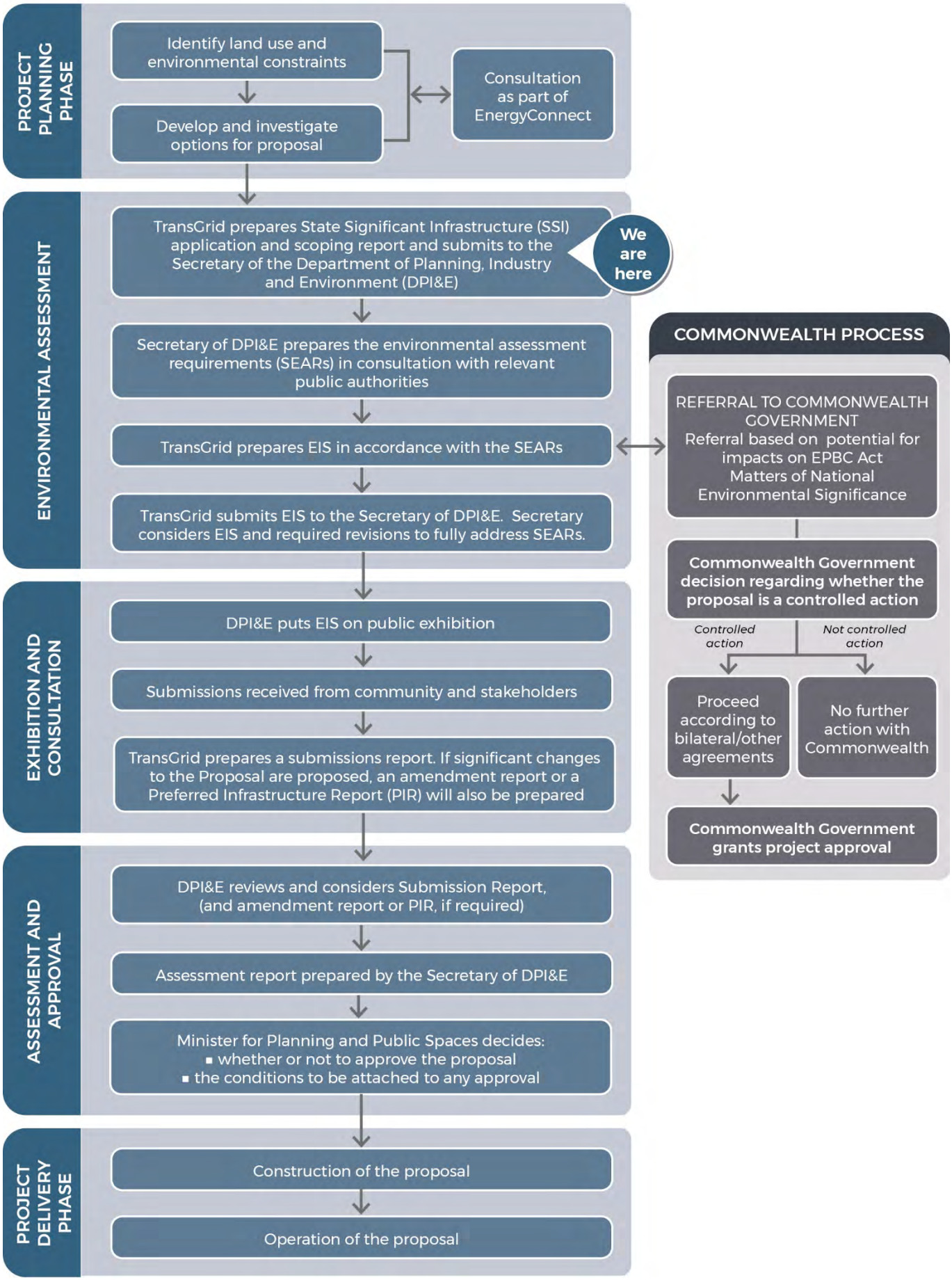


Figure 4-1 Assessment and Approval Process for the Proposal

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
State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP)	This SEPP identifies development that is State significant development (SSD), SSI and CSSI. 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.
State Environmental Planning Policy (Koala Habitat Protection 2019)	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 LGA. 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.
State Environmental Planning Policy No. 55 – Remediation of Land	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: > 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. A Phase 1 contamination investigation would be undertaken in accordance with the *Managing Land Contamination Planning Guidelines SEPP 55–Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) to inform the design of the proposal and EIS process.

Environmental planning instruments	Relationship to EnergyConnect
State Environmental Planning Policy (Primary Production and Rural Development) 2019	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). 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.

4.2.4 Local Environmental Plans

The proposal would be located within Wentworth local government area (LGA) and thus fall within Wentworth local environmental plan (LEP). While the LEP guides development within the LGA, the EP&A Act expressly provides that LEPs do not apply to SSI or CSSI projects.

Therefore, the LEP has not been further referenced in this ESR.

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 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.

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
National Parks and Wildlife Act 1974	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.
Water Management Act 2000	The NSW *Aquifer Interference Policy* (Department of Primary Industries, 2012) documents the NSW Government's intention to implement the requirement for approval of 'aquifer interference activities' under the *Water Management Act 2000*. It is not anticipated that the proposal would interfere with any aquifers as the proposal would not likely require excavation to a sufficient depth to intercept an aquifer or result in drawdown. This would be confirmed as part of the ongoing design development including the final alignment details, transmission line structure locations and depth of groundwater.
Contaminated Land Management Act 1997	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.
Crown Land Act 1989	Ministerial approval is required to grant a 'relevant interest' (i.e. a lease, licence, permit, easement or right of way) over a Crown Reserve if required. The alignment of the proposal includes areas of Crown Land. Any impacts to Crown Land would be discussed in greater detail in the EIS.
Biodiversity Conservation Act 2016	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. The EIS for the proposal would include an assessment of biodiversity impacts (refer to section 7.1).
Noxious weeds Act 1993	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 including an assessment of biodiversity impacts (refer to section 7.1).

Legislation	Requirement
Native Title (NSW) Act 1994	This Act provides for native title in relation to land or waters. 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 in accordance with the *Native Title Act 1994*. The EIS for the proposal would include an assessment of native title and Aboriginal heritage impacts (refer to section 7.2).
Heritage Act 1977	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. The EIS for the proposal would include an assessment of potential heritage impacts (refer to section 7.3).
Aboriginal Land Rights Act (NSW) 1983	This Act applies to Crown lands that are not lawfully needed for an essential public purpose; referred to as claimable Crown land. No claimable Crown lands have been identified that would be affected by the proposal. This would be confirmed as part of the preparation of the EIS.
Waste Avoidance and Resource Recovery Act 2001	This Act encourages the most efficient use of resources in order to reduce environmental harm. Waste and resource impacts associated with the proposal would be considered as part of the EIS.

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 (NES)
- 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 (MNES)

A search of the EPBC Act Protected Matter Search Tool (PMST) for the proposal study area was conducted in March 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	No wetlands of international importance (RAMSAR wetlands) have been identified within the proposal study area. The nearest RAMSAR wetland is the Riverland Wetland located within Chowilla Game Reserve in SA. This is located approximately three km south-west of the proposal study area.
Great Barrier Reef Marine Park	None
Commonwealth listed threatened species and ecological communities	Six EPBC listed threatened flora species and 19 threatened fauna species have a moderate or higher likelihood of occurrence within the proposal study area. Of these, one species (Corben's Long-eared Bat) has already been recorded within the proposal study area during preliminary field surveys. Two EPBC Act listed Threatened Ecological Communities (TECs) are considered as likely to occur within the proposal study area: > Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions > Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions. However, neither of these have been recorded within the proposal study area during preliminary field investigations.
Commonwealth listed migratory species	The results of likelihood of occurrence assessments for these migratory and marine bird species identify that 20 species have a moderate or higher likelihood of occurrence within the proposal study area. Five of these species have been recorded within the proposal study area during preliminary field surveys: > Pectoral Sandpiper > Sharp-tailed Sandpiper > Red-necked Stint > White-bellied Sea-Eagle > Rainbow Bee-eater.
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 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.

An EPBC Act referral has been lodged to the DAWE to consider whether the proposal would be considered to be a controlled action on the basis of potential impacts to the listed threatened species. The decision from the DAWE of this referral is still pending. If determined to be controlled, then a bilateral assessment process would be requested for the project.

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 proposal study area intersects with the Barkandji Traditional Owners #8 (Part A) native title area (determined). 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 potential impacts of the proposal on this title would be considered as part of the preparation of the EIS.

4.3.3 Aboriginal Land Rights Act 1983

The Commonwealth *Aboriginal Land Rights Act 1983* establishes the NSW Aboriginal Land Council and local Aboriginal land councils. The Act requires these bodies to:

- Take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law
- Promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.

The preamble of the *Aboriginal Land Rights Act 1983* states that land was traditionally owned and occupied by Aboriginal people and accepts that as a result of past government decisions, the amount of land set aside for Aboriginal people was reduced without compensation. To redress the loss of land, Aboriginal land councils can claim Crown land which, if granted, is transferred as freehold title.

'Claimable Crown lands' includes Crown lands that are not lawfully used or occupied and that are not needed, nor likely to be needed, for an essential public purpose. No claimable Crown lands have been identified that would be affected by the proposal. This would be confirmed as part of the preparation of the EIS.

5. Engagement

5.1 Introduction

TransGrid is committed to an engagement process that is proactive, transparent and represents 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 Scoping Report 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 indirectly and directly 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 Engagement undertaken as part of route selection methodology

A robust approach to route selection based on a "hierarchy of constraints" model was developed to inform route narrowing and eventual selection. The route selection assessment methodology was framed based on the desired outcomes and objectives outlined below. Critical to the development of an appropriate methodology was meaningful stakeholder participation in both the development and implementation of the methodology.

Refer to Figure 2-4 which demonstrates the route selection process and integration with stakeholder engagement at critical stages.

5.4 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 throughout the EnergyConnect proposal and specifically for the 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	> Government of South Australia (Department for Energy and Mining, Department of the Premier and Cabinet) > Minister for Energy and Mining, the Hon Dan van Holst Pellekaan Member of Parliament (MP) (SA) > The Hon Premier Steven Marshall (SA) > The Hon Premier Gladys Berejiklian (NSW) > Minister for Energy and Environment, The Hon Matthew Kean (NSW) > The Hon Angus Taylor, Minister for Energy (Cwth).
Energy Regulator / Operator	> AEMO > Australian Energy Regulator > Australian Energy Market Commission > Energy Security Board.
Federal Members	> Member for Riverina, The Hon Michael McCormack MP > Member for Farrer, The Hon Sussan Ley MP.
State Members	> Member for Albury, Justin Clancy MP > Member for Murray, Helen Dalton MP > Member for Wagga Wagga, Joe McGirr MP.

Stakeholder Group	Description
Local government – Elected Officials/ Executive Staff	The local government within the proposed study area is Wentworth Shire Council. Additional local governments nearby include: > Balranald Shire Council > Carrathool Shire Council > Edward River > Griffith Shire Council > Hay Shire Council > Lockhart Shire Council > Murray River Council > Murrumbidgee Council > Federation Council > Narrandera Shire Council > Wagga Wagga City Council > Riverina and Murray Joint Organisation (RAMJO).
Government – Departmental	> Australian Department of Agriculture, Water and the Environment (DAWE) > NSW Department of Planning, Industry and Environment (DPIE); and its divisions: – NSW Crown Lands – NSW Environment, Energy and Science > Department of Premier and Cabinet (heritage) > Property Acquisition NSW > NSW Department of Customer Service (DCS), and its division SafeWork NSW.
Major developments	> Major developments (existing, under approval and future) that may be impacted by EnergyConnect (including the proposal).
Directly impacted landholders (in corridor)	> Landholders (owners, occupiers, lease and other interest holders in the corridor).

Stakeholder Group	Description
Traditional Owners and other Aboriginal Groups	> NSW Aboriginal Land Council > NTSCORP > National Indigenous Australians Agency (NIAA) > Aboriginal Affairs, Broken Hill > NSW Indigenous Chamber of Commerce > Barkandji Traditional Owners (Native Title Group) > Barkindji Maroura Elders Council > Barkindji Maroura Elders Environment Team (BMEET) > Ta-Ru Board of Management / Maraura Barkindji Traditional Owners > Dareton Local Aboriginal Land Council > Balranald Local Aboriginal Land Council > Hay Local Aboriginal Land Council > Griffith Local Aboriginal Land Council > Deniliquin Local Aboriginal Land Council > Narrandera Local Aboriginal Land Council > Wagga Wagga Local Aboriginal Land Council.
Local land users	> Local land users e.g. irrigators, farmers within Wentworth Shire Council or surrounding LGAs not considered directly impacted or adjacent landholders.
Local Community	> Local communities within Council areas.
Local Suppliers	> Local suppliers within the Riverina.
Other Suppliers	> NSW and Australian suppliers.
Industry Groups	> NSW Farmers Association.
Interest Groups	> Local progress associations, issue-specific interest groups.
Media	> Local, State and National print, radio and television including: Sunraysia Daily, The Mildura Weekly, ABC Radio Riverina.
General Public	> General members of the public who may take an interest in EnergyConnect (including the proposal).

5.5 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.
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. Sign up is easy and via the webpage.
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 the SA/NSW border to Buronga and through to Monak, and all landholders affected by the refined proposed 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.

Activity/consultation method	Summary
Media and advertisements	Print advertisements were run in The Sunraysia Daily and the Mildura Weekly to advertise the community drop-in sessions. An interview was also given by TransGrid to ABC Mildura broadcast on 9 May 2019. The focus of communication via media was to raise general awareness of the proposal and opportunities for stakeholders to participate. Print advertisements placed in the Koori Mail and the Sunraysia Daily on the 27 February 2019 requesting registration of Aboriginal stakeholders interested in EnergyConnect (including the proposal). Print advertisements were also run in the Sunraysia Life and New South Western Standard advertising the community drop-in sessions for Q1/Q2 of 2020 and subsequently the postponement of these sessions due to COVID-19.
Factsheets	Five factsheets have been developed for EnergyConnect, which have been utilised at community drop-in sessions and are available online. The development of these five factsheets 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. **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. **Route selection**: illustrates the route selection methodology from with background information on EnergyConnect. It explains regional constraints and opportunities, route refinement investigation and local considerations being taken into account in defining the route. **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. **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. **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.
Feedback form/Online Survey	Hardcopy feedback forms were made available at each drop-in session as well as online on the project website. The purpose was to secure both general stakeholder feedback regarding the proposal and more specific feedback on the route selection process.

Activity/consultation method	Summary
Community drop-in sessions	Two community information sessions were held to provide information regarding EnergyConnect: > Wentworth, NSW on 7 May 2019 > Buronga, NSW on 8 May 2019. Both sessions lasted for 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. Additional community drop-in sessions were identified for the Wentworth region and surrounds and scheduled for Q1/Q2 2020. Two drop-in sessions were held, Euston/Robinvale and Moualemein, however, the remaining sessions have been indefinitely postponed due to the COVID-19 pandemic and social distancing restrictions.
Social media	TransGrid's Facebook page has shared various updates in relation to the proposal. This includes advertising community drop-in sessions and online resources and participation options. The focus of the posts has been to increase general awareness of the proposal and opportunities for stakeholders to participate. TransGrid's Facebook page is at: https://www.facebook.com/TransGrid/?ref=br_rs 
Community hubs	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.

5.5.1 Participation

Over 480 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, to phone calls and direct correspondence via email. Consultation was carried out with the following NSW Government agencies:

- Environment Energy and Science (EES) (previously referred to as Office of Environment and Heritage (OEH)) in regard to biodiversity
- Department of Premier and Cabinet (formerly Heritage office in OEH) for heritage matters
- NSW Crown Lands
- DPI&E.

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

Table 5-3 Engagement Participation for the Proposal

Engagement Activity	Quantity	Stakeholder Group
Phone Calls (Incoming/Outgoing)	196	> Landholders
Emails (Incoming/Outgoing)	172	> Landholders
Meetings	88	> Local Government: Wentworth Shire Council > State Government: OEH and NSW Crown Lands > Local MPs > Landholders > Registered Aboriginal Parties (RAP) > NSW Aboriginal Land Council.
Letters	78	> Landholders
Drop in sessions	Completed: > 7 May 2019 (Wentworth) > 8 May 2019 (Buronga) > 13 March 2020 (Euston/Robinvale) > 15 March 2020 (Moulamein) Postponed: > 10 drop-in sessions including Buronga & Balranald	> Landholders > Community
Public events	Attended Wentworth Agricultural Show	> Landholders > Community
Interactive Map	Three comments	> Community

Engagement Activity	Quantity	Stakeholder Group
Media advertisements	Eight	> Community > RAPs
Survey online/hardcopy	One response	> Community > Landholders

5.6 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)	110	Pending agreement and alignment: requirement for easement. What having an easement involves. Property values and allowances for compensation.
Corridor selection methodology/proposed alignment	74	Opportunities for alignment, preferences for alignment, known and unknown constraints.
Consultation process	35	Understanding consultation process in the context of project development, ensuring due diligence on addressing stakeholder concern.
Property Access	34	Landowner requirements to access properties for planning processes (geotechnical investigations, environmental assessment).
Construction impacts	33	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.
Structure design	24	Size and shape of proposed structures.
Land use and property	23	Current and future land use planning, existing farm infrastructure, biosecurity matters.
Traffic and access	20	Haulage routes, access to towns and property for constructions and work camps.
Biodiversity	19	Vegetation identification and potential impacts to native vegetation.
Socio-economic	15	Economic impacts and benefits of construction on towns, job and supplier opportunities.
Soil and water	13	Wentworth to Broken Hill pipeline, access to water for construction.

Theme	Frequency	Focus of feedback
Landscape character and visual amenity	12	Impact of structures on sightlines, especially on river views; impact on property value if visual amenity reduced.
Aboriginal heritage	9	Identification and protection of heritage items.
EMF	5	Concerns about EMF in proximity to residences.

5.7 How Feedback has been Used

Feedback received has been used to inform route alignment from the NSW/SA border to Buronga and through to Monak. At a general level, feedback from non-landholder stakeholders was used to test existing assumptions regarding Tier 1, Tier 2 and Tier 3 constraints and to ensure no Tier 1 and 2 constraints had been missed. 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. On each occasion, updated holding maps were created to illustrate the feedback given and to show how landholder feedback changed the alignment.

In combination with the engineering, environmental, land use and social studies, the feedback received has enabled the narrowing of the original 10 km preliminary alignment corridor to the proposal study area.

5.8 Future Engagement

Engagement will continue on specific issues and opportunities relevant to the proposal to inform the preparation of the EIS, as well as general 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
- Project toll-free community information number
- Project email address
- Project 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, key issues for the environmental planning and EIA 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 took into account 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
- Bushfire risk
- Socio-economic
- Surface water and hydrology.

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:

- EMF
- Air quality and greenhouse gas
- Noise and vibration
- Traffic and access
- Soils 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.

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 preliminary field surveys (provided in Appendix A). Additional field surveys to address potential data gaps and seasonal survey requirements would be undertaken as part of the EIS.

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:

- 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 six vegetation formations are identified to contain a total of 19 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 3.2 in Appendix A).

A total of four 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 four 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
- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion.

Of these, only two have been recorded within the proposal study area. TECs have either been recorded during preliminary field surveys or predicted (via broad scale mapping) in areas where access has been restricted. Ongoing field surveys will be required to confirm and assess the extent of potential and recorded TECs within the proposal study area. Figure 7-1 shows those already mapped within the proposal study area.

Two EPBC listed threatened ecological communities are considered likely to occur within the proposal study area (however have not yet been recorded during preliminary field investigations) including:

- Buloke (*Allocasuarina luehmannii*) Woodlands of the Riverina and Murray-Darling Depression Bioregions
- Coolibah (*Eucalyptus coolabah*) – Black Box (*Eucalyptus largiflorens*) Woodlands of the Darling Riverine Plains and the Brigalow Belt of South Bioregion.

7.1.1.2 Threatened Flora

Given the biologically diverse environment, database searches have identified a total of 40 threatened flora species listed under the BC Act as predicted or recorded to occur within the broader locality of the proposal study area (incorporating a broader 25km radius) with 15 listed under the EPBC Act. Of these species, 17 threatened flora species listed under the BC Act are predicted to have a moderate or high likelihood of occurrence within the proposal study area. Six threatened flora species listed under the EPBC Act are predicted to have a moderate or high likelihood of occurrence within the proposal study area.

Preliminary field investigations recorded three threatened flora species within the proposal study area:

- *Dodonaea stenozyga*
- *Acacia acanthoclada*
- *Santalum murrayanum.*

Of particular importance, was the identification of the Critically Endangered *Dodonaea stenozyga* (Desert Hopbush) within the proposal study area, which is also a Serious and Irreversible Impacts (SAII) entity under the BC Act. Of the threatened flora species identified with potential to occur within proposal study area (but not yet recorded), the following are also SAII entities under the BC Act:

- *Austrostipa nullanulla* (A spear-grass)
- *Casuarina obesa* (Swamp She-oak)
- *Pimelea serpyllifolia* subsp. *serpyllifolia* (Thyme Rice-Flower).

7.1.1.3 Threatened and Migratory Fauna

A total of 137 threatened fauna species listed under the BC Act have been identified as predicted or recorded to occur within the broader locality. Of these species, 67 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 SAII entities under the BC Act:

- Black-eared Miner
- Curlew Sandpiper
- Plains-wanderer
- Red-lored Whistler
- Striated Grasswren
- Swift Parrot.

Preliminary field investigations have identified 10 threatened fauna species listed under the BC Act within the proposal study area, being:

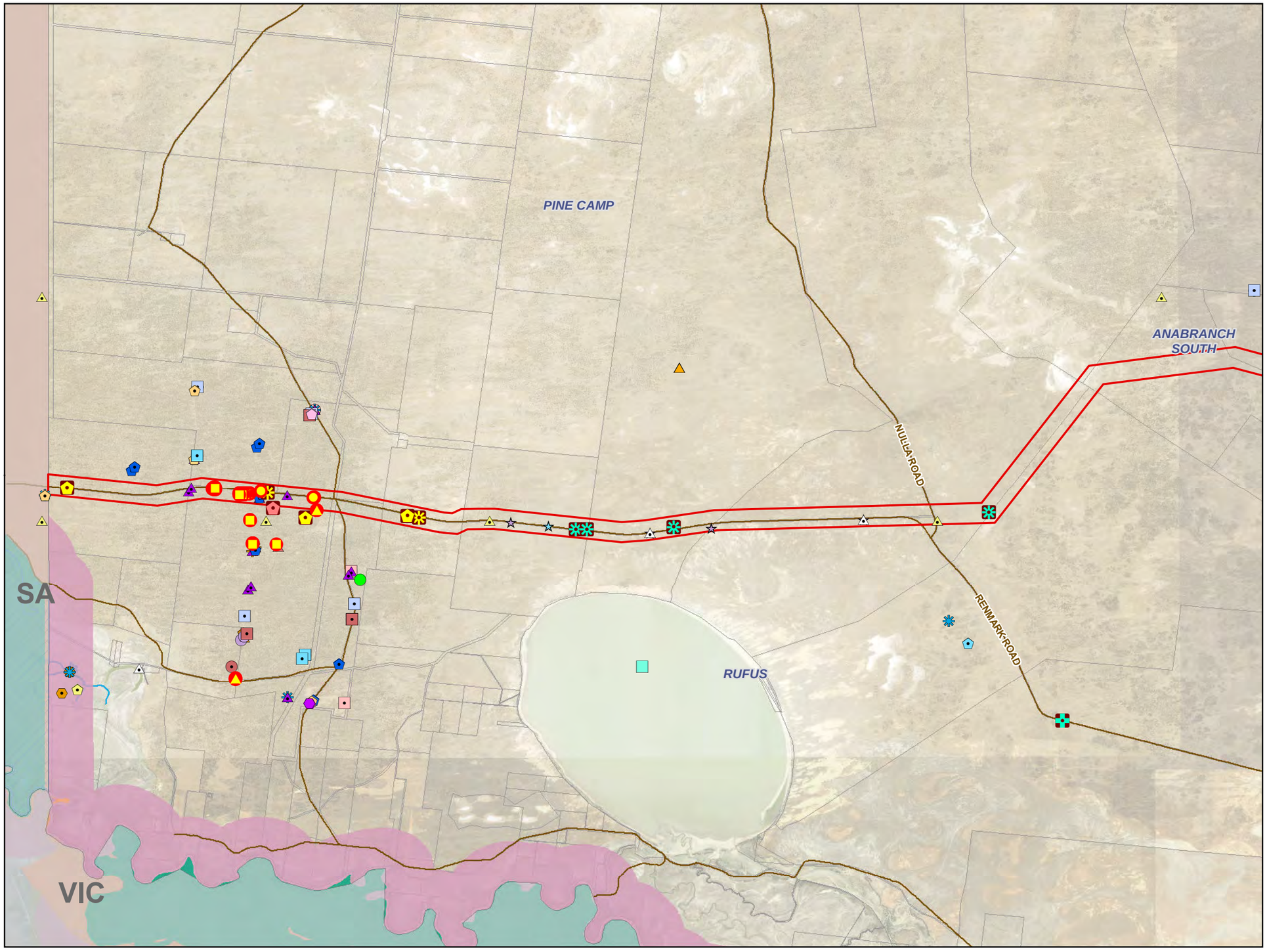
- Black-breasted Buzzard
- Chestnut Quail-thrush
- Dusky Woodswallow
- Hooded Robin
- Little Eagle
- Major Mitchell's Cockatoo
- Redthroat
- Corben's Long-eared Bat (also listed under the EPBC Act)
- Inland Forest Bat
- Little Pied Bat.

