Transgrid

People. Power. Possibilities.

HumeLink

Scoping Report

Reference: 507179-160522-REP-NN-001

Transgrid

Document prepared by:

Aurecon Australasia Pty Ltd

ABN 54 005 139 873

Level 5, 116 Military Road
Neutral Bay NSW 2089

PO Box 538
Neutral Bay NSW 2089
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

Document control		aurecon		
Report title		HumeLink Scoping Report		
Document code		507179-160522-REP-NN-001	Project number	507179
Client		Transgrid		
Rev	Date	Revision details/status	Author	Reviewer
0	2022/02/11	Issued to client	ZM, LT	MD
Current revision		0		

Contents

Executive summary

Overview and background

The Australian energy landscape is transitioning to a greater mix of low-emission renewable energy sources, such as wind and solar. To support this transition and connect Australian communities and businesses to these lower cost energy sources, the national electricity grid needs to evolve.

Transgrid proposes to increase the energy network capacity in southern New South Wales (NSW) through the development of new high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle. This proposal is collectively referred to as HumeLink.

HumeLink would connect to existing substations near Wagga Wagga and Bannaby. In addition, HumeLink would connect to a future substation at Maragle in the Snowy Mountains (referred to as the future Maragle 500 kV substation), which is subject to a separate major project assessment and approval (reference SSI-9717, EPBC 2018/836).

HumeLink would:

- Provide reliable and affordable electricity to customers
- Reinforce the southern transmission network, enable greater sharing of energy between the eastern states and unlock the full capacity of the expanded Snowy Hydro Scheme
- Enable more renewable energy generation to enter the market, supporting Australia's emissions reduction targets
- Create more than 1,000 construction jobs
- Contribute to economic activity in regional NSW, generating major benefits for local communities along the route.

HumeLink is a priority project for the Australian Energy Market Operator (AEMO) and the Federal and NSW Governments.

The proposal would support the transfer of energy from existing renewable generation as well as facilitate development of new renewable generation in South-West NSW, Wagga Wagga and Tumut renewable energy zones (REZs). The proposal would provide the required support for the network in southern NSW, allowing for the increase in transfer capacity between new renewable generation sources and the state's demand centres of Sydney, Newcastle and Wollongong. The proposal would also improve the efficiency and reliability of the current energy transfer in this part of the network.

Furthermore, by connecting with major interconnectors, HumeLink would form a key part of the transmission line infrastructure that supports the transfer of energy within the National Electricity Market (NEM). The NEM incorporates around 40,000 km of transmission lines across Queensland (QLD), NSW, Australian Capital Territory (ACT), Victoria (VIC), South Australia (SA) and Tasmania (TAS).

Construction of the proposal is targeted to commence in 2024, subject to the required planning and regulatory approvals. Once construction has commenced, the proposal is estimated to take approximately two years to construct and become operational in 2026.

The proposal - HumeLink

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 Scoping Report for HumeLink includes the following key components:

- Substation works:
  - A new substation (Gugaa 500/330 kV (Gugaa 500 kV)) located approximately 15 km east of the existing Wagga 330/132 kV substation (Wagga 330 kV)
  - Augmentation of the existing Wagga 330 kV and Bannaby 500/330 kV (Bannaby 500 kV) substations.
- New transmission line circuits between[1]:
  - Maragle 500 kV substation and Bannaby 500 kV substation (276km)
  - Maragle 500 kV substation and Gugaa 500 kV substation (108km)
  - Gugaa 500 kV substation and Bannaby 500 kV substation (296km)
  - Existing Wagga 330 kV substation and new Gugaa 500 kV substation (15km).
- Ancillary development:
  - Two telecommunication huts along the transmission lines
  - New and upgraded temporary and permanent access tracks and roads
  - Temporary facilities required for construction of the proposal e.g. laydown and staging areas, stockpiling areas, concrete batching plants, brake/winch sites, site offices, parking areas and accommodation camps.

The proponent

The proponent is NSW Electricity Networks Operations Pty Ltd (referred to as Transgrid). Transgrid operates and manages the high voltage transmission network in NSW and the ACT and is the Authorised Network Operator for the purpose of an electricity transmission or distribution network under the provisions of the *Electricity Network Assets (Authorised Transactions) Act 2015*. Transgrid is also classified as an energy services corporation under the *Energy Services Corporations Act 1995* and a transmission operator under the *Electricity Supply Act 1995*.

Transgrid's network enables more than three million homes and businesses to access a safe, reliable and affordable supply of electricity. It is made up of more than 100 substations and more than 13,000 km of high voltage transmission lines and underground cables. Current interconnections with Queensland and Victoria allow power to be transmitted between States. The network is instrumental to the electricity system and, therefore, the economy and facilitates energy trading across the NEM. Further information on Transgrid can be found at www.transgrid.com.au.

[1] These are approximate lengths for each circuit. However, as the transmission lines would be constructed in a double circuit arrangement (i.e two circuits on one set of transmission structures), the overall physical line distance would be approximately 360km

Proposal corridor

The proposal corridor encompasses the area where HumeLink assets such as transmission lines and substations are likely to be located and includes areas likely to be required for permanent and temporary access tracks tracks/roads and associated infrastructure.

The initial proposal corridor was developed using a geo-spatial tool (Route Planning Assessment Tool (RPAT)) populated with social, environmental, property and engineering considerations. These considerations were grouped as Tier 1 (no-go areas) or Tier 2 (avoid or minimise impact) criteria. In addition to these Tier 1 and Tier 2 criteria, several opportunities to minimise impacts and maximise benefits from the proposal were identified including:

- Minimising overall transmission line length to reduce costs, impacts and construction time
- Locating new transmission lines next to existing transmission lines, wherever possible, to allow use of existing access tracks for construction and maintenance
- Targeting areas of existing disturbance, such as roads, tracks and property boundaries to reduce environmental and property impacts.

To further refine and narrow the proposal corridor, Transgrid undertook preliminary environmental investigations, landowner and stakeholder engagement, and concept engineering design studies. This is an ongoing and iterative process. The outcomes of this process combined with further feasibility studies informed the identification of the proposal corridor referred to in this Scoping Report.

Preliminary environmental assessment

On 9 March 2018, the NSW Minister for Planning declared Snowy 2.0 and the proposal to be state significant infrastructure pursuant to section 5.12(4) of the EP&A Act and critical state significant infrastructure (CSSI) pursuant to section 5.13 of the EP&A Act. As a result, schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) was amended to incorporate paragraph 9 - “Snowy 2.0 and Transmission Project”. The proposal falls within clause 16 and Schedule 5, paragraph 9 of the SRD SEPP and as a result, is CSSI. The proposal does not require consent under Part 4 of the EP&A Act (clause 5.12 of the EP&A Act) and is subject to assessment under Division 5.2 of the EP&A Act. As such, this document supports an application seeking the Secretary’s Environmental Assessment Requirements (SEARs) for the Environmental Impact Statement (EIS).

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

- Biodiversity
- Aboriginal and Non-Aboriginal heritage
- Social
- Economic, property and land use
- Landscape character and visual amenity
- Soils and contamination
- Water (surface and groundwater)
- Hazards (Bushfire, electric and magnetic fields and waste)
- Traffic and access
- Noise and vibration
- Air quality and greenhouse gases
- Climate change risk
- Cumulative impacts.

As part of the preparation of the EIS, further assessment will be carried out in conjunction with the 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, while taking into consideration engineering constraints and cost implications as well as opportunities to provide additional benefits to the region where the infrastructure would be located.

The assessment would also identify mitigation and management measures to minimise potential impacts.

Consultation with affected landowners, stakeholders and the local community would continue throughout the proposal assessment, design and construction phases.

Glossary

Term/Acronym	Description
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHCRP	Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AHIMS	Aboriginal Heritage Information Management System
AOBV	Area of Outstanding Biodiversity Value
APZ	Asset protection zone
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASS	Acid sulfate soils
BAM	Biodiversity Assessment Method
BDAR	Biodiversity Development Assessment Report
BFMC	Bushfire Management Committee
BFMP	Bushfire Management Plan
BFRMP	Bush Fire Risk Management Plans
CASA	Civil Aviation Safety Authority
CCGs	Community Consultative Groups
CIA	Cumulative Impact Assessment
COAG	Council of Australian Governments
CSSI	Critical state significant infrastructure
DAWE	Australian Department of Agriculture, Water and the Environment
DoEE	(former) Australian Department of the Environment and Energy
DPE	(former) NSW Department of Planning and Environment
DPI	Department of Primary Industries
DPE	NSW Department of Planning and Environment (formerly the Department of Planning, Industry and Environment (DPIE))
Easement	A legal right applying to a parcel of land that enables the use of the land by someone other than the owner. For transmission lines, an easement is an area around the lines that allows access, construction and maintenance to take place.
EEC	Endangered ecological community
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ELF	Extremely low frequency
EMF	Electromagnetic fields
EP&A Act	*Environmental Planning and Assessment Act 1979*

Term/Acronym	Description
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environmental protection licence
ESB	Energy Security Board
FM Act	*Fisheries Management Act 1994*
FTE	Full-time equivalent
GDE	Groundwater-dependent ecosystem
HVDC	High voltage direct current
Hz	Hertz
IBA	Important Bird Areas
IBRA	Interim Biogeographical Regionalisation of Australia
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ILUA	Indigenous Land Use Agreement
ISP	Integrated System Plan
KFH	Key fish habitat
kHz	Kilohertz
km	Kilometre
kV	Kilovolt
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
m	Metre
mm	Millimetre
MOU	Memorandum of Understanding
MNES	Matters of National Environmental Significance
MW	Megawatt
NEM	National Electricity Market
NOA	Naturally occurring asbestos
NorBE	Neutral or Beneficial Effects
NSW	New South Wales
OEH	(former) NSW Office of Environment and Heritage (now the Environment, Energy and Science Group of DPE)
OLS	Obstacle limitation surface
OPGW	Optical Fibre Ground Wire
PACR	Project Assessment Conclusions Report

Term/Acronym	Description
PADR	Project Assessment Draft Report
PSCR	Project Specification Consultation Report
PCT	Plant Community Types
POEO Act	*Protection of the Environment Operations Act 1997*
PMST	Protected Matter Search Tool
Proposal	The CSSI project “HumeLink”, which is the subject of this application
Proponent	The entity seeking approval for the SSI application, which for HumeLink is the NSW Electricity Networks Operations Pty Ltd (referred to as Transgrid).
PSCR	Project Specification Consultation Report
QLD	Queensland
REZ	Renewable Energy Zones
RPAT	Route Planning Assessment Tool
RIT-T	Regulatory Investment Test for Transmission
SA	South Australia
SAII	Serious and irreversible impact
SEARs	Secretary’s Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SHR	State Heritage Register
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SSD	State significant development
SSI	State significant infrastructure
TAS	Tasmania
TEC	Threatened Ecological Community
TfNSW	Transport for New South Wales
transmission line route	The location of the transmission line structures along the middle of the transmission line easement.
VIC	Victoria

1. Introduction

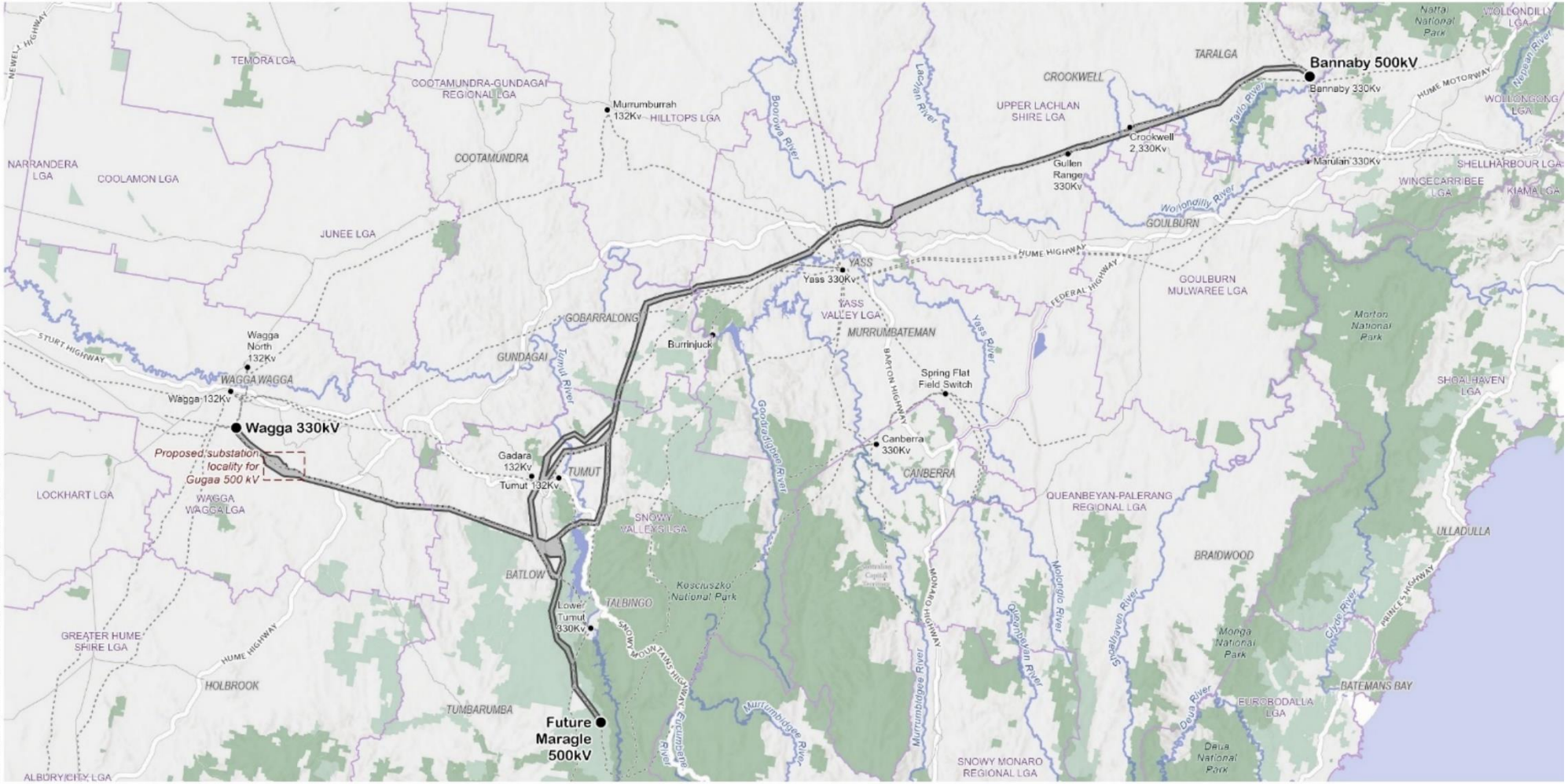
1.1. HumeLink proposal

Transgrid proposes to increase the energy network capacity in southern New South Wales (NSW) through the development of new high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle. This proposal is collectively referred to as HumeLink. The area where HumeLink assets such as transmission lines and substations are likely to be located (subject to design refinement) is referred to as the proposal corridor. An overview of the proposal corridor is provided in Figure 1-1.

The primary purpose of HumeLink is to expand the capacity of the electricity network in order to increase electricity transfer to customers across NSW and the Australian Capital Territory (ACT). HumeLink would connect to existing substations near Wagga Wagga and Bannaby. In addition, HumeLink would connect to a future substation at Maragle (in the Snowy Mountains) which is subject to a separate major project assessment and approval (reference SSI-9717, EPBC 2018/836).

On 9 March 2018, the NSW Minister for Planning declared Snowy 2.0 and this proposal to be state significant infrastructure pursuant to section 5.12(4) of the EP&A Act and critical state significant infrastructure (CSSI) pursuant to section 5.13 of the EP&A Act. As a result, schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) was amended to incorporate paragraph 9 - “Snowy 2.0 and Transmission Project”. The proposal falls within clause 16 and Schedule 5, paragraph 9 of the SRD SEPP and as a result, is CSSI. The proposal does not require consent under Part 4 of the EP&A Act (clause 5.12 of the EP&A Act) and is subject to assessment under Division 5.2 of the EP&A Act.

This Scoping Report supports the HumeLink CSSI application to the Minister for Planning under Part 5, Division 5.15 of the EP&A Act.



Proposal corridor
Existing Transgrid transmission line
Existing substation
State forest
National park and reserve
Local Government Area (LGA)

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\607179_HumeLink_ScopingReport_rev3.aprx\16-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 1-1: Proposal corridor overview

1.1.1. Proposal objectives

When completed, HumeLink aims to:

- Increase transfer capacity between southern NSW and major load centres within NSW (Sydney, Newcastle and Wollongong)
- Reinforce stability and reliability in the network
- Facilitate transition of the network to new generation sources.

1.1.2. Proposal benefits

The anticipated benefits of the proposal include:

- Safe, reliable and affordable electricity for consumers
- Increased electricity transfer capacity between states
- Greater access to lower cost energy generation
- Creation of regional jobs and support regional economic growth.

1.2. The Proponent – Transgrid

The proponent is NSW Electricity Networks Operations Pty Ltd (referred to as Transgrid)[2]. Transgrid operates and manages the high voltage transmission network in NSW and the ACT and is the Authorised Network Operator for the purpose of an electricity transmission or distribution network under the provisions of the *Electricity Network Assets (Authorised Transactions) Act 2015*. Transgrid is also classified as an energy services corporation under the *Energy Services Corporations Act 1995* and a transmission operator under the *Electricity Supply Act 1995*.

Transgrid's network enables more than three million homes and businesses to access a safe, reliable and affordable supply of electricity. It is made up of more than 100 substations and more than 13,000 km of high voltage transmission lines and underground cables. Current interconnections with QLD and VIC allow power to be transmitted between states. The network is instrumental to the electricity system and, therefore, the economy and facilitates energy trading across the NEM. Further information on Transgrid can be found at www.transgrid.com.au.

[2] Proponent details:
ACN: 609169959
Business address: 180 Thomas Street, Haymarket NSW 2000

1.3. Proposal need

In October 2016, Council of Australian Governments (COAG) energy ministers agreed to an independent review of the security and reliability of the National Electricity Market (NEM) and recommend national reforms. The Independent Review into the Future Security of the National Electricity Market was established and produced the “Blueprint for the Future Security of the NEM” in June 2017. The Blueprint identified the need for system planning to inform investment decisions and deliver an innovative, low emission, secure, and reliable power system. As a result, the first national Integrated System Plan (ISP) was developed and published in 2018 by the Australian Energy Market Operator (AEMO).

The existing transmission network in NSW (refer to Figure 1-2) was established to transport electricity primarily from generators in fossil-fuel rich areas to load centres and out to regional areas. Areas with greater renewable potential are often remote from the existing transmission network. As the NEM transitions to lower emission energy generation sources, the transmission networks will need to be reconfigured to connect renewable generation to load centres primarily located along the eastern, coastal regions of the state.

The transmission network between the Snowy Mountains and Bannaby currently carries power generated across southern NSW to the major load centres in Sydney, Newcastle and Wollongong. It also carries all the electricity that is imported from Victoria to the major load centres in NSW.

In NSW, where existing coal-fired generators will be retiring progressively from 2022 (Transmission Annual Planning Report, Transgrid 2019), there is a pressing need for new sources of supply to meet growing energy demand. As traditional generators retire, these new projects will provide the cheapest available energy to supply households, businesses 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 according to the *NSW Transmission Infrastructure Strategy* (NSW Department of Planning and Environment (DPE), 2018).

As stated in the *2019 Electricity Statement of Opportunities* (2019 ESO) (AEMO, 2019), the full benefits of new renewable generation, including upgrades to the Snowy Hydro Scheme (Snowy 2.0) will not be realised without an associated increase in transmission capacity.

The proposal would support the transfer of energy from existing renewable generation as well as facilitate development of new renewable generation in South-West NSW, Wagga Wagga and Tumut Renewable Energy Zones (REZs) as identified in the 2020 ISP. The proposal would provide the required support for the network in southern NSW, allowing for the increase in transfer capacity between new renewable generation sources and the state’s demand centres. The proposal would also improve the efficiency and reliability of the current energy transfer in this part of the network.

Furthermore, by connecting with major interconnectors outside NSW, HumeLink would form a key part of the transmission line infrastructure that supports the transfer of energy within the NEM. The NEM incorporates around 40,000 km of transmission lines across Queensland (QLD), NSW, ACT, Victoria (VIC), South Australia (SA) and Tasmania (TAS). The NEM involves wholesale electricity generation, transported via high-voltage transmission lines to large industrial energy users and to distribution networks in each region, which then deliver energy to homes and businesses.

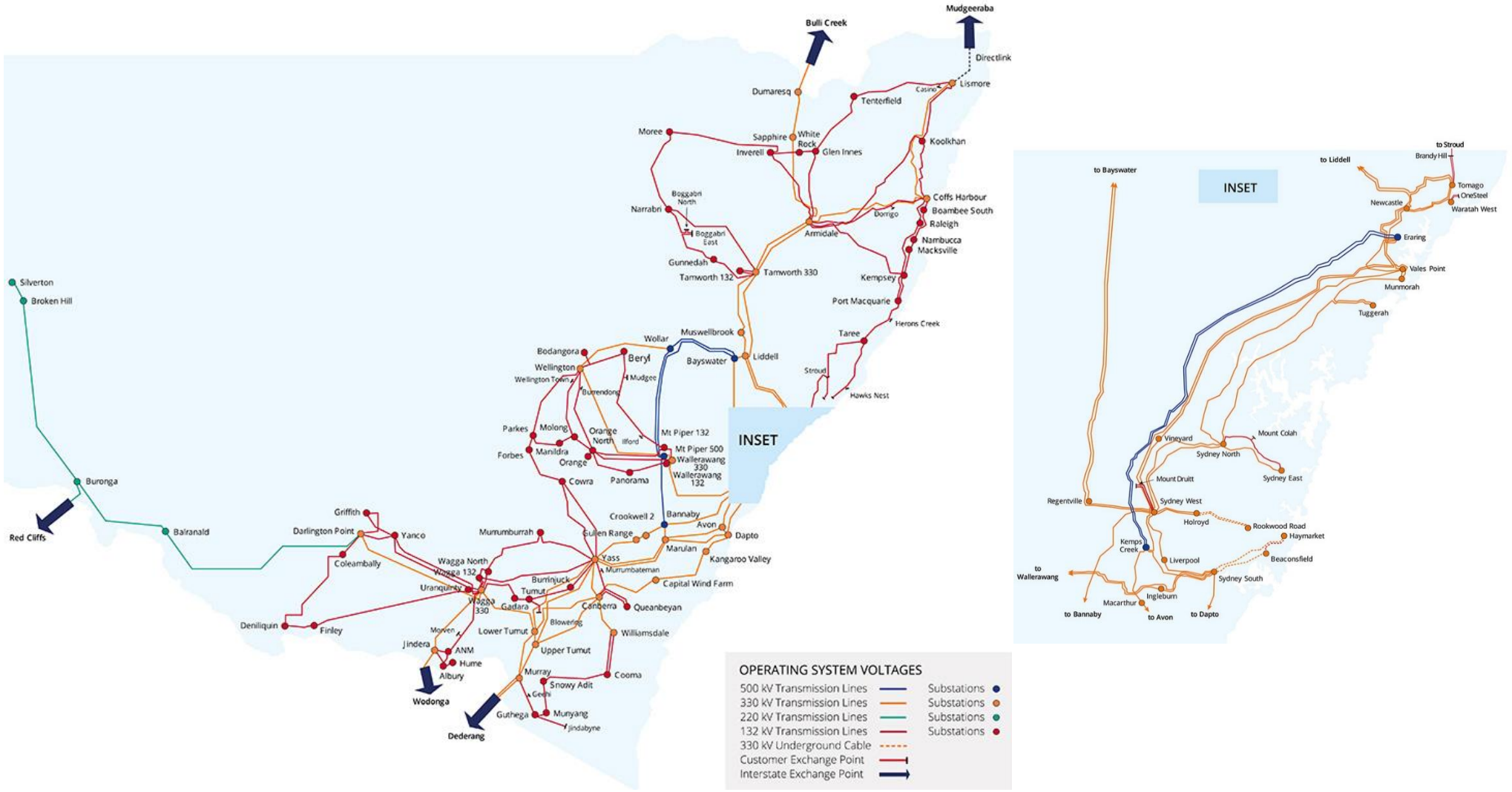


Figure 1-2 Transgrid's electricity network map (source: Transgrid, 2020a)

2. Strategic context

2.1. NSW electricity framework

2.1.1. Transmission Infrastructure Strategy 2018 and 2020 Integrated System Plan

The NSW *Transmission Infrastructure Strategy* (DPE, 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 is consistent with AEMO's ISP and 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 VIC, SA and QLD, 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.

The ISP is a 20-year forecast of overall transmission system requirements for the NEM and sets out a cost-based engineering optimisation plan to meet those requirements, considering different scenarios of how the system may change over time. An updated 2020 ISP was released in July 2020, and the draft 2022 ISP was released for comment in December 2021 by AEMO.

The ISP expects 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. The ISP identifies the role of transmission lines in connecting and sharing energy produced by geographically dispersed renewable generation.

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. Expanded transmission capacity from southern NSW to major demand centres was listed as a priority in the strategy.

The NSW *Transmission Infrastructure Strategy* also identifies three priority energy zones (refer to Figure 2-1) including the South-West Energy Zone, Central-West Energy Zone and New England Energy Zone. These are areas with high energy generation potential where planned transmission infrastructure upgrades could allow multiple generation projects to connect to the network with associated cost efficiencies.

AEMO forecasts these REZs will provide the bulk of the state's future energy supply, with up to 17,750 MW of new generation projects expected to connect to the grid. This could support an average of up to 2,000 construction jobs each year and inject up to $23 billion in investment into regional NSW.

Historically, new energy projects have typically been built alongside the existing network. However, as the existing transmission network becomes constrained, REZs will require transmission projects to unlock energy resources in new regions of the state.

As identified in the NSW *Transmission Infrastructure Strategy,* a new interconnector between Wagga Wagga, Snowy 2.0 and Bannaby north-east of Goulburn would be required to provide transmission infrastructure (refer to Figure 2-1). This interconnector was initially referred to as SnowyLink North, however is now referred to as HumeLink.

HumeLink has been identified as an Actionable grid project in the 2020 ISP (see Figure 2-2), as it would be critical in addressing the current cost, security and reliability issues which face the Australian energy network (AEMO, 2020). HumeLink complements major inter-regional interconnectors that have been proposed, including interconnectors between SA and NSW (EnergyConnect), VIC and NSW (VNI Upgrade), and QLD and NSW (QNI Upgrade).

As well as connecting with the South-West NSW REZ identified in the 2018 ISP, HumeLink would facilitate development of renewable generation in the Wagga Wagga and Tumut REZ in southern NSW identified in the 2020 ISP. The Wagga Wagga REZ is an area with high potential for solar generation and is expected to deliver about 1,000 MW of electricity. The Tumut REZ is in the Snowy Mountains area of pumped hydro generation and would add an estimated 2,230-2,570 MW of electricity to the NEM.

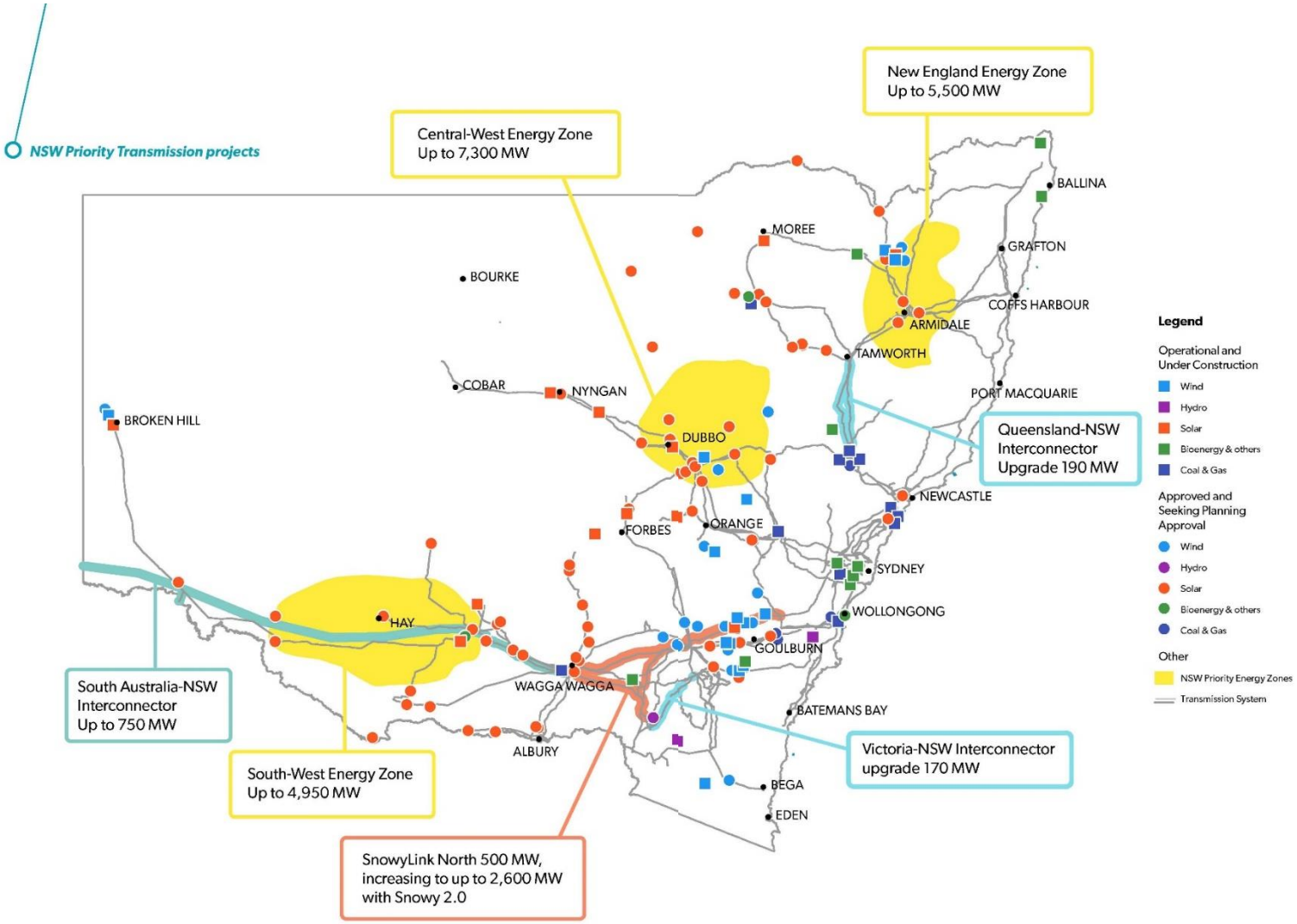
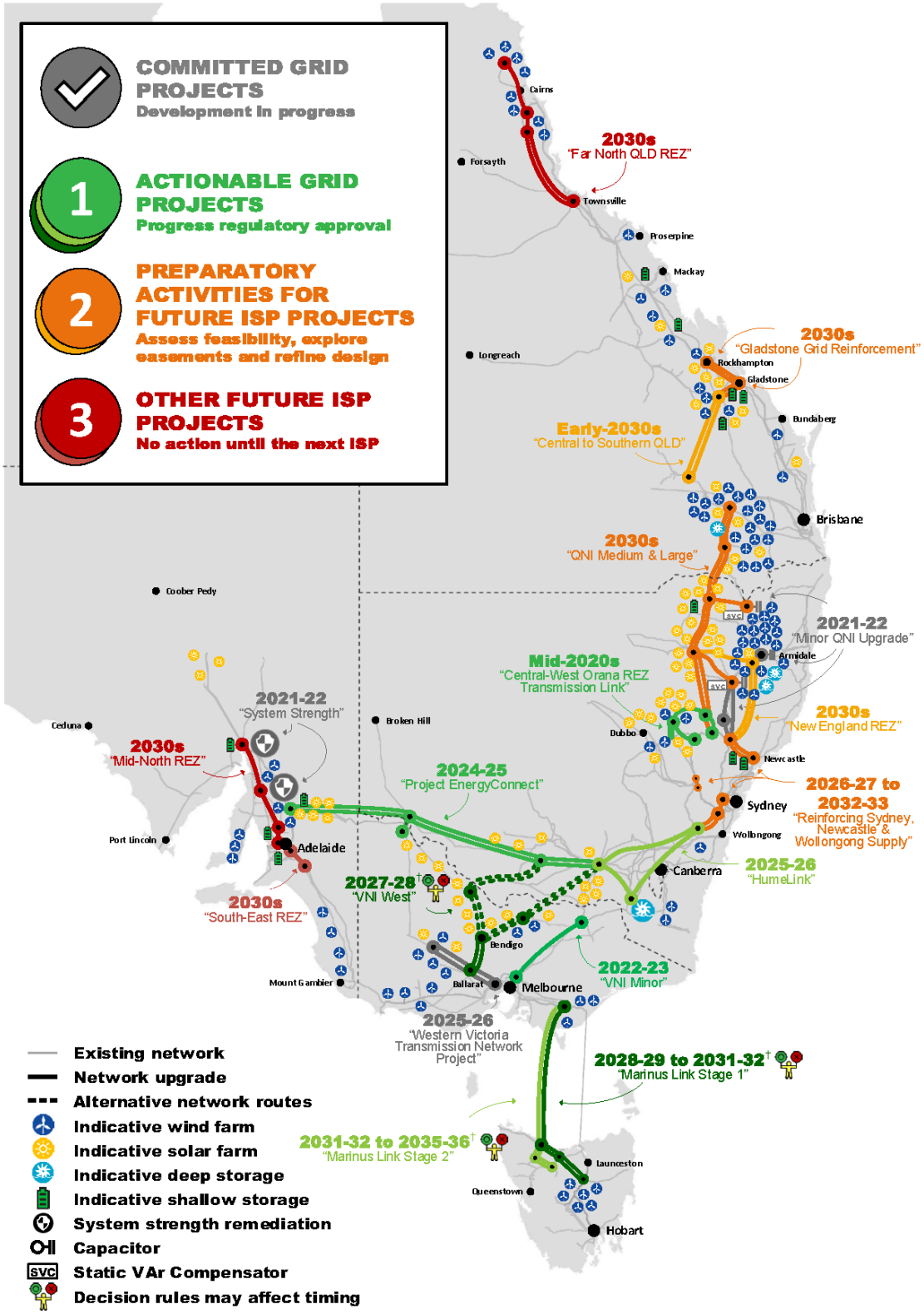


Figure 2-1 Priority transmission projects and energy zones in NSW Transmission Infrastructure Strategy (DPE, 2018)



† The timing of these actionable projects is dependent on decision rules.
All dates are indicative, and on a financial year basis. For example, 2023-24 represents the financial year ending June 2024.

Figure 2-2 2020 ISP optimal development path for the NEM (AEMO, 2020)

2.1.2. NSW Electricity Strategy 2019

The NSW Government built on the Transmission Infrastructure Strategy by publishing the Electricity Strategy in 2019 (DPIE, 2019). The Electricity Strategy plans for a reliable, affordable and sustainable electricity future that supports a growing economy and sets out actions to support the energy market.

The main risks for investors in new generation are challenges in connecting to the congested transmission network combined with potentially higher electricity loss during transmission (known as marginal loss). Marginal loss factors worsen as congestion increases, which increases the costs to generators. The losses occur as resistive heat causes power loss when electricity travels along transmission lines, especially over long distances. For potential generators in remote locations, this is a significant risk to investment.

The Electricity Strategy identifies that to connect new generation at the scale required to meet NSW's future energy needs, it is critical to develop greater transmission capacity to these new locations.

HumeLink would provide additional transmission capacity focussed on these new generation locations, which would encourage continued investment in new renewable generation sources.

2.1.3. NSW Electricity Infrastructure Roadmap 2020

The Electricity Infrastructure Roadmap (DPIE, 2020a) (the Roadmap) builds on the Electricity Strategy to provide a framework for developing the electricity system in NSW. The Roadmap is enabled by the *Electricity Infrastructure Investment Act 2020 (NSW)* which was enacted into law on 2 December 2020. Together they commit the NSW Government to:

- Declaring five REZs
- Establishing an Electricity Infrastructure Investment Safeguard to deliver new generation, long duration storage and firming capacity
- Establishing an Electricity Infrastructure Jobs Advocate and NSW Renewable Energy Sector Board
- Establishing a Transmission Development Scheme that will de-risk REZ investment.

The Roadmap aims to coordinate investment in generation and transmission infrastructure so that generators can be sure of a reliable connection to the network, and transmission infrastructure projects can be planned and approved to provide the connection in time.

By providing additional transmission capacity, HumeLink would play a critical part in providing investor confidence in new generation projects.

2.1.4. NSW Government's Net Zero Plan Stage 1: 2020 – 2030

The Net Zero Plan Stage 1: 2020 – 2030 (DPIE, 2020b) sets the foundation in NSW for action on climate change and the goal to reach net zero emissions by 2050. The plan identifies the economic opportunities presented by solar panels and wind turbines, which in combination with firming technologies, such as gas, batteries and pumped hydro, are now the cheapest forms of new, reliable electricity generation.

The plan explains that REZ delivery will involve expanding transmission infrastructure into regions to open new parts of the grid for renewable energy projects. HumeLink is a critical transmission infrastructure project that would support the transfer of energy generated within the South-West NSW REZ, Wagga Wagga REZ and Tumut REZ.

This would encourage the continued expansion of renewable energy generation within the REZs, which would help to facilitate the transition of the NEM to lower greenhouse gas emission energy sources. In

addition, HumeLink would provide an important connection to the Snowy 2.0 project to support the transfer of energy from the Snowy Mountains Hydro-electric Scheme, which would provide a major source of renewable energy generation and storage. This is aligned with the opportunities identified in the plan to use new, reliable pumped hydro electricity generation to assist NSW in reaching its goal of net zero emissions by 2050.

2.2. Commonwealth context

2.2.1. Priority transmission projects

The Australian Government has supported reforms that will ensure timely delivery of the transmission projects recommended in the 2020 ISP. The reforms aim to bring forward necessary transmission investment at least cost to energy consumers.

The Australian Government has provided support, including funding of transmission infrastructure interconnectors, and the Grid Reliability Fund announced in October 2019. On 31 January 2020, a Memorandum of Understanding (MOU) was signed by the NSW and Commonwealth governments to jointly fund energy and emissions reduction initiatives, and ensure NSW has a reliable and affordable energy system. The MOU will help NSW to meet its target of net zero emissions by 2050.

Key initiatives in the MOU include improving transmission interconnection and network access, including accelerating and delivering key transmission infrastructure capacity projects such as HumeLink to unlock existing and future generation from Snowy 2.0.

2.2.2. The post-2025 project

The Energy Security Board (ESB) was tasked by the former COAG Energy Council in March 2019 to advise on a long-term, fit-for-purpose national electricity market design. A directions paper was published in April 2020, followed by a consultation paper in September 2020. The ESB published the Post-2025 Market Design Directions Paper in January 2021, bringing together the results of consultation and forming four directions and next steps. One of the four directions is focussed on transmission and access to the transmission grid.

The report highlights that “while current access arrangements may have been adequate in the past with only incremental investment in renewables occurring, they are not fit for the future transformational change to the system. Without resolving connection issues there will be higher prices for consumers and the grid will be more difficult to operate” (ESB, 2021).

HumeLink would assist in resolving potential future connection issues associated with the shift towards renewables by providing additional transmission capacity and greater interconnectivity of the grid.

2.2.3. Paris Agreement commitments

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.

In 2019, the Climate Solutions Package was announced to invest in delivering Australia's 2030 Paris climate commitments. Technology investment and enhanced investment in Snowy Hydro through the Climate Solutions Fund are included in the package.

HumeLink 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. Key features of the proposal corridor and its surrounds

Table 2-1 summarises key features within and surrounding the proposal corridor that could be affected by the proposal, or that the proposal could affect. These features were considered during the development and selection of the preferred proposal as outlined in Chapter 3 and will continue to be considered during the assessment of impacts in the EIS.

Table 2-1 Summary of key features of the proposal corridor and its surrounds

Aspect	Key features of the proposal corridor
Local and regional community (refer to Sections 7.4.1 and 7.5.1 for more information)	• Extends across the lands of the Wiradjuri, Ngunnawal, Ngarigo and Gundungurra people • Is located within five local government areas (LGAs): Wagga Wagga, Snowy Valleys, Cootamundra-Gundagai, Yass Valley, and Upper Lachlan Shire • Is located about 3 km from Wagga Wagga (the nearest major town) • Is close to several smaller towns including Yass (5 km away), Tumut (1.5 km away) and Batlow (4.5 km away) and individual residential homesteads • Extends across predominantly privately owned land used for a wide range of agricultural purposes, State owned forestry land, as well as very small areas of National Parks and Wildlife Services estate • Follows existing transmission lines for more than half of its length
Key risks or hazards (refer to Sections 7.7.1 and 7.9.1.1 for more information)	• Is mapped Category 1 Bush Fire Prone Land (the highest risk category for bushfires) for a large portion of the southern section, as it is within and surrounded by forests, woodlands and timber plantation areas • May include geological hazards including alluvial soils, landslide prone land and naturally occurring asbestos

Relationship with other relevant future projects in the area
(refer to Section 7.14.2 for more information)
	• Directly interfaces with two other major transmission line projects proposed by Transgrid that are yet to be approved:
	  • Snowy 2.0 – Transmission Connection project at the future Maragle 500 kV substation
	  • Project EnergyConnect (NSW – Eastern Section) at the Wagga 330 kV substation
	• Is in proximity to the proposed Jeremiah Wind Farm near Adjungbilly.

Important natural or built features	• Marginally extends into three national parks: Kosciuszko National Park, Tarlo River National Park and Minjary National Park

Aspect	Key features of the proposal corridor
(refer to Sections 7.2.1.1, 7.2.2.1, 7.3.2.1, 7.8.1 and 7.10.1 for more information)	• Extends into five state conservation areas, three nature reserves and five state forests (refer to Table 7-1) • Crosses two areas listed on the National Heritage List (Snowy Mountains Scheme and Australian Alps National Parks and Reserves) as well as one item listed on the State Heritage Register and seven items listed on local environmental plans (refer to Table 7-4) • Crosses several major roads (including the Hume Highway, Sturt Highway, Barton Highway and Snowy Mountains Highway) as well as a major railway (the Main Southern Line) • Is near several regional airports and landing strips, including Tumut Airport, Wagga Wagga Airport and Royal Australian Air Force Base, Talbingo Airstrip and Crookwell Airport • Crosses major waterways including the Goobarragandra River, Lachlan River, Murrumbidgee River, Tarlo River, Tumut River near Blowering Dam, Wollondilly River near Pejar Dam, Yass River as well as smaller waterways

3. Selection of preferred proposal

Regulatory Investment Test for Transmission Once identified in the ISP, projects may be developed through the project funding approval process known as the Regulatory Investment Test for Transmission (RIT-T), where approval is sought from the Australian Energy Regulator (AER). The RIT-T process compares credible options and tests whether the net cost to the market (and therefore ultimately to consumers) would be higher under the 'do nothing' path, than if investment were to go ahead. The RIT-T does not involve the identification or assessment of specific route options but looks at the electrical connectivity between nodes.

The RIT-T process involves a process of consultation over a minimum of 12 weeks, initiated by publishing the Project Specification Consultation Report (PSCR) containing information and data on the proposal, followed by a Project Assessment Draft Report (PADR) if the proposed transmission investment is going to proceed, and a Project Assessment Conclusions Report (PACR) after another six week consultation period (AER, 2020).

The PSCR for HumeLink was released in June 2019. Following this, Transgrid published the *Project Assessment Draft Report* for HumeLink in January 2020 (Transgrid, 2020b), which was the second formal step in the RIT-T process. The PADR assessed 12 different network options for HumeLink. The options considered four arrangements:

- Option 1: A direct path between Maragle and Bannaby
- Option 2: A path between Maragle and Bannaby via Wagga Wagga, adding capacity for new renewable generation in southern NSW
- Option 3: A wider footprint via Wagga Wagga, enabling direct and added capacity for new renewable generation in southern NSW
- Option 4: A wider footprint between Maragle, Wagga Wagga and Bannaby plus additional capacity from Bannaby to Sydney

Each option was modelled at three operating capacities, 330 kV, 500 kV initially operated at 330 kV with future substation upgrades to enable 500 kV operation ("flexible 500 kV"), and 500 kV.

The PADR concluded that the 500 kV options connecting Maragle and Bannaby via Wagga Wagga (i.e. Option 2C and Option 3C) would provide the greatest net benefits of all options. Option 2C would involve four new 500 kV transmission lines while Option 3C would involve three new 500 kV transmission lines in a loop (refer to the schematics from the PADR in Figure 3-1 and Figure 3-2).

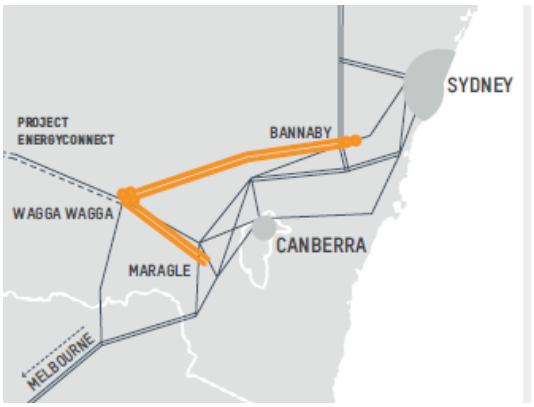


Figure 3-1 Option 2C

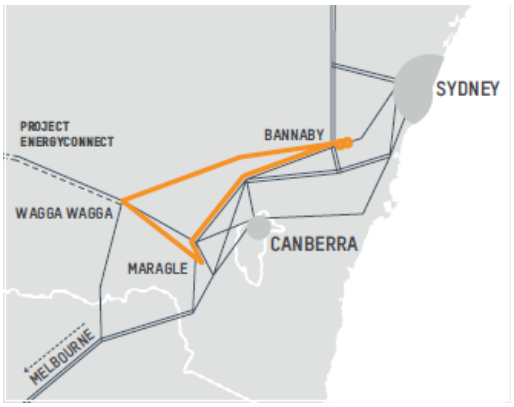


Figure 3-2 Option 3C

The PACR for HumeLink was published in July 2021 (Transgrid, 2021). The PACR concluded that Option 3C provides the greatest net benefit of all options considered across all four scenarios investigated. Option 3C was found to have approximately 23 per cent greater estimated net benefits than the second ranked option (Option 2C). Option 3C would provide more route diversity than Option 2C, reducing the risk of events such as lightning strikes, bushfires or extreme wind impacting power supply in the network. All lines in Option 3C are proposed to be constructed in a double-circuit configuration to minimise the overall costs to consumers, which was identified as a refinement in the PACR compared to the PADR.

Transgrid published an addendum to the PACR in December 2021 to provide greater detail on one of the options considered (Option 1C). There was no change to the conclusion that Option 3C is the preferred option and the RIT-T process has now been concluded.

The preferred option is expected to:

- Deliver net benefits of approximately $491 million to 2045/46 (in present value terms)
- Lower generator fuel costs required to meet demand in the NEM
- Reduce the need for new dispatchable generation investment
- Avoid capital costs that would otherwise be required to enable greater integration of renewables in the NEM
- Provide significant ‘competition benefits’ by increasing the efficiency of bidding in the wholesale market and improving the bidding behaviour of generators who may have market power.

This preferred option is generally consistent with the assumptions related to HumeLink in the 2020 ISP (refer to Section 2), including its network topology and operating capacity.

3.1. Transmission line route options

As described in Section 3, the PACR found that Option 3C, comprised of new double circuit 500 kV lines in an electrical ‘loop’ between Maragle, Wagga Wagga and Bannaby, provides the greatest net benefits of all options considered, across all scenarios investigated. The new Gugaa 500 kV substation (Gugaa 500 kV) no more than 15 km east of Wagga Wagga was included as an additional node.

An initial corridor identification study to connect the substation nodes was carried out in 2019 and considered constraints and opportunities that met technical requirements, minimised impacts and reduced costs.

A geo-spatial tool (Route Planning Assessment Tool (RPAT)) was populated with social, environmental, property and engineering considerations. These considerations were grouped as Tier 1 (no-go areas) or Tier 2 (avoid or minimise impact) criteria.

Tier 1 criteria were identified as areas that should be avoided as no-go areas due to the known presence of sensitive features and include:

- Wilderness Protection Areas
- Water sources for migratory birds protected by international agreements (JAMBA, CAMBA, ROKAMBA)
- Areas of very high Indigenous significance and World Heritage places
- Commonwealth Defence Land

- Built up areas
- Licenced airstrips
- Paralleling existing circuits north of Lower Tumut Switching Substation

Tier 2 criteria were identified as areas where impacts should be avoided if possible or minimised due to the known presence of the following features:

- Wetlands not listed as Tier 1 constraints
- Ecological conservation areas (including national parks and nature reserves)
- Endangered ecological communities and more broadly, Plant Community Types (PCTs)
- Heritage conservations areas and places
- Commonwealth land (non-Defence)
- Areas subject to exclusive use Native Title determinations
- Intensive agricultural activities and horticultural use
- Unlicensed airstrips
- Active industry (mining, wind and solar farms, industrial use)
- Homesteads
- Water crossing greater than 800 m
- Areas with high bushfire risk
- Areas with high lightning risk

In addition to these Tier 1 and Tier 2 criteria, several opportunities to minimise impacts and maximise benefits from the proposal were identified including:

- Minimising overall transmission line length to reduce costs, impacts and construction time
- Locating new transmission lines next to existing transmission lines, wherever possible, to allow use of existing access tracks for construction and maintenance
- Targeting areas of existing disturbance, such as roads, tracks and property boundaries to reduce environmental and property impacts

A corridor between 1 and 5 km wide was identified. This is referred to as the HumeLink study corridor in our engagement with landowners and stakeholders.

To further refine and narrow the proposal corridor, Transgrid undertook environmental investigations, including preliminary biodiversity and heritage assessments (refer to Appendices B and C), landowner and stakeholder engagement (refer to Section 6) and concept engineering design studies. Refinement of the corridor is an ongoing and iterative process. The outcomes of this process combined with feasibility studies undertaken for the PACR informed the identification of the current proposal corridor referred to in this Scoping Report (refer to Figure 1-1). Refer to Section 3 for more details on the proposal corridor.

3.2. Substation site selection

As the new transmission lines will connect between the 500 kV substations at Maragle and Bannaby and a 330 kilovolt (kV) substation at Wagga Wagga, the new Gugaa 500 kV substation is needed to transform the voltage. Table 3-1 sets out the steps in the site selection process.

Table 3-1: Site selection process

Step	Description
Definition of the need	Transgrid Network Planning identify a broad area for consideration based on project objectives and strategic network requirements. In particular, suitable sites needed to be identified that were no further than 15 km from Wagga Wagga and relatively close to Transgrid's existing transmission line, Line 51.
Refinement of the potential sites	Desktop review of existing information Identify constraints and opportunities, including the Tier 1 and 2 constraints and opportunities outlined in Section 3.1 Preliminary site inspections
Identification of a long list of potential sites	Apply key requirements to screen for potential sites
Short-listing of potential sites	Apply specific multi-disciplinary criteria to short-list potential sites (refer to Table 3-2).

Potential site options were subject to further assessment to identify a short-list of suitable sites. The criteria in Table 3-2 was used to short-list the sites. These additional criteria were required to narrow down the list of potential sites that may otherwise have a similar ranking when compared to the Tier 1 and 2 constraints.

Table 3-2: Short-listing criteria for substation sites

Short-listing Criteria	Description
Property	Land holding size
	Number of landowners affected
	Land use severance
	Easements and encumbrances (e.g. leases, licences, options, etc.)
Community and stakeholder	Proximity to residences and other sensitive receivers (e.g. educational institutions, hospitals, etc.)
	Potential visual impacts
Environment	Endangered ecological communities
	Extent of vegetation cover
	Minor waterbodies/waterways
	Potential contamination (as per New South Wales Environment Protection Authority (NSW EPA) contaminated sites register)
Heritage	Aboriginal Heritage Information Management System (AHIMS) listings
Design and construction	Site slope
	Distance from existing roads (length of new road required) and suitability of existing roads for construction vehicles and transformer transport (road upgrades required)
	Transmission line crossings
	Potential for flooding
Operational considerations	Connection to local electricity supply

Following the application of these criteria, short-listed sites are then discussed with the relevant landowners. Refer to Section 3 for more details on the proposed substation site(s).

3.3. Access track options

A multi-criteria assessment is being used to identify and generate access track options. Criteria used are similar to those used for the transmission line routes selection process, described in Section 3.1, to avoid adverse impacts where possible and minimise residual impacts.

Where possible, access tracks to tower locations would be sited:

- On ridge and spur alignments
- On northern and western facing slopes as they are likely to be drier than southern and eastern slopes
- Using existing roads and farm tracks
- To avoid natural drainage lines and low wetland areas where possible
- To avoid impacts to heritage and protected vegetation
- To balance cut and fill earthworks.

Road safety would be considered at curves and intersections to maximise sight distances. Curves would be widened to ensure sweep paths for larger vehicles. Track longitudinal grades would be kept within recommended guidelines. Generally, the maximum grade should be up to 8% but there may be short sections with grades up to 18%. Road crossfall grade would be 4% and road width approximately 4 m.

Waterway crossings would be designed to minimise the size of pipe and culvert construction or use rock causeways if practical.

4. The proposal

This section provides an overview of the HumeLink proposal corridor, potential location of substation site(s), concept design, construction and operational activities and delivery timing.

4.1. Overview of proposal

The proposal includes the construction and operation of around 360 km of new electricity transmission lines, substations, permanent and temporary access tracks and roads, and ancillary facilities required during construction.

The proposal corridor extends across the lands of the Wiradjuri, Ngunnawal, Ngarigo and Gundungurra people. It is located within five LGAs: Wagga Wagga, Snowy Valleys, Cootamundra-Gundagai, Yass Valley, and Upper Lachlan Shire.

The proposal traverses primarily rural areas with a range of land uses within or nearby the proposal corridor including cropping, grazing, horticulture, forestry, and renewable power generation (hydroelectric, solar, and wind). Other land uses in proximity include residences, farm buildings and infrastructure, roads and road reserves, drainage channels for irrigation, broad acre rural residential development, recreation, and existing transmission line easements.

The key components of HumeLink are:

- Substation works:
  - A new substation (Gugaa 500/330 kV (Gugaa 500 kV)) located approximately 15 km east of the existing Wagga 330/132 kV substation (Wagga 330 kV)
  - Augmentation of the existing Wagga 330 kV and Bannaby 500/330 kV (Bannaby 500 kV) substations.
- New transmission line circuits between[3]:
  - Maragle 500 kV substation and Bannaby 500 kV substation (276km)
  - Maragle 500 kV substation and Gugaa 500 kV substation (108km)
  - Gugaa 500 kV substation and Bannaby 500 kV substation (296km)
  - Existing Wagga 330 kV substation and new Gugaa 500 kV substation (15km).
- Ancillary development:
  - Two telecommunication huts along the transmission lines
  - New and upgraded temporary and permanent access tracks and roads
  - Temporary facilities required for construction of the proposal e.g. laydown and staging areas, stockpiling areas, concrete batching plants, brake/winch sites, site offices, parking areas and accommodation camps.

Further information on the key components of the proposal are provided in Section 3.3.

[3] These are approximate lengths for each circuit. However, as the transmission lines would be constructed in a double circuit arrangement (i.e two circuits on one set of transmission structures), the overall physical line distance would be approximately 360km

4.2. Proposal corridor

The proposal corridor encompasses the area where HumeLink assets such as transmission lines and substations are likely to be located and includes areas likely to be required for permanent and temporary access tracks and roads. The proposal corridor is shown in Figure 1-1.

Figure 1-1 shows the corridor within which the transmission lines would be located. The easements for the 330 kV transmission lines are likely to be 60 m wide, while the easements for the 500 kV transmission lines are likely to be 70 m wide. The easement provides a right of access to construct, maintain and operate the transmission line and other operational assets. As design progresses and further information is gathered on location-specific conditions, the precise siting of all required infrastructure will be defined such that the required easements can be identified with greater certainty. At this stage of project development, a wider proposal corridor is used as the basis of design development and environmental assessment. The proposal corridor as shown is 1 km wide in most places. A wider proposal corridor allows Transgrid to undertake further landowner engagement and community consultation (including consideration of community provided alternate route options), environmental surveys, technical investigations and consideration of engineering constraints. Three corridors options have been included for the Tumut/Blowering Dam area (refer to Figure 1-1). Community consultation and technical assessment of the three corridor options is ongoing. Only one of the three corridors in this area will be subject to assessment in the EIS.

Transgrid is also working towards narrowing the corridor to 200 m to provide more certainty to landowners on the location of the potential easement. Engagement with landowners around the 200 m corridor is underway and Transgrid intends to notify landowners of this narrowed corridor early in 2022.

The narrowed corridor is different to the footprint that will be assessed in the EIS as this accounts for potential permanent and temporary impacts from the proposal.

4.3. Proposal key components

The key components of HumeLink are summarised in Table 4-1.

Table 4-1: Summary of key components of the project

Component	Description
Transmission lines	
Form of the transmission lines and structures	The proposal includes the construction of 330 kV and 500 kV transmission lines connecting the Wagga Wagga, Bannaby and Maragle substations and the new Gugaa 500 kV substation. The new transmission lines cover around 360 km. The transmission lines would be supported on a series of free-standing steel lattice structures up to 75 m in height and generally spaced between 300 to 600 m apart. Earth wire and communications cables will be co-located on the transmission line structures. Indicative configurations of transmission line structures that may be used as part of the proposal are shown in Figure 4-1. 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 300 m^2, depending on ground conditions and the proposed structure type. Additional disturbance at each structure site to facilitate structure assembly and stringing may be required.
Transmission line easements	The easements for the 330 kV transmission lines are likely to be 60 m wide, while the easements for the 500 kV transmission lines are likely to be up to 70 m wide. The easement provides a right of access to construct, maintain and operate the transmission line and other operational assets. The easement also generally identifies the zone of initial vegetation clearance and ongoing vegetation management to ensure safe electrical clearances during the operation of the lines. It is noted that vegetation management beyond the easement may occur where nearby trees have the potential to encroach on the easement and require ongoing management to minimise safety hazards.

Component	Description
Substations	
New substation	Construction of the new Gugaa 500 kV substation including two new 500/330 kV transformers and two 500 kV reactors. The new Gugaa 500 kV substation is expected to occupy an area inclusive of buffer zones of approximately 170,000 m^2. The location of the new Gugaa substation is subject to further investigation and refinement.
Augmentation of existing Wagga 330 kV substation	The existing Wagga 330 kV substation on Ashfords Road, Gregadoo would be reconfigured to accommodate new bays for two new 330 kV transmission line circuits within the existing substation property boundary. This includes modifications to the busbars, line bays, existing line connections, bench and associated earthworks, relocation of existing high voltage equipment, drainage, external fence, internal substation roads, steelwork, cabling, and secondary systems.
Augmentation of existing Bannaby 500 kV substation	The existing Bannaby 500 kV substation on Hanworth Road, Bannaby would be expanded to accommodate connections for new 500 kV transmission line circuits. This includes modifications to the busbars, line bays, bench & associated earthworks, steelwork, drainage, external fence, internal/external substation roads, secondary containment dams, sediment containment dams, cabling, and secondary systems.
Permanent and temporary ancillary facilities	
Access	Access to each transmission line structure and the substation sites would be required during construction and operation. Wherever possible, existing roads, tracks and other existing disturbed areas would be used to minimise vegetation clearing or disturbance. In areas where there are no existing roads or tracks, suitable access would be constructed. This may include waterway crossings.
Telecommunications huts	Two telecommunications huts (optical repeaters) are required to be located along transmission lines greater than 135 km in length, to boost the signal in the Optical Fibre Ground Wire (OPGW). The telecommunications huts would be a small hut located near a transmission tower (within easement or adjacent to easement), with cable connections to the earth wire on the transmission line tower and to a local distribution line for its power supply. The telecommunications huts would be surrounded by a security fence.
Ancillary sites	Various ancillary sites would be required during the construction of the new transmission lines to support staging/laydown areas, concrete batching and workforce accommodation camps. 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 waterways and drainage lines. The location of ancillary sites would be refined during further stages of design.

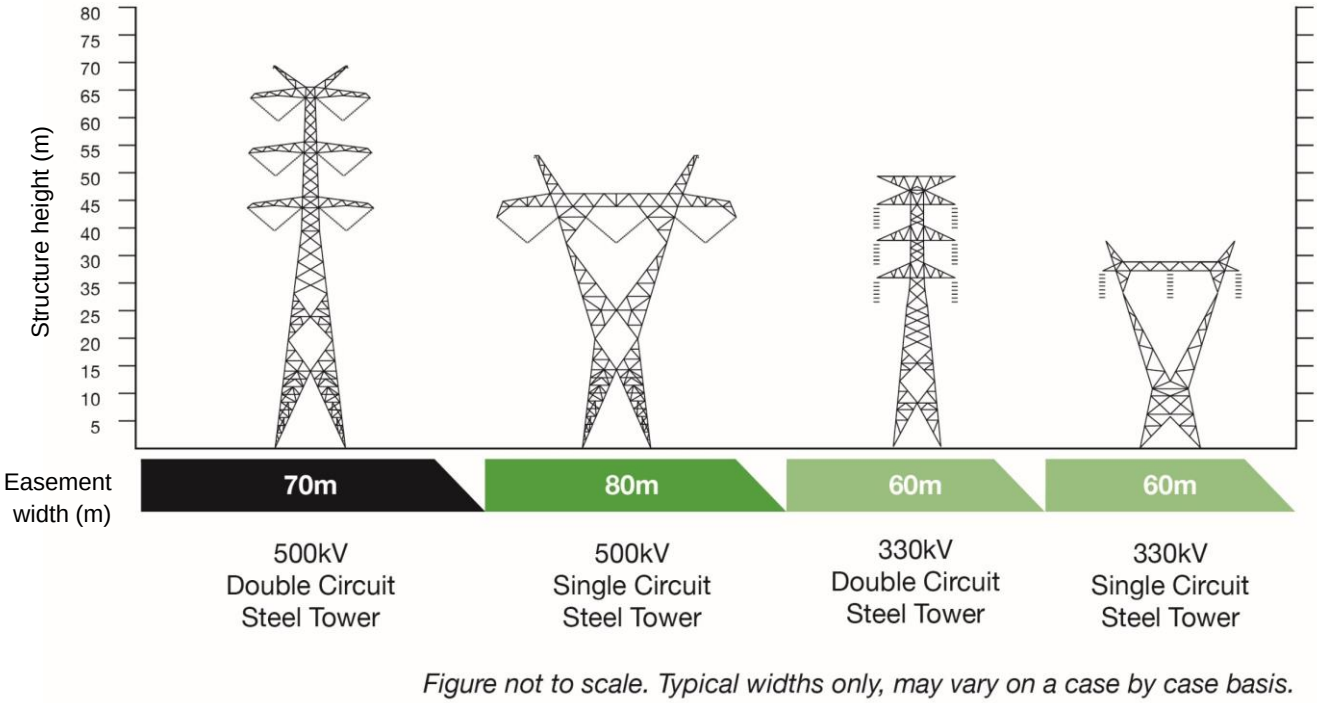


Figure 4-1: Indicative design for the transmission line structures (maximum height)

Note: Structure height and easement width may vary and not all structure types may be built as part of HumeLink

4.3.1. Construction program

Construction activities would generally be undertaken within the proposal corridor (refer to Figure 1-1). However, some associated facilities such as centralised administration and accommodation facilities, may be located outside this proposal corridor. 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
  - Stringing of conductors, overhead earth wires and OPGW
  - Installation of associated transmission line structure fittings inclusive of all earthing below ground level.

- Civil and building works associated with substations would generally include (but not be limited to):
  - Bulk earthworks and concrete foundations at the substation sites
  - Drainage, access roads, oil containment tanks/dams
  - Erection of steelwork and fencing
  - 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 in the EIS.

The construction workforce would vary depending on the stage of construction and associated activities. During peak construction activities, the project could employ around 400-1000 workers, working at multiple work fronts.

Construction of the proposal is targeted to commence in 2024, subject to the required planning and regulatory approvals. Once construction has commenced, the proposal is estimated to take approximately two years to construct. The proposal is expected to be commissioned/energised (i.e. become operational) in 2026. 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.

4.3.1.1. Construction plant and equipment

An indicative list of construction plant and equipment likely to be required for the key construction elements is provided below.

- 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
- Front end loaders
- Mulchers
- Flatbed Hiab 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

4.3.1.2. Construction hours

It is proposed that the works would be undertaken during standard construction hours. However, it is likely there would be times when working outside of standard construction hours would be required (as defined by the *Interim Construction Noise Guideline* (DECC, 2009)), subject to approval. As the details of construction methodology and project needs are developed, these hours will be refined for certain activities and addressed in the EIS.

4.3.1.3. 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 substations. Non-standard or oversized loads could also be required for the substation works (e.g. for transformer transport) and transportation of transmission line structure materials and conductors.

The haulage (transit) routes for project related vehicle trips would use much of the surrounding road network between Wagga Wagga, Tumbarumba, Yass, and Bannaby, including the highways (Hume Highway (M31), Sturt Highway (A20), and Snowy Mountain Highway (B72)), and arterial roads. Haulage routes will be described further in the EIS including routes from suitable port/s.

4.3.2. Pre-commissioning and commissioning phases

Prior to energisation of the infrastructure, a series of pre-commissioning activities would be conducted. This would include testing the new transmission line and substation earthing, primary and secondary equipment.

4.3.3. Operation phase

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

- Regular inspection (ground and aerial) and maintenance of electrical equipment
- 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.

5. Statutory context

Matter	Statutory requirements
Power to grant approval	Section 5.15 of the EP&A Act provides for a proponent to apply for the approval of the Minister under Division 5.2 to carry out SSI. Clause 192 of the *Environmental Planning and Assessment Regulation 2000* set out the requirements to be included in the application including: • Details of any approvals that would, but for section 5.23 of the Act, be required for the carrying out of the SSI; • Details of any authorisations that must be given under section 5.24 of the Act if the application is approved, and • A statement as to the basis on which the proposed infrastructure is SSI including, if relevant, the capital investment value of the proposed infrastructure. Set out below is commentary that addresses the above. In addition, permissibility, Commonwealth environmental approval requirements, other NSW legislative requirements and environmental planning instruments are addressed. ***CSSI*** On 7 March 2018, the then NSW Minister for Planning declared Snowy 2.0 and the proposal to be CSSI. The proposal is declared CSSI under section 5.13 of the EP&A Act by virtue of clause 16 and paragraph 9 of Schedule 5 of the SRD SEPP. Under clause 14 of SRD SEPP, HumeLink is SSI as follows: (a) the project falling within Schedule 3, paragraph 1 of the SRD SEPP on the basis that it is development for the purposes of clause 41 of *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP). Clause 41 permits 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'. 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.* Clause 41 also includes provisions relating to the carrying out of the works on land reserved under the *National Parks and Wildlife Act 1974.* Certain parameters must be met for that part of the development located in land reserved under that legislation. Part of the proposal traverses land reserved under the *National Parks and Wildlife Act 1974* however, the development would be carried out on NPWS reserved land over which an easement would be granted and would be consistent with the terms or nature of the easement. This meets the requirements in clause 41(1)(c) of the Infrastructure SEPP. The whole of the proposal meets the relevant parameters in clause 41 of the Infrastructure SEPP; and (b) the proposal being declared as CSSI under section 5.13 of the EP&A Act by virtue of clause 16 of the SRD SEPP. The proposal falls within the provisions of Schedule 5, paragraph 9 "Snowy 2.0 Transmission Project" of the SRD SEPP. The proposal does not require consent under Part 4 of the EP&A Act by virtue of clause 5.12 of the EP&A Act. The proposal requires approval from the NSW Minister for Planning under Division 5.2 of the EP&A Act. 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.
Permissibility	The declaration of the proposal as CSSI has the effect that the proposal may be carried out without development consent under Part 4 of the EP&A Act. See clause 16(a) of the SRD SEPP.

Matter	Statutory requirements
Mandatory matters for consideration	The proposal will consider all relevant Minister's mandatory matters for consideration before a determination is made. Mandatory matters would include preparation of an EIS and a public authority submissions report (on the EIS and Amendment report (if required) and consideration of any recommendations from the DPE assessment.
Other approvals - EPBC Act Approval	**EPBC Act approval** The proposal could potentially result in significant impacts on Matters of National Environmental Significance (MNES) protected under Division 1 of Part 3 of the EPBC Act. The MNES outlined under the EPBC Act include: • World Heritage properties • National Heritage places • Ramsar wetlands • EPBC Act listed threatened species, threatened ecological communities or their habitat • EPBC Act listed migratory species • Marine environment and the Great Barrier Reef Marine Park • Commonwealth land or actions by the Commonwealth agency • Proposed actions involving coal seam gas or large coal mining development or nuclear action An EPBC Act referral for HumeLink was submitted in November 2021 to the Commonwealth Australian Department of Agriculture, Water and the Environment (DAWE) under section 68 of the EPBC Act, seeking a determination as to whether: • the proposal is a controlled action within the meaning of section 67 of the EPBC Act, requiring approval under section 75 of that Act; and • HumeLink will be assessed by the relevant authorities in the NSW under the agreement titled "Agreement between the Commonwealth of Australia and the State of New South Wales relating to Environmental Assessment" and dated 26 February 2015 as amended by "Amending Agreement No 1" from 24 March 2020, (Assessment Bilateral Agreement), pursuant to Part 5 of the EPBC Act. Potential impacts of the proposal on MNES would be confirmed in the EIS. If the proposal is determined to be a controlled action, any associated Commonwealth assessment requirements would be considered during development of the EIS.
Other Approvals - Other legislative approvals that are not required for SSI (Section 5.23)	Under section 5.23(1) of the EP&A Act, certain approvals are not required for SSI including: • Permits under Sections 201, 205 or 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 *National Parks and Wildlife Act 1974* (NP&W Act) • A bushfire safety authority under Section 100B of the *Rural Fires Act 1997* • Certain 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. In addition, under section 5.23(2) of the EP&A Act, Division 8 of Part 6 of the *Heritage Act 1977* does not apply to prevent or interfere with the carrying out of approved SSI. Under section 5.23(3), the following directions, orders or notices cannot be made or given so as to prevent or interfere with the carrying out of approved CSSI: • An interim protection order (within the meaning of the NP&W Act), • 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 • A remediation direction under Division 3 (Remediation directions) of Part 6A of the NP&W Act, • An order or direction under Part 11 (Regulatory compliance mechanisms) of the *Biodiversity Conservation Act 2016* (BC 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*.

Matter	Statutory requirements
Other approvals - Authorisations that must be given (section 5.24 of the EP&A Act)	Under section 5.24 of the EP&A Act, certain approvals are required to be granted consistent with any approval to carry out an SSI. In the context of this proposal, the following may be required: • 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. • An approval under section 15 of the *Mine Subsidence Compensation Act 1961*.
Other legislation that may be applicable	The following legislation may or may not be applicable to the proposal regardless of being declared CSSI. General commentary is provided below and the applicability and extent of assessment would be confirmed in the EIS. ***Biodiversity Conservation Act 2016*** As CSSI, Transgrid is required to assess biodiversity impacts of the HumeLink proposal in accordance with the *Biodiversity Conservation Act 2016* (BC Act). The EIS for the proposal would include a Biodiversity Development Assessment Report including findings of field surveys and an assessment of biodiversity impacts. ***National Parks and Wildlife Act 1974*** The proposal corridor marginally encroaches within the curtilage of Kosciuszko National Park. The transmission line easement for the proposal is likely to be refined to minimise direct impacts to national parks, however the use and/or maintenance of existing access tracks within Kosciuszko National Park may be required. If the proposal is planned 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. Aboriginal cultural heritage is also dealt with under the NP&W Act. Despite approvals not being required as per section 5.23 of the EP&A Act, an assessment of Aboriginal cultural heritage impact will be carried out and mitigation measures proposed. ***Forestry Act 2012*** The proposal corridor includes several State forests (refer to Table 7-1). The *Forestry Act 2012* outlines several requirements for the management, acquisition and use of State forests, which would need to be considered prior to any construction of the proposal. In particular, Clause 34 of the *Forestry Act 2012* states “The Minister may, on such terms and conditions as the Minister thinks fit, grant an easement or right of way through or over land within a State forest or flora reserve”. ***Water Management Act 2000*** Approval of ‘aquifer interference activities’ may be required under the *Water Management Act 2000* if the proposal is expected to intercept an aquifer or result in drawdown. The likelihood of the proposal intercepting groundwater aquifers and resulting in drawdown would be assessed in the EIS. ***Contaminated Land Management Act 1997*** Notification of the NSW Environment Protection Authority (EPA) could be required in relation to the contamination of land during construction and/or operation of the proposal. ***Biosecurity Act 2015*** The proposal will have a duty to report, prevent, eliminate or minimise biosecurity risks as far as reasonably practicable. ***Native Title (NSW) Act 1994 and Native Title Act 1993 (Cth)*** Where relevant, consultation must be conducted with Native title holders or registered native title claimants. No current native title areas have been identified that would be affected by the proposal. However, the EIS would include an assessment of native title. ***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.