In addition, 18 threatened fauna species and 21 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.

Three Migratory/Marine species (Pectoral Sandpiper, Sharp-tailed Sandpiper, Red-necked Stint) and two Marine species (White-bellied Sea-Eagle, Rainbow Bee-eater) listed under the EPBC Act have been recorded within the proposal study area during preliminary field surveys.

7.1.1.4 Fish

Areas of mapped key fish habitat (shown on Figure 7-1) have been considered to provide moderate likelihood of occurrence for three threatened fish species including Murray Cod (*Maccullochella peelii*), Murray Hardyhead (*Craterocephalus fluviatilis*) and Silver Perch (*Bidyanus bidyanus*).



Proposal study area
Ramsar Wetlands
Protected Ecological Areas
Important Wetlands
Migratory Bird Flight Path Protection Area

WSP field verified threatened flora

Acacia acanthoclada
Dodonaea stenozyga
Santalum murrayanum

Bionet threatened flora within 10km - non SAII

Acacia acanthoclada
Austrostipa nullanulla
Cratystylis conocephala
Santalum murrayanum
Tetratheca pilosa subsp. pilosa

WSP field verified threatened fauna

Chestnut Quail-thrush
Hooded Robin
Little Eagle
Major Mitchell's Cockatoo
Redthroat

Bionet threatened fauna within 10km - non SAII

Brown Treecreeper (eastern subspecies)
Chestnut Quail-thrush
Dusky Woodswallow
Gilbert's Whistler
Hooded Robin (south-eastern form)
Inland Forest Bat
Jewelled Gecko
Little Eagle
Major Mitchell's Cockatoo
Mallee Worm-lizard
Malleefowl
Marble-faced Delma
Purple-crowned Lorikeet
Red-lored Whistler
Redthroat
Regent Parrot (eastern subspecies)
Ringed Brown Snake
Shy Heathwren
Southern Bell Frog
Southern Hairy-nosed Wombat
Southern Ningaui
Spotted Harrier
Varied Sittella
White-fronted Chat

Map: PS117658_SCPE_002_A2	Author: Robert.Suansri	
Date: 15/04/2020	Approved by: - Z.McLaughlin	

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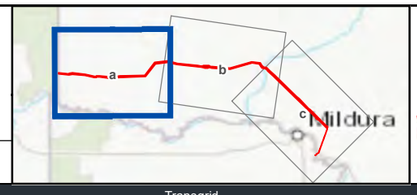
Coordinate system: GCS GDA 1994

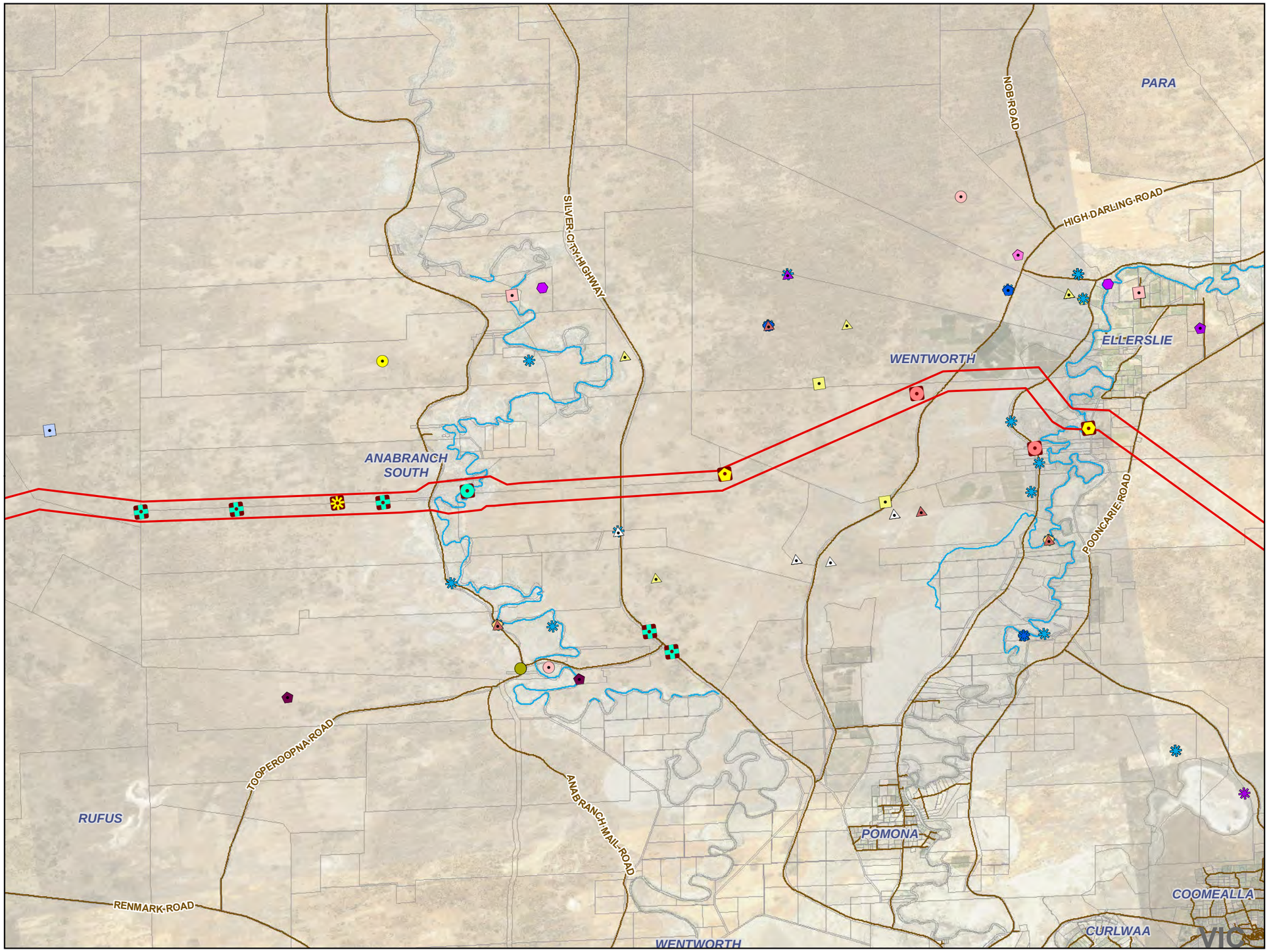
Scale ratio correct when printed at A3



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

ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

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



Proposal study area

Protected Ecological Areas

Bionet threatened flora within 10km - non SAII

- *Cratystylis conocephala*
- *Solanum karsense*

WSP field verified threatened fauna

- Black-breasted Buzzard
- Hooded Robin
- Inland Forest Bat
- Little Eagle
- Little Pied Bat
- Major Mitchell's Cockatoo

Bionet threatened fauna within 10km - SAII

- Plains-wanderer

Bionet threatened fauna within 10km - non SAII

- Black-breasted Buzzard
- Boodie, Burrowing Bettong (mainland)
- Brown Treecreeper (eastern subspecies)
- Bush Stone-curlew
- Chestnut Quail-thrush
- Curlew Sandpiper
- Dusky Woodswallow
- Gilbert's Whistler
- Greater Stick-nest Rat
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Pied Bat
- Major Mitchell's Cockatoo
- Malleefowl
- Marble-faced Delma
- Numbat
- Spotted Harrier
- Square-tailed Kite
- Varied Sittella
- White-fronted Chat

Map: PS117658_SCPE_002_A2	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

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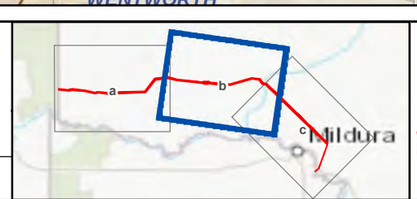

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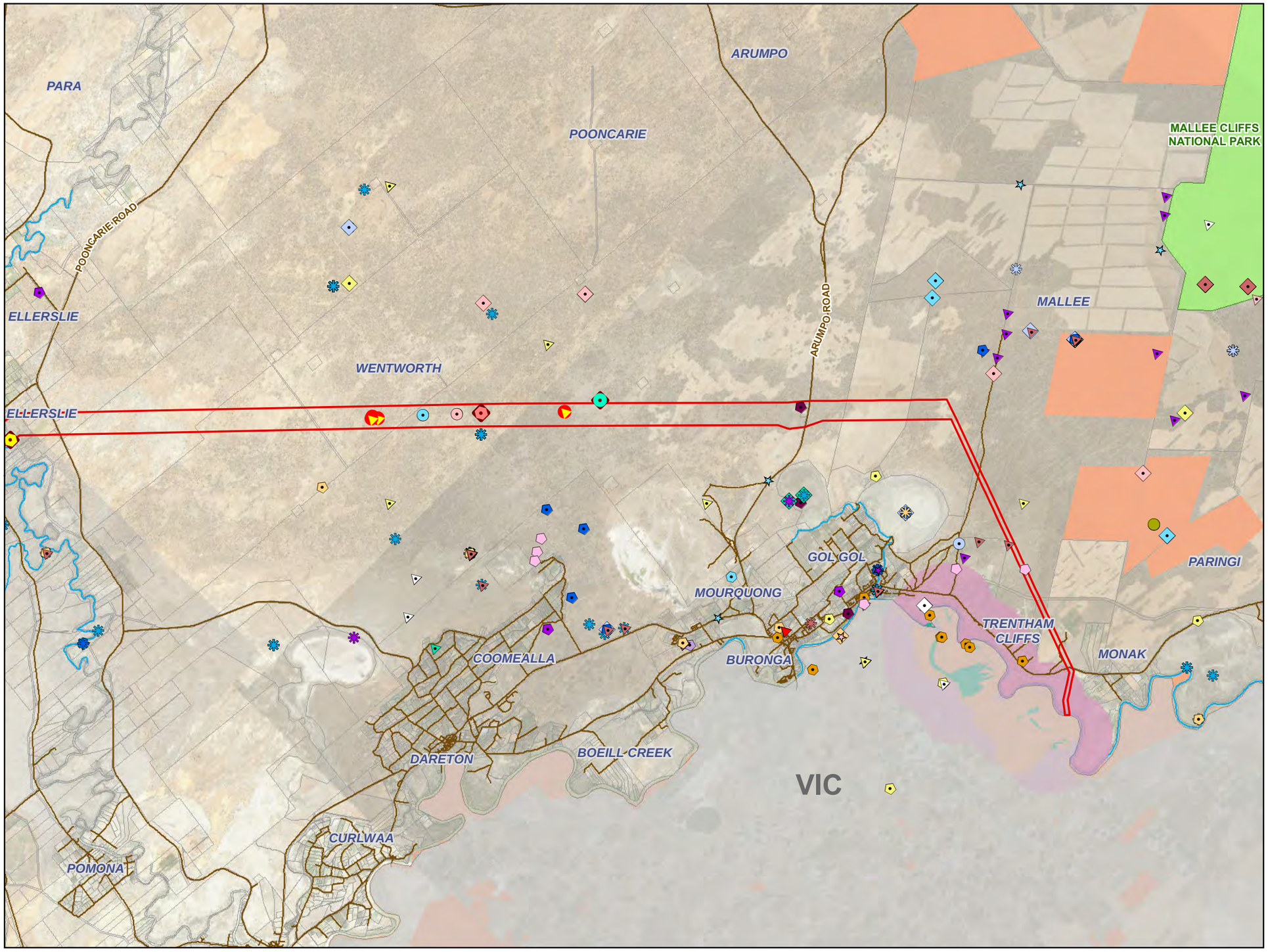
Figure 7-1b
Ecology values of the proposal study area



Proposal study area
NPWS reserve
Protected Ecological Areas
Important Wetlands
Migratory Bird Flight Path Protection Area

WSP field verified threatened flora

Santalum murrayanum

Bionet threatened flora within 10km - SAII

Casuarina obesa

Bionet threatened flora within 10km - non SAII

Santalum murrayanum
Solanum karsense
Swainsona pyrophila

WSP field verified threatened fauna

Corben's Long-eared Bat
Inland Forest Bat
Little Pied Bat

Bionet threatened fauna within 10km - non SAII

Australasian Bittern
Australian Bustard
Australian Painted Snipe
Bilby
Black Falcon
Black-chinned Honeyeater (eastern subspecies)
Black-tailed Godwit
Blue-billed Duck
Boodie, Burrowing Bettong (mainland)
Brolga
Brown Treecreeper (eastern subspecies)
Bush Stone-curlew
Chestnut Quail-thrush
Curlew Sandpiper
Desert Mouse
Dusky Woodswallow
Eastern Hare-wallaby
Flame Robin
Freckled Duck
Gilbert's Whistler
Greater Stick-nest Rat
Grey Falcon
Hooded Robin (south-eastern form)
Inland Forest Bat
Koala
Kultarr
Little Eagle
Little Pied Bat
Major Mitchell's Cockatoo
Mallee Worm-lizard
Malleefowl
Marble-faced Delma
Mitchell's Hopping-mouse
Numbat
Pig-footed Bandicoot
Purple-crowned Lorikeet
Red-tailed Phascogale
Regent Parrot (eastern subspecies)
Southern Bell Frog
Southern Ningaui
Southern Scrub-robin
Spotted Harrier
Spotted-tailed Quoll
Square-tailed Kite
Varied Sittella
Western Blue-tongued Lizard
Western Pygmy Possum
White-bellied Sea-Eagle
White-fronted Chat
Yellow-bellied Sheathtail-bat

Map: PS117658_SCPE_002_A2	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

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

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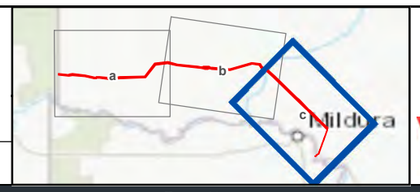

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Figure 7-1c
Ecology values of the proposal study area

7.1.1.5 Ongoing Surveys

Surveys were commenced by Jacobs in 2018 and followed on by WSP from 2019. WSP is continuing to undertake vegetation community and targeted threatened species surveys in 2020. These surveys are developing a baseline dataset of confirmed PCTs and important habitat to inform proposal scoping and design.

The surveys are finding that the vegetation condition generally ranges from medium to high within areas of conservation reserves or larger areas of intact remnant vegetation outside of reserves. Remaining areas comprise of low value vegetation within cleared agricultural land-use areas and heavily grazed land where cover and diversity of plants is lower. Severe drought has been noted to be heavily influencing large areas of the proposal study area.

Important habitat values and notable features have been identified and include:

- Old growth mallee and intact mallee habitats, predominantly along the western portion of the NSW alignment, near the SA border. Although there was evidence of some grazing within the understorey at sites assessed, these habitats take many years to develop, and within adjacent habitat in SA they are characterised as critical habitat for the EPBC listed Black-eared Miner. Old growth continuous mallee also represents important habitat for a number of other conservation significant species.
- The Darling River and Darling Anabranch crossings, and associated riparian habitat, represent important habitat features in the proposal study area. Parts of the riparian floodplain have been subjected to heavy grazing impacts and were suffering from impacts as a result of drought conditions following the time of the survey, but these areas still reflect ecotonal transitions in habitat across the landscape, and therefore are likely to support elevated biodiversity.

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:

- DPI&E 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 2016*. 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 is proposed to be submitted for the proposal's potential impact on MNES.

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

The proposal study area falls within the Dareton Local Aboriginal Land Council (LALC) boundary and areas of the Barkandji Native Title Group traditional lands.

A search of Aboriginal objects, sites and places registered on Aboriginal Heritage Information Management System (AHIMS) was carried out and identified 43 previously recorded sites within the proposal study area. None of these sites were located in the section of the proposal study area between Buronga and the NSW/Victorian border at Monak. In addition, 63 previously unrecorded Aboriginal site features were recorded within the proposal study area during inspection for preliminary geotechnical works for the proposal, with 36 of these features being recorded at two geographical locations. These recordings are currently being processed for submission to the AHIMS database. Overall, the number of Aboriginal sites is considered low, given the approximate 160km 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, sand bodies and sand sheets within valley floor contexts, and the margins of river terraces.

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 extension and ancillary activities.

The *Native Title (New South Wales) Act 1994* would apply to land affected by native title claims in NSW. Under clause 103 of the Act, there is a requirement to notify native title claimants affected by the proposal. 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, 2010).

7.3 Non-Aboriginal Heritage

7.3.1 Existing Environment

Searches were undertaken 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 Wentworth LEP.

A list of NSW non-Aboriginal heritage items identified within the proposal study area are provided in Table 7-1 and shown on Figure 7-2. All are described as having local heritage significance and no items of State, Commonwealth or World Heritage value were identified within the proposal study area.

Table 7-1 List of NSW Non-Aboriginal Heritage Items within the Proposal Study Area

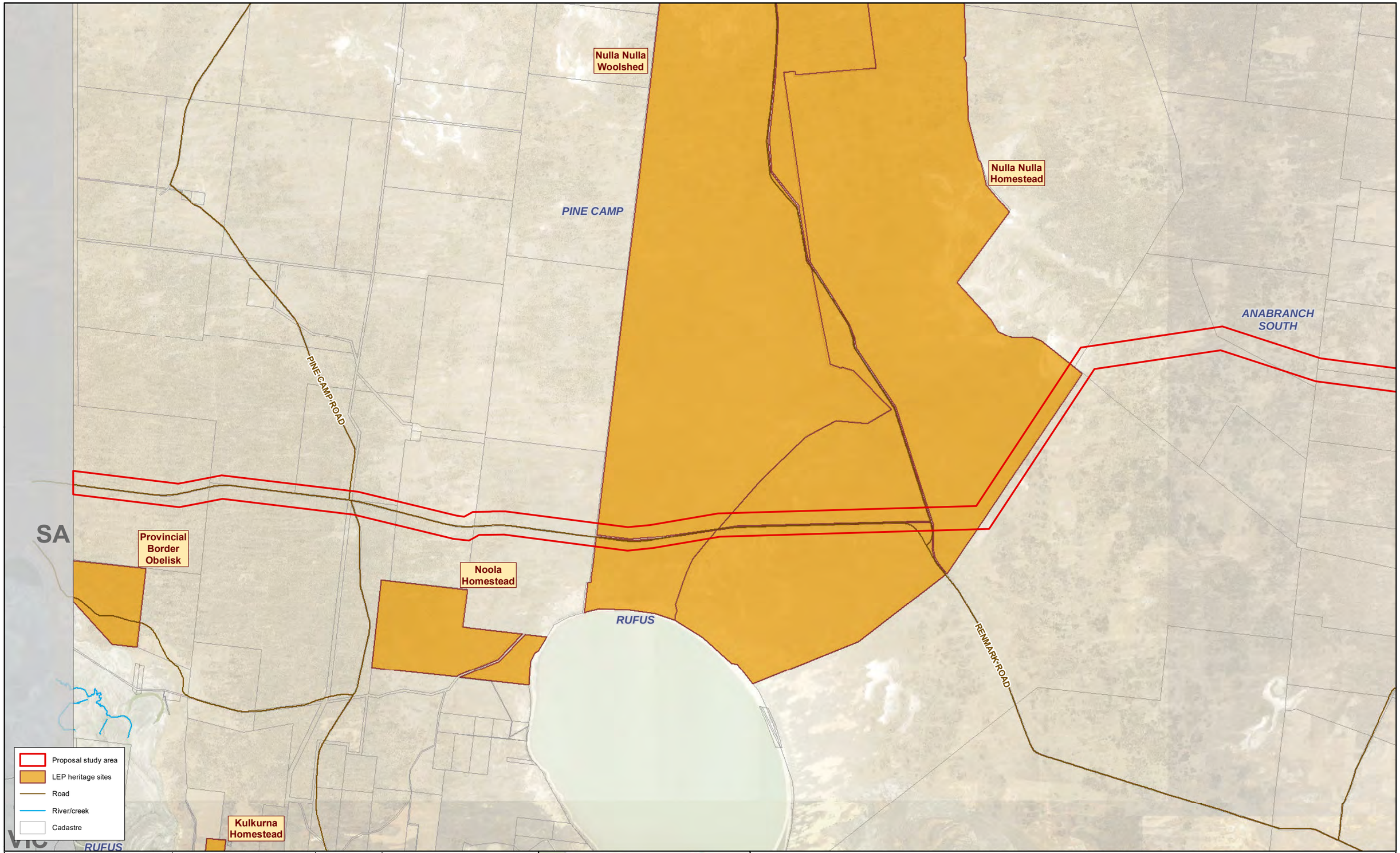
Item name	Locality	List	Reference
Nulla Nulla Homestead	Wentworth	Wentworth LEP	I82
Nulla Nulla Woolshed	Wentworth	Wentworth LEP	I81
Sturts Billabong	Pomona	Wentworth LEP	I27

7.3.2 Issues for Consideration

As identified in Table 7-1, there are three listed non-Aboriginal heritage items located within the proposal study area, which have all been identified as having local heritage significance. 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) wherever possible.

7.3.3 Method of Assessment

A non-Aboriginal heritage assessment will 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).



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Date: 15/04/2020	Approved by: - Z.McLaughlin		

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

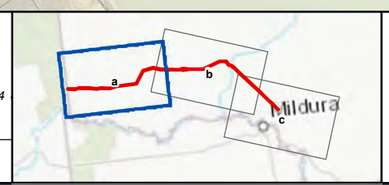

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Figure 7-2a
Non-Aboriginal heritage items within the proposal study area

PARA
NOB ROAD
HIGH DARLING ROAD
Para Homestead
PARA
Para Woolshed and Shearers Quarters
LOW DARLING ROAD
POONCARIE
Hazeldell Homestead
ELLERSLIE
Sturts Billabong
ANABRANCH SOUTH
POONCARIE ROAD
SILVER CITY HIGHWAY
Avoca Homestead Complex
WENTWORTH
Avoca Homestead
Tapio Homestead
MILPARA ROAD
POMONA
COOMEALLA
CURLWAA
DARETON

Proposal study area
State Heritage Register Curtilage
LEP heritage sites
Existing transmission line infrastructure
Road
River/creek
Cadastre

Map: PS117658_SCPE_005_A2
Author: Robert.Suansri
Date: 15/04/2020
Approved by: - Z.McLaughlin

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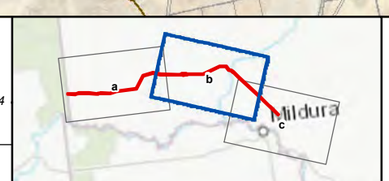

ENERGYCONNECT (NSW - WESTERN SECTION)
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Figure 7-2b
Non-Aboriginal heritage items within the proposal study area

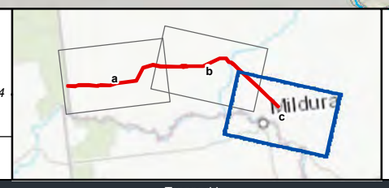
ARUMPO
POONCARIE
WAMBERRA ROAD
ARUMPO ROAD
WENTWORTH
MALLEE
MALLEE CLIFFS NATIONAL PARK
COOMEALLA
DARETON
Sulphur Shed
CURLWAA
MOURQUONG
GOL GOL
BURONGA
BOEILL CREEK
Old Mildura Bridge
VIC
PARINGI
TRENTHAM CLIFFS
MONAK
STURT HIGHWAY

Proposal study area
LEP heritage sites
NPWS reserve
Existing transmission line infrastructure
Road
River/creek
Cadastre

Map: PS117658_SCPE_005_A2
Author: Robert.Suansri
Date: 15/04/2020
Approved by: - Z.McLaughlin

0 1 2 3 4 5 km
1:150,000
Coordinate system: GDA 1994 MGA Zone 54
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



ENERGYCONNECT (NSW - WESTERN SECTION)
SCOPING REPORT

Figure 7-2c
Non-Aboriginal heritage items within the proposal study area

7.4 Land Use and Property

7.4.1 Existing Environment

The proposal is located within the Wentworth LGA to the immediate north of the Murray River and Lake Victoria. The nearest major town is Mildura (Victoria) located about 15km from the eastern end of the proposal study area. Buronga (NSW) is located just under 10km from the closest point of the proposal study area, refer to Figure 1-2.

Land use adjacent to and within the proposal study area is predominantly for agricultural purposes including sheep grazing for wool and meat, cattle crazing, cereal cropping and limited areas of irrigation along the Darling River. Other land uses within and surrounding the proposal study area include: farm buildings and infrastructure, roads and road reserves, broad acre rural residential development and drainage channels for irrigation. The existing Buronga substation and the Broken Hill to Buronga and Buronga to Red Cliffs transmission lines also are located within sections of the proposal study area. The land uses of the proposal study area are shown on Figure 7-3.

The land use zoning of the proposal study area is predominantly RU1 Primary Production with small areas zoned E2 Environmental Conservation. The local waterways and their banks in the proposal study area are generally used for recreational purposes.

Land tenure in the proposal study area is predominantly Western Division Land Lease with small areas of freehold property.

The proposal study area contains no National Parks, state forests, certified aerodromes, defence or Commonwealth lands or mining tenements.

7.4.2 Issues for Consideration

The proposed final location and footprints of permanent and temporary sites (see section 3.3) developed as part of the proposal would be confirmed and assessed as part of the EIS.

In addition to the easement for the transmission line, freehold land would be acquired for the proposed expansion of the Buronga substation. The proposal is not expected to impact on Commonwealth land.

7.4.3 Method of Assessment

Land use and property would be considered as part of the EIS. The assessment would take into consideration feedback received from landholders.

Map: PS117658_SCPE_004_A2	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

0 1 2 3 4 5 km

1:150,000

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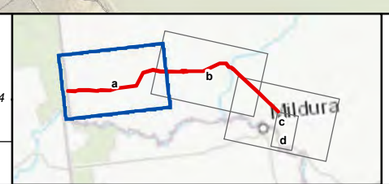
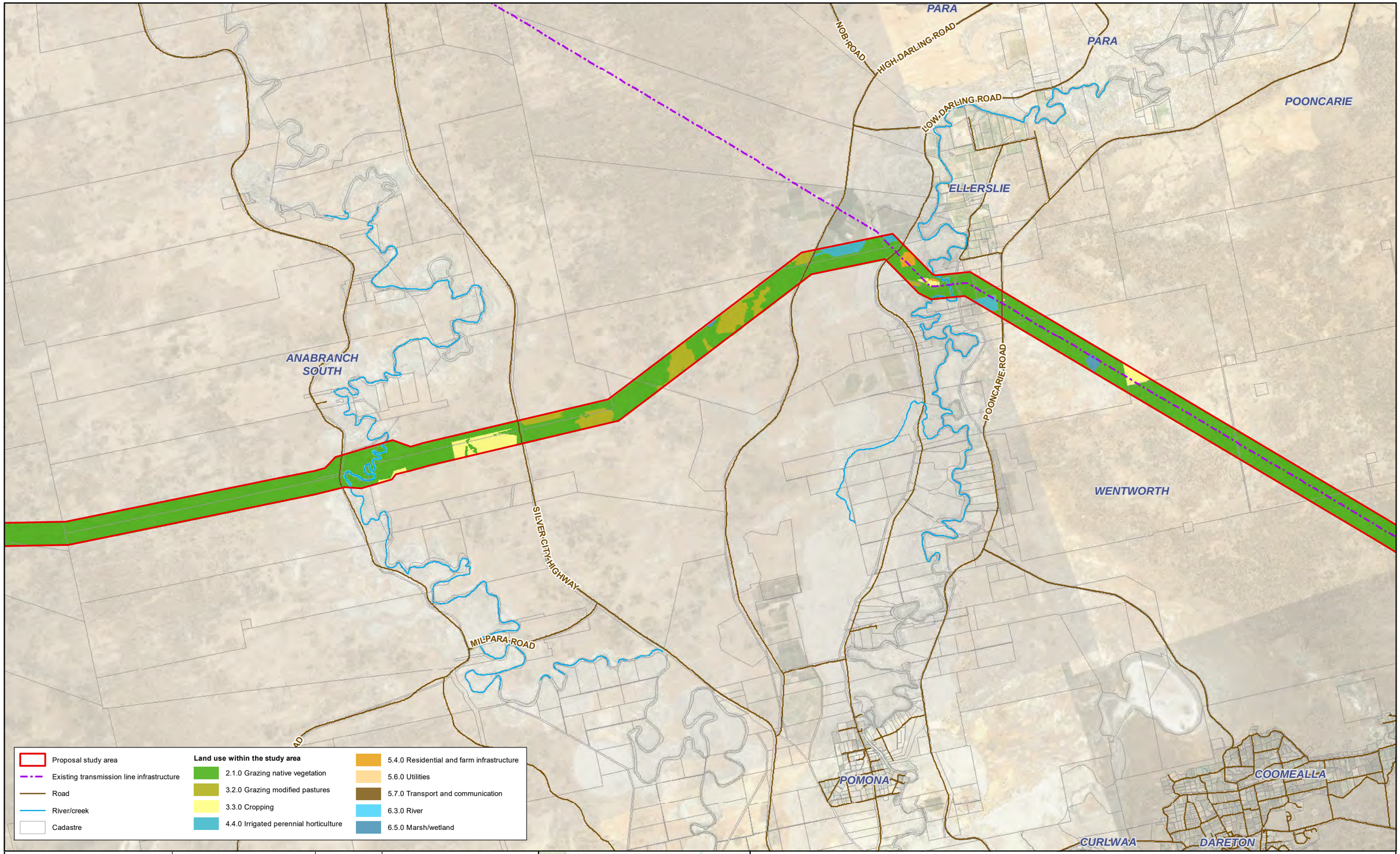


ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

Figure 7-3a

Land use in the proposal study area



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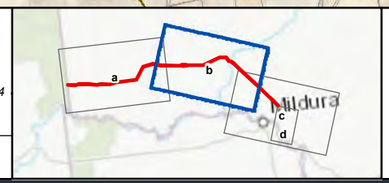
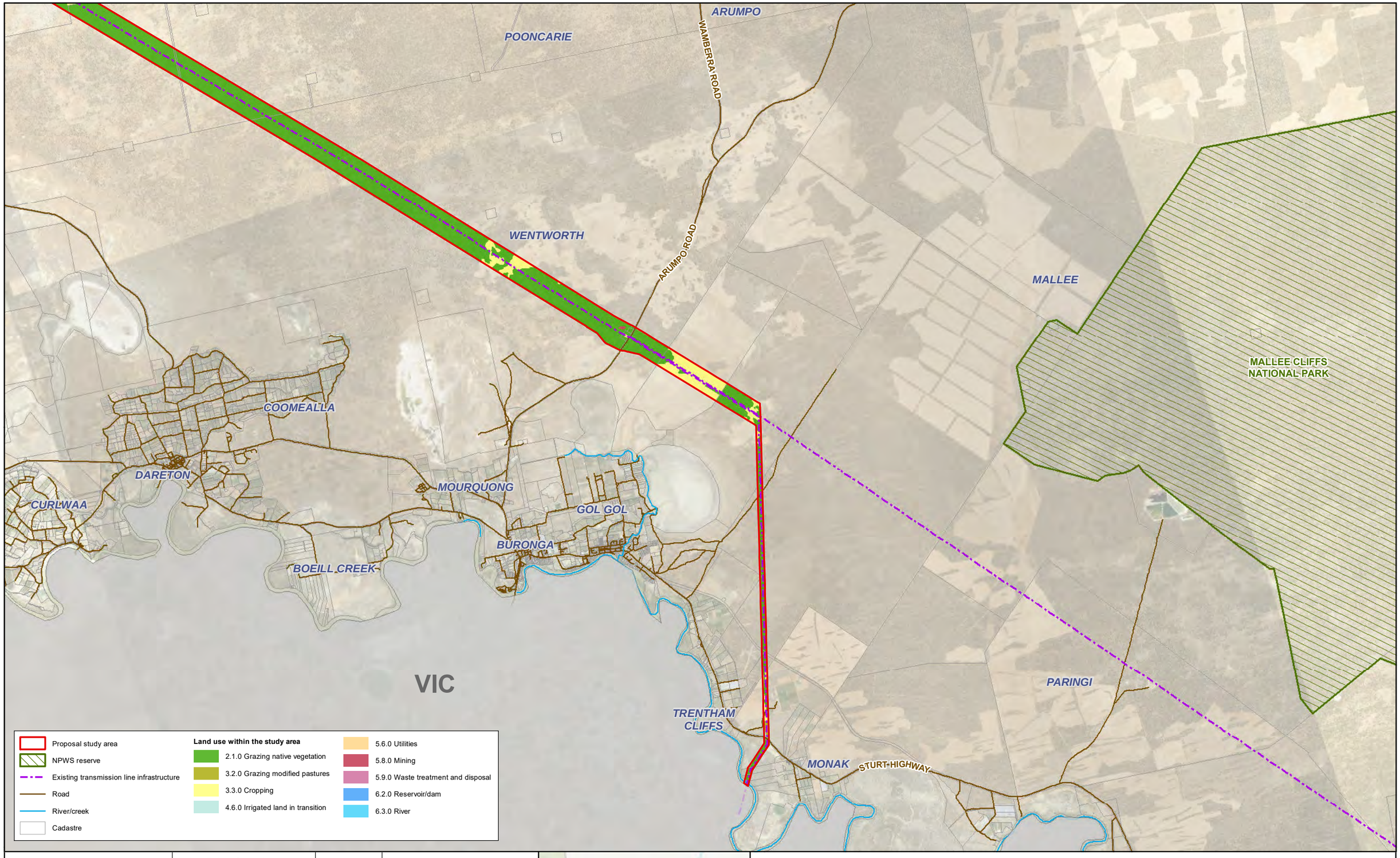


Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; MetroMap; NSWSS

ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

Figure 7-3b

Land use in the proposal study area



Map: PS117658_SCPE_004_A2	Author: Robert.Suansri
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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

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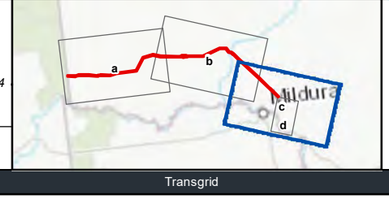
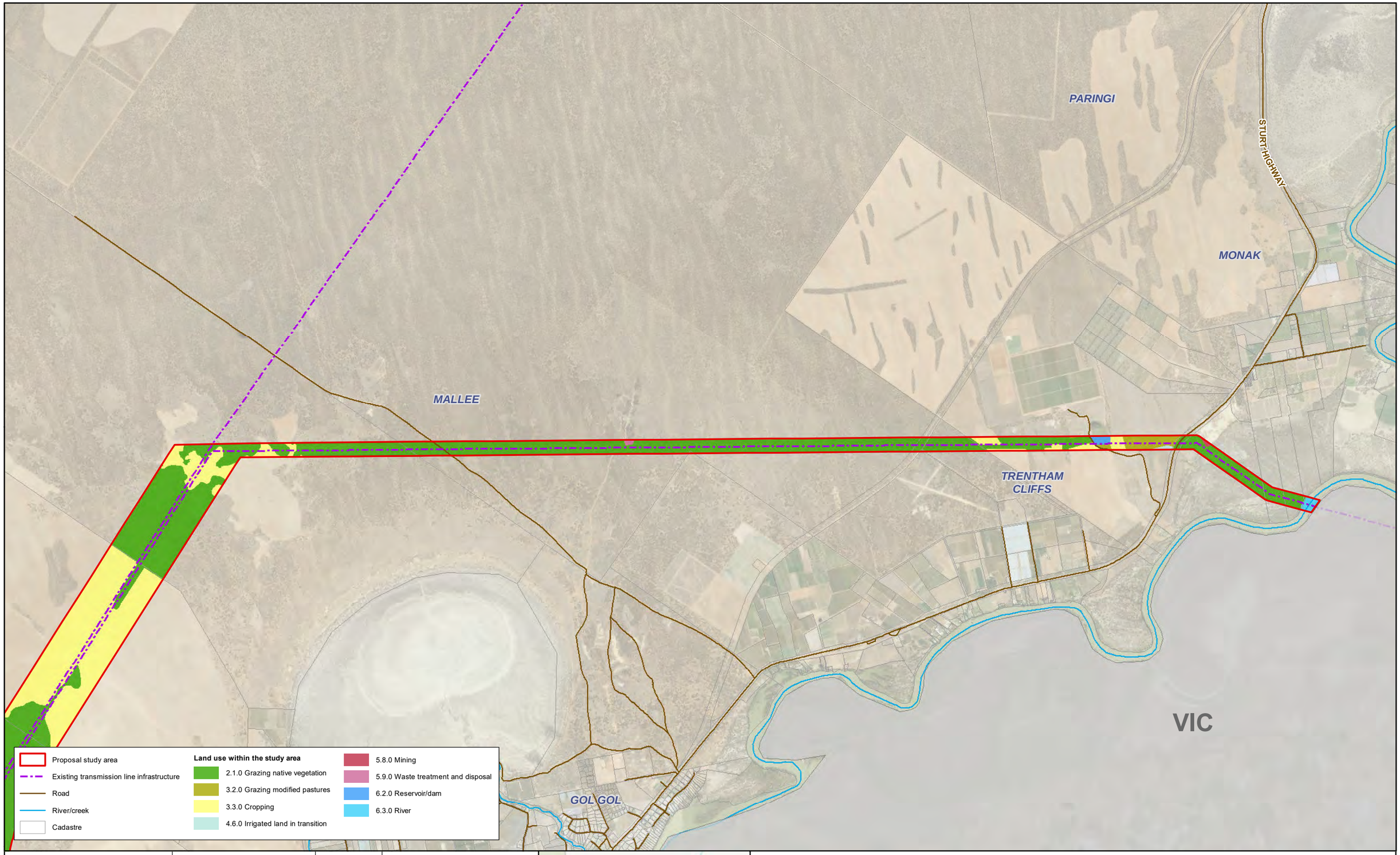


ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

Figure 7-3c

Land use in the proposal study area



Map: PS117658_SCPE_004_A2	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

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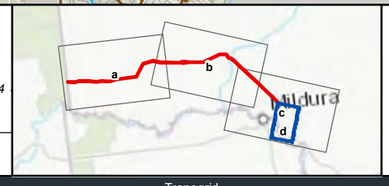
Coordinate system: GDA 1994 MGA Zone 54

Scale ratio correct when printed at A3



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ENERGYCONNECT (NSW - WESTERN SECTION)
SCOPING REPORT

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

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 between 25 and 30m in height and existing substations on Arumpo Road and Pooncarie Road are currently part of this visual landscape. Due to the flat topography landscape views are generally vast. There is a limited number of residential dwellings located within 500m of the proposal study area.

Main roads and tourist routes within the proposal study area include the Sturt Highway and the Silver City Highway. There are no major or regional towns within the proposal study area and there is a limited number of sensitive receptors in around the proposal study area.

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. Hence the visual impacts would need to be considered during the EIS phase.

During construction, the presence of plant and vehicles may result in short-term temporary visual impacts for sensitive receptors. The clearing of vegetation and ground disturbance during construction of the transmission lines (and easement), substation and access tracks would result in long-term localised visual impacts. The main sensitive receptors during construction and operation would be residences within 500m from the proposal.

During operation, the proposal would introduce large structures up to 80m in height into the landscape. In this landscape, there is the potential for the structures to be visually noticeable from distances of around 6.5km. The structures would be visible beyond this distance however they would not be visually dominant. The exact location of each structure would be identified during detailed design, however, they would generally be placed approximately 300 to 600m apart along the alignment. The long span length between structures would minimise the effect of the proposal as a visual barrier.

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 Bushfire Risk

7.6.1 Existing Environment

The proposal study area is located within the Lower Western Bushfire Management Zone, incorporating the Wentworth LGA, and is overseen by the Lower Western Zone Bushfire Management Committee (BFMC).

The Lower Western Zone Bush Fire Management Plan (BFMP) (Lower Western Zone Bush Fire Management Committee, 2016) identifies community assets at risk and sets out a five-year program of coordinated multi-agency treatments to reduce the risk of bushfire to the assets. Treatments may include such things as hazard reduction burning, grazing, community education, fire trail maintenance and establishing community fireguard groups.

The typical / average climate in the Lower Western Zone is characterised by warm to hot summers averaging 31 degrees and cool to mild winters averaging 17 degrees with regular frosts. Temperature variation is distinct with summer temperatures exceeding 40 degrees Celsius, and cool to mild winters with frosts occurring on a regular basis. The annual historical mean rainfall for the Wentworth area is 268mm.

Substantial variations from these figures have occurred in the last ten years with both areas experiencing prolonged drought conditions followed up by above average rainfall totals in 2010 & 2011. These drought conditions have caused a reduction in the fuel loads across the landscape. The BFMP indicates that the bushfire season in the plan area generally runs from October to March.

Prevailing weather conditions associated with the bush fire season in the Lower Western Zone BFMC area are strong westerly to northerly winds in spring, with high temperatures occurring throughout spring, summer and extending into autumn at times. High temperatures combined with thunderstorm activity through the bushfire season can initiate significant fire events.

7.6.2 Issues for Consideration

Hot works undertaken as part of the proposal could potentially start a fire, such as sparks from plant or equipment. 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. 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 bush fire. The design, operation and maintenance of the proposal would consider vegetation management within the transmission line easement, and asset protection zones around the substation.

7.6.3 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. The EIS would consider the bushfire hazard and risks of ignition associated with the proposal.

7.7 Socio-Economic

7.7.1 Existing Environment

The proposal study area is located in the Wentworth LGA. The population of the Wentworth LGA in 2017 was 6,972, with a population density of about 0.3 person per square kilometre. The largest industry of employment in Wentworth LGA is agriculture, forestry and fishing. The unemployment rate for Wentworth LGA in 2016 was 6.1 per cent, which was lower than the regional NSW unemployment rate (6.3 per cent) at the time. The median weekly household income in the Wentworth LGA was $692 which is below the Australian and NSW median weekly household incomes (ABS, 2016). Given the remoteness of the proposal study area, there is limited access to existing infrastructure, including road, rail, gas, electricity, water and sewerage services.

7.7.2 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 approximately $1.1 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 project delivery.

Negative impacts to the local community and the majority of local businesses are unlikely as a result of the proposal, given the remoteness of the location of the proposal.

The provision of accommodation and services for the combined construction workforce associated with the proposal may put pressure on available accommodation and services. However, the distance from towns of sufficient size to support the required workforce would likely require the establishment of one or more temporary workers camps to allow the safe and accessible accommodation of workers and support staff.

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 (ie along public roads) could potentially result in adverse hazards and risks to public safety if not managed appropriately. As described in Section 7.5.2, consideration of the proposal's potential impact on agriculture should be considered during the EIS phase.

7.7.3 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.

Substantial economic and cost benefit analysis has gone into the planning and justification of EnergyConnect, as detailed in Chapter 2. Detailed economic impact assessment to support the EIS is not considered necessary given the extensive government economic assessment process through the RIT(T), however the direct and indirect socio-economic benefits of the construction and operation of the proposal would be considered and summarised in the EIS.

7.8 Surface Water and Hydrology

7.8.1 Existing Environment

The proposal study area is intersected by two major waterways the Darling and Great Darling Anabranch River. The locality is watered by a number of natural watercourses, both permanent and ephemeral. Several natural waterbodies are also located near the proposal study area, including Lake Victoria which is located about 2.5km south. These waterways are shown in Figure 1-2.

The proposal study area is located within the *Lower Murray Darling Unregulated and Alluvial Water Sources 2011 water sharing plan*. The proposal area is not within land mapped as a flood planning area under the Wentworth LEP. There is limited water availability within the proposal study area as the region is currently drought affected.

7.8.2 Issues for Consideration

Water use and access to water during construction for activities associated with the proposal such as concrete batching, dust suppression and minor uses such as ablutions for workers, could potentially be an issue for the proposal due to the water scarcity issues which are ongoing in this region. Water sources and the amount of water to be used for the proposal will 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.

A search of the Bureau of Meteorology's Australia Groundwater Explorer on 3 June 2019, indicated the groundwater level across the proposal study area is variable from two to 40m. In the event that groundwater is encountered during the construction works (e.g. during the boring for the installation of new structures or the expansion of Buronga substation), minor temporary dewatering may be required.

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 expansion and the 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 expansion) creating obstructions. Structures would generally be located outside floodplains with the exception of the Darling River and Anabranch crossings. No structures would be located within the major water sources, however they may be located within the floodplain. Structures would be designed to not impede flood flow.

7.8.3 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.

8. Other Issues

8.1 Electromagnetic Fields

8.1.1 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.

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 study area contains existing 220kV transmission lines, low-voltage distribution lines and Buronga substation which are all current sources of EMF.

8.1.2 Issues for Consideration

The proposal would introduce new high voltage transmission lines between the NSW/SA border and Buronga. Consequently, there would be additional increases to electric and magnetic fields. 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).

8.1.3 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 a high voltage transmission line.

8.2 Air Quality and Greenhouse Gas

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

8.2.2 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 receptors during construction would be residences within 100m from the proposal. There are limited sensitive receptors located within 500m of the proposal study area.

Due to the relatively small scale of construction works required at each structure location, and the progressive nature of the construction works, the effects of any dust generated would be localised and short term.

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. In addition, substation equipment and switchgear such as circuit breakers, disconnectors and transformers may contain sulphur hexafluoride (SF^6) which is a greenhouse gas.

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, climate change and greenhouse gases are not considered to be key issues for the proposal.

8.2.3 Method of Assessment

The EIS would include an assessment of air quality impacts during construction in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2016). The EIS would also 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.

The use of the SF^6 containing substation equipment would need to be managed to prevent inadvertent release into the environment. The greenhouse gas emissions for the proposal would be quantified and presented in the EIS. This would include potential impacts of the SF^6 contained in substation equipment.

8.3 Noise and Vibration

8.3.1 Existing Environment

The proposal study area is located in a remote, rural area with limited residential dwellings located within 500m of the proposal study area. Various towns including Wentworth, Dareton, Buronga, Mildura, Gol Gol, Monak and Red Cliffs are situated along the Darling and Murray Rivers to the south of the proposal study area near the NSW/Victoria border.

Existing noise conditions in the majority of 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 surrounding road network (namely Silver City Highway, Sturt Highway and other major roads near the proposal study area). The existing substation at Buronga is also considered to be a local noise source.

8.3.2 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 (for foundations and helipads (if required), and the construction of access tracks, stringing of the lines, road upgrades and increased traffic volumes. The expansion of the Buronga substation would result in both construction and operational noise in the area immediately surrounding the facility.

However, for the majority of the proposal study area, these activities would not be expected to cause major noise and vibration impacts due to the short duration of work at each location and distance from sensitive receivers. Works at these 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 the vibration assessment once the preferred alignment is refined.

During operation, the proposal is not anticipated to contribute to major noise impacts on surrounding receivers. There is potential that the expanded and upgraded substations at Buronga may introduce some additional noise sources to their localities, however the extent of impact from these would be confirmed following detailed design of the proposal at these locations.

8.3.3 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, in particular during construction. Recommendations for mitigations measures to avoid or minimise noise and vibration impacts wherever reasonable and feasible would be identified.

8.4 Traffic and Access

8.4.1 Existing Environment

The proposal travels parallel to a section of Renmark Road and is expected to cross the Silver City Highway, Pooncarie Road, Arumpo Road, Sturt Highway and a number of other local roads and tracks. The major roads are shown on Figure 1-2.

8.4.2 Issues for Consideration

An increase in local and regional traffic would be likely to occur during the construction of the proposal including over-size and non-standard loads. Bulk movements of spoil and fill would be required in particular for works proposed at the substation. Estimates of truck and vehicle movements would be confirmed during subsequent stages of the proposal development and 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 unlikely cause considerable disruptions to other road users. It is assumed that access would be maintained for the public at all times.

Access to existing properties is not anticipated to be substantially affected by the construction of the proposal. Some minor impacts to access may occur where access tracks are required for the construction and operation of the proposal. 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.

8.4.3 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 (transformer), pre-fabricated buildings 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.