Matter	Statutory requirements
	Crown Land Management Act 2016 The proposal must meet the requirements for ownership, use and management of Crown Land. This includes the permissions and authorisations needed when planning the development of activities on Crown Land as well as the process for the acquisition of Crown Land. ***Waste Avoidance and Resource Recovery Act 2001*** The Act promotes waste avoidance and efficient resource use to reduce generation of waste through the Waste Avoidance and Resource Recovery Strategy. Waste and resource use impacts associated with the proposal would be considered as part of the EIS. ***Electricity Supply Act 1995*** Transgrid is a transmission operator and network operator under the *Electricity Supply Act 1995.* Under clause 45(1), for the purpose of exercising its functions under this or any other Act or law, a network operator may carry out any of the following work— (a) work comprising the erection, installation or extension of electricity works on public land, (b) work on any land comprising or connected with the alteration, maintenance or removal of existing electricity works on any land, (c) work on public land that is connected with the erection, installation, extension, alteration, maintenance or removal of electricity works on any land. However, in accordance with Clause 45(4) no such work (other than routine repairs or maintenance work) may be carried out unless— (a) notice of the proposal to carry out the work has been given to the local council, and (b) the local council has been given a reasonable opportunity (being not less than 40 days from the date on which the notice was given) to make submissions to the network operator in relation to the proposal, and (c) the network operator has given due consideration to any submissions so made. Transgrid would provide notification to Wagga Wagga City Council, Snowy Valleys Council, Cootamundra-Gundagai Regional Council, Yass Valley Council and Upper Lachlan Shire Council, as required in accordance with this Act. ***Aboriginal Land Rights Act 1983*** The purpose of the *Aboriginal Land Rights Act 1983 (NSW)* includes providing land rights for Aboriginal persons and representative Aboriginal Land Councils in the State. This Act applies to Crown lands that are not lawfully needed for an essential public purpose; referred to as claimable Crown land. The EIS will consider if there are any claimable Crown lands that have been identified that may be affected by proposal.
NSW Environmental Planning Instruments (Section 5.22 of the EP&A Act)	Section 5.22 of the EP&A Act states that environmental planning instruments do not apply to SSI and CSSI projects. In any event, the following key environmental planning instruments have been considered in relation to the proposal and will be addressed in the EIS. ***State Environmental Planning Policy (State and Regional Development) 2011*** **(SRD SEPP)** The proposal has been declared as SSI and CSSI, by Ministerial order, under Sections 5.12(4) & 5.13 of the EP&A Act. Schedule 5 of the SRD SEPP was incorporated on 9 March 2018 to include the proposal as CSSI. ***State Environmental Planning Policy (Sydney Drinking Water Catchment)*** This SEPP aims to provide for healthy water catchments that will deliver high quality water and supports water quality objectives in the Sydney drinking water catchment by ensuring that consent authorities only allow proposed developments that have a neutral or beneficial effect on water quality. As the north-eastern most part of the proposal is within the Sydney drinking water catchment (refer to Figure 7-11), a Neutral or Beneficial Effects (NorBE) assessment will be carried out. While State significant infrastructure is not specified in the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011, the consultation protocol between NSW Department of Planning and Environment (DPE) and WaterNSW requires the consideration of the principle of achieving a neutral or beneficial effect on water quality for State significant projects within the Sydney drinking water catchment.

Matter	Statutory requirements
	State Environmental Planning Policy (Koala Habitat Protection) 2021 The policy applies to a number of LGAs across NSW, including the Wagga Wagga, Snowy Valleys, Yass Valley and Upper Lachlan Shire LGAs, however it does not apply to land zoned RU1 Primary Production, RU2 Rural Landscape or RU3 Forestry. The policy does not apply to the Cootamundra-Gundagai 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. ***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.

6. Engagement

6.1. Engaging on HumeLink

HumeLink is a large and complex infrastructure proposal with a high-level of community interest. Transgrid recognises the diverse engagement and information needs of the community and has committed to a robust plan of engagement that will be inclusive and participative in nature.

Transgrid has dedicated local place managers and land access officers supported by a specialised community engagement team to deliver local and best practice community engagement to communities and landowners.

Independently facilitated community consultative groups (CCGs), which include a wide range of stakeholders, have also been established to provide input into the planning process throughout all stages of the proposal.

The hands-on engagement is complemented with desktop research to understand demographics, land use and unique characteristics to ensure that engagement is reflective of the community that Transgrid is working in.

In parallel, Transgrid is planning to work with communities to develop and implement a social legacy that goes beyond the functional scope of the proposal.

Transgrid aims to build trust in the community through a comprehensive engagement 'no surprises' approach, delivering on commitments, and keeping all stakeholders informed throughout the development of the proposal.

Transgrid has endorsed the IAP2 public participation spectrum as the best-practice approach to community engagement. The level of consultation with each stakeholder group has been based on the IAP2 public participation spectrum.

Transgrid has aligned their approach to community participation in accordance with the *Undertaking Engagement Guidelines for State Significant Projects* (DPIE, 2021), which are recently released government guidelines for engagement during the environmental impact assessment process. These guidelines outline several objectives for engagement, including that it should be open and inclusive, easy to access, relevant, timely and meaningful. The guidelines also establish that at this stage of the proposal, Transgrid is required to:

- Identify any early engagement that has been carried out that is relevant to the proposal (addressed in Section 6.3)
- Identify the key stakeholders for further engagement (addressed in Section 6.4)
- Plan how they intend to engage with the community, council and government agencies, so that engagement is proportionate to the scale and nature of the proposal and the likely level of community interest in the proposal (addressed in Section 6.6).

The engagement approach also aligns with:

- *Property Acquisition Standards* (NSW Government, 2019)
- *Quality Assurance Standard in Community and Stakeholder Engagement* (IAP2, 2015)
- *Clean Energy Council Community Engagement Guidelines* (CEC, 2018)
- *Community Participation Plan* (DPIE, 2019).

Transgrid's engagement and communications approach for HumeLink is to ensure that it is:

- Open and inclusive by:
  - Maintaining a consistent approach to communications and engagement so community and stakeholders know what to expect
  - Maintaining genuine, honest, and transparent two-way engagement, which is frequent and respectful
  - Understanding the values and opinions of the community and other stakeholders and providing opportunities to reflect these values and opinions in decision-making.
- Easy to access by:
  - Working to engage all landowners, community and stakeholders and enabling them to provide meaningful and informed feedback
  - Engaging affected community and other stakeholders, including those that are hard to reach to seek their perspectives, keep them informed and remove barriers to participation
  - Maintaining a clear and transparent process for collecting stakeholder feedback.
- Relevant by:
  - Tailoring communication and engagement to stakeholder needs and expectations.
- Timely by:
  - Refining and updating the engagement process to reflect both community and stakeholder and regulatory requirements and preferences as required
  - Seeking feedback from the community and other interested stakeholders during the undertaking of relevant specialist studies.
- Meaningful by:
  - Ensuring the process to identify a study corridor and route options includes engagement and consideration of stakeholder feedback
  - Involving community and other stakeholders in designing mitigation measures to reduce potential impacts of the proposal on the community and other stakeholders
  - Reporting on how feedback / issues / concerns / opportunities have been integrated into the corridor refinement and route options assessment processes.

6.2. Improving our engagement

6.2.1. Background

Transgrid heard that landowners and the communities in the HumeLink corridor were not satisfied with engagement to date and these concerns were taken seriously.

Transgrid engaged independent Landowner and Community Advocate, Rod Stowe, to assess past engagement and consultation practices for HumeLink and make recommendations for improvement. A report titled "Review of HumeLink Engagement Process – Findings of the Review" dated July 2021 (Stowe Report) was made public and is published on Transgrid's website.

Transgrid has committed to and implemented all 20 recommendations made in the Stowe Report.

The improvements to engagement focused on:

- Gaining an increased understanding of stakeholders and their need
- Regular, compassionate and meaningful engagement
- Assessing potential impacts to stakeholders and appropriate mitigations
- Embedding local place managers and ensuring there is an appropriately sized team to deliver engagement effectively
- Establishment of the CCGs
- Alignment with the Landowner and Community Advocate Report and its recommendations
- Achieving regulatory requirements, industry standards and best practice.

Transgrid will continue to engage with identified stakeholders according to the newly adopted principles and approach following the Landowner and Community Advocate Report. As new stakeholders are identified, Transgrid will apply the same framework.

The independent Landowner and Community Advocate will be available throughout the proposal development to support the community on any issues that cannot be satisfactorily resolved following Transgrid's engagement and complaints processes. Information as to how landowners, the community and stakeholders can engage with the Advocate is available on the HumeLink web page.

6.2.2. Landowner and Community Advocate recommendations

6.2.2.1. Overview

Transgrid has committed to and has implemented all recommendations from the Stowe report. Some of the key areas where Transgrid proposes to improve its engagement and consultation approach are:

- Clarity around how and when Transgrid is engaging – planned activities and timeline, including the information to landowners and the community on how they can participate
- Engagement tools are confirmed (and adapted if required) in response to community and stakeholder feedback
- Ensuring that there is clarity about why Transgrid engages with the community, landholders and stakeholders in the proposal corridor areas, the frequency of this engagement and how it relates to the proposal planning process
- Ensuring that the public has clear information about the methodology Transgrid uses to refine the corridor, identify route options and the role that the public has in this process
- Information provided on how feedback from landowners, community and stakeholders is used in the refinement of the corridor
- Ensuring that all stakeholders have the time and opportunity to provide feedback
- Ensuring landowners, community and stakeholders are clear about the potential impacts as well as the proposal planning process
- Valuing and committing to ongoing, transparent engagement.

6.2.2.2. Implementation plan

Table 6-1 details how Transgrid is delivering on the recommendations of the Landowner and Community Advocate report.

Table 6-1 Implementation of the Landowner and Community Advocate recommendations

#	Action	Indicative timeframe						
		Jul-21	Aug 21	Sep 21	Oct-21	Nov 21	Dec 21	Jan 22
A	**Improve consistency of engagement**							
A1	Conduct stakeholder research							
A2	Establish a Community Consultative Committee in the five LGAs							
A3	Embed skilled locally based place managers for consistent and readily available point of contact							
A4	Implement regular regional engagement							
B	**Enhance information quality and sharing**							
B1	Move HumeLink communications to a regular basis							
B2	Agree and articulate parameters that are in and out of engagement scope with the HumeLink project team							
B3	Commit to publicly providing rationale behind choices regarding community feedback							
B4	Explain the criteria for the next stage of decision making							
B5	Place managers review mapping and analysis of feedback before publicly presented							
B6	Ask community members to nominate topics for detailed fact sheets and FAQs							
B7	Prepare accessible information on the RIT-T and EIS process, regulatory frameworks and statutory and non-statutory consultation							
B8	Prepare accessible information on the process for property access and acquisition after review and endorsement by an independent party							
B9	Undertake independent peer review to verify accuracy							
C	**Resource engagement to the required level**							
C1	Secure endorsement and support for strategy by Transgrid executive and the Humelink project leaders							
C2	Test the reset strategy with key stakeholders							
C3	Appoint a strategic lead							
C4	Utilise expertise of organisations on best practice liaison with impacted landowners							
C5	Embed skilled locally based place managers for consistent and readily available point of contact							
C6	Mandate engagement and communications training for all community facing project team members							
C7	Develop partnerships with local health services to provide support for landowners							

6.3. Engagement to date

Transgrid will engage with landowners, Traditional Owners, stakeholders, and the broader community throughout all stages of the proposal. A key focus to date has been on ensuring that potentially affected landowners (landowners with properties within the proposal corridor) receive comprehensive updates about the proposal and that they have the opportunity to provide information about their properties and farm businesses. Local councils, key stakeholders and the broader community have also been consulted and feedback on the proposal continues to be encouraged.

There are several ways that communities and stakeholders can provide feedback – face to face, phone, email, the interactive map, and webinars and through the CCGs. Transgrid is committed to sharing with the community how this feedback has been considered as part of the corridor refinement and route options process, for better proposal outcomes and/or to minimise potential impacts. Table 6-2 outlines the range of engagement opportunities provided up to lodgement of the Scoping Report.

Table 6-2 Engagement activities up to Scoping Report lodgement

Engagement activity/tool	Quantity	Summary	Stakeholder group
Toll free community enquiry number	220 calls	A dedicated toll-free telephone number (1800 317 367) to receive and respond to enquiries from the community and interested stakeholders.	All
Dedicated email address	2623 emails	A dedicated email address (humelink@transgrid.com.au) to receive and respond to enquiries from the community and interested stakeholders.	All
HumeLink website	13,770 visits to the website	The HumeLink web page on the Transgrid website (transgrid.com.au/humelink) provides a proposal overview, key dates and proposal milestones, details about the approvals process and how community can get involved, as well as a range of proposal fact sheets and other information. This is updated regularly.	All
Online interactive map	1677 comments on the interactive map	An online interactive map allows stakeholders to comment and share local information. The map details the route refinement process and is updated to reflect the corridor refinement stages. All comments are considered as part of the planning process.	Landowners Interested community Local businesses Community groups
Stakeholder briefings	67 briefings held	Regular briefings and presentations are provided to relevant local councils and key industry stakeholders. The briefings have included presentations and discussions on the need for HumeLink, how stakeholders would like to be engaged, and any other topics of interest. They also provide an opportunity to listen and receive information from stakeholders and to explore opportunities to work together.	Government representatives (local, state, and federal) Community groups Local businesses Industry representatives Major development proponents Aboriginal representative groups
Landowner one-on-one meetings	423 meetings held	Face-to-face, on-property meetings will continue to be held with landowners within the corridor throughout the proposal. These meetings help Transgrid to understand individual property constraints, farm businesses, current and future land use, and other local information.	Landowners

Engagement activity/tool	Quantity	Summary	Stakeholder group
Fact sheets, newsletters	Regular updates at key proposal milestones and factsheets issued as required	Newsletters will be sent to landowners directly and will be made available to all stakeholders on the HumeLink web page. They will also be emailed to key stakeholders and interested community members. Factsheets will continue to be developed in response to feedback from community and landowners about what topics they would like more information about. Factsheet topics include: • HumeLink (overview of the proposal) • Route selection • Landowner consultation • Ecological surveys All newsletters and factsheets are available on the HumeLink web page.	Landowners General community Key stakeholders All interested community
Notifications, information packs	557 landowners received packs in September	All landowners within the corridor will continue to receive notifications when there is; new information about the proposal and the planning process, for request to enter property to complete environmental/ technical studies, and for any other updates. Notifications are often accompanied with newsletters, maps, and fact sheets to form information packs. These information packs are issued to provide landowners and other stakeholders with as much detail as possible to ensure they understand the proposal and are able to provide meaningful feedback.	Landowners Community Key stakeholders
Events, webinars and drop-in sessions	3 community events (limited due to COVID-19)	Transgrid will continue to hold events to enable the broader community to find out more about HumeLink and provide feedback. Events include community festivals and agricultural shows. Drop in sessions are planned to continue where possible at key stages of the proposal. COVID-19 restrictions have prevented face to face engagement so webinars have been held to enable engagement to continue, noting that Transgrid's preference is to engage face to face.	Community focussed
Community Consultative Groups (CCGs)	3 CCGs established	The first Community Consultative Group meetings were held in October 2021 and the second one in November 2021. The groups will run throughout the development of the proposal. There are three groups across the five LGAs and they provide an opportunity for discussion and to workshop key issues with Transgrid and landowners, local community organisations, councils, and other members of the communities in the HumeLink proposal study corridor.	Community, landowners, and community representatives

Engagement activity/tool	Quantity	Summary	Stakeholder group
Media, social media and advertising	Media releases distributed	Full-page advertising and digital campaigns have been run in local newspapers to promote the proposal and opportunities for engagement and this will continue at key stages throughout the proposal. Media organisations include: • Wagga Daily Advertiser • Goulburn Post • Tumut and Adelong Times • Gundagai Independent • Tumbarumba Times • Yass Valley Times • Crookwell Gazette Media releases continue to be issued on new route options and other HumeLink announcements. Social media is also used to share proposal updates	All

6.4. Stakeholder engagement

Transgrid has engaged with a range of relevant stakeholders across the HumeLink corridor. Table 6-3 provides a list of stakeholder groups who have been engaged to date. Transgrid expects this list to grow and diversify as the development of the proposal continues and the engagement broadens.

Key areas of discussion with stakeholders have included:

- Need for the proposal
- Community and stakeholder engagement
- Consideration of feedback into the proposal planning process
- Potential impacts
- Alternate route options
- The use of public land
- Status of the proposal
- Corridor refinement process
- Regulatory approvals
- Compensation.

A key focus for Transgrid has been to meet with landowners. There have been more than 423 meetings with landowners on- property up to November 2021. The purpose of these meetings has been to understand landowner sentiment and any concerns or opportunities, seek input and receive local information including local farming operations, logistics, land use and environmental and cultural considerations.

Stakeholder identification and engagement will continue throughout the development of the proposal and will be updated as appropriate.

Table 6-3 Summary of stakeholder engagement and interest

Stakeholder	Engagement	Topics of interest
Community	HumeLink newsletter and fact sheets Website and Interactive Map 1800 number and HumeLink email CCGs Webinars, information sessions and public displays Support services, such as independent counselling	Local employment opportunities Environmental and social concerns Cumulative impacts Community sponsorship opportunities Community benefits Opportunities for improved communication and consultation Opportunities to collaborate for better regional outcomes Impact to local businesses
Landowners	One on one meetings and site visits HumeLink newsletter and fact sheets Targeted notifications Website and Interactive Map 1800 number and HumeLink email CCGs Webinars, information sessions and public displays Support services, such as independent counselling	Impact to local farm businesses and landowners Easement guidelines Compensation Opportunities for improved communication and consultation Environmental and social concerns
Government (political representatives) The Office of the Hon Premier, Dominic Perrottet (NSW) Treasurer and Minister for Energy, Matthew Kean (NSW) Minister for Planning (NSW), Anthony Roberts Minister for Infrastructure (NSW), Rob Stokes Minister for Environment and Heritage (NSW), James Griffin	Briefings / presentations Briefing Notes	Community sentiment Media interest Regulatory considerations
Local Federal Members Kristy McBain, Eden-Monaro Hon Michael McCormack (Deputy Prime Minister), Wagga Wagga Hon. Angus Taylor (Minister for Energy and Emissions Reduction), Hume Hon Sussan Ley (Minister for the Environment)	Briefings / presentations HumeLink newsletter and fact sheets	Community sentiment/ issues arising Constituent concerns Media interest
Local State Members Joe McGirr, Wagga Wagga Wendy Tuckerman, Goulburn Stephanie Cooke, Cootamundra Justin Clancy, Albury	Member of Parliament briefings Electorate officer briefings Constituent meetings HumeLink newsletter and fact sheets	Community sentiment / issues arising Constituent concerns Media interest

Stakeholder	Engagement	Topics of interest
Local Government (elected officials and Executive staff) Snowy Valleys Council Upper Lachlan Shire Council Wagga Wagga Council Cootamundra-Gundagai Regional Council Yass Valley Council	Councillor briefings Council presentations Emails / phone calls HumeLink newsletter and fact sheets	Community sentiment / issues arising Constituent concerns Local impacts Media interest Local opportunities and constraints, such as considerations around Tumut airport Use of public vs private land
Government (Departmental and Agency) Heritage NSW DPE (NSW) (including Biodiversity Conservation Division) DAWE (Fed) Department of Primary Industries (NSW) Forestry Corporation of NSW Centre for Property Acquisition (NSW) Transport for NSW Rural Fire Service	Briefings / presentations Technical meetings Interface meetings Emails / phone calls HumeLink newsletter and fact sheets	Field survey requirements Hunting restrictions Impact of proposed routes on firefighting and fuel reduction burns Impact on operations Compensation Opportunities to share lessons and to collaborate for better regional outcomes
Traditional Owners and other Aboriginal representative groups Brungle-Tumut Local Aboriginal Land Council Onerwal Local Aboriginal Land Council Pejar Local Aboriginal Land Council Wagga Wagga Local Aboriginal Land Council Wagonga Local Aboriginal Land Council Riverina Murray Regional Alliance	Briefings / presentations Emails / phone calls HumeLink newsletter and fact sheets CCGs Website and Interactive Map Community sponsorship program	Culturally significant sites Cultural heritage survey requirements and findings Opportunities for improved communication and consultation Community sponsorship opportunities Opportunities to collaborate for better regional outcomes
Community groups Community organisations Service groups (Rotary etc) Issue-specific interest groups (e.g. environment, health) Local business PIAC, EUAA, ECA, St Vincent de Paul, Tesla, AiGroup	Briefings / presentations HumeLink newsletter and fact sheets Website and Interactive Map CCGs Community sponsorship program Support services, such as independent counselling	Local employment opportunities Community sponsorship opportunities Opportunities for improved communication and consultation Opportunities to collaborate for better regional outcomes
Industry representative groups NSW Farmers Association	Briefings / presentations HumeLink newsletter and fact sheets Website and Interactive Map Community Consultative Groups Support services, such as independent counselling	Impact to local farm businesses and landowners Easement guidelines Local employment opportunities Community sponsorship opportunities Opportunities to collaborate for better regional outcomes Opportunities for improved communication and consultation Compensation

Stakeholder	Engagement	Topics of interest
Major development proponents and renewable generators (e.g. Snowy Hydro, CWP Renewables, Tilt Renewables, Spark Renewables)	Briefings / presentations HumeLink newsletter and fact sheets Website and Interactive Map Technical meetings Interface meetings Emails / phone calls	Workforce capacity Cumulative impacts Interface management Constraints and opportunities Opportunities to share lessons and to collaborate for better regional outcomes

6.5. Key community themes

In mid-2020, Transgrid started engaging with landowners and stakeholders within the corridor. Since this time, stakeholders have provided feedback across a range of themes. Table 6-4 provides an overview of the key trends in feedback received up to November 2021.

Table 6-4 Feedback themes

Theme	Number of times topic was raised	Focus of feedback
Proposed alignment	364	Location of route Preferences for alignment Concerns about the alignment Proposed alternative alignments Timeframes for route refinement Level of influence on alignment Consultation timings and process What it means to live with a powerline Easement guidelines Route selection process Compensation process Known and unknown constraints Use of public versus private land
Impacts on land use and property	220	Protection of productive agricultural land Current and future land-use plans Existing farming infrastructure Impact to farming operations Property access Gates and livestock Biosecurity Easement guidelines Construction impacts Consent to enter protocols
Impacts of towers	97	Tower locations Size and shape of the towers Impact to visual amenity Impact to property value Impact to farming operations Level of influence on tower placement Easement guidelines and exclusion zones Design safety features

Theme	Number of times topic was raised	Focus of feedback
Impact on the environment	48	Protecting Landcare plantings Clearing requirements Construction impacts Easement guidelines Identification and protection of heritage items Undergrounding the line Use of public vs private land
Impacts on health	37	Concerns about effects of electric and magnetic fields (EMF) on people and animals

6.6. Ongoing engagement

Best practice engagement will remain a key focus and Transgrid will continue to engage potentially affected landowners, Traditional Owners and the community to ensure they receive comprehensive updates about the proposal, they have the opportunity to provide feedback on the proposal and the planning process and are involved in the opportunities to create a broader social legacy.

Table 6-5 summarises a range of engagement and communication activities that have been and will continue to be carried out by Transgrid during the 'improving the engagement' phase of the proposal. Transgrid will update the engagement approach as required, including changes to the proposal scope or timeframes, feedback from community and stakeholders, opportunities to increase community involvement in the proposal, and other considerations such as restrictions resulting from COVID-19.

Table 6-5 Summary of ongoing stakeholder engagement

Communications action	Objective	Stakeholders	Collateral
August 2021			
Bulk landowner mailout	Provide HumeLink update and confirm commitment to engagement reset	General community	Newsletter and letter Website updates
Landowner check-in calls and survey	Introduce new place managers, follow-up newsletter distribution and conduct short survey on information needs and communication preferences	Landowners	FAQs Short phone survey
Initiate regular stakeholder briefings	Provide regular opportunities for feedback	Proposal stakeholders, with a focus on community representative groups	Phone scripts / emails Presentations
September 2021			
Briefing with councils	To provide status update on the proposal and seek feedback	Local government	Presentation
Call for CCG nominations	CCG establishment	Local community	Adverts Media release Targeted invites Website Social media

Communications action	Objective	Stakeholders	Collateral
Ecological survey engagement	Confirm access arrangements and any other considerations	Landowners	Property maps Notifications Phone calls
Meet with Local Aboriginal Land Councils (LALCs) & Traditional Owners	To provide status update on the proposal and seek feedback	LALC	Presentation
Bulk landowner mailout	Provide HumeLink update and confirm commitment to engagement reset	General community	Newsletter Website updates Social media
Meet with community groups	To provide status update on the proposal and seek feedback	Community groups	Presentation Phone
Community Partnerships Program	Provide support for local initiatives to build relationships with local and impacted communities	Landowners General community Community groups	Email Newsletter Website
Regular key stakeholder meetings	Provide regular opportunities for information sharing and collaboration	Key stakeholders, including Snowy Hydro and Forestry NSW	Online meetings
October 2021			
Cultural Heritage Survey engagement	To provide overview of upcoming work	Landowners	Fact sheet Landowner letter
Landowner check-in calls	Provide proposal update, follow-up newsletter distribution, and seek feedback	Landowners	Phone FAQs
Webinar	Provide overview of the proposal	All	Webinar
Landowner engagement	Engage landowners	Landowners CCGs Community groups	Property maps Stakeholder briefing LAO pre-briefing FAQs On-property meetings Media statement Phone
CCG inaugural meeting	Establish terms of reference and group priorities	CCG members	Presentation Social media
Pulse check on engagement	Evaluate awareness and sentiment	General community	Surveys Phone
Engagement on environmental studies	Confirm access arrangements	Landowners	Fact sheet Website Land Access Officer pre-briefing FAQs On-property meetings Phone
November 2021			
Ongoing engagement	Engage landowners	Landowners	On-property meetings Phone

Communications action	Objective	Stakeholders	Collateral
CCG second meeting	Engage on corridor refinement	CCG members	Presentation Social media
Landowner check-in calls	Provide HumeLink update and seek feedback	Landowners	Phone FAQs
Local Aboriginal Land Council/ Traditional Owner Groups check-in calls	Provide HumeLink update and seek feedback	LALCs	Phone FAQs
December 2021			
CCG third meeting (optional)	Engage on corridor refinement	CCG members	Presentation Social media
Landowner end of year text	Thank landowners for their input	Landowners	SMS
January 2022			
Landowner check-in calls	Re-engage with landowners for the new year and provide overview of next steps	Landowners	FAQs Phone
Local Aboriginal Land Council/ Traditional Owner Groups check-in calls	Re-engage for the new year and provide overview of next steps	LALCs	FAQs
Reassess information needs and develop new collateral	Ensure information needs are being responded to	All	Fact sheet Website Social media
February 2022			
CCG meetings (ongoing)	Ongoing opportunity for engagement with a focus on proposal next steps	CCG members	Presentation Social media
HumeLink newsletter	Update on the proposal	Landowners, community and all interested stakeholders	Digital and hard copy versions and published online
Community group meetings	Ongoing engagement Provision of information Receiving feedback	Landowner groups	Meeting notes and as requested Presentations Maps
Face to face individual meetings	Ongoing engagement Provision of information Receiving feedback	Landowner	Meeting notes and as requested Maps
Member of Parliament and Council meetings	Ongoing engagement Provision of information Feedback on approach		Meeting notes and as requested Presentations
Community information sessions	Both targeted information sessions and broad HumeLink information sessions to provide information about the proposal	Landowners, community and all interested stakeholders	Presentations Maps Infographics
March 2022			
Ongoing engagement as outlined above			

Communications action	Objective	Stakeholders	Collateral
Geotechnical engagement commences	Confirm land access arrangements	Landowners	Land Access Officer pre-briefing Phone FAQs On-property meetings
Community Partnerships Program	Provide support for local initiatives to build relationships with local and impacted communities	Landowners General community Community groups	Email Newsletter (if timing allows) Website/social media Phone CCGs
April 2022			
Land acquisition process commences along sections of the route	To provide guidance and set expectations through next phase of the proposal	Landowners	Ministerial briefing Stakeholder briefing FAQs Land Access Officer pre-briefing Fact sheet Landowner letter Website On-property meetings Phone

Engagement will continue and will inform the preparation of the EIS, the proposal more broadly and to identify opportunities for the project to leave a broader social legacy. Transgrid is committed to continuing to engage landowners, the community and stakeholder throughout all proposal stages and to build and maintain strong relationships within the communities where the HumeLink infrastructure will be located.

Transgrid is committed to improving engagement on HumeLink so that it is robust, transparent, and effective. As mentioned above, Transgrid has heard that some landowners and community members have not been satisfied with the engagement for the proposal to date and take these concerns seriously.

Ongoing community and stakeholder engagement established through early engagement activities will complement and support the formal consultation required under planning regulations, including activities that may be stipulated in the SEARs and in the preparation of the EIS.

Engagement approaches will be evaluated and reviewed on a quarterly basis or as needed to ensure they are providing effective participation opportunities and responding to stakeholder needs and expectations. Regular community and stakeholder check-ins will also be conducted to track engagement performance, sentiment and issues of concern and opportunity.

7. Proposed assessment of impacts

7.1. Issues identification

A preliminary assessment has been carried out to identify the relevant environmental issues for HumeLink, including a description of the existing environment and identification of potential impacts during construction and operation of the proposal. For each issue, the scope and required level of assessment to be undertaken as part of the EIS is identified. The significance of each issue and need for specialist assessment has been based on the potential environmental impact and likely level of stakeholder interest.

This chapter considers the environmental issues relevant to the proposal requiring further assessment in the EIS.

Environmental issues are described in terms of the sensitivity of the proposal corridor and surrounds, scale and nature of impacts and the ability to avoid, mitigate or offset the impacts. The assessment approach is described in terms of the data requirements, investigations required, methodology for assessing impacts, applicable criteria, and relevant government plans, policies and guidelines. Planned community engagement on the proposal during the preparation of the EIS is also highlighted for each issue.

The data presented in the figures for each environmental issue is likely to be an over representation of what could potentially be impacted by the proposal. The proposal corridor shown represents the full range of options being considered and the final proposal corridor, once selected, will have a much smaller impact area than currently indicated.

7.2. Biodiversity

7.2.1. Terrestrial ecology

7.2.1.1. Existing environment

The proposal corridor has been the subject of ongoing terrestrial biodiversity surveys to validate PCTs and determine if threatened flora and fauna species and communities are present within the Interim Biogeographic Regionalisation for Australia (IBRA) subregions within the proposal corridor. A preliminary (terrestrial) biodiversity assessment, presented in Appendix B, includes a desktop review of published data, supplemented by survey data collected to date. The biodiversity study area includes the proposal corridor and a buffer zone of 500 m to identify biodiversity features that are relevant to the proposal. Note that a 10 km buffer around the proposal corridor has been used for threatened flora and fauna searches consistent with the *BioNet Atlas user manual* (OEH, 2019) and standard practice for the Commonwealth DAWE Protected Matters Online Search Tool (PMST). The PMST generates a list of potential or known MNES, based on records and modelling.

The existing environment as described in Appendix B is summarised below, and IBRA subregions, Important Bird Areas and threatened species sightings from the BioNet dataset and field investigations to date are shown in Figure 7-1.

The biodiversity study area extends through three IBRA bioregions:

- NSW South Eastern Highlands IBRA Region
- NSW South Western Slopes IBRA Region
- The Australian Alps Bioregion.

Within the bioregions, the proposal corridor crosses six IBRA subregions:

- Inland Slopes
- Murrumbateman
- Bungonia
- Crookwell
- Bondo
- Snowy Mountains.

Within the biodiversity study area, important biodiversity values are known to occur within protected areas including national parks, nature reserves, state conservation areas and State forest areas. Protected areas and State forest areas within the proposal corridor are listed in Table 7-1.

Table 7-1 Protected areas and State Forest areas within the proposal corridor

National parks	State conservation areas	Nature reserves	State forests
Kosciuszko National Park Tarlo River National Park Minjary National Park	Eurabbie Flora Reserve Laurel Hill Flora Reserve Tumut Subregion of the Southern Region Protected Area Forestry Management Areas in Tumut (FMZ2) Protected Area Wereboldera Conservation Area	Back Arm Nature Reserve Bango Nature Reserve Mudjarn Nature Reserve	Red Hill State Forest Maragle State Forest Tumut State Forest Bago State Forest Green Hills State Forest

Important Bird Areas (IBAs) have been mapped by BirdLife Australia for certain threatened species. IBAs within the proposal corridor include the South West Slopes IBA and Australian Alps IBA, shown in Figure 7-1.

There are seven threatened ecological communities (TECs) listed under the BC Act that have been identified within the biodiversity study area during field surveys, as shown in Table 7-2 and detailed further in Appendix B.

Table 7-2: NSW listed threatened ecological communities within the biodiversity study area

Threatened ecological community	NSW status under the BC Act
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Critically Endangered
Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion	Critically Endangered
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions	Critically Endangered
Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions	Endangered

Threatened ecological community	NSW status under the BC Act
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps Bioregions	Endangered
Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Endangered
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Endangered

The TECs identified in the preliminary biodiversity assessment (Appendix B) that are likely to require additional assessment as potential serious and irreversible impact (SAII) entities include:

- Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions TEC
- Illawarra Subtropical Rainforest in the Sydney Basin Bioregion TEC
- Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion TEC
- Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions TEC
- White Box Yellow Box Blakely's Red Gum Woodland TEC.

A Commonwealth protected matters search carried out on 17 September 2021 found six threatened ecological communities listed under the EPBC Act that likely to occur or may occur within the biodiversity study area, shown in Table 7-3 with further detail provided in Appendix B. No Commonwealth threatened ecological communities were listed as being known to occur within the biodiversity study area.

Table 7-3: Commonwealth listed threatened ecological communities within biodiversity study area

Name	EPBC Act status	Likelihood of occurrence
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Likely to occur
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Likely to occur
Alpine Sphagnum Bogs and Associated Fens	Endangered	Likely to occur
Grey Box (Eucalyptus macrocarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Likely to occur
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	May occur
Weeping Myall Woodlands	Endangered	May occur

Currently in NSW there are four areas of outstanding biodiversity value that have been declared under the BC Act. None of these areas are located in or near the proposal corridor.

A BioNet Vegetation Classification database search on 16 November 2021 found the following as occurring within the biodiversity study area (the full list is provided in Appendix B):

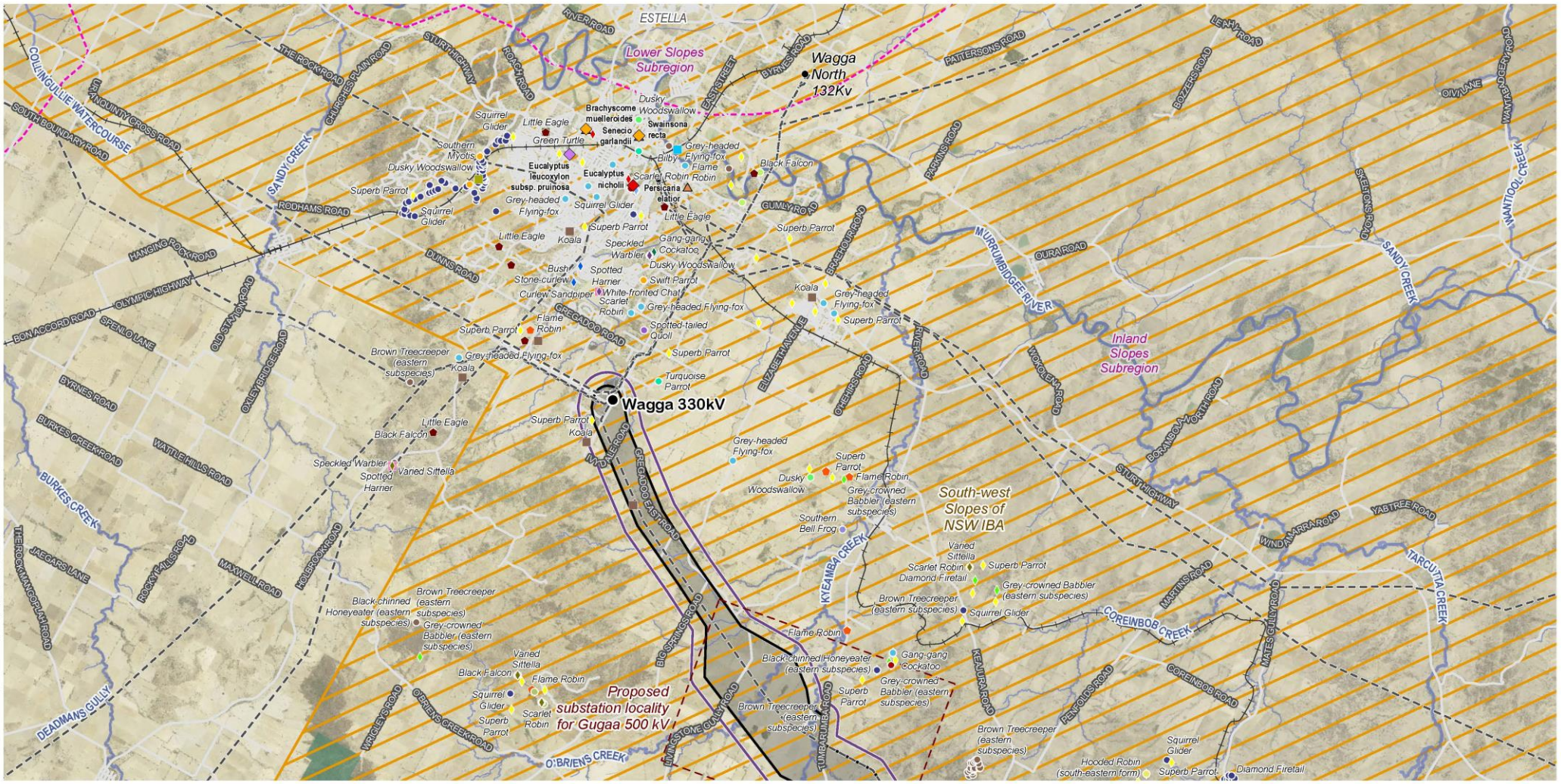
- 85 plant community types
- 25 threatened flora species
- 37 birds
- 17 mammals
- Five frog records
- Three reptiles
- One insect species.

A Commonwealth protected matters search on 17 September 2021 identified the following matters of national environmental significance under the EPBC Act, including:

- 44 threatened flora species
- 11 bird species
- 10 species of mammals
- Five fish species
- Eight frog species
- Two species of insect
- Two reptile species
- 13 listed migratory species.

Terrestrial ecological surveys carried out to date have included vegetation mapping validation, Biodiversity Assessment Method (BAM) vegetation integrity plots, targeted seasonal flora surveys and targeted seasonal fauna surveys. Details of the survey strategy, periods of survey and results to date are detailed in Appendix B. Surveys carried out to date have found that the proposal corridor is largely covered with native vegetation in moderate to good condition.

Figure 7-1 shows the BioNet threatened species records within and surrounding the biodiversity study area as well as additional records from the field investigations carried out to date.

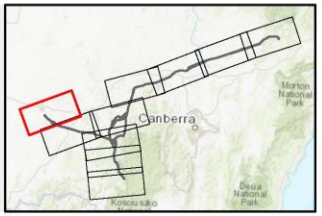


Proposal corridor
Existing Transgrid transmission line
Substation
Railway
Watercourse
National park and reserve
Biodiversity study area

IBRA Subregions
Important Bird Areas

NSW BioNet Threatened Species (Flora)
Brachyscome muelleroides
Eucalyptus leucoxylon subsp. pruinosa
Eucalyptus nicholii
Persicaria elatior
Senecio garlandii
Swainsona recta

NSW BioNet Threatened Species (Fauna)
Barking Owl
Bilby
Black Falcon
Black-chinned Honeyeater (eastern subspecies)
Brown Treecreeper (eastern subspecies)
Bush Stone-curlew
Curlew Sandpiper
Diamond Firetail
Dusky Woodswallow
Eastern Hooded Dotterel
Flame Robin
Gang-gang Cockatoo
Green Turtle
Grey-crowned Babbler (eastern subspecies)
Grey-headed Flying-fox
Hooded Robin (south-eastern form)
Koala
Little Eagle
Little Lorikeet
Regent Honeyeater
Scarlet Robin
Southern Bell Frog
Southern Myotis
Speckled Warbler
Spotted Harrier
Spotted-tailed Quoll
Squirrel Glider
Superb Parrot
Swift Parrot
Turquoise Parrot
Varied Sittella
White-fronted Chat
Yellow-bellied Sheathtail-bat



C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

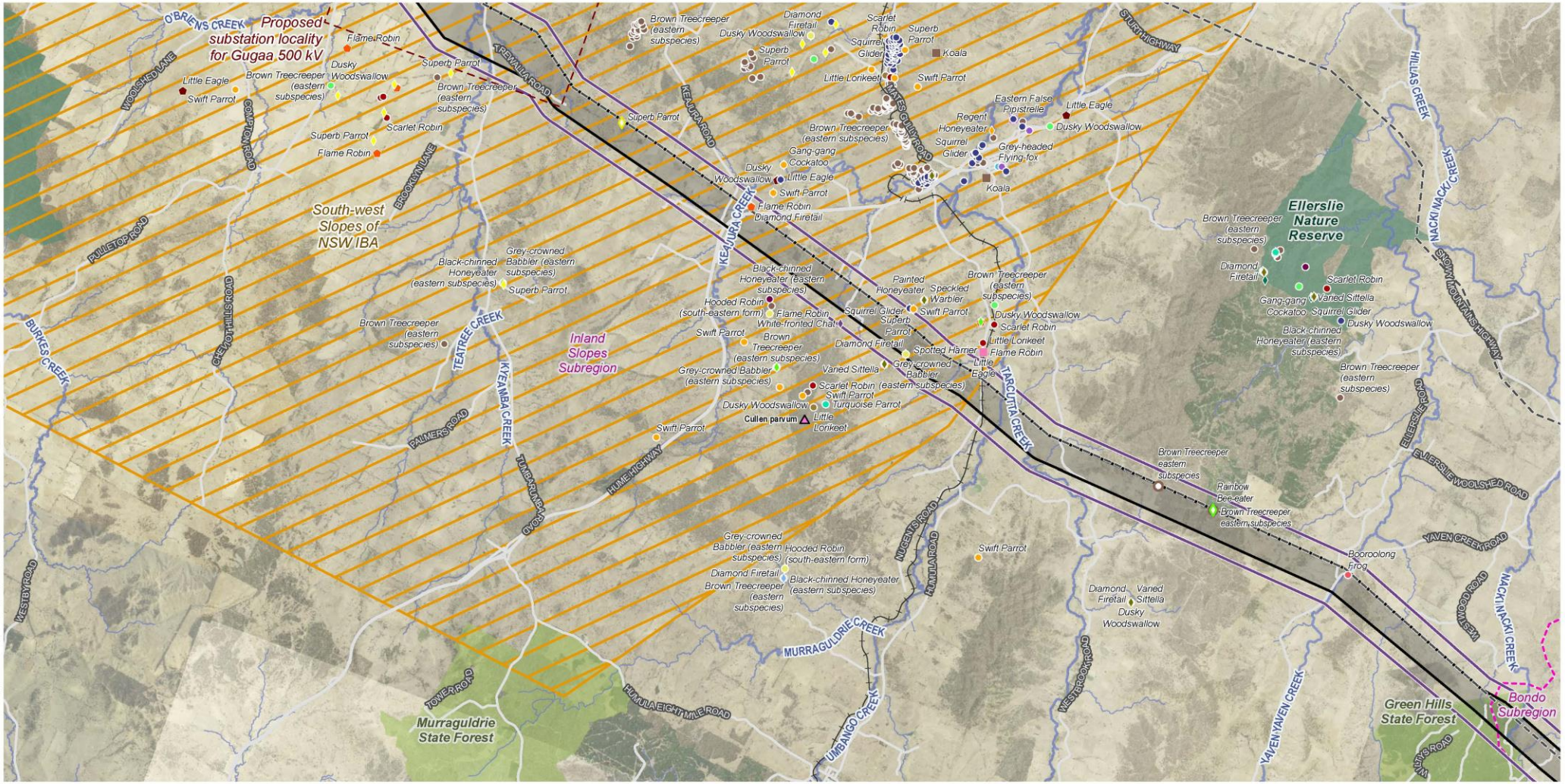
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

1:150,000
0 3 6km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-1-1: Terrestrial biodiversity



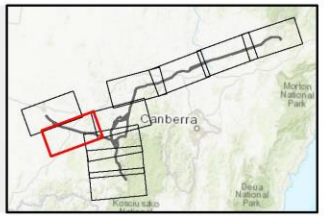
Proposal corridor
Existing Transgrid transmission line
Substation
Railway
Watercourse
National park and reserve
State forest

Biodiversity study area
IBRA Subregions
Important Bird Areas

ELA Field Validated Threatened Species (Fauna)
- Brown Treecreeper eastern subspecies
- Rainbow Bee-eater
- Superb Parrot

NSW BioNet Threatened Species (Flora)
- Cullen parvum

NSW BioNet Threatened Species (Fauna)
- Black-chinned Honeyeater (eastern subspecies)
- Booroolong Frog
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Dusky Woodswallow
- Eastern False Pipistrelle
- Flame Robin
- Gang-gang Cockatoo
- Grey-crowned Babbler (eastern subspecies)
- Grey-headed Flying-fox
- Hooded Robin (south-eastern form)
- Koala
- Large Bent-winged Bat
- Little Eagle
- Little Lorikeet
- Painted Honeyeater
- Regent Honeyeater
- Scarlet Robin
- Southern Myotis
- Speckled Warbler
- Spotted Harrier
- Spotted-tailed Quoll
- Squirrel Glider
- Superb Parrot
- Swift Parrot
- Turquoise Parrot
- Varied Sittella
- White-fronted Chat



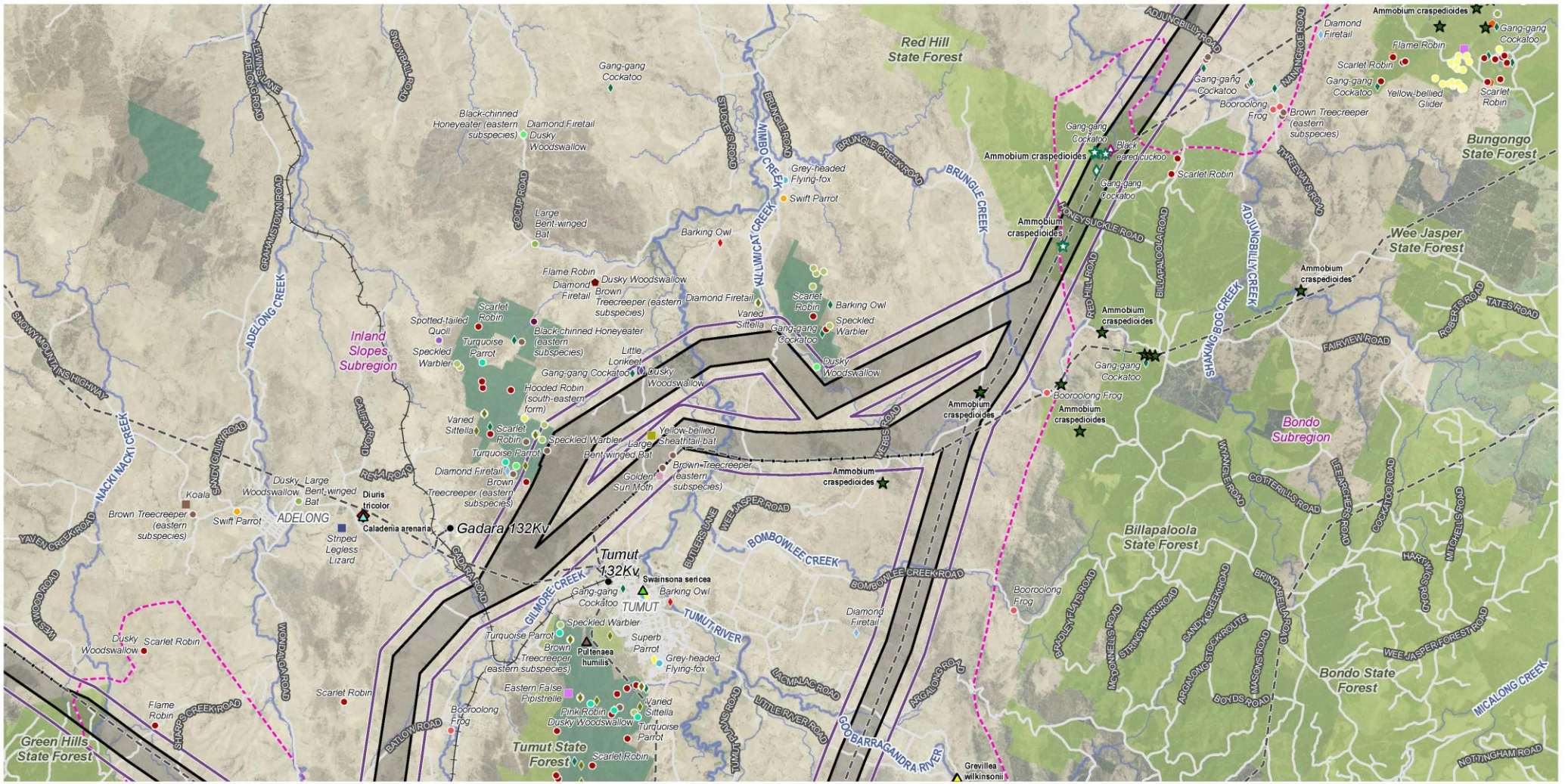
C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

1:150,000
0 3 6km

Projection: GDA 1994 MGA Zone 55

FIGURE 7-1-2: Terrestrial biodiversity



Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

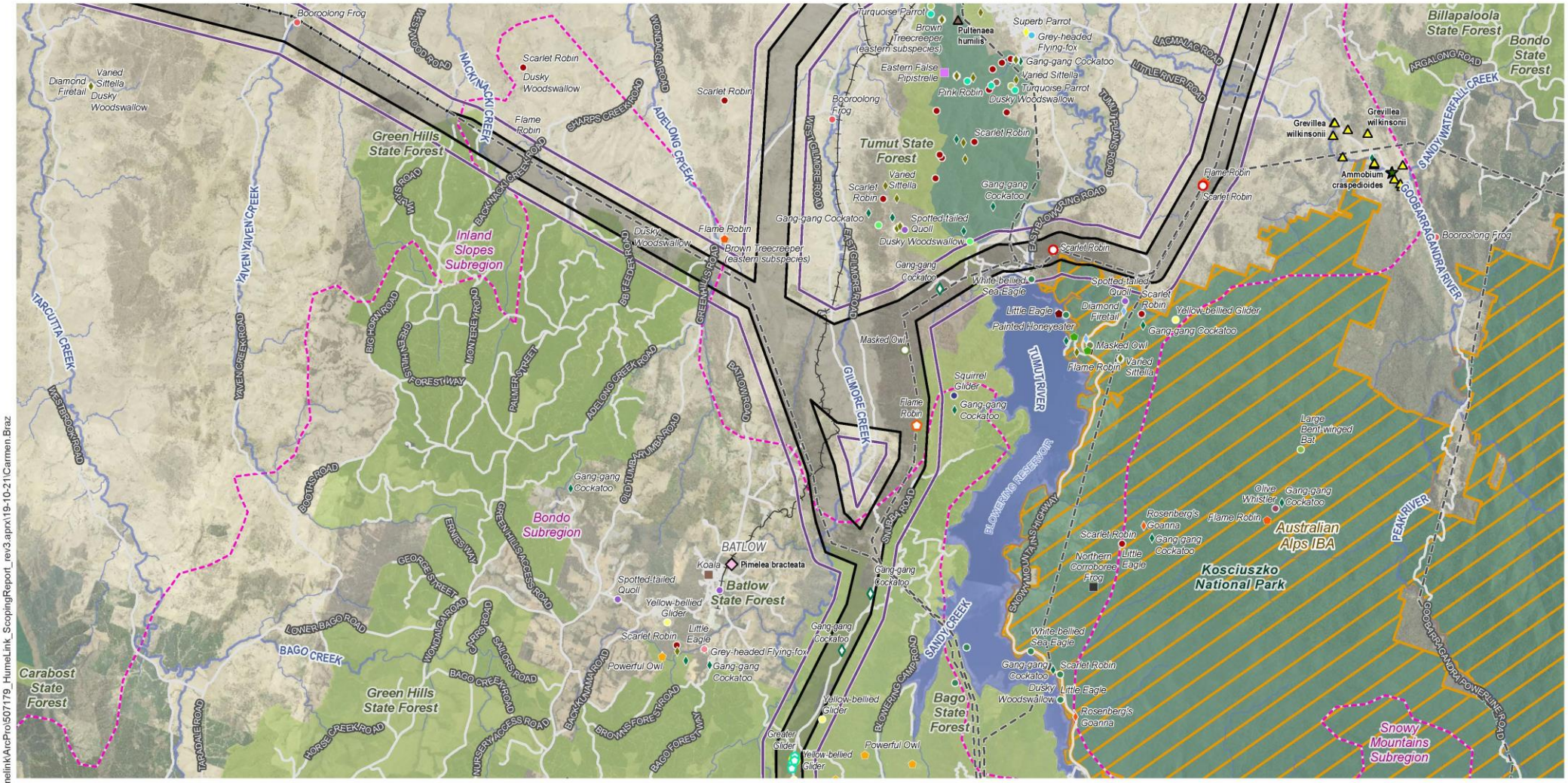
1:150,000
0 3 6km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-1-3: Terrestrial biodiversity

C:\Users\carmen.braz\Documents\HumelinkVArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz



Proposal corridor
Existing Transgrid transmission line
Substation
Railway
Watercourse
National park and reserve

State forest
Biodiversity study area
IBRA Subregions
Important Bird Areas

ELA Field Validated Threatened Species (Fauna)
Flame Robin
Gang-gang Cockatoo

Greater Glider
Masked Owl
Scarlet Robin
Yellow-bellied Glider

NSW BioNet Threatened Species (Flora)
Ammobium craspedioides
Grevillea wilkinsonii

Pimelea bracteata
Pultenaea humilis

NSW BioNet Threatened Species (Fauna)
Boorolong Frog
Brown Treecreeper (eastern subspecies)
Diamond Firetail
Dusky Woodswallow

Eastern False Pipistrelle
Flame Robin
Gang-gang Cockatoo
Grey-headed Flying-fox
Koala
Large Bent-winged Bat
Little Eagle

Magpie Goose
Masked Owl
Northern Corroboree Frog
Olive Whistler
Painted Honeyeater
Pink Robin
Powerful Owl

Rosenberg's Goanna
Scarlet Robin
Speckled Warbler
Spotted-tailed Quoll
Squirrel Glider
Superb Parrot
Turquoise Parrot

Varied Sittella
White-bellied Sea-Eagle
Yellow-bellied Glider

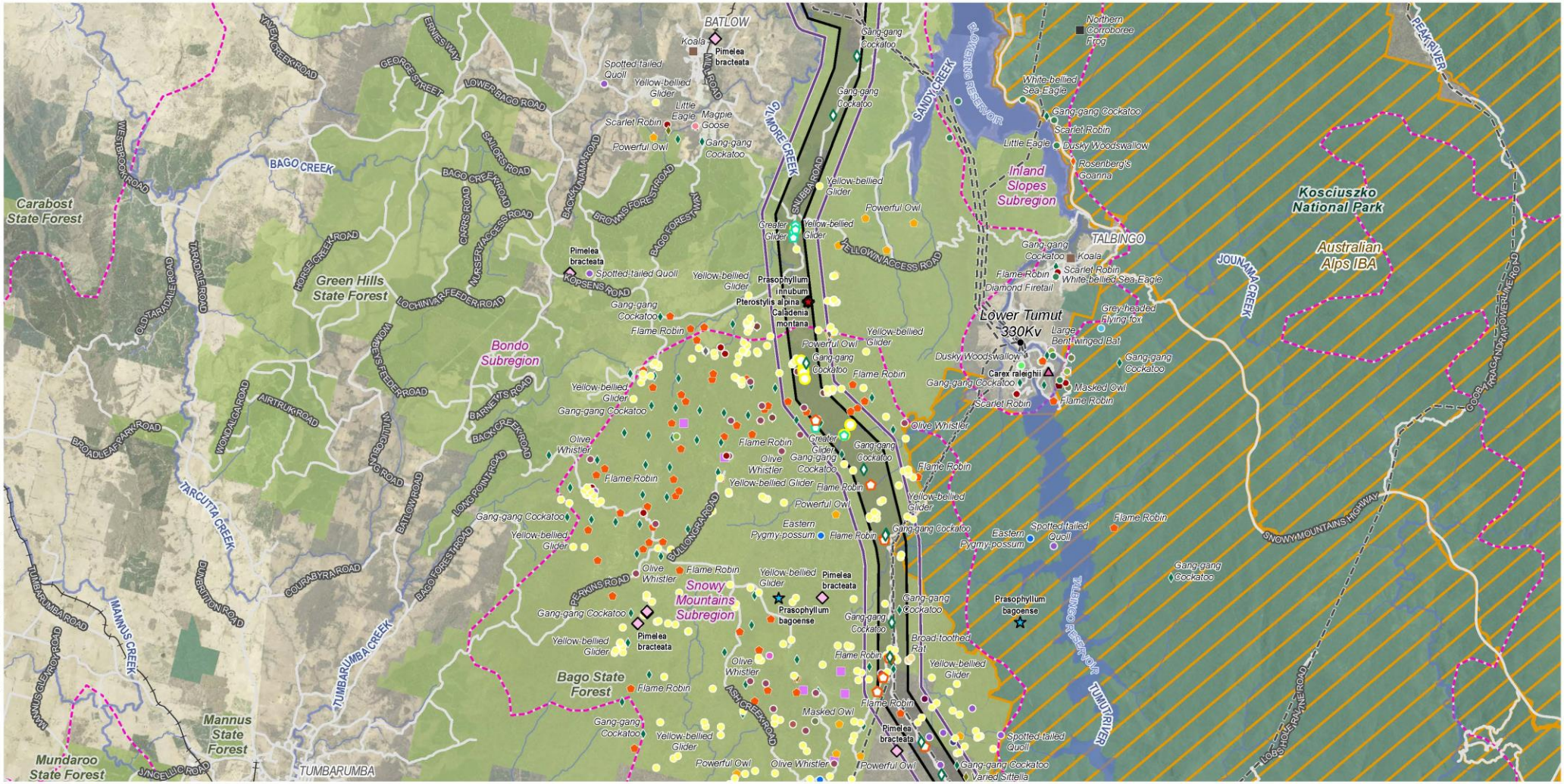
C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

1:151,150
0 3 6km

Projection: GDA 1994 MGA Zone 55

FIGURE 7-1-4: Terrestrial biodiversity



C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

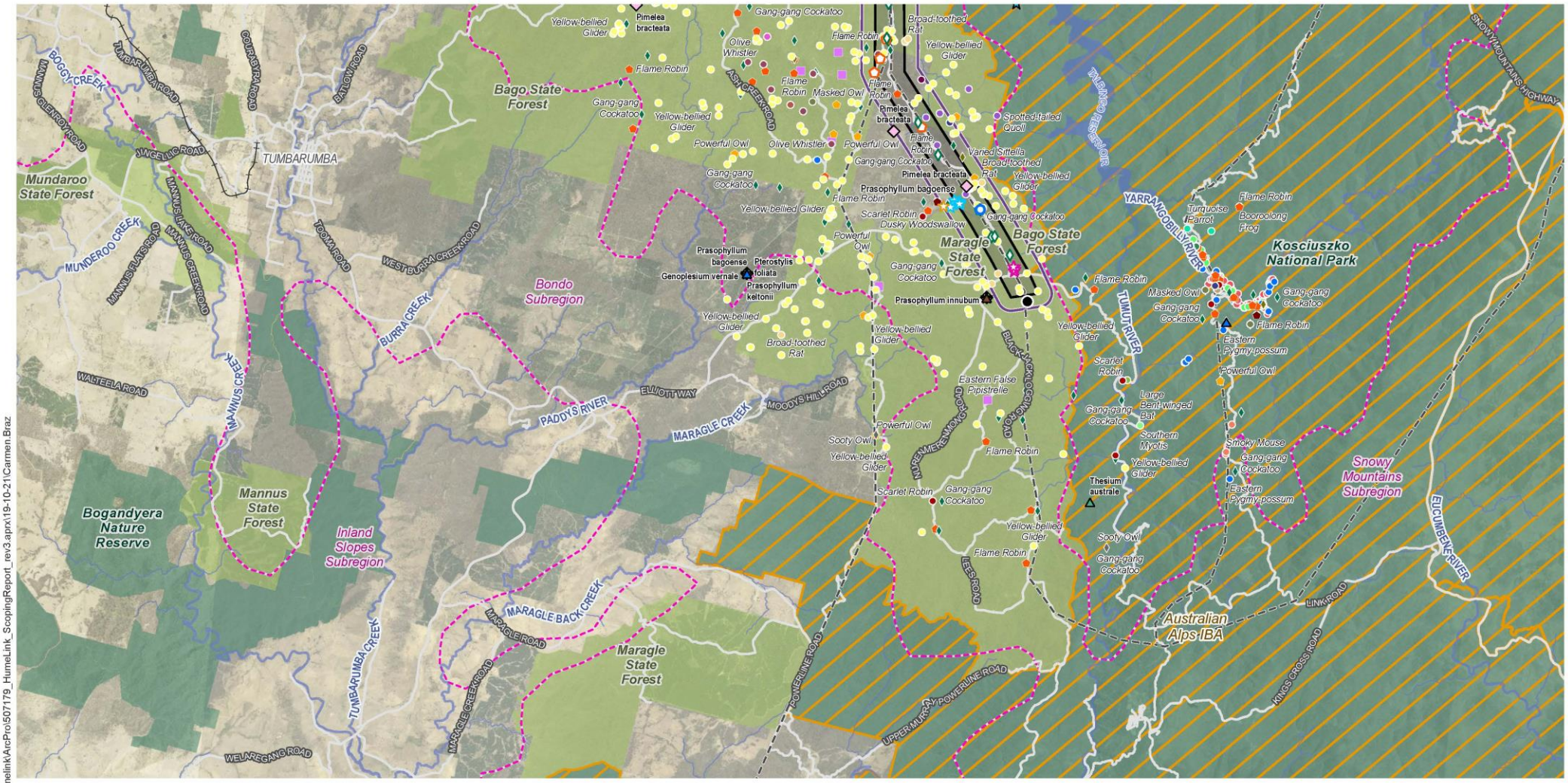
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

1:151,150
0 3 6km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-1-5: Terrestrial biodiversity



Proposal corridor
Existing Transgrid transmission line
Substation
Railway
Watercourse
National park and reserve
State forest
Biodiversity study area

IBRA Subregions
Important Bird Areas

ELA Field Validated Threatened Species (Flora)
Prasophyllum bagoense
Prasophyllum keltonii
Xerochrysum palustre

ELA Field Validated Threatened Species (Fauna)
Alpine Tree Frog

Eastern Pygmy Possum
Flame Robin
Gang-gang Cockatoo

NSW BioNet Threatened Species (Flora)
Genoplesium vernale
Pimelea bracteata
Prasophyllum bagoense
Prasophyllum innubum
Prasophyllum keltonii
Pterostylis foliata
Thelymitra atronitida
Thesium australe

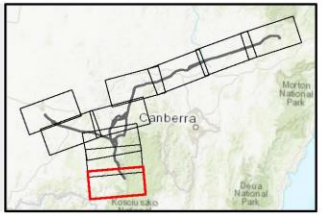
NSW BioNet Threatened Species (Fauna)
Black-chinned Honeyeater (eastern subspecies)
Booroolong Frog

Broad-toothed Rat
Brown Treecreeper (eastern subspecies)
Diamond Firetail
Dusky Woodswallow
Eastern False Pipistrelle
Eastern Pygmy-possum
Flame Robin
Gang-gang Cockatoo

Gilbert's Whistler
Greater Broad-nosed Bat
Large Bent-winged Bat
Little Eagle
Masked Owl
Northern Corroboree Frog
Olive Whistler
Pink Robin

Powerful Owl
Regent Honeyeater
Scarlet Robin
Smoky Mouse
Sooty Owl
Southern Myotis
Spotted-tailed Quoll
Squirrel Glider

Turquoise Parrot
Varied Sittella
White-bellied Sea-Eagle
Yellow-bellied Glider



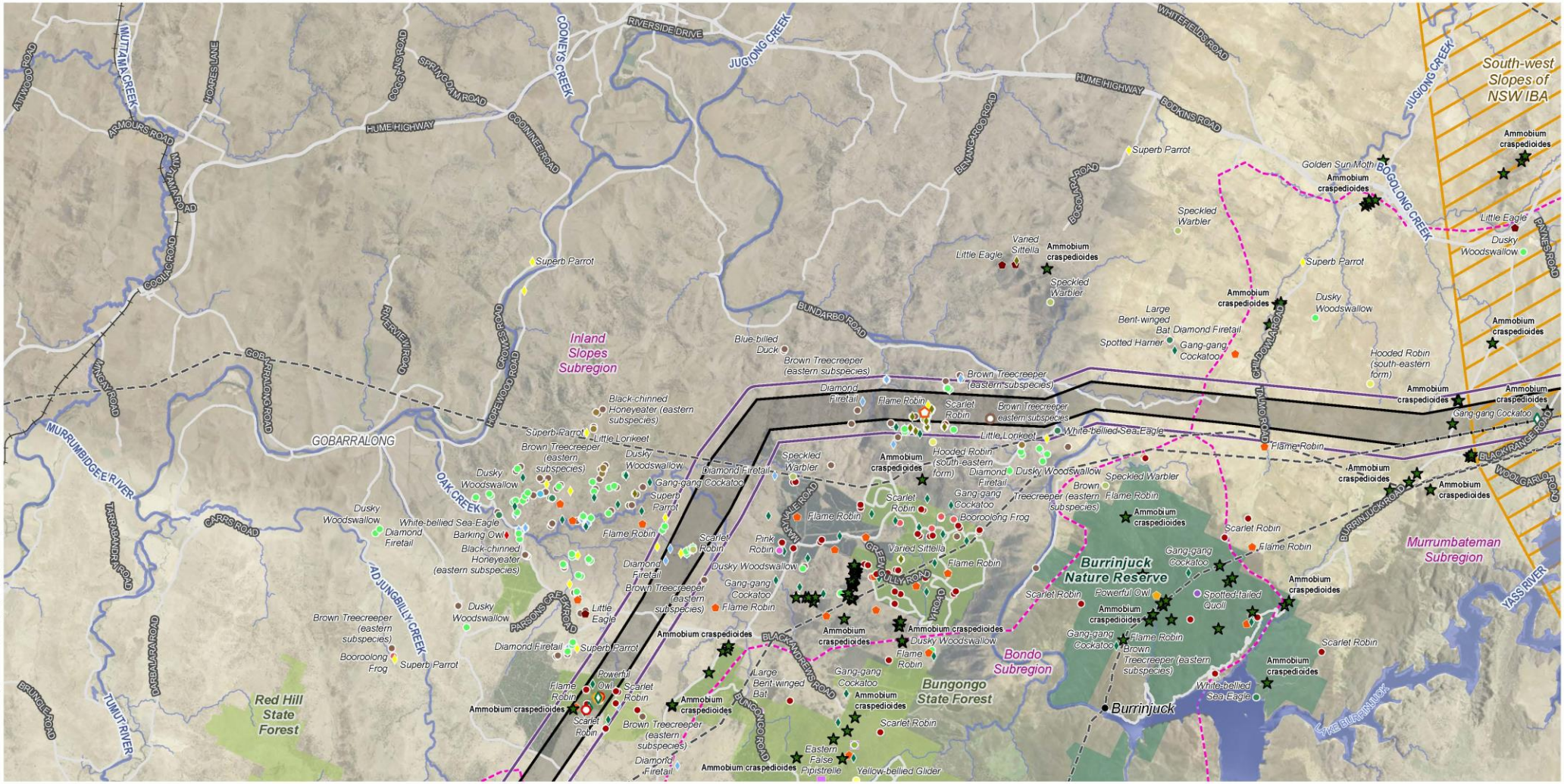
C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

1:151,150
0 3 6km

Projection: GDA 1994 MGA Zone 55

FIGURE 7-1-6: Terrestrial biodiversity



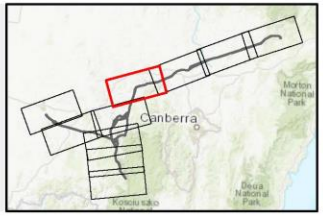
Proposal corridor
Existing Transgrid transmission line
Substation
Railway
Watercourse
National park and reserve
State forest

Biodiversity study area
IBRA Subregions
Important Bird Areas

ELA Field Validated Threatened Species (Fauna)
Brown Treecreeper eastern subspecies
Flame Robin
Gang-gang Cockatoo
Powerful Owl
Scarlet Robin

NSW BioNet Threatened Species (Flora)
Ammobium craspedioides

NSW BioNet Threatened Species (Fauna)
Barking Owl
Black-chinned Honeyeater (eastern subspecies)
Blue-billed Duck
Booroolong Frog
Brown Treecreeper (eastern subspecies)
Diamond Firetail
Dusky Woodswallow
Eastern False Pipistrelle
Flame Robin
Gang-gang Cockatoo
Golden Sun Moth
Grey-headed Flying-fox
Hooded Robin (south-eastern form)
Large Bent-winged Bat
Little Eagle
Little Lorikeet
Pink Robin
Powerful Owl
Scarlet Robin
Southern Myotis
Speckled Warbler
Spotted Harrier
Spotted-tailed Quoll
Superb Parrot
Varied Sittella
White-bellied Sea-Eagle
Yellow-bellied Glider



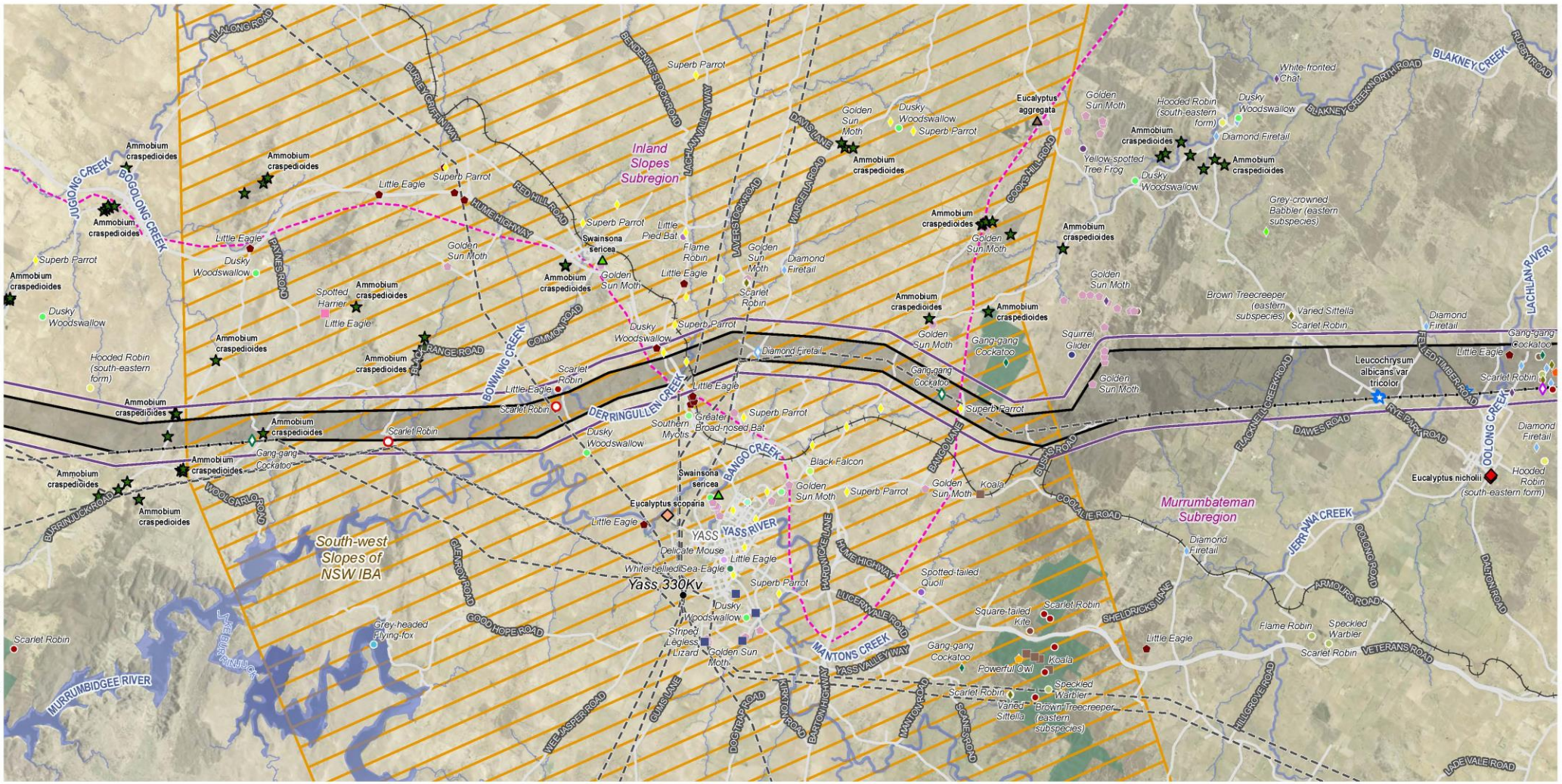
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