8.5 Soils and Water Quality

8.5.1 Existing Environment

8.5.1.1 Soils

The proposal study area lies within the Murray Darling Depression bioregion which occupies southwest NSW, crosses into Victoria, SA, and spreads over 19,000,000 hectares. It is bounded in the north by Broken Hill and the Murray River to the south. The proposal study area is characterised by flat inland topography.

The Murray Darling Depression 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 (eSpade, June 2019).

Geological maps on a 1:250,000 scale, provided by Geoscience Australia, identified several land systems within the proposal study area, which can be placed into three major geomorphic categories as follows (refer to Figure 8-1):

- Sandplains - Belvedere, Bulgamurra, Hatfield, Menilta, Overnewton, Roo Roo, Trelega and Huntingfield
- Dunefields - Arumpo, Haythorpe, Mandleman and Marona
- Alluvial Plains - Anabranch, Canally, Darling, Riverland and Leaghur.

The NSW Land and Soil Capability (LSC) assessment scheme (2012) defines LSC classes based on biophysical features of the land, including soil type, slope, landform position, acidity, salinity, drainage, rockiness and climate. The purpose of the LSC class is to provide an indication of the land management practices that can be applied to a parcel of land without causing degradation of the land and soil on-site, and to the environment, ecosystems and infrastructure off-site. The proposal study area is predominately LSC class 5 (Severe limitations) and LSC class 6 (Very severe limitation). There are also scattered pockets of LSC class 4 (moderate to severe limitation) and LSC class 8 (Extreme limitations).

Based on an understanding of local geology there is a low risk of encountering geological units with naturally occurring asbestos within the proposal study area.

PINE CAMP

ANABRANCH SOUTH

RUFUS

PINE CAMP ROAD

NULLA ROAD

RENMARK ROAD

SA

VIC

Be Ap Be Ap Be Hy Rr Lh Lh Lh Be Hy Be Hf Be Hu Be Ap

Soil land systems of Western NSW

- Proposal study area
- Road
- River/creek
- Cadastre
- Arumpo (Ap)
- Belvedere (Be)
- Hatfield (Hf)
- Haythorpe (Hy)
- Huntingfield (Hu)
- Leaghur (Lh)
- Roo Roo (Rr)

Map: PS117658_SCPE_015_A1	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

0 1 2 3 4 5 km

1:150,000

Coordinate system: GDA 1994 MGA Zone 54

Scale ratio correct when printed at A3

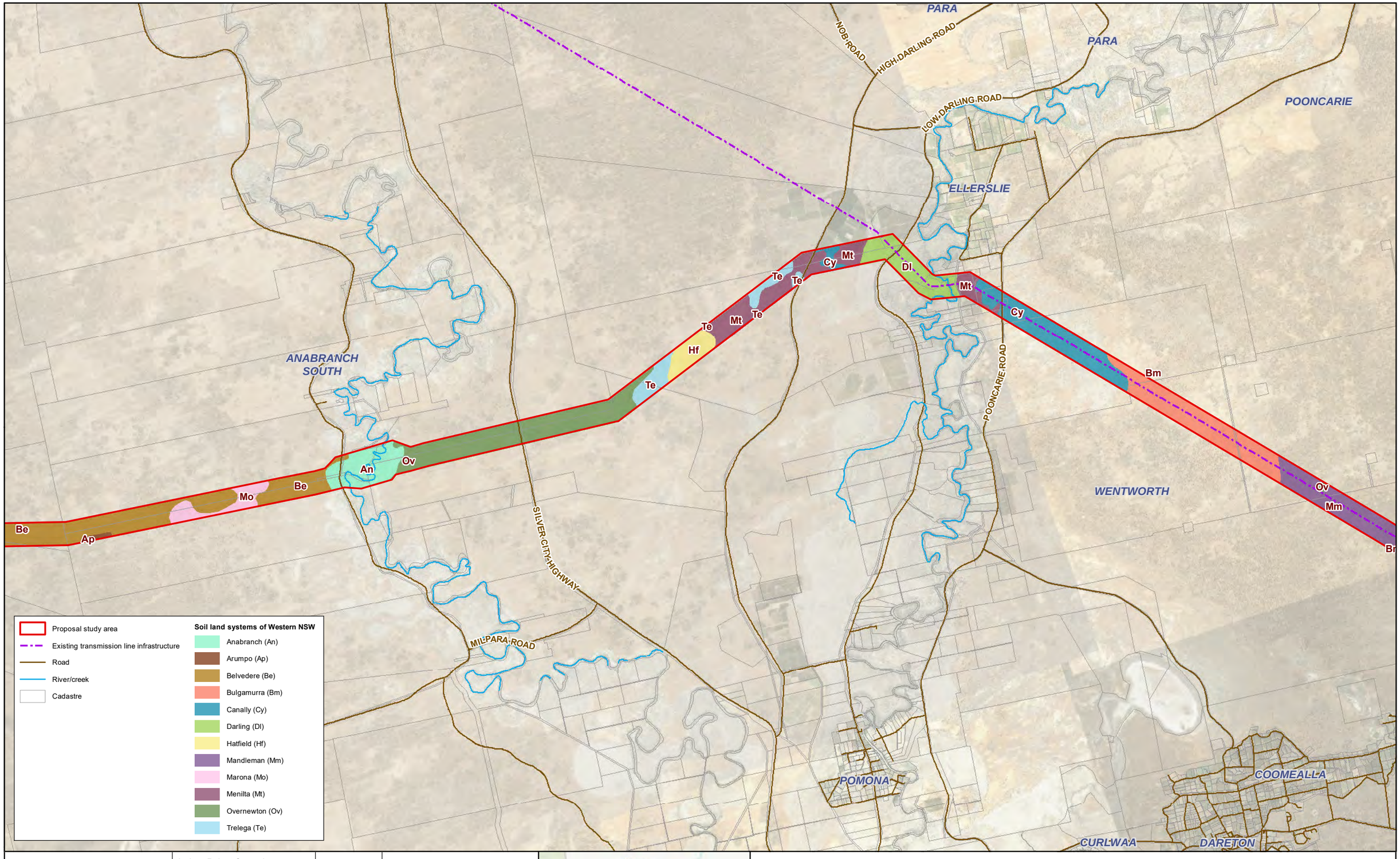
a b c d Mildura

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

ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

Figure 8-1a

Soil land systems in the proposal study area



Map: PS117658_SCPE_015_A1	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

0 1 2 3 4 5 km

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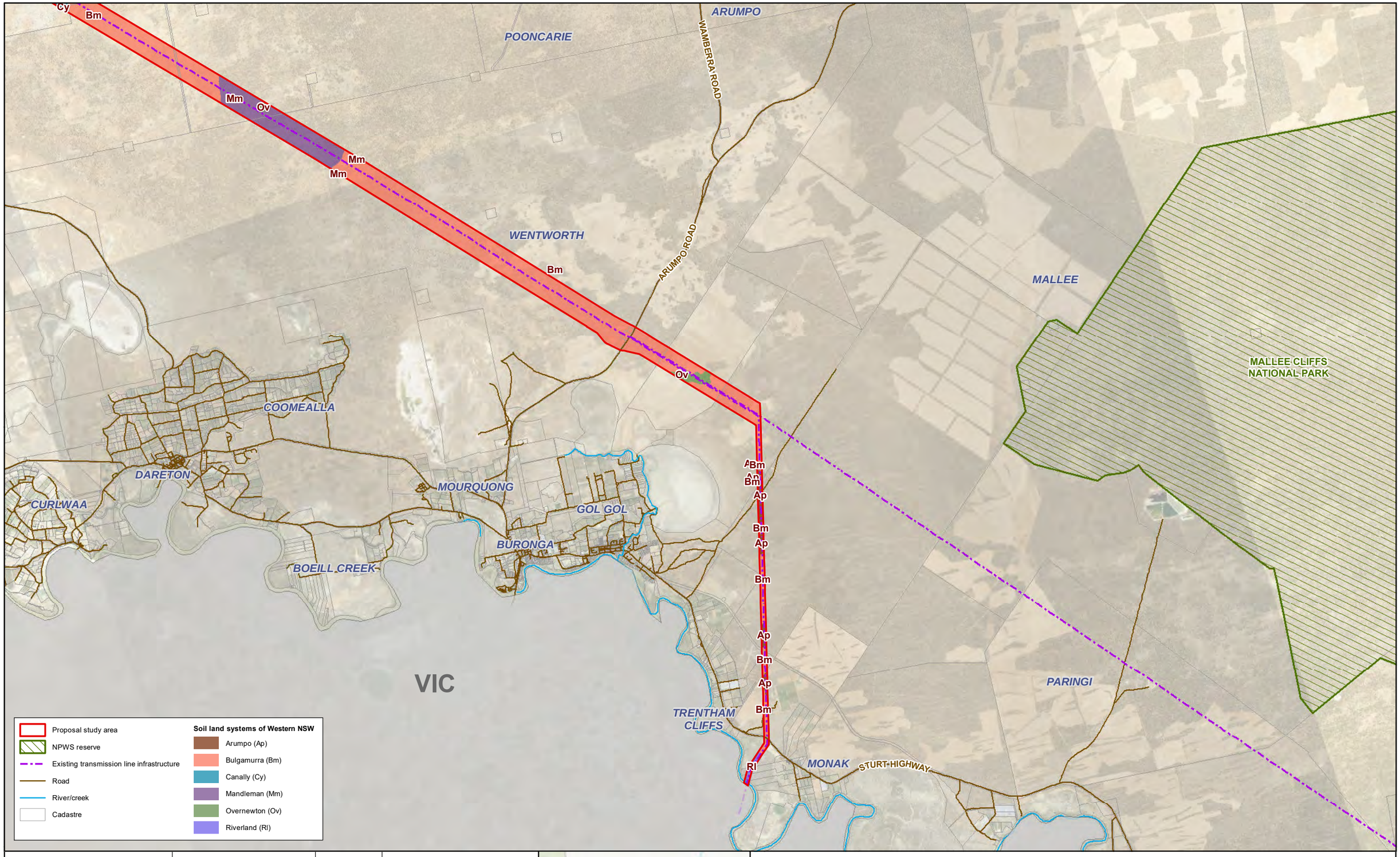
Coordinate system: GDA 1994 MGA Zone 54

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

ENERGYCONNECT (NSW - WESTERN SECTION)
SCOPING REPORT

Figure 8-1b
Soil land systems in the proposal study area



Map: PS117658_SCPE_015_A1

Author: Robert.Suansri

Date: 15/04/2020

Approved by: - Z.McLaughlin

0 1 2 3 4 5 km

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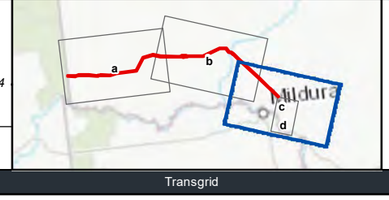
Coordinate system: GDA 1994 MGA Zone 54

Scale ratio correct when printed at A3

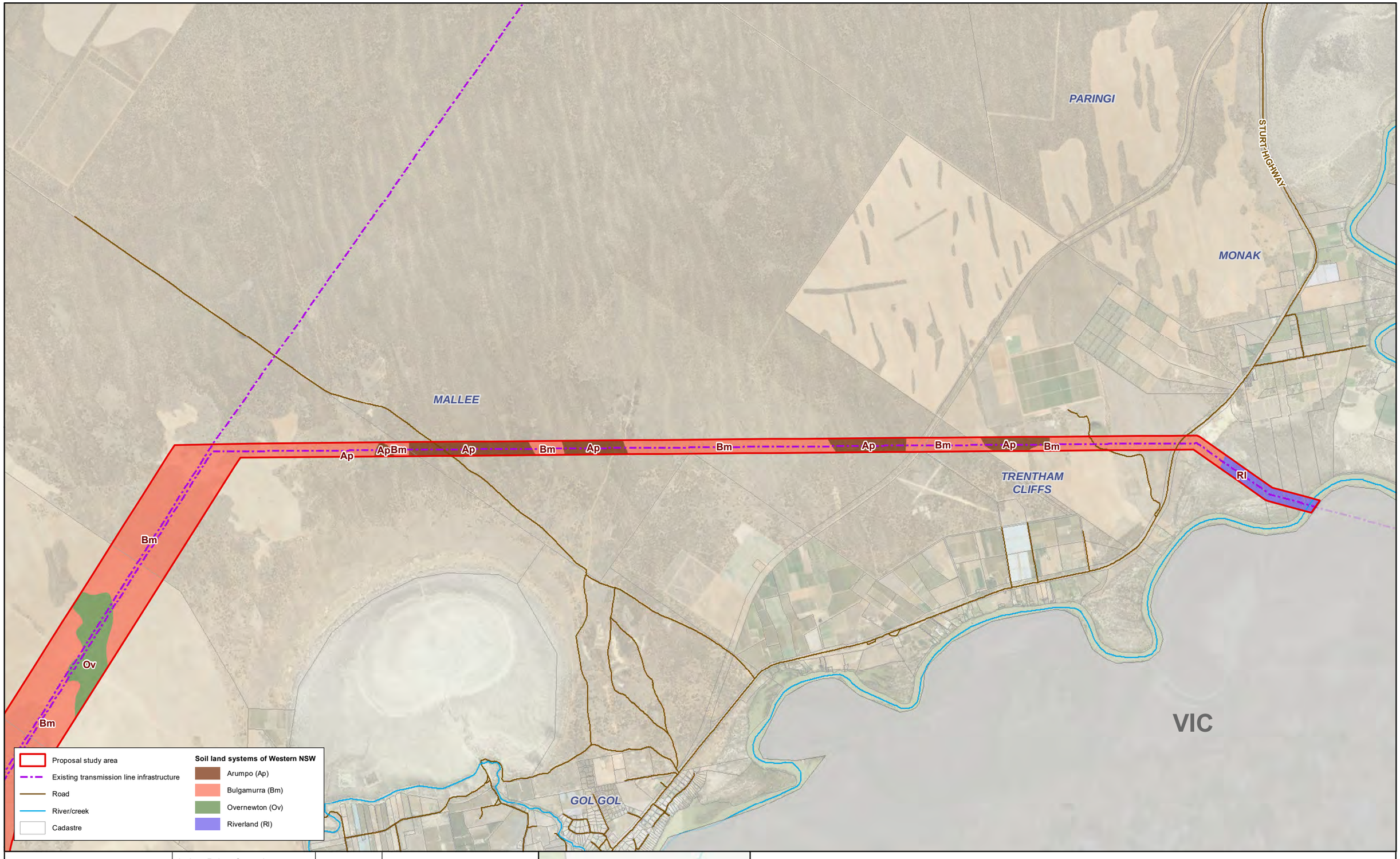


Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; MetroMap; NSWSS

ENERGYCONNECT (NSW - WESTERN SECTION) SCOPING REPORT

Figure 8-1c

Soil land systems in the proposal study area



Map: PS117658_SCPE_015_A1	Author: Robert.Suansri
Date: 15/04/2020	Approved by: - Z.McLaughlin

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

0 1 km

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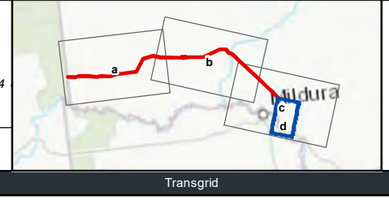
Coordinate system: GDA 1994 MGA Zone 54

Scale ratio correct when printed at A3



ENERGYCONNECT (NSW - WESTERN SECTION)
SCOPING REPORT

Figure 8-1d

Soil land systems in the proposal study area

Given the existing site characteristics consist of predominately undeveloped rural land, it is anticipated that existing on site contamination risks would be minimal. A search of the list of NSW contaminated sites notified to the EPA for Wentworth LGA on 9 April 2020, found no sites within the proposal study area. The closest sites are over 10km away and located in the surrounding suburbs of Rufus River (SA Water Depot), Buronga (Caltex Service Station), and Wentworth (Service Station). A search of the public contaminated land record of notices database was undertaken on 9 April 2020 did not identify any properties that are currently or formerly regulated under the *Contaminated Land Management Act 1997*. 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 DDT contamination.

8.5.1.2 Water Quality

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 pollute nearby waterways and affect water quality.

8.5.2 Issues for Consideration

8.5.2.1 Soils

The main impacts on soils from the proposal would generally be from excavation works during construction. Soil disturbance activities, such as excavation works, 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.

Construction of the Buronga substation expansion is 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.

Although localised terrain may impact the location of structures and ancillary facilities during construction, topography is unlikely to be a key factor in the impact assessment. Landscape features that are likely to affect structure location include the Darling River and Darling Anabranch.

Contamination may occur from hydrocarbon spills from the operation of plant 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 expanded substation as part of the proposal, there would be potential to release contaminates into the environmental from hydrocarbon leaks / spills from machinery and oil filled equipment (such as the substation transformers) as well as site drainage, sewerage and waste water. The final design would include oil spill containment systems in accordance with the legislation and standards.

8.5.2.2 Water Quality

Water quality impacts have the potential to occur during construction if fuel or chemical spills from construction vehicles 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 poor construction management during storm events.

If not adequately managed, the proposed structures may result in minor impact to local surface run-off and flow regimes.

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.

8.5.3 Method of Assessment

A geotechnical assessment 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.

8.6 Waste Management and Resource Use

8.6.1 Existing Environment

Given the remoteness of the proposal, there is limited access to existing waste management facilities.

8.6.2 Issues for Consideration

8.6.2.1 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).

However, 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.

Excavation works required for construction of the structure footings and access tracks would generate some excess spoil which may require the identification and establishment of a long-term spoil emplacement sites. Options to re-use excavated material for the construction works would be investigated during detailed design.

8.6.2.2 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. It is expected that the community would be highly sensitive to any impacts on local water supplies, especially given the current drought conditions.

8.6.3 Method of Assessment

The EIS would identify potential waste streams associated with construction 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. The source of water to be used during construction would also be determined during the EIS phase.

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
- Bushfire risk
- Socio-economic
- Surface water and hydrology.

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:

- EMF
- Air quality and greenhouse gas
- Noise and vibration
- 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 also 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 proposal assessment, design and construction phases.

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Appendix A Preliminary Biodiversity Assessment

TRANSGRID

PRELIMINARY BIODIVERSITY ASSESSMENT

ENERGYCONNECT (NSW – WESTERN SECTION)

MAY 2020

Question today
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Create for the future

Preliminary Biodiversity Assessment
EnergyConnect (NSW – Western Section)

TransGrid

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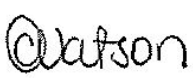
REV	DATE	DETAILS
A	15/04/2020	For TransGrid review
B	12/05/2020	Revised draft for TransGrid review

	NAME	DATE	SIGNATURE
Prepared by:	Clementine Watson	12/05/2020	
Reviewed by:	Toby Lambert	12/05/2020	
Approved by:	Toby Lambert	12/05/2020	

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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 5 cm; (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 km 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	An area of intact native vegetation that: **a** occurs on the development site or biodiversity stewardship site, and **b** includes native vegetation that has a gap of less than 100 m from the next area of moderate to good condition native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site.
Plant community type (PCT)	A NSW plant community type identified using the PCT classification system.
Proposal	EnergyConnect (NSW – Western 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 the SA/NSW border (near Chowilla) and Buronga and a 200 metre wide corridor from Buronga to the NSW/Victorian border at Monak, Red Cliffs.
Preliminary development footprint	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. 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.
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 *Biodiversity Conservation Act 2016* (BC Act) which commenced on 25 August 2017
BC Act	*Biodiversity Conservation Act 2016* (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: – 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	NSW Department of Planning, Industry and Environment, 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.
EIA	Environmental impact assessment
EIS	Environmental impact statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FM Act	*Fisheries Management Act 1994* (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	A 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 distributor in South Australia (SA)) are currently investigating the proposed construction and operation of a new electrical interconnector and network support options 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 are anticipated to be assessed and approved in stages, starting with the western section. The western section is the subject of this report and extends from the SA/NSW border near Chowilla to Buronga, and from Buronga to the NSW/Victoria border at Monak, near Red Cliffs (referred to collectively as 'the proposal').

EnergyConnect 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 two potential Threatened Ecological Communities (TECs) listed under the *Biodiversity Conservation Act 2016 (*BC Act). No ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are considered to occur with the proposal study area.

Preliminary field investigations have to date recorded three threatened flora species within the proposal study area. Of particular importance was the identification of the Critically Endangered *Dodonaea stenozyga* (Desert Hopbush) within the proposal study area. In addition, 14 threatened flora species listed under the BC Act, and six threatened flora species listed under the EPBC Act, are predicted to have a moderate or high likelihood of occurrence within the proposal study area.

Preliminary field investigations have also identified 10 threatened fauna species within the proposal study area. In addition, 57 threatened listed fauna species under the BC Act are predicted to have a moderate or high likelihood of occurrence within the proposal study area. 18 threatened fauna species listed under the EPBC Act are predicted have a moderate or higher likelihood of occurrence within the proposal study area.

Desktop assessment and likelihood assessment identified 20 migratory and/or marine bird species, listed under the EPBC Act, with moderate or higher potential to occur within the proposal study area. Of these, five migratory and/or marine bird species have been recorded within the proposal study area during preliminary field investigations.

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

1 INTRODUCTION

1.1 BACKGROUND

TransGrid (electricity transmission operator in New South Wales (NSW)) in conjunction with ElectraNet (electricity distributor in South Australia (SA)) are currently investigating the proposed construction and operation of a new electrical interconnector and network support options between SA and NSW.

The interconnector is aimed at reducing 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 known collectively as EnergyConnect involves constructing a high voltage electricity interconnector approximately 900 kilometres long between the power grids of SA (starting at Robertstown) 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.

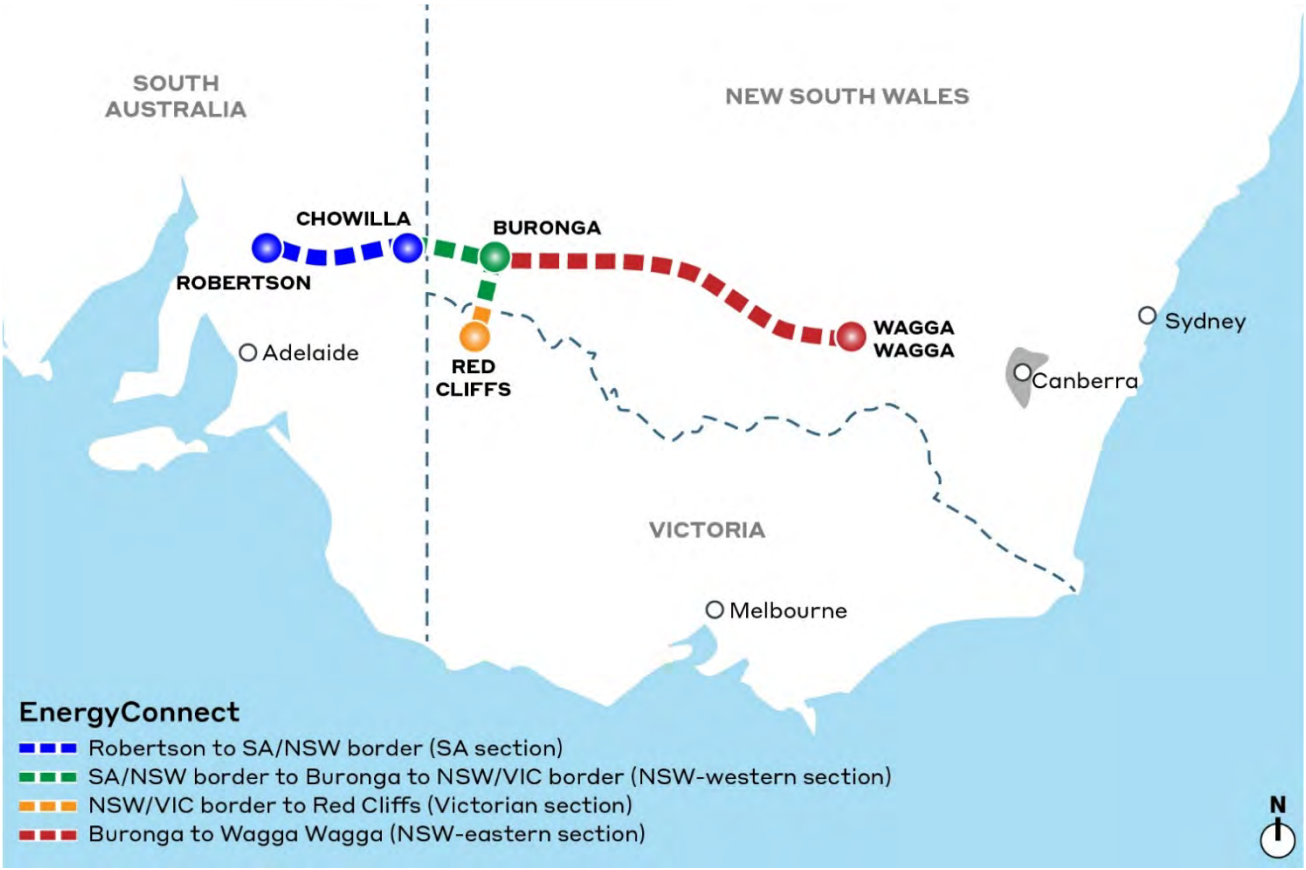


Figure 1.1 Overview of EnergyConnect

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 are anticipated to be assessed and approved in stages, starting with the western section. The western section is the subject of this report and extends from the SA/NSW border near Chowilla to Buronga, and from Buronga to the NSW/Victoria border at Monak, near Red Cliffs (referred to collectively as 'the proposal').