1:150,000
0 3 6km

Projection: GDA 1994 MGA Zone 55

FIGURE 7-1-7: Terrestrial biodiversity

C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz



C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

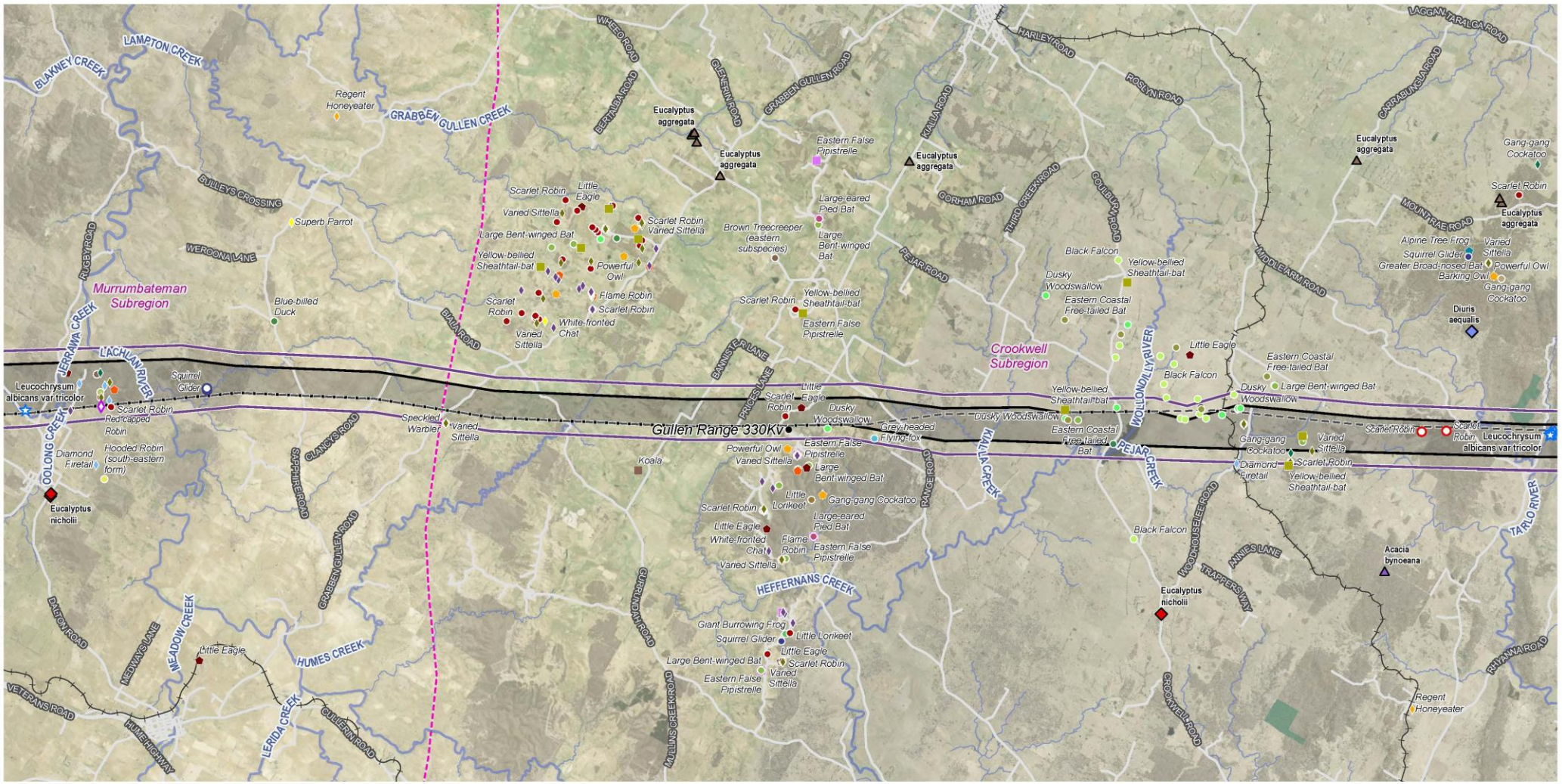
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

1:150,000
0 3 6km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-1-8: Terrestrial biodiversity



Proposal corridor
Existing Transgrid transmission line
Substation
Railway
Watercourse
National park and reserve
Biodiversity study area
IBRA Subregions
ELA Field Validated Threatened Species (Flora)
Leucochrysum albicans var tricolor
ELA Field Validated Threatened Species (Fauna)
Red-capped Robin
Scarlet Robin
Squirrel Glider
NSW BioNet Threatened Species (Flora)
Acacia bynoeana
Diuris aequalis
Eucalyptus aggregata
Eucalyptus nicholii
NSW BioNet Threatened Species (Fauna)
Alpine Tree Frog
Barking Owl
Black Falcon
Blue-billed Duck
Brown Treecreeper (eastern subspecies)
Diamond Firetail
Dusky Woodswallow
Eastern Coastal Free-tailed Bat
Eastern False Pipistrelle
Flame Robin
Gang-gang Cockatoo
Giant Burrowing Frog
Greater Broad-nosed Bat
Grey-headed Flying-fox
Hooded Robin (south-eastern form)
Koala
Large Bent-winged Bat
Large-eared Pied Bat
Little Eagle
Little Lorikeet
Powerful Owl
Regent Honeyeater
Scarlet Robin
Speckled Warbler
Squirrel Glider
Superb Parrot
Varied Sittella
White-bellied Sea-Eagle
White-fronted Chat
Yellow-bellied Sheathtail-bat

1:150,000
0 3 6km

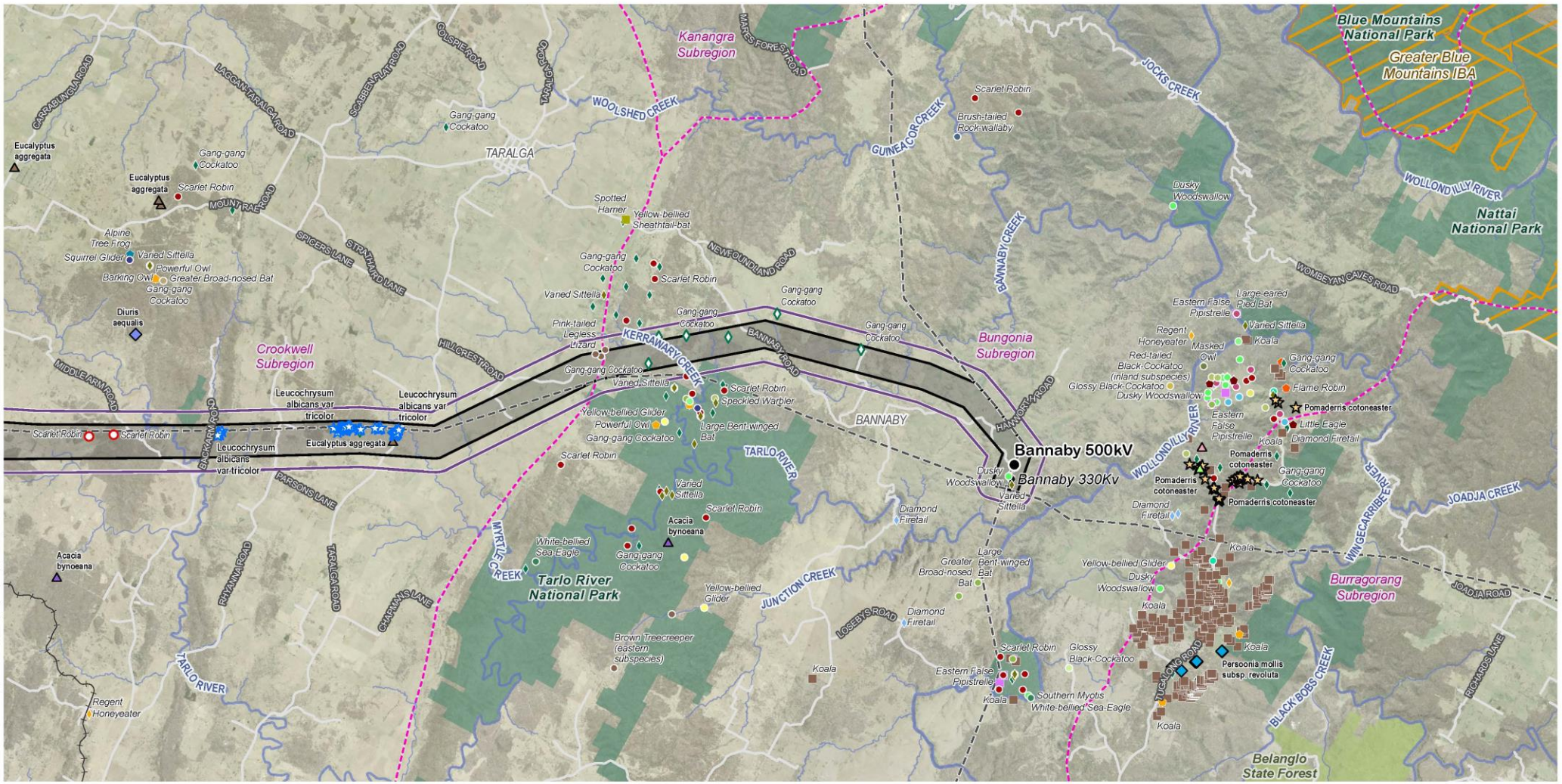
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

Projection: GDA 1994 MGA Zone 55

C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

HumeLink **Scoping Report**

FIGURE 7-1-9: Terrestrial biodiversity



C:\Users\carmen.braz\Documents\HumelinkVArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; ELA Field Validated Threatened Species: Ecological Australia (ELA), collected 2019-2021; NSW BioNet Species Sightings Data Collection; NSW Department of Planning, Industry and Environment; Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0: Department of Agriculture, Water and the Environment; Important Bird Areas (IBA) 2009: Bioregional Assessment Program; Transgrid; ESRI Topo*

1:150,000
0 3 6km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-1-10: Terrestrial biodiversity

7.2.1.2. Potential impacts

Construction

The most significant potential impacts on terrestrial ecology are likely to occur during the construction phase. The key potential adverse effects are:

- Direct loss of vegetation and habitats
- Damage to habitats, vegetation and foraging areas
- Injury or mortality of fauna
- Habitat fragmentation
- Disturbance from noise, vibration, movement and human presence
- Introduction or inadvertent spread of weeds and pathogens.

Potential impacts will vary between each of the key components of the proposal. The new and expanded substations could potentially require vegetation clearance to allow for a level bench for the substation buildings and equipment, and the surrounding bushfire asset protection zone. This would directly remove vegetation and cause indirect impacts to species and habitat adjacent to the cleared area during construction.

Transgrid has an obligation under the NSW Electricity Supply (Safety and Network Management) Regulation 2014 to have a system in place to manage bushfire risk relating to electricity lines and other assets that are capable of initiating bushfire. The amount of vegetation clearance in the easement is planned and carried out in accordance with this plan and would depend on the local terrain and vegetation. Generally, when on flat terrain, vegetation over 4 m in height would need to be removed. Where the transmission lines span a valley, the distance from live wires would be greater, it may be possible to retain more vegetation. Footings for transmission line structures will require full clearance.

Access tracks are required to the foot of each transmission tower and require full clearance of vegetation along each track to a width of approximately 4 m to allow for passage of construction vehicles. Upgrades of existing access tracks could also result in some vegetation trimming or removal.

Ancillary areas such as laydown areas, tower construction pads, communications hut, concrete batching and workforce accommodation could require full clearance of vegetation, while brake and winch sites are more temporary and may be able to retain ground vegetation during use.

Operation

During operation, vegetation would need to be maintained through pruning or removal to prevent ignition of fires and to keep access tracks clear. Transgrid's bushfire risk management plan provides specific detail on how inspection and maintenance activities are carried out prior to and during the bushfire season. Maintenance of access tracks within the boundary of Kosciuszko National Park may be carried out in accordance with existing access and operational protocols established between Transgrid and the National Parks and Wildlife Service.

Potential impacts of transmission line bird or bat strikes, line noise, EMF and radio interference from transmission infrastructure on fauna such as bats is an emerging area of investigation and will be considered further in the EIS.

7.2.1.3. Approach to assessment in the EIS

A detailed terrestrial ecology assessment will be carried out in the EIS, and specific consultation will continue to be carried out on this issue with landowners and government agencies. The assessment and field surveys will be carried out in accordance with the BAM. Direct and indirect impacts to biodiversity will be assessed in the Biodiversity Development Assessment Report (BDAR). The proposal corridor will continue to be refined to avoid and minimise impacts where possible, and an offset strategy will be developed to address unavoidable impacts to ensure a net increase in biodiversity values as a result of the proposal.

Field surveys that have been carried out to date are described in Appendix B. Further field work will be carried out to validate plant community types, assess vegetation condition (including the presence of weeds) and determine the presence of threatened ecological communities and species. Survey strategies will be developed as part of ongoing consultation with DPE's Biodiversity and Conservation Division.

The following government plans, policies and guidelines will be relevant to field survey and assessment in the EIS:

- *Biodiversity Assessment Method* (DPIE, 2020)
- *NSW Threatened Species Survey and Assessment Guidelines* (various)
- *Guideline for applying the Biodiversity Assessment Method at severely burnt sites* (DPIE, 2020),
- *Commonwealth EPBC 1.1 Significant Impact Guidelines – Matters of National Environmental Significance* (Commonwealth of Australia, 2013)
- *Commonwealth Department of the Environment – Nationally Threatened Ecological Communities and Threatened Species Guidelines* (various)
- *Commonwealth Department of the Environment – Survey Guidelines for Nationally Threatened Species* (various)
- *Developments adjacent to National Parks and Wildlife Service lands – Guidelines for consent and planning authorities* (NSW National Parks and Wildlife Service, 2020).

7.2.2. Aquatic ecology

7.2.2.1. Existing environment

The proposal corridor extends across four water catchments, namely Hawkesbury-Nepean, Lachlan, Murrumbidgee, and Murray and crosses major rivers including the Goobarragandra River, Lachlan River, Murrumbidgee River, Tarlo River, Tumut River near Blowering Dam, Wollondilly River near Pejar Dam, Yass River as well as several creeks and minor streams.

Mapped key fish habitat is present throughout the proposal corridor, which generally follows the named waterways (waterways are shown in Figure 7-1). The term 'fish' includes all aquatic invertebrates such as yabbies, shrimps, oysters, mussels and insect larvae.

Included in the definition of key fish habitat are water body types that may be found in the proposal corridor, such as:

- Permanently flowing rivers and creeks including those where the flow is modified by upstream dam(s), up to the top of the natural bank regardless of whether the channel has been physically modified
- Intermittently flowing rivers and creeks that retain water in a series of disconnected pools after flow ceases including those where the flow is modified by upstream dam(s), up to the top of the natural bank regardless of whether the channel has been physically modified
- Billabongs, lakes, lagoons, wetlands associated with other permanent fish habitats (e.g. permanent rivers and creeks, estuaries etc.)
- Weir pools and dams (e.g. Blowering Dam), up to full supply level, where the weir/dam is across a natural stream channel or waterway
- Flood channels or flood runners that may normally be dry but would be used by fish to move/migrate across or along floodplains between habitats during high flow events
- Any waterbody known to support or could be confidently expected (based on predictive modelling) to support threatened species, threatened populations or threatened communities listed under the provisions of Part 7A of the FM Act.

Threatened species and key threatening process are listed in schedules 4, 4A and 5 of the FM Act in accordance with the criteria prescribed in the Fisheries Management (General) Regulation 2010 and mapped in the Fisheries NSW Spatial Data Portal. Species of FM Act-listed threatened fish mapped as potentially occurring within the biodiversity study area are listed in Appendix B.

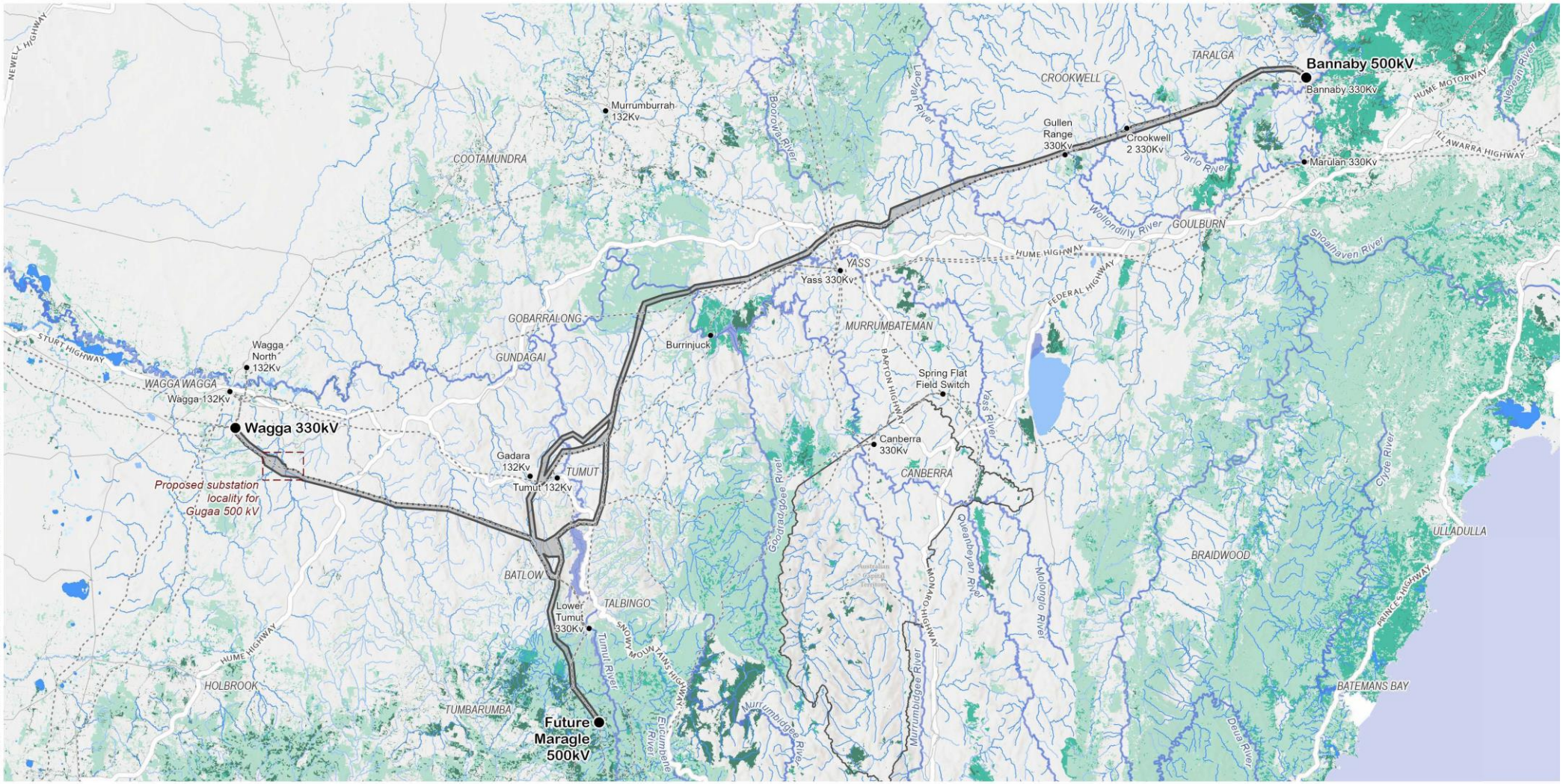
There are a number of high and moderate potential aquatic and terrestrial groundwater dependent ecosystems (GDEs) within the biodiversity study area mapped on the GDE Atlas (Bureau of Meteorology, 2017), as shown and described in Appendix B. An overview of the location of the mapped terrestrial and aquatic GDEs in relation to the proposal corridor is shown on Figure 7-2. A more detailed map series showing the GDEs within and near the proposal corridor is provided in Appendix D. The aquatic GDEs generally correspond with the larger named waterways. Within or adjacent to the biodiversity study area, the mapped aquatic GDEs include Yorkers Creek, Native Dog Gully and New Zealand Gully and Appletree Gully in the west of the biodiversity study area, the Tumut River, and Sheep Station Creek, Lick Hole Gully, Cave Gully, Wallace Creek, Stable Creek and the Yarrangobilly River to the east of the biodiversity study area.

The proposal corridor contains some areas of high potential terrestrial GDEs in the vicinity of Maragle and Bago State forests and on the western edge of Kosciuszko National Park, however, as described in Appendix B, they are not entirely dependent on groundwater. The areas of high potential GDEs include areas of the:

- Black Sallee - Snow Gum low woodland of montane valleys, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT
- Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT.
- Alpine Ash - Snow Gum shrubby tall open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT.
- Robertsons Peppermint - Broad-leaved Peppermint - Nortons Box - stringybark shrub-fern open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion PCT

- Ribbon Gum - Narrow-leaved (Robertsons) Peppermint montane fern - grass tall open forest on deep clay loam soils in the upper NSW South Western Slopes Bioregion and western Kosciuszko escarpment PCT
- Snow Gum - Mountain Gum shrubby open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT · Brittle Gum - peppermint open forest of the Woomargama to Tumut region, NSW South Western Slopes Bioregion PCT.

The assessment in Appendix B found that the alpine and sub-alpine peatlands, damp herbfields and fens, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT in the higher altitude alpine areas in the Bago plateau in the Bago and Maragle State forests are the most sensitive of the terrestrial GDEs present in the proposal corridor and are likely to be highly dependent on groundwater.



Proposal corridor

Existing Transgrid transmission line

Existing substation

Groundwater Dependent Ecosystems

Terrestrial

- High potential GDE
- Moderate potential GDE
- Low potential GDE

Aquatic

- High potential GDE
- Low potential GDE
- Moderate potential GDE

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes): NSW Foundation Spatial Data Framework; Groundwater Dependent Ecosystems: NSW Department of Planning, Industry and Environment; Transgrid: ESRI Topo*

1:925,000

0 20 40km

Projection: GDA 1994 MGA Zone 55

FIGURE 7-2: Groundwater Dependent Ecosystems

7.2.2.2. Potential impacts

Construction

Aquatic ecology impacts are most likely to occur through:

- Direct disturbance to riparian land and aquatic habitat during construction of new waterway crossings
- Turbidity and sedimentation due to eroded soil transported to waterways from earthworks and construction vehicle movements near waterways
- Spill of materials such as fuel or pesticides near a waterway.

Establishment of waterway crossings would involve the placement of rock on the bank or bed of the waterway, as required. The crossings may also involve installation of pipes to allow water to flow through the structure. Placement of material within waterways has the potential to alter stream flows, water levels and aquatic habitat.

Operation

During operation, impacts could include the transport and deposition of sediment during maintenance activities such as access track upgrades, work on transmission tower footings, and construction of level pads for elevated work platforms, or caused by ongoing erosion of exposed soil on access tracks. Spills could also occur during maintenance works.

7.2.2.3. Approach to assessment in the EIS

Field survey will be carried out using a visual rapid appraisal method to rate key indicators of aquatic and riparian condition. These will be used to classify key fish habitat types and waterway classes using definitions developed by Department of Primary Industries (DPI) Fisheries. Results will be assessed, and the application of available mitigation measures identified in an aquatic ecology assessment in the EIS. Relevant government guidelines for the assessment will include:

- *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2018)
- *Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013* (DPI, 2013)
- *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (NSW Fisheries, 2003)
- *Aquatic Ecology in Environmental Impact Assessment – EIA Guideline* (Marcus Lincoln Smith, 2003)
- *NSW State Groundwater Dependent Ecosystems Policy* (Department of Land and Water Conservation 2002)
- *Methods for the identification of high probability groundwater dependent vegetation ecosystems* (DPI, 2016)
- *Survey guidelines for Australia's threatened fish, Guidelines for detecting fish listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (Department of Sustainability, Environment, Water, Populations and Community, 2011).

7.3. Heritage

7.3.1. Aboriginal cultural heritage

7.3.1.1. Existing environment

HumeLink extends across the lands of the Wiradjuri, Ngunnawal, Ngarigo and Gundungurra people. A program of Aboriginal consultation has been initiated in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (Department of Environment, Climate Change and Water (DECCW), 2010) to invite registration of interest in the proposal.

A preliminary heritage assessment has been prepared for HumeLink to provide a detailed desktop analysis of known Aboriginal cultural heritage items and sites relevant to the proposal, and is presented in Appendix C. The preliminary heritage assessment report identifies available Aboriginal heritage information and provides a brief analysis of gaps in data within the heritage study area, defined as an area within a buffer zone of 1 km either side of the proposal corridor.

A search of the Aboriginal Heritage Information Management System (AHIMS) in September 2021 found 291 Aboriginal heritage items/recordings in the heritage study area, shown in Figure 7-3. A more detailed map series showing the AHIMS sites within the heritage study area is provided in Appendix D.

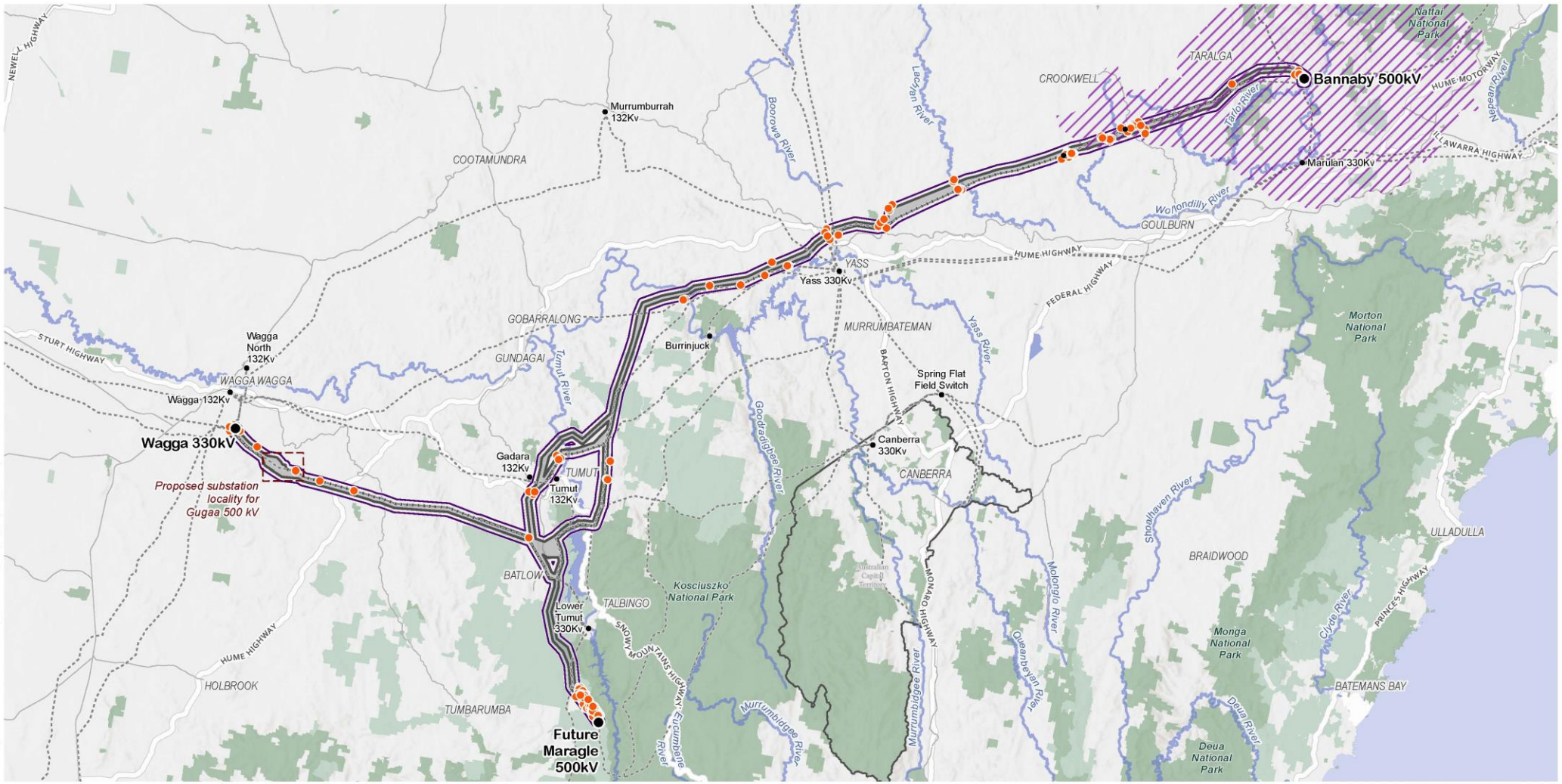
The Aboriginal sites in the heritage study area tend to be clustered in areas where previous archaeological surveys have taken place, with gaps in the data likely reflecting an absence of survey rather than an absence of Aboriginal sites. For example, the area around Adjungbilly has not been previously surveyed and is likely to contain many Aboriginal sites due to several waterways and potential resource zones in that area.

The known Aboriginal sites recorded in AHIMS within the heritage study area include the following archaeological site types/features (the number in brackets represents the number of items/recordings):

- Aboriginal ceremony and dreaming (2)
- Aboriginal resource and gathering (4)
- Artefacts (both isolated finds and artefact scatters) (204)
- Ceremonial ring (1)
- Hearth (1)
- Modified trees (32)
- Stone arrangement (2)
- Potential archaeological deposits (45).

The site types that are most likely to occur in the heritage study area are artefact scatters, isolated finds and modified/scarred trees. The most archaeologically sensitive topographic contexts in the heritage study area are elevated ground adjacent to water sources, and river and creek terraces.

There are no native title claims in the heritage study area. An Indigenous Land Use Agreement (ILUA) is in place at the eastern extent of the heritage study area, including Bannaby 500 kV substation. The Gundungurra Area Agreement (NI2014/001) was registered on 27 February 2015.



Proposal corridor
Existing Transgrid transmission line
Existing substation
Waterway
National park and reserve
State forest
Heritage study area
Indigenous Land Use Agreement
AHIMS

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; Aboriginal Heritage Information Management Systems (AHIMS): provided by NOHC (April 2021); Indigenous Land Use Agreements: National Native Title Tribunal; Transgrid; ESRI Topo*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

FIGURE 7-3: Registered and listed cultural heritage items and Indigenous Land Use Agreement area

7.3.1.2. Potential impacts

Construction

Potential impacts on Aboriginal cultural heritage could occur from construction vehicle and equipment movements, vegetation clearance and earthworks on or near Aboriginal sites. Vegetation clearance, excavation and grading would have a major impact on any surviving archaeological features both above and below ground. Indirect impacts could be caused by increased erosion and sedimentation or vibration from ground disturbance.

Construction of the new Gugaa 500 kV substation would require earthworks to prepare a level bench, and full clearance of any vegetation. Transmission line structures would similarly require full vegetation clearance and excavation to construct footings, while the transmission line easements would require full vegetation clearance for new access tracks and sufficient vegetation clearance elsewhere in the easement to prevent bushfire. Ancillary works such as parking and laydown areas, brake and winch sites and workforce accommodation would also involve work that could impact Aboriginal cultural heritage items.

Operation

During operation, there would be potential to impact Aboriginal cultural heritage sites while carrying out access track and vegetation maintenance or tower and transmission line maintenance nearby. However, the potential for accidental impacts would be minimised through implementation of standard Transgrid protocols (such as delineation of no-go zones near known Aboriginal heritage sites) during maintenance activities.

7.3.1.3. Approach to assessment in the EIS

A detailed Aboriginal Cultural Heritage Assessment Report (ACHAR) will be prepared for the EIS in accordance with Heritage NSW guidelines. The ACHAR would include an assessment of the impact to Aboriginal cultural heritage including Aboriginal sites, areas of archaeological sensitivity and areas of cultural important. The assessment will involve developing and refining a landscape-based predictive model to show the archaeological resource and sensitivity of the study area.

A program of Aboriginal consultation has been initiated and will continue be carried out in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010). Parties to the Gundungurra Area Agreement have been included in consultation carried out to date.

Archaeological field survey of the proposal corridor, including identification of new sites and re-inspection of known sites to clarify their location and condition, will be conducted with the participation of Aboriginal stakeholder representatives. The need for archaeological test excavation to further investigate sites, particularly potential archaeological deposits that could be impacted by the proposal, will be evaluated.

The assessment will consider whether the proposal is likely to impact on the values for which the Australian Alps National Park are listed. If a likely impact is identified, the ACHAR will include an assessment of the impact of the proposal on moth feasting which is one of the identified elements of significance in the listing of the Australian Alps National Parks and Reserves and will consider the location of any potential rock shelter sites.

The following government plans, policies and guidelines will be relevant to assessment in the EIS:

- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010a)
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*| (Office of Environment and Heritage (OEH), 2011).

7.3.2. Non-Aboriginal heritage

7.3.2.1. Existing environment

A preliminary heritage assessment based on a review of archaeological and historical data is provided in Appendix C. The preliminary heritage assessment considers if known historic/non-Aboriginal sites are located in the heritage study area and surrounds.

There are 18 non-Aboriginal heritage listed items within the heritage study area, of which there are 11 heritage listed items that have curtilages that are located entirely or partially within the proposal corridor, based on database searches carried out in September 2021. This includes two listings on the National Heritage List, one listing on the NSW State Heritage Register (SHR), and 7 listings on Local Environmental Plans (LEPs). Two sites are listed as indicative on the Register of the National Estate (RNE), Kileys Run and Kosciuszko National Park (1981 boundary) and are not listed on any other register. The RNE was closed in 2007 and is no longer a statutory list.

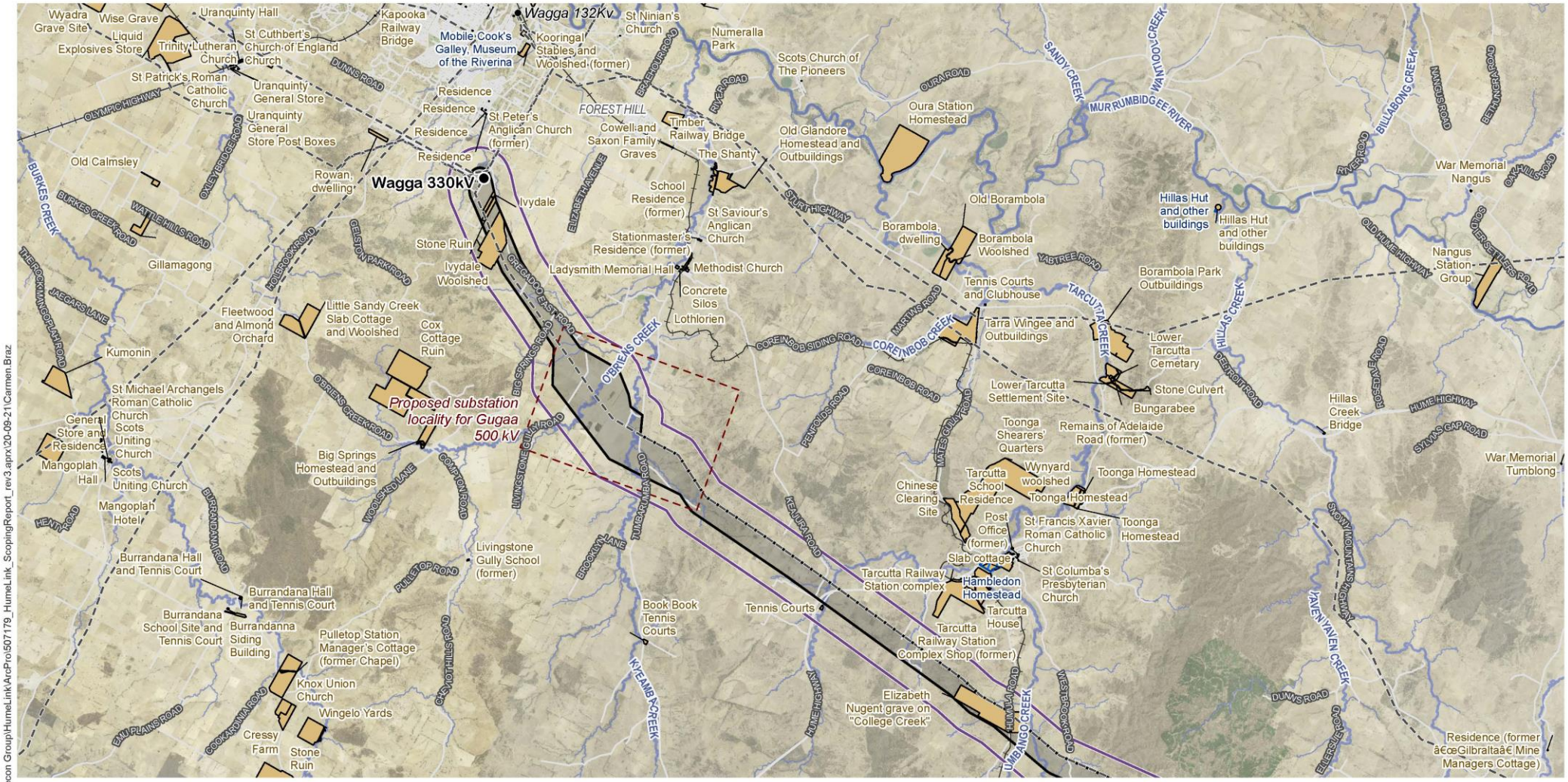
Listed heritage items are shown in Figure 7-4 and listed in Table 7-4 (those shaded in the table are in the heritage study area but not in the proposal corridor).

Table 7-4: Heritage listed items within the proposal corridor and heritage study area

Site Name	Item ID	Type	Significance	LGA	List
Snowy Mountains Scheme	1058	Historic	National	Snowy-Valley	National Heritage List, RNE
Australian Alps National Parks and Reserves	28	Natural	National	Snowy-Valley	National Heritage List
Hillas Farm Homestead and Outbuildings	I1	Historic	State	Upper Lachlan	SHR, LEP
Bunnaby Homestead	I2	Historic	Local	Upper Lachlan	LEP
Bannaby Shearing Shed c. 1886	I3	Historic	Local	Upper Lachlan	LEP
Flour Mill	I121	Historic	Local	Upper Lachlan	LEP
St Stephen's Anglican Church	I124	Historic	Local	Upper Lachlan	LEP
Pejar Creek Underbridge	I43	Historic	Local	Upper Lachlan	LEP
Tarlo River National Park	I160	Natural	Local	Upper Lachlan	LEP
Coolalie limestone kilns and quarry	A297	Historic	Local	Yass Valley	LEP
Derringullen Creek fossil area	A299	Natural	Local	Yass Valley	LEP, RNE
Ivydale	I72	Historic	Local	Wagga Wagga	LEP
Ivydale Woolshed	I73	Historic	Local	Wagga Wagga	LEP

Site Name	Item ID	Type	Significance	LGA	List
Stone ruin	I71	Historic	Local	Wagga Wagga	LEP
Tennis Courts	I190	Historic	Local	Wagga Wagga	LEP
Elizabeth Nugent grave on “College Creek”	I202	Historic	Local	Wagga Wagga	LEP
Kileys Run	16005	Historic/ Intangible	Indicative on the RNE	Cootamundra-Gundagai	RNE
Kosciuszko National Park (1981 boundary)	659	Natural	National	Snowy-Valley	RNE

There may be unrecorded historic sites and features of heritage significance within the heritage study area. Structures of historical interest and heritage significance may be standing, ruined, buried, abandoned or still in use.



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

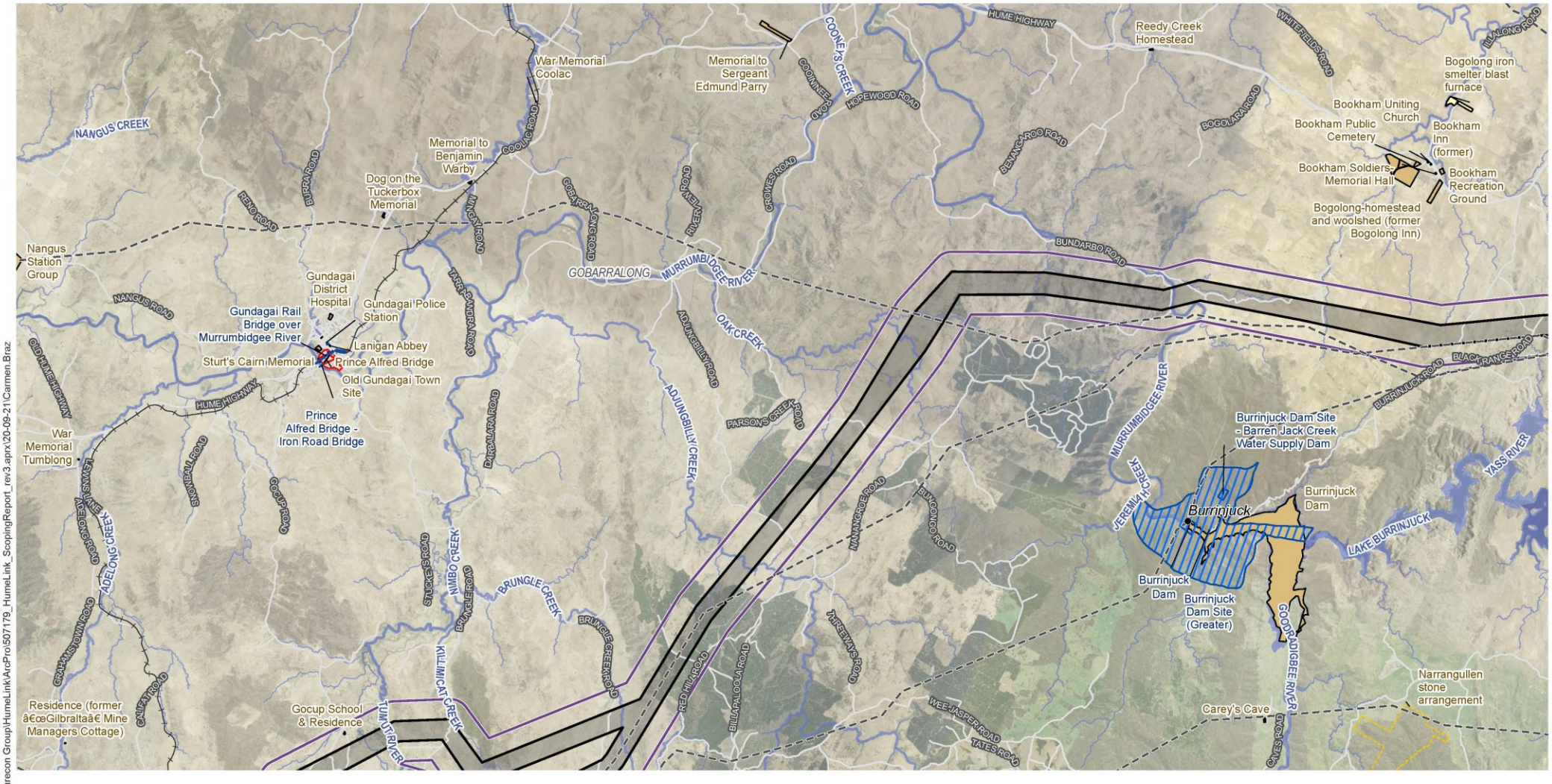
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; National Heritage List Spatial Database (NHL): Heritage Branch of the Australian Government Department of Agriculture, Water and the Environment; State Heritage Register - Curtilages: NSW Department of Premier and Cabinet; Environmental Planning Instrument - Heritage (HER): Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

1:200,000
0 5 9km

Projection: GDA 1994 MGA Zone 55

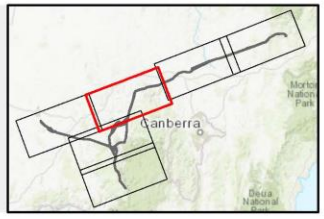
HumeLink **Scoping Report**

FIGURE 7-4-1: Non Aboriginal Heritage



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Heritage study area
State heritage item
Local heritage item (LEP)
Aboriginal Place of Heritage Significance
Conservation Area - General
Item - Archaeological
Item - General



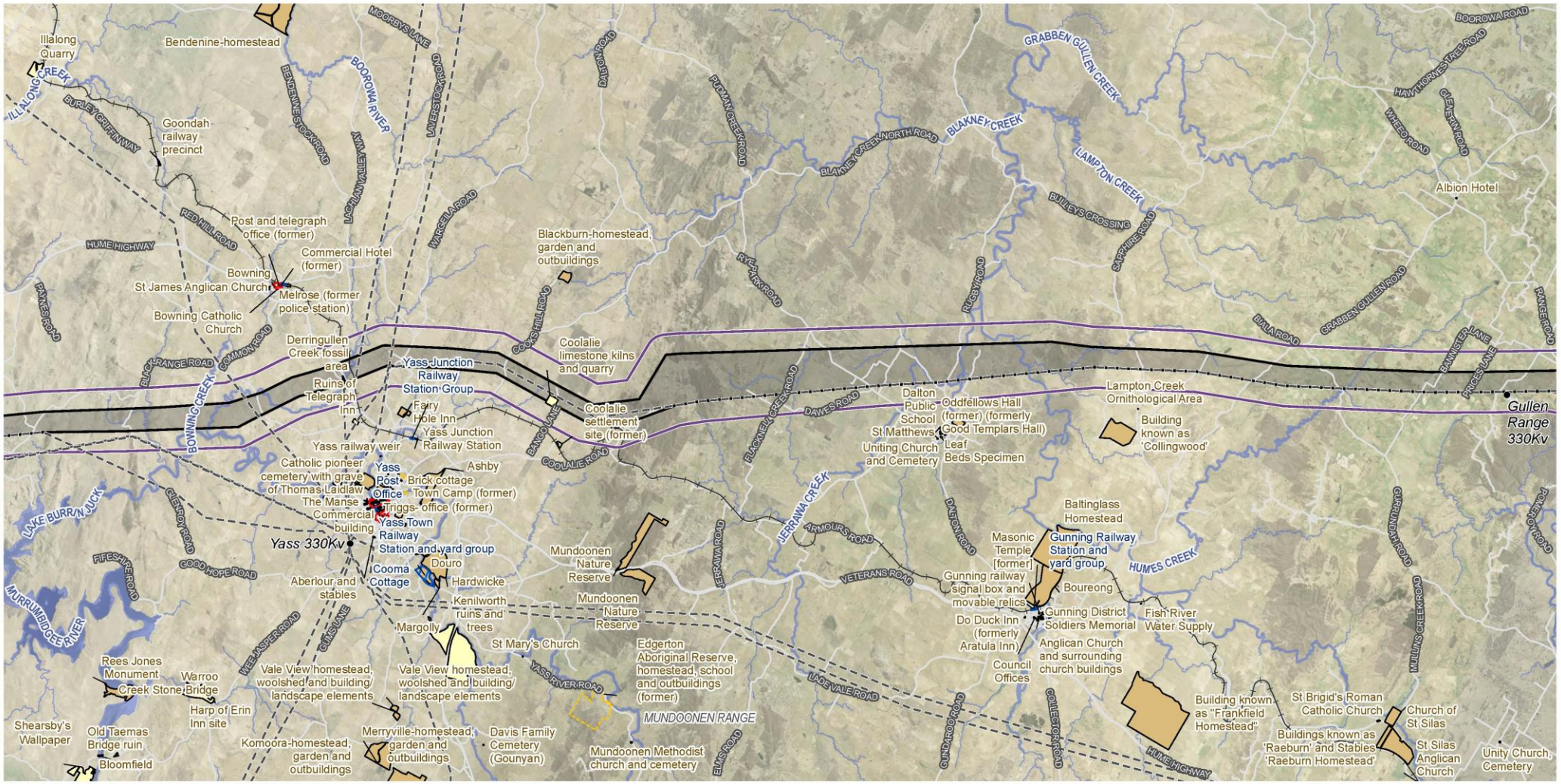
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; National Heritage List Spatial Database (NHL): Heritage Branch of the Australian Government Department of Agriculture, Water and the Environment; State Heritage Register - Curtilages: NSW Department of Premier and Cabinet; Environmental Planning Instrument - Heritage (HER): Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

1:200,000
0 5 9 km

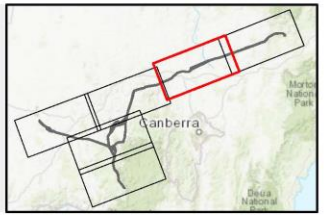
Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-4-2: Non Aboriginal Heritage



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Heritage study area
State heritage item
Local heritage item (LEP)
Aboriginal Place of Heritage Significance
Conservation Area - General
Item - Archaeological
Item - General



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

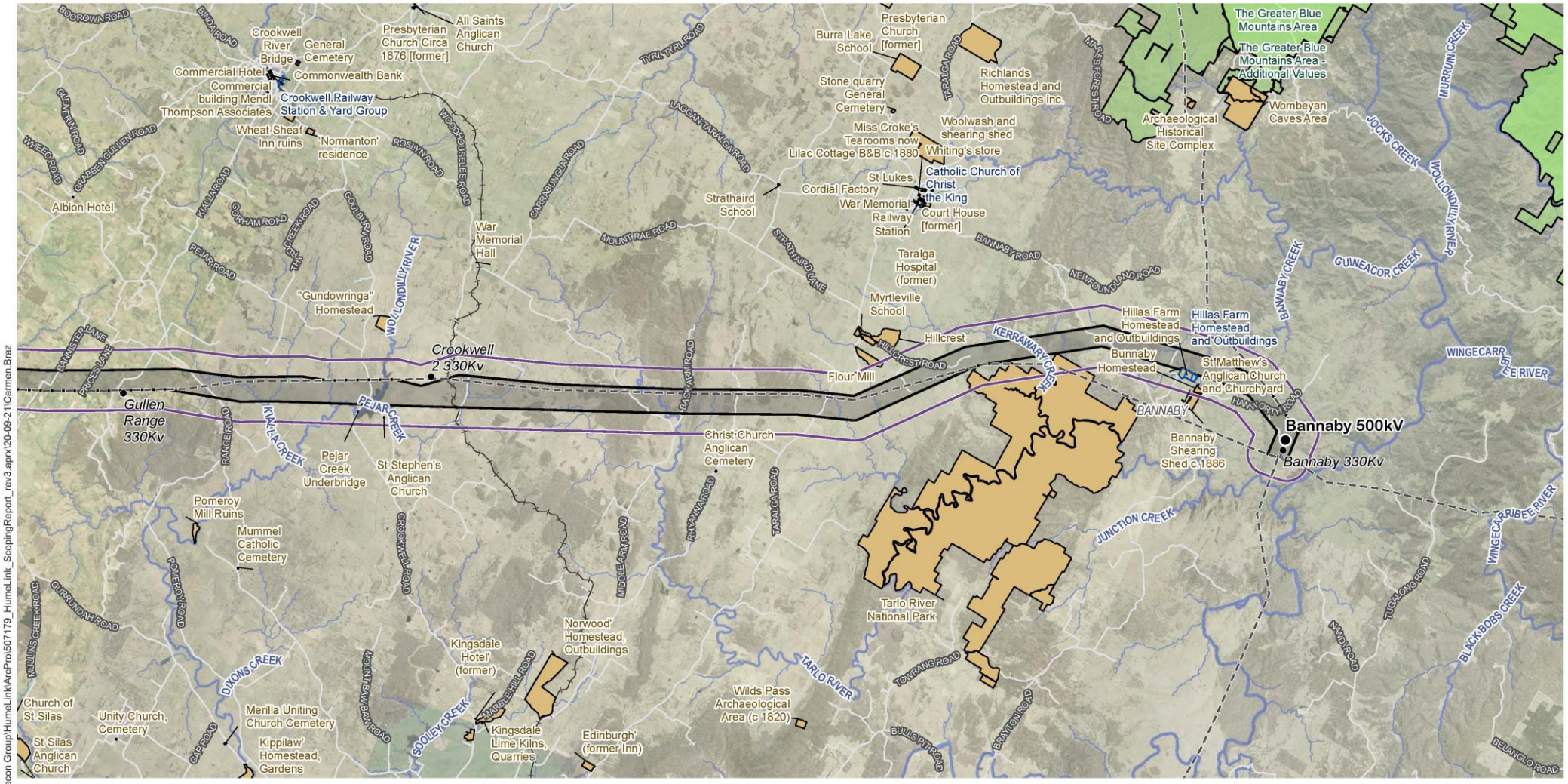
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; National Heritage List Spatial Database (NHL): Heritage Branch of the Australian Government Department of Agriculture, Water and the Environment; State Heritage Register - Curtilages: NSW Department of Premier and Cabinet; Environmental Planning Instrument - Heritage (HER): Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

1:200,000
0 5 9km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-4-3: Non Aboriginal Heritage



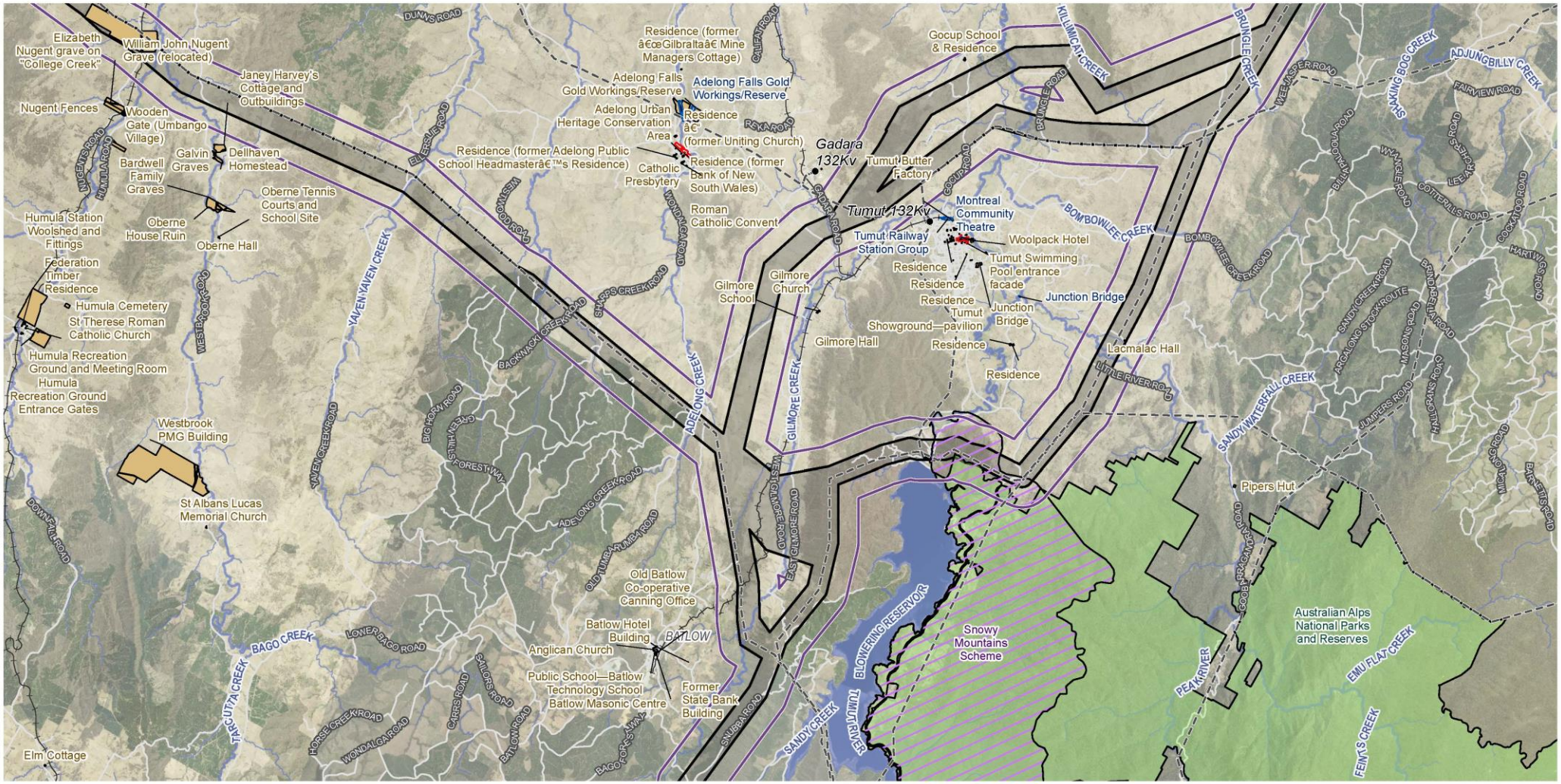
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; National Heritage List Spatial Database (NHL): Heritage Branch of the Australian Government Department of Agriculture, Water and the Environment; State Heritage Register - Curtilages: NSW Department of Premier and Cabinet; Environmental Planning Instrument - Heritage (HER): Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

1:200,000
0 5 9 km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-4-4: Non Aboriginal Heritage



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Heritage study area
State heritage item
Local heritage item (LEP)
Conservation Area - General
Item - General
National heritage item
Historic
Natural

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; National Heritage List Spatial Database (NHL): Heritage Branch of the Australian Government Department of Agriculture, Water and the Environment; State Heritage Register - Curtilages: NSW Department of Premier and Cabinet; Environmental Planning Instrument - Heritage (HER): Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

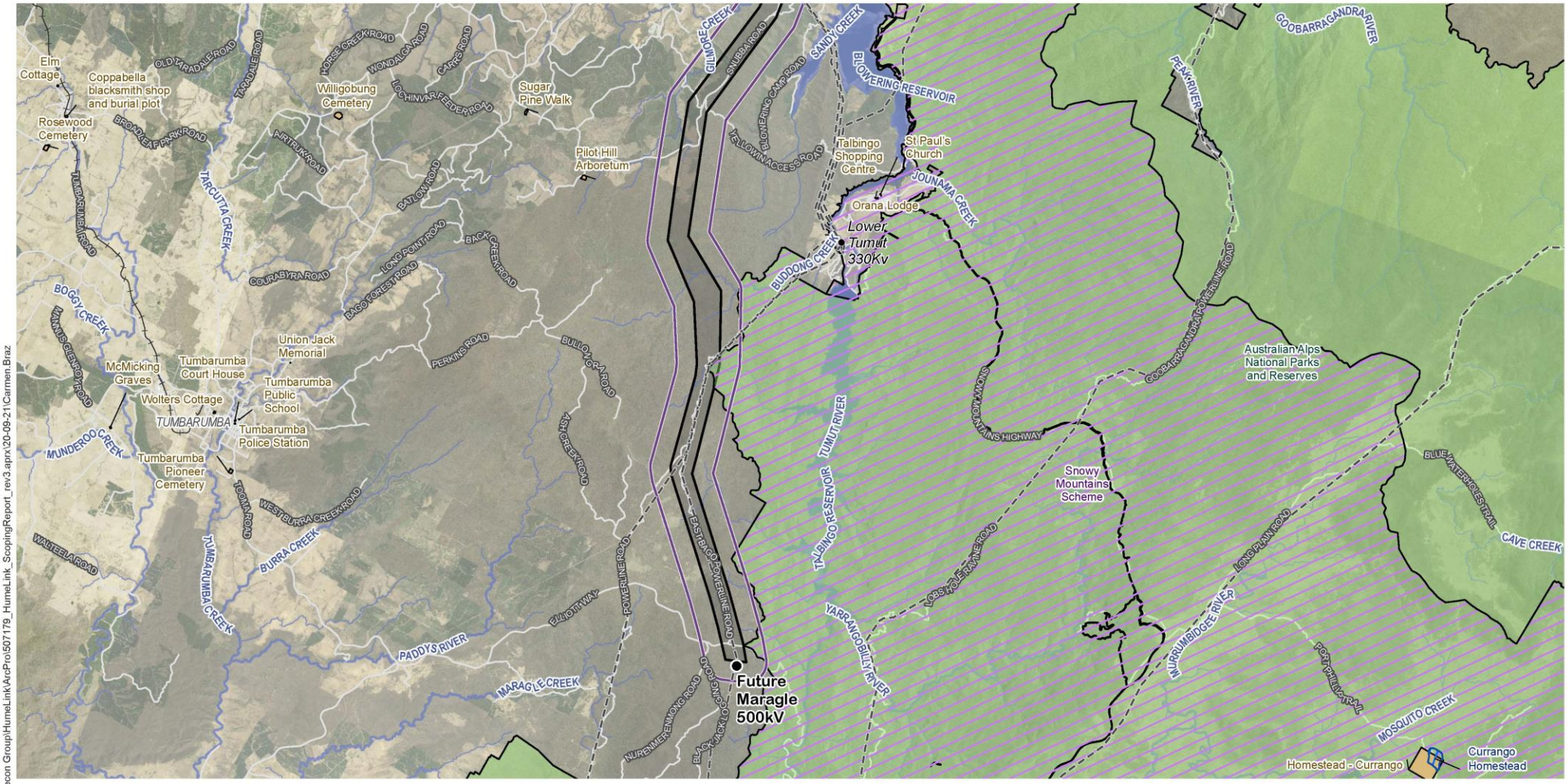
1:200,000
0 5 9km

Projection: GDA 1994 MGA Zone 55

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

HumeLink **Scoping Report**

FIGURE 7-4-5: Non Aboriginal Heritage



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; National Heritage List Spatial Database (NHL): Heritage Branch of the Australian Government Department of Agriculture, Water and the Environment; State Heritage Register - Curtilages: NSW Department of Premier and Cabinet; Environmental Planning Instrument - Heritage (HER): Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

1:200,000
0 5 9km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-4-6: Non Aboriginal Heritage

7.3.2.2. Potential impacts

Construction

Activities with the potential to impact on non-Aboriginal heritage include access works, vegetation clearance, earthworks and construction works. Vegetation clearance, excavation and grading could have a major impact on any surviving archaeological features both above and below ground. Indirect impacts could be caused by increased erosion and sedimentation from ground disturbance. The potential for vibration impacts would be assessed through the Noise and Vibration Assessment detailed in Section 7.11.

Construction of the new Gugaa 500 kV substation would require earthworks to prepare a level bench, and full clearance of any vegetation. Transmission line structures would similarly require full vegetation clearance and excavation to construct footings, while the transmission line easements would require full vegetation clearance for new access tracks and sufficient vegetation clearance elsewhere in the easement to prevent bushfire. Ancillary works such as parking and laydown areas, brake and winch sites and workforce accommodation would also involve work that could impact archaeological items.

Operation

There would be limited potential for the proposal to directly impact historic heritage items during operation. The potential for effects on the settings of heritage assets would be assessed through the Landscape and Visual Impact Assessment discussed in Section 7.6.

7.3.2.3. Approach to assessment in the EIS

A detailed non-Aboriginal cultural heritage assessment will be carried out for the EIS. The assessment will include a review of the historical context of the area, including early aerial photography and recent high-resolution imagery, parish maps and portion plans to identify potential archaeological sites, surviving built structures or other previously unidentified features. The assessment will consider potential heritage items identified through community consultation and published or unpublished secondary sources.

The assessment will consider whether the proposal is likely or not to have a significant impact on the values for which the Snowy Mountains Scheme and Australian Alps National Parks and Reserves are listed on the National Heritage List, which classifies them as MNES under the EPBC Act. To do this, the assessment will examine the landscape through which the proposal corridor would pass and if this would affect any features within the listed item that are integral to the values of that place.

Archaeological field survey will be carried out to identify potential impact to known and unknown items. Where possible, impacts will be avoided or minimised. Mitigation and management measures would be developed to address any residual impacts that cannot be avoided.

The following government plans, policies and guidelines will be relevant to assessment in the EIS:

- *Commonwealth EPBC 1.1 Significant Impact Guidelines – Matters of National Environmental Significance* (Commonwealth of Australia, 2013)
- *NSW Skeletal Remains: Guidelines for Management of Human Remains* (Heritage Office, 1998)
- *Historical Archaeology Code of Practice* (Heritage Branch Department of Planning, 2006)
- *NSW Heritage Manual* (Heritage Office and Department of Urban Affairs and Planning, 1996)

- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (Heritage Branch Department of Planning, 2009)
- *Criteria for the Assessment of Excavation Directors* (NSW Heritage Council, 2019)
- *Burra Charter and Practice Notes* (Australia International Council on Monuments and Sites, 2013).

7.4. Social

7.4.1. Existing environment

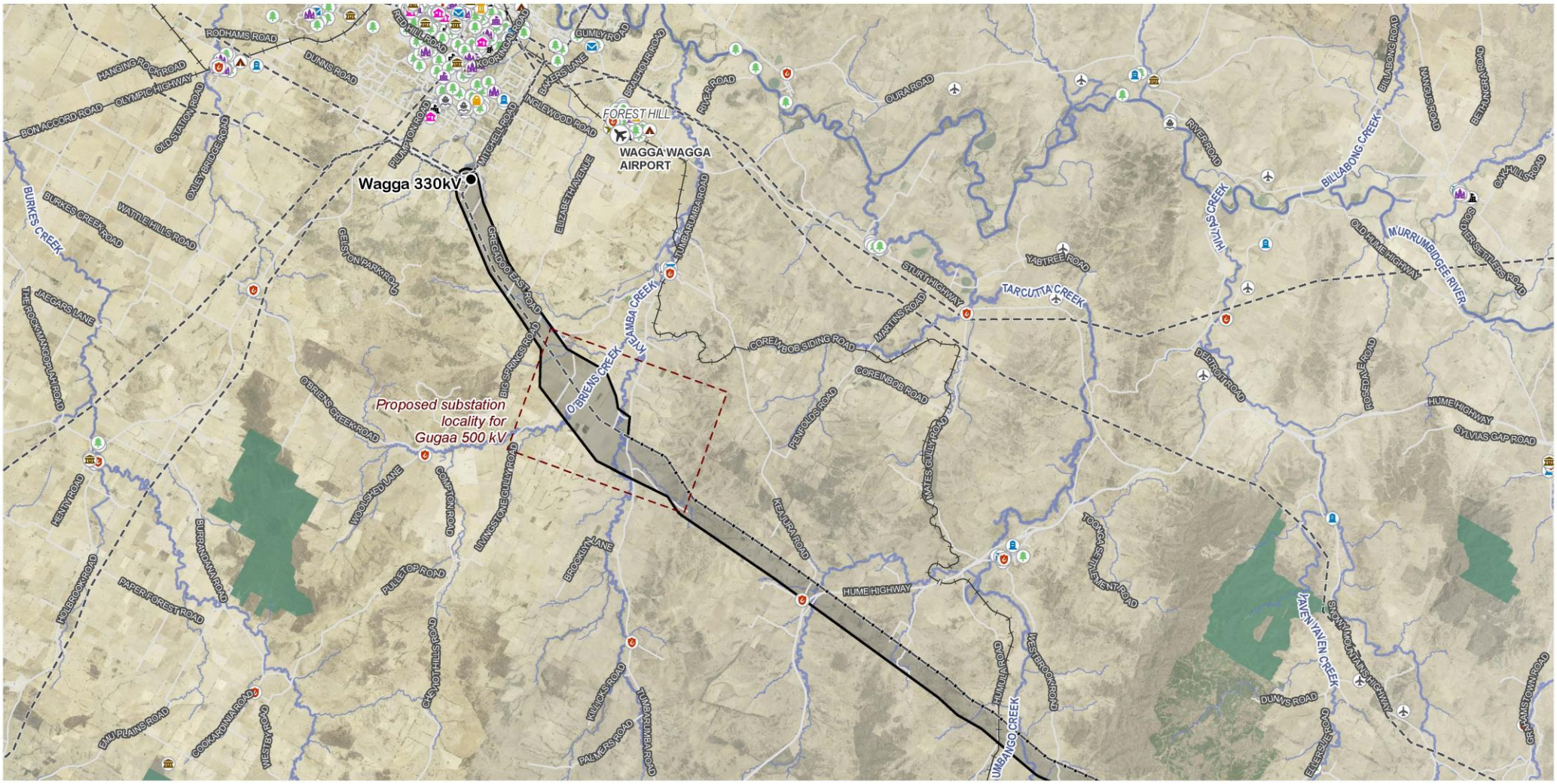
The proposal is located within rural NSW. Wagga Wagga and Gundagai are large centres providing access to a range of social infrastructure, services and accommodation supported by other, smaller towns near the proposal corridor (refer to Figure 7-5).

Landowner engagement to date, along with community aspirations collated from direct feedback, studies, and desktop research, suggest that there is a strong sense of pride and connectedness of the community to the rural offering of the area. Many landowners report that five or more generations of their family have been farmers. There is also a sense of connection and value placed on the recreational opportunities presented by the alpine area, especially Kosciuszko National Park. There is also a consistent desire expressed in strategic plans to protect and enhance the natural environment. Goulburn Mulwaree Council, Upper Lachlan Shire Council and Yass Valley Council prepared a joint Regional Community Strategic Plan, identifying that they face similar challenges and aspirations for the future. Smaller towns along or near the corridor, such as Yass, Tumut and Batlow, demonstrate a sense of connectedness and community spirit, reflected through their offering of various clubs and societies and religious organisations and churches.

When compared with NSW, using the Census 2016, the population of the LGAs of Wagga Wagga, Snowy Valleys, Yass Valley, Cootamundra-Gundagai, and Upper Lachlan Shire can broadly be characterised by:

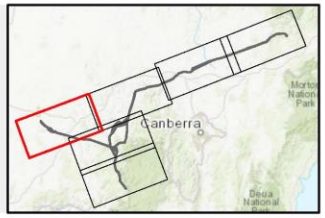
- A high Australian-born population, with a low proportion of population born overseas.
- An older population, except for Wagga Wagga which presents a younger population.
- High engagement with the labour force, with many who work as trades workers, labourers and machinery operators and drivers, and many travel to work with a car or truck, which is consistent with the rural, agricultural character of the LGAs.

With reference to vulnerable or marginalised groups, and when compared with NSW, the LGAs have more women than men, with a higher proportion of people who engage in unpaid domestic work, care for children or a person with a disability. Wagga Wagga LGA has increased cultural and language diversity due to a higher proportion of Aboriginal and Torres Straight Island people. Cultural connection to areas of natural importance such as permanent waterbodies will be important for Aboriginal and Torres Straight Island people.