For the section between Buronga and Wagga Wagga, and sections of EnergyConnect that are located in SA or Victoria, reporting and environmental planning approvals will be prepared, and sought separately, under the relevant jurisdictions.

The proposal would involve the construction and operation of new high voltage (HV) electricity transmission lines between the SA/NSW border at Chowilla and Buronga including a connection from Buronga to the NSW/Victoria border near Red Cliffs as well as substation and ancillary works. The scope of proposal includes:

- about 135 km of new 330 kV transmission lines and associated infrastructure between the SA/NSW border near Chowilla and the existing Buronga substation
- an upgrade to the existing 220 kV transmission line between the existing Buronga substation and the NSW/Victoria border at Monak, near Red Cliffs
- an expansion and upgrade of the existing Buronga substation from an operating capacity of 220 kV to 330 kV
- 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.

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:** the western section of EnergyConnect in NSW. i.e. the components of EnergyConnect from the SA/NSW border near Chowilla to Buronga, and from Buronga to the NSW/Victoria border at Monak, near Red Cliffs.
- **Proposal study area:** The proposal study area is a one-kilometre wide corridor between the SA/NSW border near Chowilla and Buronga, and a 200-metre wide corridor between Buronga and the NSW/Victoria border at Monak, near Red Cliffs (refer Figure 3.1).

1.4 PURPOSE OF THE REPORT

This Preliminary Biodiversity Assessment (this report) has been prepared by WSP Australia Pty Ltd on behalf of TransGrid. The purpose of this report is to present preliminary biodiversity findings within the proposal study area based on desktop, preliminary and ongoing field validation to inform the Scoping Report, and initial communications with determining authorities.

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 would be prepared in accordance with the Biodiversity Assessment Method 2017 (BAM). It is likely that a BDAR will need to be prepared to support an Environmental Impact Statement (EIS) for the proposal in accordance with the *Biodiversity Conservation Act 2016* (BC Act).

This report also considers 'Matters of National Environmental Significance' (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The overall purpose of this report to is to present all biodiversity constraints requiring assessment and/or consideration under the relevant NSW and Commonwealth legislation. Separate assessments are being prepared for EnergyConnect between Buronga and Wagga Wagga, and within other states. This report solely considers the components of EnergyConnect that are within western section of NSW, between SA/NSW border near Chowilla to Buronga, and from Buronga to the NSW/Victoria border at Monak, near Red Cliffs.

More detailed studies and assessment reporting for the refined design will be completed in the future in accordance with the requirements of the relevant determining authorities.

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	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	Senior Ecologist – field surveys and reporting
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 Suansari	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, 06/04/2020	20 km 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, 06/04/2020	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, 06/04/2020	20 km search around the proposal study area	(Department of the Environment and Energy 2019b) (Department of Environment and Energy, 2020a)
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 2016c)
- 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).

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 Section 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 (250 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 inhabitants the proposal study area and has not been recorded recently in the locality (25 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 Landuse 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.

It should be noted that these areas have been identified 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 sections of EnergyConnect, and these have currently been conducted mainly within the Border to Buronga section, and then Buronga to Balranald. At the time of this report, WSP has completed no survey along the section towards Red Cliffs, Victoria however Jacobs (2019) has mapped part of this section as part of a previous Preliminary Ecological Constraints Assessment. 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 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
19–22 November 2018 (Jacobs, 2019)	Border to Buronga substation (excluding Buronga substation to Darling River)	Rapid data points Preliminary investigations Vegetation mapping
15–16 January 2019 (Jacobs, 2019)	Buronga substation to Darling River	Rapid data points Preliminary investigations Vegetation mapping
2–3 April 2019 (Jacobs, 2019)	Buronga to Red Cliffs substation (Victoria)	Rapid data points Preliminary investigations Vegetation mapping
August 2019 (Jacobs, 2019)	Border to Buronga (including the section towards Red Cliffs)	BAM plots Vegetation mapping
13–24 October 2019	Border to Buronga	Rapid data points BAM plots Targeted threatened flora surveys Vegetation mapping Habitat assessments Targeted fauna surveys Camera trapping installation
19–23 December 2019	Tareena Station (near SA/NSW Border)	Rapid data points BAM plots Targeted threatened flora surveys Vegetation mapping Habitat assessment Targeted fauna surveys
19–20 February 2020	Tareena Station and Big Bend (near SA/NSW Border)	Targeted threatened flora surveys Targeted fauna surveys
17–22 March 2020	Border to Buronga	Targeted threatened flora surveys Targeted fauna surveys

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 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 m^2 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 m^2 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 m^2 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 m^2 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 a number of 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 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 dunefields 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 ha area methodology as described in 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 the proposal study area during the summer season in 2019 and 2020. 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 HERPETOFAUNA 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 m of water body edge); and
- nocturnal Call playback survey methodologies were also used were 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.

Reptiles have been surveyed via the use of pitfall traps on areas between the Border and Buronga.

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 NATIVE VEGETATION

The proposal study area has been identified to traverse a diverse range of native vegetation types including 7 broad NSW vegetation formations, being:

- 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 preliminary field validation these 6 vegetation formations are identified to contain a total of 19 native PCTs. An overview of each PCT, its associated vegetation formation, class, threat status, estimated historical percentage cleared (previously in the area) and broad location within the preliminary development footprint is presented in Table 3.1.

PCT mapping and preliminary impact calculations for the Buronga to Victorian border part of the proposal are based on the most accurate available mapping, which consists of the previous field-validated mapping conducted by Jacobs (2019). Whilst the Jacobs mapping does not cover the entire study area, it contains the best preliminary information that guides threatened species and communities preliminary habitat assessment. Future field validation by WSP in 2020 will provide accurate information in this regard for the future EIS assessment.

Note that as surveys in 2020 progress, detailed PCT mapping will be completed for the entire final 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 PRELIMINARY DEVELOPMENT FOOTPRINT[#] (HA)
Forested wetlands						
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)	Inland Riverine Forests	–	–	–	42	0.77
Saline wetlands						
PCT 63 – Spiny Lignum – Slender Glasswort open forbland saline wetland on lake edges in the semi-arid and arid climate zones	Inland Saline Lakes	–	–	–	10	0.72
PCT 64 – Samphire – Water Weed – Sea-Heath shrubland saline wetland of depressions of the arid and semi-arid (warm) zones		–	–	–	0	0.59
PCT 166 – Disturbed annual saltbush forbland on clay plains and inundation zones mainly of south western NSW		–	–	–	34	1.51
Semi-arid Woodlands (Grassy sub-formation)						
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)	Inland Floodplain Woodlands	–	–	Endangered	50	24.12
PCT 16 – Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)		–	–		50	0.04

VEGETATION TYPE	VEGETATION CLASS	BC ACT[1]	EPBC ACT[2]	FM ACT[3]	% CLEARED	RECORDED WITHIN PRELIMINARY DEVELOPMENT FOOTPRINT[#] (HA)
Semi-arid Woodlands (Shrubby sub-formation)						
PCT 19 – Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains[4]	Riverine Sandhill Woodlands	Endangered	–	–	70	2.80
PCT 21 – Slender Cypress Pine – Sugarwood – Western Rosewood open woodland on sandy rises mainly in the Riverina Bioregion and Murray Darling Depression Bioregion[5]		Endangered	–	–	80	3.05
PCT 28 – White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone		Endangered	–	–	73	0.30
PCT 58 – Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion[5]	Semi-arid Sand Plain Woodlands	Endangered	–	–	50	53.80
PCT 170 – Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Sand Plain Mallee Woodlands	–	–	–	41	53.80
PCT 171 – Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Dune Mallee Woodlands	–	–	–	19	25.51
PCT 172 – Deep sand mallee of irregular dunefields of the semi-arid (warm) zone		–	–	–	1	0.84
PCT 221 – Black Oak – Pearl Bluebush open woodland of the sandplains of the semi-arid warm and arid climate zones	Semi-arid Sand Plain Woodlands	–	–	–	30	1.06

VEGETATION TYPE	VEGETATION CLASS	BC ACT[1]	EPBC ACT[2]	FM ACT[3]	% CLEARED	RECORDED WITHIN PRELIMINARY DEVELOPMENT FOOTPRINT[#] (HA)
Arid Shrublands (Acacia sub-formation)						
PCT139 – Prickly Wattle tall open shrubland of dunes and sandplains of semi-arid and arid regions	Sand Plain Mulga Scrublands	–	–	–	50	0.70
PCT 143 – Narrow-leaved Hopbush – Scrub Turpentine – Senna shrubland on semi-arid and arid sandplains and dunes*		–	–	–	30	1.10
Arid Shrublands (Chenopod sub-formation)						
PCT 152 – Lunette chenopod shrubland mainly of the Murray Darling Depression Bioregion	Riverine Chenopod Shrublands	–	–	–	27	1.92
PCT 154 – Pearl Bluebush low open shrubland of the arid and semi-arid plains*		–	–	–	43	14.19
PCT 155 – Bluebush shrubland on stony rises and downs in the arid and semi-arid zones*		–	–	–	50	57.07

(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) Listed as Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion under the BC Act (Endangered)

(5) 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)

* WSP acknowledge these PCTs are associated with the TEC *Acacia loderia* shrubland, however field verification observed that majority did not meet the TEC condition type or thresholds, and therefore for the purposes of this study have not been included as this TEC.

\# The term development footprint refers to 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 includes the clearing footprint. 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.

3.2 THREATENED BIODIVERSITY – BC ACT

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). SAII entities are threatened biodiversity considered to be most at risk of extinction and any assessment of proposed State Significant Infrastructure with SAII impacts requires specific consideration of any additional and appropriate measures that will minimise those impacts prior to approval.

3.2.1 THREATENED ECOLOGICAL COMMUNITIES

A total of four 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 four 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
- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion.

Of these, only two have been recorded within the proposal study area. An overview of each threatened ecological community, its threat status, associated PCTs within the proposal study area is presented in Table 3.2.

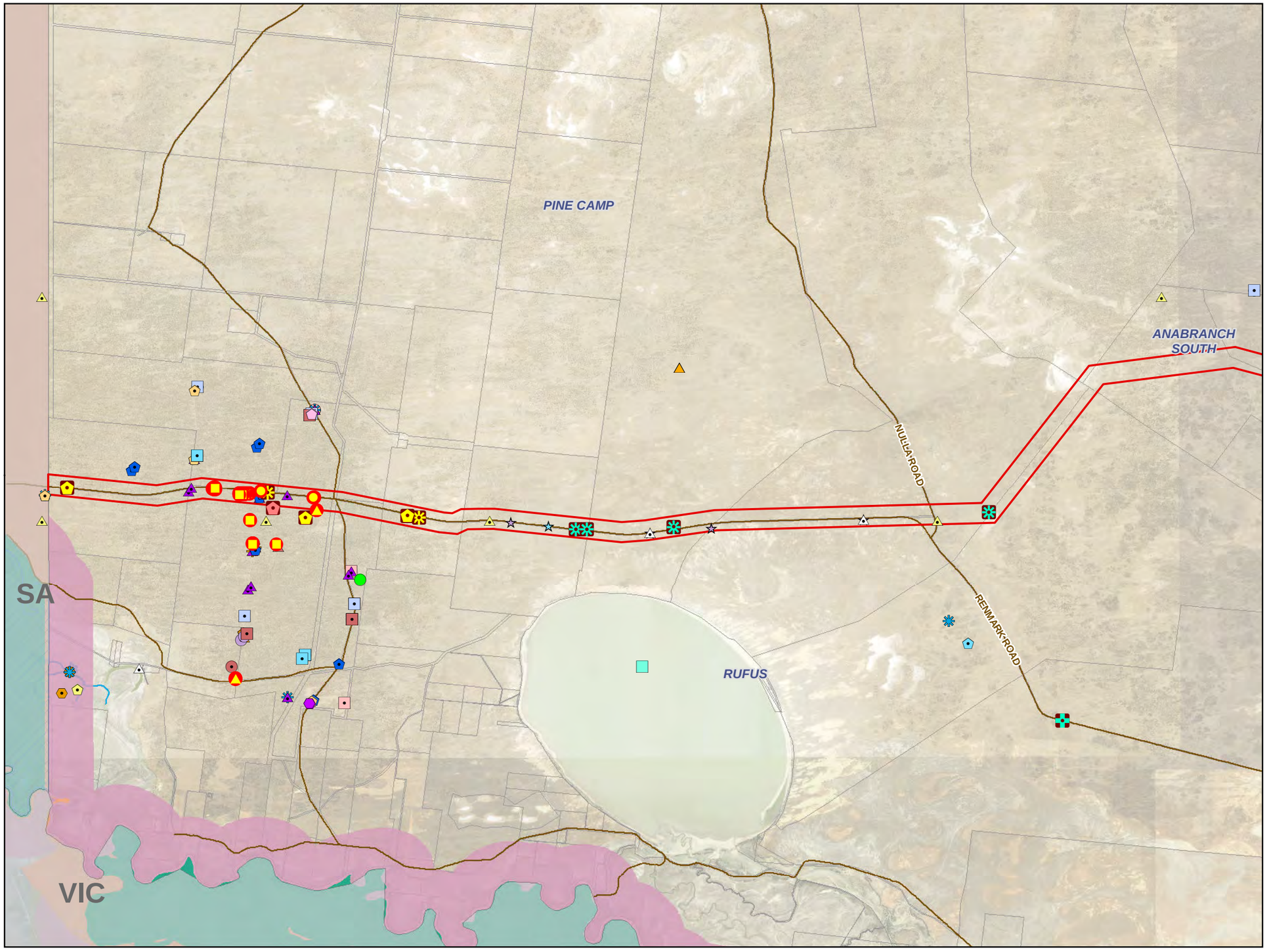
TEC's have either been recorded during preliminary field surveys, or predicted (via broad scale mapping) in areas where access has been restricted, as seen in Figure 3.1.

The planned additional and ongoing 2020 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 3.2 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 (HA)
Acacia loderi Shrublands	Endangered	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. The community generally occurs as scattered patches within broader vegetation types for example it is often interspersed by woodlands of Belah (*Casuarina pauper*), Rosewood (*Alectryon oleifolius*) or Leopardwood (*Flindersia maculosa*). The occurrence of this community has been assessed for the purposes of this study to include the following within the proposal study area: — PCT 58 – Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.	Potential (survey required to confirm)
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: — PCT 19 – Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains. May also align to: — PCT 21 – Slender Cypress Pine – Sugarwood – Western Rosewood open woodland on sandy rises mainly in the Riverina Bioregion and Murray Darling Depression Bioregion (for the purposes of this study this PCT has been included).	Recorded

(1) Endangered under the *Biodiversity Conservation Act* (BC Act)



- Proposal study area
- Ramsar Wetlands
- Protected Ecological Areas
- Important Wetlands
- Migratory Bird Flight Path Protection Area

WSP field verified threatened flora

- *Acacia acanthoclada*
- *Dodonaea stenozyga*
- *Santalum murrayanum*

Bionet threatened flora within 10km - non SAII

- *Acacia acanthoclada*
- *Austrostipa nullanulla*
- *Cratystylis conocephala*
- *Santalum murrayanum*
- *Tetratheca pilosa subsp. pilosa*

WSP field verified threatened fauna

- Chestnut Quail-thrush
- Hooded Robin
- Little Eagle
- Major Mitchell's Cockatoo
- Redthroat

Bionet threatened fauna within 10km - non SAII

- Brown Treecreeper (eastern subspecies)
- Chestnut Quail-thrush
- Dusky Woodswallow
- Gilbert's Whistler
- Hooded Robin (south-eastern form)
- Inland Forest Bat
- Jewelled Gecko
- Little Eagle
- Major Mitchell's Cockatoo
- Mallee Worm-lizard
- Malleefowl
- Marble-faced Delma
- Purple-crowned Lorikeet
- Red-lored Whistler
- Redthroat
- Regent Parrot (eastern subspecies)
- Ringed Brown Snake
- Shy Heathwren
- Southern Bell Frog
- Southern Hairy-nosed Wombat
- Southern Ningaui
- Spotted Harrier
- Varied Sittella
- White-fronted Chat

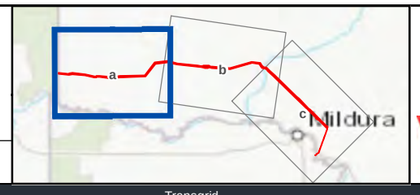
Map: PS117658_BAR_001_A1	Author: Robert.Suansri	
Date: 15/04/2020	Approved by: - T.Lambert	

0 2 4 6 km

1:200,000

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

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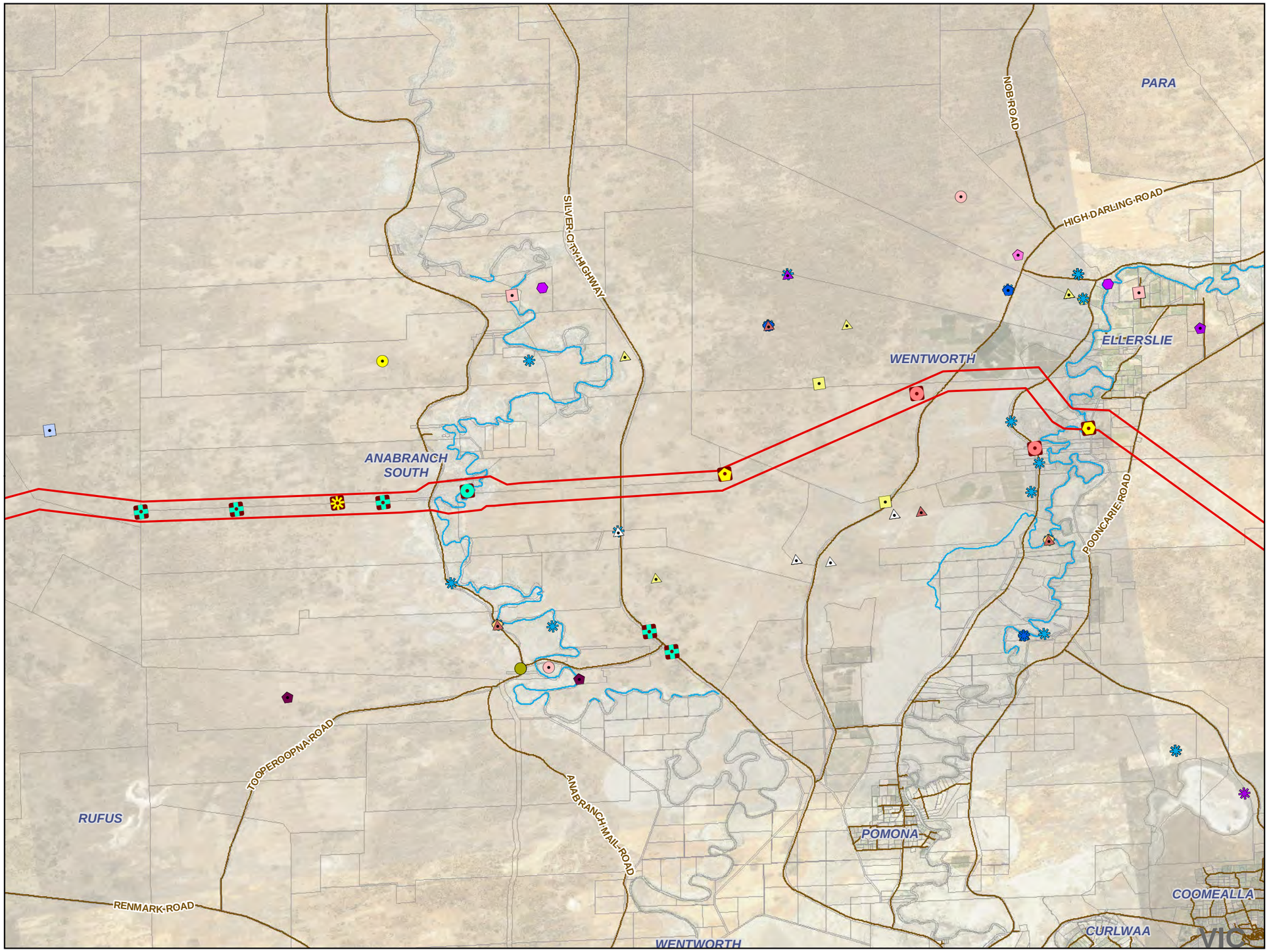
Figure 3.1a
Ecology values of the proposal study area



Proposal study area

Protected Ecological Areas

Bionet threatened flora within 10km - non SAII

- *Cratystylis conocephala*
- *Solanum karsense*

WSP field verified threatened fauna

- Black-breasted Buzzard
- Hooded Robin
- Inland Forest Bat
- Little Eagle
- Little Pied Bat
- Major Mitchell's Cockatoo

Bionet threatened fauna within 10km - SAII

- Plains-wanderer

Bionet threatened fauna within 10km - non SAII

- Black-breasted Buzzard
- Boodie, Burrowing Bettong (mainland)
- Brown Treecreeper (eastern subspecies)
- Bush Stone-curlew
- Chestnut Quail-thrush
- Curlew Sandpiper
- Dusky Woodswallow
- Gilbert's Whistler
- Greater Stick-nest Rat
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Pied Bat
- Major Mitchell's Cockatoo
- Malleefowl
- Marble-faced Delma
- Numbat
- Spotted Harrier
- Square-tailed Kite
- Varied Sittella
- White-fronted Chat

Map: PS117658_BAR_001_A1

Author: Robert.Suansri

Date: 15/04/2020

Approved by: - T.Lambert

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Coordinate system: GCS GDA 1994

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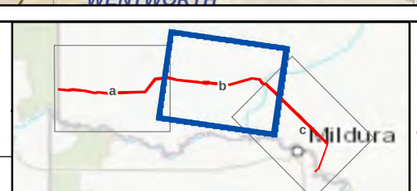

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; MetroMap; NSWSS

ENERGY CONNECT
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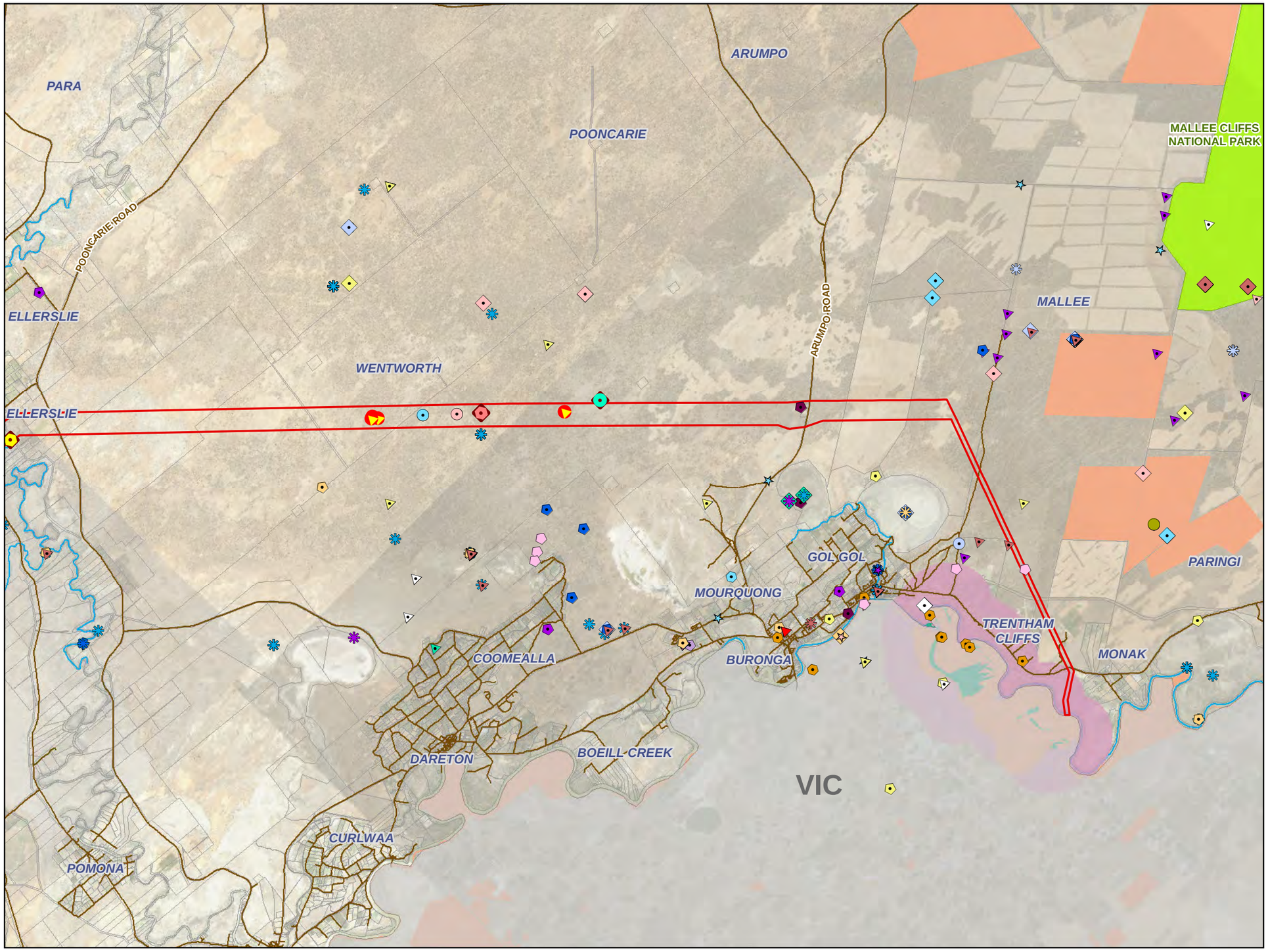
Figure 3.1b
Ecology values of the proposal study area



- Proposal study area
- NPWS reserve
- Protected Ecological Areas
- Important Wetlands
- Migratory Bird Flight Path Protection Area

WSP field verified threatened flora

- *Santalum murrayanum*

Bionet threatened flora within 10km - SAII

- *Casuarina obesa*

Bionet threatened flora within 10km - non SAII

- *Santalum murrayanum*
- *Solanum karsense*
- *Swainsona pyrophila*

WSP field verified threatened fauna

- Corben's Long-eared Bat
- Inland Forest Bat
- Little Pied Bat

Bionet threatened fauna within 10km - non SAII

- Australasian Bittern
- Australian Bustard
- Australian Painted Snipe
- Bilby
- Black Falcon
- Black-chinned Honeyeater (eastern subspecies)
- Black-tailed Godwit
- Blue-billed Duck
- Boodie, Burrowing Bettong (mainland)
- Brolga
- Brown Treecreeper (eastern subspecies)
- Bush Stone-curlew
- Chestnut Quail-thrush
- Curlew Sandpiper
- Desert Mouse
- Dusky Woodswallow
- Eastern Hare-wallaby
- Flame Robin
- Freckled Duck
- Gilbert's Whistler
- Greater Stick-nest Rat
- Grey Falcon
- Hooded Robin (south-eastern form)
- Inland Forest Bat
- Koala
- Kultarr
- Little Eagle
- Little Pied Bat
- Major Mitchell's Cockatoo
- Mallee Worm-lizard
- Malleefowl
- Marble-faced Delma
- Mitchell's Hopping-mouse
- Numbat
- Pig-footed Bandicoot
- Purple-crowned Lorikeet
- Red-tailed Phascogale
- Regent Parrot (eastern subspecies)
- Southern Bell Frog
- Southern Ningaui
- Southern Scrub-robin
- Spotted Harrier
- Spotted-tailed Quoll
- Square-tailed Kite
- Varied Sittella
- Western Blue-tongued Lizard
- Western Pygmy Possum
- White-bellied Sea-Eagle
- White-fronted Chat
- Yellow-bellied Sheathtail-bat

Map: PS117658_BAR_001_A1

Author: Robert.Suansri

Date: 15/04/2020

Approved by: - T.Lambert

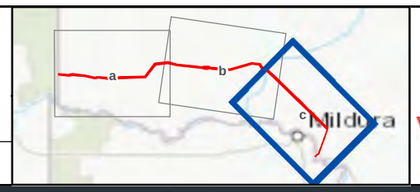
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; MetroMap; NSWSS

0 2 4 6 km

1:200,000

Coordinate system: GCS GDA 1994

Scale ratio correct when printed at A3



ENERGY CONNECT
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Figure 3.1c
Ecology values of the proposal study area

3.2.2 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.

3.2.2.1 THREATENED FLORA SPECIES

Database searches have identified a total of 40 threatened flora species that are predicted or known to occur within the proposal locality. The results of likelihood of occurrence assessments identified that 17 threatened flora species have a moderate or higher likelihood of occurrence within the proposal study area (see Appendix A for further detail).

Preliminary field investigations by WSP identified three of these threatened flora species within the proposal study area (Table 3.3 and Figure 3.1). These species are described below.

Table 3.3 Threatened flora species recorded during surveys within the proposal study area during WSP targeted surveys

SPECIES NAME	COMMON NAME	BC ACT	EPBC ACT	SAII
Acacia acanthoclada	Harrow Wattle	Endangered	–	No
Dodonaea stenozyga	Desert Hopbush	Critically Endangered	–	Yes
Santalum murrayanum	Bitter Quandong	Endangered	–	No

*DODONAEA STENOZYGA (*DESERT HOPBUSH*)*

Dodonaea stenozyga (Desert Hopbush) was recorded along Renmark Road, within the Border to Buronga section of the proposal study area (Figure 3.1). This species was previously presumed extinct in NSW until a population was recorded in 1998 from Nanya Station north-west of Wentworth in the Scotia region. Recent targeted threatened flora surveys have identified two discrete populations of this species, about one kilometre apart and comprise a total number of about 149 plants. This species was recorded within PCT 171 – Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Photo 3.1 and Photo 3.2). This species is listed as Critically Endangered and as a SAII entity under the BC Act.

*SANTALUM MURRAYANUM (*BITTER QUANDONG*)*

Santalum murrayanum (Bitter Quandong) was recorded within the proposal study area. An occurrence of two individual plants were recorded within the Border to Buronga section of the proposal study area about 1 kilometre west of the Rufus River Road (Figure 3.1). Several specimens were also recorded to the eastern section of Border to Buronga, three plants occur in close proximity to each other within vegetation type PCT 171 – Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion whilst a single individual was recorded from PCT 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Photo 3.5 and Photo 3.6).

*ACACIA ACANTHOCLADA (*HARROW WATTLE*)*

Acacia acanthoclada (Harrow Wattle) was recorded within the proposal study area, along Renmark road west of Rufous River Road, within the Border to Buronga section (Figure 3.1). Two individuals of this species were recorded within vegetation type PCT 171 – Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Photo 3.3 and Photo 3.4).

Photo 3.1 *Dodonaea stenozyga* growth form

Photo 3.2 Leaf and fruit of *Dodonaea stenozyga*

Photo 3.3 *Acacia acanothoclada* shrub growth form growing within stock proof fenced area

Photo 3.4 *Acacia acanothoclada* a rigid spinescent shrub

Photo 3.5 *Santalum murrayanum*

Photo 3.6 *Santalum murrayanum* leaf arrangement

SAII ENTITIES

One species (*Dodonaea stenozyga)* recorded by WSP is a SAII entity under the BC Act. Of the threatened flora species identified with potential to occur within proposal study area, the following are also SAII entities under the BC Act:

- *Austrostipa nullanulla* (A spear-grass)
- *Casuarina obesa* (Swamp She-oak)
- *Pimelea serpyllifolia* subsp. *serpyllifolia* (Thyme Rice-Flower).

3.2.2.2 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 67 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 10 of these threatened fauna species during surveys within the proposal study area (Table 3.4 and Figure 3.1).

Table 3.4 Threatened fauna species recorded within the proposal study area during WSP targeted surveys

COMMON NAME	SPECIES NAME	BC ACT[1]	EPBC ACT[2]	RECORDED[3]
Black-breasted Buzzard	*Hamirostra melanosternon*	V	–	O
Chestnut Quail-thrush	*Cinclosoma castanotum*	V	–	O
Dusky Woodswallow	*Artamus cyanopterus*	V	–	O
Hooded Robin	*Melanodryas cucullata*	V	–	O
Little Eagle	*Hieraaetus morphnoides*	V	–	O
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V	–	O
Redthroat	*Pyrrholaemus brunneus*	V	–	O
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	T
Inland Forest Bat	*Vespadelus baverstocki*	V	–	T
Little Pied Bat	*Chalinolobus picatus*	V	–	T

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

(2) V = Vulnerable, E = Endangered, M = Migratory 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 three threatened microbat species were recorded via Harp trapping within the proposal study area (Figure 3.1).

SAII ENTITIES

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

- Black-eared Miner
- Curlew Sandpiper
- Plains-wanderer
- Red-lored Whistler
- Striated Grasswren, and
- Swift Parrot.

3.2.3 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.

Areas of mapped key fish habitat have been considered to provide moderate likelihood of occurrence for three threatened fish species (see Appendix B for further detail). These species are:

- Murray Cod (*Maccullochella peelii*)
- Murray Hardyhead (*Craterocephalus fluviatilis*)
- Silver Perch (*Bidyanus bidyanus*).

Impacts from the proposal on aquatic habitats, particularly mapped key fish habitats (Strahler 4/5th Order streams) are considered likely to be low and would mostly span 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.

3.2.4 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
- Lowland Murray River aquatic ecological community.

As a minimum the proposal would impact on the Lowland Darling River aquatic ecological community, as it crosses the Great Darling Anabranch, Darling River 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 PCT 15 and 16, and possibly wetlands which occur on the floodplains of these river systems. This would need to be verified through the planned field surveys.

3.2.5 NATIONAL PARKS, STATE FORESTS AND CONSERVATION AREAS

Within the broader locality, important biodiversity values are known to occur within a range of conservation areas including National Parks, State Forest and other protected areas. No direct impacts are known within the proposal study area. An overview of recorded conservation areas is provided below.

3.2.5.1 NSW NATIONAL PARKS

No NSW National Parks are within the proposal study area. Two NSW National Parks occur within a 10-km radius of the proposal study area (Figure 3.1), these include:

- Mallee Cliffs National Park; and
- Kemendok National Park.

3.2.5.2 NSW STATE FORESTS

No NSW State Forests are within the proposal study area.

3.2.5.3 SA NATIONAL PARKS

Multiple South Australian National Park occur to the west of the proposal study area, the closest one being 3 km to the west. These includes Murray River National Park, Chowchilla Game Reserve and Danggali Conservation Park. Kings Billabong Park also occurs to the south of Murray River near the Red Cliffs connection, in South Australia.

3.2.5.4 OTHER PROTECTED AREAS

Other protected areas have also been recorded outside the proposal study area but within a 10-km radius of the proposal locality and are listed below.

- Southern Mallee Protected Area (Department of Environment and Energy)
- River Murray Reserve.

3.3 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

3.3.1 THREATENED ECOLOGICAL COMMUNITIES

Based on broad scale state vegetation mapping and database searches a total of two candidate threatened ecological communities listed under the EPBC Act were considered likely to occur. These are:

- Buloke (*Allocasuarina luehmannii*) Woodlands of the Riverina and Murray-Darling Depression Bioregions
- Coolibah (*Eucalyptus coolabah*) – Black Box (*Eucalyptus largiflorens*) Woodlands of the Darling Riverine Plains and the Brigalow Belt of South Bioregion.

Neither of these, or any other threatened ecological communities listed under the EPBC Act were recorded within the proposal study area during preliminary field investigations.

3.3.2 THREATENED FLORA

Database searches have identified a total of 15 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 6 threatened flora species to have a moderate or higher likelihood of occurrence within the proposal study area (see Appendix A for further detail).

3.3.3 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 18 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, one threatened fauna species listed under the EPBC Act have already been recorded within the proposal study area during field surveys; Corben’s Long-eared Bat.

3.3.4 MIGRATORY BIRD SPECIES

Database searches have identified a total of 25 migratory and marine bird species, listed under the EPBC Act, that are predicted or known to occur within the proposal locality.

The results of likelihood of occurrence assessments for these migratory and marine bird species identify that 21 species have a moderate or higher likelihood of occurrence within the proposal study area (see Appendix B for further detail). Of these, three Migratory/Marine and two Marine listed species under the EPBC Act have been recorded within the proposal study area during field surveys (Table 3.5).

Table 3.5 Migratory and Marine listed species under the EPBC Act recorded within the proposal study area

COMMON NAME	SPECIES NAME	BC ACT[1]	EPBC ACT[2]
Pectoral Sandpiper	*Calidris melanotos*	n/a	Migratory/Marine
Sharp-tailed Sandpiper	*Calidris acuminata*	n/a	Migratory/Marine
Red-necked Stint	*Calidris ruficollis*	n/a	Migratory/Marine
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Vulnerable	Marine
Rainbow Bee-eater	*Merops ornatus*	n/a	Marine

(1) Vulnerable under the BC Act

(2) Listed Migratory or Marine under the Commonwealth EPBC Act.

3.3.5 WORLD AND NATIONAL HERITAGE

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

Willandra Lake Region is listed as both a National and World Heritage area and is located to the north-east of Buronga, approximately 50-km to the north.

3.3.6 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.

3.3.6.1 NATIONALLY IMPORTANT WETLANDS

No nationally important wetlands are within the proposal study area within NSW.

In Victoria, if the Victorian section follows the current preliminary route it would cross the Murray River and traverse the edge of King Billabong Wetland, a nationally important wetland.

3.3.6.2 WETLANDS OF INTERNATIONAL IMPORTANCE (RAMSAR WETLANDS)

Three RAMSAR wetlands or Wetlands of International importance were identified by database searches. One of these is within 10 km of the proposal study area:

- Riverland – in Chowchilla Game Reserve, located 3 km to the south-west of the SA/NSW state border at western end of the proposal, located in South Australia.

4 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 3.1) 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 SAII 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 2 biodiversity constraints are:

- threatened species (flora/fauna) – other non-SAII 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 3 km of existing alignment)
- threatened ecological communities listed under the BC Act (non-SAII)
- 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 40m riparian buffer on these features as outlined under Table 14 of the BAM.

5 FUTURE APPROACH

5.1 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 OEH for the identification of Category 1 land to be excluded from the BAM in accordance with the Native vegetation regulatory map: method statement (2017) is recommended. 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 was 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.

A 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, it is the proposed Category 1-exempt land is likely to be provided to OEH for an initial meeting and confirmation.

5.2 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.

5.3 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 with the proposal study area and these will continue throughout 2020. 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.

5.4 PRELIMINARY RECOMMENDATIONS FOR AVOIDANCE

Based on preliminary field surveys and desktop assessment within the proposal study area the preliminary recommendations regarding the proposal include:

- Avoidance wherever possible of areas that have been identified with threatened ecological communities under both BC Act and EPBC Act, as part of any revised or final alignment design.
- It is recommended that avoidance of all threatened flora species recorded wherever possible is implemented as part of any revised or final alignment design. Of particular importance, will be to maximise avoidance of impacts to the Critically Endangered listed *Dodonaea stenozyga* (Desert Hopbush) as part of the final proposal design. Where alignment changes are proposed, it is recommended that these areas are also inspected to ensure no threatened flora species occur.
- It is recommended that removal of intact Mallee Low Woodland is avoided, where possible, to minimise impacts on threatened microbats and minimise offset obligations. Where alignment changes are proposed, it is recommended that these areas are surveyed to ensure no other threatened fauna species occur.
- Further surveys should be considered in the northern portion of the proposal study area where Corben's Long-eared Bat (*Nyctophilus corbeni*) were recorded to gain a better understanding of their population dynamics and use of the study area.

6 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 plant community types (PCTs) identified are considered to be form potential Threatened Ecological Communities. These PCTs are considered to potentially form two 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)
- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion (recorded within proposal study area)

No threatened ecological communities listed under the EPBC Act have been recorded within proposal study area during preliminary surveys.

Given the biologically diverse environment, database searches have identified a total of 40 threatened flora species listed under the BC Act as predicted or recorded to occur within the broader locality of the proposal study area, including 15 threatened flora species listed under the EPBC Act. In addition, a total of 137 threatened fauna species listed under the BC Act have been identified as predicted or recorded to occur within the broader locality, with 49 listed under the EPBC Act.

Preliminary field investigations recorded three threatened flora species within the proposal study area. Of particular importance, was the identification of the Critically Endangered *Dodonaea stenozyga* (Desert Hopbush) within the proposal study area. In addition, 14 threatened flora species listed under the BC Act, and six threatened flora species listed under the EPBC Act, are predicted to have a moderate or high likelihood of occurrence within the proposal study area

Preliminary field investigations also identified 10 threatened fauna species within the proposal study area. In addition, 57 threat listed fauna species under the BC Act are predicted to have a moderate or high likelihood of occurrence within the proposal study area. As well as 18 threatened fauna species, as listed under the EPBC Act, are predicted have a moderate or higher likelihood of occurrence within the proposal study area

Desktop assessment and likelihood assessment identified 20 migratory and/or marine bird species, listed under the EPBC Act, with moderate or higher potential to occur within the proposal study area. Of these, five migratory and/or marine bird species have been recorded within the proposal study area during preliminary field investigations.

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

A Biodiversity Development Assessment Report would need to be prepared as part of the EIS, which would further identify and clarify the potential significance of biodiversity impacts associated with the proposal. The BDAR would be prepared in accordance with BC Act and BAM. Further targeted detailed threatened species seasonal survey will be required to ensure compliance with the BAM along with vegetation integrity plot based native vegetation surveys.

Potential measures would be identified to avoid and minimise any adverse biodiversity effects and further detailed design 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 is considered highly likely.

7 LIMITATIONS

7.1 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.

7.2 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.

7.3 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.

7.4 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.

7.5 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.

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APPENDIX A

THREATENED FLORA LIKELIHOOD OF OCCURRENCE

A1 THREATENED FLORA LIKELIHOOD OF OCCURRENCE

Table A.1 Threatened flora likelihood of occurrence

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Acacia acanthoclada	Harrow Wattle	E	–	No	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	Recorded.
Acacia carneorum	Purple-wood Wattle	V	V	No	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 and PCT 21.	Professional opinion	Low. Although associated habitat occurs within the study area, the species was not recorded during targeted surveys and there are no records within 100 km of the proposal. Therefore, the species is considered unlikely to occur.
Acacia currani	Curly-bark Wattle	V	V	No	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.
Acacia notabilis	Mallee golden Wattle	E	–	No	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. The only record from the locality is about 12 km to the south at Red Cliff Scenic Reserve where the species is considered planted.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Acacia phasmoides	Phantom Wattle	V	V	No	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.
Atriplex acutiloba	–	EX	–	No	Little known. Found in arid areas in western NSW and South Australia. In NSW, it is considered likely to occur in similar habitat to *Atriplex velutinella* which grows in sandy or saline areas.	Professional opinion	Moderate. Although the species is presumed extinct in NSW, there are three records south of Balranald (recorded in 2017). Potential habitat recorded in the study area.
Atriplex infrequens	A Saltbush	V	V	No	*Atriplex infrequens* 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 164; 166; 170.	Professional opinion PMST	Moderate. Associated vegetation types occur within the study area.
Austrostipa metatoris	A spear-grass	V	V	No	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 19; 170.	BioNet;	Moderate. Associated vegetation types occur within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Austrostipa nullanulla	A spear-grass	E	–	Yes	Within the Murray Mallee it is restricted to gypseous lunettes and copi rises 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. Associated vegetation types recorded within the study area include PCT 152 and PCT 154.	Professional opinion	Moderate. Potential habitat recorded in the study area and species has been recorded in proximity to the study area.
Brachyscome papillosa	Mossgiel Daisy	V	V	No	Recorded primarily in clay soils on Bladder Saltbush (*Atriplex vesicaria*) and Leafless Bluebush (*Maireana aphylla*) plains, but also in grassland and in Inland Grey Box (*Eucalyptus microcarpa*) - Cypress Pine (*Callitris* spp.) woodland. Associated vegetation types within the study area: PCT 15; 16; 152; 154; 164.	BioNet; PMST	Moderate. Associated vegetation types occur within the study area.
Caladenia tensa	Greencomb Spider-orchid	–	E	No	The rigid spider-orchid occurs in *Callitris* spp. (cypress pine), *Eucalyptus leucoxylon* (yellow gum) woodland and *Melaleuca uncinata* (broombush) mallee on Tertiary and Quaternary aeolian sandy loams in the Murray-Darling Depression bioregion. PCT association unknown.	PMST	Low. Preferred habitat not recorded and no records within the locality.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Casuarina obesa	Swamp She-oak	E	–	Yes	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. Species has a highly restricted distribution in NSW, largely confined to a known population on the shores of Lake Benanee, northwest of Robinvale. Potential habitat may occur within the Red Cliffs portion of the study area.
Codonocarpus pyramidalis	–	EX	V	No	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. Species is now considered extinct in NSW, nearest records >60 km north east from 1919 and 1920.
Cratystylis conocephala	Bluebush Daisy	E	–	No	Bluebush Daisy grows in mallee with areas of Belah (*Casuarina pauper*) 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 study area.PCT 58; 170; 171.
Distichlis distichophylla	Australian Saltgrass	E	–	No	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.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Dodonaea sinuolata subsp. acrodentata	A Hopbush	E	–	Yes	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; 143.	Professional opinion	Low. Whilst associated habitat occurs, based on the restricted distribution of this species it is considered unlikely to occur within the study area.
Dodonaea stenozyga	Desert Hopbush	CE	–	Yes	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	Recorded.
Dysphania plantaginella	–	E	–	Yes	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 166.	Professional opinion	Low. Study area occurs outside the species known distribution, only a single record in NSW, near Ivanhoe.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Eleocharis obicis	Spike-Rush	V	V	No	Grows in ephemerally 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 11; 164.	BioNet	Low. Although associated vegetation types occur within the study area, the study area is outside the distribution of this species (i.e. west of Robinvale). There is a single record to the north of the study area however this is greater than 200 km from the study area (north of Broken Hill). Therefore the species is considered unlikely to occur.
Erodiophyllum elderi	Koonamore Daisy	E	–	Yes	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.
Eucalyptus leucoxylon subsp. *pruinosa*	Yellow Gum	V	–	No	*Eucalyptus leucoxylon* subsp. *pruinosa* 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; 15; 16; 19.	BioNet	Low. Although associated habitat was recorded the species was not observed during surveys completed and the nearest record is approx. 50 km east of the study area in Robinvale (historic record from 1922).

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Kippistia suaedifolia	Fleshy Minuria	E	–	No	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	Moderate. Potential habitat occurs in the study area.
Lasiopetalum behrii	Pink Velvet Bush	CE	–	Yes	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 Pooncarie 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	Low. Although associated vegetation types occur the species was not recorded during surveys completed.
Lepidium monoplocoides	Winged Peppercress	E	E	No	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 *Allocasuarina luehmannii* (Bulloak) and/or eucalypts, particularly *Eucalyptus largiflorens* (Black Box) or *Eucalyptus populnea* (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. Associated vegetation types within the study area: PCT 15; 16; 170.	BioNet, PMST	Moderate. Associated vegetation types occur within the study area and requires targeted surveys following rain.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Leptorhynchos waitzia	Button Immortelle	E	–	Yes	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 170.	Professional opinion	Low. Although PCT 170 is widespread throughout the study area, most of it is highly disturbed due to heavy grazing pressures. Records within the greater locality are also scarce (two records in proximity to Mildura) and historic (187 and 1889). Therefore, the species is considered unlikely to occur.
Maireana lanosa	Woolly Bluebush	EX	–	No	*Maireana lanosa* is found in red sand or loam on saline flats or floodplains. This species is presumed extinct in NSW.	Professional opinion	Low. Presumed extinct in NSW, targeted during broader threatened species searches.
Pilularia novae-hollandiae	Austral Pillwort	E	–	Yes	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. No associated vegetation types within the study area.	BioNet	Low No associated vegetation types occur within the study area. Record within locality (near Mildura) is from 1986 and is not known to form part of a known extant population in NSW (EES Group species profile). Furthermore, no predicted habitat or known habitat occurs within the locality of the study area (EES Group species profile).