Proposal corridor
Existing Transgrid transmission line
Substation
Proposed substation locality for Gugaa 500 kV
Watercourse
Railway
National park and reserve

Points of Interest
Art Gallery / Museum
Community Facility
Nursing Home / Retirement Village
Police Station
Fire Station / SES
Cemetery
Observatory
Place Of Worship
Post Office
Hospital / Ambulance
Shopping Centre
Tourist Park / Home Village
Education
Parks and recreation
Airport
Landing Ground
Wharf / Boat Ramp



Source: *Base data (aerial imagery, transport, water, and cadastral themes), points of interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

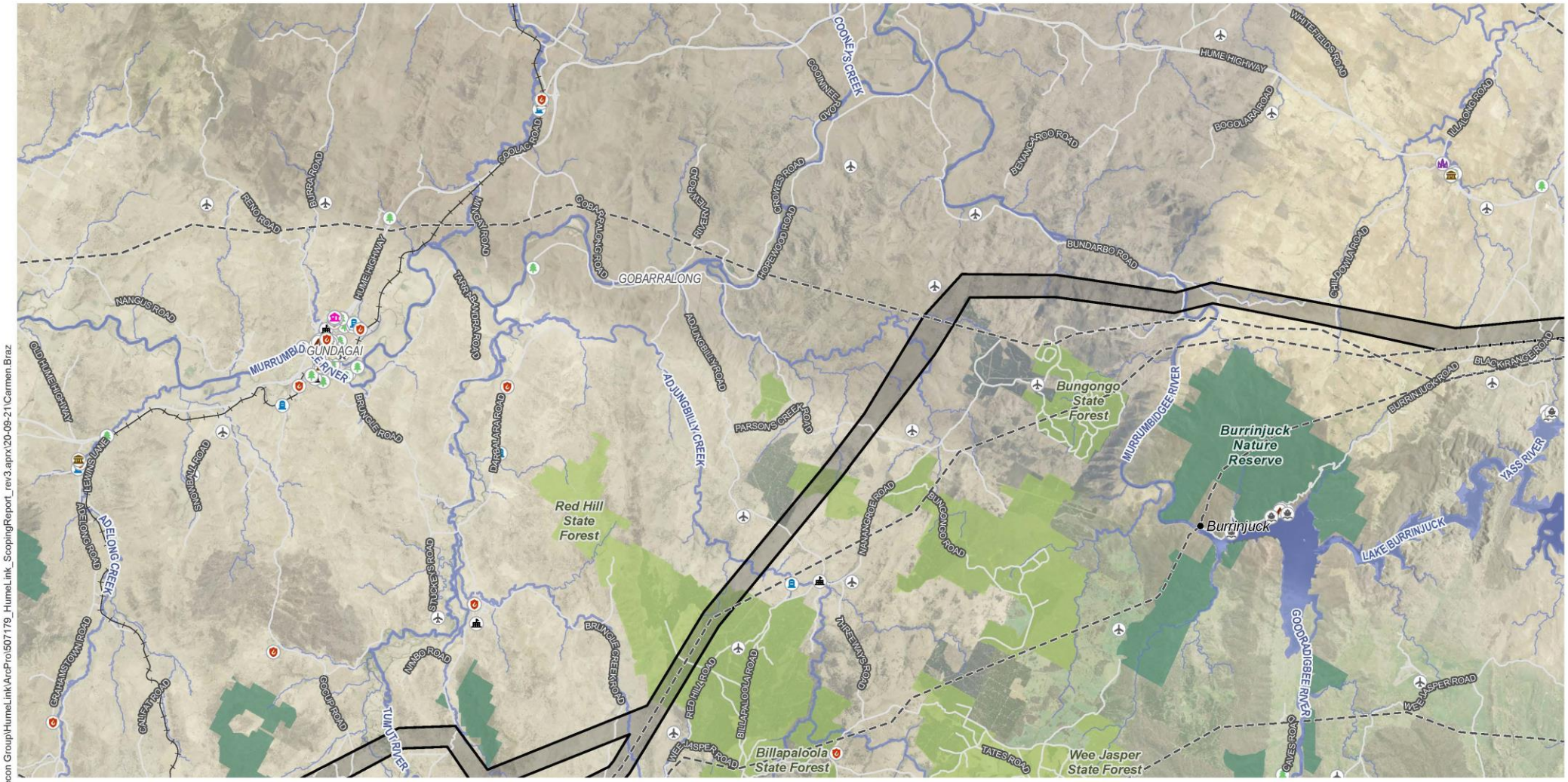
1:200,000
0 5 9km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-5-1: Social

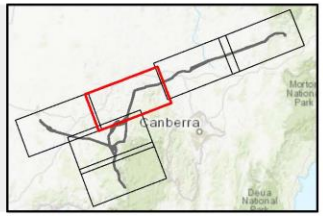
C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Railway

National park and reserve
State forest

Points of Interest
Art Gallery / Museum
Community Facility
Nursing Home / Retirement Village
Medical Centre / Health Services
Court House
Police Station
Fire Station / SES
Cemetery
Library
Local Government Chambers
Place Of Worship
Post Office
Hospital / Ambulance
Tourist Information Centre
Tourist Park / Home Village
Education
Parks and recreation
Landing Ground
Wharf / Boat Ramp
Railway Station



Source: *Base data (aerial imagery, transport, water, and cadastral themes), points of interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

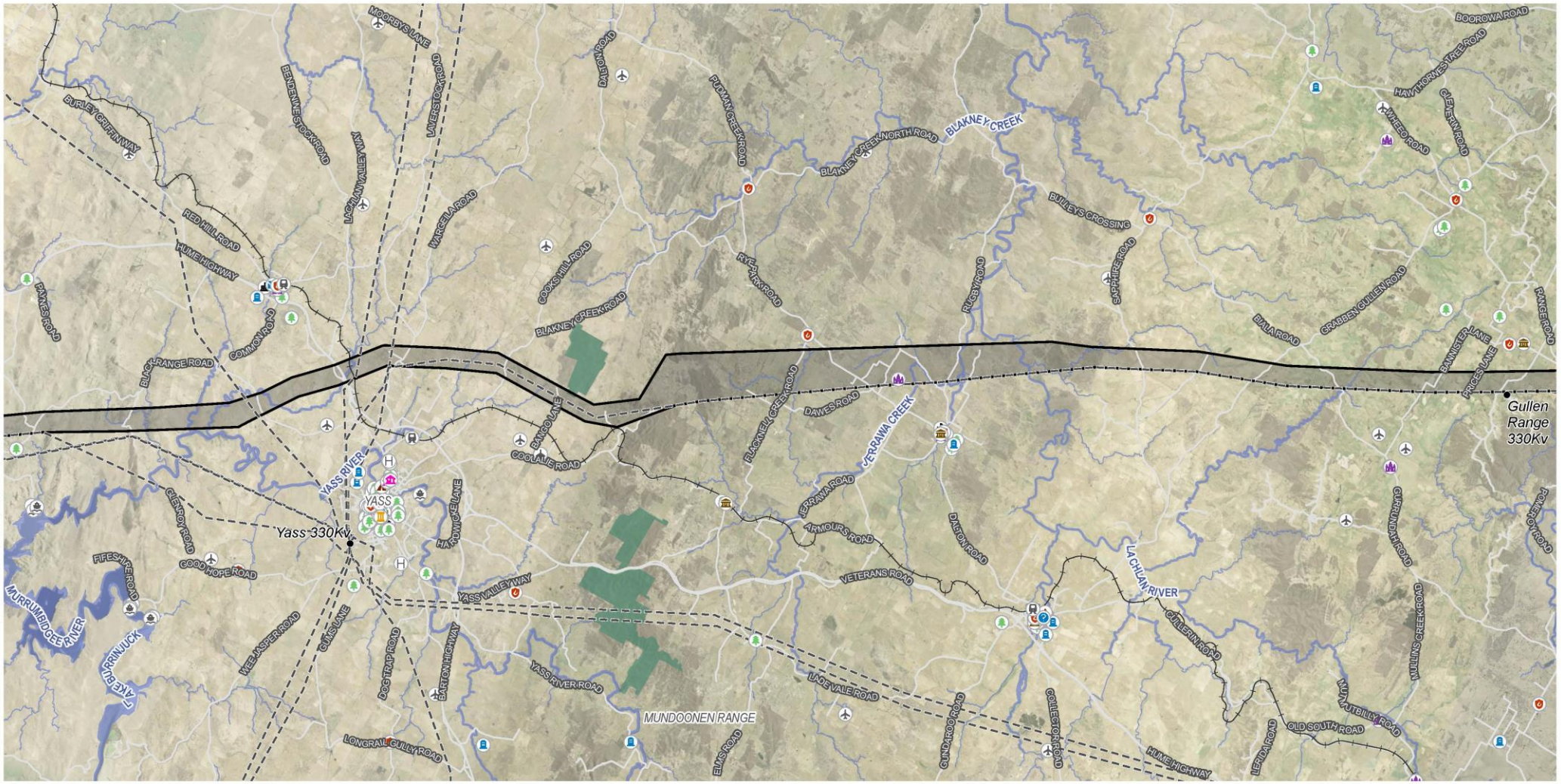
1:200,000
0 5 9 km

Projection: GDA 1994 MGA Zone 55

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

HumeLink **Scoping Report**

FIGURE 7-5-2: Social



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Railway

National park and reserve

Points of Interest
Art Gallery / Museum
Community Facility
Nursing Home / Retirement Village
Medical Centre / Health Services
Court House
Police Station
Fire Station / SES
Cemetery
Library
Local Government Chambers
Place Of Worship
Post Office
Hospital / Ambulance
Tourist Information Centre
Tourist Park / Home Village
Education
Parks and recreation
Helipad
Landing Ground
Wharf / Boat Ramp
Railway Station

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

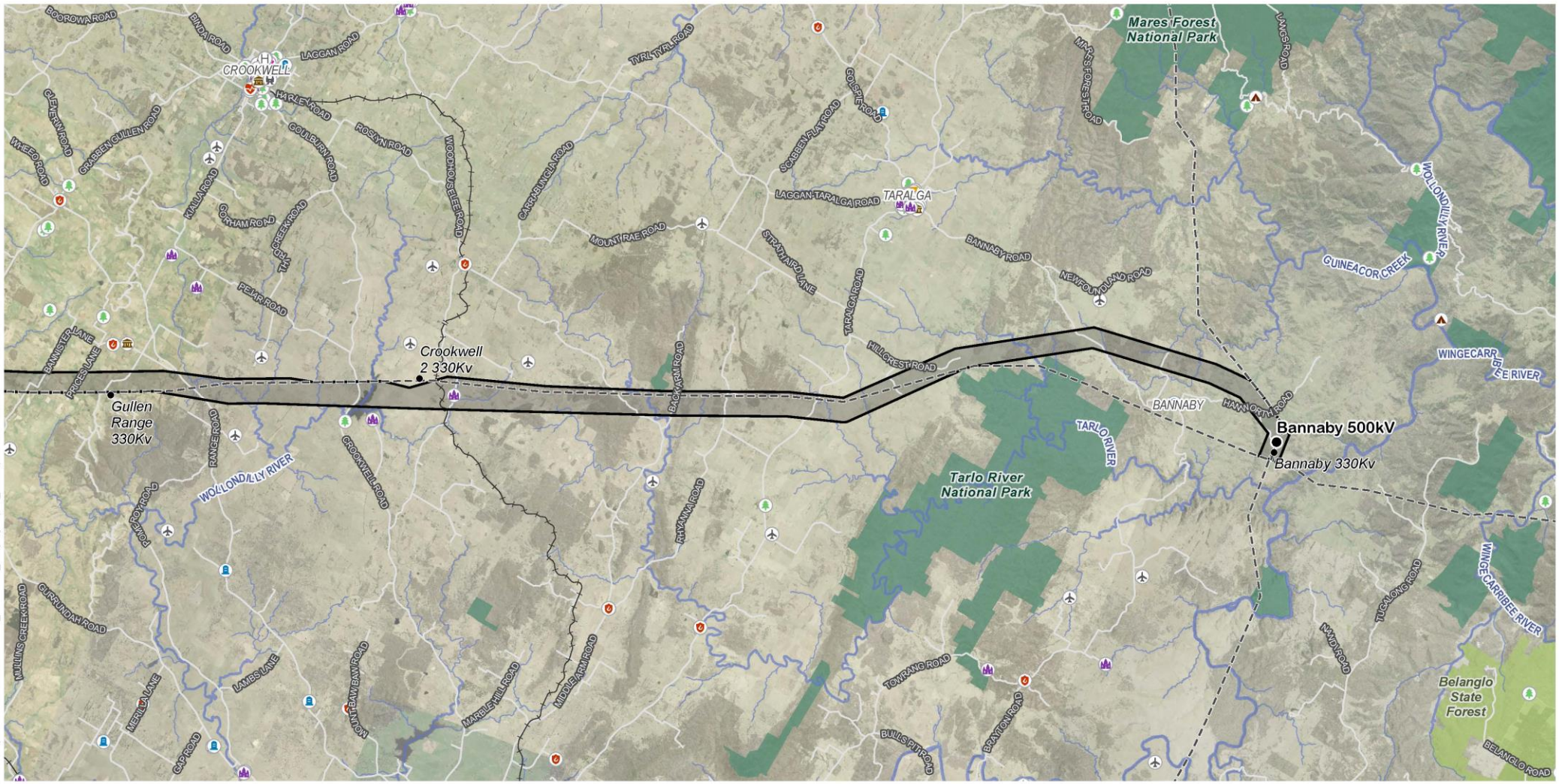
Source: *Base data (aerial imagery, transport, water, and cadastral themes), points of interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

1:200,000
0 5 9km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-5-3: Social



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Railway

National park and reserve
State forest

Points of Interest
Art Gallery / Museum
Community Facility
Nursing Home / Retirement Village
Medical Centre / Health Services
Court House
Police Station
Fire Station / SES
Cemetery
Library
Local Government Chambers
Place Of Worship
Post Office
Hospital / Ambulance
Tourist Information Centre
Tourist Park / Home Village
Education
Parks and recreation
Helipad
Landing Ground
Railway Station

Source: *Base data (aerial imagery, transport, water, and cadastral themes), points of interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

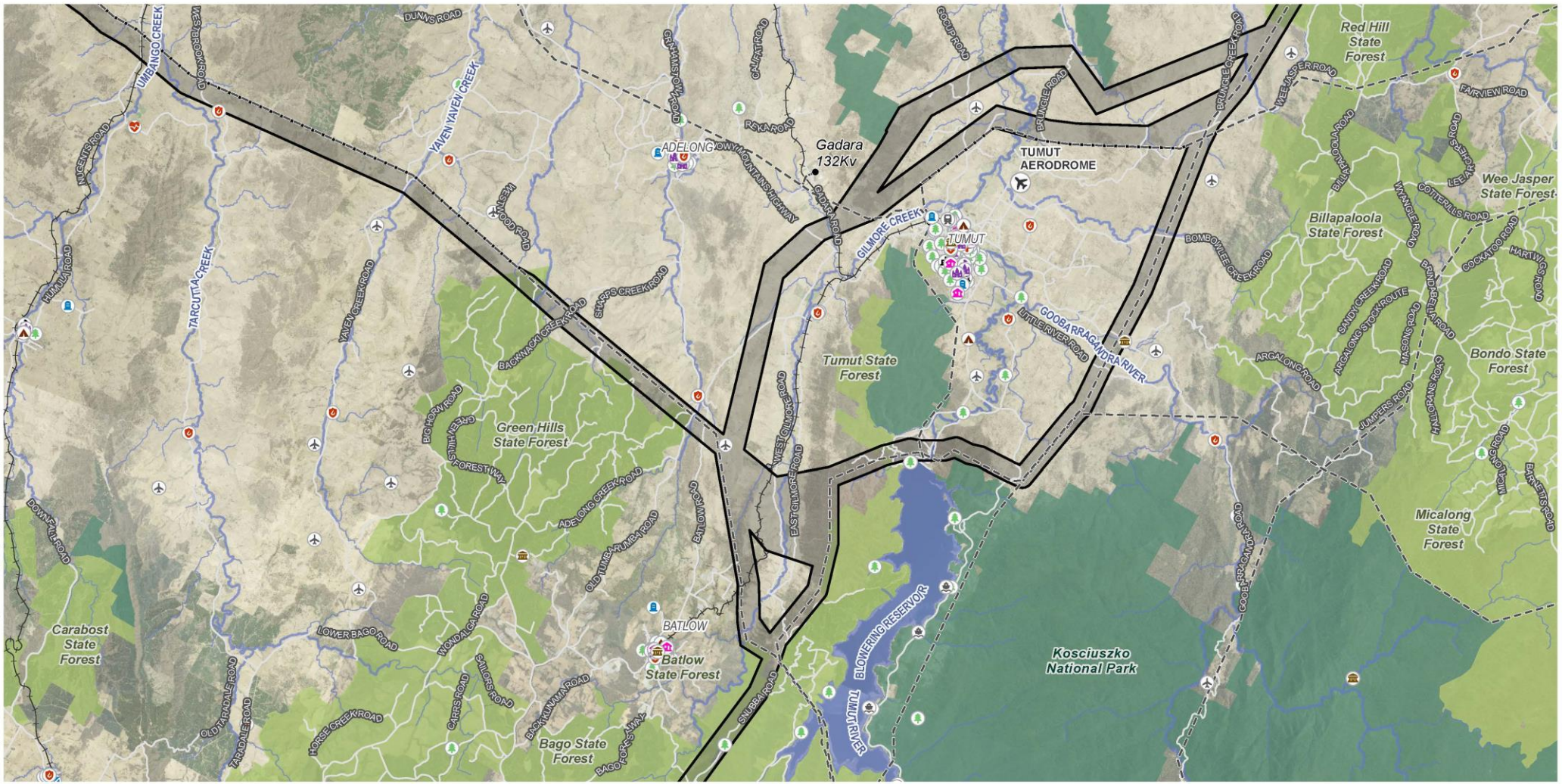
1:200,000
0 5 9 km

Projection: GDA 1994 MGA Zone 55

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen Braz

HumeLink **Scoping Report**

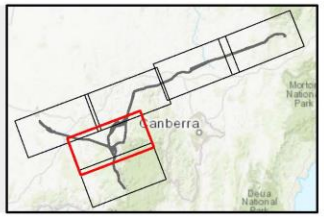
FIGURE 7-5-4: Social



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Railway

National park and reserve
State forest

Points of Interest
Art Gallery / Museum
Community Facility
Nursing Home / Retirement Village
Medical Centre / Health Services
Court House
Police Station
Fire Station / SES
Cemetery
Library
Local Government Chambers
Place Of Worship
Post Office
Hospital / Ambulance
Tourist Information Centre
Tourist Park / Home Village
Education
Parks and recreation
Airport
Landing Ground
Wharf / Boat Ramp
Railway Station



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

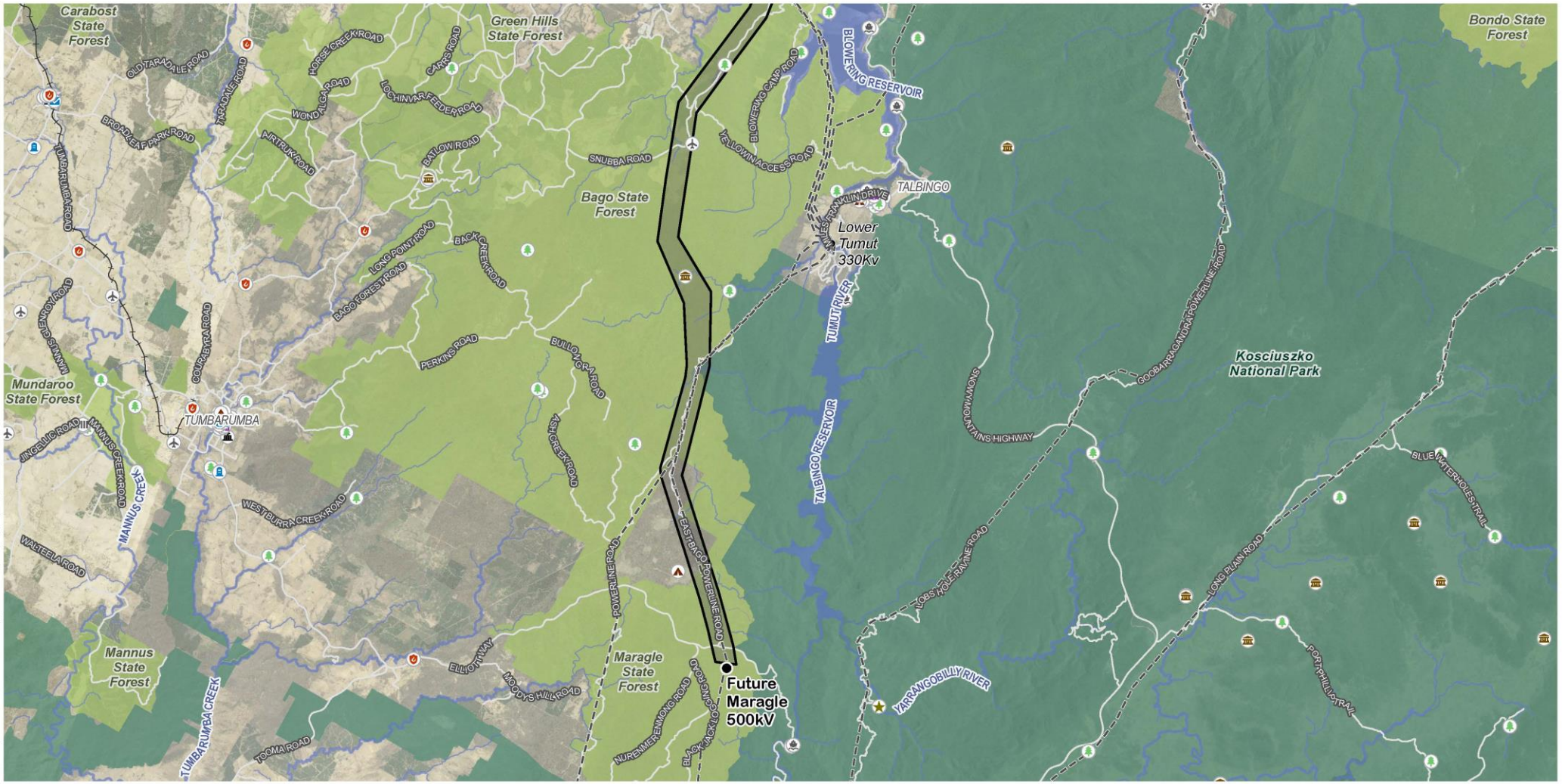
Source: *Base data (aerial imagery, transport, water, and cadastral themes), points of interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

1:200,000
0 5 9km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

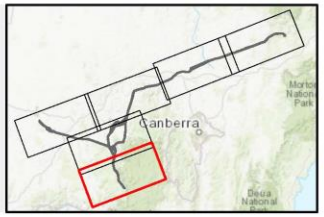
FIGURE 7-5-5: Social



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Railway

National park and reserve
State forest

Points of Interest
Community Facility
Nursing Home / Retirement Village
Court House
Gaol
Police Station
Fire Station / SES
Cemetery
Library
Local Government Chambers
Observatory
Place Of Worship
Post Office
Hospital / Ambulance
Tourist Information Centre
Tourist Park / Home Village
Education
Parks and recreation
Helipad
Landing Ground
Wharf / Boat Ramp



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes), points of interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

1:200,000
0 5 9km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-5-6: Social

7.4.2. Potential impacts

Construction

The distance of the proposal corridor from towns of sufficient size to support the required workforce would require the establishment of temporary accommodation camps along the route to allow the safe and accessible accommodation of workers and support staff. This provision may limit the pressure on local accommodation and social infrastructure in the smaller towns. However, some construction workers, support staff and their families are still likely to stay within towns, which may temporarily change the population and character of the towns, including changes to social cohesion. Some LGAs that may experience temporary population growth and housing demand include the Goulburn Mulwaree and Wagga Wagga LGAs.

Construction of the proposal may also result in temporary changes to the way of life and surroundings, including increased construction noise, dust and visual changes that may be experienced by people near the proposal corridor. There may also be changes to access due to temporary traffic delays and construction vehicle movements. Changes to the way of life and surroundings would be most noticeable for people near the substations and construction compounds, as these areas would experience construction activities on a larger scale and for a longer duration compared to the transmission line sections, as construction activities would move progressively along the proposed alignment.

Construction activities may also result in temporary changes and restrictions to property access and land use, which may cause uncertainty and anxiety for landowners and occupiers. It may also affect a sense of cultural connection to the land for Aboriginal people. Impacts to property and land use are discussed further in Section 7.5.

Operation

Potential operational impacts include:

- Changes to the way of life and surroundings, related to potential noise and visual impacts. The extent of this impact, in the case of substation locations, would be dependent on proximity to residential areas, schools, healthcare and workplaces. It is anticipated that residents who live in proximity to the proposed transmission line alignment and substations would experience the greatest changes to the way of life from changes in surrounding views and noise levels.
- Social benefit of improved electricity supply, as well as ancillary social benefits, such as improved access from new access roads.

7.4.3. Approach to assessment in the EIS

A detailed social impact assessment will be carried out for the EIS. The assessment will rely on input from economic, land use and property, agricultural, heritage, urban design, landscape and visual, air quality and noise and vibration assessments.

The social impact assessment will be undertaken and informed by outcomes of stakeholder and community consultation. A social baseline will be based on:

- Community engagement scope and feedback on the proposal
- State, regional and local policies and strategies relevant to social impact
- Analysis of key population and demographic indicators, including data from the 2016 Australian Bureau of Statistics Census of Population and Housing
- Review of existing social infrastructure and community features within the social impact study area, including recreation uses, educational facilities, places of worship, emergency facilities, community facilities/services, public transport and walking and cycling facilities
- Existing data and information on local business and industry, employment and income and dwelling characteristics.

The assessment will identify and assess the potential social impacts of the proposal's construction and operation on local amenity, social infrastructure and access.

Measures will be identified to manage or mitigate potential impacts on the social environment and maximise potential benefits of the proposal.

The following government plans, policies and guidelines are relevant to the proposal:

- *Social Impact Assessment Guideline for State Significant Projects* (DPIE, 2021).

7.5. Economic, property and land use

7.5.1. Existing environment

The proposal corridor extends across a large area of predominantly privately owned land used for a wide range of agricultural purposes, State owned forestry land, as well as very small areas that are marginally within nature reserves and Kosciuszko National Park. The proposal corridor follows existing transmission lines for more than half the length. The following describes the existing economic, property and land use environment.

Economic

The area is largely rural, with the main industries of employment at the 2016 Census being farming, hospitals, aged care services, grocery stores and defence. Employment rates across the five LGAs was generally higher than the regional NSW rate.

Wagga Wagga is a large, commercial centre providing industrial offerings and commercial shopping services for the surrounding, regional area. The smaller towns, such as Yass, Tumut and Batlow, form important hubs for commercial offerings to the wider rural area.

The proposal corridor is in the Riverina Murray Region, mapped as part of DPI's Important Agricultural Land regions (DPI, 2018). The Riverina Murray Region accounts for 12.7 percent of all agricultural output in NSW and makes the largest regional contribution to agricultural production in NSW (DPI, 2018). Agriculture is the most important sector for employment in the Riverina and identified as a vital part of the economic and ongoing growth of the region. Agricultural industries have existed in the surrounding area since European settlement in the 1830s and have remained a key part of the economic fabric of the surrounding area. Current agricultural uses include sheep and cattle grazing and grain cropping. The proposal corridor also traverses land used for horticulture and forestry purposes.

Property

Land tenure in the proposal corridor is predominantly freehold, particularly on the western side of the proposal corridor. To the east, State forests and NSW National Parks and Wildlife Service estates make up a substantial portion of land.

Crown Land including road reserves and rail corridors occur throughout the proposal corridor. There are 993 Crown Land sites in the proposal corridor, including 76 Crown waterways, 838 Crown roads and 79 Crown parcels. There are no Commonwealth landholdings within the proposal corridor.

There are no native title claims near the proposal corridor. An ILUA (Gundungurra Area Agreement (NI2014/001)) at the eastern extent of proposal, near the Bannaby substation, was registered on 27 February 2015.

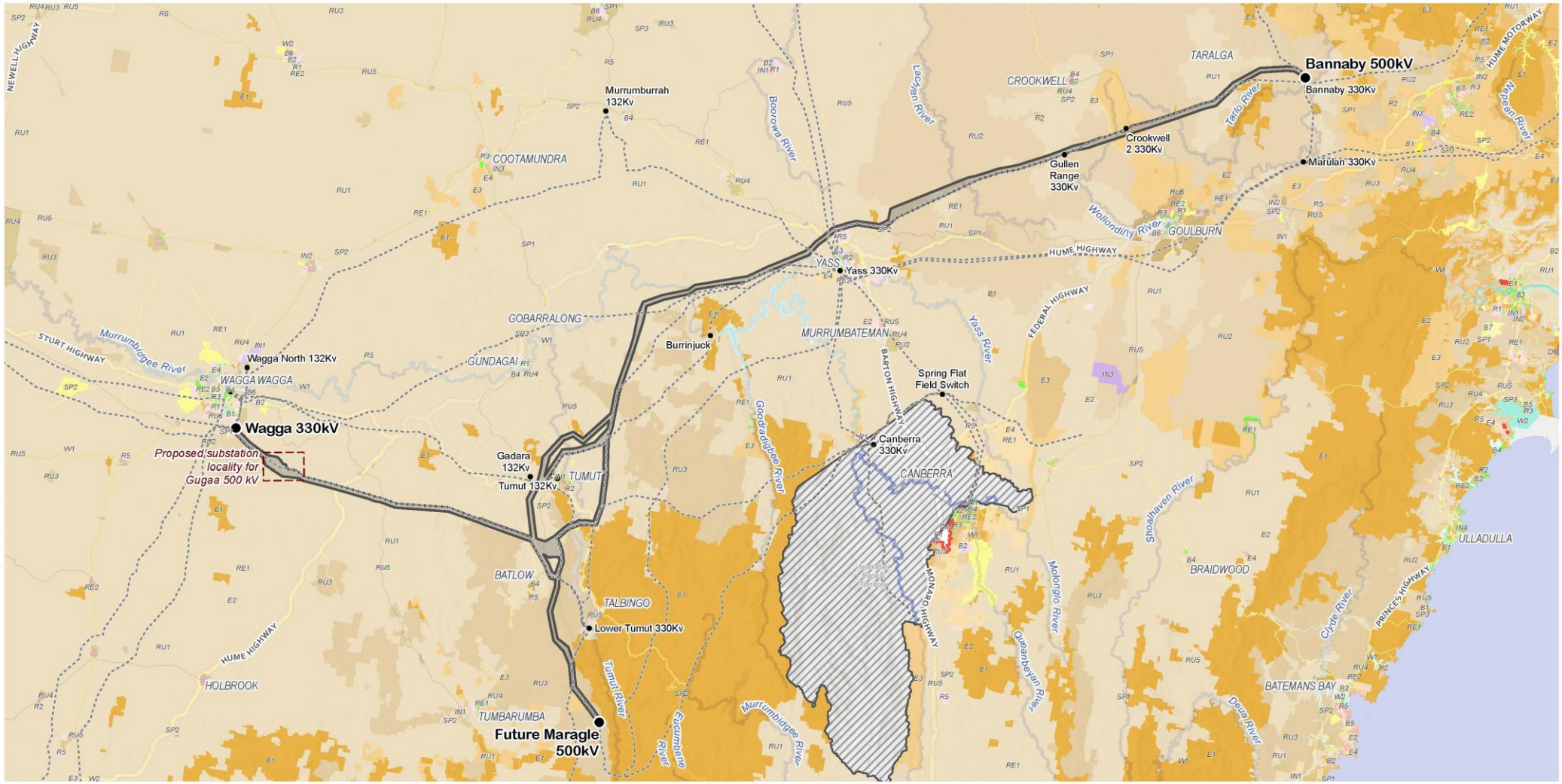
Land use

The proposal corridor extends across the lands of the Wiradjuri, Ngunnawal, Ngarigo and Gundungurra people. The proposal corridor is located within the LGAs of Wagga Wagga, Snowy Valleys, Yass Valley, Cootamundra-Gundagai, and Upper Lachlan Shire and is near the LGA of Goulburn Mulwaree. The nearest major town is Wagga Wagga located about 3 km north-east of the corridor at its closest point (western end of the proposal corridor). Smaller towns near the proposal corridor include Yass, Tumut and Batlow.

Land in the proposal corridor is predominantly zoned RU1 Primary Production. There are also small areas of land zoned as E1 National Parks and Nature Reserves, E2 Environmental Conservation (now referred to as C2 Environmental Conservation), E3 Environmental Management (now referred to as C3 Environmental Management), W1 Natural Waterways, R5 Large Lot Residential, SP1 Special Activities, SP2 Infrastructure, SP3 Tourist, RU2 Rural Landscape and RU3 Forestry (see overview of land zoning Figure 7-6 (please note Environmental zones have been renamed) and more detailed map series in Appendix D).

The predominant land uses along or near the proposal corridor are as follows:

- Agriculture – most of the area surrounding the proposal is used for agricultural purposes including irrigated cropping, dryland cropping and dryland grazing
- Forestry – the proposal corridor includes several State forests, including Red Hill, Maragle, Tumut and Bago that would be used for forestry purposes
- Transport infrastructure – the transmission line would cross the Sturt Highway, Hume Highway, Barton Highway, Snowy-Mountains Highway, as well as several regional roads, local roads and tracks. The transmission lines would also cross the Wagga Wagga, Cootamundra Tumut, Main Southern, and Goulburn Crookwell railway lines (refer to Section 7.10)
- Kosciuszko National Park, Tarlo River National Park, nature reserves and other conservation areas (refer to Section 7.2.1.1). These areas are commonly used for recreation.
- Rivers and waterways – key waterways present within the proposal corridor including Goobarragandra River, Lachlan River, Murrumbidgee River, Tarlo River, Tumut River near Blowering Dam, Wollondilly River near Pejar Dam, Yass River as well as several creeks and minor streams
- Electrical infrastructure including the existing Wagga 330 kV and Bannaby 500 kV substations, and transmission lines and distribution lines.
- Energy generation including wind turbines, solar farms, and hydroelectric dams.



Proposal corridor
Existing Transgrid transmission line
Existing substation

NSW Land Zoning

B1 Neighbourhood Centre
B2 Local Centre
B3 Commercial Core
B4 Mixed Use
B5 Business Development
B6 Enterprise Corridor
B7 Business Park
E1 National Parks and Nature Reserves
E2 Environmental Conservation
E3 Environmental Management
E4 Environmental Living
IN1 General Industrial
IN2 Light Industrial
IN3 Heavy Industrial
IN4 Working Waterfront
R1 General Residential
R2 Low Density Residential
R3 Medium Density Residential
R4 High Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RE2 Private Recreation
RU1 Primary Production
RU2 Rural Landscape
RU3 Forestry
RU4 Primary Production Small Lots
RU5 Village
RU6 Transition
SP1 Special Activities
SP2 Infrastructure
SP3 Tourist
W1 Natural Waterways
W2 Recreational Waterways
W3 Working Waterways
DM Deferred Matter
ACT excluded

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; Environmental Planning Instrument - Land Zoning: Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-6: Land use zoning

7.5.2. Potential impacts

Construction

As a result of the proposal, a significant amount of expenditure would be spent within the local, regional and NSW economies during the construction phase over a relatively short period of time. The construction phase would also generate notable opportunities for local employment and suppliers, which would benefit the economy of nearby towns.

During construction, the proposal has the potential for land use and property impacts to agricultural activities, horticulture operations, forestry operations and other existing land uses within the proposal corridor. This would include interruptions to seasonal cropping and harvesting activities, biosecurity risks from construction movements and some temporary restrictions to access and use of portions of properties near construction activities. Land may be temporarily leased during the construction program to develop necessary ancillary sites.

The construction of the proposal may involve use and/or upgrade of existing access tracks within Kosciuszko National Park, which would result in negligible land use impacts as this is consistent with its existing use. There would also be temporary disruption to existing land uses through changes in traffic (due to haulage and other construction related transportation) and amenity impacts, including noise, vibration and air quality.

Operation

When fully completed, the proposal would facilitate enhanced security and reliability of energy supply with associated economic benefits to consumers across the NEM including:

- Safe, reliable and affordable electricity for consumers
- Greater access to lower cost energy generation
- Creation of regional jobs and support for regional economic growth.

Operation of the proposal would result in a permanent change in land use from the existing land use (mostly agriculture or forestry) to electrical infrastructure where permanent infrastructure is located along the transmission line (e.g. tower structures and permanent access tracks) and at the substation sites.

Property would need to be acquired permanently by Transgrid (on behalf of the NSW government's Electricity Transmission Ministerial Holding Corporation) for the new Gugaa 500 kV substation. Easements for the transmission lines could place restrictions on land use. This may include some limitations on agricultural activities in and around the transmission line easement, such as limits on the height of machinery that could operate within transmission line easements and restrictions to any nearby pivot irrigation systems. The land within an easement, and immediately next to the proposal could continue to be used for grazing and other agricultural activities that do not require tall crops or large machinery. The easements would reduce the land available within the proposal corridor for forestry and certain horticultural land uses, due to limitations on the height of vegetation that would be permitted within the easement as well as aerial activities such as spraying of fertilisers and pesticides.

The proposal would be refined to avoid encroachment within the obstacle limitation surface (OLS) of regional airports, however the new transmission line easement may result in impacts to existing private landing grounds nearby (refer to Figure 7-17).

Access track easements may also be required to ensure Transgrid can access its infrastructure for maintenance purposes.

Other economic activities close to the proposal, such as tourism and recreational activities, may be affected from changes to amenity, such as the visual presence and noise from the operational transmission line and substation infrastructure. The proposal is expected to be refined so that the proposed transmission line easement avoids direct impacts to national parks, therefore any impacts on this land use is expected to be negligible.

7.5.3. Approach to assessment in the EIS

A detailed economic impact assessment will be undertaken for the proposal.

The economic impact assessment will:

- Identify and quantify the potential significant impacts (costs and benefits) including use of land (land capability), construction, recurrent costs, benefit of electricity amplification and any other relevant impacts. Ways to quantify these impacts will be considered, such as opportunity cost of the land (land value impacts), construction costs, marginal recurrent costs such as maintenance and security, and the benefit of electricity amplification (wholesale revenue or gross value added / gross domestic product)
- Consider impacts to businesses (including agriculture, horticulture and forestry), which will be checked for consistency against the agricultural impact assessment
- Assess economic impacts from construction including quantification of job generation resulting from construction and post construction
- Consider intergenerational benefits and equitable distribution of electricity amplification, once operational, assuming a 50-year design life.

The methodology for the economic impact assessment will be guided by the *TPP17-03 NSW Government Guide to Cost-Benefit Analysis*.

A separate property and land use impact assessment will be undertaken for the proposal.

The property and land use impact assessment will:

- Define the relevant study area and assessment framework
- Consider the existing environment, including existing land use and zoning, land capability, Crown land presence, mining licenses, infrastructure easements, stock routes, land values, and ownership patterns (government and private)
- Consider property acquisition, including a summation of characteristics such as real property description, ownership (public/private), land zoning, current use, acquisition type (partial/full and size, temporary/permanent)
- Assess potential construction and operational impacts and relevant mitigation measures.

A supporting assessment of potential agricultural impacts would be undertaken and included in the land use and property assessment. This would include consideration of existing agricultural operations near the proposal, biosecurity risks and appropriate mitigation measures to minimise impacts on agriculture.

7.6. Landscape character and visual amenity

7.6.1. Existing environment

Much of the land within the proposal corridor is used for agricultural purposes including broad acre cropping and grazing. The landscape is a mix of:

- Flat land with views to low elevation, rolling hills, which is typical of the section of the proposal corridor from Wagga Wagga to Wondalga and from Yass to Bannaby that is mainly used for agriculture
- Forested areas, which generally aligns with the areas of State forest
- Alpine areas, which generally aligns with the area within and near Kosciuszko National Park.

The proposal corridor parallels existing transmission lines for a large portion of the proposal. Given the relatively flat land within a large portion of the proposal corridor, the existing transmission line structures would be visible for long distances. Existing substations at Wagga Wagga and Bannaby, wind turbines, solar farms and dams are also currently part of the visual landscape.

The alpine environment of Kosciuszko National Park is within the southern section of the proposal corridor and is part of the Australian Alps Bioregion. Kosciuszko National Park is characterised by peaked ranges, and broad forested valleys, and is the only true alpine environment in NSW. The future substation at Maragle (reference SSI-9717, EPBC 2018/836) and associated transmission lines and access tracks would likely be visible from Kosciuszko National Park.

Sensitive viewpoints around the proposal corridor include views from residential dwellings, recreational users of protected areas and State forest areas and dedicated public viewpoints such as at Blowering Dam.

7.6.2. Potential impacts

Construction

During construction, the presence of construction plant (particularly those large features such as cranes), vehicles and compound sites may result in short-term temporary visual impacts for sensitive receivers near the proposed corridor. Vegetation clearing required for construction has the potential to result in long-term visual impacts.

Operation

During operation, the proposal would introduce large steel lattice structures up to 75 m in height and new large substation infrastructure into the landscape. The exact location of each transmission line structure would be determined during detailed design; however, they would generally be placed between 300 to 600 m apart along the alignment.

Given their height and the surrounding landscape, there is the potential for the transmission line structures to be noticeable for distances of several kilometres. It is expected that the new infrastructure would be more visible across flat, open terrain, compared to areas of dense vegetation that may partially screen the structures or where the transmission line easement is shielded by topography.

The presence of transmission infrastructure and easements could result in indirect impacts on historic heritage items through visual changes to the setting, particularly in areas close to national parks and reserves.

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 (such as residences) and viewing locations or parallel to existing transmission line infrastructure where the degree of landscape change would be less.

7.6.3. Approach to assessment in the EIS

A detailed landscape character and visual impact assessment would be undertaken as a viewpoint-based assessment to identify potential visibility of the proposal from different viewpoints along the corridor. This assessment will identify and describe landscape character areas and unique qualities, consider heritage and other social values, and consider the impacts on the landscape character and views during construction and operation during the day and night.

The assessment of landscape character and visual amenity impacts will include:

- Public realm views from roads, towns and groups of residences, open space viewing areas and reserves to substations and transmission lines
- Views from residences or other sensitive receivers identifying the potential viewshed of the proposal and aerial photograph interpretation.

The sensitivity of the landscape and visual receptors will be evaluated, followed by a prediction of the magnitude of the change that each will experience as a result of the proposal. These will be combined to determine the significance of the effect during construction and during operation. The assessment will develop mitigation measures to minimise the impacts of the proposal, where practicable.

The following guidelines would be used for the landscape and visual impact assessment:

- *Guidance note EIA-04 Guideline for Landscape Character and Visual Impact Assessment* (Transport for New South Wales (TfNSW), 2020)
- *Guidelines for Landscape and Visual Impact Assessment*| (GLVIA3), Third Edition (Landscape Institute and Institute of Environmental Management and Assessment, 2013)
- *Guidance Note for Landscape and Visual Assessment* (Australian Institute of Landscape Architects, 2018).

7.7. Soils and contamination

7.7.1. Existing environment

7.7.1.1. Topography and geology

The proposal corridor passes through a wide variety of terrains, ranging between alpine regions near Maragle at approximately 1,225 m elevation, and alluvial valleys near the Murrumbidgee River with a minimum elevation of approximately 385 m.

The proposal is within the geological subdivision known as the Lachlan Orogen or Lachlan Fold Belt, which was generally formed at a convergent plate margin. This formational environment resulted in a highly varied geological environment dominated by deep-water sedimentary rocks, volcanic rocks and granitic plutons, as well as extensive thrust (reverse) faulting and folding. Simplified regional geological mapping is shown in Figure 7-7.

Faults within the Lachlan Orogen are not considered geologically active, and so do not pose a likely threat of geological movement and earthquakes. However, the faults will result in defects in the rock mass that affect the strength of material and will therefore be a consideration in locating assets including transmission line structures and the new Gugaa 500 kV substation.

As shown in Figure 7-8, exploration and mining titles exist in several locations along the proposal corridor including at Batlow, Tumut, Yass, Dalton and south of Crookwell. Mining reserves are in place near Tumut.

Appendix D includes more detailed geology and mining figures for the proposal corridor.

7.7.1.2. Soil

Due to the complex geology, varying topography and climate influences, there is a diverse range of soil types across the proposal corridor. According to the Australian Soils Classification (Isbell and National Committee on Soil and Terrain (NCST), 2016) the main soil orders within the proposal corridor include Kurosols, Kandosols, Dermosols, Ferrosols, Rudosols, Tenosols, Natric Kurosols, Sodosols, Chromosols, Vertosols, Alluvial Tenosols and Hydrosols (shown in Figure 7-9).

Geological hazards in the proposal corridor include:

- Alluvial soils, which can be unconsolidated and vary in their strength
- Landslides, where the risk relates to slope, groundwater, geology, soil type, climate, and anthropogenic impacts
- Naturally occurring asbestos, which can release silicate fibres to the air when disturbed leading to adverse health impacts.

Landslide risk and naturally occurring asbestos are shown in Figure 7-10 and in more detailed figures provided in Appendix D.

Naturally occurring asbestos (NOA) minerals are associated with rock formations that are present within NSW in the Lachlan Fold Belt. Asbestos is a naturally occurring mineral comprised of fibrous silicate crystals. When disturbed, these microscopic fibres can be released into the air. Inhalation of asbestos fibres have been found to lead to serious disease decades after exposure, such as asbestosis, leading to mesothelioma and cancer. The probability of encountering NOA within the top 10 m of the ground surface in the proposal corridor and surrounds is shown in Figure 7-10. This shows that there is potential for NOA to be encountered within sections of the proposal corridor near Maragle and Tumut.

Salinity occurs in many areas of NSW, and includes dryland salinity, irrigation and river salinity, and urban salinity. Hydrogeological mapping on the eSpade tool indicates a high likelihood of salinity near Yass, with a lower occurrence in alpine areas to the south of the proposal corridor.

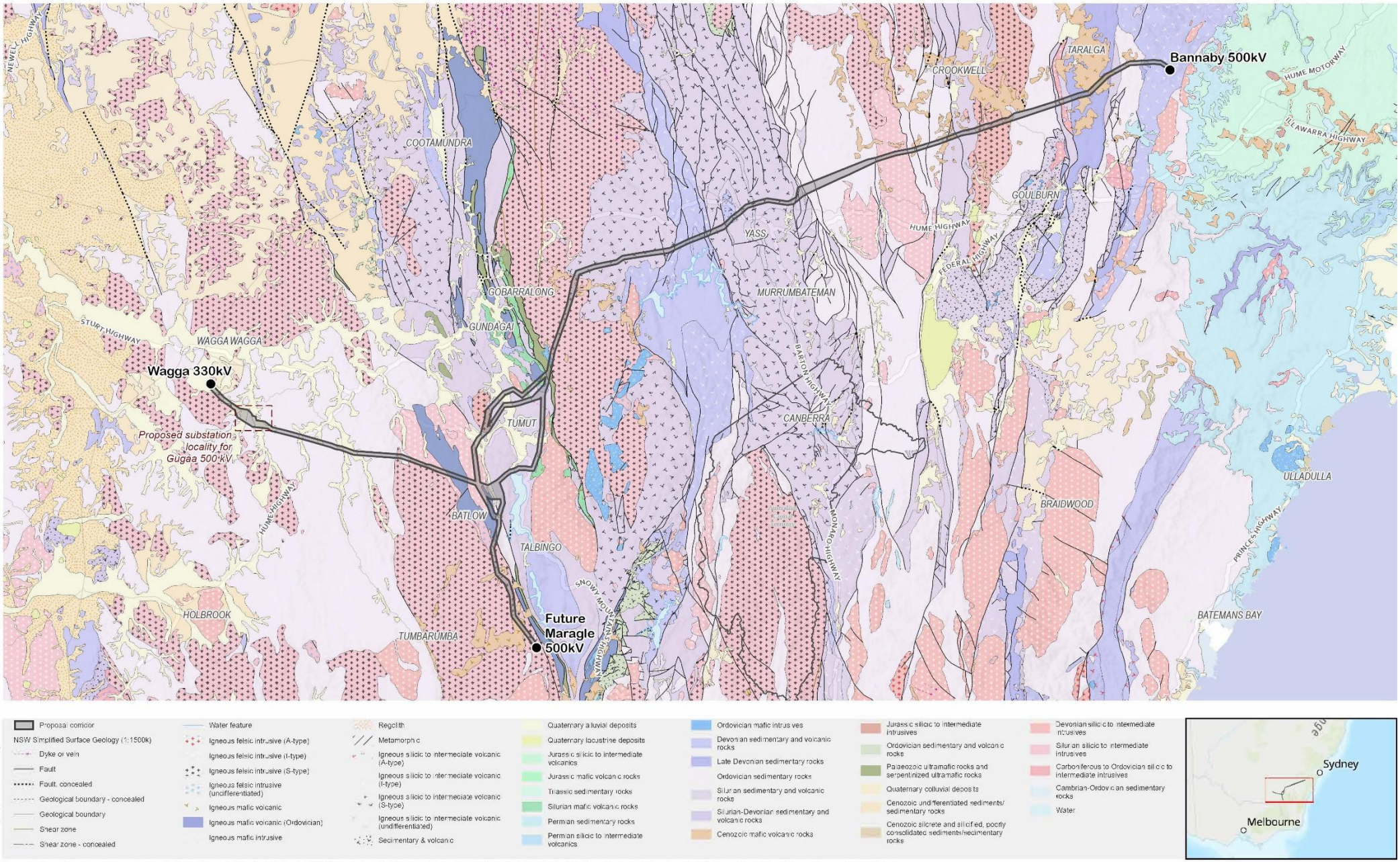
Acid sulfate soils (ASS) are naturally occurring soils that contain high concentrations of micro-crystalline iron sulfide (pyrite), which on contact with oxygen and water combines to become sulfuric acid, potentially making the soil highly acidic. The acidic conditions of ASS may affect the durability of buried concrete and steel structures, and disturbed material may result in the acidification of nearby environments if not properly handled. ASS are typically formed in regions that are subjected to long term waterlogged conditions, as are found in coastal estuarine environments and wetlands. Localised inland ASS can occur within drainage lines, wetlands and billabongs where sulfate is present in the landscape. There is a low probability of encountering inland ASS where salinity as a source is not present in the landscape.

The geological landscape of the proposal corridor may contain localised dykes and veins where pyrite is present, which when disturbed may become highly acidic. In regions where foundation structures are expected to be founded in rock, the potential occurrence of pyrite will be assessed based on geological mapping.

7.7.1.3. Land contamination

The proposal corridor consists of large areas of undeveloped rural land and native vegetation, which indicates that existing land contamination from previous or current activities on the land is unlikely to be widespread.

A search of notified contaminated sites published by the EPA in September 2021 shows no sites located within the proposal corridor. The nearest sites notified to the EPA to the proposal corridor are shown in Figure 7-10 and in more detailed figures provided in Appendix D, which mainly include service stations and other industrial sites. Localised contamination not identified on the register could be present due to unregistered landfill and waste storage, agricultural chemicals storage, active or disused livestock dip sites and localised pesticide use.



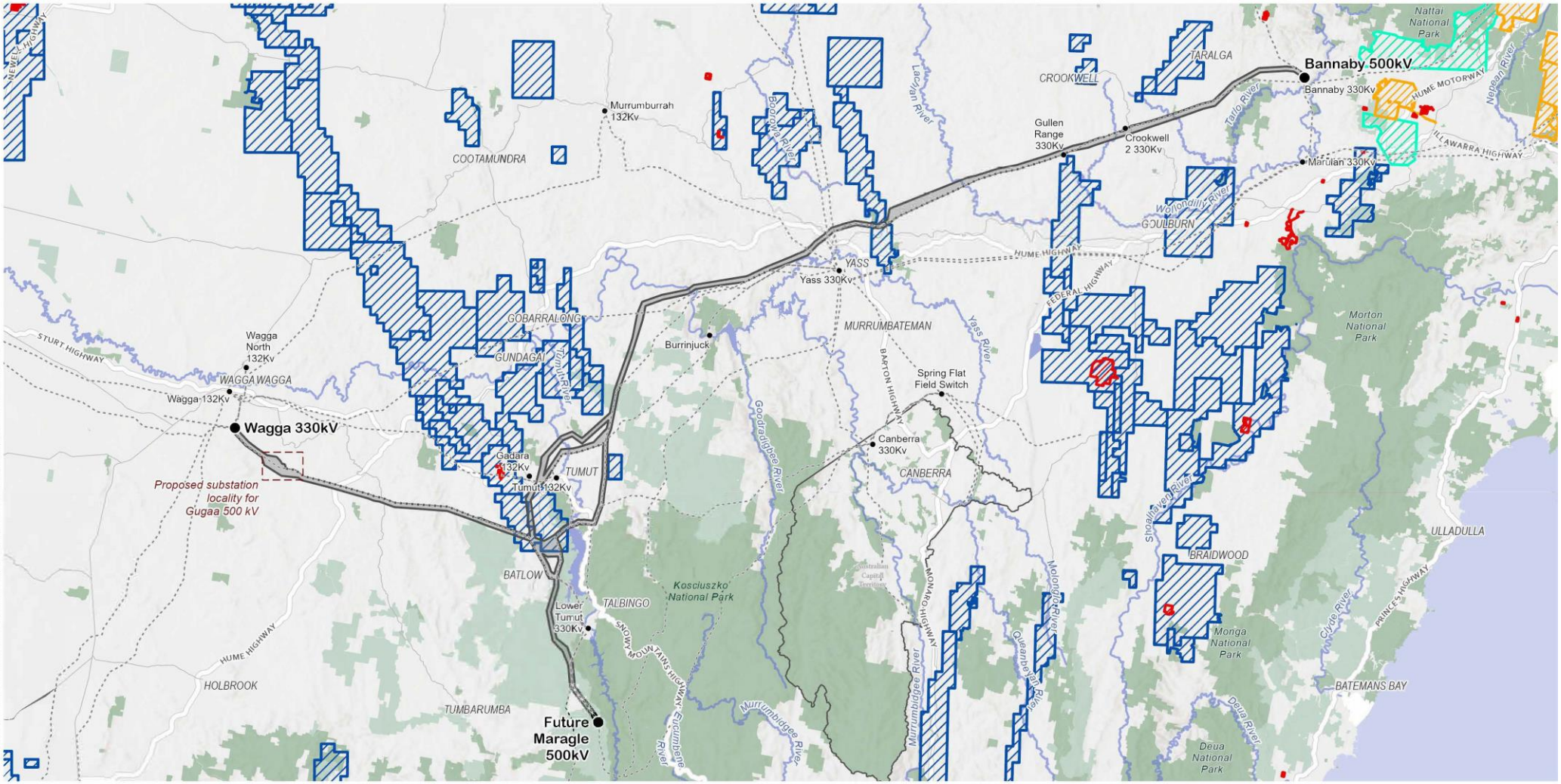
C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; NSW 1500K Simplified Surface Geology: Department of Regional New South Wales,Transgrid; ESRI Topo*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

FIGURE 7-7: Geology



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\17-09-21\Carmen.Braz

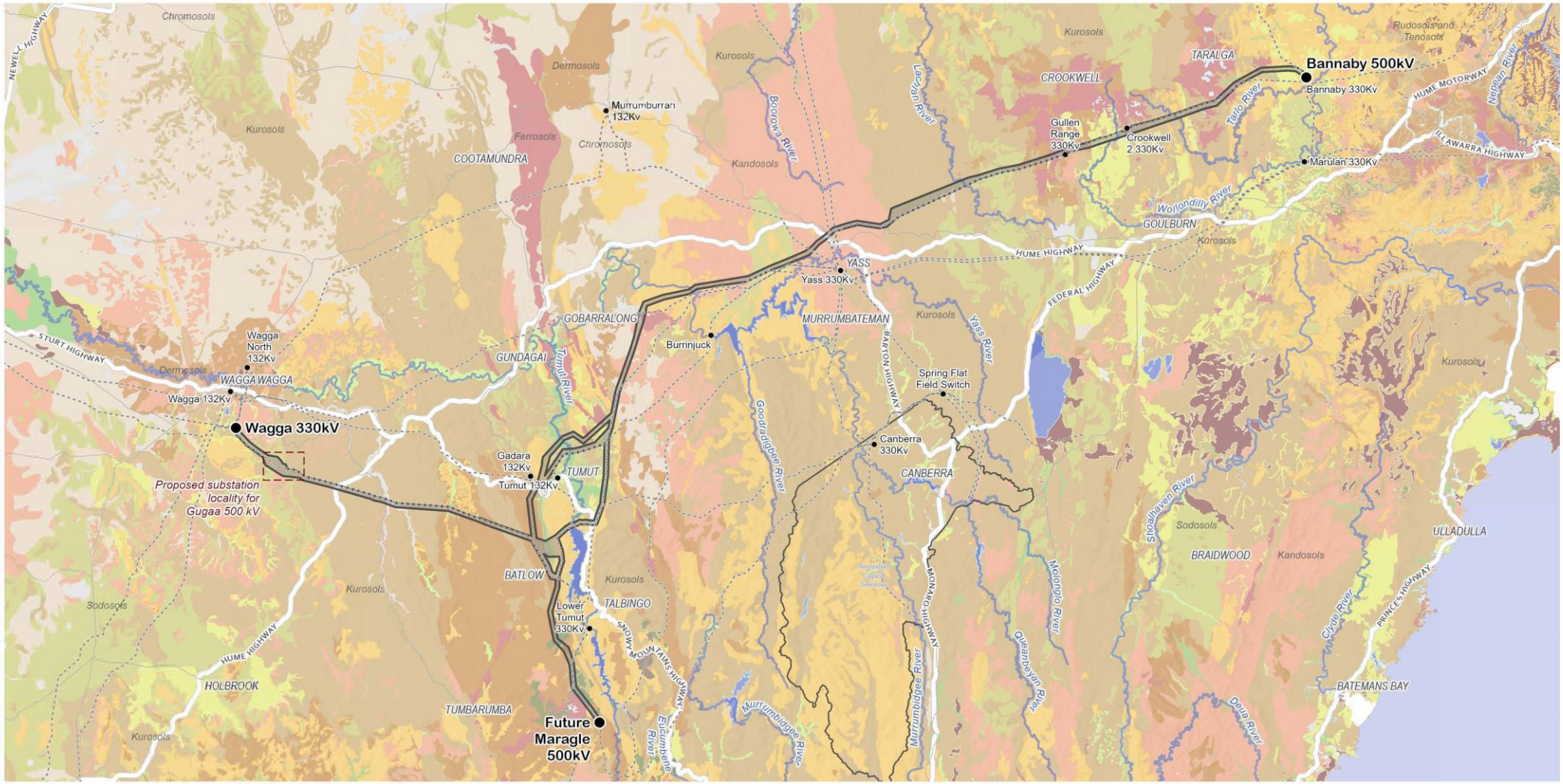
Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Exploration and Mining Titles: Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-8: Mining



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\16-09-21\Carmen.Braz

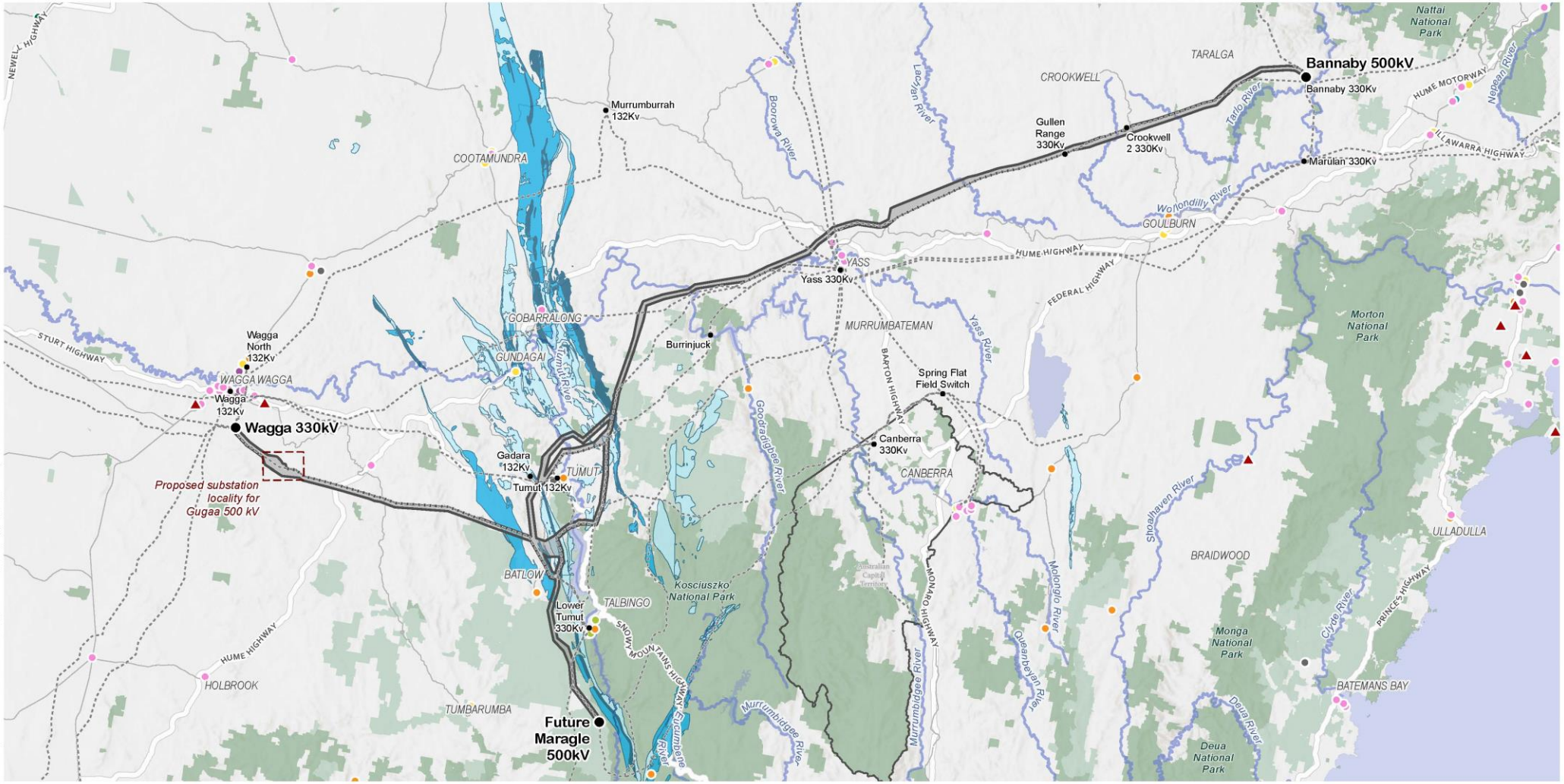
Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; Australian Soil Classification (ASC) soil type map of NSW, Version 4.5: Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-9: Australian Soil Classifications



Proposal corridor
Existing Transgrid transmission line
Existing substation
National park and reserve
State forest
Landslide Risk (DPIE)
PFAS sites
EPA Notified Contaminated Sites
Gasworks
Landfill
Metal Industry
Other Industry
Other Petroleum
Service Station
Chemical Industry
Unclassified
Naturally Occurring Asbestos Potential
High Asbestos Potential
Medium Asbestos Potential
Low Asbestos Potential

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; PFAS, Notified Contaminated Site: NSW Environment Protection Authority; Naturally Occurring Asbestos: Department of Regional New South Wales; Transgrid; ESRI Topo*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-10: Contamination and other hazards

7.7.2. Potential impacts

Construction

Potential impacts on soils and geology during construction could include:

- Landslides resulting from excavation or vibration near unstable soil or geology
- Physical and chemical changes to soil quality, mixing of soils and changes to drainage
- Mobilisation and spread of pre-existing contamination in the surrounding soil if disturbed during construction
- Localised soil contamination due to spills and leaks from construction vehicles and equipment
- Soil erosion and mobilisation by natural weather conditions such as wind, rain, snow and frost, resulting in sedimentation downslope or dust deposition
- Soil compaction from movement of vehicles and machinery
- Changes in soil salinity from soil disturbance, vegetation clearance and groundwater aquifer interference
- Disturbance of naturally occurring asbestos
- Disposal of excess spoil.

Construction of the new Gugaa 500 kV substation would require bulk earthworks to prepare a level foundation for installation of the substation infrastructure. This could result in excess spoil or the need to import clean fill. Some excavated material may be suitable for reuse such as in access track construction. Excess spoil that is not suitable for reuse would need to be disposed of offsite at an appropriately licenced facility.

Construction of the transmission tower footings would require removal of vegetation and excavation, while construction and upgrades of access tracks to each transmission tower would require surface disturbance, and emplacement of suitable gravel and fill materials.

Contamination may occur from leaks or spills from the operation or refuelling of plant, equipment and vehicles during construction. Construction would also require transportation and storage of fuels, oils and chemicals, which could potentially spill or leak and result in localised contamination.

Use of worker facilities within ancillary facilities and accommodation camps would produce sewerage and wastewater, which could contaminate land if accidentally released.

NOA can release silicate fibres to the air when disturbed, which may be hazardous to human health. Construction of transmission line structures and access roads within regions of NOA would require more stringent safety controls and monitoring during excavation of foundation structures, as well as management of spoil.

Operation

Similar impacts to soil could be caused during operation, though at a much smaller scale than construction, including soil erosion or compaction from vehicle and equipment movements during maintenance activities, and potential spills and leaks of chemicals and fuels, which could result in localised contamination to the surrounding land.

The main contamination risk at substations during operation would be associated with potential leaks from oil-filled equipment, such as substation transformers. Spills may result from storage of fuels and chemicals, fire events or indirectly through the overflow of firefighting water from substation spill containment systems. The final design would include oil spill containment systems and bunds in accordance with relevant legislation and standards.

Operational assets could also be impacted by the strength of soils and underlying rocks or landslides, which may impact the structural integrity of substation, transmission line structures or condition of access tracks, which will be considered in siting and design of the assets.

7.7.3. Approach to assessment in the EIS

A detailed soils and contamination assessment and preliminary site investigation would be undertaken for the EIS to assess the potential impacts of all the construction and operational activities associated with the proposal. This would include a detailed assessment of the existing environment, review of available historical aerial photography and mapping of contamination sources such as:

- Registered contaminated sites
- Former livestock dip locations
- Unexploded ordnance risk sites
- Sites with notable per- and polyfluoroalkyl substances investigation risk.

Site inspections would be carried out to assess visual indications of surface filling, dumped wastes, land uses, and other contamination risks. The assessment would include impact assessment and identification of management and mitigation measures, including measures to manage the risk of contamination, soil erosion and sedimentation as well as any monitoring requirements for the proposal.

Detailed geotechnical investigations will be carried out to inform the design of the proposal. Data from site investigations would be used to validate regional soil and geological mapping.

The following government plans, policies and guidelines will be relevant to assessment in the EIS:

- *National environment protection (Assessment of site contamination) measure* (National Environment Protection Council, 2013)
- *Managing Land Contamination: Planning Guidelines SEPP 55 –Remediation of Land* (DUAP & EPA, 1998)
- *Guidelines for Consultants Reporting on Contaminated Sites* (EPA, 2020)
- *Guidelines for the NSW Site Auditor Scheme* (EPA, 2017a)
- *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA, 2015)
- Urban and regional salinity – guidance given in the Local Government Salinity Initiative booklets (http://www.environment.nsw.gov.au/salinity/solutions/urban.htm) which includes Site Investigations for Urban Salinity (DLWC, 2002)
- *Guidelines for Managing Salinity in Rural Areas* (OEH, 2015)
- *Naturally Occurring Asbestos – Asbestos Management Plan Guide* (HACA, 2017)
- *Code of practice: How to manage and control asbestos in the workplace* (SafeWork NSW, 2019)
- *Managing asbestos in or on soil* (NSWG, 2014)
- *Soil and Landscape Issues in Environmental Impact Assessment* (DLWC, 2000)
- *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004)

- *Managing Urban Stormwater: Soils and Construction Volume 2* (DECC, 2008)
- *Landslide risk management guidelines presented in Australian Geomechanics Society* (2007).

7.8. Water

7.8.1. Existing environment

7.8.1.1. Surface water

The proposal corridor extends across four surface water catchments, namely Hawkesbury-Nepean, Lachlan, Murrumbidgee and Murray (refer to Figure 7-11). The area within the Hawkesbury-Nepean catchment is also part of the Sydney drinking water catchment. Water sharing plans are in place in each of these catchments, as shown in Figure 7-12.

The proposal corridor crosses major waterways including the Goobarragandra River, Lachlan River, Murrumbidgee River, Tarlo River, Tumut River near Blowering Dam, Wollondilly River near Pejar Dam, Yass River as well as several creeks and minor streams. Existing water quality within the proposal corridor is expected to be influenced by surrounding land uses, such as existing agricultural operations that may have resulted in increased pollutants (from pesticides, herbicides, fertilisers) and sedimentation within nearby waterways.

As discussed in Section7.2.2.1, key fish habitat is present within the proposal corridor within named waterways.

7.8.1.2. Groundwater

Groundwater is water found under ground in soil and fractures in the underlying bedrock. Groundwater aquifer boundaries and existing boreholes in the proposal corridor are shown in Figure 7-13.

Figure 7-13 also shows areas that have been mapped as having vulnerable groundwater resources (DPIE, 2014). The data shows show the vulnerability (or level of risk) of aquifers to contamination relating to physical characteristics of the location, such as the depth to the water table and soil type. Areas of groundwater vulnerability within the proposal corridor are near Tumut and between Gobarralong and Yass.

Groundwater sharing plans that are in place within the proposal corridor include:

- NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011
- Greater Metropolitan Region Groundwater Sources 2011
- Murrumbidgee River Unregulated and Alluvial Water Sources 2012.

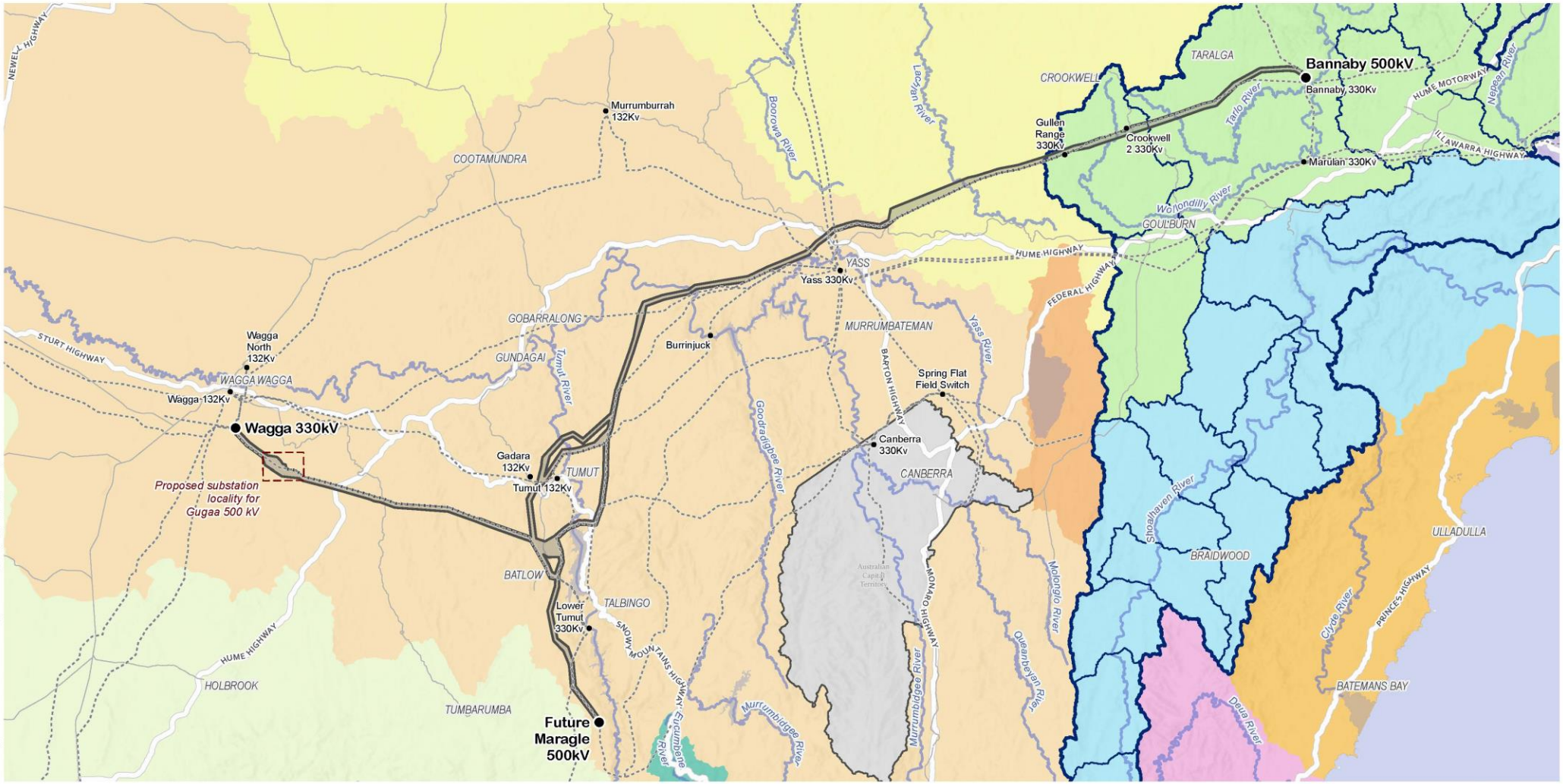
As discussed in Section 7.2.2.1, there are a number of high and moderate groundwater dependent ecosystems within the proposal corridor.

7.8.1.3. Hydrology and flooding

Bureau of Meteorology (BoM) rainfall data (BoM, 2021) shows that:

- From 1941 to 2020, Wagga Wagga (station 72150) had an average annual rainfall of 571 mm, and ranged from 245 mm to 1019 mm
- From 1955 to 2020, Blowering Dam (station 72056) near Tumut had an average annual rainfall of 968 mm, and ranged from 377 mm to 1557 mm
- From 1886 to 2020, Gunning (station 70043) had an average annual rainfall of 655 mm, and ranged from 228 mm to 1453 mm.