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Pimelea serpyllifolia subsp. *serpyllifolia*	Thyme Rice-Flower	E	–	Yes	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 study area, including areas near Red Cliffs which have not yet been surveyed yet.
Pterostylis cheraphila	Floodplain Rustyhood	–	V	No	*Pterostylis cheraphila* is endemic to western Victoria, centred around Dimboola and Murtoa. It grows in open *Eucalyptus largiflorens/Eucalyptus leucoxylon* 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.
Pterostylis cobarensis	Cobar Rustyhood	V	–	No	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. Although associated PCTs were recorded the study area occurs outside the known distribution of this species. Nearest records of the species to the study area are two record near Ivanhoe from 2011. Outside of these the closest records are greater than 200 km from the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Santalum murrayanum	Bitter Quandong	E	–	No	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 *Eucalyptus socialis* and *Pimelea microcephala*. 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	Recorded.
Solanum karsense	Menindee Nightshade	V	V	No	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 15; 16; 166.	BioNet, PMST	Moderate. Associated habitat occurs within the area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Swainsona adenophylla	Violet Darling Pea	E	–	Yes	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; 15.	Professional opinion	Low. No records in the locality, distribution is restricted to the Menindee region.
Swainsona colutoides	Bladder Vetch	E	–	No	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. Vegetation associations recorded in the study area and species has been recorded in the greater locality. Species is a drought affected species, targeted surveys following rain required to confirm absence.
Swainsona flavicarinata	Yellow-Keeled Swainsona	E	–	Yes	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. No associated vegetation types within the study area.	Professional opinion	Low. No associated habitat recorded. And study area outside the species known distribution in NSW (restricted to Broken Hill region).

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Swainsona murrayana	Slender Darling Pea	V	V	No	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.	PMST	Low. Although associated habitat was recorded, the study area occurs outside the species known distribution in NSW. The nearest record occurs greater than 150km away and majority of records occur east of Balranald.
Swainsona pyrophila	Yellow Swainson-pea	V	V	No	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 *Eucalyptus dumosa* 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 habitat occurs, no targeted surveys completed in Red Cliffs section of the study area and species has been recorded nearby.
Swainsona sericea	Silky Swainson-pea	V	–	No	Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. No vegetation associations recorded in study area.	BioNet	Moderate. Although no vegetation associations recorded, species has been recorded frequently near Red Cliffs. Field validation of vegetation types at this location needed.
Tecticornia flabelliformis	Bead Glasswort	–	V	No	The Bead Glasswort *Tecticornia flabelliformis* 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. Preferred habitat not recorded and study area outside species known distribution.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Wilsonia rotundifolia	Round-leafed Wilsonia	E	–	No	Grows in mud in coastal saltmarsh and inland saline or brackish lake beds. Associated vegetation types recorded within the study area: PCT 63 and PCT 163.	BioNet	Low. Only small areas of marginal quality habitat were identified; the species was not recorded during surveys.

(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 THREATENED FAUNA LIKELIHOOD OF OCCURRENCE

Table B.1 Threatened fauna likelihood of occurrence

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Amphibians							
Booroolong Frog	*Litoria booroolongensis*	E	E	No	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	Low. Lack of suitable associated habitat.
Painted Burrowing Frog	*Neobatrachus pictus*	E	–	No	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 recorded.
Sloane's Froglet	*Crinia sloanei*	V	–	No	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	Low. Associated habitat in the form of water bodies recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Southern Bell Frog	*Litoria raniformis*	E	V	No	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.** Scattered records within locality. Associated habitat in the form of water bodies recorded.
Birds							
Australasian Bittern	*Botaurus poiciloptilus*	E	E	n/a	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis 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.
Australian Bustard	*Ardeotis australis*	E	–	No	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	*Rostratula australis*	E	E	N/a	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	*Ninox connivens*	V	–	No	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 habitat recorded within the study area.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Bar-tailed Godwit	*Limosa lapponica baueri*	–	VM	N/a	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.
Bar-tailed Godwit	*Limosa lapponica menzbieri*	–	CEM	N/a	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.
Black Falcon	*Falco subniger*	V	–	n/a	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	*Hamirostra melanosternon*	V	–	No	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	**Recorded** Associated habitat recorded within study area.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	–	N/a	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi)* and Forest Red Gum (*E. tereticornis*).	BioNet	Low. Lack of suitable associated habitat.
Black-eared Miner	*Manorina melanotis*	CE	E	Yes	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 habitat recorded within the study area.
Black-necked Stork	*Ephippiorhynchus asiaticus*	E1	–	N/a	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	Low. Rare occurrences cannot be discounted.
Black-tailed Godwit	*Limosa limosa*	V	M	No	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.
Blue-billed Duck	*Oxyura australis*	V	–	N/a	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 study area, species may occur during migration movements and dispersal during the breeding season.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Brolga	*Grus rubicunda*	V	–	N/a	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)	*Climacteris picumnus victoriae*	V	–	N/a	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 (*Eucalyptus camaldulensis*) 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	Low. Outside the known distribution for this species. The nominate race *Climacteris picumnus picumnus* was recorded within the proposal study area
Bush Stone-curlew	*Burhinus grallarius*	E	–	No	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	BioNet	Low. Associated habitat recorded in riparian areas.
Caspian Tern	*Hydroprogne caspia*	–	M	N/a	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	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Cattle Egret	*Ardea ibis*	–	M	N/a	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	Low. Marginal suitable habitat available. Rare occurrences during migration.
Chestnut Quail-thrush	*Cinclosoma castanotum*	V	–	N/a	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	*Tringa nebularia*	–	M	N/a	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]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Common Sandpiper	*Actitis hypoleucos*	–	M	N/a	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	*Calidris ferruginea*	E	CE	Yes	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.
Diamond Firetail	*Stagonopleura guttata*	V	–	N/a	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.
Double-banded Plover	*Charadrius bicinctus*		M	–	The Double-banded Plover is found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers. It is sometimes associated with coastal lagoons, inland saltlakes, exposed seagrass beds, exposed reefs and rock platforms and coastal sand dunes	PMST	Low. Mainly restricted to coastal environments.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	–	N/a	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.
Eastern Curlew	*Numenius madagascarensis*	–	CEM	–	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	*Pandion cristatus*	V	M	No	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes.	BioNet	Low. Lack of suitable associated habitat.
Flame Robin	*Petroica phoenicea*	V	–	N/a	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys.	BioNet	Low. Lack of suitable associated habitat.
Fork-tailed Swift	*Apus pacificus*	–	M	N/a	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.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Freckled Duck	*Stictonetta naevosa*	V	–	N/a	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.
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	–	No	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	Low. Lack of suitable associated habitat.
Gilbert's Whistler	*Pachycephala inornata*	V	–	N/a	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' (Exocarpus species) appear to be an important habitat component in Belah and Red Gum communities, though in the latter case other dense shrubs, such as Lignum and wattles, are also utilised.	BioNet	**Moderate.** Known to occur within locality.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	–	No	Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, *Allocasuaraina diminuta*, and *A. gymnathera*. 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 (*Casuarina cristata*).	BioNet	**Moderate.** Known to occur within locality, and potential habitat; PCT 58 – Black Oak – Western Rosewood recorded within the study area.
Glossy Black-Cockatoo, Riverina population	*Calyptorhynchus lathami*	E	–	–	This population now occurs west of longitude 146º 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 (*Allocasuarina verticillata*) remain.	BioNet	**Moderate.** Known to occur within locality, PCT 58 – Black Oak – Western Rosewood was recorded within the study area. .
Glossy Ibis	*Plegadis falcinellus*	–	M	N/a	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	*Calidris tenuirostris*	V	CEM	Yes	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	*Falco hypoleucos*	E	–	N/a	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 study area.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Grey Plover	*Pluvialis squatarola*	–	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.
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	–	N/a	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	**Moderate** Associated habitat recorded within the study area.
Gull-billed Tern	*Gelochelidon nilotica*	–	M	N/a	Prefer shallow, often ephemeral, terrestrial wetlands, either fresh or saline, especially lakes, swamps and lagoons, particularly those with mudflats; sometimes on inundated ground, including saltpans, claypans and saltmarsh or watercourses and associated floodplains.	BioNet	**Moderate.** May occur intermittently in wetland habitats.
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	–	N/a	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	**Recorded** Associated habitats including Mallee and Arid Shrublands recorded within the study area.
Latham's Snipe	*Gallinago hardwickii*	–	M	N/a	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	*Numenius minutus*	–	M	N/a	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.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Little Eagle	*Hieraaetus morphnoides*	V	–	No	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	BioNet	**Recorded** Associated habitat recorded.
Little Lorikeet	*Glossopsitta pusilla*	V	–	N/a	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	Low. Lack of suitable associated habitat.
Little Stint	*Calidris minuta*	–	Ma	N/a	Little Stint is migratory a shorebird species.	BioNet	**Moderate.** May occur intermittently in wetland habitats.
Long-toed Stint	*Calidris subminuta*	–	M	N/a	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	*Anseranas semipalmata*	V	–		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	*Lophochroa leadbeateri*	V	–	No	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	**Recorded.** Associated habitat including Saltbush, Arid Shrubland and Cypress Pine communities recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Mallee Emu-wren	*Stipiturus mallee*	–	E	N/a	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.
Malleefowl	*Leipoa ocellata*	E	V	N/a	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	**Moderate.** Associated Mallee communities, recorded.
Marsh Sandpiper	*Tringa stagnatilis*	–	M	N/a	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	*Tyto novaehollandiae*	V	–		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	Low. No records within the locality. Rare occurrences along riparian habitats cannot be discounted.
Night Parrot	*Pezoporus occidentalis*	X	E	N/a	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 Though not previously recorded within locality. Associated habitats recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Pacific Golden Plover	*Pluvialis fulva*	–	M	N/a	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.
Painted Honeyeater	*Grantiella picta*	V	V	N/a	Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) 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 Amyema.	BioNet, PMST	Low. No associated habitat recorded.
Pectoral Sandpiper	*Calidris melanotos*	–	M	N/a	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	**Recorded.** Recorded within Chowilla regional reserve. May occur intermittently in wetland habitats.
Pied Honeyeater	*Certhionyx variegatus*	V	–	N/a	Inhabits wattle shrub, primarily Mulga (*Acacia aneura*), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering; feeds on nectar, predominantly from various species of emu-bushes (*Eremophila spp.*); also from mistletoes and various other shrubs (e.g. *Grevillea spp.);* also eats saltbush fruit, berries, seed, flowers and insects.	BioNet	**Moderate.** Associated habitats, including Mallee and River Red Gum woodlands recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Plains-wanderer	*Pedionomus torquatus*	E	CE	Yes	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	**Moderate.** Associated vegetation recorded within the area.
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	V	–	N/a	Distribution is centred 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. This study area is on the fringe of the populations distribution. Rare occurrences during favourable conditions cannot be discounted.
Purple-gaped Honeyeater	*Lichenostomus cratitius*	V	–	N/a	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, and River Red Gum Woodland communities, recorded.
Rainbow Bee-eater	*Merops ornatus*	–	Ma	N/a	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.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Red Knot	*Calidris canutus*	–	E	No	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	*Pachycephala rufogularis*	CE	V	Yes	Found in mallee woodland with a shrub layer, usually of Broombush and native pine such as Mallee Pine (*Callitris verrucosa*), 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.
Red-necked Stint	*Calidris ruficollis*	–	M	N/a	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	**Recorded.** Recorded within Chowilla regional reserve.
Redthroat	*Pyrrholaemus brunneus*	V	–	No	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	**Recorded.** Associated habitats including Saltbush, Canegrass and Chenopod communities, recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Yes	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	Low. Not recorded west of Balranald.
Regent Parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	E	V	No	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	**Moderate**. Frequently recorded within locality. Associated habitat recorded.
Ruddy Turnstone	*Arenaria interpres*	–	M	N/a	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	*Philomachus pugnax*	–	M	N/a	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 of 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.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Rufous Fieldwren	*Calamanthus campestris*	V	–	N/a	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. Associated habitats including Saltbush and Bluebush communities, recorded.
Scarlet Robin	*Petroica boodang*	V	–	N/a	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	*Calidris acuminata*	–	M	N/a	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	**Recorded.** Recorded within Chowilla regional reserve. May occur intermittently in wetland habitats.
Shy Heathwren	*Hylacola cautus*	V	–	N/a	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	*Drymodes brunneopygia*	V	–	N/a	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.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Speckled Warbler	*Chthonicola sagittata*	V	–	N/a	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 recorded.
Spotted Harrier	*Circus assimilis*	V	–	N/a	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 study area traverses suitable habitat.
Square-tailed Kite	*Lophoictinia isura*	V	–	No	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.
Striated Grasswren	*Amytornis striatus*	V	–	Yes	Confined to areas with mature spinifex (*Triodia irritans*), 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 habitat recorded.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Superb Parrot	*Polytelis swainsonii*	V	V	No	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	Low. Lack of suitable associated habitat.
Swift Parrot	*Lathamus discolor*	E	CE	Yes	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 *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Forest Red Gum *E. tereticornis*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*.	BioNet, PMST	**Moderate.** Associated habitats, including River Red Gum riparian communities, recorded.
Turquoise Parrot	*Neophema pulchella*	V	–	N/a	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. May occur intermittently to utilise marginal foraging habitats.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Varied Sittella	*Daphoenositta chrysoptera*	V	–	N/a	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 decorticating 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	*Numenius phaeopus*	–	M, Ma	N/a	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	*Haliaeetus leucogaster*	V	-	No	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	**Moderate.** May occur intermittently in wetland habitats

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
White-browed Treecreeper population in Carrathool local government area south of the Lachlan River and Griffith local government area	*Climacteris affinis*	E	–	No	This Endangered population is recognised within the Griffith and Carrathool local government area.	BioNet	Low. Study area is outside of populations recognised distribution.
White-fronted Chat	*Epthianura albifrons*	V	–	N/a	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.** The study area traverses suitable habitat.
White-throated Needletail	*Hirundapus caudacutus*	–	V/M	N/a	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 study area on a seasonal basis.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
White-winged Black Tern	*Chlidonias leucopterus*	–	M	N/a	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.
Wood Sandpiper	*Tringa glareola*	–	M, Ma	N/a	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 *Eucalyptus camaldulensis* 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	*Bidyanus bidyanus*	–	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 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]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Murray Hardyhead	*Craterocephalus fluviatilis*	–	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 study area traverses Local Government Areas that contain mapped key fish habitats (Strahler 4/5 Order streams).
Flathead Galaxias	*Galaxius rostratus*	–	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	Low. Current known distributions do not include habitats within the locality.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Murray Cod	*Maccullochella peelii*	–	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 study area traverses Local Government Areas that contain mapped key fish habitats (Strahler 4/5 Order streams).
Trout Cod	*Maccullochella macquariensis*	–	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	Low. Current known distributions do not include habitats within the locality.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Macquarie Perch	*Macquaria australasica*	–	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	Low. Current known distributions do not include habitats within the locality.
Mammals							
Kultarr	*Antechinomys laniger*	E	–	n/a	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. 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	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Desert Mouse	*Pseudomys desertor*	CE	–	Yes	Most records of the Desert Mouse come from sand dune or sand plain habitats dominated by Spinifex (T*riodia* 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. It is considered unlikely that this species persists, however its presence cannot be entirely discounted due to the Spinifex habitats in the locality.
Southern Ningaui	*Ningaui yvonneae*	V	–	n/a	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	Low. 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	*Dasyurus maculatus*	V	E	n/a	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	Low. Unlikely to occur. No records within the locality.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Brush-tailed Rock Wallaby	*Petrogale penicillata*	E	V	Yes	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. No records for this species occur within the locality.
Western Pygmy Possum	*Cercartetus concinnus*	E	–	n/a	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 (*Triodia* spp.) or with an understorey of tea-tree (*Leptospermum* spp.) and also in Belah (*Casuarina pauper*) 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 Morrant & Petit 2012).	Bionet	**Moderate.** Numerous records within locality and the study area traverses suitable habitat.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Red-tailed Phascogale	*Phascogale calura*	X	V	n/a	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	*Petaurus norfolcensis*	V	–	No	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	Low. No records for this species occur within the locality.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Squirrel Glider in the Wagga Wagga Local Government Area	*Petaurus norfolcensis*	E	–	No	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	Low. Outside the distribution of this LGA.
Greater Glider	*Petauroides volans*	–	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	Low. No records for this species occur within the locality.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Koala	*Phascolarctos cinereus*	V	V	No	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	Low. Outside known distribution, no records within the area.
Grey-headed Flying-Fox	*Pteropus poliocephalus*	V	V	No	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	Low. Outside known distribution, no records within the area.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Little Pied Bat	*Chalinolobus picatus*	V	–	n/a	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	**Recorded.** Trapped in open woodland, River Red Gum Woodland and Mallee/Black Oak woodland.
Southern Myotis	*Myotis macropus*	V	–	No	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	Low. This species is rarely found more than 100 km inland (except along major rivers).
Eastern Bent-wing Bat	*Miniopterus schreibersii oceanensis*	V	–	Yes	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	Low. Outside the known distribution for this species.
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	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	Low. Outside the known distribution for this species.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	–	n/a	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 study area occurs in habitats where this species known distribution is mapped.
Inland Forest Bat	*Vespadelus baverstocki*	V	–	n/a	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.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	n/a	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, bulloke 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 Mallee woodland.
Reptiles							
Bardick	*Echiopsis curta*	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 study area occurs in habitats where this species known distribution is mapped.
Mallee Worm-lizard	*Aprasia inaurita*	E	–	n/a	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 Triodia scariosa. Shelters in sand, leaf litter, insect nests and under mallee stumps.	Bionet	**Moderate.** The study area occurs in habitats where this species known distribution is mapped.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Marble-faced Delma	*Cyclodomorphus melanops elongatus*	E	–		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 study area occurs in habitats where this species known distribution is mapped.
Jewelled Gecko	*Strophurus elderi*	V	–	n/a	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 (Triodia spp.) habitats on red sand plains and dunes, from Spinifex grasslands to Acacia or mallee woodlands with a Spinifex understory.	Bionet	**Moderate.** The study area occurs in habitats where this species known distribution is mapped.
Mallee Slender Blue-tongue Lizard	*Cyclodomorphus melanops elongatus*	E	–	n/a	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 (Triodia spp.) understory, on sandy or sandy/gravel plains, ridges and hillslopes.	Bionet	**Moderate.** The study area occurs in habitats where this species known distribution is mapped.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Pink-tailed Worm-Lizard	*Apraisia parapulchella*	V	V	No	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 (*Themeda australis*). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. 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.	Professional Opinion	Low. Outside the known distribution for this species.

COMMON NAME	SCIENTIFIC NAME	BC ACT[1]	EPBC ACT[2]	SAII	ASSOCIATED HABITAT	SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Striped Legless Lizard	*Delma impar*	V	V	No	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. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass *Themeda australis*, spear-grasses *Austrostipa* spp. and poa tussocks *Poa* spp., and occasionally wallaby grasses *Austrodanthonia* spp. 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.	Professional Opinion	Low. Outside the known distribution for this species.
Yellow-tailed plain slider	*Lerista xanthura*	V	–	No	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 study area occurs in habitats where this species known distribution is mapped.
Western Blue-tongued Lizard	*Tiliqua occipitalis*	V	–	n/a	Arid areas, often associated with mallee and spinifex. Found in a variety of xeric habitats, often in close association with mixed mallee/ *Triodia* communities(Cogger, 2000)(Cogger, 2000)(Cogger, 2000)(Cogger, 2000)(Cogger, 2000).	Bionet	**Moderate.** The 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 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

ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With approximately 48,000 talented people globally, we engineer projects that will help societies grow for lifetimes to come.

Appendix B Preliminary Desktop Cultural Heritage Assessment Report

EnergyConnect

NSW – Western Section

Public Version – all Aboriginal site location information removed

May 2020

Navin Officer

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EXECUTIVE SUMMARY

This Environmental Scoping Report refers to the components of EnergyConnect from the border of South Australia (SA) and New South Wales (NSW) to Buronga, incorporating a bifurcation towards the border of NSW and Victoria at Monak (the proposal). For the components of EnergyConnect that are located in SA, VIC, or other sections within NSW, environmental planning approvals would be sought separately under the relevant jurisdictions.

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.

This study provides a preliminary desktop heritage assessment of Aboriginal and non-Aboriginal heritage of a broad 10km heritage study corridor which encompasses the proposal study area and some additional buffer area.

Aboriginal Heritage

A total of forty-three (43) Aboriginal heritage items/recordings are included on the OEH Aboriginal Heritage Information Management System (AHIMS) within the 1km proposal study area between the SA/NSW border and Buronga. No Aboriginal heritage items have been recorded in the 200m wide branch of the proposal that extends towards the Victorian border near Monak.

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. A total of two hundred and eighty-nine (289) 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

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. It should be noted that many of the 289 sites display multiple archaeological and/or non-archaeological features within each recording.

Non-Aboriginal Heritage

Three (3) sites have curtilages that are located entirely or partially within the proposal study area. These sites are listed on the Wentworth Council Local Environmental Plan (LEP). A further four (4) sites have curtilages that are located entirely or partially within the heritage study corridor and are locally listed on the Wentworth LEP. No Commonwealth listed items were found within the proposal study area or the heritage study corridor.

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1. INTRODUCTION

1.1 Project Description

This Environmental Scoping Report refers to the components of EnergyConnect from the border of South Australia (SA) and New South Wales (NSW) to Buronga, incorporating a bifurcation towards the border of NSW and Victoria (VIC) at Monak (the proposal). For the components of EnergyConnect that are located in SA, VIC, or other sections within NSW, environmental planning approvals would be sought separately under the relevant jurisdictions.

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It is expected that construction of the proposal would commence in 2021. It is anticipated that the energisation of the proposal is expected to occur in 2022.

The key components of the proposal include:

- Construction of new transmission lines and associated infrastructure between the SA/NSW border near Chowilla and the existing Buronga substation;
- An upgrade to the existing single circuit transmission line to a 220 kV double circuit transmission line between the Buronga substation and the NSW/VIC border at Monak, near Red Cliffs;
- Expansion of the existing Buronga 220 kV substation to an operating capacity of 330 kV;
- Establishment and upgrade of access tracks and roads at the substation and transmission line structures, 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 Proposal would traverse around 160 kilometres, typically in an east-west alignment across south western NSW between the SA/NSW border and Buronga, with an added north-south section to the NSW/Victoria border at Monak, near Red Cliffs. Along the corridor, the Proposal would mainly traverse the Murray Darling Depression bioregions, whilst also briefly interacting with waterways and lakes that are part of the Riverina and Darling Riverine Plains bioregions.

The Proposal would typically traverse areas of rural land, and land that has been developed primarily for agricultural uses including irrigated horticulture, 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.

The Murray River and Darling River systems and their major and minor tributaries and lakes, are key environmental features within the region. 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.

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.

1.2 Report Terminology

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

- **EnergyConnect:** an interconnector of about 700 km between the power grids of SA and NSW, with an added connection to north-west VIC
- **The proposal:** the components of EnergyConnect between SA/NSW border and Buronga, and extending to the NSW/VIC border at Monak
- **The proposal study area:** The study area for this report typically comprises:
    - a one km wide corridor between the SA/NSW border and Buronga
    - a 200 metre corridor from Buronga substation to the NSW/VIC border at Monak, near Red Cliffs (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 the SA/NSW border and Buronga and down to the NSW/VIC border at Monak (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 project 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 3.5;
- 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.