Flood risk mapping is provided through the NSW Environmental Planning Instrument – Flood Planning (DPIE, 2019a) and shown in Figure 7-14. No part of the proposal corridor traverses through regions noted as having development implications due to flood risk, however this map is not prescriptive and areas outside of those identified in the flood mapping dataset may be subject to flooding events.



Proposal corridor

Existing Transgrid transmission line

Existing substation

Sydney Drinking Water Catchment

NSW Catchment boundaries (NSW Conservation Act)

- A.C.T.
- Clyde
- Hawkesbury
- Lachlan
- Lake George
- Lake Illawarra / Port Hacking
- Moruya
- Murray
- Murrumbidgee
- Shoalhaven
- Snowy

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; Catchment Boundaries NSW, State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011: Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

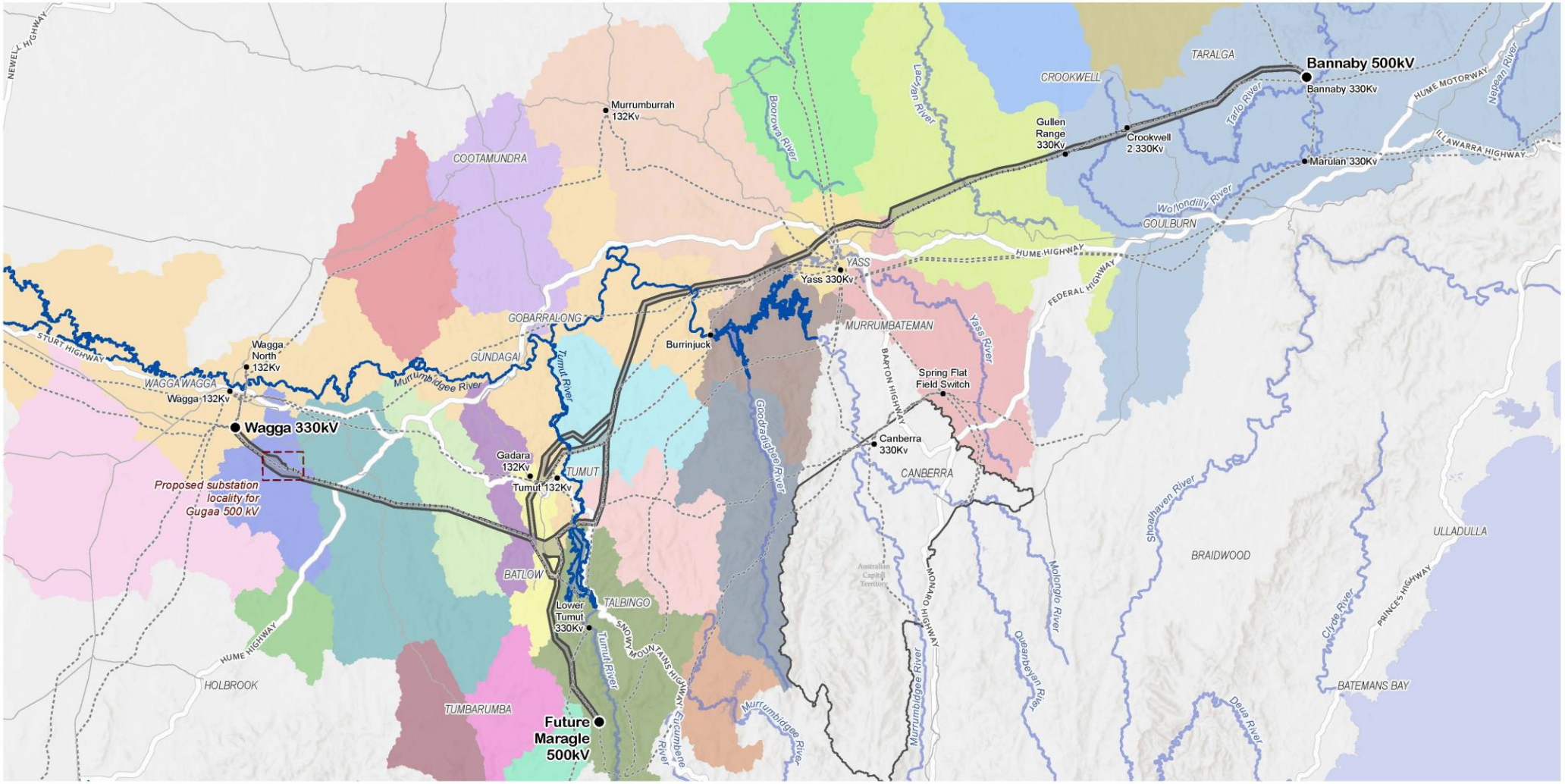
1:925,000

0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-11: Surface water catchments



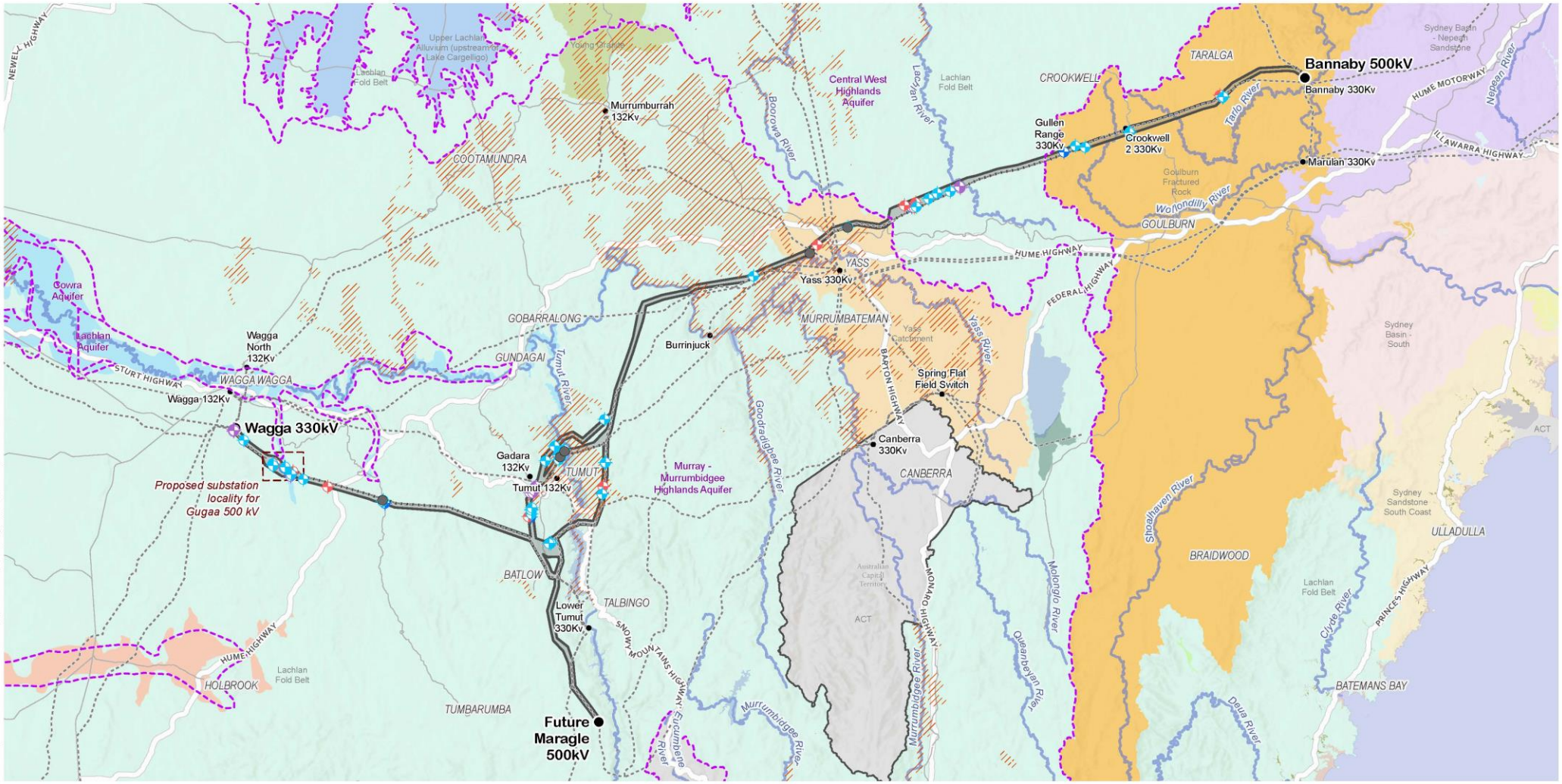
C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; Water Sharing Plans: Department of Planning, Industry and Environment; Aquifer boundary - Australian Hydrological Geospatial Fabric: Bureau of Meteorology; Transgrid; ESRI Topo*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

FIGURE 7-12: Water sharing plans - Surface water



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; Water Sharing Plans, Environmental Planning Instrument - Groundwater Vulnerability: Department of Planning, Industry and Environment; Groundwater Bores: WaterNSW; Aquifer boundary - Australian Hydrological Geospatial Fabric: Bureau of Meteorology; Transgrid; ESRI Topo*

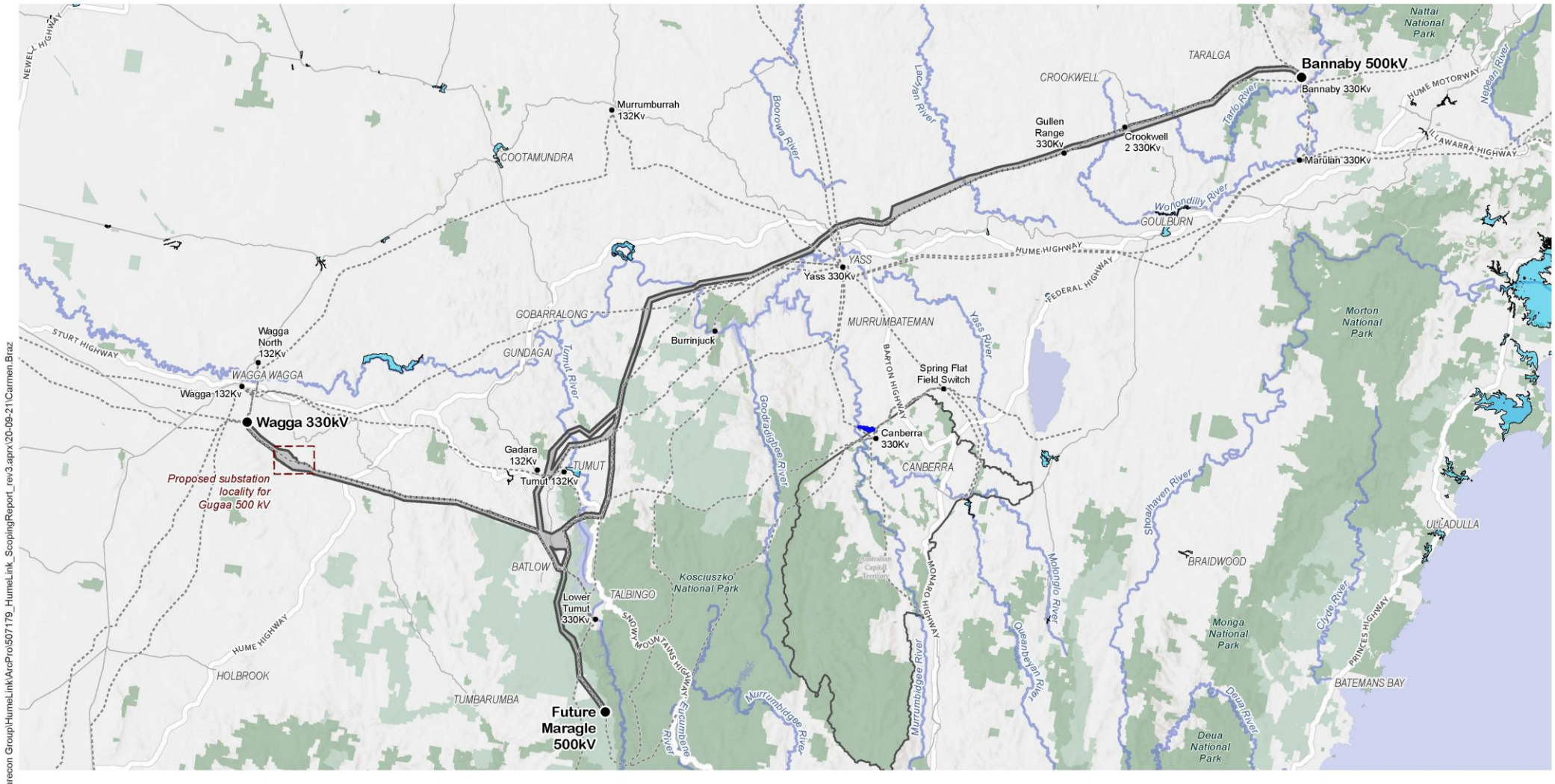
1:925,000

0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-13: Groundwater



C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes) NSW Foundation Spatial Data Framework; Environmental Planning Instrument - Flood: Department of Planning, Industry and Environment; Transgrid; ESRI Topo*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-14: Hydrology and flooding

7.8.2. Potential impacts

Construction

Potential impacts on water during construction would be associated with:

- Use of limited water supply
- Sedimentation and turbidity of eroded soil material
- Leaks and spills of fuels, chemicals or wastewater impacting surface water or groundwater quality
- Changes to surface water flow patterns due to the location of earthworks, flow diversions, bunding, material stockpiles and temporary drainage infrastructure
- Temporary dewatering of excavations
- Drinking water quality impacts.

Substation construction impacts would potentially arise from vegetation clearing, earthworks causing erosion and sediment laden water runoff to enter surrounding waterways. Leaks and spills from construction machinery and stored fuel and chemicals could potentially occur during construction at substations. During construction of the level foundation for the new Gugaa 500 kV substation, groundwater could be intercepted, and dewatering may be required. Construction activity would increase the area of impermeable surfaces, increasing the amount and velocity of surface water runoff.

Transmission tower construction including earthworks for footings could cause erosion and encounter groundwater, leading to the need for dewatering. Erosion and spills would also cause an adverse impact during construction of access tracks to transmission line structures and establishment of waterway crossings for construction vehicles, plant and equipment.

Establishment of waterway crossings would involve the placement of rock on the bank or bed of the waterway, as required. The crossings may also involve installation of pipes to allow water to flow through the structure. The placement of material within the waterway has the potential to alter stream flows, water levels and aquatic habitat.

Water use and access to water during construction for ancillary facilities such as concrete batching, and dust suppression could potentially be an issue for the proposal due to the drought sensitivity in regional NSW. As such, it is expected that the community would be sensitive to any impacts on local water supplies.

Operation

Potential impacts related to water during operation are most likely to be associated with:

- Changes to local hydrology, including the quality, quantity and patterns of surface water runoff and drainage, as a result of the new and expanded substation benches
- Transport and deposition of sediment from ground disturbance as well as vehicle and equipment movements during maintenance activities
- Potential leaks and spills of chemicals and fuels during maintenance activities or as the result of fire water overflowing from substation bunds during an emergency.

No groundwater issues are expected during operation.

7.8.3. Approach to assessment in the EIS

A detailed surface water and groundwater assessment will be included in the EIS. The proposal corridor will be characterised in terms of climate and rainfall conditions, catchments, soils and geology, topography including waterways and wetlands, hydrogeology and groundwater conditions. Flow conditions in waterways and the geomorphology of waterways will be described in terms of stream orders, NSW River Styles, condition, recovery potential and fragility.

Sensitive receiving environments down-gradient of the proposal will be identified, and a review of existing surface water quality will be carried out, including review of any existing water quality data, waterway classifications, local water quality guideline values and strategic water quality issues. The baseline water quality conditions will be identified, including catchment disturbance conditions, physical, chemical or biological processes, Water Quality Objectives and applicable trigger values for water quality indicators, including physical and chemical stressors and toxicants.

The assessment will identify existing boreholes, groundwater users and groundwater dependent ecosystems that could be impacted by the proposal. Groundwater conditions will be determined including occurrence, flow, chemistry, environmental and anthropogenic resource potential. Publicly available data and data from completed geotechnical investigations will be reviewed.

The assessment will identify the likely water demands during construction and operation, and the feasibility and impact of water supply options will be confirmed.

For the proposed new Gugaa 500 kV substation, a representative model will be developed to estimate potential runoff and discharge volumes and qualities and generate conceptual sizing of any required permanent bio-retention basins. A high-level assessment of potential for local water beneficial re-use from any proposed erosion and sediment control features at the substation site will be conducted. Impacts on runoff generated from the cleared proposed transmission line corridors and other ancillary infrastructure sites will be assessed on a qualitative basis.

The likely impact of the proposal on water quantity and quality during construction and operational stages would be determined by reviewing proposed erosion and sediment control and drainage structures to identify potential impacts on surface waters and sensitive receiving environments from stormwater runoff. The assessment will review consistency with the relevant NSW River Flow Objectives and the relevant Water Quality Objectives.

As part of the proposal corridor is within the Sydney drinking water catchment, a NorBE assessment will be carried out. While State significant infrastructure is not specified in the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011, the consultation protocol between DPE and WaterNSW requires the consideration of the principle of achieving a neutral or beneficial effect on water quality for State significant projects within the Sydney drinking water catchment.

A qualitative geomorphic assessment will be carried out where the proposal corridor crosses waterways using the NSW River Styles mapping (NSW Department of Industry, 2019). Potential impacts on the local geomorphology from any predicted changes in flow conditions and in-channel works will be assessed.

Potential impacts to groundwater resources, quality, users and receiving environments will be assessed for construction and operational activities, including excavations, surface water diversions, and temporary changes to drainage conditions.

The hydrology and flooding assessment will be informed by a review of available flood and overland flow study reports and available mapping.

Flood modelling will be carried out to assess broad scale impacts and local impacts at the proposed new Gugaa 500 kV substation. Hydrological and hydraulic modelling will include a catchment analysis and hydrological analysis of catchments using *Australian Rainfall & Runoff 2019* (Geoscience Australia, 2019). A hydraulic model will be developed based on this analysis and used to carry out flood modelling and flood risk assessment.

Transmission line structures are assumed to have minimal impact on flood behaviour therefore only a qualitative impact assessment will form part of the technical paper.

For all aspects of the surface and groundwater assessments, impacts will be considered, and mitigation and management measures will be developed. Impacts are anticipated to be manageable though appropriate design of permanent drainage and water quality treatment systems for the new and expanded substations, siting new infrastructure away from floodplains or waterways where possible, and implementation of standard management measures for maintenance activities.

The following government plans, policies and guidelines are relevant to the proposal:

- *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004)
- *Managing Urban Stormwater: Soils and Construction Volume 2* (DECC, 2008)
- *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DECC, 2008)
- *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI Fisheries, 2013)
- *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions* (OEH, 2017)
- *National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting* (Department of Agriculture and Water Resources, 2018)
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000 / ANZG, 2018)
- *NSW Aquifer Interference Policy* (DPI Water, 2012)
- *NSW Groundwater Dependent Ecosystem Policy* (Department of Land & Water Conservation, 2002)
- *NSW Groundwater Quality Protection Policy* (Department of Land & Water Conservation, 1998)
- *NSW State Rivers and Estuaries Policy* (1993)
- *NSW Water Quality and River Flow Objectives* (DECCW, 2006)
- *Neutral or Beneficial Effect on Water Quality Assessment Guideline* (Sydney Catchment Authority, 2015)
- *Erosion and Sediment Control on Unsealed Roads* (OEH, 2012)
- *Australian Rainfall & Runoff 2019* (Geoscience Australia, 2019)
- *The NSW Floodplain Development Manual: The Management of Flood Liable Land* (Department of Infrastructure, Planning and Natural Resources, 2005)
- *Practical Considerations of Climate Change – Flood risk management guidelines* (DECC, 2007)
- *PS 07-003 New guideline and changes to Section 117 direction and EP&A Regulation on flood prone land* (Department of Planning, 2007).

7.9. Hazards

7.9.1. Bushfire

7.9.1.1. Existing environment

The bushfire risk across the proposal corridor varies depending on the vegetation, topography and climatic conditions. The vegetation hazard across the proposal corridor is highly variable, with areas of rural grazing land, cropping and areas of grassland, woodland and forest presenting distinct bushfire risks. Bushfires are caused by a variety of factors, including lightning strikes, arson, sparks from hotworks and heavy plant, vehicle ignition, escaped burn offs/campfires and electrical incidents such as fallen power lines.

A large portion of the southern extent of the proposal corridor is mapped as Category 1 Bush Fire Prone Land (NSW Rural Fire Service, 2020), which is the highest risk category for bushfires, as shown in Figure 7-15. This category is associated with forests, woodlands and the timber plantation areas of State forests, crown lands and National Parks. Due to a combination of factors, including vegetation cover and steep terrain, this land is particularly susceptible to fires which are difficult to suppress and can spread over many weeks under adverse conditions. In the grassland and open woodland in the east-west corridor from Bannaby to Wagga Wagga, grass fires can spread more rapidly over larger distances. High temperatures combined with thunderstorm activity in these areas can initiate major fire events. Prolonged drought conditions can also exacerbate bushfire impacts.

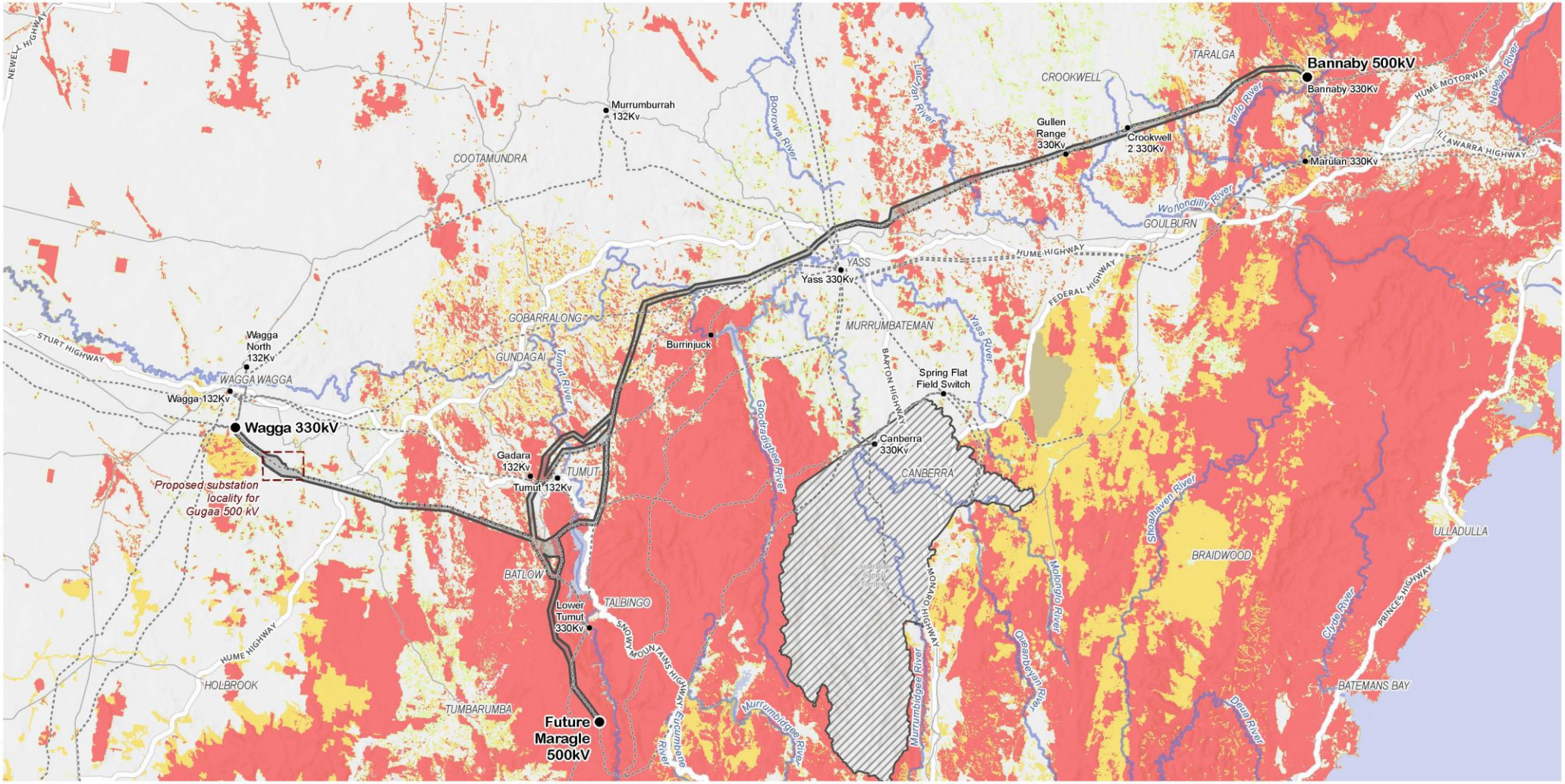
Areas in the proposal corridor recently affected by bushfires initially had a reduced fuel load, however regenerating ground and elevated fuels will increase bushfire risk over time. For example, the southern portion of the proposal area near Maragle was burnt by the Dunns Roads bushfire in January 2020, which impacted more than 330,000 ha of land and caused extensive damage to commercial assets. Areas affected by the 2019/2020 bushfires are shown in Figure 7-16.

Transgrid has an obligation under the NSW Electricity Supply (Safety and Network Management) Regulation 2014 to have a system in place to manage bushfire risk relating to electricity lines and other assets that are capable of initiating bushfire. Transgrid has assessed this risk and set out management measures in a bushfire risk management plan.

Bush Fire Risk Management Plans (BFRMPs), which are developed and maintained by local Bush Fire Management Committees across NSW, relevant to the area covered by the proposal corridor include:

- Riverina BFRMP
- Snowy Valleys BFRMP
- South West Slopes BFRMP
- Southern Tablelands BFRMP.

The BFRMPs list the main sources of ignition as lightning, harvesting and farm machinery, illegal burn off, campfires, incendiarism (arson), and accidental ignition and escapes from legal burning.



Proposal corridor

Existing Transgrid transmission line

Existing substation

Bush Fire Prone Land

Vegetation Category 1

Vegetation Category 2

Vegetation Buffer

ACT excluded

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Bushfire Prone Land: NSW RFS; Transgrid; ESRI Topo*

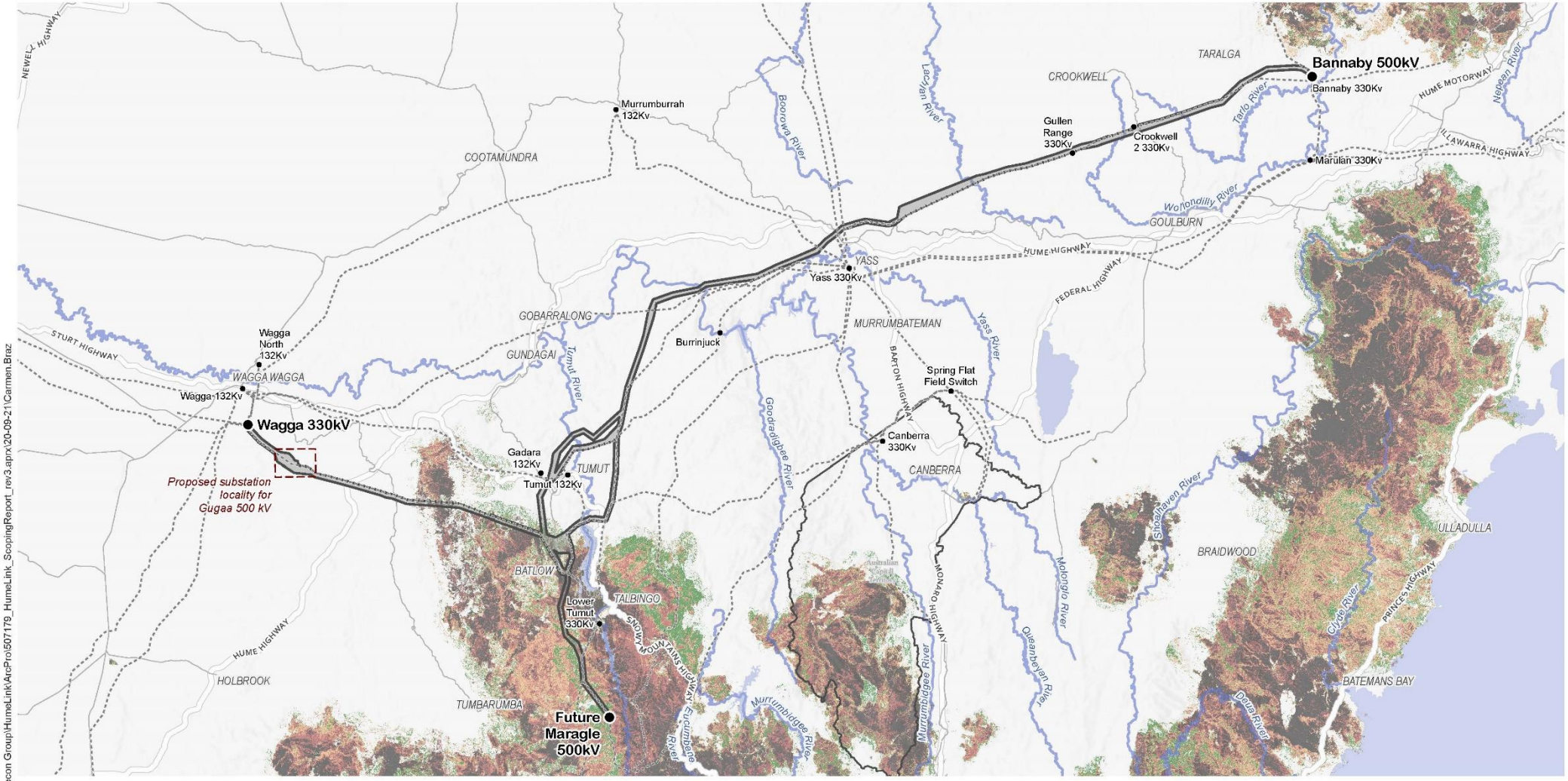
1:925,000

0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-15: Bushfire prone land



Proposal corridor

Existing Transgrid transmission line

Existing substation

FESMv3 Severity Classes

Unburnt

Low - burnt understory with unburnt canopy

Medium -partial canopy scorch

High- full canopy scorch/partial consumption

Extreme - full canopy consumption

C:\Users\carmen.braz\OneDrive - Aurecon Group\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\20-09-21\Carmen.Braz

Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Fire Extent and Severity Mapping (FESM) 2019/20: Department of Planning, Industry and Environment;Transgrid; ESRI Topo*

1:925,000

0 20 40km

Projection: GDA 1994 MGA Zone 55

FIGURE 7-16: Fire extent and severity 2019/20

7.9.1.2. Potential impacts

Construction

During construction, there is a risk that construction activities could be impacted by fires as well as a risk that construction activities could initiate fires.

Bushfire impacts during substation construction are unlikely at existing substations where works occur within established asset protection zones (APZs) and procedural controls are implemented or where substation work is located outside bush fire prone land, such as at the new Gugaa 500 kV substation (refer to Figure 7-15).

Construction activities at transmission tower locations that involve hot works, such as grinding, welding or cutting, or may otherwise result in sparks from plant or equipment, could increase the risks of bushfire ignition. This risk of fire is highest near heavily vegetated areas within Category 1 bushfire prone land (refer to Figure 7-15) and cured grasslands, and near stockpiles of removed vegetation.

Operation

Transgrid's risk approach to asset management assumes that every substation and transmission line has the potential to be impacted by fire, or to initiate fire. During operation, ongoing vegetation management occurs within the transmission line easement and asset protection zones are maintained around the substations to minimise bushfire risk. Bushfires may also pose a risk to network operations where physical damage to infrastructure occurs or when network operations are interrupted and requires an assessment by a network crew.

During operation, vegetation needs to be managed due to annual plant growth increasing fuel hazard and the potential for growing tips to contact with live lines and initiate a fire. Controlling fires along live transmission line breaks is constrained by the potential for electrical arcing from smoke and heat convection to impact ground crews and limited aerial firefighting options. These constraints highlight the need for ongoing vegetation management for bushfire risk reduction.

The access tracks to transmission line easements in limited circumstances may provide a formed control line or an access route to assist with firefighting suppression activities, though generally only form a small part of an existing road or track network.

7.9.1.3. Approach to assessment in the EIS

A detailed bushfire risk assessment will be prepared to inform the EIS of the potential impact of the proposal on bushfire risk and potential impacts to public safety, property, and the environment. The assessment will identify bushfire risks within the proposal corridor and aim to minimise potential impact of bushfire risks and hazards.

An initial high-level desktop assessment of bushfire risk factors would be conducted to consider fire weather, historic fire occurrence potential ignition sources, vegetation, slope, access and construction standards for assets across the proposal corridor. A preliminary bushfire hazard assessment would also be prepared to collect information on the areas with greatest consequence and likelihood of fire ignition. Sensitive community assets would be identified through a review of BFRMPs from nearby local government areas as well as spatial analysis based on publicly accessible data.

Field work would be carried out in key locations and indicative high-risk locations identified in the desktop analysis. This assessment aims to confirm vegetation, slope and access on site for key infrastructure.

Project specific bushfire mitigation measures will be developed in the EIS to reduce the potential for and impacts from bushfires on the development and surrounding communities. The measures will indicate APZs required for structures, indicative bushfire attack level for substation and workforce accommodation building construction, access requirements for ancillary infrastructure during construction works, vegetation management requirements, water supply and other services, and requirements for emergency and evacuation planning.

The following government plans, policies and guidelines will be relevant to assessment in the EIS:

- *Planning for Bush Fire Protection* (NSW Rural Fire Service, 2019)
- AS3959:2018 – Construction of buildings in bushfire-prone areas (Standards Australia, 2018).

7.9.2. Electric and magnetic fields

7.9.2.1. Existing environment

An electric field is produced every time voltage runs through a wire. Magnetic fields are produced by the flow of an electric current through a wire. The higher the voltage or current, the greater the associated electric or magnetic field. Together, the electric and magnetic fields are referred to as EMF.

Electricity transmission produces extremely low frequency (ELF) EMF. ELF EMF is in the lower part of the electromagnetic spectrum in the frequency range 0-3000 Hz (WHO, 2007). In the natural environment, EMF occurs with electric fields present in the atmosphere in ionospheric currents, thunderstorms and lightning, and static magnetic fields created by the earth's core. Artificial EMF is also produced wherever electricity or electrical equipment is in use. Powerlines, electrical equipment and household appliances are sources of EMF.

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

7.9.2.2. Potential impacts

Construction

EMF is not expected to be an issue during construction as the transmission lines will not be energised.

Operation

Based on engagement carried out to date, EMF presents a significant perceived impact in the community and is one of the concerns received from community feedback (refer Section 6.5).

The proposed HumeLink transmission lines would produce EMF when in service. Being related to voltage, the electric fields associated with high voltage equipment remain relatively constant over time, except where the operating voltage changes. Conversely, being related to current, the magnetic field strength resulting from an electrical installation varies continually with time as the load on the equipment varies. 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 electric and magnetic fields associated with electrical equipment, whilst interrelated, are not dependent on each other and as such can exist independently.

The proposal would introduce new high voltage transmission lines and substation infrastructure within the proposal corridor, which would result in additional increases to EMF in the local area.

Transgrid adopts a precautionary approach to the management of EMF by (Transgrid, 2020):

- Taking electric and magnetic fields into account in the design and location of new facilities
- Closely monitoring ongoing research and reviews by scientific panels and international policy developments
- Regularly reviewing policies and practices in light of the latest scientific information
- Measuring field strengths in and around Transgrid installations and other places where appropriate
- Providing up-to-date information to interested people on request.

The proposed transmission lines and substations would be designed and built to ensure that exposure levels are within the limits recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for limiting exposure to EMF published in 2010, which are endorsed by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

EMF is strongest closest to the wires and reduces quickly with distance. Transgrid will design the transmission lines to ensure that the EMF levels are within the guideline limits at the edge of the easement. The proposed transmission lines would also be located as far as possible from residential dwellings to further minimise this risk.

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 line structures. The height of the conductors would be at least 11 m above ground level.

The likelihood of EMF effects on plants and various animals, including cows, sheep, pigs and horses is considered to be negligible (WHO, 2005).

7.9.2.3. Approach to assessment in the EIS

Outcomes of an EMF assessment for the proposal will be provided in the EIS using the ICNIRP Guideline, which has been adopted by ARPANSA.

The ICNIRP Guideline sets ‘Basic Restrictions’ derived from the levels at which interactions with the central nervous system are established, with a safety factor applied. The Basic Restrictions are expressed in terms of electric field levels within the human body but, as these levels can only be assessed by sophisticated computer modelling of the body. ICNIRP also sets ‘Reference Levels’ for EMF. These levels are conservatively set such that, provided they are met, the Basic Restrictions will also be met without the need for more comprehensive analysis.

The ICNIRP ‘Basic Restrictions’ and ‘Reference Levels’ for the general public will be used as compliance criteria in the EIS assessment of electric and magnetic fields.

Given the inconclusive nature of the science regarding EMF at levels commonly associated with electrical equipment and human health, the ‘prudent avoidance’ approach will be applied.

Predicted EMF levels will be modelled using input data to be used in the EMF assessment including:

- Transmission line location
- Easement widths
- Electrical loadings
- Details of other electrical assets in proximity to the proposed lines
- Construction types
- Structure details
- Conductor details
- Ground clearances.

The relevant guideline for assessment of EMF in the EIS will be:

- *ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz – 100 kHz)* (ICNIRP, 2010).

7.9.3. Waste

7.9.3.1. Existing environment

The waste management facilities available near the proposal corridor are at:

- Wagga Wagga approximately 600 m west
- Goulburn approximately 23 km south
- Marulan 29 km approximately south east
- Canberra 52 km approximately south east
- Young approximately 68 km north.

7.9.3.2. Potential impacts

Construction

During construction, typical waste materials would include:

- Vegetation waste from clearing of easements and access roads
- Spoil from excavation activities
- Surplus construction materials such as steel, concrete, construction off-cuts and packaging
- Waste from ancillary facilities including construction compounds and accommodation camps
- Wastewater produced at accommodation camps and any dewatering
- Small quantities of waste oils, greases, chemicals and lubricants from operation of construction plant and equipment
- General domestic waste from construction personnel.

Operation

During operation, the main source of waste material is expected to be from vegetation maintenance with small quantities of other waste materials expected to be generated from maintenance activities.

7.9.3.3. Approach to assessment in the EIS

A standard assessment of waste impacts and management will be included in the EIS to identify potential waste streams associated with construction and operation of the proposal and would include standard management practices to avoid or minimise waste from the proposal. This would include management of spoil to balance cut and fill volumes.

Waste would need to be carefully managed and handled in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014). Construction waste would be segregated and stockpiled on site, with materials such as clean excavated soil, concrete, timber, plastic and metals separated for reuse or recycling. Any potentially contaminated or hazardous materials would need to be handled carefully and segregated to minimise the risk of cross-contamination. Waste requiring disposal would be directed to a waste management facility that is lawfully permitted to accept that type of waste.

The following government guideline will be relevant to assessment in the EIS:

- *Waste Classification Guidelines* (NSW EPA, 2014).

7.10. Traffic and access

7.10.1. Existing environment

The existing road network within and near the proposal corridor includes several major roads including (refer to Figure 7-17):

- Hume Highway (M31), which crosses the proposal corridor about 13 km south-east of the Wagga 330 kV substation and 5.5 km north-west of Yass and near Nangus
- Sturt Highway (A20), which crosses the proposal corridor about 24 km north-east of the Wagga 330 kV substation
- Barton Highway (A25), which crosses the proposal corridor about 7 km north-west of Yass
- Snowy Mountains Highway (B72), which crosses the proposal corridor north of Blowering Dam.

The proposal corridor is also crossed or close to several other major roads as well as a number of local and private rural roads with varying speed limits and conditions.

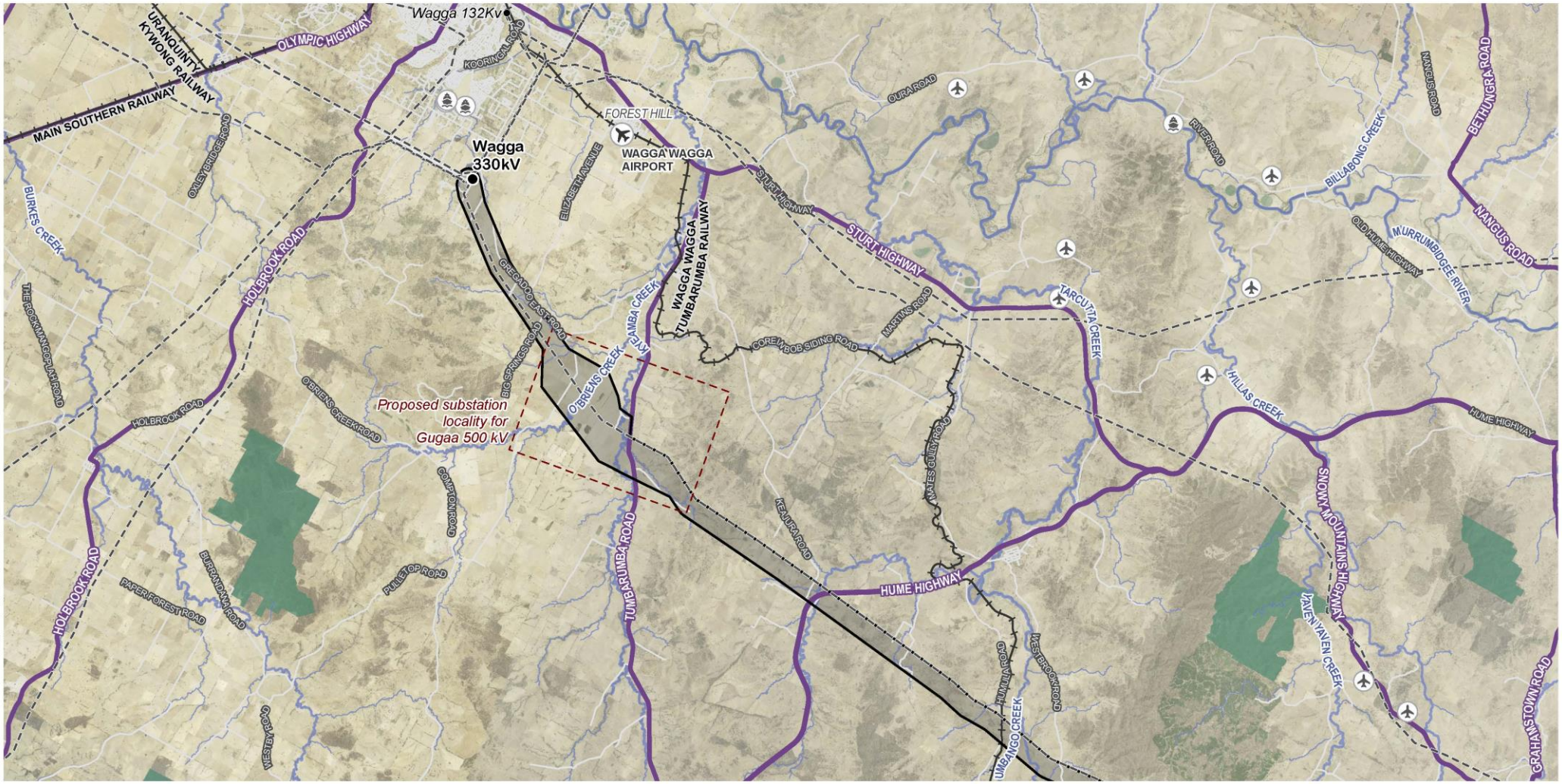
The proposal corridor crosses the Main Southern Line about 5.5 km north-west of Yass near the Hume Highway. This is a major railway line that runs from Sydney to Albury near the Victorian border, passing through the Southern Highlands, Southern Tablelands, South West Slopes and Riverina regions. The proposal also intersects disused branches of the Main Southern Line. This includes:

- The Wagga Wagga / Tumbarumba line
- The Cootamundra / Tumut line
- The Goulburn / Crookwell line
- The Gilmore / Batlow line (also known as the Kunama line).

The proposal corridor is near several regional airports including:

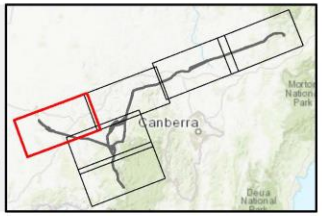
- Tumut Airport, which is located about 1.5 km south of the proposal corridor
- Wagga Wagga Airport and Royal Australian Air Force Base, which is located about 7.5 km north-east of the Wagga 330 kV substation
- Talbingo Airstrip, which is located about 7.5 km east of the proposal corridor
- Crookwell Airport, which is located about 10.5 km north of the proposal corridor.

Figure 7-17 shows the location of these regional airports as well as smaller landing grounds near the proposal corridor.



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Railway
Major road*
Transport facilities**
Airport
Landing Ground
Wharf / Boat Ramp

*Major road defined as Motorways, Primary roads, and Arterial roads from NSW Transport Theme Road segment hierarchy
**Transport related facilities (including private landing grounds and helipads) obtained from publicly available NSW Points of Interest (POI) dataset. This data may not be accurate and requires further validation from landowners.



C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

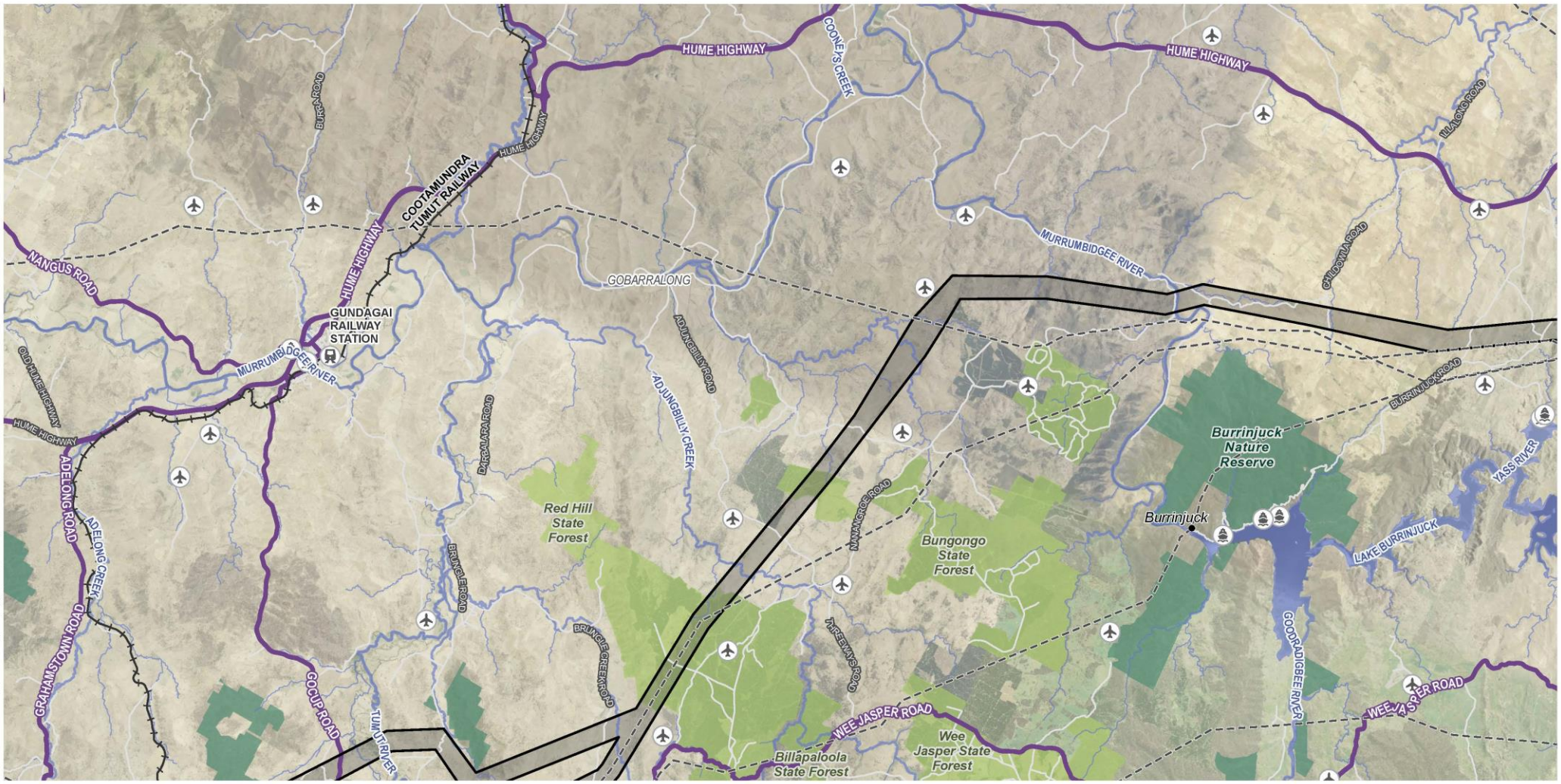
Source: *Base data (aerial imagery, transport, water, and cadastral themes) & Points of Interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

1:200,000
0 4 8km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

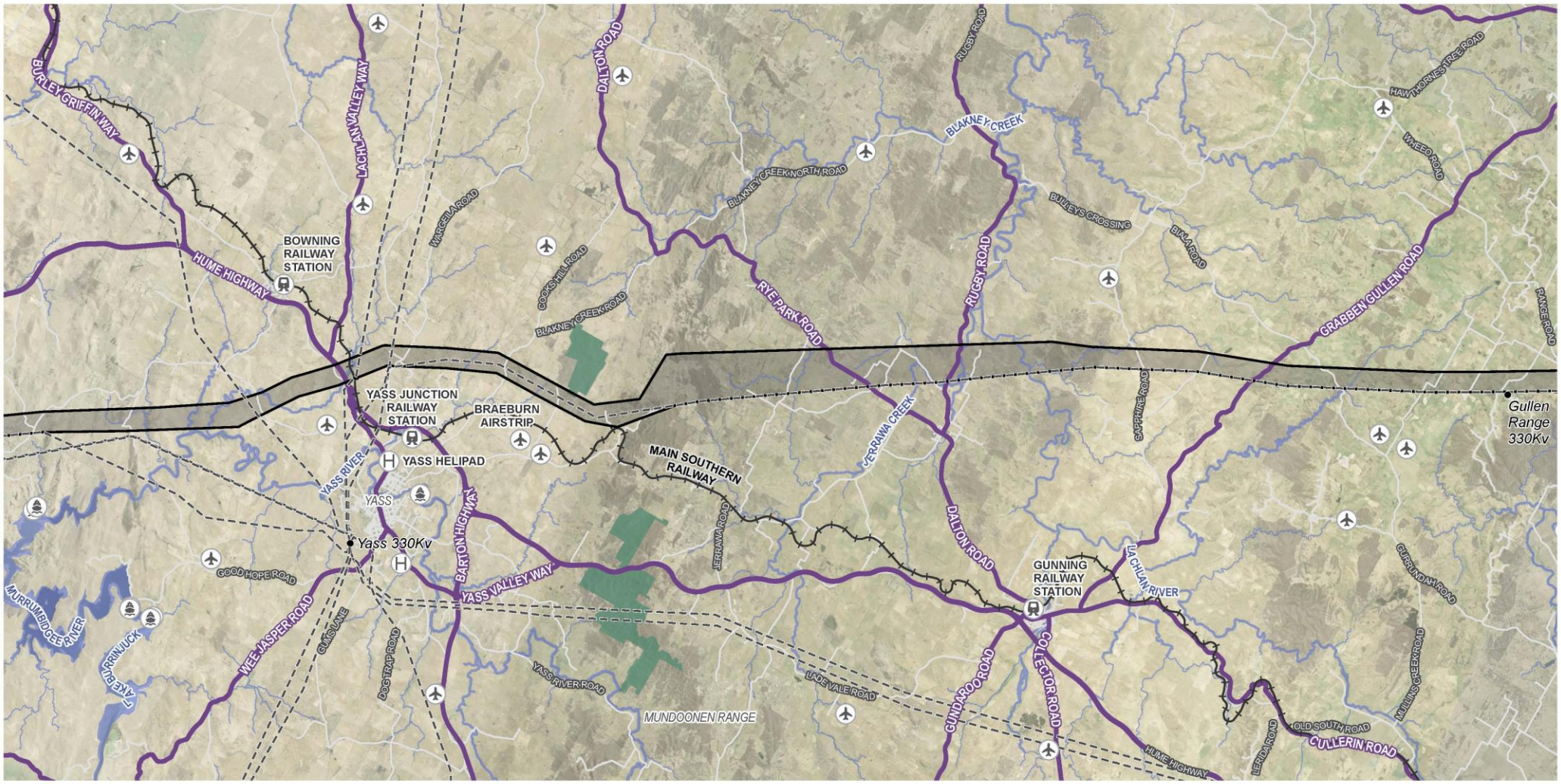
FIGURE 7-17-1: Transport



C:\Users\carmen.braz\Documents\Humelink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

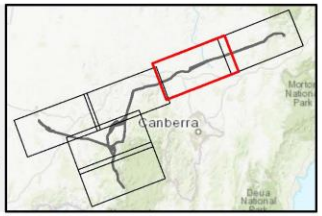
HumeLink **Scoping Report**

FIGURE 7-17-2: Transport



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Railway
Major road*
Transport facilities**
Helipad
Landing Ground
Wharf / Boat Ramp
Railway Station

*Major road defined as Motorways, Primary roads, and Arterial roads from NSW Transport Theme Road segment hierarchy
**Transport related facilities (including private landing grounds and helipads) obtained from publicly available NSW Points of Interest (POI) dataset. This data may not be accurate and requires further validation from landowners.



C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

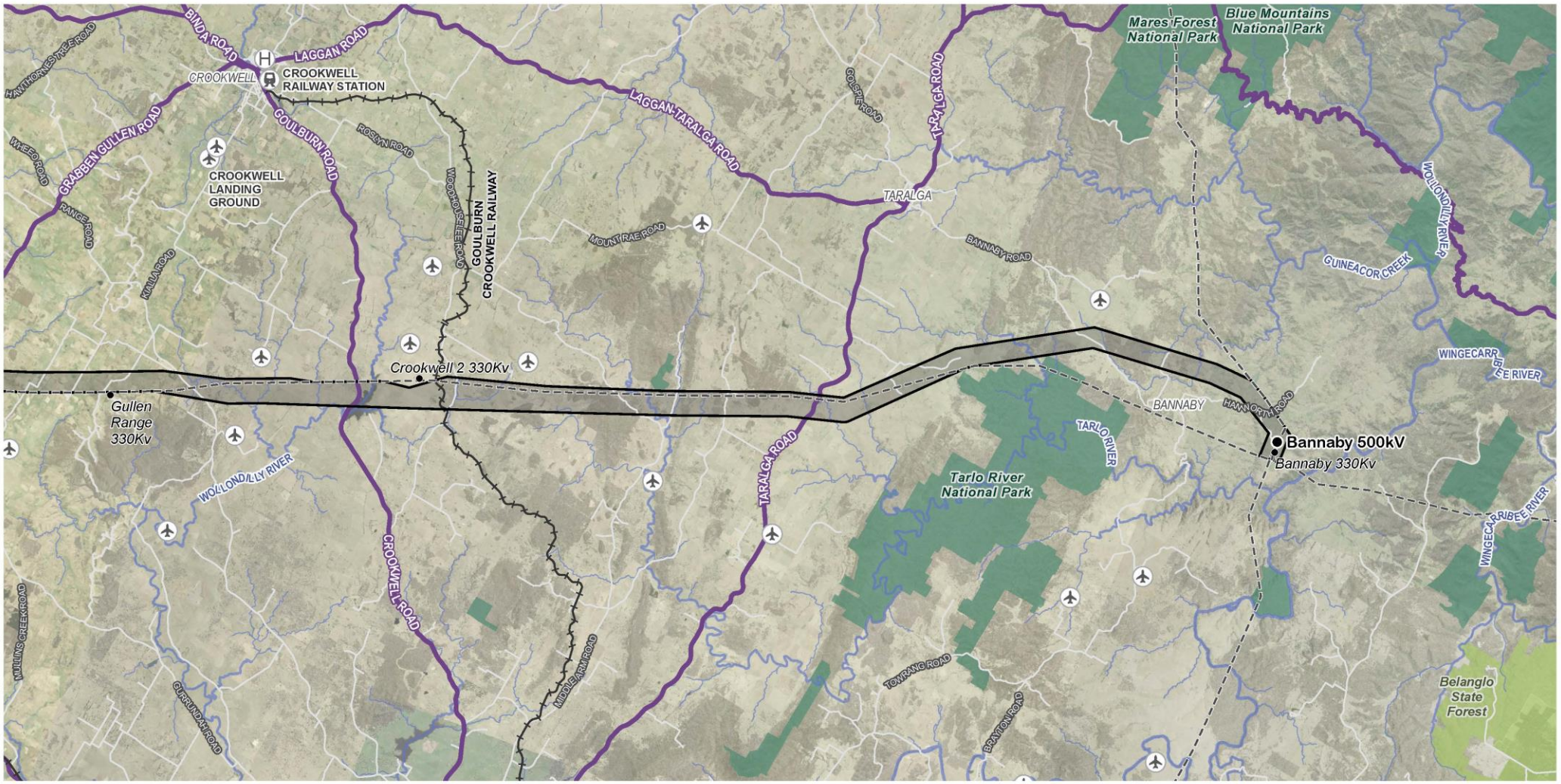
Source: *Base data (aerial imagery, transport, water, and cadastral themes) & Points of Interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

1:200,000
0 4 8km

Projection: GDA 1994 MGA Zone 55

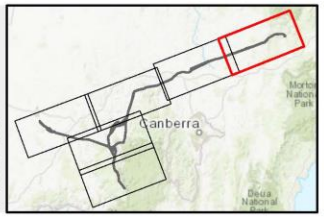
HumeLink **Scoping Report**

FIGURE 7-17-3: Transport



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Railway
Major road*
Transport facilities**
Helipad
Landing Ground
Railway Station

*Major road defined as Motorways, Primary roads, and Arterial roads from NSW Transport Theme Road segment hierarchy
**Transport related facilities (including private landing grounds and helipads) obtained from publicly available NSW Points of Interest (POI) dataset. This data may not be accurate and requires further validation from landowners.



C:\Users\carmen.braz\Documents\HumelinkArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

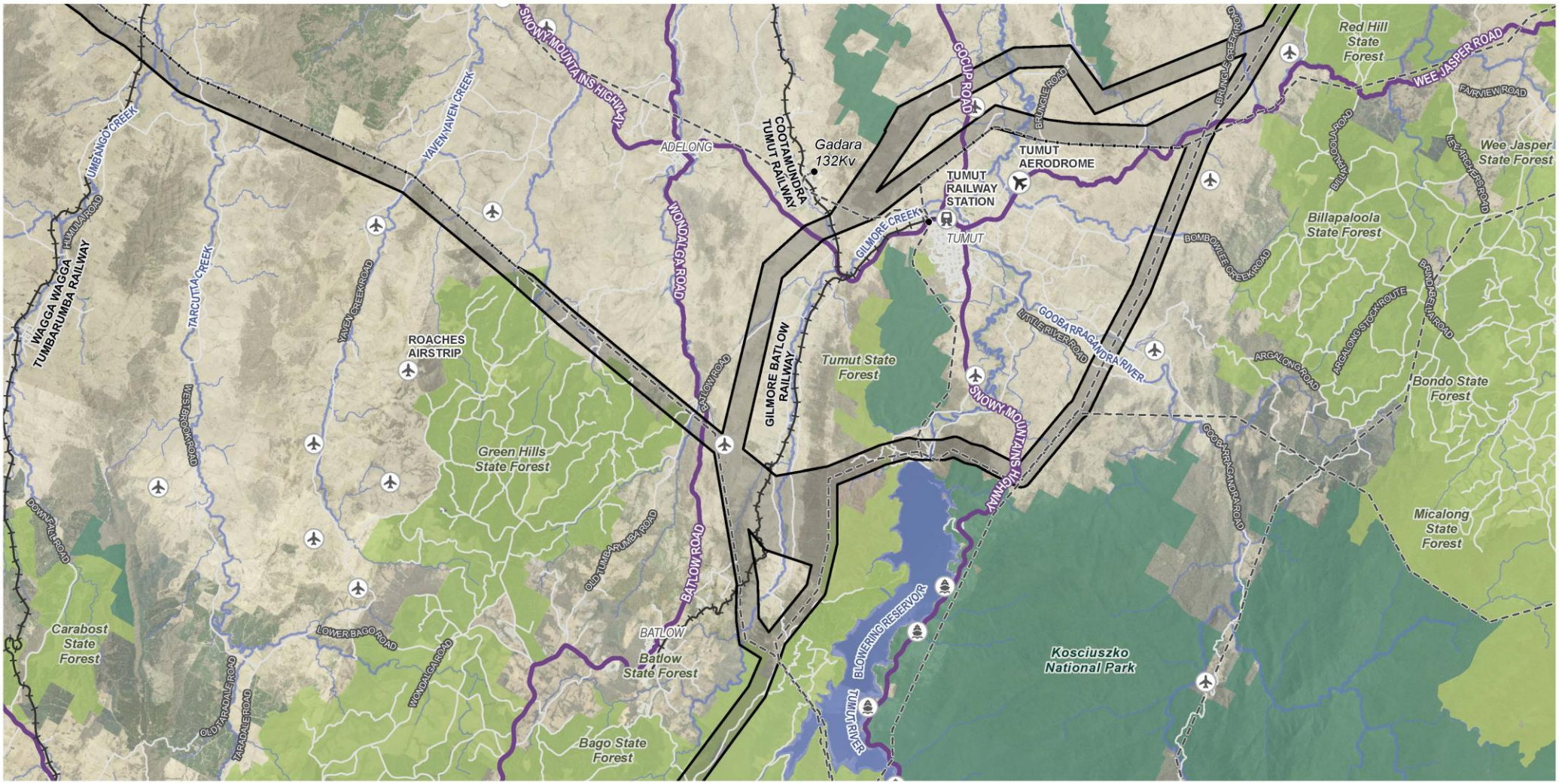
Source: *Base data (aerial imagery, transport, water, and cadastral themes) & Points of Interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

1:200,000
0 4 8km

Projection: GDA 1994 MGA Zone 55

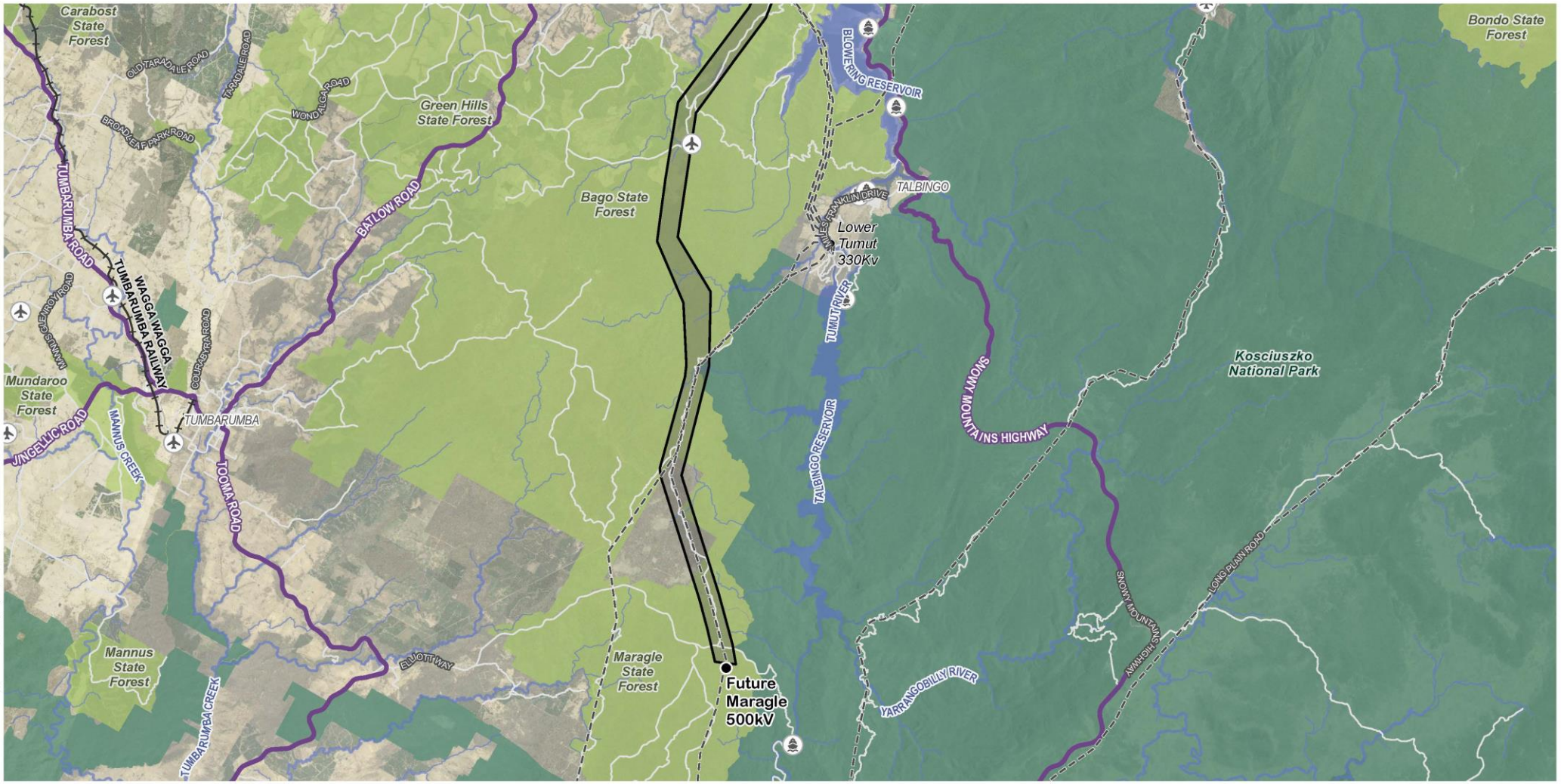
HumeLink **Scoping Report**

FIGURE 7-17-4: Transport



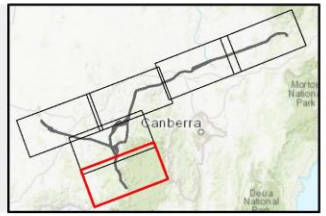
HumeLink **Scoping Report**

FIGURE 7-17-5: Transport



Proposal corridor
Existing Transgrid transmission line
Substation
Watercourse
Railway
Major road*
Transport facilities**
Helipad
Landing Ground
Wharf / Boat Ramp

*Major road defined as Motorways, Primary roads, and Arterial roads from NSW Transport Theme Road segment hierarchy
**Transport related facilities (including private landing grounds and helipads) obtained from publicly available NSW Points of Interest (POI) dataset. This data may not be accurate and requires further validation from landowners.



Source: *Base data (aerial imagery, transport, water, and cadastral themes) & Points of Interest; NSW Foundation Spatial Data Framework; Transgrid; ESRI Topo*

1:200,000
0 4 8km

Projection: GDA 1994 MGA Zone 55

HumeLink **Scoping Report**

FIGURE 7-17-6: Transport

C:\Users\carmen.braz\Documents\HumeLink\ArcPro\507179_HumeLink_ScopingReport_rev3.aprx\19-10-21\Carmen.Braz

7.10.2. Potential impacts

Construction

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

- Delivery of construction equipment and materials such as concrete, water, wires, cables and gravel
- Delivery of large equipment to be installed at the substations such as transformers and reactors and prefabricated elements such as for the transmission tower structures
- Movement and/or removal of excavated soil and waste materials
- Construction workers driving to and from the construction work sites and workforce accommodation each day.

The construction traffic is likely to use the surrounding major road network that is approved for use by heavy vehicles for transportation of key elements of construction plant and equipment and bulk material haulage. A number of other regional, local and private roads in the surrounding road network that connects to the proposal corridor may also be used by construction traffic for the proposal, where major roads are not located near the desired access points. The proposal is also likely to require oversized or non-standard vehicles for transportation of oversized items and equipment from other parts of the state by road. Light vehicles would typically be used to transport construction workers to and from work sites, towns and workforce accommodation.

Some construction equipment and materials may be transported to the proposal corridor via shipping ports, railways or airports. This may be required for transportation of prefabricated items or materials that are not readily available locally within NSW.

The volumes of heavy and light vehicles generated during construction of the proposal may result in a noticeable increase in traffic using the surrounding road network, particularly along local or regional roads where existing traffic volumes are typically lower. Small towns located near the proposal could be impacted by increased local or regional traffic pressures from the movements of the proposal workforce.

There may be some temporary disruptions to traffic movements along roads within the proposal corridor during the transmission line stringing works above or near the road or delivery of large project components such as transformers, steel lattice and conductors (wires) and dangerous goods. This may require temporary traffic management or lane closures for safety; however, this would be scheduled to minimise impacts during peak traffic periods. Similarly, stringing of the proposed transmission line above the Main Southern Line near Yass may also need to be scheduled within rail possession periods or periods with no scheduled train movements for safety. Any impacts associated with this are expected to be short in duration and unlikely to cause considerable disruptions to road or rail users.

The construction of the proposal may also result in changed access to some nearby properties, where existing access roads or tracks are temporarily closed, or areas of land are proposed to be fenced off for safety during construction work. Alternate access arrangements would need to be developed in consultation with the relevant landholders. Existing access tracks to sections of the proposal may be inadequate for the delivery of some material, plant and equipment. As such, access tracks would be built or upgraded to allow access to each transmission tower, substation site and ancillary sites during construction. New access tracks are likely to be constructed predominantly within the proposal corridor, however some additional connection access tracks or roads may be required to extend outside of the proposal corridor.

Helicopters may also be used for the delivery of some equipment and materials, while drones could be used for stringing of the transmission lines in certain areas.

Operation

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 along access tracks and the surrounding road network.

Access to existing properties is not anticipated to be substantially affected by operation of the proposal, however some minor impacts may occur where new or realigned access tracks are required. The location of any permanent access changes would be developed in consultation with the relevant landowners.

The new transmission line structures and substation infrastructure would need to be located outside the obstacle limitation surface (OLS) of any nearby regional airports to avoid conflicts with air traffic.

7.10.3. Approach to assessment in the EIS

Traffic impacts from the proposal would be assessed by analysing traffic on the existing road and freight network and considering road safety. An assessment of operational impacts will include a review of expected operational traffic activities and generated traffic volume. Construction and operational impacts will be assessed by reviewing expected construction activities and generated traffic volumes, haulage routes and distribution of construction traffic, and the impact of activities on road network performance, road access and safety, public and active transport.

The existing road network will be characterised, including the existing road widths and the condition of the road surface, existing road capacity, daily and peak traffic volumes including consideration of peak holiday traffic, and the proportion of light and heavy vehicles. The current performance of key intersections will be reviewed on designated construction access routes along with accident history and safety requirements. The assessment will consider the requirements for maintaining local resident road access and access to active and passive recreation areas including national parks near the proposal corridor. A driven study to assess the suitability of potential haulage routes for transportation of heavy and/or oversized equipment and the need for any road upgrades would also be carried out.

Site access management strategies to minimise conflict and improve safety will be developed, along with management and mitigation measures to reduce the negative impact of project construction and operation. Helicopter and drone flights would be arranged in consultation with local landholders and the Civil Aviation Safety Authority (CASA) to minimise any potential air traffic conflicts. The design of the proposal would also consider the OLS of nearby regional airports.

The following government plans, policies and guidelines are relevant to the proposal:

- *Future Transport Strategy 2056* (TfNSW, 2020)
- *TfNSW Guidelines on External and Developer-led Works Affecting Transport Assets* (TfNSW, 2019)
- *Development Near Rail Corridors and Busy Roads* (Department of Planning, 2008)
- *Guide to Pavement Technology Part 6: Unsealed Pavements* (Austroads, 2009)
- *Austroads Guide to Traffic Management* (Austroads, 2020)
- *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2020).

7.11. Noise and vibration

7.11.1. Existing environment

The proposal corridor is in a rural setting, with individual residential dwellings on agricultural land making up the majority of the nearest sensitive receivers. Near the proposal corridor are the cities of Wagga Wagga, approximately 3 km away, and Goulburn, approximately 18 km from the proposal corridor. Nearby towns include Yass (5 km), Tumut (1.5 km from the nearest corridor option) and Batlow (4.5 km).