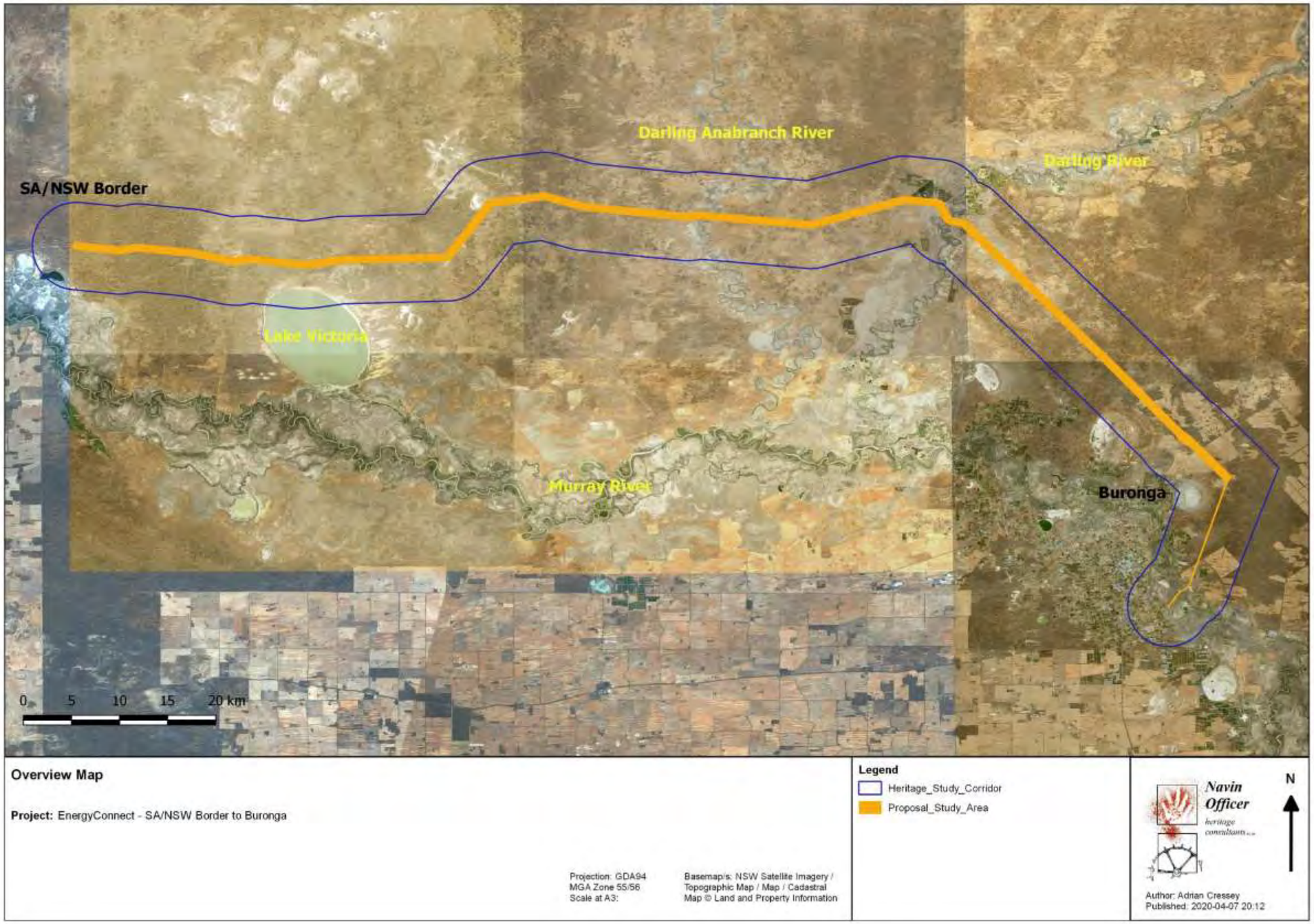

Figure 1.1 Overview of the proposal study area and heritage study corridor

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 its surrounds. 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 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 Wentworth Local Environmental Plan.

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, or from the historical record. An Aboriginal site may have both archaeological and intangible values.

Archaeological site	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.
Artefact	an object, normally portable, made or modified by human hand (see 'stone artefact').
Artefact scatter	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 *scatter* was intended only to be descriptive and did 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.
Background discard/scatter	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. 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.
Isolated find	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.
Lithic assemblage (of stone)	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').
NOHC	Navin Officer Heritage Consultants
Open camp site	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 *open camp site* 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, 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 SA/NSW border and Buronga and down to the NSW/VIC border at Monak (approximately 5km either side) (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 significants 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

Earthen 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 association 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:

1. 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;

2. Areas of land that display evidence of human activity or occupation; and

3. 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 forty-three (43) Aboriginal heritage items/recordings are included on the OEH Aboriginal Heritage Information Management System (AHIMS) within the 1km proposal study area between the SA/NSW border and Buronga. No Aboriginal heritage items have been recorded in the 200m wide branch of the proposal that extends towards the Victorian border near Monak. Figure 3.1 shows an overview of the proposal study area with locations of the Aboriginal heritage recordings. All 43 AHIMS sites are listed in Appendix 1.

Furthermore, sixty-three (63) previously unrecorded Aboriginal site features were recorded during inspection for preliminary geotechnical works for the proposal, with thirty-six (36) of these features being recorded at two geographical locations. All of these Aboriginal site features 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 160km 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 1.2 or 3.1 for an overview). A total of two hundred and eighty-nine (289) 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

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. It should be noted that many of the 289 sites display multiple archaeological and/or non-archaeological features within each recording. As mentioned above, sixty-three 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 3.1-3.5.

Finally, there are seven (7) *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 association 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 transmission line corridor are mound sites, freshwater middens and burials. The most archaeologically sensitive topographic contexts in the transmission line 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.

Map Removed as deemed Confidential

Figure 3.1 Aboriginal sites in relation to the proposal study area and heritage study corridor (Overview)

Map Removed as deemed Confidential

Figure 3.2 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Map Removed as deemed Confidential

Figure 3.3 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

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Figure 3.4 AHIMS listed Aboriginal Sites in relation to proposal study area (orange) and heritage study corridor (blue)(10km)

Map Removed as deemed Confidential

Figure 3.5 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

Previous iterations of the proposal have been well surveyed by Edmonds' (2002a and 2002b), however alignment changes mean that the centreline for the current proposal has not been subject to focussed archaeological survey in its entirety. Site clustering clearly occurs around existing and remnant bodies of water, with site density reducing significantly with increased distance from rivers, flood plain edges, and lakes. The proposal covers areas of existing transmission line easement as well as greenfield areas. The greenfield section of the proposal is between the SA/NSW border and Low Darling Road (about 100km), with the proposal then tracking existing transmission line easement from Low Darling Road to the NSW/VIC border at Monak (about 60km).

The greenfield portion of the proposal has been subject to a wider variation of post European impacts, ranging from patches of remnant Mallee bush, to heavily overstocked pastoral leases, some ploughed for feed production and some not, that have been subject to prolonged periods of drought, especially over the last 15-20 years. Up to date archaeological survey is necessary to evaluate the and mitigate the impacts of the proposal to Aboriginal heritage, assess the current condition of previously recorded sites, as well as inspect current vegetation cover and ground exposure along the proposal corridor, particularly the greenfield portion of the study area. Survey priority should also focus on areas of higher archaeological sensitivity along the existing transmission line, including the section of the proposal crossing the Darling River and associated floodplains, as well as the southernmost portion between Dansons Road and Monak (adjacent to the Murray River).

4 NON-ABORIGINAL HERITAGE

4.1 Heritage Listed Items

Three (3) heritage listed sites have curtilages that are located entirely or partially within the proposal study area. These sites are listed on the Wentworth Council Local Environmental Plan (LEP). All are described as having local heritage significance. A further four (4) heritage listed sites have curtilages that are located entirely or partially within the heritage study corridor. These sites are listed on the Wentworth Council LEP. This results in a total of seven (7) locally listed sites. Six (6) of these sites are built heritage, with the majority associated with farming and agriculture. The remaining site is an area of historic landscape associated with Sturts Billabong (Item #27).

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 4.2-4.4 show more focussed views of the site curtilages. Note – only historic sites in close proximity to the proposal are mapped.

Table 4.1 Heritage listed items within the proposal study area (grey) and the heritage study corridor (white)

Site Name	Item ID	Category	Significance	LEP
Anabranch Hall	I1	Hall (Built)	Local	Wentworth LEP 2011
Sturt's Billabong	I27	Historic Landscape	Local	Wentworth LEP 2011
Hazeldell Homestead	I28	Agriculture (Built)	Local	Wentworth LEP 2011
Noola Homestead	I75	Homestead Complex (Built)	Local	Wentworth LEP 2011
Nulla Nulla Woolshed	I81	Woolshed (Built)	Local	Wentworth LEP 2011
Nulla Nulla Homestead	I82	Homestead (Built)	Local	Wentworth LEP 2011
Provincial Border Obelisk	I95	Monument (Built)	Local	Wentworth LEP 2011

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;
- Traces of agricultural and industrial processing or extractive sites;
- 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, trading nodes and transport corridors;
- Nineteenth-century structures, such as farm dwellings, outbuildings; 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

Structures of historical interest and heritage significance may be standing, ruined, buried, abandoned or still in use.

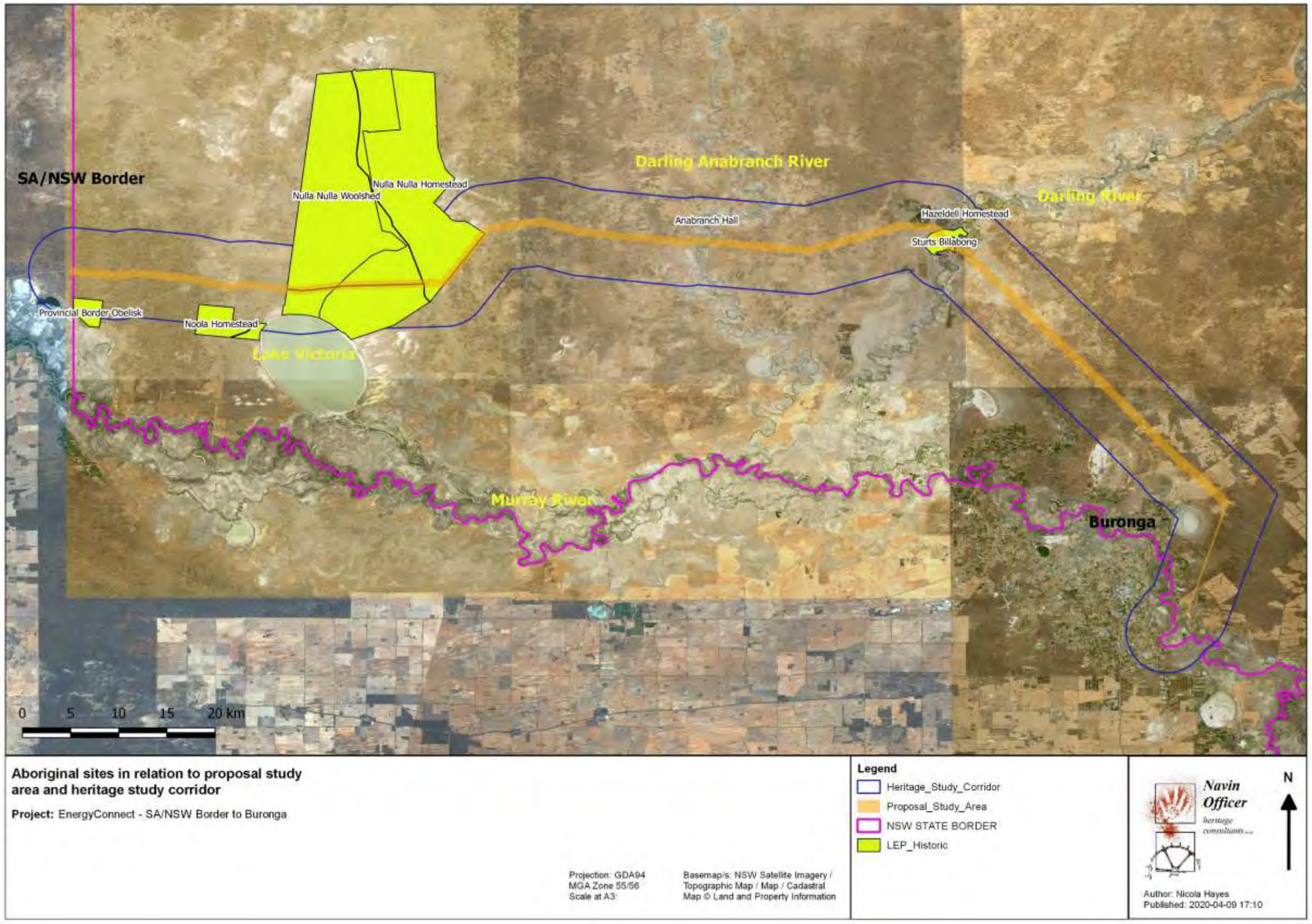

Figure 4.1 Overview of historic sites relative to the proposal study area and heritage study corridor

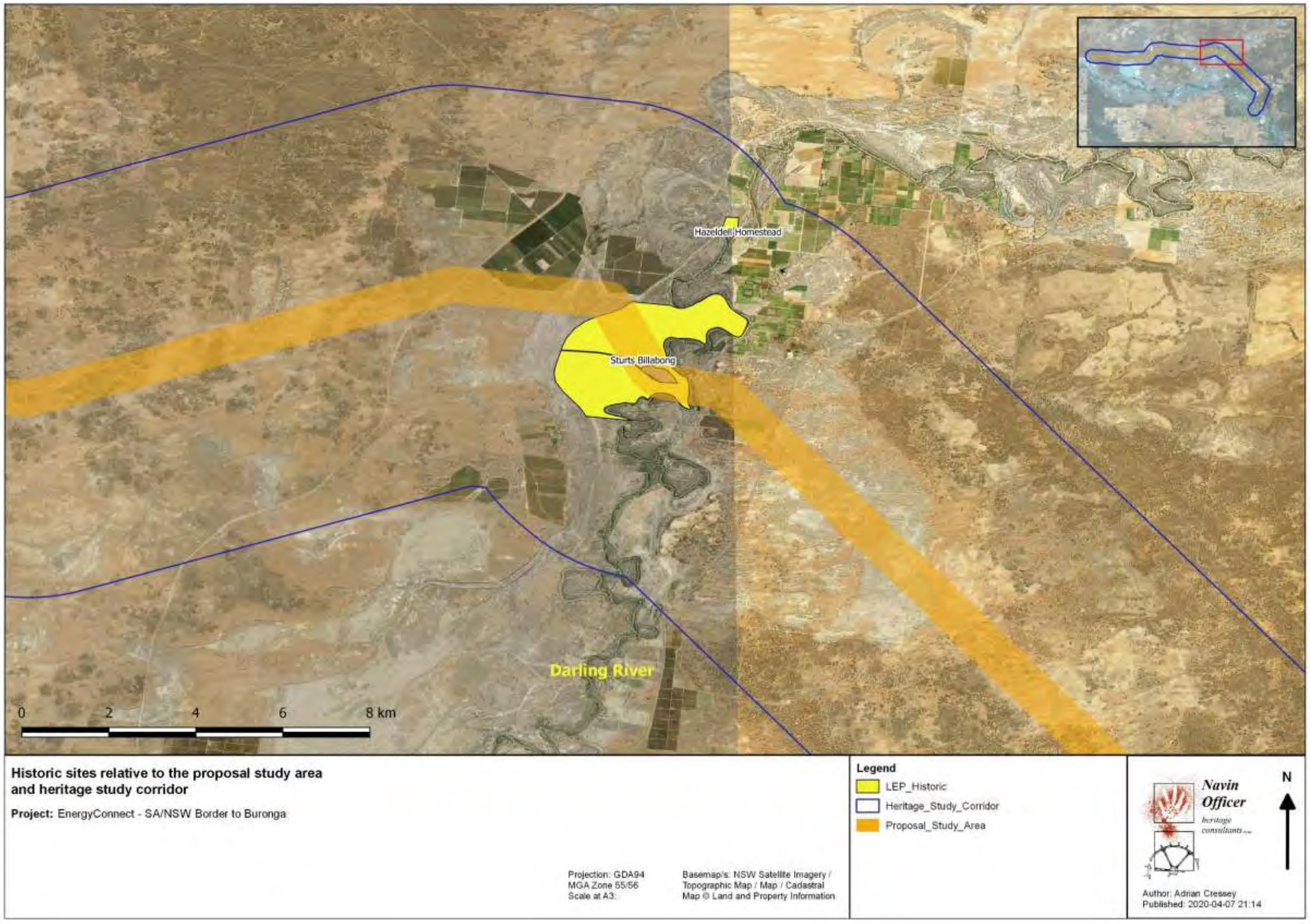

Figure 4.2 Historic sites relative to the proposal study area and heritage study corridor

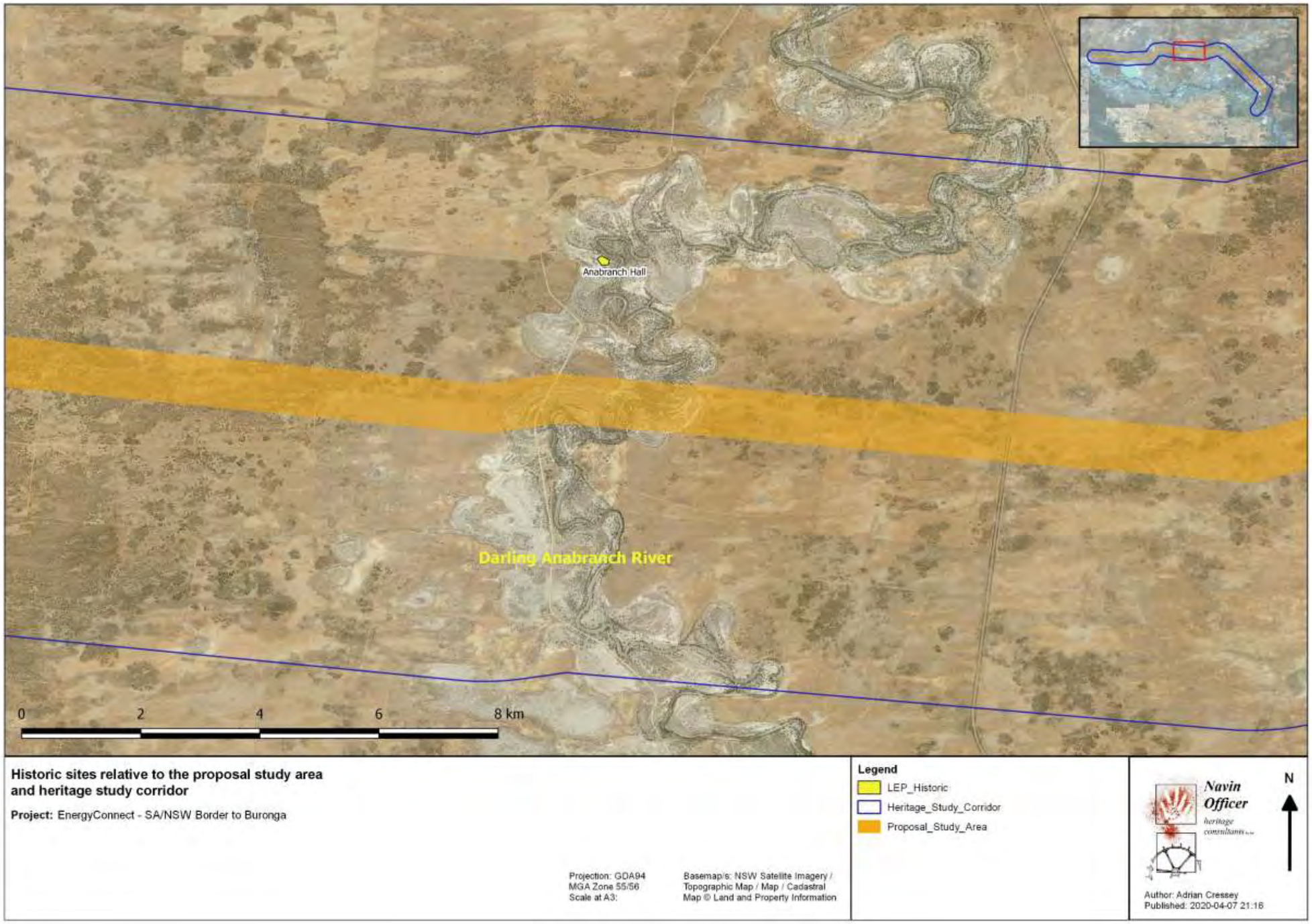

Figure 4.3 Historic sites relative to the proposal study area and heritage study corridor

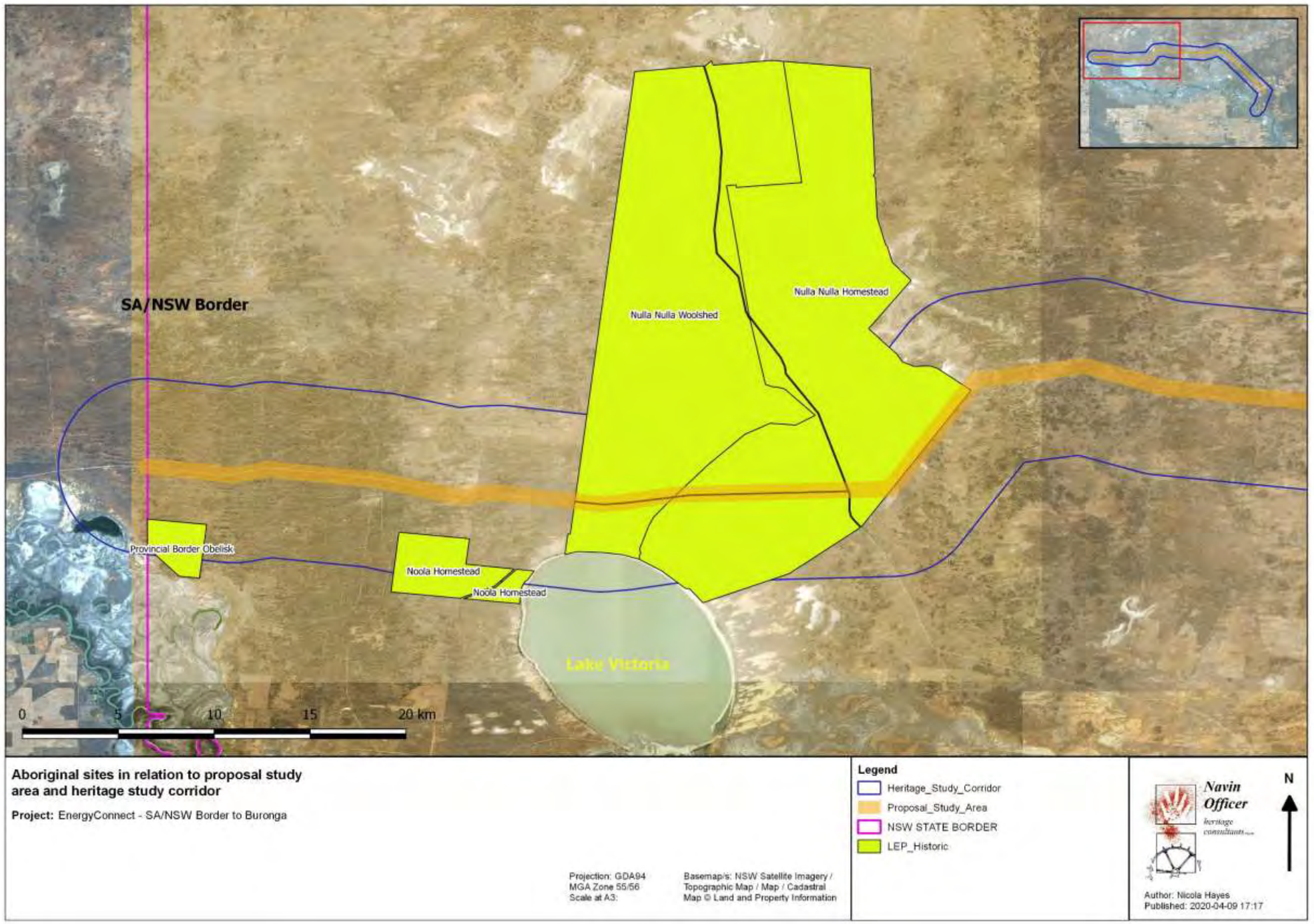

Figure 4.4 Historic sites relative to the proposal study area and heritage study corridor

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 intersects with the Barkandji Traditional Owners #8 (Part A) native title area (determined).

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.

6 CONSTRAINTS AND KEY ISSUES

From a heritage perspective, 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 is 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, particularly in areas of the proposal identified for early construction, such as the Buronga Substation. 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 broader EnergyConnect project, as well as the local Aboriginal community and their culture.

Previously conducted assessments of non-Aboriginal heritage have focused on the built environment. 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. Key issues for the progression of the proposal in regard to cultural heritage assessment can be identified as follows:

- Continue liaising with EES Group of DPIE 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 hi-res 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

- The proposal study area has been the subject to patchy archaeological survey. 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 easement are necessary.

- 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

- The proposal study area has been the subject to patchy archaeological survey. 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 and enable the evaluation of project alignment options.

8.1 Aboriginal heritage

1. Develop and refine a landscape-based predictive model of the archaeological resource of the study area using relevant and comparable local and regional data, as well as high-resolution imagery of the 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 into project team route 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 into project team route refinement.

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APPENDIX 1

AHIMS RECORDINGS WITHIN PROPOSAL STUDY AREA

Table Removed as deemed Confidential