Existing ambient noise near the proposal corridor would be associated with natural noise sources, human activity, domestic animals, agricultural machinery, forestry and wind farms, and transport noise on road and rail networks. The existing substations at Wagga Wagga and Bannaby and the future substation at Maragle (reference SSI-9717, EPBC 2018/836) are considered to be local noise sources.

7.11.2. Potential impacts

Construction

Potential noise and vibration impacts during construction phase would be associated with:

- Operation of high-noise generating plant and equipment such as excavators, piling rigs, chainsaws, mulchers, graders, dozers during construction activities such as vegetation clearance, earthworks and piling
- Blasting for rock breaking during earthworks, which may be required subject to further ground condition investigations
- Increased road traffic noise along haulage routes and near workforce accommodation due to heavy vehicle and light vehicle movements transporting construction staff, equipment and materials to and from the construction areas
- Implosive jointing of conductors
- Use of construction compounds and accommodation camps.

Construction of the new Gugaa 500 kV substation and upgrades at existing substations would result in construction noise impacts to sensitive receivers near the substation sites. Construction of transmission line structures would have minor noise impacts on the closest sensitive receivers that would be short in duration given that construction activities would move progressively along the proposed alignment.

Minimal vibration impacts are expected from the proposal due to the distance from sensitive receivers.

Operation

Potential operational impacts include:

- Noise from operation of noise generating equipment within the new and expanded substations, such as transformers, generators, reactors and mechanical heating, ventilation and cooling systems
- Noise from live transmission lines, which is typically associated with corona discharge noise that is highest during certain weather conditions such as light rain, mist or fog
- Radio frequency interference from live transmission lines.

There may also be occasional minor noise impacts from maintenance activities at substations and along the transmission easements associated with vehicle movements, plant and equipment. However, these maintenance activities are expected to be infrequent, short in duration and localised.

7.11.3. Approach to assessment in the EIS

A detailed construction and operational noise and vibration assessment will be included in the EIS. Monitoring would be carried out near proposed permanent substation infrastructure, large proposed ancillary facilities and existing high-voltage transmission lines.

The noise and vibration assessment methodology for the EIS will include:

- Characterising the existing noise environment and establishing noise and vibration criteria/goals
- Identifying representative construction scenarios, locations and working times
- Estimating potential increases to road traffic noise on haulage routes and near workforce accommodation
- Predicting noise at sensitive receivers
- Analysing noise impacts in accordance with guidelines
- Identify potential vibration impacts, safe working distances from construction equipment and potentially impacted receivers within those distances.

Operational noise modelling will be carried out for substations where there is noise generating equipment being installed, or where there are sensitive receivers within 1 km of the substation.

Management and mitigation measures will be developed to reduce the noise and vibration impacts of construction and operation of the proposal.

The following government plans, policies and guidelines will be relevant to noise and vibration assessment in the EIS:

- *Noise Policy for Industry* (NSW EPA, 2017b)
- *Interim Construction Noise Guideline* (DECCW, 2009)
- *Draft Construction Noise Guideline* (NSW EPA, 2020)
- *Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006)
- German Standard DIN 4150-3: *Structural Vibration – Effects of Vibration on Structures*
- *Road Noise Policy* (DECCW, 2011).

7.12. Air quality and greenhouse gases

7.12.1. Existing environment

The proposal corridor avoids more densely populated areas. Sensitive receivers are generally isolated rural properties within or adjacent to the proposal corridor.

The closest representative NSW rural air quality network sites to the proposal corridor are located at Wagga Wagga North and Goulburn, both of which monitor airborne particulate matter concentrations. Over the last five years (2016-2021), the most exceedances of monthly particulate matter air quality goals occurred at both Goulburn and Wagga Wagga North between November 2019 and February 2020 (see Figure 7-18) and are likely related to multiple bushfires that were active in NSW at the time.

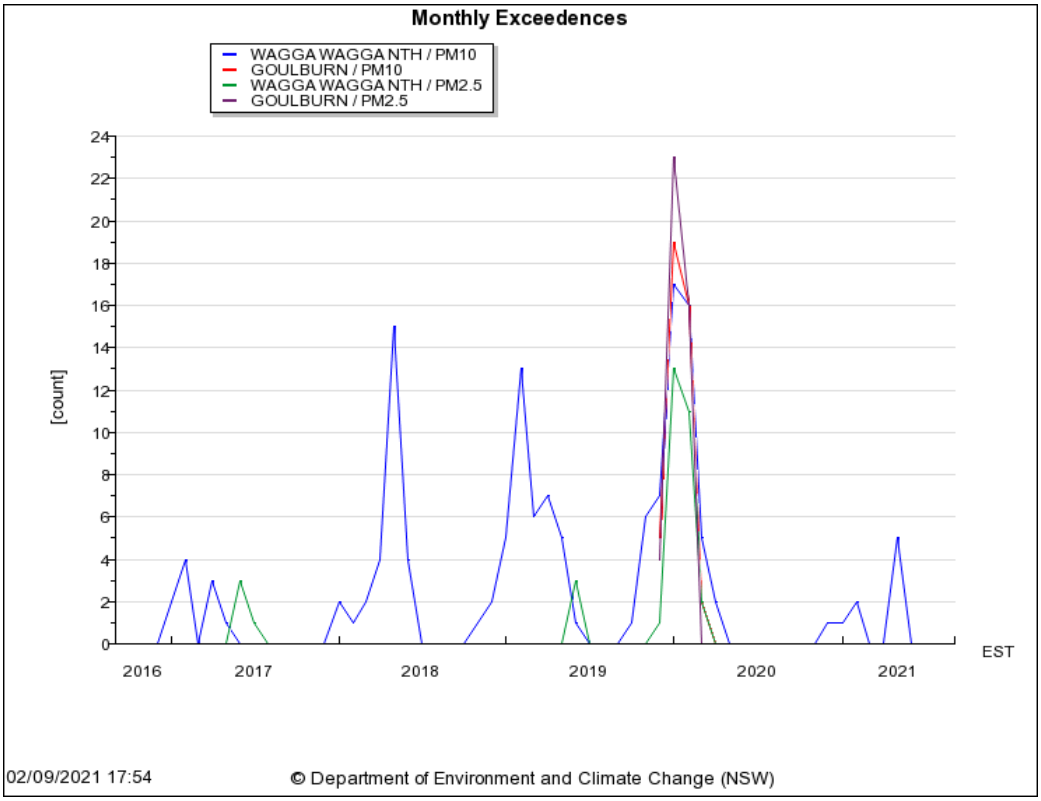


Figure 7-18 Monthly air quality exceedances at Goulburn and Wagga Wagga North (DPIE, 2021)

Sources of air pollutants near the proposal corridor that are listed on the National Pollutant Inventory include quarries, landfills, fuel storages, sawmill, paper mill, feedlot, abattoir and cement works (NPI, 2021). Other air pollution sources would include vehicle and dust emissions from roads, agricultural activities and forestry practices.

7.12.2. Potential impacts

Construction

Air quality impacts during construction are anticipated to include dust deposition on surfaces, visible dust plumes and health impacts due to elevated particulate matter concentrations in the air. Construction activities that are likely to generate emissions to the air include:

- Excavation and earthworks
- Stockpile management
- Concrete batching plants
- Access track construction, maintenance, and use
- Combustion emissions from vehicles and equipment.

Construction of the new Gugaa 500 kV substation and other substation work and establishment and use of construction compounds (particularly those with concrete batching plants) could cause localised air quality impacts over a sustained period of time.

Air quality impacts during transmission tower construction and access track establishment are likely to be short term and localised with a small scale of construction works occurring at each location.

Greenhouse gas emissions are likely to be generated due to vegetation removal, stationary combustion of fuels, combustion of fuel for transport, consumption of electricity, and from waste.

Operation

While some dust and combustion exhaust emissions from vehicles and equipment may be generated during maintenance activities, no significant operational air quality impacts are anticipated.

7.12.3. Approach to assessment in the EIS

A standard construction air quality assessment will be included in the EIS. Air quality impacts associated with dust generated by construction activities will be assessed qualitatively based on the methodology in Guidance on the Assessment of Dust from Demolition and Construction developed in the United Kingdom by the Institute of Air Quality Management.

The assessment will consider the risk of dust effects from construction activities based on the scale and nature of the works and the sensitivity of the area surrounding the activity. Data requirements will include areas of soil disturbance, materials and equipment, vehicle movements, scheduling, and the likely location or distance to receivers of emission sources such as the new Gugaa 500 kV substation, accommodation camps, laydown and stockpile areas and concrete batching plants. Site-specific mitigation measures will be identified to manage and minimise adverse impacts.

Annual greenhouse gas emissions will be estimated using the National Greenhouse Accounts Factors.

The following government plans, policies and guidelines will be relevant to assessment in the EIS:

- *Guidance on the Assessment of Dust from Demolition and Construction* (Institute of Air Quality Management, 2014)
- *National Greenhouse Accounts Factors* (Australian Government Department of Industry, Science and Resources, 2020).

7.13. Climate change risk

7.13.1. Existing environment

Climate is described in terms of long-term weather statistics for a particular location comprising averages, variations and extremes. AdaptNSW regional climate change snapshots provide an indicative view of climate change risks that are current influence on assets and operations across the proposal corridor (OEH, 2014a and 2014b). Climate parameters considered in the snapshots include temperature, temperature extremes, rainfall, frost and fire weather.

Two AdaptNSW regions encompass the proposed corridor (refer to Figure 7-19):

- Riverina Murray
- South East and Tablelands.

The Riverina Murray region includes the NSW side of the Murray River, as well as the Lachlan and Murrumbidgee rivers. Lying west of the Great Dividing Range, the landscape is dominated by large floodplains and unconfined river valleys. The South East and Tablelands region spans the coastline from Durras Lake near Batemans Bay to the Victorian border. The south-eastern corner of NSW is home to Australia's highest summits, including Mount Kosciuszko and Mount Townsend, and the headwaters of the

Snowy, Murray, Murrumbidgee and Lachlan rivers. Well known for its beaches, the South East and Tablelands Region includes enclosed beach compartments as well as large coastal embayments such as Batemans Bay (OEH, 2014a and 2014b) (Figure 7-19).

The AdaptNSW snapshots prepared in 2014 present likely changes in climate in the near future (by 2030) and far future (by 2070). Near future changes are likely to impact construction of the proposal, while far future changes are relevant to operational assets since their design life is generally 50 years. Likely changes to climate are summarised in Table 7-5.

Table 7-5: Likely changes in climate to 2030 and 2070

Climate parameter	Near future (by 2030)	Far Future (by 2070)
Temperature	Maximum temperature increase of 0.7°C Minimum temperature increase of 0.6°C	Maximum temperature increase of 2-2.1°C Minimum temperature increase of 1.9-2°C
Temperature extremes – hot days (reaching >35°C)	More hot days, with an additional 3-8 hot days per year on average regionally, mostly in summer, and an additional 5-10 hot days per year in the south-west slopes. There is little change to the number of hot days for the Snowy Mountains.	More hot days, with an additional 8-23 hot days per year regionally, mostly in summer, spring and autumn, and 30 additional hot days in the south-west slopes. There is little change to the number of hot days for the Snowy Mountains.
Temperature extremes – cold days (reaching <2°C)	Fewer cold nights overall, with an average of 7-12 fewer cold nights across the region The greatest decreases are projected to occur in the mountains with 10-20 fewer cold nights.	Fewer cold nights, overall, with an average of 21-35 fewer cold nights across the region. The greatest decreases are projected to occur in the mountains with 20-30 fewer cold nights. The Snowy Mountains peaks could experience over 40 fewer cold nights by 2070.
Rainfall *(Note – while there are some consistent patterns, the projections reflect considerable variability in rainfall across the region and from year to year)*	Spring rainfall is likely to decrease, with the greatest change projected for the south-west slopes. Autumn rainfall is likely to increase across the proposal corridor. Winter rainfall may also decrease towards the east of the proposal corridor.	Spring rainfall is likely to decrease, with the greatest change projected for the south-west slopes and Snowy Mountains. Autumn rainfall is likely to increase across the proposal corridor. Winter rainfall may also decrease towards the east of the proposal corridor.
Fire weather	Increase in severe fire weather days, up to two more days every five years by 2030. The increases are mainly in spring and summer, with a decrease in fire weather in autumn.	Similar to the near future projection, with a greater increase in fire weather days in spring.

Within the Riverina Murray region, the climate varies across the proposal corridor and is highly influenced by topography. The alpine Snowy Mountains area on the eastern boundary of the region, experience more rainfall and colder winters. The average maximum temperature in summer is 14°C and the average minimum temperature in winter is -6°C. Long-term temperature trends indicate that temperatures have been increasing in the since around 1950, with most of the temperature increase occurring in the last two decades. There do not tend to be any hot days in the Snowy Mountains with temperatures above 35°C, however there are over 200 cold nights per year in the peaks, where minimum temperatures are under 2°C. Average annual rainfall ranges from 1600–2400 mm (OEH, 2014a).

Within the South East and Tablelands region, the south-western slopes area has a more temperate climate. Wagga Wagga has an average maximum temperature in summer of 32°C, while the average minimum temperature in winter is 3°C. There are 10-30 hot days with temperatures above 35°C, and about

50 cold nights per year, where minimum temperatures are under 2°C. The South West Slopes receive an average annual rainfall in the range of 400–800 mm (OEH, 2014a).

Bureau of Meteorology climate statistics for Goulburn Airport (searched on 5 May 2021) near the north-eastern section of the proposal corridor show an average maximum temperature in summer of 28°C and the average minimum temperature in winter of 4°C. There are on average 7 hot days with temperatures above 35°C, and about 98 cold nights per year, where minimum temperatures are under 2°C. Goulburn receives an average annual rainfall of 544 mm.

Figure 7-19 AdaptNSW regions

7.13.2. Potential impacts

7.13.2.1. Construction

During construction, climate change risks would be associated with severe weather events, such as extreme temperature, flooding, changes in rainfall patterns and fire risk, placing increased pressure on control measures to prevent flooding, erosion and sedimentation and bushfire ignition. Extreme weather could delay construction of the proposal, damage materials and cause adverse health impacts for workers.

7.13.2.2. Operation

Operational vulnerability to climate change could potentially include:

- An increase in the number and severity of weather-related electricity outages
- Higher temperatures causing increased demand for electricity, while at the same time causing thermal expansion of power lines (resulting in line sag), increased resistance of transmission, and decreased amount of power that can be securely transmitted, and accelerated aging of transformers
- Flooding of substations causing damage to substation equipment with effort and time required to clean up and repair equipment, and weakening of the tower structures due to erosion or debris impact
- Damage from bushfires, often coinciding with the increased demand for electricity from high temperatures.

7.13.3. Approach to assessment in the EIS

Resilience of the operational assets to extreme weather will be considered in the detailed design of assets, including allowance for wind loading, ice and snow, sag and appropriate clearances for transmission lines, and cooling systems for substations and transformers. Coatings on the conducting wires give some protection against high temperatures.

Assessment and development of mitigation measures will be carried out in the EIS for related issues such as bushfire, surface water, flooding and hydrology. The Australian government guideline *Climate change impact and risk management – A guide for business and government* (Australian Greenhouse Office, 2006) will be relevant to these assessments in the EIS.

7.14. Cumulative impacts

The cumulative impacts of the proposal would be assessed in the EIS in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE, 2021).

The assessment of cumulative impacts focusses on the proposal's interaction with other projects in the vicinity of the proposal, and where construction and/or operational timeframes are likely to be concurrent.

The EIS will include a standard qualitative, combined incremental assessment to consider the combined impact of the different proposal issues. The EIS assessment methodologies for issues such as biodiversity, heritage, water, traffic, air quality and noise for the proposal will involve identifying a baseline condition, including the impacts of past and present projects, and determining the incremental impacts of the proposal.

7.14.1. Approach to assessment in the EIS

Issues that require cumulative impact assessment are based on:

- The NSW Government's strategic planning framework including relevant legislation, plans, policies listed in Chapter 4 and guidelines listed throughout Section 7
- The proposal and relevant future projects that may be developed over the same time period
- Key matters that could be materially affected by the cumulative impacts
- The likely scale and nature of the cumulative impacts of these projects.

Table 7-6 describes the issues subject to cumulative assessment for the proposal, including the study area and time period.

Table 7-6: Issues to be assessed in the cumulative impact assessment

Issue	Rationale	Study area extent	Time period[4]
Terrestrial ecology	Due to the extent of vegetation removal and the possibility of other future projects removing the same PCTs and habitat for the threatened species that are likely to be impacted by the proposal.	The biodiversity cumulative impact study area would be based on the range and distribution of the listed threatened species within each IBRA subregion, and will focus on those species that are at risk of serious or irreversible harm due to the cumulative impacts of the proposal with other relevant future projects.	Construction and operation
Aboriginal cultural heritage	Combined effects of ground disturbance that can impact on archaeological items	Specific locations where the proposal would impact sensitive items representing similar heritage values as other relevant future projects	Construction and operation
Historic heritage	Combined impacts within the curtilage of heritage listed items	Specific curtilages where the proposal impacts overlap with other relevant future projects	Construction and operation
Social	Both positive and negative impacts are anticipated in combination with other future projects, including long-term intergenerational impacts, and short-term cumulative impacts such as community benefits and impacts during construction	Regional social impacts, focused on key localities	Construction and operation
Land use	Changes to the availability of future or planned land uses, when combined with the construction or operation of other future projects, especially on land that is currently used or zoned for agricultural or forestry purposes	Regional land use impacts, considering representative land use types	Construction and operation
Property	Temporary leasing, permanent acquisition, and new easements on land titles especially where large or multiple land parcels in single ownership are affected	Regional impacts of property acquisitions (including easements) for the proposal and other relevant future projects	Construction and operation
Visual and landscape character	Proximity to proposed future projects, such as renewable generation projects	Specific viewpoints or landscapes impacted by more than one project	Construction and operation

[4] The construction timeframe is assumed to be two years and the operational timeframe is assumed to be 50 years from construction completion, as 50 years is the proposed design life of the proposal.

Issue	Rationale	Study area extent	Time period[4]
Soil contamination	Where contaminants are present in the proposal corridor and near other potentially relevant future projects	Specific locations of existing contamination that may be impacted by the proposal and other relevant future projects	Construction
Surface water	Simultaneous construction activities with other potentially relevant future projects	Downstream impacts where other relevant future projects are in the same catchment as the proposal	Construction
Bushfire	An increase to the fire risk during construction and operation in bushfire prone areas	Areas of contiguous vegetation impacted by the proposal and other relevant future projects	Construction and operation
Traffic	Where construction of the proposal occurs at the same time and area as future potential major projects that generate large volumes of traffic	Specific main transport routes and towns where there is an overlap of potential traffic impacts	Construction
Noise	Where the construction and operational noise impacts of the proposal overlap with the noise impacts of other relevant future projects and result in material noise impacts on certain sensitive receivers	Focused areas at the specific locations where there is an overlap of noise impacts resulting in material noise impacts on certain sensitive receivers	Construction and operation
Waste	Where other potentially relevant future projects use the same waste management facilities	Waste management facilities that may need to service several projects	Construction

7.14.2. Future projects

Relevant future projects to consider in the cumulative impact assessment will be identified through a search of:

- DPE's online major projects database
- NSW Government's list of Special Activation Precincts, linked to the Snowy Hydro Legacy Fund
- Local council websites.

A search of DPE's online major projects database was carried out in September 2021 to identify State significant development (SSD) and SSI projects in the locality. Relevant future projects include:

- SSD projects of relevance to the proposal are mainly located in or near Wagga Wagga, Yass and Goulburn and comprise the following electricity generation (wind and solar) projects; Uranquinty Solar Farm (south-west of Wagga Wagga), Gregadoo Solar Farm (south of Wagga Wagga), Culcairn Solar Farm (south of Wagga Wagga), Jeremiah Wind Farm (west of Yass), Western Range Solar Farm (east of Yass), Gunning Solar Farm (east of Yass), Yass Solar Farm (south of Yass) and Parkesbourne Solar Farm (west of Goulburn). Other SSD projects near Tumut and Wagga Wagga, comprise modifications to existing approvals related to established paper mill and quarry activities, respectively.
- SSI projects with relevance to the proposal include:
  - Snowy 2.0 – Transmission Connection to the south, which is yet to be approved and would involve constructing the future Maragle substation (reference SSI-9717, EPBC 2018/836) that is proposed to be connected to as part of HumeLink.
  - Snowy 2.0 – Main Works and Mod 2 – Tunnelling to the south-east of the proposal, which would involve the development of an underground pumped hydro power station and ancillary structure.
  - Project EnergyConnect (NSW – Eastern Section) to the north-west of the proposal, which is another high voltage transmission line proposed by Transgrid (that would connect to HumeLink at the Wagga 330 kV substation.

Major greenfield and urban renewal developments that are scheduled for the area include:

- The Wagga Wagga Special Activation Precinct Master Plan came into effect in May 2021 and focusses on the area spanning out from the Bomen Business Park in Wagga Wagga.
- A master planning process for the Snowy Mountains precinct is currently underway, with the exact boundary to be defined in the draft master plan.

Other future projects to be considered in the cumulative impact assessment will include:

- Projects that are classified as designated development
- Projects that require assessment under Division 5.1 of the EP&A Act that are likely to significantly affect the environment and require an EIS
- Projects that have been declared to be controlled actions under the EPBC Act.

8. Conclusions

The proposal is subject to assessment under Division 5.2 of the EP&A Act 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 SRD SEPP.

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

- Biodiversity
- Aboriginal and Non-Aboriginal heritage
- Social
- Economic, property and land use
- Landscape character and visual amenity
- Soils and contamination
- Water (surface and groundwater)
- Hazards (Bushfire, electric and magnetic fields and waste)
- Traffic and access
- Noise and vibration
- Air quality and greenhouse gases
- Climate change risk
- Cumulative impacts.

As part of the preparation of the EIS, further assessment would be carried out in conjunction with the 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 landowners, stakeholders and the local community would continue throughout the proposal assessment, design and construction phases.

9. References

Australia ICOMOS Charter for the Conservation of Places of Significance (2013), *Burra Charter 2013,* Accessed from*: https://australia.icomos.org/publications/charters/*

Australian Bureau of Statistics (2016) Census of Population and Housing

Australian Energy Market Operator Limited (2018) *Integrated System Plan*, Accessed from: https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/isp/2018/integrated-system-plan-2018_final.pdf?la=en&hash=40A09040B912C8DE0298FDF4D2C02C6C

Australian Energy Market Operator Limited (2019), *2019 Electricity Statement of Opportunities,* Accessed from: *https://aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEM_ESOO/2019/2019-Electricity-Statement-of-Opportunities.pdf*

Australian Energy Market Operator Limited, (2020), *Integrated System Plan*, Accessed from: https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en&hash=6BCC72F9535B8E5715216F8ECDB4451C

Australian Energy Regulator (2020), *Application guidelines: Regulatory investment test for transmission*, Australian Energy Regulator, August 2020. Accessed from: https://www.aer.gov.au/system/files/AER%20-%20Regulatory%20investment%20test%20for%20transmission%20-%2025%20August%202020.pdf

Australian Greenhouse Office (2006), *Climate change impact and risk management - A guide for business and government,* Accessed from: https://www.environment.gov.au/system/files/resources/21c04298-db93-47a6-a6b0-eaaaae9ef8e4/files/risk-management.pdf

Australian Government (2019), *Memorandum of Understanding*, Accessed from: https://energy.nsw.gov.au/media/2001/download

Bureau of Meteorology (2021) *Climate Data Online*, Accessed from: http://www.bom.gov.au/climate/data/

Bradstock, R (2010), 'A biogeographic model of fire regimes in Australia: current and future implications', Global Ecology and Biogeography, vol. 19, pp. 145–158.

Clean Energy Council (2018), *Community Engagement Guidelines.*

Commonwealth Australia (2013), *Commonwealth EPBC 1.1 Significant Impact Guidelines – Matters of National Environmental Significance,* Accessed from: https://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nes-guidelines_1.pdf

Department of Environment and Climate Change (DECC). (2009). *Interim Construction Noise Guideline (ICNG),* Accessed from: https://www.epa.nsw.gov.au/~/media/EPA/Corporate%20Site/resources/noise/09265cng.ashx.

Department of Planning, Industry and the Environment (DPIE) (2019), *Community Participation Plan,* Accessed from: https://shared-drupal-s3fs.s3-ap-southeast-2.amazonaws.com/master-test/fapub_pdf/Community+Participation+Plan/DPIE+CPP.pdf

Department of Planning, Industry and the Environment (DPIE) (2021), *Undertaking Engagement Guidelines for State Significant Projects,* Accessed from: https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/Policy-and-legislation/GD1265-RAF-Engagement-Guidelines-final.pdf

Energy Security Board (2021), Post 2025 Market Design Directions Paper, Accessed from: https://esb-post2025-market-design.aemc.gov.au/32572/1609802925-p2025-january-directions-paper.pdf

Geoscience Australia (2019), *Australian Rainfall & Runoff 2019,* Accessed from: http://arr.ga.gov.au/arr-guideline

Heritage Branch Department of Planning (2009), *Assessing Significance for Historical Archaeological Sites and 'Relics',* Accessed from: *https://www.environment.nsw.gov.au/resources/heritagebranch/heritage/ArchSignificance.pdf*

International Association for Public Participation (IAP2) (2015), *Quality Assurance Standard for Community and Stakeholder Engagement,* Accessed from: https://www.iap2.org.au/wp-content/uploads/2019/07/IAP2_Quality_Assurance_Standard_2015.pdf

International Commission on Non-Ionising Radiation Protection (2010), *Guidelines for Limiting Exposure to Time-varying Electric and Magnetic Fields* (1Hz to 100 kHz), Health Physics 99(6):818-836; 2010.

Isbell, R.F. and National Committee on Soil and Terrain (2016), *Australian Soils Classification*, Second Edition, CSIRO Publishing

Landscape Institute and Institute of Environmental Management and Assessment (2013), *The Guidelines for Landscape and Visual Impact Assessment,* Third Edition

National Environment Protection Council (2013), *National environment protection*

National Native Title Tribunal (2015), NI2014/001 - Gundungurra Area Agreement, Accessed from: http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/ILUA_details.aspx?NNTT_Fileno=NI2014/001

NSW Department of Environment, Climate Change and Water NSW (2010a), *Aboriginal Cultural Heritage Consultation Requirements for Proponents*, Accessed from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Aboriginal-cultural-heritage/aboriginal-cultural-heritage-consultation-requirements-for-proponents-2010-090781.pdf

NSW Department of Industry (2013), *Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013,* Accessed from: http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/468927/Policy-and-guidelines-for-fish-habitat.pdf

NSW Department of Industry (2018), *Guidelines for controlled activities on waterfront land—Riparian corridors*, Accessed from: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/156865/NRAR-Guidelines-for-controlled-activities-on-waterfront-land-Riparian-corridors.pdf

NSW Department of Industry (2019), NSW River Styles mapping, Accessed from: https://www.industry.nsw.gov.au/water/science/surface-water/monitoring/river-health/river-styles

NSW Department of Land and Water Conservation (2002), *NSW State Groundwater Dependent Ecosystems Policy*, Accessed from: http://www.water.nsw.gov.au/ArticleDocuments/34/groundwater_dependent_ecosystem_policy_300402.pdf.aspx

NSW Department of Planning (2003), *Aquatic Ecology in Environmental Impact Assessment – EIA Guideline,* Accessed from: https://www.hornsby.nsw.gov.au/__data/assets/pdf_file/0018/41292/NSW-Aquatic-Ecology-in-EIA-Guide.pdf

NSW Department of Planning, Industry and Environment (2014), *Environmental Planning Instrument - Groundwater Vulnerability map*, Accessed from: https://datasets.seed.nsw.gov.au/dataset/epi-groundwater-vulnerability

NSW Department of Planning, Industry and Environment (2017), *Social Impact Assessment Guideline for resource projects,* Accessed from: https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/social-impact-assessment-guideline-2017-09.pdf

NSW Department of Planning, Industry and Environment (2018), *Transmission Infrastructure Strategy 2018,* Accessed from: https://energy.nsw.gov.au/sites/default/files/2018-11/DPE8754%20NSW%20Transmission%20Infratructure%20Strategy_WEB.ACC_.PDF

NSW Department of Planning, Industry and Environment (2019), *Electricity Strategy*, Accessed from: https://energy.nsw.gov.au/sites/default/files/2019-11/NSW%20Electricity%20Strategy%20-%20Final%20detailed%20strategy_0.pdf

NSW Department of Planning, Industry and Environment (2019a), *NSW Environmental Planning Instrument – Flood Planning*, Accessed from: https://data.gov.au/dataset/ds-nsw-bfb12a0f-d014-4fa2-95e7-3f71783c738d/details?q=

NSW Department of Planning, Industry and Environment (2020a), Electricity Infrastructure Roadmap, Accessed from: https://energy.nsw.gov.au/government-and-regulation/electricity-infrastructure-roadmap#:~:text=The%20NSW%20Government's%20Electricity%20Infrastructure,end%20of%20its%20technical%20life

NSW Department of Planning, Industry and Environment (2020b), *Net Zero Plan Stage 1: 2020 – 2030*, Accessed from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Climate-change/net-zero-plan-2020-2030-200057.pdf?la=en&hash=D65AA226F83B8113382956470EF649A31C74AAA7

NSW Department of Planning, Industry and Environment (2020c), Engagement guide for State significant projects, Accessed from: https://shared-drupal-s3fs.s3-ap-southeast-2.amazonaws.com/master-test/fapub_pdf/00+-+Planning+Portal+Exhibitions/Major+Projects+reform/Undertaking+Engagement+Guide.pdf

NSW Department of Planning, Industry and Environment (2020d), *Draft Social Impact Assessment Guideline*, Accessed from: : https://shared-drupal-s3fs.s3-ap-southeast-2.amazonaws.com/master-test/fapub_pdf/00+-+Planning+Portal+Exhibitions/SIA/SIA+Publication+for+Publication+Online+20201022.pdf

NSW Department of Primary Industries (2016), *Methods for the identification of high probability groundwater dependent vegetation ecosystems,* Accessed from: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/151894/High-Probability-GDE-method-report.pdf

NSW Department of Primary Industries (2018), *Important Agricultural Land Mapping in NSW*, Accessed form: https://www.dpi.nsw.gov.au/agriculture/lup/agriculture-industry-mapping/important

NSW Department of Sustainability, Environment, Water, Populations and Community (2011), Survey guidelines for Australia's threatened fish, Guidelines for detecting fish listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999, Accessed from: https://www.environment.gov.au/system/files/resources/6c9817ee-517b-4c13-9d8c-e66a61514f53/files/survey-guidelines-fish.pdf

NSW Department of Urban Affairs and Planning & the NSW Environmental Protection Agency (1998), *Managing Land Contamination: Planning Guidelines SEPP 55 –Remediation of Land,* Accessed from: https://www.environment.nsw.gov.au/resources/clm/gu_contam.pdf

NSW Environment Protection Authority (2015), Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997,

NSW Environment Protection Authority (2017a), Guidelines for the NSW Site Auditor Scheme Accessed from: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/contaminated-land/17p0269-guidelines-for-the-nsw-site-auditor-scheme-third-edition.pdf

NSW Environment Protection Authority (2017b), *Noise Policy for Industry*, Accessed from: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/17p0524-noise-policy-for-industry.pdf https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/17p0524-noise-policy-for-industry.pdf

NSW Fisheries (2003), *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings,* Accessed from: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/633505/Why-do-fish-need-to-cross-the-road_booklet.pdf

NSW Government (2019), *Property Acquisition Standards,* Accessed from: https://www.propertyacquisition.nsw.gov.au/sites/default/files/resources/Property%20Acquisition%20Standards_0.pdf

NSW Heritage Branch Department of Planning (2006), *Historical Archaeology Code of Practice*

NSW Heritage Council (2011), Criteria for the Assessment of Excavation Directors,

NSW Heritage Office and Department of Urban Affairs and Planning (1996), NSW Heritage Manual, New South Wales

NSW Heritage Office (1998), NSW Skeletal Remains: Guidelines for Management of Human Remains, New South Wales

NSW Environment Protection Authority (2020), *Guidelines for Consultants Reporting on Contaminated Sites,* Accessed from: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/contaminated-land/20p2233-consultants-reporting-on-contaminated-land-guidelines.pdf

NSW Office of Environment and Heritage (2011), *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW,* Accessed from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Aboriginal-cultural-heritage/guide-to-investigating-assessing-reporting-aboriginal-cultural-heritage-nsw-110263.pdf

NSW Office of Environment and Heritage (2014a), *Murray Murrumbidgee – Climate change snapshot*, Sydney, NSW, Accessed from: https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/Murray-Murrumbidgee-Climate-Change-Downloads

NSW Office of Environment and Heritage (2014b), *South East and Tablelands – Climate change snapshot*, Sydney, NSW, Accessed from: https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/South-East-and-Tablelands-Climate-Change-Downloads

NSW Office of Environment and Heritage (2015), Guidelines for Managing Salinity in Rural Areas

NSW State Emergency Service, NSW Department Planning, Industry and Environment (2021), *NSW SES Flood Data Portal*, Accessed from: https://flooddata.ses.nsw.gov.au/

NSW Treasury (2017), *TPP17-03 NSW Government Guide to Cost-Benefit Analysis*., Accessed from: https://arp.nsw.gov.au/assets/ars/393b65f5e9/TPP17-03_NSW_Government_Guide_to_Cost-Benefit_Analysis_0.pdf

F. L. Sutherland; I. T. Graham; R. E. Pogson; D. Schwarz; G. B. Webb; Robert R. Coenraads; C. M. Fanning; J. D. Hollis; T. C. Allen (2002), *The Tumbarumba Basaltic Gem Field, New South Wales: in relation to sapphire-ruby deposits of eastern Australia*, published by The Australian Museum, 10 July 2002

Transgrid (2019), *NSW Transmission Annual Planning Report 2019,* Accessed from: https://www.transgrid.com.au/what-we-do/Business-Planning/transmission-annual-planning/Documents/2019%20Transmission%20Annual%20Planning%20Report.pdf

Transgrid (2020a), Our Network, Accessed from: https://www.transgrid.com.au/what-we-do/our-network/Pages/default.aspx

Transgrid (2020b), *Project Assessment Draft Report*, Accessed from: https://www.transgrid.com.au/what-we-do/projects/regulatory-investment-tests/Documents/Powering%20Sydney%27s%20Future%20-%20RIT-T%20PADR.pdf

Transgrid (2020c), Fact sheet Electric and Magnetic Fields, Accessed from: https://www.transgrid.com.au/being-responsible/public-safety/Documents/EMF%20Fact%20Sheet%20October%202017.pdf

Transgrid (2021), *Reinforcing the NSW Southern Shared Network to increase transfer capacity to demand centres (HumeLink)- Project Assessment Conclusions Report*, Accessed from: https://www.transgrid.com.au/what-we-do/projects/current-projects/Reinforcing%20the%20NSW%20Southern%20Shared%20Network/Documents/TransGrid%20HumeLink%20PACR.pdf

World Health Organization (2005), *Electromagnetic fields and public health – Effects of EMF on the Environment,* Accessed from: https://www.who.int/peh-emf/publications/facts/envimpactemf_infosheet.pdf

World Health Organization (2007), *Extremely low frequency fields*, Environmental Health Criteria, Vol. 238, Geneva, Accessed from: https://www.who.int/peh-emf/publications/elf_ehc/en/

Appendix A Scoping summary table

A.1 Scoping summary table

Level of assessment	Matter	CIA	Engagement	Relevant government plans, policies and guidelines	Scoping report reference
Detailed	Terrestrial ecology	Yes	Landowners Government agencies	• *Biodiversity Assessment Method* (DPIE, 2020) • *NSW Threatened Species Survey and Assessment Guidelines* (various) • *Guideline for applying the Biodiversity Assessment Method at severely burnt sites* (DPIE, 2020), • *Commonwealth EPBC 1.1 Significant Impact Guidelines – Matters of National Environmental Significance* (Commonwealth of Australia, 2013) • *Commonwealth Department of the Environment – Nationally Threatened Ecological Communities and Threatened Species Guidelines* (various) • *Commonwealth Department of the Environment – Survey Guidelines for Nationally Threatened Species* (various) • *Developments adjacent to National Parks and Wildlife Service lands - Guidelines for consent and planning authorities* (NSW National Parks and Wildlife Service, 2020)	7.2.1
Standard	Aquatic ecology	No	Landowners Government agencies	• *NRAR Guidelines for Controlled Activities on Waterfront Land* (DPI, 2018) • *Policy and Guidelines for Fish Habitat Conservation and Management* – Update 2013 (DPI, 2013) • *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (NSW Fisheries, 2003) • *Aquatic Ecology in Environmental Impact Assessment – EIA Guideline* (Marcus Lincoln Smith 2003) • *NSW State Groundwater Dependent Ecosystems Policy* (Department of Land and Water Conservation 2002) • *Methods for the identification of high probability groundwater dependent vegetation ecosystems* (DPI, 2016) • *Survey guidelines for Australia's threatened fish, Guidelines for detecting fish listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (Department of Sustainability, Environment, Water, Populations and Community, 2011)	7.2.2
Detailed	Aboriginal cultural heritage	Yes	Parties to the Gundungurra Area Agreement In accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010).	• *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010a) • *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011)	7.3.1
Detailed	Non-Aboriginal cultural heritage	Yes	Government agencies	• *Commonwealth EPBC 1.1 Significant Impact Guidelines – Matters of National Environmental Significance* (Commonwealth of Australia, 2013) • *NSW Skeletal Remains: Guidelines for Management of Human Remains* (Heritage Office, 1998) • *Historical Archaeology Code of Practice* (Heritage Branch Department of Planning, 2006) • *NSW Heritage Manual* (Heritage Office and Department of Urban Affairs and Planning, 1996) • *Assessing Significance for Historical Archaeological Sites and 'Relics'* (Heritage Branch Department of Planning, 2009) • *Criteria for the Assessment of Excavation Directors* (NSW Heritage Council, 2019) • *Burra Charter and Practice Notes (Australia ICOMOS (International Council on Monuments and Sites), 2013).*	7.3.2
Detailed	Social	Yes	Councils	• *Social Impact Assessment Guideline for State significant projects* (DPIE, 2021)	7.4
Detailed	Economic	No	None	• *TPP17-03 NSW Government Guide to Cost-Benefit Analysis.*	7.5
Detailed	Land use and property	Yes	None	None.	7.5
Detailed	Landscape character and visual amenity	Yes	None	• *Guidance note EIA-04 Guideline for Landscape Character and Visual Impact Assessment* (TfNSW, 2021) • *Guidelines for Landscape and Visual Impact Assessment (GLVIA3), Third Edition* (Landscape Institute and Institute of Environmental Management and Assessment, 2013) • *Guidance Note for Landscape and Visual Assessment* (Australian Institute of Landscape Architects, 2018)	7.6
Detailed	Soils and contamination	Yes	None	• *National environment protection (Assessment of site contamination) measure* (National Environment Protection Council, 2013) • *Managing Land Contamination: Planning Guidelines SEPP 55 –Remediation of Land* (DUAP & EPA, 1998) • *Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA, 2020) • *Guidelines for the NSW Site Auditor Scheme* (EPA, 2017a) • *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA, 2015) • *Urban and regional salinity – guidance given in the Local Government Salinity Initiative booklets (http://www.environment.nsw.gov.au/salinity/solutions/urban.htm) which includes Site Investigations for Urban Salinity* (DLWC, 2002) • *Guidelines for Managing Salinity in Rural Areas* (OEH, 2015) • *Naturally Occurring Asbestos - Asbestos Management Plan Guide* (HACA, 2017) • Code of practice: How to manage and control asbestos in the workplace (SafeWork NSW, 2019) • *Managing asbestos in or on soil* (NSWG, 2014) • *Soil and Landscape Issues in Environmental Impact Assessment* (DLWC, 2000) • *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) • *Managing Urban Stormwater: Soils and Construction Volume 2* (DECC, 2008) • *Landslide risk management guidelines presented in Australian Geomechanics Society* (2007)	7.7

Level of assessment	Matter	CIA	Engagement	Relevant government plans, policies and guidelines	Scoping report reference
Detailed	Surface water and groundwater	Yes	DPE WaterNSW	• *National Water Quality Management Strategy* (Department of Agriculture and Water Resources, 2018) • *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) • *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008) • *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DECC, 2008) • *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI Fisheries, 2013) • *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions* (OEH, 2017) • *National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting* (Department of Agriculture and Water Resources, 2018) • *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000 / ANZG, 2018) • *NSW Aquifer Interference Policy* (DPI, 2012) • *NSW Groundwater Dependent Ecosystem Policy* (Department of Land & Water Conservation, 2002) • *NSW Groundwater Quality Protection Policy* (Department of Land & Water Conservation, 1998) • *NSW State Rivers and Estuaries Policy* (1993) • *NSW Water Quality and River Flow Objectives* (DECCW, 2006) • *Neutral or Beneficial Effect on Water Quality Assessment Guideline* (Sydney Catchment Authority, 2015) • *Erosion and Sediment Control on Unsealed Roads* (OEH, 2012) • *Australian Rainfall & Runoff 2019* (Geoscience Australia, 2019) • *The NSW Floodplain Development Manual: the Management of Flood Liable Land* (Department of Infrastructure, Planning and Natural Resources, 2005) • *Practical Considerations of Climate Change – Flood risk management guidelines* (DECC, 2007) • *PS 07-003 New guideline and changes to Section 117 direction and EP&A Regulation on flood prone land* (Department of Planning, 2007) • *Erosion and Sediment Control on Unsealed Roads* (OEH, 2012)	7.8
Detailed	Bushfire risk	Yes	None	• *Planning for Bush Fire Protection* (NSW Rural Fire Service, 2019) • AS3959:2018 – Construction of buildings in bushfire-prone areas (Standards Australia 2018)	7.9.1
Standard	Electric and magnetic fields	No	None	• *ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz – 100 kHz)* (ICNIRP, 2010)	7.9.2
Standard	Waste	Yes	None	• *Waste Classification Guidelines* (NSW EPA, 2014)	7.9.3
Standard	Traffic and access	Yes	Local landholders Civil Aviation Safety Authority (CASA)	• *Future Transport Strategy 2056* (Transport for NSW, 2020) • *TfNSW Guidelines on External and Developer-led Works Affecting Transport Assets* (Transport for NSW, 2019) • *Development Near Rail Corridors and Busy Roads* (Department of Planning, 2008) • *Guide to Pavement Technology Part 6: Unsealed Pavements* (Austroads, 2009) • *Austroads Guide to Traffic Management* (Austroads, 2020) • *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2020)	7.10
Detailed	Noise and vibration	Yes	None	• *Noise Policy for Industry* (NSW EPA, 2017b) • *Interim Construction Noise Guideline* (DECCW, 2009) • *Draft Construction Noise Guideline* (NSW EPA, 2020) • *Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006) • German Standard DIN 4150-3: *Structural Vibration – Effects of Vibration on Structures* • Road *Noise Policy (*DECCW, 2011)	7.11
Standard	Air quality and greenhouse gas	No	None	• *Guidance on the Assessment of Dust from Demolition and Construction* (Institute of Air Quality Management, 2014) • *National Greenhouse Accounts* Factors (Australian Government Department of Industry, Science and Resources, 2020).	7.12
Standard	Climate change risk	No	None	• *Climate change impact and risk management - A guide for business and government (Australian Greenhouse Office, 2006)*	7.13

Appendix B Preliminary Biodiversity Assessment

HumeLink Preliminary Biodiversity Assessment

Aurecon for Transgrid

507179-160522-REP-KK-002

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

DOCUMENT TRACKING

Project Name	HumeLink Preliminary Biodiversity Assessment
Project Number	18344 - 21COF
Project Manager	Andrew Walsh
Prepared by	Leura Kowald & Kristen Bigland
Reviewed by	Meredith Henderson
Approved by	Andrew Walsh
Status	**Final**
Version Number	**0**
Last saved on	**26 November 2021**

This report should be cited as 'Eco Logical Australia 2021. *HumeLink Preliminary Biodiversity Assessment*. Prepared for Aurecon for Transgrid.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Aurecon and Transgrid.

Template 2.8.1

Contents

List of Figures

List of Tables

Abbreviations

Abbreviation	Description
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
AOI	Area of Interest used for field surveys
BAM	Biodiversity Assessment Method
BAAS	NSW Biodiversity Accredited Assessor System
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
Biodiversity study area	The proposal corridor plus a 500 m buffer
BoM	Bureau of Meteorology
BOS	NSW Biodiversity Offset Scheme
CE	Critically Endangered
CSSI	Critical State Significant Infrastructure
DAWE	Commonwealth Department of Agriculture, Water, and the Environment
DPIE	NSW Department of Planning, Industry, and Environment
E	Endangered
EIS	Environmental Impact Statement
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPBC Regs	*Environment Protection and Biodiversity Conservation Regulations 2000*
FM Act	NSW *Fisheries Management Act 1994*
GDE	Groundwater Dependent Ecosystems
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometres
kV	Kilovolt
LoO	Likelihood of Occurrence
MNES	Matters of National Environmental Significance
MW	Megawatt
NDVI	Normalised difference vegetation index
NEM	National Energy Market
NSW	New South Wales
PBA	Preliminary Biodiversity Assessment

Abbreviation	Description
PCT	Plant Community Types
PEA	Preliminary Environmental Assessment
PMST	Commonwealth Department of Agriculture, Water, and the Environment (DAWE) Protected Matters Online Search Tool
The proposal	The HumeLink 500 kV transmission line which would carry electricity to customers from new generation sources, including the expanded Snowy Hydro scheme. It would connect Wagga Wagga, Bannaby and Maragle.
Threatened flora and fauna search area	The Proposal corridor plus a ten kilometre buffer used for BioNet Atlas Records and the PMST
Proposal corridor	The proposal corridor encompasses the area where HumeLink assets such as transmission lines and substations are likely to be located.
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
VIS	NSW Vegetation Information System
White Box Yellow Box Blakely's Red Gum Woodland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was commissioned by Aurecon for Transgrid to provide a Preliminary Biodiversity Assessment (PBA) to support the Scoping Report for the construction and operation of the proposed HumeLink project (the proposal).

TransGrid propose to construct new 500 kilovolt (kV) high-voltage transmission lines and associated infrastructure as part of the 'HumeLink' Critical State Significant Infrastructure (CSSI) project. The key components of HumeLink are:

- Substation works:
    - A new substation (Gugaa 500/330 kV (Gugaa 500 kV)) located approximately 15 km east of the existing Wagga 330/132 kV substation (Wagga 330 kV)
    - Augmentation of the existing Wagga 330 kV and Bannaby 500/330 kV (Bannaby 500 kV) substations
- New transmission lines between:
    - Maragle 500 kV substation and Bannaby 500 kV substation
    - Maragle 500 kV substation and Gugaa 500 kV substation
    - Gugaa 500 kV substation and Bannaby 500 kV substation
    - Wagga 330 kV substation and Gugaa 500 kV substation
- Ancillary development:
    - Two telecommunication huts along the transmission lines
    - New and upgraded temporary and permanent access tracks and roads
    - Temporary facilities required for construction of the proposal e.g. laydown and staging areas, stockpiling areas, concrete batching plants, brake/winch sites, site offices, parking areas and accommodation camps

The purpose of this report is to provide a detailed review of the existing environment via available information, validated with results of surveys carried out to date, identify likely impacts during construction and operation, as well as potential cumulative impacts, and detail the methodology that will be used in the EIS assessment. Specifically, the report is intended to inform the Department of Planning, Infrastructure and Environment (DPIE) on the ecological constraints present such as threatened species, populations, ecological communities, or their habitats, listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and to inform the request for Secretary's Environmental Assessment Requirements (SEARs) as part of a Scoping Report being prepared by Aurecon.

A preliminary database assessment was undertaken to identify the likely biodiversity constraints that may be present within the biodiversity study area, which is defined as the proposal corridor plus a 500 m buffer. This included a review of:

- Aerial imagery

- Bioregion mapping
- Land tenure
- Land systems
- Vegetation
- Hydrology
- Land use mapping.

A preliminary database assessment was undertaken of threatened flora and fauna species to identify the likely biodiversity constraints that may be present within the biodiversity study area. The flora and fauna searches were conducted as the proposal corridor plus a 10 km buffer referred to as the threatened flora and fauna search area. This included a review of:

- BioNet Atlas Database (16 November 2021)
- Protected Matters Search Tool, for Matters of National Environmental Significance (MNES) (17 September 2021).

The desktop analysis identified that the study area potentially contained biodiversity constraints, in particular threatened species, populations, and ecological communities and their habitats listed under both the BC Act and EPBC Act.

Preliminary field studies were commenced by ELA in November 2019 to validate the desktop data. This report contains data collected from December 2019 to August 2021. The field studies are ongoing. The objective of the field study was to consider habitat availability for key biodiversity values within the biodiversity study area. The field study also served to inform any planning for future detailed assessment.

The field study broadly supported the desktop assessment and confirmed that a significant portion of the proposed development is located on agricultural lands that also contain a mix of woodlands and forests consistent with threatened ecological communities (TECs) listed under both the NSW BC Act and the Commonwealth EPBC Act.

The desktop mapping identified over 85 mapped Plant Community Types (PCTs) within the biodiversity study area. Other key ecological constraints include:

- Areas of mapped TECs
- Riparian areas and buffer zones
- Known areas of threatened plant species.

The study area, including the current route corridor, is extensively covered with native vegetation in moderate to good condition. As the proposal has been declared CSSI, it will be assessed consistent with the NSW Biodiversity Assessment Method 2020 (BAM). Impacts to native vegetation and threatened species will be required to be reasonably avoided, minimised and mitigated prior to consideration of offsets.

Avoidance and minimisation must be demonstrated at an early stage and this preliminary assessment should be used as a guide to commence this process. Key to avoiding and minimising impacts to native biodiversity will be:

- Minimising overall line length
- Designing the proposal to avoid the most valuable vegetation types and habitats
- Locating access tracks where vegetation is cleared already or co-locating with other proposed clearing
- Prioritising existing cleared land and / or treeless native pasture for infrastructure
- Considering biodiversity in the proposal design including route options analysis.

1. Introduction

Eco Logical Australia Pty Ltd (ELA) was commissioned by Aurecon for Transgrid (the proponent) to provide a Preliminary Biodiversity Assessment (PBA) to support a Scoping Report for the construction and operation of the proposed HumeLink project (the proposal).

1.1. Background

Transgrid propose to construct new high-voltage transmission lines and associated infrastructure, which would connect Wagga Wagga, Bannaby and Maragle and is collectively referred to as 'HumeLink' (refer to **Figure 1**). HumeLink would connect to existing substations near Wagga Wagga and Bannaby. In addition, HumeLink would connect to a future substation at Maragle in the Snowy Mountains (referred to as the future Maragle 500 kV substation) which is subject to a separate major project assessment and approval (reference SSI-9717, EPBC 2018/836). HumeLink would involve the construction and operation of a new substation (referred to as the Gugaa 500 kV substation) located approximately 15 km east of the existing Wagga 330 kV substation.

The primary purpose of HumeLink is to expand the capacity of the electricity network in southern NSW. It will increase electricity transfer to customers in NSW and the ACT.

This section provides an overview of the HumeLink proposal corridor, concept design, construction and operational activities and delivery timing.

1.1.1. Project Details

The proposal includes the construction and operation of around 360 km of new electricity transmission lines, substations, permanent and temporary access tracks and roads and ancillary facilities required during construction.

The HumeLink study area extends across the lands of the Wiradjuri, Ngunnawal, Ngarigo and Gundungurra people. It is located within five local government areas (LGAs): Wagga Wagga, Snowy Valleys, Cootamundra-Gundagai, Yass Valley, and Upper Lachlan Shire.

The study area traverses primarily rural areas with a range of land uses including cropping, grazing, horticulture, forestry, and renewable power generation (hydroelectric, solar, and wind). Other land uses within and surrounding the proposal includes residences, farm buildings and infrastructure, roads and road reserves, drainage channels for irrigation, broad acre rural residential development, recreation, and existing transmission line easements.

The key components of HumeLink are:

- Substation works:
    - A new substation (Gugaa 500/330 kV (Gugaa 500 kV)) located approximately 15 km east of the existing Wagga 330/132 kV substation (Wagga 330 kV)
    - Augmentation of the existing Wagga 330 kV and Bannaby 500/330 kV (Bannaby 500 kV) substations
- New transmission lines between:
    - Maragle 500 kV substation and Bannaby 500 kV substation

  - Maragle 500 kV substation and Gugaa 500 kV substation
  - Gugaa 500 kV substation and Bannaby 500 kV substation
  - Wagga 330 kV substation and Gugaa 500 kV substation

- Ancillary development:

  - Two telecommunication huts along the transmission lines
  - New and upgraded temporary and permanent access tracks and roads
  - Temporary facilities required for construction of the proposal e.g. laydown and staging areas, stockpiling areas, concrete batching plants, brake/winch sites, site offices, parking areas and accommodation camps

1.1.2. Purpose of the Report

The purpose of this PBA is to present preliminary biodiversity findings within the biodiversity study area based on desktop assessment and preliminary field validation, including the biodiversity constraints requiring assessment and/or consideration for the proposal under the relevant NSW and Commonwealth legislation (including matters of national environmental significance (MNES)).

This report also identifies potential data gaps and seasonal survey requirements that pose potential issues that would likely need to be addressed as part of a Biodiversity Development Assessment Report (BDAR) that will be prepared to support an Environmental Impact Statement (EIS) for the proposal. The BDAR will be prepared in accordance with the Biodiversity Assessment Method 2017 (BAM) and *Biodiversity Conservation Act 2016* (BC Act). The HumeLink BDAR will be informed by further field surveys that will be undertaken in 2021 and 2022.

1.1.3. Study Area

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

- **The proposal (otherwise referred to as HumeLink):** comprises new high voltage transmission lines between Maragle, Wagga Wagga and Bannaby, a new substation near Wagga Wagga, upgrade of existing substations and ancillary infrastructure. This is described in section 0 of this PBA.
- **Proposal corridor:** the area where HumeLink assets such as transmission lines and substations are likely to be located
- **Biodiversity study area:** The proposal corridor plus a 500 m buffer*.
  *Note that a 10 km buffer around the proposal has been used for threatened flora and fauna searches consistent with the *BioNet Atlas user manual* (OEH, 2019) and standard practice for the Commonwealth DAWE Protected Matters Online Search Tool (PMST). The PMST generates a list of potential or known MNES, based on records and modelling.

The location of the proposal corridor and biodiversity study area are shown in Figure 1. Key locations and existing transmission infrastructure are shown in Figure 2 and Figure 3.

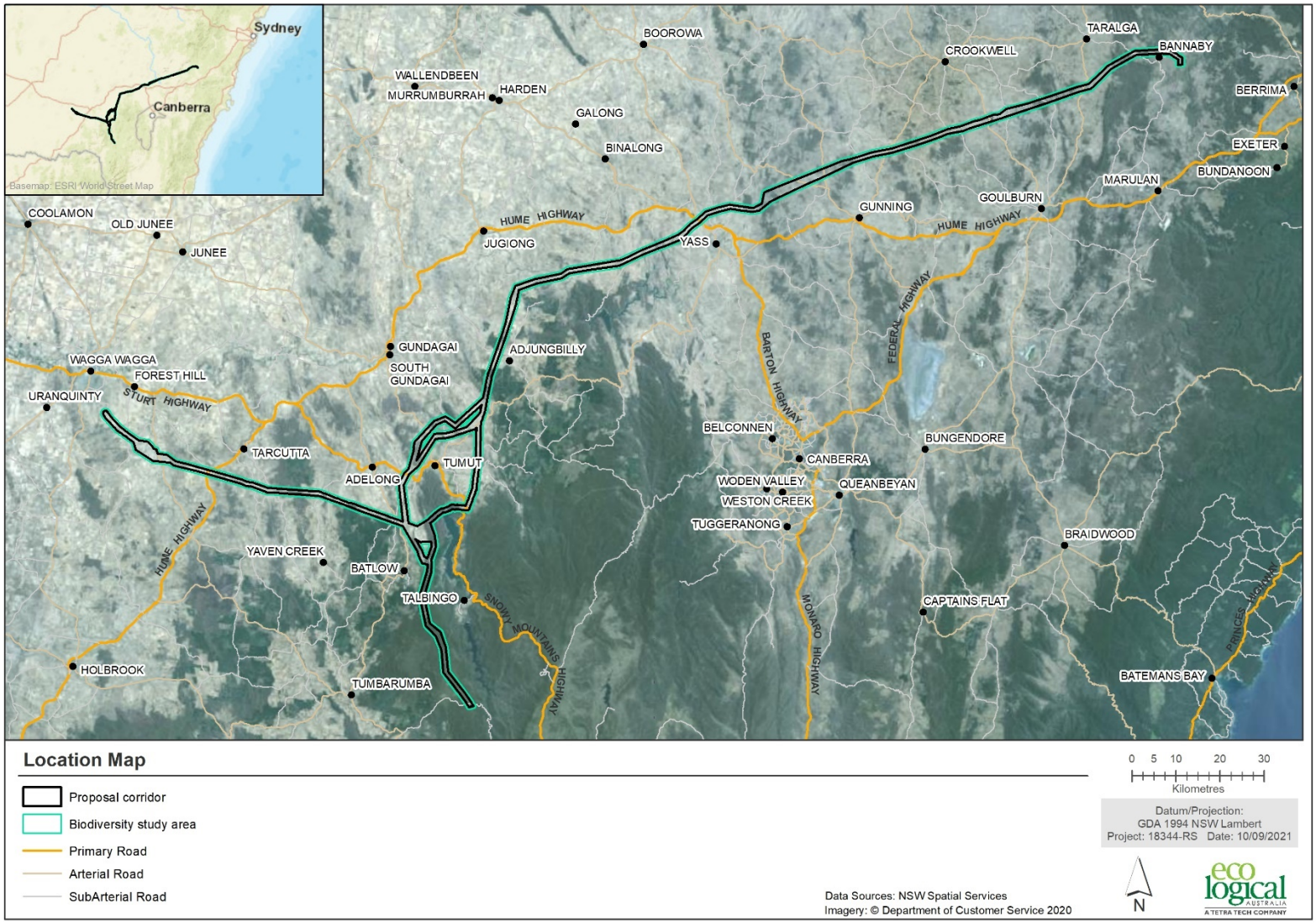


Figure 1: Locality and biodiversity study area

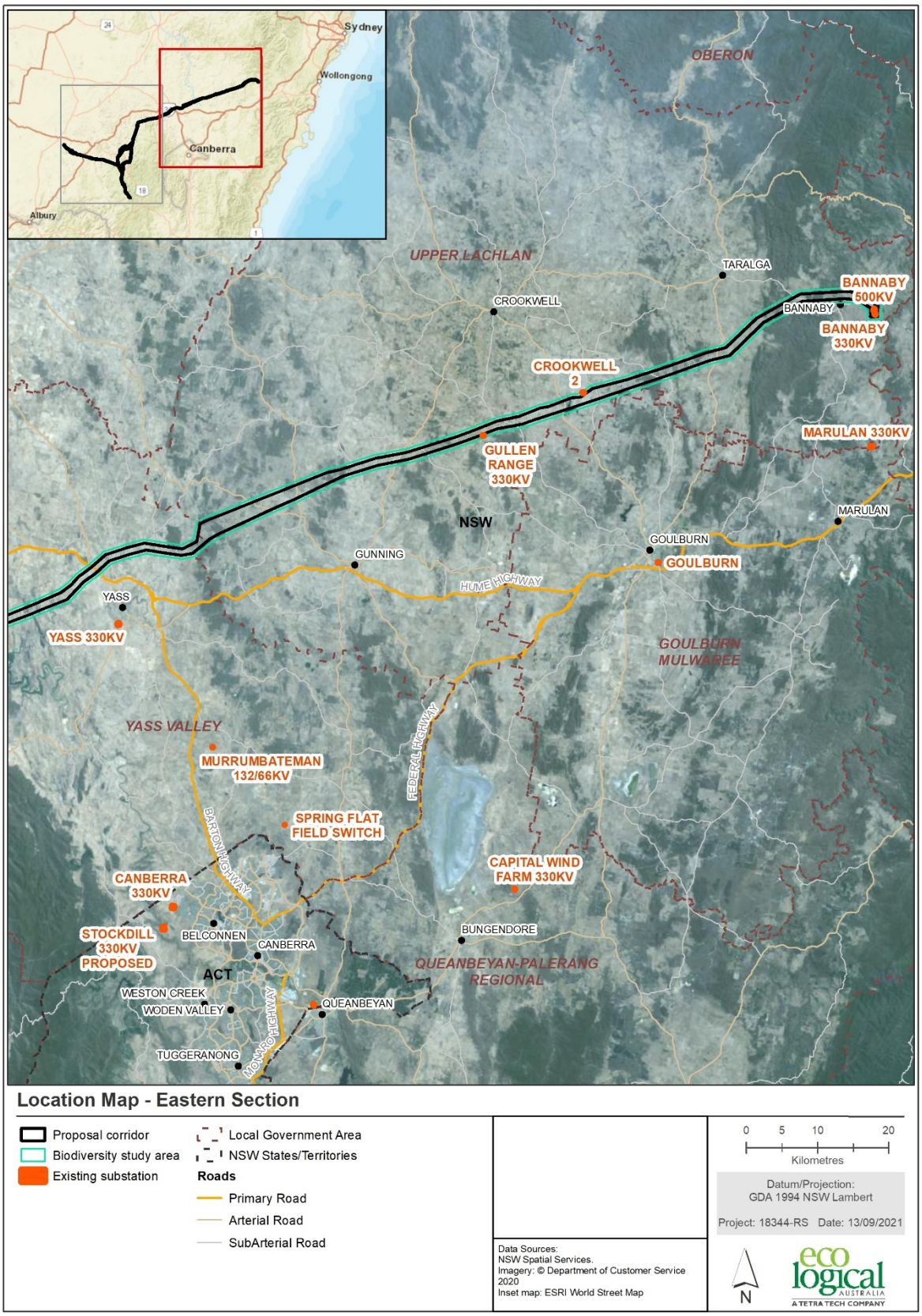


Figure 2: Key features of the proposal (1/2)

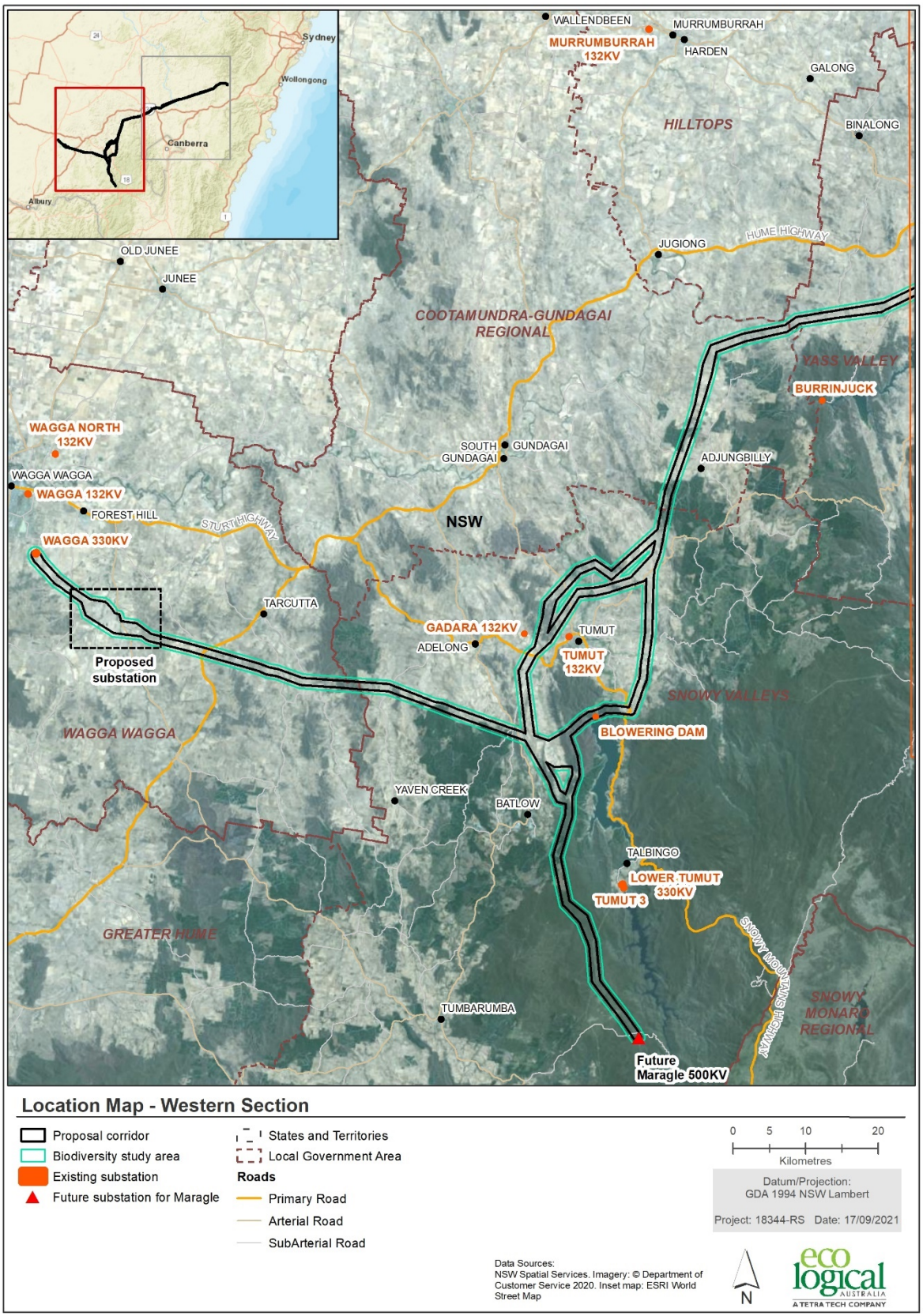


Figure 3: Key features of the proposal (2/2)

1.2. NSW Assessment

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), HumeLink 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 9) of the SRD SEPP.

As a CSSI project, impacts to biodiversity are to be assessed in accordance with the NSW *Biodiversity Conservation Act 2016* (BC Act) and using the NSW Biodiversity Assessment Method (BAM).

The BAM requires survey and mapping of Plant Community Types (PCTs), vegetation integrity (condition) assessment, and targeted survey for threatened flora and fauna species (species credit species only). The BAM measures three types of credits:

- Ecosystem credit species. For ecosystem credit species, threatened species habitat for individual species that can be reliably predicted to occur with a PCT. For this reason, targeted surveys for individual ecosystem credit species are not required. Under the BAM, any offsetting for impacts to ecosystem credit species are captured in the vegetation offsets associated with the ecosystem.
- Species credit species. These species require separate targeted surveys. If species credit species or habitat for species credit species are identified during surveys, then offsetting for that area of habitat affected by an activity is required under the BAM
- Dual credit species. These are species where their behaviour and habitat requirements meet the criteria for both a species credit species and an ecosystem credit species (OEH, 2018). Typically, only the portion of the species' habitat that contributes to the species credit component is required to be assessed and potentially offset.

The BAM then requires the proponent to respond to biodiversity values present and avoid and minimise the likely impacts of the proposal. Specifically, the proponent (Transgrid) must justify any unavoidable impacts, including impacts to prescribed matters (as identified in the BAM), as well as consideration of any Serious and Irreversible Impacts (SAII). The BAM simplifies the summary of unavoidable impacts into a credit requirement (ecosystem or species credits).

All unavoidable residual impacts must be offset consistent with the BC Act, whereby credits are generated at a separate landholding (known as a stewardship site) for ongoing management and predicted gains in biodiversity value. The credits can then be purchased by a proponent from the landholder or traded by the landholder to the Biodiversity Conservation Trust. The credits could then be available for purchase via the Biodiversity Conservation Fund.

The HumeLink Scoping Report (including this PBA) will accompany the proponent's application for approval to carry out a SSI project. The Department of Planning, Industry and Environment (DPIE) will then prepare the Secretary's Environmental Assessment Requirements (SEARs) including requirements for field survey and biodiversity assessment in the form of a BDAR to be included in the EIS.

The purpose of this report, as an appendix to the Scoping Report, is to provide a detailed review the existing environment via partially validated desktop information, identify likely impacts during

construction and operation, as well as potential cumulative impacts, and detail the methodology that will be used in the EIS assessment. DPIE will then use this information to inform the SEARs.

1.3. Commonwealth Assessment

The proposal is also being referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) as a controlled action due to potential significant impacts to MNES protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A EPBC Act Referral is being prepared for the proposal, which is separate to this PBA.

Under the *Bilateral agreement made under section 45 of the EPBC Act relating to environmental assessment* (the bilateral agreement; DotE 2015), a proposed action does not require assessment under Part 8 of the EPBC Act, if the action is to be assessed under Part 4 Division 4.1 or Part 5 Division 5.2 of the EP&A Act, provided the assessment:

- Contains an assessment of all impacts the action has on each MNES (which will be specifically included in the BDAR).
- Contains enough information about the controlled action and its relevant impacts to allow the Commonwealth Minister to make an informed decision whether or not to approve the action.
- Addresses all matters outlined in Schedule 4 of the *Environment Protection and Biodiversity Conservation Regulations 2000* (EPBC Regs; DotE 2000).

Under the *Amending Agreement No.1* commenced on 24 March 2020 between the NSW and Commonwealth Governments, the bilateral agreement will now apply to SSI assessments carried out under the BC Act and applied to HumeLink. The Commonwealth Government retain authority to issue their own approval under the Bilateral Agreement. Further, the Commonwealth have endorsed the NSW Biodiversity Offset Scheme (BOS) as a mechanism to resolve the requirement for biodiversity offsets.

1.3.1. Commonwealth Biodiversity Offsets

The EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) outlines the Commonwealth Government's approach to the use of environmental offsets ('offsets') under the EPBC Act.

Offsets are defined as measures that compensate for the *residual adverse impacts* of an action on the environment. Unless a significant impact is likely on a particular MNES, then offsets are not required. Where appropriate, offsets are considered during the assessment phase of an EIS under the EPBC Act. This policy provides transparency around how the suitability of offsets is determined. The suitability of a proposed offset is considered as part of the decision as to whether or not to approve a proposed action under the EPBC Act.

The BAM provides proponents with flexibility for biodiversity offsets in NSW, such as variation to 'like for like' offsets. Biodiversity offsets will be delivered via like-for-like offsets where feasible, however if like-for-like offsets are not feasible or achievable, conservation actions may need to be developed in consultation with DAWE and DPIE to benefit the affected threatened species or ecological communities and provide direct and measurable conservation outcomes for MNES.

2. Survey Methodology

The survey methodology for this PBA has been informed by the HumeLink Biodiversity Survey and Assessment Strategy (ELA, 2020a), which is provided in Appendix D of this PBA. The following chapter outlines the methods used to describe known or predicted biodiversity values within the biodiversity study area. All field work undertaken to inform this report was carried out under the appropriate licences, including a biodiversity licence as required under Part 2 of the BC Act (License Number: SL100243) and an Animal Research Authority (CSB 19/2112) issued by the Department of Primary Industries (Agriculture). Licences are provided in Appendix C of this PBA.

2.1. Personnel

A number of suitably qualified ecological professionals have contributed to the field work and preparation of this PBA. These contributors and their qualifications are provided in Table 1.

Table 1: Contributors and roles

Name	Qualifications	Role
Alicia Scanlan	• Bachelor of Science (Ecology and Biogeography) University of Wollongong (1998)	Threatened flora surveys Threatened fauna surveys
Andrew Carty	• Bachelor of Environmental Science, University of Newcastle • Certificate IV Natural Area Restoration and Management, Hunter TAFE	Threatened fauna survey BAM Plots
Arne Bishop	• Bachelor of Environmental Science/Bachelor of Landscape Architecture, University of Canberra • Accredited BAM Assessor – BAAS 17065	Threatened flora surveys
Bronwyn Callaghan	• Bachelor of Environmental Science (Hons), University of Wollongong (1998) • Accredited BAM Assessor – NSW Biodiversity Accredited Assessor System (BAAS) 20019 (NSW Gov, 2021)	Coordination of and participation in threatened species (flora) targeted surveys BAM plots Vegetation validation
Cameron Radford	• Bachelor of Science (Environmental Science and Biology) University of Sydney (2009) • Master of Wildlife Health and Population Management (Wildlife Biology) University of Sydney (2010) • PhD Candidate - Human-wildlife Conflict Mitigation, University of Sydney (2019)	Threatened fauna surveys
Carolina Mora	• Bachelor of Science (Advanced) (Honours Class I): Geography. The University of Sydney (2018) • Bachelor of Science (Advanced): Marine Science. The University of Sydney (2017)	BAM plots
Claire Wheeler	• Graduate Certificate River Restoration and Management, Charles Sturt University (2016) • Bachelor of Environmental Management, Macquarie University (2005) • Certificate III Conservation & Land Management, Ryde TAFE (2007)	Threatened fauna surveys Threatened flora surveys

Name	Qualifications	Role
Clare Duck	• Master of Forest Ecosystem Science, University of Melbourne (2017) • Bachelor of Arts, University of Melbourne - major in Geography and minor in Philosophy (2014)	BAM plots
Dan McKenzie	• Bachelor of Environmental Science and Management (Honours), University of Newcastle (2011)	Threatened fauna surveys
Danielle Woodhams	• Bachelor of Science (Wildlife Conservation and Biology) Honours, La Trobe University (2015)	Threatened fauna surveys (mammals, nocturnal birds, reptiles, frogs)
Dee Ryder	• Bachelor of Environmental Science Management	Threatened fauna surveys
Diane Campbell	• Bachelor of Science, University of Sydney • Accredited BAM Assessor – BAAS 17069	Threatened flora surveys BAM plots
Dr Frank Lemckert	• Bachelor of Science, Terrestrial Ecology and Marine Management, University of Sydney (1984) • Master of Science, Population biology of the Common Froglet, University of Sydney (1991) • PhD, Management of forest frogs in timber production forests of NSW, University of Newcastle (2009)	Threatened fauna technical lead (mammals, nocturnal birds, reptiles, frogs) Threatened Fauna Surveys
Dr Lachlan Copeland	• Research PhD in plant systematics, University of New England (Systematic studies in *Homoranthus* (*Myrtaceae*: *Chamelaucieae*): species limits, phylogeny, and generic boundaries) (2005) • Bachelor of Natural Resources (Hons), University of New England (1995)	Threatened flora surveys
Dr Meredith Henderson	• PhD, Victoria University, Melbourne. Vegetation dynamics in response to fire and slashing in remnants of Western Basalt Plains grasslands and the implications for conservation management (2003) • Bachelor of Science (Honours), University of Wollongong (1991) • Accredited BAM Assessor - BAAS 17001	Technical Lead
Griffin Taylor-Dalton	• Bachelor of Zoology, Major in Conservational Biology (WSU) (2017)	Threatened flora surveys BAM plots
Hugh James	• Bachelor of Environmental Science and Management (Hons)	BAM plots
James King	• Bachelor of Environmental Systems (Honours), University of Sydney, (2018)	Threatened flora surveys Threatened fauna surveys
Janene Devereux	• Bachelor of Science (Marine Science), University of Newcastle (2008)	Threatened fauna surveys
Jennifer Young	• Bachelor of Environmental Science, Southern Cross University (2017)	
Julia Ryeland	• PhD in Ecology and Environment - Western Sydney University (2016 – 2021) • BA of Environ. Science (Wildlife and Conservation Biology) (1st Class Hons) - Deakin University (2014)	Threatened fauna surveys

Name	Qualifications	Role
Karen Spicer	• Bachelor of Environmental Science (Biology) Hons 1, University of NSW (1999) • WIRES Volunteer	BAM plots
Katy Wilkins	• Bachelor of Science in Biodiversity and Conservation, Macquarie University (2010)	Threatened flora surveys
Kazz Tokek	• Bachelor of Biological Science with Honours (Ecology), La Trobe University (2002)	Threatened fauna surveys
Keagan Jones	• Bachelor of Environmental Science and Management, Majoring in Earth Systems. University of Newcastle (2020)	Threatened flora surveys
Kristen Bigland	• Bachelor of Applied Science (Ecosystems and Ecology), Charles Darwin University (2014)	PBA author
Lauren Perkins	• Bachelor of Science (Marine Science), University of Technology Sydney (2017)	Threatened flora surveys Threatened fauna surveys
Leura Kowald	• Bachelor of Arts and Science (Biodiversity and Physical Geography), University of New England (2019) • Certificate III Horticulture (Landscape), Ryde School of Horticulture, Northern Sydney Institute TAFE (2010)	PBA author BAM plots Threatened flora surveys Threatened fauna surveys
Loren Appleby	• Bachelor of Science (Ecology & Conservation Biology), Griffith University (2012)	Threatened flora surveys Threatened fauna surveys
Melinda Westcook	• Bachelor of Science (Environmental Biology) University of Technology Sydney (2012) • Master of Science (Bird foraging behaviour), University of Technology Sydney (2017)	Threatened flora surveys
Michael Gregor	• Bachelor of Science (Geography) UNSW (2015) • Conservation and Land Management Certificate 3	BAM plots Threatened flora surveys
Mike Lawrie	• Bachelor of Environmental Science and Management - University of Newcastle (2011) • Master of Environment (Specialisation in Environmental Science) – Macquarie University (2016)	Threatened fauna surveys
Nicole McVicar	• Accredited BAM Assessor - BAAS 18077 • Bachelor of Environmental Science, Macquarie University • Bush Regeneration Certificate II, Ryde TAFE	BAM plot technical lead
Nigel Cotsell	• Masters of Natural Resources, University of New England (2015) • Bachelor of Science (Zoology/Animal Biology), The Australian National University (1990)	Threatened fauna surveys
Pearce Thomas	• Bachelor of Environmental Science, University of Canberra (2014) • Bachelor of Landscape Architecture, University of Canberra (2012)	Threatened flora surveys Threatened fauna surveys
Robyn Stevens	• Master of Science and Technology in Spatial Information, University of New South Wales (2010) • Bachelor of Science (Evolution and Diversity of the Australian Biota), Sydney University (1997)	GIS analysis

Name	Qualifications	Role
	• Certificate III - Conservation and Land Management – Ryde College of TAFE (2010)	
Roger Lembit	• Agricultural Science, University of Sydney (1979)	Threatened flora surveys
Samantha Patch	• Bachelor of Marine Science/Environmental Science and Management, Southern Cross University (2021)	Threatened fauna survey BAM Plots
Shawn Ryan	• Bachelor of Environmental Science and Management, University of Newcastle (2011)	Threatened flora surveys
Sophie Montgomery	• Bachelor of Environmental Science & Management (Sustainability) University of Newcastle (2020)	Threatened flora surveys
Stacey Wilson	• Master of Environment (Environmental Science) – Macquarie University (2015) • Bachelor of Biodiversity and Conservation – Macquarie University (2013) • Certificate III Conservation Land Management – Ryde TAFE (2015)	BAM plots

2.2. Data and Literature Review

A background review of existing information was undertaken to inform the field surveys. The purpose of the background review was to identify the existing environment relative to the biodiversity study area. The review focussed on database searches, relevant ecological reports pertaining to the study area and relevant GIS layers.

The data review was used to prepare a list of PCTs, threatened species, populations and communities as well as important habitat for migratory species with a likelihood of occurrence in the biodiversity study area. The searches were also undertaken to identify if any Areas of Outstanding Biodiversity Value were present.

A summary of the datasets searched for this PBA is provided Table 2.

Table 2: Database review sources

Data type	Data source and date	Area
Aerial imagery	Best available from NSW Land and Property Information Contours, 2-10m, NSW LPI Feb 2015	NA
Bioregions	Interim Biogeographic Regionalisation for Australia (IBRA) 7	Biodiversity study area
Subregions	IBRA7	Biodiversity study area
NSW (Mitchell) Landscapes	NSW (Mitchell) Landscapes Version 3.1	Biodiversity study area
Plant Community Type Mapping	• Riverina South-East Local Land Services Vegetation Compilation Map (SELLS_Veg_20190923) • Office of Environment and Heritage (OEH) State Vegetation Type Mapping (RiverinaSVM_v1p2_PCT_E_4469) • SELLS_AOI_Vegetation • HumeLink Corridor (25 May 2020) • HumeLink Corridor (v 7 2021)	Biodiversity study area

Data type	Data source and date	Area
	• NSW BioNet Vegetation Classification dataset	
Threatened Ecological Communities	• NSW Final Determinations • Commonwealth Approved Listing Advice	Biodiversity study area
Local Government Areas	Australian Local Government Association Council Maps and Boundaries - National Map	Biodiversity study area
Flora & fauna database searches	• Commonwealth DAWE Protected Matters Online Search Tool (PMST) • BioNet records from the locality (1980 onwards) • NSW DPIE Areas of Outstanding Biodiversity Value Register • DAWE Species Profile and Threats Database • DPIE Threatened Biodiversity Data Collection • The Biodiversity Assessment Method (BAM) (2017)	Biodiversity study area
Key Fish Habitat (KFH)	NSW DPIE Fisheries Spatial Data Portal	Biodiversity study area
Rivers and Streams	NSW DPIE Strahler Stream Order	Biodiversity study area
Wetlands	Office of Environment and Heritage NSW. Data Currency: 2010-06-29	Biodiversity study area
CAPAD	'Collaborative Australian Protected Areas Database (CAPAD) 2018, Commonwealth of Australia 2019'.	Biodiversity study area
Burnt Areas	Google Earth Engine Burnt Areas Map (DPIE, 2020)	Biodiversity study area
Important Areas	Birds Australia (2009) Birds Australia - Important Bird Areas (IBA) 2009. Bioregional Assessment Source Dataset. Viewed 13 March 2019, http://data.bioregionalassessments.gov.au/dataset/5d488350-83b6-4e71-8d17-687ad8ff9941.	Biodiversity study area
Forests and Protected Areas	NSW NPWS Reserves and NSW State Forest	Biodiversity study area

2.3. Field Survey

Several seasonal biodiversity field surveys have been carried out to inform the proposal. Seasonal surveys were ongoing at the time of preparation of this PBA. The survey strategy is outlined in detail in the HumeLink Biodiversity Survey and Assessment Strategy (ELA, 2020a), which is provided in Appendix D of this PBA. The survey strategy was developed taking into account:

- The size of the biodiversity study area – the biodiversity study area extends over 270 km from east to west. To survey effectively and accurately, multiple survey teams, over many survey days were therefore necessary to cover the area and habitat diversity.
- Seasonal survey windows – the seasonality of threatened flora and fauna means that there are limited windows for surveying certain species. The survey efforts were planned and coordinated with consideration of these windows.

Table 3 summarises the field surveys that have been completed to date.

Table 3: Summary of survey effort

Survey effort	Ecological aspect	Dates	Location*	Description
Completed surveys				
Limited Summer Surveys 2019/2020 (surveys commenced midway through the seasonal survey period)	Vegetation	4 November 2019 - 22 November 2019	Shown in Figure 4 Bago State Forest Maragle State Forest Red Hill Green Hill Public road reserves	Desktop assessment Rapid data points Vegetation mapping
	Orchid	16 December – 19 December 2019	Bago State Forest Maragle State Forest McPherson Plain Modder Creek Plain	Databases assessment Literature review Targeted flora surveys Random meander Parallel field transverse
	Bats	27 January 2020 – 31 January 2020 10 February 2020- 14 February 2020	Due to access issues, three sites out of seven sites near Gundagai were surveyed. The three sites, Coolac Gold Mine, Robinson & Rices Mine, and Long Tunnel Mine, were surveyed in detail.	Desktop assessment Literature review Targeted bat survey Visual survey Harp trapping Ultrasonic call detectors (bat detectors)
Spring Survey 2020	Vegetation	19 October 2020 – 27 November 2020	The Bago, Green Hill, Red Hill, and Maragle State Forest Study Area The Kyeamba Valley and Line 51 Study Area	Desktop assessment Literature review BAM Vegetation Integrity Plots Targeted threatened flora survey
Summer Survey 2020/2021	Vegetation	February 2021 – March 2021	Area of Interest (AOI) Centreline v1.4 (current at the time of survey) areas (Figure 4): • Goulburn • Yass • Wagga Wagga • Red Hill • Bago • Maragle	Desktop assessment Literature review BAM Vegetation Integrity Plots
	Targeted flora	February 2021 – March 2021	AOI Centreline v1.4 (current at the time of survey) areas: • Bannaby • Goulburn • Yass	Targeted flora surveys

Survey effort	Ecological aspect	Dates	Location*	Description
			• Gundagai • Wagga Wagga • Red Hill • Green Hill • Bago • Maragle SF	
	Targeted fauna	February 2021 – March 2021	AOI Centreline v1.4 (current at the time of survey) areas: • Bannaby • Goulburn • Yass • Gundagai • Wagga Wagga • Red Hill • Green Hill • Bago • Maragle	Targeted fauna surveys
Autumn Survey 2021	Vegetation	April 2021 – May 2021	AOI Centreline v1.6 (current at the time of survey), then v1.9 from mid-May targeted areas (Figure 4): • Green Hill • Tumut • Gundagai • Yass • Goulburn • Bannaby	Desktop assessment Literature review Vegetation validation BAM Vegetation Integrity Plots
	Targeted flora	April 2021 – May 2021	AOI Centreline v1.6 (current at the time of survey) targeted areas: • Bago • Goulburn • Bannaby	Targeted flora surveys
	Targeted fauna	April 2021 – May 2021	AOI Centreline v1.6 (current at the time of survey) targeted areas: • Bago • Wagga Wagga • Yass	Targeted fauna surveys
Winter Survey 2021	Vegetation	June - August 2021	AOI Centreline v1.9 (current at the time of survey) targeted areas (Figure 4): • Bannaby • Goulburn	Desktop assessment Literature review Vegetation validation

Survey effort	Ecological aspect	Dates	Location*	Description
			• Yass • Tumut • Bago	
	Targeted fauna	June to August 2021	AOI Centreline v1.9 (current at the time of survey) targeted areas: • Bannaby • Yass • Wagga • Bago • Tumut	Targeted fauna surveys

Note: *Area of interest centrelines were used for survey effort and refined throughout the duration of the survey, location of the survey line area described below:

AOI Centreline v1.4 – Starts in the south east from Nurenmerenmong the AOI corridor splits two ways, north towards the west of Blowering Dam towards Tumut Plains where it splits again for a short distance and re joins at Red Hill near Tumut, through Red Hill State Forest up to Gobarralong. The second AOI corridor heads west past Maragle State Forest and heads north near Tumbarumba towards Green Hill State Forest, Taradale, Oberne Creek, Tarcutta Hills Reserve, Big Springs to Gregadoo. A third corridor runs south west to north east from near big springs and runs north east towards Borambola, Nangus, to Gobarralong where it meets the first AOI corrido and continues north east towards Woolgarlo, Bango Nature Reserve and leads towards Bannaby.

AOI Centreline v1.6 – Starts in the same area as AOI 1.4 in Nurenmerenmong, it alters the alignment between Green Hill State Forest and Oberne Creek taking a more direct route. The rest of the alignment between 1.4 and 1.6 remains the same.

AOI Centreline v1.9 - Starts in the same area as AOI 1.4 and 1.6 in Nurenmerenmong, the alignment remains mostly the same as AOI 1.6the. The split in the alignment around the Tumut Plains is removed and is a single corridor through mostly private property is a direct path. The other change between 1.6 and 1.9 is the alignment take a route further east near Bango Nature Reserve and then maintains a relatively direct alignment to Bannaby slight south east of the alignment in AOI 1.6. The rest of the alignment remains unchanged.

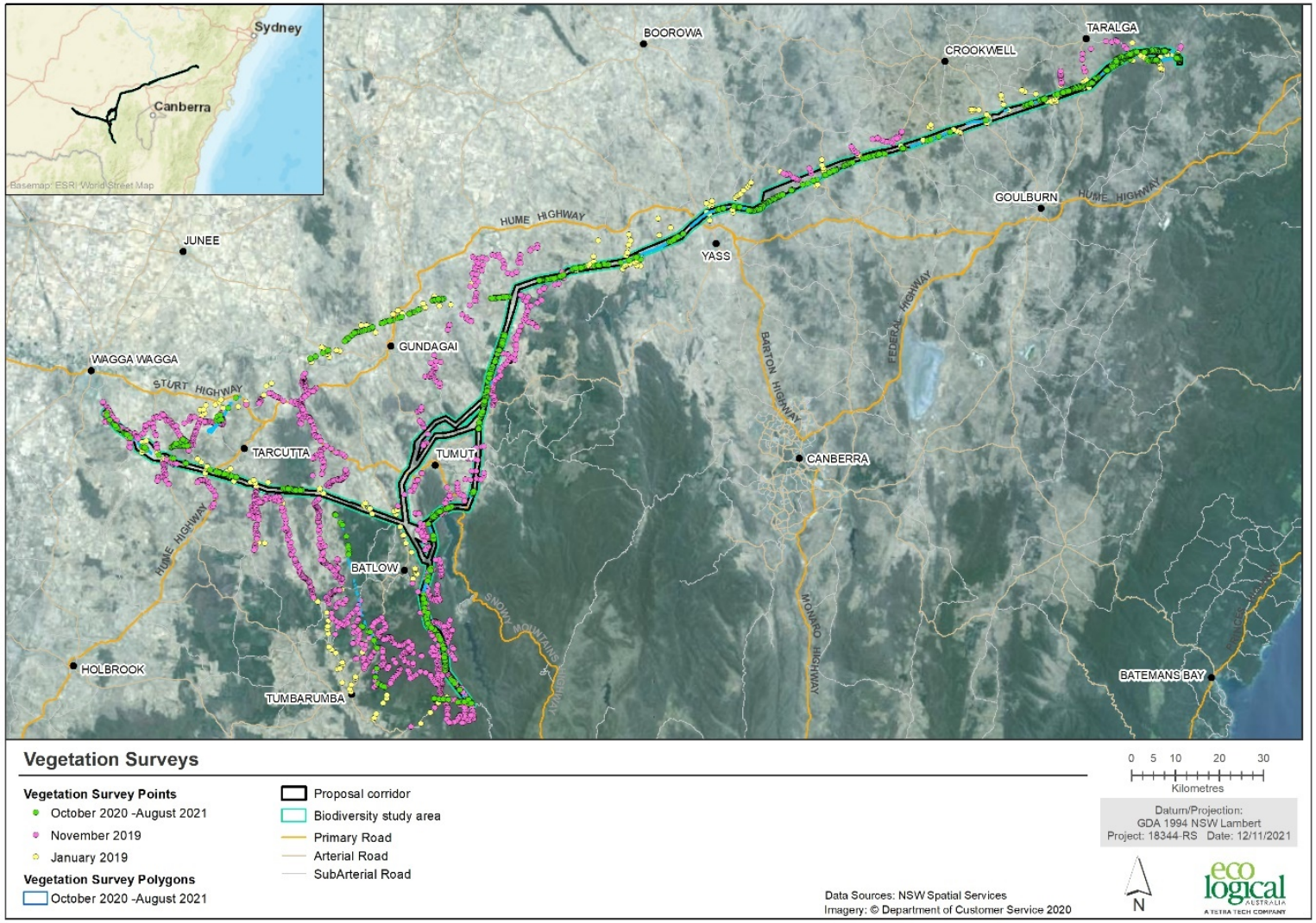


Figure 4: Vegetation survey 2019 - 2021

2.4. Survey limitations

The survey across the entire proposal corridor has not been completed, therefore the results relate to only those areas accessed at the time of writing. Parts of the proposal corridor were burnt in the 2019/2020 bushfires. Where areas were burnt and vegetation integrity plots were carried out, the DPIE guideline for burnt area assessments was applied. In the time prior to the bushfires, drought was a feature that may have affected the presence of some species.

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. Data review

The findings of the data review are summarised in Table 4

Table 4:Data review results

Data type	Key findings
Aerial imagery	The biodiversity study area covers a large portion of south-western NSW, ranging from Taralga to Wagga Wagga. Significant areas of cleared land due to agriculture. Scattered woodland and forest vegetation present.
Bioregions	There are three IBRA bioregions present within the biodiversity study area: • NSW South Eastern Highlands IBRA Region • NSW South Western Slopes IBRA Region • Australian Alps Bioregion
Subregions	There are six IBRA subregions within the biodiversity study area: • Inland Slopes • Murrumbateman • Bungonia • Crookwell • Bondo • Snowy Mountains
Catchment	The biodiversity study area is located within the following catchments: • Lachlan • Hawkesbury • Murrumbidgee
NSW (Mitchell) Landscapes	There are 28 Mitchell landscapes within the biodiversity study area: • Adelong Granite Ranges • Adrah Hills and Ranges • Boorowa Volcanics • Burrinjuck Ridges • Cabramurra - Kiandra Basalt Caps and Sands • Carabost Hills and Ranges • Coffin Rock Granite Hills • Cootamundra - Tumut Serpentinite and Ultramafics • Crookwell Basalts and Sands • Dalton Hills • Doura Volcanics • Gundary Plains • Gunning Hills • Marilba Range • Minjary Hills and Ranges • Mt Bundarbo Basalt Caps • Murrumbidgee - Tarcutta Channels and Floodplains • Oberon - Kialla Granites

Data type	Key findings
	• Rockley Plains • Sydney Basin Western Escarpment • Tooma Granite Ranges • Towrang Ranges • Tumut Channels and Floodplain • Upper Lachlan Channels and Floodplains • Upper Murrumbidgee Gorge • Wollondilly - Bindook Tablelands and Gorges • Wonga Hills and Ranges • Young Hills and Slopes
Plant Community Type Mapping	At least 85 mapped PCTs are mapped as occurring within the biodiversity study area. These PCTs are described in section 3.3.2 of this PBA
Threatened Ecological Communities	Desktop searches indicate there are seven threatened ecological communities (TEC) within the biodiversity study area. These TECs are described in section 3.3.3 of this report.
LGAs	The biodiversity study area is located in the following seven LGAs: • Cootamundra-Gundagai Regional • Snowy Valleys • Upper Lachlan Shire • Wagga Wagga • Yass Valley • Goulburn • Mulwaree (500 m buffer only)

Flora & fauna database searches	A search of the BioNet database (16 November 2021) identified 88 threatened species from 1980 onwards under the BC Act within the threatened flora and fauna search area:
	• 25 threatened flora species (sensitive species removed)
	• 37 birds
	• 17 mammals
	• Five frog records
	• Three reptiles
	• One insect species.
	Of these species, the majority of likely species are woodland birds that are ecosystem credits under the BAM, and not listed under the EPBC Act. Search results are provided in Appendix A of this PBA.
	The PMST identified the following MNES under the EPBC Act within the threatened flora and fauna search area (17 September 2021):
	• Seven wetlands of international importance
	• Six listed TECs
	• 82 listed threatened species, comprising:
	  • 44 threatened flora species
	  • 11 bird species
	  • 10 species of mammals
	  • Five fish
	  • Eight frog species
	  • Two species of insect
	  • Two reptile species
	• 13 listed migratory species.
	Searches are provided in Appendix B of this PBA.

Data type	Key findings
KFH	The LGAs relevant to the biodiversity study area and locality include areas of mapped KFH. These LGAs are: • Cootamundra-Gundagai Regional • Snowy Valleys • Upper Lachlan Shire • Wagga Wagga •
Rivers and Streams	The biodiversity study area contains multiple 1st to 4th Strahler Order Streams. Waterways greater than or equal to 5th order in the study area: • Adelong Creek • Adjungbilly Creek • Boiling Down Creek • Bombowlee Creek • Bowning Creek • Brungle Creek • Buddong Creek • College Creek • Derringullen Creek • Gilmore Creek • Goobarragandra River • Gregadoo Creek • Jerrawa Creek • Keajura Creek • Kialla Creek • Killimicat Creek • Kyeamba Creek • Lachlan River • Melamalong Creek • Middle Creek • Murrumbidgee River • Nacki Creek • Oak Creek • O'Briens Creek • Pejar Creek • Sandy Creek • Tarcutta Creek • Tarlo River • Tooles Creek • Tumut River • Turrallo Creek • Umbango Creek • Wollondilly River • Yass River • Yaven Creek
Wetlands	The Tomney Wetlands is a wetland of national importance, which is located in the biodiversity study area.
Burnt Areas	There is significant variation in the condition of the biodiversity study area. A large portion of the State Forest within the biodiversity study area is mapped as being burnt in the 2019/2020 bushfires. As a result, the structure and composition are altered in areas in the south western

Data type	Key findings
	portion of the biodiversity study area, such as within the Bago, Green Hills, Red Hill and Maragle State. Other areas to the east of Gundagai are to date unburnt.
Forests and Protected Areas	The biodiversity study area includes the following State Forests: • Bago State Forest • Green Hills State Forest • Maragle State Forest • Red Hill State Forest • Tumut State Forest

3.2. Landscape Context

The majority of the biodiversity study area is located within the Southern Eastern Highlands, NSW South Western Slopes, and the Australian Alps IBRA regions. The South Eastern Highlands IBRA Region covers the dissected ranges and plateau of the Great Dividing Range that are topographically lower than the Australian Alps, which lie to the southwest. The highlands are part of the Lachlan fold belt that runs through the eastern states as a complex series of metamorphosed Ordovician to Devonian sandstones, shales and volcanic rocks intruded by numerous granite bodies.

The NSW South Western Slopes IBRA Region is an extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria with an area of 8,657,426 ha. About 93% of this bioregion occurs in NSW, with the remainder in Victoria. The NSW portion of the bioregion occupies about 10% of the state (DPIE, 2016).

In NSW, the Australian Alps IBRA Region is entirely surrounded by the South Eastern Highlands IBRA Region. The alpine area comprises granites that have formed faulted, stepped ranges at the point where the South Eastern Highlands in NSW turn west into Victoria. More recent volcanic activity produced basalts and, in the Pleistocene, the cold climate superimposed glacial features on the landscape. The bioregion was the only part of the mainland to have been affected by Pleistocene glaciation and contains a variety of unique glacial and periglacial landforms above 1,100 m altitude.

The IBRA 7 subregions and bioregions within the biodiversity study area are shown in Table 5.

Table 5:Landscape context - IBRA Subregions and Bioregions

IBRA sub region 7	IBRA region 7	Hectares of proposal corridor
Inland Slopes	NSW South Western Slopes	46,280
Murrumbateman	South Eastern Highlands	14,871
Bungonia	South Eastern Highlands	3,714
Crookwell	South Eastern Highlands	12,089
Bondo	South Eastern Highlands	6,922
Snowy Mountains	Australian Alps	5,142

3.2.1. Areas of Outstanding Biodiversity Value

Areas of declared critical habitat under the *Threatened Species Conservation Act 1995* have become the first declared areas of outstanding biodiversity value in NSW with the commencement of the

BC Act. To date, there are only four declared areas of outstanding biodiversity value and these areas are not located in or near the biodiversity study area.

3.3. Native Vegetation

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

3.3.1. Keith Formations

'Vegetation formation' is the top level of the hierarchy in Keith's vegetation classification system. Formations represent broad groups distinguished primarily by structural and physiognomic features, with the addition of functional features such as salinity and drought tolerance in some cases (Keith, 2004). These vegetation formations are described in Table 6.

Table 6: Description of Keith's (2004) vegetation formations (source: OEH, 2021)

Vegetation formation	Description	Example photograph
Alpine Bogs and Fens	Wetlands comprising either dense to open patches of sclerophyllous shrubs up to 1 m tall (bogs), or more open and shorter communities of herbs and sedges (fens). The bogs often have conspicuous hummocks of moss, but this is less often so in the fens	Figure 5
Alpine Herbfields	Low herbfields dominated by forbs and grasses with scattered shrubs in rocky sites. The dominant herbs in this class are daisies with rosettes of leaves. These together with abundant tussock grasses form an almost continuous cover over the landscape, generally no more than 0.3 m tall.	Figure 6
Floodplain Transition Woodlands	Open woodland 15-25 m tall and dominated by box eucalypts. The understorey is characterised by a largely continuous grassy ground cover and a sparse layer of mostly sclerophyllous shrubs.	Figure 7
Inland Rocky Hill Woodlands	Open eucalypt and pine woodland with scattered shrubs and a sparse groundcover. Sandy loams derived from sandstones and conglomerates on rocky hills and ranges reviving less than 550 mm rainfall annually, with variants on basalt hills in the northern part of the range	Figure 8
Montane Wet Sclerophyll Forests	Eucalypt forest 20-35 m tall with a prominent stratum of sclerophyllous and mesophyllous shrubs and an open herbaceous groundcover.	Figure 9
Southern Tableland Dry Sclerophyll Forests	Open eucalypt forest 20-35 m tall, with variable density of shrubs, and a diverse, relatively continuous herbaceous-grassy groundcover. The shrubs include a mixture of sclerophyllous and mesophyllous species.	Figure 10
Subalpine Woodlands	Low, open eucalypt woodland dominated by one or two tree species, typically 5-15 m tall. The understorey, includes a variable sclerophyll shrub stratum and ground cover dominated by tussock grasses and a variety of herbs	Figure 11

Vegetation formation	Description	Example photograph
Tableland Clay Grassy Woodlands	Open eucalypt forest and woodland, 15-30 m tall, with a sparse shrub stratum and a dense, compositionally variable, and relatively diverse groundcover dominated by tussock grasses and herbs.	Figure 13
Temperate Montane Grasslands	Closed tussock grassland with a variety of perennial herbs including erect, scrambling and rosette forms, as well as geophytic orchids and lilies in the spaces between the tussocks.	Figure 12
Upper Riverina Dry Sclerophyll Forests	Open eucalypt forest or woodland up to 20 m tall with open sclerophyllous shrub stratum and a patchy groundcover of grasses.	Figure 14
Western Slopes Dry Sclerophyll Forests	Open eucalypt forest or woodland 10-25 m tall, dominated by ironbark eucalypts and cypress pines with an open sclerophyllous shrub stratum and sparse to moderate grassy groundcover	Figure 15
Western Slopes Grasslands	Closed tussock grassland with sporadic shrubs and herbs. The dominant tussock grass, *Austrostipa aristiglumis* (plains grass), may grow in dense swards as tall as 1.5 m, often to the exclusion of other grass species	Figure 16
Western Slopes Grassy Woodlands	Eucalypt woodland typically up to 20 m tall with a sparse shrub stratum and continuous groundcover of tussock grasses and a variety of herbs	Figure 17

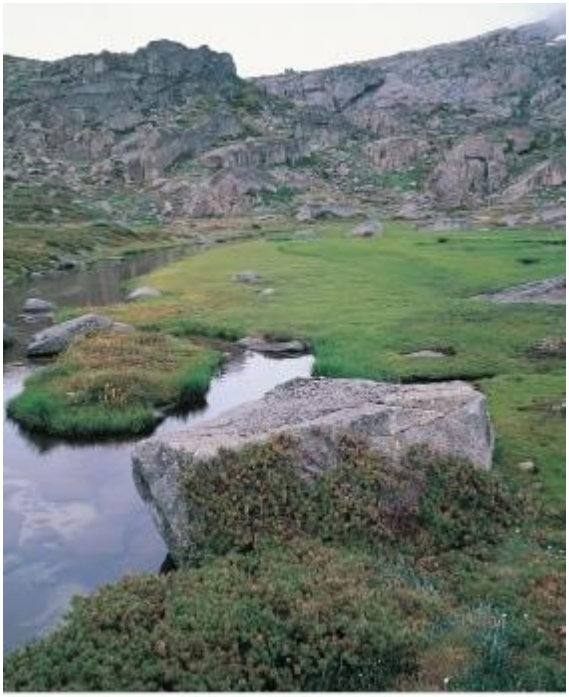


Figure 5: Alpine Bogs and Fens (source: DPIE, 2020)

Figure 6: Alpine herbfields (DPIE, 2020a)

Figure 7: Floodplain transition woodlands (DPIE, 2020b)

Figure 8: Inland Rocky Hill Woodland (DPIE, 2020c)

Figure 9: Montane Wet Sclerophyll Forests (DPIE, 2020d)

Figure 10: Southern Tableland Dry Sclerophyll Forests (DPIE, 2020e)

Figure 11: Subalpine Woodland (DPIE, 2020f)

Figure 12: Temperate Montane Grasslands (DPIE, 2020g)

Figure 13: Tableland Clay Grassy Woodland (DPIE, 2020h)

Figure 14: Upper Riverina Dry Sclerophyll Forests (DPIE, 2020i)

Figure 15: Western Slopes Dry Sclerophyll Forest (DPIE, 2020j)

Figure 16: Western Slopes Grasslands (DPIE, 2020k)

Figure 17: Western Slopes Grassy Woodlands (NSW DPIE, 2020l)

3.3.2. Plant Community Types and Threatened Ecological Communities

The PCTs present in NSW are described in the BioNet Vegetation Classification database (BioNet Vegetation, 2021). The PCTs outlined in the BioNet Vegetation Classification database provide a focal point for vegetation type mapping and regulatory assessment processes.

The desktop assessment indicated that there were 85 PCTs listed as occurring within the biodiversity study area. A rapid and high-level survey to validate areas of the proposal occurred in 2019. The survey concluded that there was high accuracy of the vegetation mapping on public lands around Maragle and Tumut to Wagga Wagga. Mapping was less accurate from the section of corridor between Red Hills SF and Bannaby, and generally on private land. The purpose of this work was to better understand the level of accuracy of existing vegetation mapping and associated ecological constraints, and to inform further refinement of the proposal. The vegetation validation continued in Winter 2021.

From Spring 2020, vegetation integrity plots (BAM plots) were undertaken to further validate the mapped PCTs. A total of 172 BAM plots were surveyed by August 2021 where consent to enter to access land had been granted by landowners.

A summary of the PCTs, listing under the BC Act and EPBC Act and percentage cleared is provided in Table 7. Mapped PCTs from the data review in section 3.1 and field validation relevant to the biodiversity study area are shown in Figure 18 to Figure 21.

Table 7: Mapped PCTs in the biodiversity study area

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
-999[2]	Unmapped	NA	NA	-	-	-	NA
-888[3]	Unknown PCT	NA	NA	-	-	-	NA
0	Not Native	NA	NA	-	-	-	NA – no surveys planned or undertaken
5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.	Inland Riverine Forests, Forested Wetlands	NA	-	-	40	No
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Floodplain Transition Woodlands	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar, and Brigalow Belt South Bioregions (BC Act) (EPBC Act)	Endangered	Endangered	92	Yes
79	River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion	Eastern Riverine Forests	NA	-	-	66	No
85	River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion	Eastern Riverine Forests	NA	-	-	73	No
185	Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	Inland Rocky Hill Woodlands	NA	-	-	20	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (White Box Yellow Box Blakely's Red Gum Woodland) (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	94	Yes
268	White Box - Blakelys Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	63	Yes
276	Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	90	No
277	Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	95	Yes
278	Riparian Blakelys Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	80	Yes
280	Red Stringybark – Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	80	Yes

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
283	Apple Box - Blakelys Red Gum moist valley and footslopes grass-forb open forest of the NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	91	Yes
285	Broad-leaved Sally grass - sedge woodland on valley flats and swamps in the NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion	Upper Riverina Dry Sclerophyll Forests	NA	-	-	75	No
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion	Western Slopes Dry Sclerophyll Forests	NA	-	-	67	No
289	Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Upper Riverina Dry Sclerophyll Forests	NA	-	-	60	No
290	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion	Upper Riverina Dry Sclerophyll Forests	NA	-	-	67	No
294	Nortons Box - Red Box - White Box tussock grass open forest of the southern section of the NSW South Western Slopes Bioregion	Upper Riverina Dry Sclerophyll Forests	NA	-	-	47	No
295	Robertson's Peppermint - Broad-leaved Peppermint - Nortons Box - stringybark shrub-fern open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	Southern Tableland Wet Sclerophyll Forests	NA	-	-	40	No
296	Brittle Gum - peppermint open forest of the Woomargama to Tumut region, NSW South Western Slopes Bioregion	Southern Tableland Wet Sclerophyll Forests	NA	-	-	60	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
297	Broad-leaved Peppermint - Nortons Box - Red Stringybark tall open forest on red clay on hills in the southern part of the NSW South Western Slopes Bioregion	Upper Riverina Dry Sclerophyll Forests	NA	-	-	40	No
298	Apple Box - Nortons Box - Blakelys Red Gum valley flat moist grassy tall open forest in the southern NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion	Upper Riverina Dry Sclerophyll Forests	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	86	Yes
299	Riparian Ribbon Gum - Robertson's Peppermint - Apple Box riverine very tall open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	Southern Tableland Wet Sclerophyll Forests	NA	-	-	50	No
300	Ribbon Gum - Narrow-leaved (Robertson's) Peppermint montane fern - grass tall open forest on deep clay loam soils in the upper NSW South Western Slopes Bioregion and western Kosciuszko escarpment	Southern Tableland Wet Sclerophyll Forests	NA	-	-	20	Yes
301	Drooping Sheoak - *Ricinocarpus bowmannii* - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt	Western Slopes Grassy Woodlands	Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions	Endangered	-	72	No
302	Riparian Blakelys Red Gum - Broad-leaved Sally woodland - tea-tree - bottlebrush - wattle shrubland wetland of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	Upper Riverina Dry Sclerophyll Forests	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	50	No
304	Candlebark - Apple Box - Narrow-leaved Peppermint tall open forest on granite in the Tumbarumba region of the South Eastern	Upper Riverina Dry Sclerophyll Forests	NA	-	-	90	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
	Highlands Bioregion and upper NSW South Western Slopes Bioregion						
305	Apple Box - Broad-leaved Peppermint - Red Stringybark shrubby hill open forest in the upper NSW South Western Slopes Bioregion and adjacent South Eastern Highlands Bioregion	Upper Riverina Dry Sclerophyll Forests	NA	-	-	40	No
306	Red Box - Red Stringybark - Nortons Box hill heath shrub - tussock grass open forest of the Tumut region	Upper Riverina Dry Sclerophyll Forests	NA	-	-	33	No
309	Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Western Slopes Dry Sclerophyll Forests	NA	-	-	15	No
310	Nortons Box - Red Stringybark grassy tall open forest on sheltered slopes in the Tumbarumba - Murray River region of the NSW South Western Slopes Bioregion	Upper Riverina Dry Sclerophyll Forests	NA	-	-	40	No
311	Red Stringybark - Broad-leaved Peppermint - Nortons Box heath open forest of the upper slopes subregion in the NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion	Upper Riverina Dry Sclerophyll Forests	NA	-	-	15	No
312	Yellow Box grassy tall woodland on valley flats in the upper slopes of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	Southern Tableland Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	93	No
313	Brittle Gum - Broad-leaved Peppermint open forest with tall dense shrub understorey on riparian coarse-grained granitic soils in the NSW South Western Slopes Bioregion	Upper Riverina Dry Sclerophyll Forests	NA	-	-	0	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
314	Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	Upper Riverina Dry Sclerophyll Forests	NA	-	-	50	No
316	Nortons Box - Red Box - Red Stringybark +/- Nodding Flax Lily forb-grass open forest mainly on the Tumut region	Western Slopes Grassy Woodlands;	NA	-	-	63	No
317	Currawang very tall shrubland on siliceous rocky ridges and cliffs mainly in the NSW South Western Slopes Bioregion	Inland Rocky Hill Woodlands	NA	-	-	13	No
318	Mugga Ironbark -Tumbledown Red Gum - Red Box - Black Cypress Pine open forest on shallow stony soils on hills in the NSW South Western Slopes Bioregion	Inland Rocky Hill Woodlands	NA	-	-	60	No
319	Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Inland Rocky Hill Woodlands	NA	-	-	60	No
320	Kangaroo Grass - Redleg Grass forb-rich temperate tussock grassland of the northern Monaro, ACT and upper Lachlan River regions of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	Western Slopes Grassland	Natural Temperate Grassland of the South Eastern Highlands	-	Critically Endangered	96	No
335	Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Inland Floodplain Swamps	NA	-	-	83	Yes
337	Apple Box - Silver Banksia - Drooping Sheoak open woodland - tall shrubland in protected gullies of the Coolac - Tumut serpentinite belt, NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions	Endangered	-	90	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
343	Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamophic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	Western Slopes Dry Sclerophyll Forests	NA	-	-	88	No
346	White Box - Blakelys Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion	Western Slopes Dry Sclerophyll Forests	NA	-	-	60	No
347	White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	63	No
348	Red Stringybark - Long-leaved Box - Joycea pallida grassy open forest in the upper Lachlan catchment, NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	Western Slopes Dry Sclerophyll Forests	NA	-	-	60	No
349	Inland Scribbly Gum - Red Stringybark open forest on hills composed of silicous substrates in the mid-Murrumbidgee and upper Lachlan catchments mainly in the western South Eastern Highlands Bioregion	Southern Tablelands Dry Sclerophyll Forests	NA	-	-	50	No
351	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	Southern Tablelands Dry Sclerophyll Forests	Mt Canobolas Xanthoparmelia Lichen Community	Endangered	-	60	No
352	Red Stringybark - Blakelys Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	Southern Tableland Dry Sclerophyll Forests	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	86	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
426	Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	NA	NA	NA	90	No
498	Black Sallee plateau low woodland in the southern Brigalow Belt South Bioregion	New England Grassy Woodland	Mount Kaputar high elevation and dry rainforest land snail and slug community in the Nandewar and Brigalow Belt South Bioregions	Endangered	-	20	No
637	Alpine and sub-alpine peatlands, damp herbfields and fens, South Eastern Highlands Bioregion and Australian Alps Bioregion	Alpine Bogs and Fens	Montane Peatlands and Swamps of the New England Tableland (BC Act) (EPBC Act)	Endangered	Endangered	5	No
638	Alpine Ash - Mountain Gum moist shrubby tall open forest of montane areas, southern South Eastern Highlands Bioregion and Australian Alps Bioregion	Montane Wet Sclerophyll Forests	NA	-	-	5	Yes
639	Alpine Ash - Snow Gum shrubby tall open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion	Montane Wet Sclerophyll Forests	NA	-	-	5	No
641	Alpine grassland/herbfield and open heathlands in Kosciuszko National Park, Australian Alps Bioregion	Alpine Herbfields	NA	-	-	5	No
644	Alpine Snow Gum - Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko NP, South Eastern Highlands Bioregion and Australian Alps Bioregion	Subalpine Woodlands	NA	-	-	5	No
679	Black Sallee - Snow Gum low woodland of montane valleys, South Eastern Highlands Bioregion and Australian Alps Bioregion	Subalpine Woodlands	Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion	Critically Endangered	-	35	Yes

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
			Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions				
703	Blakely's Red Gum - Yellow Box - Rough-barked Apple grassy woodland of the Capertee Valley, Sydney Basin Bioregion	Southern Tableland Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	75	No
731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion	Southern Tableland Grassy Woodlands	NA	-	-	80	Yes
766	Carex sedgeland of the slopes and tablelands	Montane Bogs and Fens	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions (BC Act)	Endangered		75	No
			Natural Temperate Grassland of the South Eastern Highlands (EPBC Act)		Critically Endangered		
796	Derived grassland of the NSW South Western Slopes	Western Slopes Grasslands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	0	Yes
797	Derived grassland of the South Eastern Highlands Bioregion and South East Corner Bioregion	Temperate Montane Grasslands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	0	No

PCT ID	PCT Community Type name	Vegetation class/formation		Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
				Lowland Grassy Woodland in the South East Corner Bioregion (BC Act)	Endangered	-		
				Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion (BC Act)	Critically Endangered	-		
				Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions (BC Act)	Critically Endangered	-		
797	Derived grassland of the South Eastern Highlands Bioregion and South East Corner Bioregion	Temperate Grasslands	Montane	White Box Yellow Box Blakely's Red Gum Woodland (BC Act, EPBC Act)	Critically Endangered	Critically Endangered	0	Yes
				Lowland Grassy Woodland in the South East Corner Bioregion (BC Act)	Endangered			
				Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion (BC Act)	Critically Endangered			
				Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions (BC Act)	Critically Endangered			

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
840	Forest Red Gum - Yellow Box woodland of dry gorge slopes, southern Sydney Basin Bioregion and South Eastern Highlands Bioregion	Central Gorge Dry Sclerophyll Forests	White Box Yellow Box Blakely's Red Gum Woodland (BC Act, EPBC Act)	Critically Endangered	Critically Endangered	50	No
858	Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north-east South-Eastern Highlands Bioregion	Central Gorge Dry Sclerophyll Forests	NA	-	-	20	No
877	Hinterland dry rainforest	Dry Rainforests	Western Sydney Dry Rainforest in the Sydney Basin Bioregion (Part) (BC Act) Western Sydney Dry Rainforest in the Sydney Basin Bioregion (Part) (EPBC Act)	Endangered	Critically Endangered	25	No
939	Montane wet heath and bog of the eastern tablelands, South Eastern Highlands Bioregion	Montane Bogs and Fens	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin	Endangered	-	50	Yes
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges, South Eastern Highlands Bioregion and Australian Alps Bioregion	Southern Tableland Dry Sclerophyll Forests	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Endangered	-	5	Yes
963	Narrow-leaved Peppermint - Mountain Gum - Brown Barrel moist open forest on high altitude ranges, northern South Eastern Highlands Bioregion	Southern Escarpment Wet Sclerophyll Forests	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (BC Act) Mount Gibraltar Forest in the Sydney Basin Bioregion (EPBC Act)	Endangered	Endangered	30	No
979	New England Blackbutt - Diehard Stringybark dry open forest of the escarpment ranges of the	Northern Escarpment Dry Sclerophyll Forests	NA	-	-	20	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
	eastern New England Tableland Bioregion and NSW North Coast Bioregion						
1079	Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	Southern Lowlands Wet Sclerophyll Forests	NA	-	-	45	No
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	Southern Tableland Dry Sclerophyll Forests	NA	-	-	61	Yes
1097	Ribbon Gum - Narrow-leaved Peppermint grassy open forest on basalt plateaux, Sydney Basin Bioregion and South Eastern Highlands Bioregion	Southern Tableland Wet Sclerophyll Forests	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (BC Act) Robertson Basalt Tall Open forest in the Sydney Basin and South Eastern Highlands Bioregions (BC Act) Robertson Basalt Tall Open forest in the Sydney Basin and South Eastern Highlands Bioregions (EPBC Act)	Endangered CE	Endangered	95	No
1100	Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion	Tableland Clay Grassy Woodlands	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (E) Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion (CE) Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and	Endangered (E) Critically Endangered (CE)	-	83	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
			South East Corner Bioregions (CE)				
1105	River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion	Eastern Riverine Forests	NA	-	-	40	No
1107	River Peppermint - Narrow-leaved Peppermint open forest on sheltered escarpment slopes, Sydney Basin Bioregion and South East Corner Bioregion	Southern Escarpment Wet Sclerophyll Forests	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (BC Act) Robertson Basalt Tall Open forest in the Sydney Basin and South Eastern Highlands Bioregions (BC Act) Robertson Basalt Tall Open forest in the Sydney Basin and South Eastern Highlands Bioregions (EPBC Act) Southern Highlands Shale Woodlands in the Sydney Basin Bioregion (EPBC Act)	Endangered Critically Endangered	Endangered Critically Endangered	10	No
1150	Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north-east South-Eastern Highlands Bioregion	South East Dry Sclerophyll Forests	NA	-	-	40	No
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest of the South Eastern Highlands Bioregion	South East Dry Sclerophyll Forests	NA	-	-	90	Yes
1155	Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion	South East Dry Sclerophyll Forests	NA	-	-	20	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
1190	Snow Gum - Candle Bark shrubby open forest in valleys of the southern ACT ranges, South Eastern Highlands Bioregion	Subalpine Woodlands	NA	-	-	10	No
1191	Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	Subalpine Woodlands	Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion (CE) Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions (CE)	Critically Endangered	-	95	No
1196	Snow Gum - Mountain Gum shrubby open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion	Subalpine Woodlands	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Endangered	-	5	Yes
1224	Sub-alpine dry grasslands and heathlands of valley slopes, southern South Eastern Highlands Bioregion and Australian Alps Bioregion	Temperate Montane Grasslands	NA	-	-	5	No
1256	Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Montane Bogs and Fens	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands, and Australian Alps bioregions (BC Act, EPBC Act) Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion (BC Act, EPBC Act)	Endangered Critically Endangered	Endangered Critically Endangered	85	No

PCT ID	PCT Community Type name	Vegetation class/formation	Threatened Ecological Community name	BC Act listing	EPBC Act listing	% cleared	Recorded during field survey[1]
			Blue Mountains Swamps in the Sydney Basin Bioregion (BC Act, EPBC Act) Natural Temperate Grassland of the South Eastern Highlands (EPBC Act)				
1300	Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	Dry Rainforests	Illawarra Subtropical Rainforest in the Sydney Basin Bioregion (BC Act)	Endangered	Critically Endangered	90	No
			Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion (BC Act)	Endangered	Critically Endangered		
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Southern Tablelands Grassy Woodlands	White Box Yellow Box Blakely's Red Gum Woodland (BC Act) (EPBC Act)	Critically Endangered	Critically Endangered	94	Yes

Note: [1] A 'no' response in 'recorded during field survey' means that the PCT has not yet been recorded or validated in the area. This may be due to the PCT not being present, or that area where the PCT is likely to occur has not been assessed / surveyed.

[2] Areas of vegetation that are unmapped (-999). The original mapping contained 28,588.5 ha of unmapped area, field survey assigned 2,493.2 ha to PCT, 29.32% of the biodiversity study area.

[3] Areas of vegetation mapping does not align with a current PCT (-888) and therefore unknown PCT. Original mapping contained 856.5 ha of unknown PCTs -888, field survey assigned 32.5 ha to PCT, 0.9% of the biodiversity study area. Due to the preliminary nature of ongoing surveys these PCTs will be confirmed during future surveys informing the EIS.

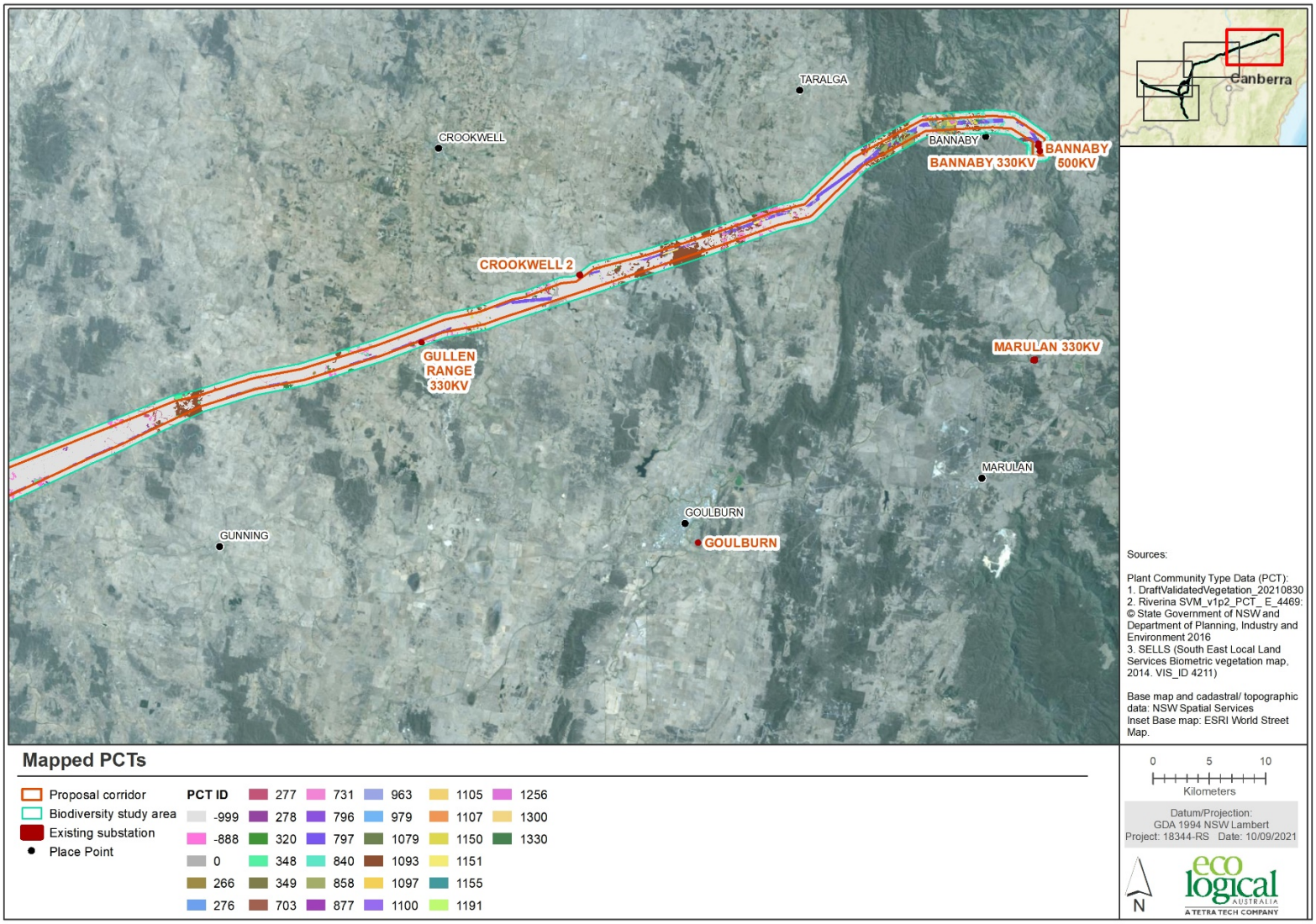


Figure 18: Mapped PCTs (1/4)

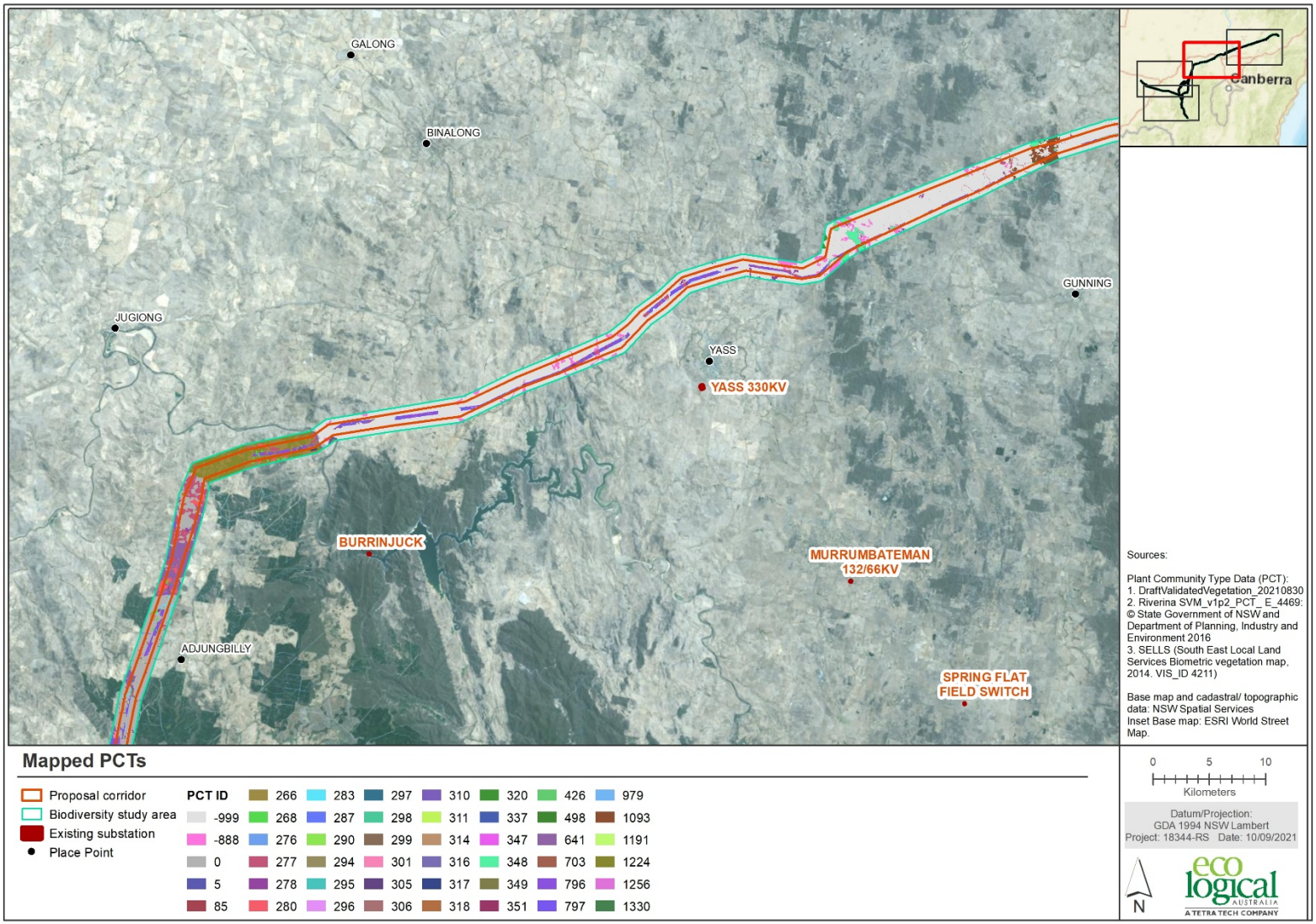


Figure 19: Mapped PCTs (2/4)

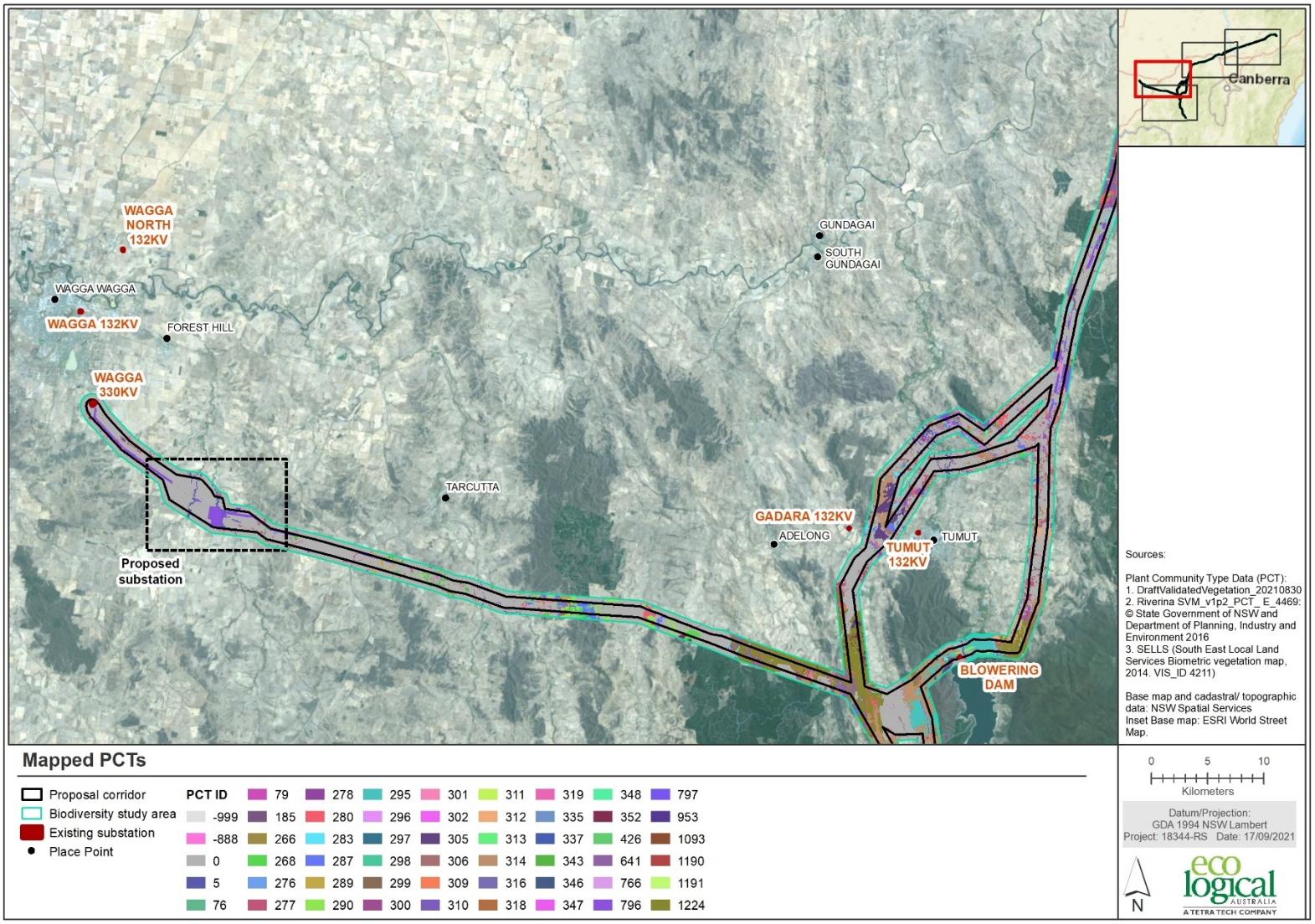


Figure 20: Mapped PCTs (3/4)

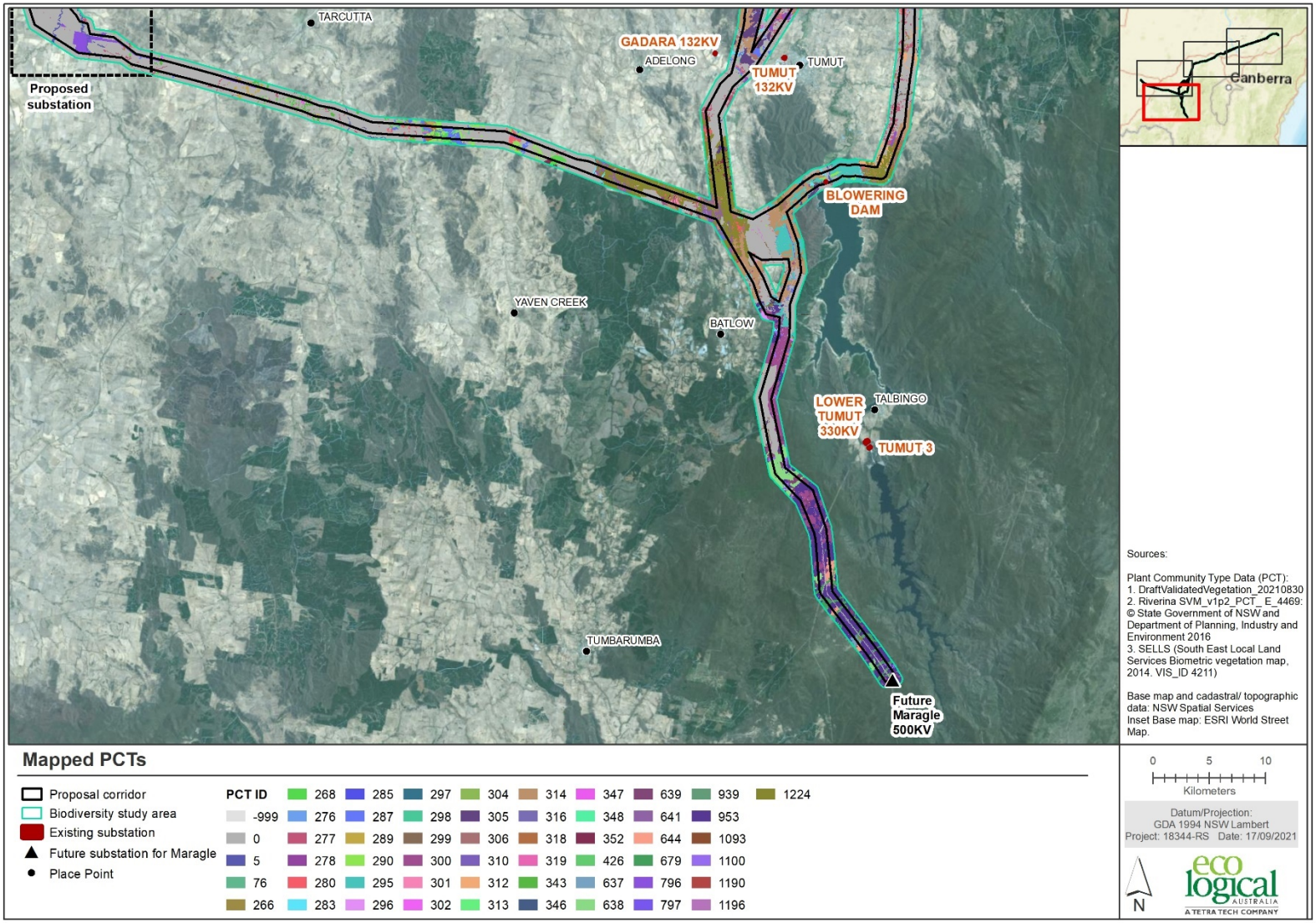


Figure 21: Mapped PCTs (4/4)

3.3.3. State-listed Threatened Ecological Communities

There are seven TECs listed under the BC Act mapped as occurring within the biodiversity study area and have been observed during field survey. These TECs and the associated listings are described in Table 8.

The following BC Act-listed TECs were mapped as occurring within the biodiversity study area, but have not been recorded during field surveys (they may occur and have not yet been surveyed or they may not occur at all):

- Artesian Springs Ecological Community in the Great Artesian Basin – very unlikely to occur in the biodiversity study area and confined to the central – northern parts of NSW
- Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion – very unlikely to occur in the biodiversity study area and confined to within the local government areas of Bland and Temora
- Western Sydney Dry Rainforest in the Sydney Basin Bioregion (Part) – unlikely to occur within the biodiversity study area and generally confined to the far southern section of the Cumberland Plain, in the Razorback Range near Picton
- Robertson Basalt Tall Open forest in the Sydney Basin and South Eastern Highlands Bioregions – unlikely to occur in the biodiversity study area and confined to Robertson Basalt on the Southern Highlands of NSW but also found on the Cambewarra Range
- Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion – very unlikely to occur in the biodiversity study area and confined to an area to the north and west of the proposal in the local government areas of Lithgow and Blue Mountains City
- Blue Mountains Swamps in the Sydney Basin Bioregion – very unlikely to occur in the biodiversity study area and is confined to an area to the north of the study area in the Blue Mountains
- Mt Canobolas *Xanthoparmelia* Lichen Community (Part) – very unlikely to occur in the biodiversity study area and occurs to the north of the proposal near Bathurst
- Mount Kaputar high elevation and dry rainforest land snail and slug community in the Nandewar and Brigalow Belt South Bioregions
- Illawarra Subtropical Rainforest in the Sydney Basin Bioregion – very unlikely to occur in the biodiversity study area and is recorded from the local government areas of Wollongong, Shellharbour, Shoalhaven and Kiama
- Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion – very unlikely to occur in the biodiversity study area and confined to the Milton region on the South Coast of NSW.

Table 8: Threatened ecological communities - BC Act listing

TEC	BC Act listing
Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion	Critically Endangered
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions	Critically Endangered
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Critically Endangered

TEC	BC Act listing
Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions	Endangered
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar, and Brigalow Belt South Bioregions	Endangered
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands, and Australian Alps bioregions	Endangered
Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Endangered

MONARO TABLELAND COOL TEMPERATE GRASSY WOODLAND IN THE SOUTH EASTERN HIGHLANDS BIOREGION

Monaro Tablelands Cool Temperate Grassy Woodland is a woodland to low open woodland community. It is characterised by a sparse to very sparse tree (woodland to open woodland) layer dominated by *Eucalyptus pauciflora* (snow gum) either as a single species or with any of *Acacia melanoxylon* (blackwood), *E. rubida* (candlebark), *E. stellulata* (black sallee) and/or *E. viminalis* (ribbon gum) as co-dominants. Other tree species may occur within the community, although very infrequently and always as canopy sub-dominants.

The tree layer becomes shorter and sparser with declining moisture availability or increasing levels of soil water logging. Tree cover may be reduced or absent due to historic land management practices.

A continuous ground layer is usually present, although this may vary in composition and cover. The ground layer is typically dominated by *Themeda triandra* (kangaroo grass) and *Poa sieberiana* (snow grass), although a relatively wide range of frequently encountered species also make a substantial contribution to the ground cover.

The community can also occur as secondary grassland where trees have been removed but the understorey composition remains largely intact. The composition can be difficult to separate from natural temperate grassland, with landscape cues such as the presence of snow gum in a similar landscape position used as a guide (DPIE, 2019c).

WERRIWA TABLELANDS COOL TEMPERATE GRASSY WOODLAND IN THE SOUTH EASTERN HIGHLANDS AND SOUTH EAST CORNER BIOREGIONS

Werriwa Tablelands Cool Temperate Grassy Woodland ranges in structure from woodland to low open woodland. It is characterised by a sparse to very sparse (woodland to open woodland) tree layer dominated by *Eucalyptus pauciflora* (snowgum) either in single species stands or with *E. rubida* (candlebark) as a co-dominant. Other tree species have been recorded within the community, although very infrequently and always as canopy sub-dominants (DPIE, 2019b).

Tree height and cover vary as a function of moisture availability, drainage, and past land management. The tree layer becomes shorter and sparser with declining moisture availability or increasing levels of soil waterlogging. Trees may be reduced or absent due to historic management.

A continuous ground layer is usually present, although this may vary in composition and cover due to natural variation and historic management.

The community can also occur as secondary grassland where trees have been removed but the understorey composition remains largely intact. The composition can be difficult to separate from natural temperate grassland, with landscape cues such as the presence of snow gum in a similar landscape position used as a guide.

WHITE BOX - YELLOW BOX - BLAKELY'S RED GUM GRASSY WOODLAND AND DERIVED NATIVE GRASSLAND IN THE NSW NORTH COAST, NEW ENGLAND TABLELAND, NANDEWAR, BRIGALOW BELT SOUTH, SYDNEY BASIN, SOUTH EASTERN HIGHLANDS, NSW SOUTH WESTERN SLOPES, SOUTH EAST CORNER AND RIVERINA BIOREGIONS

This TEC is comprised of many PCTs, over 102 in the NSW South Western Slopes Bioregion alone. This TEC is mapped (based on spatial modelling) in the Ravine area east of the Flying Fox Trail and west of the Yarrangobilly River (DPIE, 2020m). This area has not been verified in the field and detailed field survey is required to determine the presence and distribution of this TEC.

COOLAC-TUMUT SERPENTINITE SHRUBBY WOODLAND IN THE NSW SOUTH WESTERN SLOPES AND SOUTH EASTERN HIGHLANDS BIOREGIONS

This TEC corresponds to the Drooping Sheoke - *Ricinocarpus bowmannii* - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt PCT. This TEC is mapped as occurring in the east of the study area north of Roundtop Mountain and adjacent to Lobs Hole Ravine Road which is on limestone and shale geology. Some of these mapped areas along Lobs Hole Ravine Road were visited in the field and found not to contain the TEC but instead disturbed areas consisting of sparse to dense regrowth of *Eucalyptus rubida*, *Acacia dealbata*, *Dodonaea viscosa* subsp. *angustissima*, *Bursaria spinosa*, *Calytrix tetragona*, and *Exocarpos strictus*. The characteristic species *Allocasuarina verticillata*, *Acacia implexa*, *Xanthorrhoea glauca* and *Ricinocarpos bowmanii* were not present in the areas visited. Based on the site visits, the available mapping of this TEC is likely to be inaccurate. This TEC may still be present in the biodiversity study area where small areas of outcropping of serpentenite occur such as the belt of serpentenite and ultramafics on the western slope of Sheep Station Ridge (DPIE, 2017).

INLAND GREY BOX WOODLAND IN THE RIVERINA, NSW SOUTH WESTERN SLOPES, COBAR PENEPLAIN, NANDEWAR, AND BRIGALOW BELT SOUTH BIOREGIONS

Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions is the name given to the ecological community found on relatively fertile soils of the western slopes and plains of NSW in which *Eucalyptus macrocarpa* (Inland Grey Box) is the most characteristic species. The community generally occurs where average rainfall is 375-800 mm pa (Moore 1953, Beadle 1981, Botanic Gardens Trust 2005) and the mean maximum annual temperature is 22-26°C (Botanic Gardens Trust 2005).

In NSW the community principally occurs within the Riverina and South West Slopes Bioregions and is also found in portions of the Cobar Peneplain, Nandewar, and Brigalow Belt South Bioregions (DPIE, 2019f).

MONTANE PEATLANDS AND SWAMPS OF THE NEW ENGLAND TABLELAND

Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions is the name given to the ecological community associated with accumulated peaty or organic-mineral sediments on poorly drained flats in the headwaters of streams. It occurs on undulating tablelands and plateaus, above 400-500 m elevation,

generally in catchments with basic volcanic or fine-grained sedimentary substrates or, occasionally, granite. Montane Peatlands and Swamps is characterised by a dense, open, or sparse layer of shrubs with soft-leaved sedges, grasses, and forbs. Characteristic shrubs include *Baeckea gunniana*, *B. utilis*, *Callistemon pityoides*, *Leptospermum juniperinum*, *L. lanigerum*, *L. myrtifolium*, *L. obovatum*, *L. polygalifolium*. Species of *Epacris* and *Hakea microcarpa* are also common shrubs. Species of *Poa* and *Carex* comprise the highest cover and biomass. It is the only type of wetland that may contain more than trace amounts of *Sphagnum* spp., the hummock peat-forming mosses. Small trees may be present as scattered emergents or absent from the community (DPIE, 2019)

TABLELAND BASALT FOREST IN THE SYDNEY BASIN AND SOUTH EASTERN HIGHLANDS BIOREGIONS

The western portion of the biodiversity study area in the Maragle and Bago State Forests where areas of Olivine Basalt occur lies within the Australian Alps bioregion. The portion of the study area that falls within and near the edge of the South Eastern Highlands bioregions contains PCTs that may form part of this TEC including:

- Snow Gum - Mountain Gum shrubby open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion (mapped in the Maragle State Forest on Biotite Granodiorite geology)
- Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges, South Eastern Highlands Bioregion and Australian Alps Bioregion (mapped in the Maragle State Forest on Biotite Granodiorite geology and in the Kosciuszko National Park Lobs Hole Ravine area on Quartzite and Siltstone geology).

While this PCT is named the Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions it may also occur on loam or clay soils derived from mudstones, granites, alluvium and other substrates at altitudes between 600 – 900 m above sea level. This TEC also includes disturbed areas of derived grasslands. This TEC may be present wherever *Eucalyptus viminalis* and/or *E. dalrympleana* subsp. *dalrympleana* occurs in the South East Highlands portion of the study area. Detailed field survey is required to determine the presence and distribution of this TEC (DPIE, 2019d).

3.3.4. Aquatic Habitats

The biodiversity study area extends over 270 km from east to west, and crosses several catchments, including:

- Lachlan
- Central West
- Murray
- Murrumbidgee.

The Murrumbidgee River is a major watercourse that connects Gundagai to Wagga Wagga and is a major landscape feature of the biodiversity study area. Other named major rivers include:

- Tumut River
- Yass River
- Lachlan River
- Goobarragandra River

- Tarlo River.

The following large waterbodies occur within the biodiversity study area:

- Blowering Reservoir – within the biodiversity study area
- Pejar Dam – within the biodiversity study area
- Talbingo Reservoir – within the biodiversity study area.

Mapped water bodies, stream order and drainage lines are shown in Figure 22 and Figure 23.

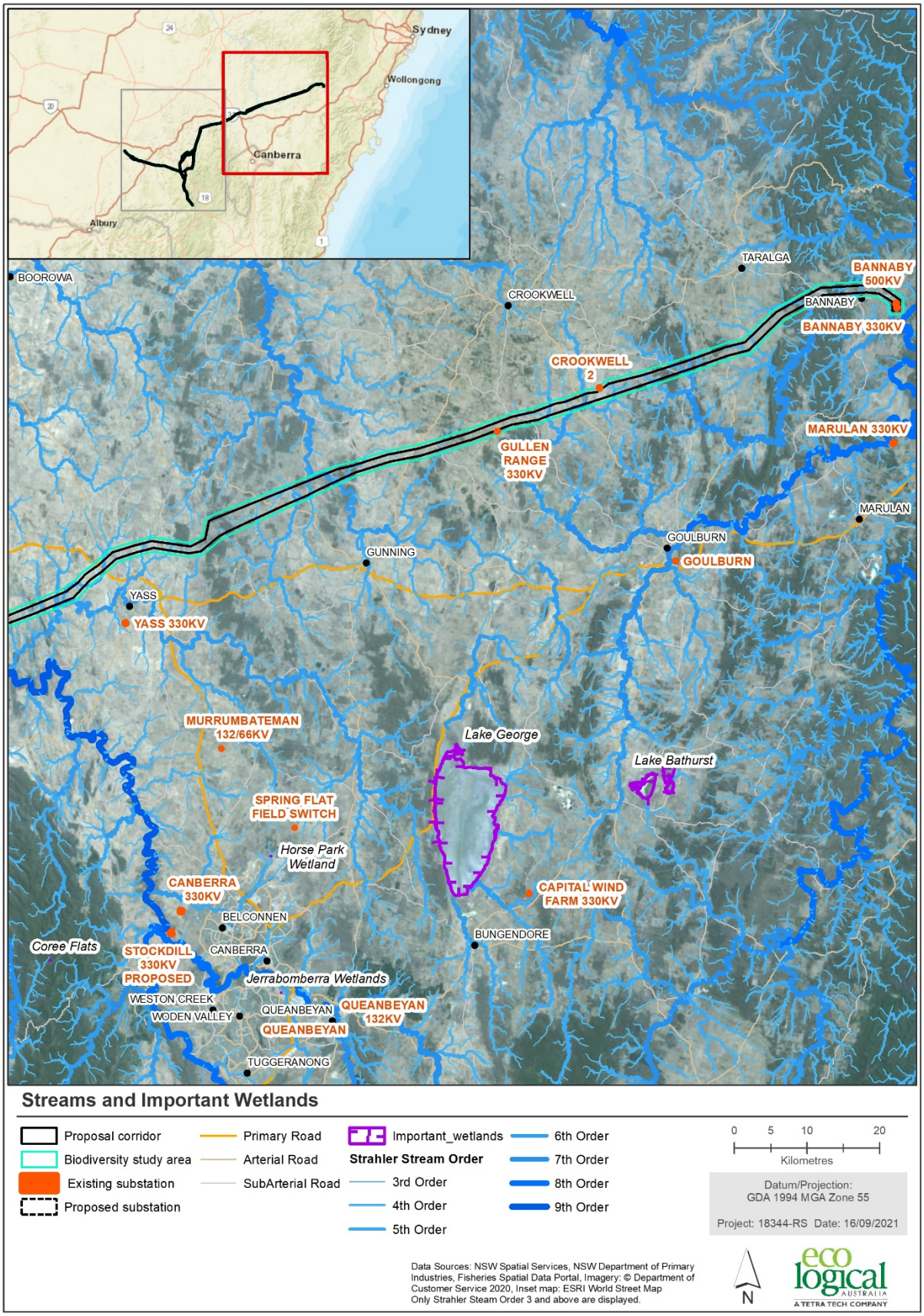


Figure 22: Strahler Streams and important wetlands (1/2)

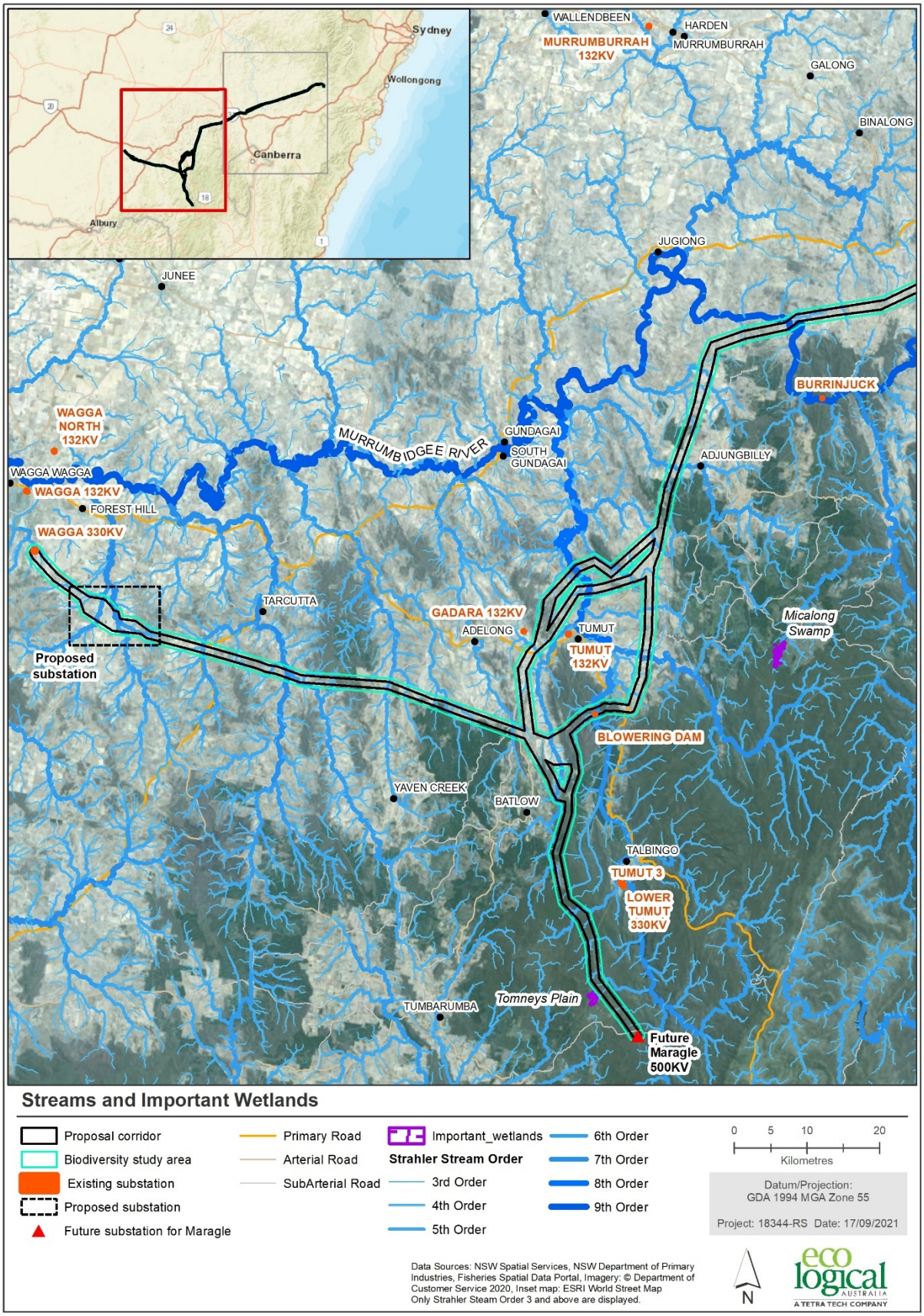


Figure 23: Strahler streams and important wetlands (2/2)

3.3.5. Groundwater Dependent Ecosystems

There are a number of high and moderate potential aquatic groundwater dependent ecosystems (GDEs) and terrestrial GDEs mapped within the study area by the GDE Atlas (Bureau of Meteorology, 2017). The aquatic GDEs correspond with the larger named water courses. Within or adjacent to the biodiversity study area, the mapped aquatic GDEs include Yorkers Creek, Native Dog Gully and New Zealand Gully and Appletree Gully in the west of the biodiversity study area, the Tumut River, and Sheep Station Creek, Lick Hole Gully, Cave Gully, Wallace Creek, Stable Creek and the Yarrangobilly River to the east of the biodiversity study area.

The Atlas of GDEs (Bureau of Meteorology, 2017) identifies portions of the biodiversity study area as containing some areas of moderate to high potential groundwater dependent terrestrial vegetation. The Atlas of GDEs dataset uses the same polygons as the Riverina Regional Native Vegetation Map Version v1.0 - VIS_ID 4469 (Office of Environment and Heritage, 2016). The study area around Maragle and Bago State Forests and western edge of the Kosciuszko National Park contain some areas of high potential terrestrial GDEs including areas of the:

- Black Sallee - Snow Gum low woodland of montane valleys, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT
- Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT.
- Alpine Ash - Snow Gum shrubby tall open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT.
- Robertsons Peppermint - Broad-leaved Peppermint - Nortons Box - stringybark shrub-fern open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion PCT
- Ribbon Gum - Narrow-leaved (Robertsons) Peppermint montane fern - grass tall open forest on deep clay loam soils in the upper NSW South Western Slopes Bioregion and western Kosciuszko escarpment PCT
- Snow Gum - Mountain Gum shrubby open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT · Brittle Gum - peppermint open forest of the Woomargama to Tumut region, NSW South Western Slopes Bioregion PCT.

While most of these PCTs are considered with a moderate to high likelihood to be GDEs they would not likely be obligate GDEs (i.e. they are not entirely dependent on groundwater). These PCTs are not restricted to locations of groundwater discharge and are not located within aquifers. These PCTs are likely to be opportunistic facultative GDEs that depend on the subsurface presence of groundwater (often accessed via the capillary fringe – subsurface water just above the water table) in some locations but not in others, particularly where an alternative source of water (i.e. rainfall) cannot be accessed to maintain ecological function.

The Alpine and sub-alpine peatlands, damp herbfields and fens, South Eastern Highlands Bioregion and Australian Alps Bioregion PCT in the higher altitude alpine areas in the Bago plateau in the Bago and Maragle State Forest presents the highest constraint in terms of terrestrial GDEs as it is likely to be highly dependent on groundwater.

3.4. Threatened Species

As outlined in section 3.1 of this PBA, threatened species database searches were carried out for the biodiversity study area. The BioNet records identified in total 88 records of flora and fauna species listed as threatened under the BC Act (refer Appendix A of this PBA). The PMST search identified 82 threatened species listed on the EPBC Act within the threatened flora and fauna search area (refer Appendix B). In addition, BAM species credit species for the proposal are provided in Appendix E of this PBA.

Preliminary field surveys have been carried out to validate the data and are ongoing. Of the 42 threatened flora species surveyed for between summer 2019/2020 and winter 2021, only six species were observed. These were *Thelymitra alpicola* (Alpine Sun-orchid), *Prasophyllum bagoense* (Bago Leek Orchid), *Prasophyllum keltonii* (Kelton's Leek Orchid), *Ammobium craspedioides* (Yass Daisy), *Leucocrysum albicans* var. *tricolor* (Hoary Sunray) and *Xerochrysum palustre* (Swamp Everlasting).

Of the 34 threatened fauna species surveyed for between summer 2019/2020 and winter 2021, only seven species were recorded. These were *Callocephalon fimbriatum* (Gang-gang Cockatoo), *Cercartetus nanus* (Eastern Pygmy-possum), *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Petauroides volans* (Greater Glider), *Polytelis swainsonii* (Superb Parrot), and *Petaurus norfolcensis* (Squirrel Glider). An additional number of species were recorded, despite not being targeted. These were *Climacteris picumnus victoriae* (Brown Tree Creeper), *Litoria verreauxii alpina* (Alpine Tree Frog), *Merops ornatus* (Rainbow Bee-eater), *Petroica boodang* (Scarlet Robin), *Petroica phoenecia* (Flame Robin), *Petaurus australis* (Yellow-bellied Glider), *Pachycephala olivacea* (Olive Whistler), *Stagonopleura guttata*, *Artamus cyanopterus* (Dusky Woodswallow), *Chthonicola sagittate* (Speckled Warbler), Tyto novaehollandiae (Masked Owl) and *Daphoenositta chrysoptera* (Varied Sitella).

A further summary of the field surveys carried out to date is provided in the following sections.

Threatened flora and fauna species records from BioNet (BC Act) searches and field validation surveys are shown in Figure 24 to Figure 28.

3.4.1. Threatened Flora Species

3.4.1.1. Limited Summer Surveys 2019/2020

Field surveys were conducted between 16 December 2019 – 19 December 2019, in and around Bago State Forest in southern NSW targeting four threatened orchid species. Three threatened orchid species were observed:

- *Thelymitra alpicola* (Alpine Sun-orchid) – Species credit species
- *Prasophyllum bagoense* (Bago Leek Orchid) – Species credit species
- *Prasophyllum keltonii* (Kelton's Leek Orchid) – Species credit species.

The only species targeted but not observed was *Pterostylis oreophila* (Blue-tongue Greenhood). For this species, approximately 41 km of road in the study area were driven slowly, looking for areas of suitable microhabitat above 1100 m altitude. A review of all previous records for NSW and the ACT suggested that the species was highly unlikely to grow below this elevation. Whenever areas of suitable habitat were seen, ecologists traversed the area on foot. This suitable microhabitat consisted of wet, boggy areas near drainage lines and springs lined with *Leptospermum grandiflorum* (Mountain Tea-tree),

mostly above 1200 m altitude, but rarely as low as 1100 m. Discussions with experts who have observed this species in the field suggest that it may not have been seen in NSW for over 10 years (D. Rouse pers. comm., M. Clements pers. comm., D. Jones pers. comm.). The species was badly affected by bushfires in 2003 in southern NSW and the ACT with all the experts cited above believing it led to local extinctions of most of the known populations. The species appears to be highly habitat specific and only small areas of this suitable habitat (high altitude, boggy soils beneath tea trees) exist in the study area.

3.4.1.2. Spring Surveys 2020

During the spring survey 2020 field work window, survey was carried out for the following 14 threatened flora species:

- *Ammobium craspediodes* (Yass Daisy) – Species credit species
- *Brachyschome papillosa* (Mossgiel Daisy) – Species credit species
- *Caladenia concolor* (Crimson Spider Orchid) – Species credit species
- *Diuris aequalis* (Buttercup Doubletail) – Species credit species
- *Eleocharis obiscis* (Spike-Rush) – Species credit Species
- *Grevillea wilkinsonii* (Tumut Grevillea) – Species credit species
- *Pomaderris cotoneaster* – Species credit species
- *Prasophyllum* sp Wybong - Species credit species
- *Prostanthera gilesii* – Species credit species
- *Pterostylis foliata* (Slender Greenhood) – Species credit species
- *Pultenaea elusa* (Elusive Bush-pea) – Species credit species
- *Pultenaea parrisiae* (Parris' Bush-pea) – Species credit species
- *Swainsona recta* (Small Purple-pea) – Species credit species
- *Swainsona sericea* (Silky Swainson-pea) – Species credit species.

Only one targeted threatened species, *Ammobium craspedioides* (Yass Daisy), was recorded during the surveys (ELA, 2020a). Survey was carried out for all the species in suitable habitat and following the recommended survey effort guidelines. However, apart from the Yass Daisy, no other threatened flora species were recorded during this survey. There had been good rain in 2020, no further bushfires and species were surveyed in the correct season. The results reflect that these species are generally absent from the areas of suitable habitat.

Summer Surveys 2020/2021

There were 24 species targeted for survey in summer 2020 / 2021:

- *Acacia bynoeana* (Bynoe's Wattle)
- *Caesia parviflora* var. *minor* (Small Pale Grass-lily)
- *Calotis glandulosa* (Mauve Burr-daisy)
- *Carex klaphakei* (Klaphake's Sedge)
- *Cullen parvum* (Small Scurf-pea)
- *Discaria nitida* (Leafy Anchor Plant)
- *Eucalyptus aggregata* (Black Gum)
- *Eucalyptus macarthurii* (Paddys River Box, Camden Woollybutt)
- *Glycine latrobeana* (Clover Glycine)
- *Grevillea iaspicula* (Wee Jasper Grevillea)
- *Leucochrysum albicans* var. *tricolor* (Hoary Sunray)
- *Lysimachia vulgaris* var. *davurica* (Yellow Loosestrife)
- *Persoonia glaucescens* (Mittagong Geebung)
- *Persoonia mollis* subsp. *revoluta*
- *Phyllota humifusa* (Dwarf Phyllota)
- *Pomaderris delicata* (Delicate Pomaderris)
- *Pomaderris pallida* (Pale Pomaderris)
- *Prasophyllum innubum*
- *Rutidosis leptorrhynchoides* (Button Wrinklewort)
- *Senecio garlandii* (Woolly Ragwort)
- *Solanum armourense* (Solanum armourense)
- *Thesium australe* (Austral Toadflax)
- *Xerochrysum palustre* (Swamp Everlasting)
- *Zieria citriodora* (Lemon Zieria).

Survey was carried out for all the species in suitable habitat and following the recommended survey effort guidelines and in the appropriate season. There had been above average rain in 2020, no further bushfires. The results reflect that these species are generally absent from the areas of suitable habitat. Only two threatened flora species were identified during summer survey 2020/2021:

- *Leucocrysum albicans* var. *tricolor* (Hoary Sunray) – Species credit species
- *Xerochrysum palustre* (Swamp Everlasting) – Species credit species.

Threatened species are shown in Figure 24 to Figure 28.

3.4.1.3. Autumn surveys 2021

The following species were targeted for survey in Autumn 2021:

- *Eucalyptus aggregata*
- *Grevillea iaspicula*
- *Leucochrysum albicans* var. *tricolor*
- *Rutidosis leptorrhynchoides*

- *Senecio garlandii*
- *Xerochrysum palustre*
- *Zieria citriodora.*

Only one of these species was observed during the surveys.

- *Leucochrysum albicans* var*. tricolor* (Hoary Sunray).

3.4.1.4. Winter surveys 2021

No targeted threatened flora surveys were conducted as part of the Winter 2021 survey season.

Only one species was incidentally observed during other survey effort.

- *Leucochrysum albicans* var. *tricolor* (Hoary Sunray).

3.4.2. Threatened Fauna Species

3.4.2.1. Limited Summer Surveys 2019/2020

ELA undertook a desktop assessment to identify potential Large Bent-winged Bat roosting habitat (e.g. caves, mines and tunnels) within the study area. NSW BioNet Atlas (DPIE 2020b) records of the species in the study area were searched for any records listed as 'in cave' under the 'microhabitat' code, records listed as 'nest/roost' under the 'observation type', or records with >500 individuals; no such records were found. Bridges were excluded from the assessment as they do not represent potential Large Bent-winged Bat breeding habitat.

Existing and historical mine locations were mapped using MinView, a publicly accessible database provided by the Division of Resources and Geoscience (DPIE 2020a). An expert bat ecologist used the known attributes of each mine and aerial photography to exclude open cut mines and alluvial workings that are not suitable as Large Bent-winged Bat breeding habitat. Additional information about the mines was obtained through the Derelict Mines Program, including whether the mines had been closed or filled in, and aerial mapping was used to detect evidence of recent ground disturbance. The result of the desktop assessment was the identification of seven survey locations.

Ultrasonic bat call data was recorded for the following species of threatened microbats:

- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) – Ecosystem credit species
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat) – Dual credit species*
- *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat) – Ecosystem credit species*

  *Note: Species not recorded within the current biodiversity study area.

The biodiversity study area also contains suitable habitat for two species of microbats:

- *Myotis macropus* (Southern Myotis) – Species credit species
- *Nyctophilus corbeni* (Corben's Long-eared Bat) – Ecosystem credit species.

All five species are listed as 'Vulnerable' under the NSW BC Act, and targeted threatened bat surveys was carried out to confirm presence within the biodiversity study area.

While Large Bent-winged Bat calls were among three threatened microbat species recorded using ultrasonic detectors, no Large Bent-wing Bats were observed during field surveys of potential bat habitat. In addition, the survey sites did not appear to comprise Large Bent-winged Bat breeding habitat (ELA, 2019).

3.4.2.2. Spring Surveys 2020

During this seasonal survey period, potential habitat for the following species of threatened fauna was identified:

- *Liopholis guthega* (Guthega Skink) – Species credit species
- *Cyclodomorphus praealtus* (Alpine Sheoak Skink) – Species credit species
- *Aprasia parapulchella* (Pink-tailed Worm-Lizard) – Species credit species.

Suitable habitat was only identified for a limited number of bird species. No target species were identified during bird surveys at the time of the Spring Survey 2020 (ELA, 2020b).

3.4.2.3. Summer Surveys 2020/2021

An initial list of species was shortlisted for survey in summer 2020 / 2021:

- *Burramys parvus* (Mountain Pygmy-possum)
- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Cercartetus nanus* (Eastern Pygmy-possum)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Isoodon obesulus* (Southern Brown Bandicoot (eastern))
- *Litoria aurea* (Green and Golden Bell Frog)
- *Lophoictinia isura* (Square-tailed Kite)
- *Mastacomys fuscus* (Broad-toothed Rat)
- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat)
- *Mixophyes balbus* (Stuttering Frog)
- *Mixophyes iteratus* (Giant Barred Frog)
- *Myotis macropus* (Southern Myotis)
- *Petauroides volans* (Greater Glider)
- *Petaurus norfolcensis* (Squirrel Glider)
- *Petrogale penicillata* (Brush-tailed Rock-wallaby)
- *Phascogale tapoatafa* (Brush-tailed Phascogale)
- *Phascolarctos cinereus* (Koala)
- *Polytelis swainsonii* (Superb Parrot)
- *Potorous tridactylus* (Long-nosed Potoroo)
- *Pseudomys fumeus* (Smoky Mouse)
- *Pseudophryne corroboree* (Southern Corroboree Frog)
- *Pseudophryne pengilleyi* (Northern Corroboree Frog).

However, some of these species were excluded from the survey based on absence of habitat features or known species ranges.

The following threatened fauna species were recorded within the biodiversity study area during the summer survey 2020/2021 period:

- *Callocephalon fimbriatum* (Gang Gang Cockatoo) – Dual credit species
- *Cercatetus nanus* (Eastern Pygmy Possum) – Species credit species
- *Climacteris picumnus victoriae* (Brown Tree Creeper) – Ecosystem credit species
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) – Ecosystem credit species
- *Litoria verreauxii alpine* (Alpine Tree Frog) – Species credit species
- *Merops ornatus* (Rainbow Bee-eater) - EPBC Act migratory species
- *Miniopterus orianae oceanensis* (potential) (Large Bent-wing Bat) – Dual credit species*
- *Petauroides volans* (Greater Glider) – Species credit species
- *Petaurus australis* (Yellow-bellied Glider) – Ecosystem credit species
- *Petroica boodang* (Scarlet Robin) – Ecosystem credit species
- *Petroica phoenecia* (Flame Robin) – Ecosystem credit species
- *Pomatostomus temporalis* (Grey-crowned Babbler) – Ecosystem credit species*
- *Rhipidura rufifrons* (Rufous Fantail)*
- *Tyto novaehollandiae* (Masked Owl) – Dual credit species.

  *Note: Species not recorded within the current biodiversity study area.

Threatened species are shown in Figure 24 to Figure 28.

3.4.2.4. Autumn surveys 2021

The following threatened fauna were surveyed for in Autumn 2021:

- *Cyclodormorphus praealtus* (Alpine She-oak Skink)
- *Liopholis guthega* (Guthega Skink)
- *Pseudomys fumeus* (Smoky Mouse)
- *Mastacomys fuscus* (Broad-toothed Rat)
- *Phascogale tapoatafa* (Brush-tailed Phascogale)
- Large forest owls.

The following threatened fauna were observed:

- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Climacteris picumnus victoriae* (Brown Treecreeper (eastern subspecies))
- *Petaurus norfolcensis* (Squirrel Glider)
- *Petroica boodang* (Scarlet Robin)
- *Petroica phoenicea* (Flame Robin)
- *Falsistrellus tasmaniensis* (Eastern Falsistrellus)
- *Stagonopleura guttata* (Diamond Firetail)
- *Polytelis swainsonii* (Superb Parrot).

3.4.2.5. Winter surveys 2021

The following threatened fauna were surveyed for in Winter 2021:

- *Phascogale tapoatafa* (Brush-tailed Phascogale)
- *Petauroides volans* (Greater Glider)
- *Petaurus norfolcensis* (Squirrel Glider)
- *Burhinus magnirostris* (Bush Stone-curlew)
- *Crinia sloanei* (Sloane's Froglet)
- *Calyptorhynchus lathami* (Glossy Black-Cockatoo)
- *Lathamus discolor* (Swift Parrot)
- *Xanthomyza phrygia* (Regent Honeyeater)
- Large forest owls.

The following threatened fauna were observed:

- *Petaurus norfolcensis* (Squirrel Glider).
- *Petroica boodang* (Scarlet Robin).

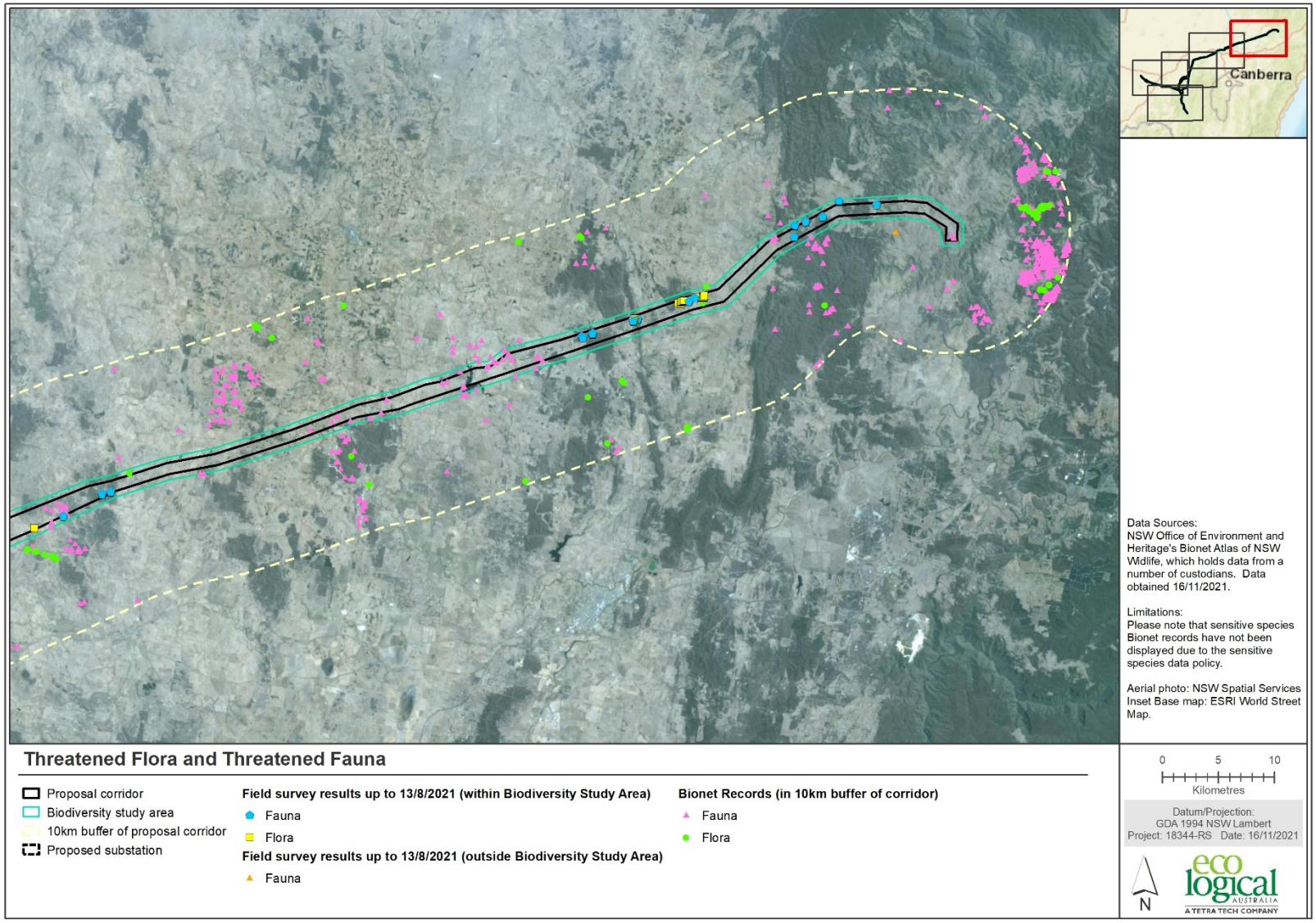


Figure 24: Threatened Flora and Fauna Records (BioNet NSW BC Act) (1/5)

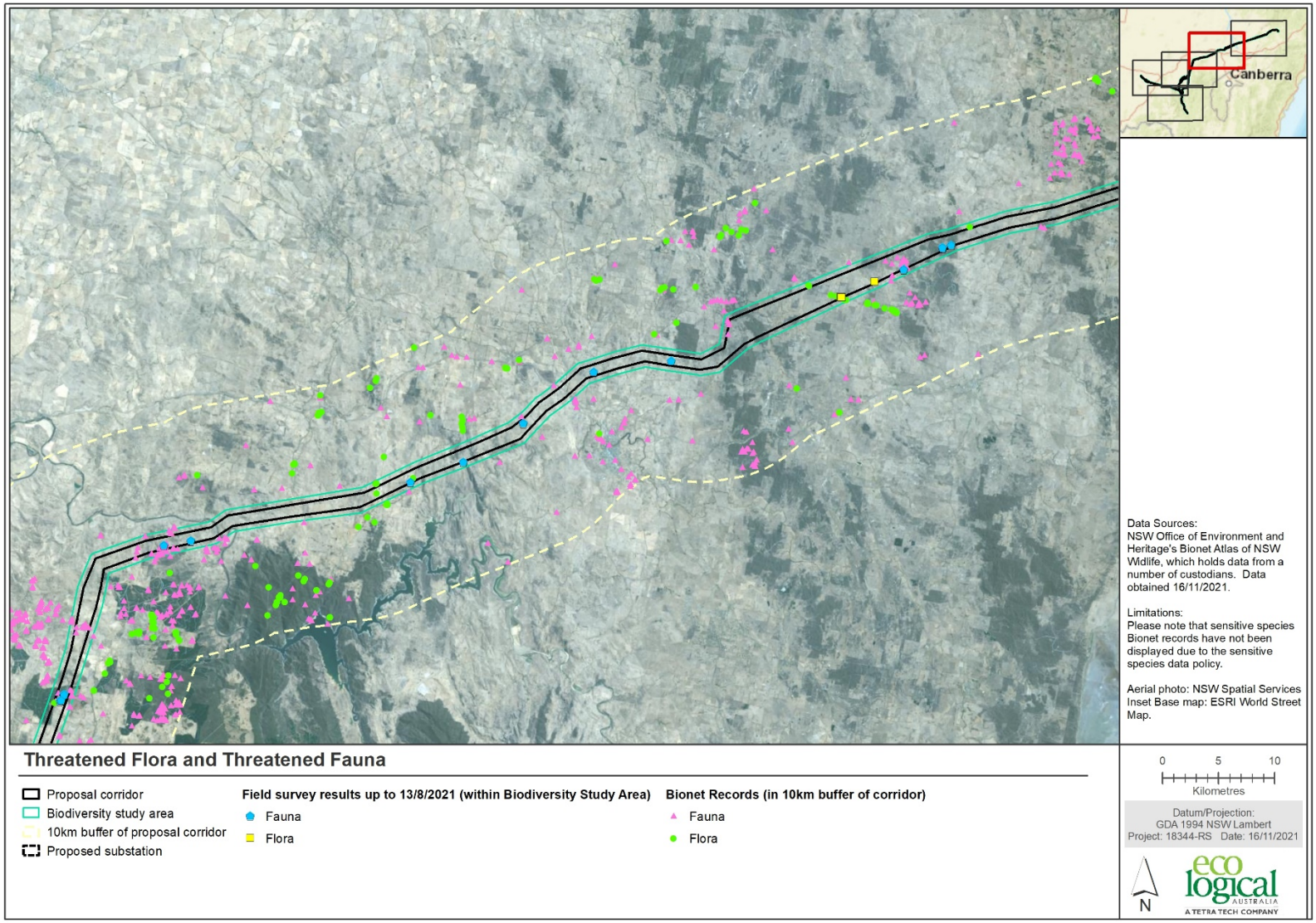


Figure 25: Threatened Flora and Fauna Records (BioNet NSW BC Act) (2/5)

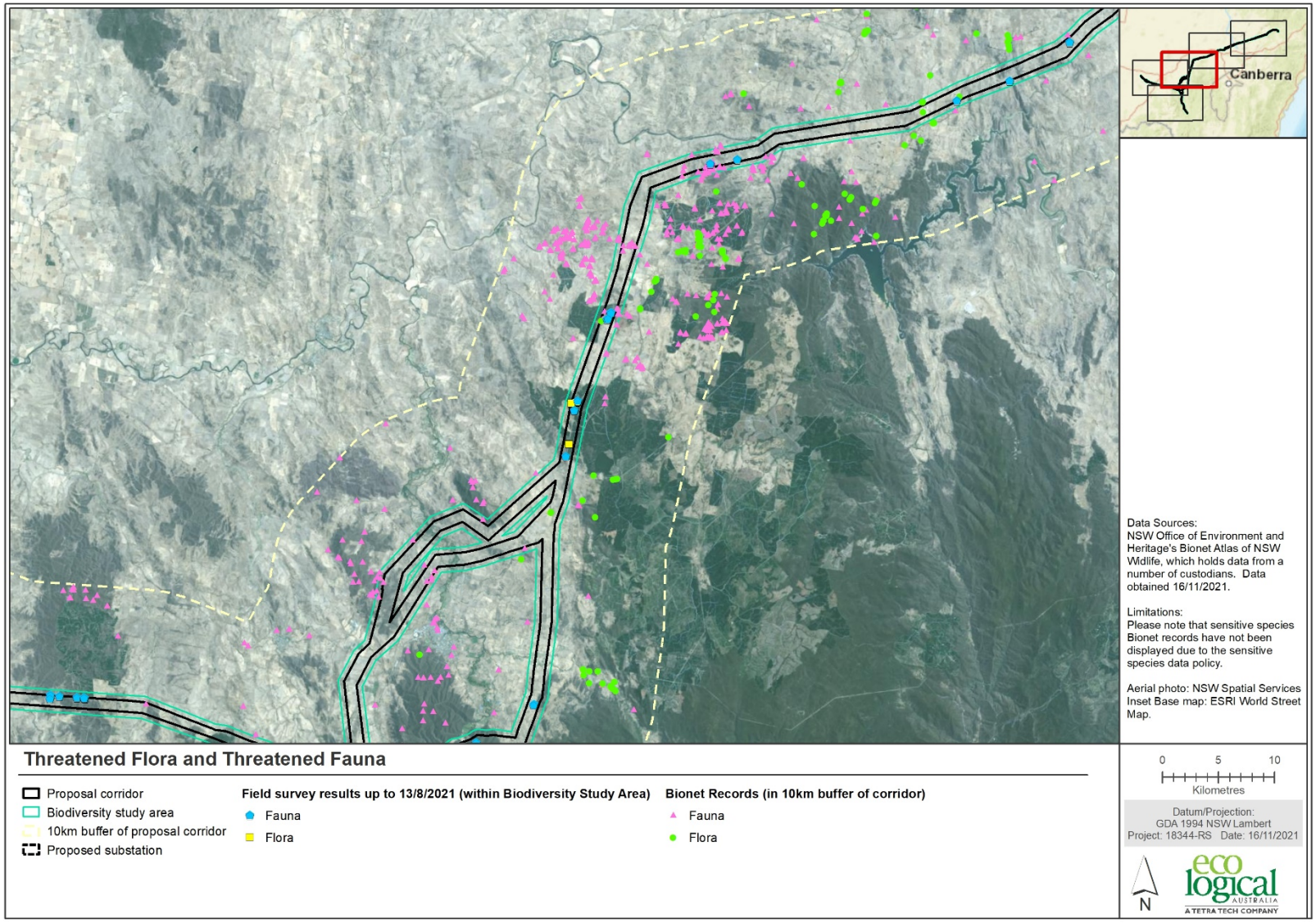


Figure 26: Threatened Flora and Fauna Records (BioNet NSW BC Act) (3/5)

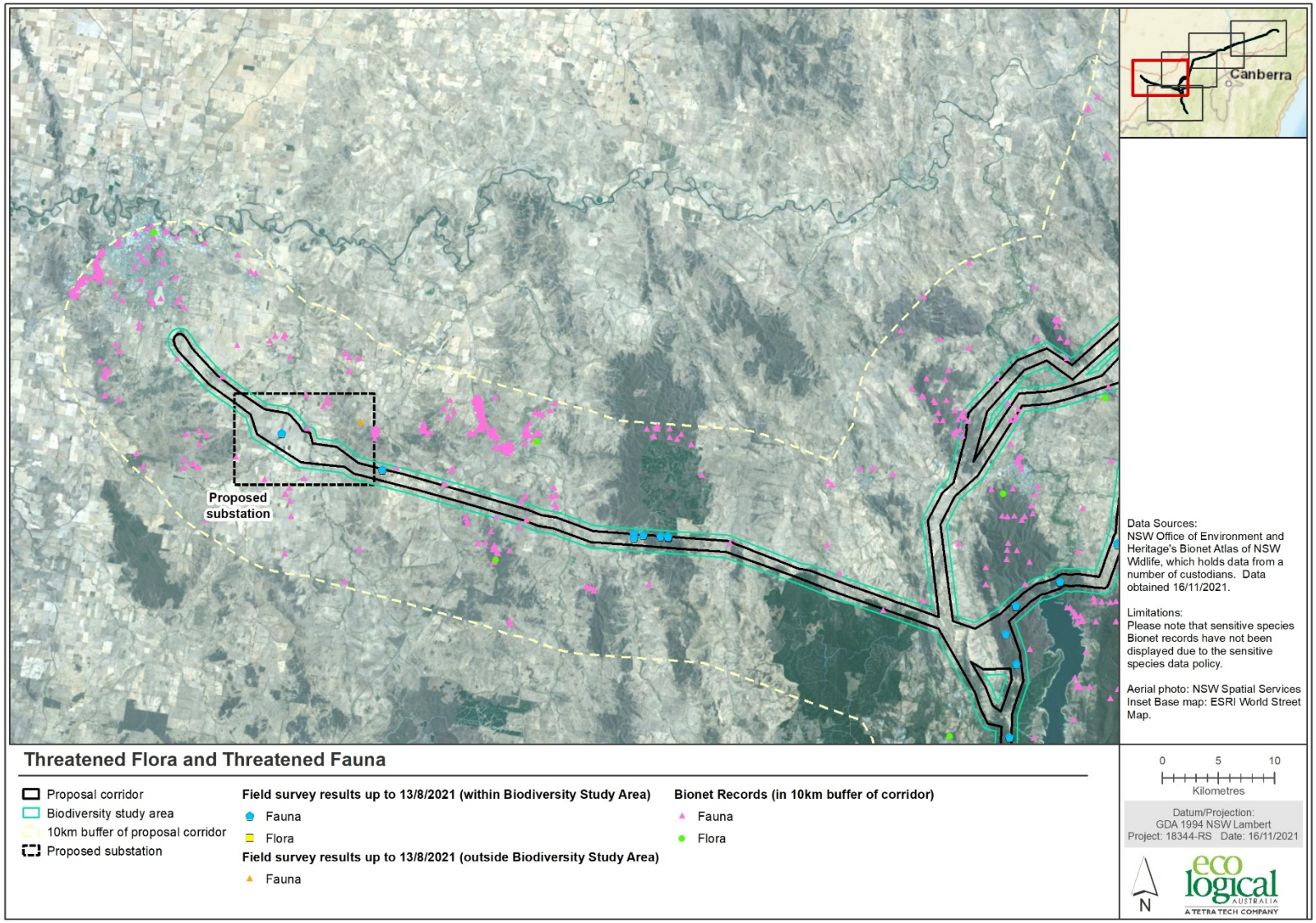


Figure 27: Threatened Flora and Fauna Records (BioNet NSW BC Act) (4/5)

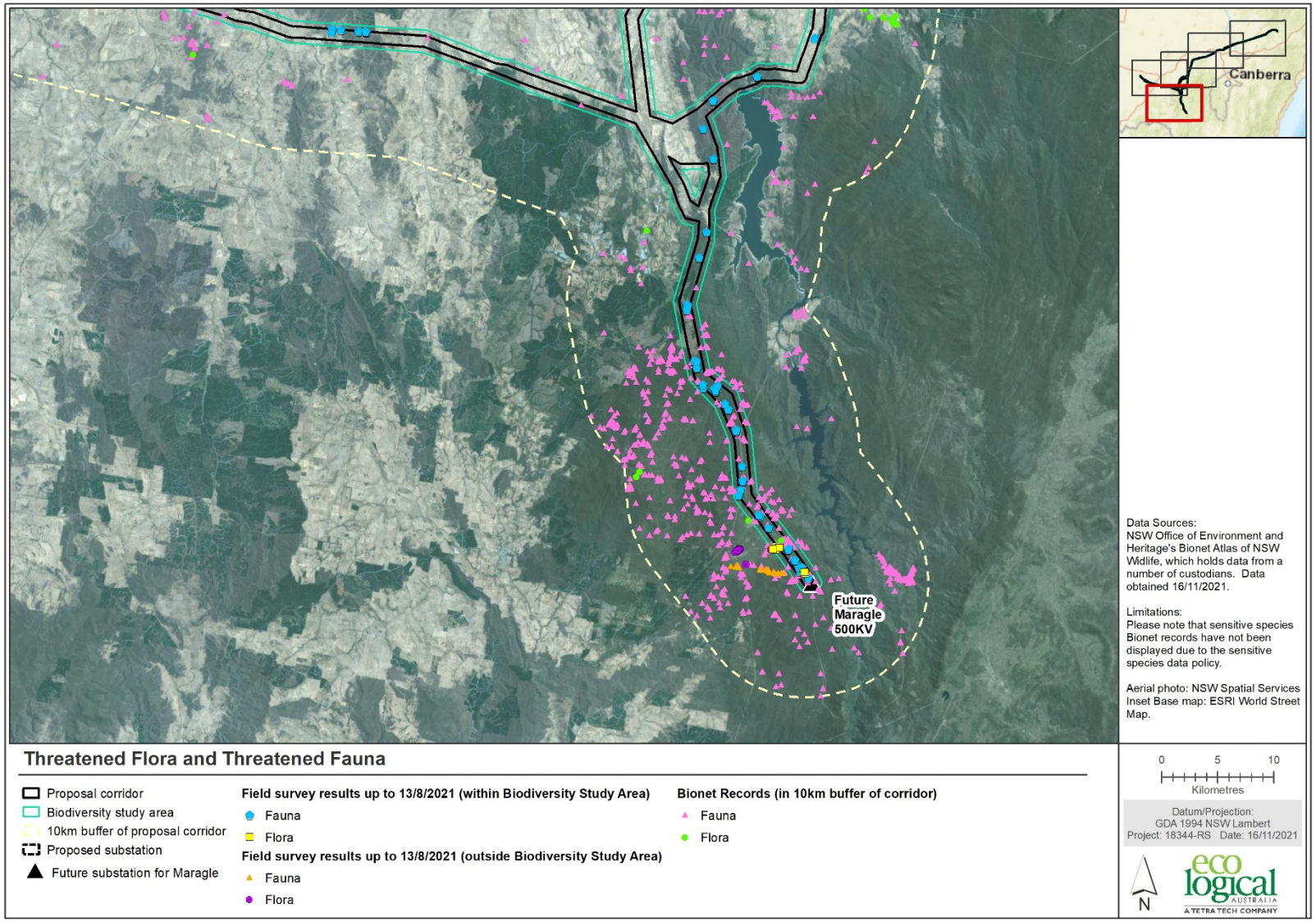


Figure 28: Threatened Flora and Fauna Records (BioNet NSW BC Act) (5/5)

3.4.3. Further survey work

Threatened flora and fauna survey was not completed across the biodiversity study area. There have been vegetation mapping updates made based on BAM plot survey data. These areas of greatest change have occurred in the agricultural lands, generally outside public lands. These areas have been subject to disturbance, ongoing agricultural use and are challenging to accurately map using remote sensing. Many additional polygons of derived native grassland have been added to the validated vegetation as an example. These changes have resulted in potentially more areas requiring survey for threatened flora species.

Additional seasonal surveys are planned for Spring 2021 and in 2022. In accordance with the BAM requirements, survey will need to be completed in the species' survey period, or the species will need to be assumed present in relevant vegetation zones, or species' expert reports prepared.

3.5. Serious and Irreversible Impacts

The concept of SAII is to protect threatened entities that are most at risk of extinction. The Biodiversity Offsets Scheme recognises that there are some types of serious and irreversible impacts that the community expects will not occur except where the consent authority considers that this type of impact is outweighed by the social and economic benefits that the development will deliver to the State. The principles for determining SAII are outlined in the *Biodiversity Conservation Regulation 2017.*

The BC Act permits the relevant Minister to give consent to or approve SSI which is likely to have SAII. The Minister must take those impacts into consideration and determine whether there are any additional and appropriate measures that will minimise those impacts if consent or approval is to be granted. This generally translates into additional avoidance and mitigation measures, and offset requirements.

Potential species (and their habitat) that meet the SAII principles and criteria are outlined in the BioNet Threatened Biodiversity Data Collection. During the EIS phase, the BDAR must provide additional impact assessment information for these entities to support decision makers. The preliminary assessment indicates that the potential SAII entities that may be of relevance include the following TECs:

- Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions TEC
- Illawarra Subtropical Rainforest in the Sydney Basin Bioregion TEC
- Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion TEC
- Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions TEC
- White Box Yellow Box Blakely's Red Gum Woodland TEC.

The following BC Act-listed threatened flora have potential for SAII:

- *Caladenia concolor* (Crimson Spider Orchid)
- *Grevillea wilkinsonii* (Tumut Grevillea)
- *Prasophyllum bagoense*
- *Prasophyllum innubum*
- *Prasophyllum keltonii* (Kelton's Leek Orchid)

- *Pterostylis oreophila* (Blue-tongued Greenhood)
- *Solanum armourense*
- *Thelymitra atronitida* (Black-hooded Sun Orchid).

In addition, the following BC Act-listed threatened fauna are listed as potential SAII:

- Brush-tailed Rock-wallaby
- Large-eared Pied Bat
- Large Bent-winged Bat
- Regent Honeyeater
- Swift Parrot
- Sooty Owl
- Yellow-spotted Tree Frog
- Spotted Tree Frog
- Northern Corroboree Frog
- Golden Sun Moth.

3.6. FM Act Listed Species and Endangered Ecological Communities

The eligibility of threatened species and key threatening process to be listed in the schedules of the FM Act is determined by the Fisheries Scientific Committee in accordance with the criteria prescribed in the *Fisheries Management (General) Regulation 2010*.

All threatened species searches (BioNet and PMST) were reviewed against the NSW DPIE Fisheries *Threatened species lists* (NSW DPI, 2021) and associated *Freshwater threatened species distribution maps* (NSW DPI, 2021a). There are three species of FM Act-listed threatened fish that may occur within the biodiversity study area. These species and the associated FM Act listing are provided in Table 9. There are no FM Act-listed TEC within the biodiversity study area.

Table 9:FM Act listed threatened species records within the biodiversity study area

Scientific name	Common name	FM Act listing
Galaxias rostratus	Flathead Galaxias	Critically Endangered
Macquaria australasica	Macquarie Perch	Endangered
Maccullochella macquariensis	Trout Cod	Endangered

3.7. National Parks, Conservation Areas and State Forests

Important biodiversity values are known to occur within the biodiversity study area. There are multiple protected areas within the biodiversity study area, including national parks, nature reserves, State conservation areas, and State forests. Nature reserves within the biodiversity study area include:

- Back Arm
- Bango
- Mudjarn.

National parks within the biodiversity study area include:

- Tarlo River National Park
- Kosciuszko National Park
- Minjary.

The following NSW State Forests were recorded within the biodiversity study area:

- Bago
- Maragle
- Green Hills
- Tumut
- Red Hill.

The following Conservation Areas are located within the biodiversity study area:

- Wereboldera Conservation Area
- Eurabbie Flora Reserve
- Laurel Hill Flora Reserve
- Tumut Subregion of the Southern Region Protected Area
- Forestry Management Areas in Tumut (FMZ2) Protected Area.

National parks, conservation areas and state forests relevant to the biodiversity study area and locality are shown in Figure 29 and Figure 30.

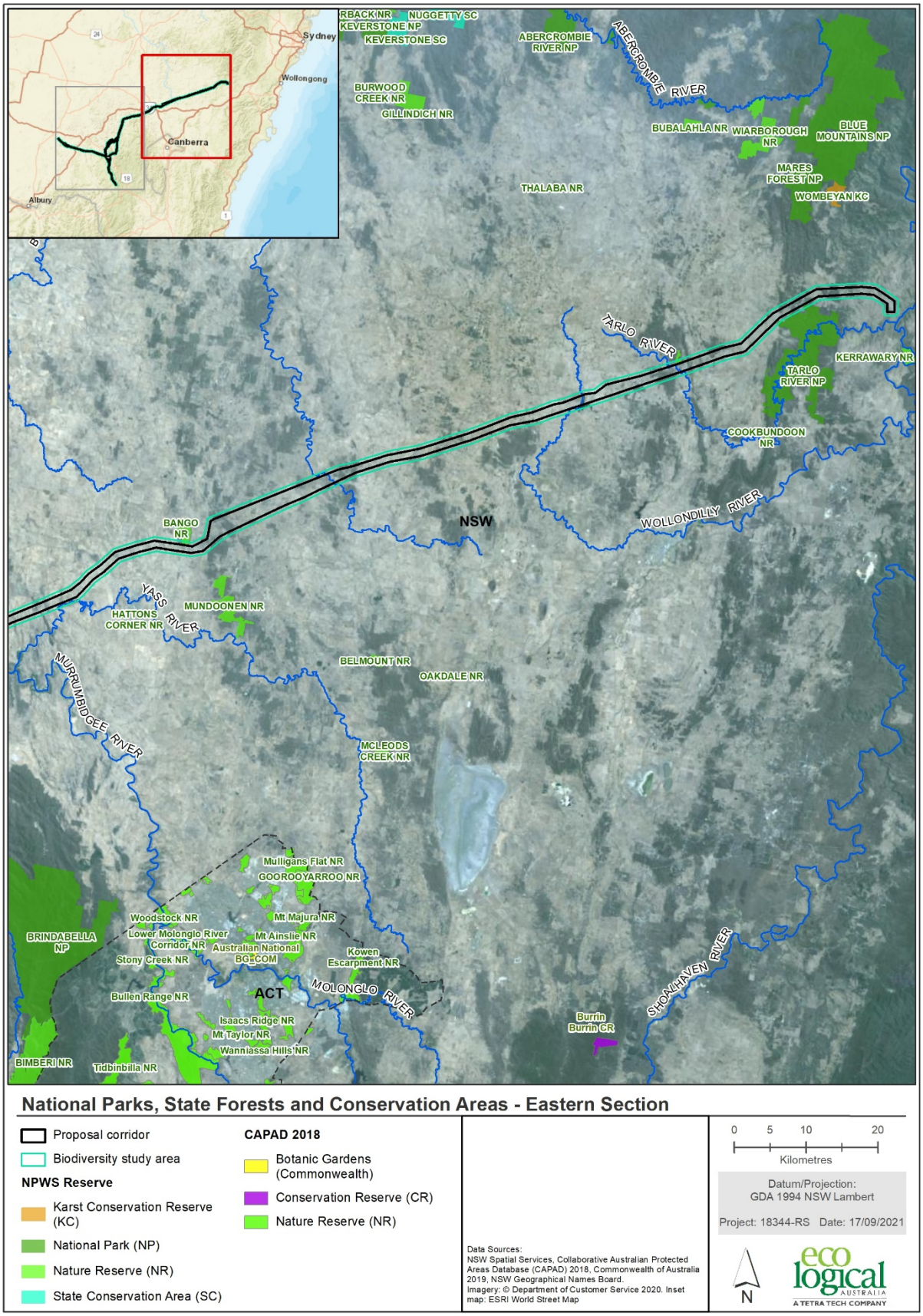


Figure 29: National parks, conservation areas and state forests (1/2)

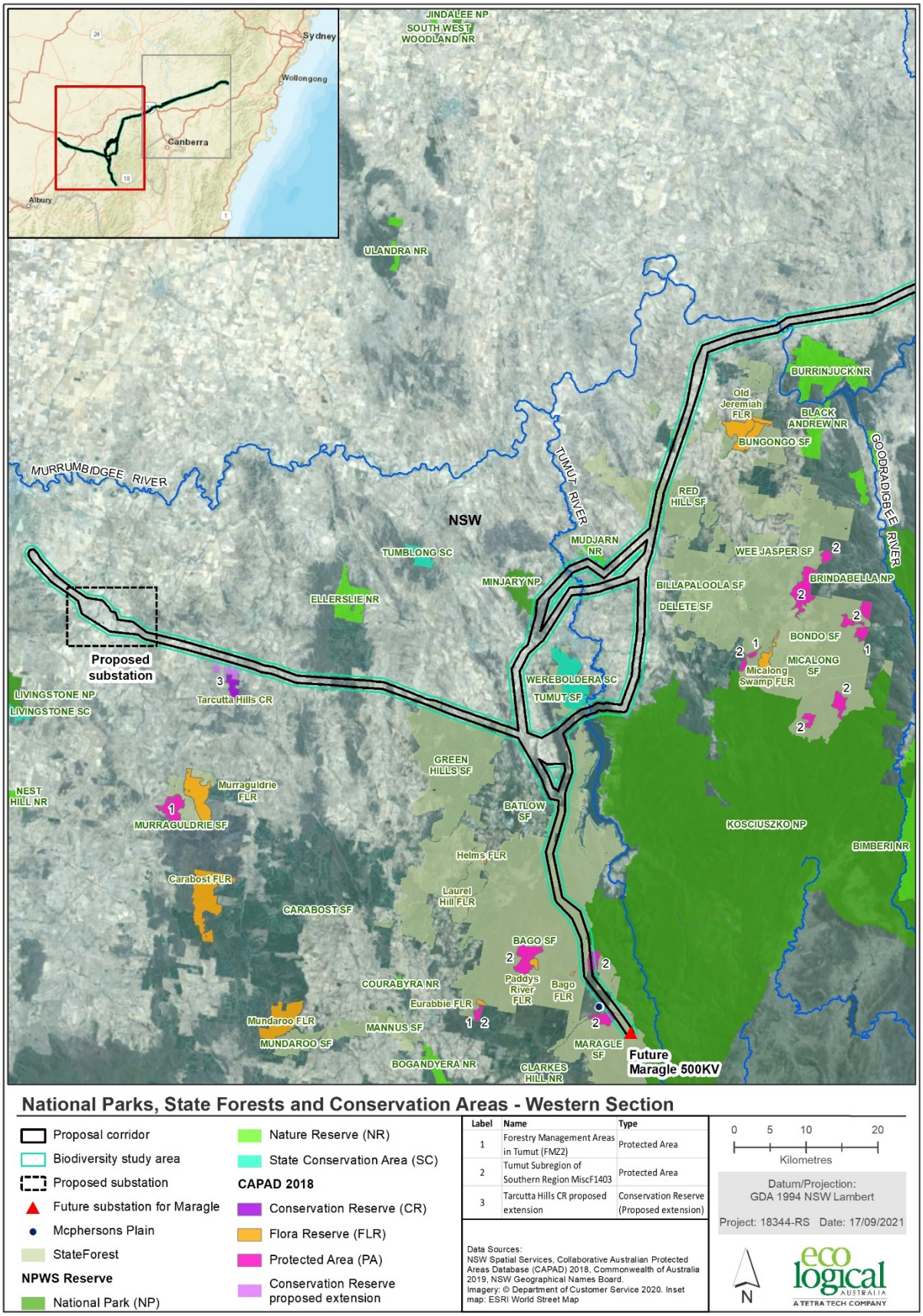


Figure 30: National parks, conservation areas and state forests (2/2)

3.8. Limitations

The desktop assessment and field survey undertaken for this PBA provide a limited view into the ecological values of the biodiversity study area. This report is not a comprehensive assessment of the biodiversity in the study area and is not a BDAR. Further survey will be carried out for the HumeLink BDAR and EIS. For this reason, the diversity of flora and fauna species provided in this PBA should not be seen to be comprehensive.

The majority of the distribution and type of PCTs outlined in this report are based off desktop research and limited rapid field survey. A detailed survey according to the methods outlined in the BAM are required to make a definitive determination of PCTs and to map PCT boundaries. A period of several seasons or years is often needed to identify all the species present in an area, especially as some species are only apparent at certain times of the year. Although these surveys are underway, at the time of preparation of this PBA, the surveys were not complete.

The conclusions of this report are therefore based upon available data and limited field survey and are indicative of the environmental condition of the subject sites at the time of the survey. It should be recognised that site conditions, including the presence of threatened species, can change with time. To address this limitation, the assessment has aimed to identify the presence and suitability of the habitat for threatened species as discussed in the following section.

4. Matters of National Environmental Significance

4.1. Commonwealth-listed Threatened Ecological Communities

A search of the PMST was carried out and is provided in Appendix B of this PBA. The search indicated that six EPBC Act-listed TECs are known to occur, likely to occur or may occur in the threatened flora and flora search area (refer Table 10).

Table 10: Listed TECs

Name	EPBC Act status	Type of presence
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community likely to occur within area
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community likely to occur within area
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area

Three EPBC Act listed TECs are likely to correspond with the PCTs that have been recorded in the biodiversity study area (Table 11). The remaining three EPBC Act listed TECs have not yet been sampled or verified in the biodiversity study area.

Table 11:Threatened ecological communities under the EPBC Act and corresponding PCTs

TEC full name	TEC short name	EPBC Act listing	Corresponding PCT validated in study area
Alpine Sphagnum Bogs and Associated Fens	Alpine Sphagnum Bogs and Associated Fens	Endangered	939
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia	Grey Box Grassy Woodland	Endangered	76
White Box Yellow Box Blakely's Red Gum Woodland	Box Gum Woodland	Critically Endangered	266, 268, 277, 278, 280, 283, 298, 796, 797, 1330

4.2. Threatened Flora

A search of the PMST was carried out for the threatened flora and fauna search area. There were 44 threatened flora species or species habitat known to occur within the biodiversity study area and are listed in Appendix B of this report.

Due to the large extent, variability, and generally high quality of the habitats in the study area, many EPBC Act listed threatened plant species are known to occur or are considered likely to occur. The McPherson's Plain area, which is located about 16 km north east of Maragle, contains many of the orchids of concern.

The PMST threatened flora species predictions are provided in Table 12.

Table 12: EPBC Act listed threatened flora species

Species name	Common name	EPBC Act listing
Acacia bynoeana	Bynoe's Wattle, Tiny Wattle	Vulnerable
Ammobium craspedioides	Yass Daisy	Vulnerable
Amphibromus fluitans	River Swamp Wallaby-grass, Floating Swamp Wallaby-grass	Vulnerable
Brachyscome muelleroides	Mueller Daisy	Vulnerable
Caladenia arenaria	Sand-hill Spider-orchid	Endangered
Caladenia concolor	Crimson Spider-orchid, Maroon Spider-orchid	Vulnerable
Caladenia tessellata	Thick-lipped Spider-orchid, Daddy Long-legs	Vulnerable
Calotis glandulosa	Mauve Burr-daisy	Vulnerable
Colobanthus curtisiae	Curtis' Colobanth	Vulnerable
Commersonia prostrata	Dwarf Kerrawang	Endangered
Cynanchum elegans	White-flowered Wax Plant	Endangered
Diuris aequalis	Buttercup Doubletail	Vulnerable
Diuris ochroma	Pale Golden Moths	Vulnerable
Dodonaea procumbens	Trailing Hop-bush	Vulnerable
Eucalyptus aggregata	Black Gum	Vulnerable
Eucalyptus macarthurii	Camden Woollybutt, Paddys River Box	Endangered
Genoplesium baueri	Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid	Endangered
Genoplesium vernale	Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid	Endangered
Glycine latrobeana	Clover Glycine, Purple Clover	Vulnerable
Grevillea iaspicula	Wee Jasper Grevillea	Endangered
Grevillea raybrownii	NA	Vulnerable
Grevillea wilkinsonii	Tumut Grevillea	Endangered
Helichrysum calvertianum	NA	Vulnerable
Kunzea cambagei	NA	Vulnerable
Lepidium hyssopifolium	Basalt Pepper-cress, Peppercress, Rubble Peppercress, Pepperweed	Endangered
Lepidium monoplocoides	Winged Pepper-cress	Endangered
Leucochrysum albicans var. *tricolor*	Hoary Sunray, Grassland Paper-daisy	Endangered

Species name	Common name	EPBC Act listing
Persoonia mollis subsp. *revoluta*		Vulnerable
Phyllota humifusa	Dwarf Phyllota	Vulnerable
Pomaderris brunnea	Rufous Pomaderris, Brown Pomaderris	Vulnerable
Pomaderris cotoneaster	Cotoneaster Pomaderris	Endangered
Pomaderris pallida	Pale Pomaderris	Vulnerable
Prasophyllum bagoense	Bago Leek-orchid	Critically Endangered
Prasophyllum innubum	Brandy Marys Leek-orchid	Critically Endangered
Prasophyllum keltonii	Kelton's Leek-orchid	Critically Endangered
Prasophyllum petilum	Tarengo Leek Orchid	Endangered
Pterostylis oreophila	Blue-tongued Orchid, Kiandra Greenhood	Critically Endangered
Rhizanthella slateri	Eastern Underground Orchid	Endangered
Rutidosis leptorrhynchoides	Button Wrinklewort	Endangered
Senecio macrocarpus	Large-fruit Fireweed, Large-fruit Groundsel	Vulnerable
Swainsona recta	Small Purple-pea, Mountain Swainson-pea, Small Purple Pea	Endangered
Thelymitra kangaloonica	Kangaloon Sun Orchid	Critically Endangered
Thesium australe	Austral Toadflax, Toadflax	Vulnerable
Xerochrysum palustre	Swamp Everlasting, Swamp Paper Daisy	Vulnerable

4.3. Threatened Fauna

A search of the PMST was carried out for the threatened flora and fauna search area and 38 species of threatened fauna listed under the EPBC Act were identified. The threatened fauna records comprise the following:

- 11 bird species
- 10 species of mammals
- Five fish
- Eight frog species
- Two insect species
- Two reptiles.

Threatened fauna records listed under the EPBC Act are provided in refer Table 13.

Table 13:EPBC Act listed threatened fauna species

Species name	Common name	EPBC Act listing
Birds		
Anthochaera phrygia	Regent Honeyeater	Critically Endangered
Botaurus poiciloptilus	Australasian Bittern	Endangered
Calidris ferruginea	Curlew Sandpiper	Critically Endangered
Falco hypoleucos	Grey Falcon	Vulnerable

Species name	Common name	EPBC Act listing
Grantiella picta	Painted Honeyeater	Vulnerable
Hirundapus caudacutus	White-throated Needletail	Vulnerable
Lathamus discolor	Swift Parrot	Critically Endangered
Leipoa ocellata	Malleefowl	Vulnerable
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Critically Endangered
Polytelis swainsonii	Superb Parrot	Vulnerable
Rostratula australis	Australian Painted Snipe	Endangered
Fish		
Galaxias rostratus	Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow	Critically Endangered
Maccullochella macquariensis	Trout Cod	Endangered
Maccullochella peelii	Murray Cod	Vulnerable
Macquaria australasica	Macquarie Perch	Endangered
Nannoperca australis	Southern Pygmy Perch (Murray-Darling Basin lineage)	Vulnerable
Mammals		
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	Vulnerable
Dasyurus maculatus (south east mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll	Endangered
Mastacomys fuscus mordicus	Broad-toothed Rat (mainland), Tooarrana	Vulnerable
Nyctophilus corbeni	Corben's Long-eared Bat, South-eastern Long-eared Bat	Vulnerable
Petauroides volans	Greater Glider	Vulnerable
Petrogale penicillata	Brush-tailed Rock-wallaby	Vulnerable
Phascolarctos cinereus	Koala	Vulnerable
Pseudomys fumeus	Smoky Mouse, Konoom	Endangered
Pseudomys novaehollandiae	New Holland Mouse, Pookila	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Frogs		
Crinia sloanei	Sloane's Froglet	Endangered
Heleioporus australiacus	Giant Burrowing Frog	Vulnerable
Litoria booroolongensis	Booroolong Frog	Endangered
Litoria raniformis	Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog	Vulnerable
Litoria spenceri	Spotted Tree Frog	Endangered

Species name	Common name	EPBC Act listing
Litoria verreauxii alpina	Alpine Tree Frog, Verreaux's Alpine Tree Frog	Vulnerable
Pseudophryne corroboree	Southern Corroboree Frog	Critically Endangered
Pseudophryne pengilleyi	Northern Corroboree Frog	Critically Endangered
Reptiles		
Aprasia parapulchella	Pink-tailed Worm-lizard, Pink-tailed Legless Lizard	Vulnerable
Delma impar	Striped Legless Lizard, Striped Snake-lizard	Vulnerable
Insects		
Paralucia spinifera	Bathurst Copper Butterfly, Purple Copper Butterfly, Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper	Vulnerable
Synemon plana	Golden Sun Moth	Critically Endangered

4.4. Migratory Bird Species

Based on the results of the PMST (17 September 2021), 13 listed migratory species that are listed under the EPBC Act may occur in the biodiversity study area. These species are provided in Table 14.

Table 14: EPBC Act listed migratory species that are considered likely to occur

Species name	Common name	EPBC Act listing
Migratory marine species		
Apus pacificus	Fork-tailed Swift	Listed Migratory
Migratory terrestrial species		
Hirundapus caudacutus	White-throated Needletail	Vulnerable
Monarcha melanopsis	Black-faced Monarch	Listed Migratory
Motacilla flava	Yellow Wagtail	Listed Migratory
Myiagra cyanoleuca	Satin Flycatcher	Listed Migratory
Rhipidura rufifrons	Rufous Fantail	Listed Migratory
Migratory wetland species		
Actitis hypoleucos	Common Sandpiper	Listed Migratory
Calidris acuminata	Sharp-tailed Sandpiper	Listed Migratory
Calidris ferruginea	Curlew Sandpiper	Critically Endangered
Calidris melanotos	Pectoral Sandpiper	Listed Migratory
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	Listed Migratory
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Critically Endangered
Pandion haliaetus	Osprey	Listed Migratory

4.5. World and National Heritage

The PMST search indicated there are two National Heritage Places within the biodiversity study area:

- Australian Alps National Parks and Reserves (natural)
- Snowy Mountains Scheme (historic).

There are no World Heritage Places within the study area.

4.6. Wetlands of National and International Importance

4.6.1. Nationally Important Wetlands

The PMST search identified one nationally important wetland within the biodiversity study area being Tomneys Plains. Tomneys Plains is situated on the western side of the southern tablelands, approximately 10 km north-east of Tumbarumba and is within the NSW South Western Slopes Bioregion (Figure 23).

4.6.2. Wetlands of International Importance

The biodiversity study area does not contain any wetlands of international importance (Ramsar wetlands). The nearest Ramsar wetlands to the biodiversity study area are:

- Banrock Station Wetland Complex 600 – 700 km downstream
- Barmah Forest 200 – 300 km downstream
- Gunbower Forest 300 – 400 km downstream
- Hattah-Kulkyne Lakes 400 – 500 km downstream
- NSW Central Murray State Forests 200 – 300 km downstream
- Riverland 500 - 600km downstream
- The Coorong, and Lakes Alexandrina and Albert Wetland 600 – 700 km downstream.

Due to the distance of these Ramsar wetlands from the study area they are considered unlikely to be affected and will not be assessed in the EIS.

5. Conclusion

The biodiversity study area has been identified to traverse a range of native Keith formations, PCTs and IBRA bioregions. There are 28 NSW (Mitchell) landscapes within the biodiversity study area, resulting in a high degree of variation in the soil and vegetation characteristics. Vegetation characteristics range from of floodplain wetlands, woodlands, wet and dry sclerophyll forests, grasslands and alpine bogs and fens. The existing land use is a mix of grazing (modified pastures), grazing (native vegetation) and productive native forests.

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

The proposal has been identified to have potential impacts on the following TECs listed under the BC Act which have been recorded in the biodiversity study area:

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (SAII)
- Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions (SAII)
- Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands, and Australian Alps bioregions
- Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion
- Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions
- Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (SAII)
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar, and Brigalow Belt South Bioregions

The following BC Act-listed TECs are mapped as occurring within the biodiversity study area, but have not been recorded during field surveys:

- Artesian Springs Ecological Community in the Great Artesian Basin
- Blue Mountains Swamps in the Sydney Basin Bioregion
- Illawarra Subtropical Rainforest in the Sydney Basin Bioregion.
- Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion
- Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion
- Mount Kaputar high elevation and dry rainforest land snail and slug community in the Nandewar and Brigalow Belt South Bioregions
- Mt Canobolas Xanthoparmelia Lichen Community
- Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion
- Robertson Basalt Tall Open forest in the Sydney Basin and South Eastern Highlands Bioregions

- Western Sydney Dry Rainforest in the Sydney Basin Bioregion

Based on desktop searches, there are 88 threatened species under the BC Act within the threatened flora and fauna search area:

- 25 threatened flora species (sensitive species removed)
- 37 birds
- 17 mammals
- Five frog records
- Three reptiles
- One insect species.

The following MNES under the EPBC Act are listed as occurring within the threatened flora and fauna search area:

- Seven wetlands of international importance
- Seven listed TECs
- 82 listed threatened species, comprising:
    - 44 threatened flora species
    - 11 bird species
    - 10 species of mammals
    - Five fish
    - Eight frog species
    - Two species of insect
    - Two species of reptiles
    - 13 listed migratory species.

The following threatened fauna species were recorded from field work within the biodiversity study area:

- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) – Ecosystem credit species
- *Callocephalon fimbriatum* (Gang Cockatoo) – Dual credit species
- *Cercatetus nanus* (Eastern Pygmy Possum) – Species credit species
- *Climacteris picumnus victoriae* (Brown Tree Creeper) – Ecosystem credit species
- *Litoria verreauxii alpine* (Alpine Tree Frog) - Species credit species
- *Petauroides volans* (Greater Glider) – Species credit species
- *Petaurus australis* (Yellow-bellied Glider) – Ecosystem credit species
- *Petroica boodang* (Scarlet Robin) – Ecosystem credit species
- *Petroica phoenecia* (Flame Robin) – Ecosystem credit species
- *Tyto novaehollandiae* (Masked Owl) – Dual credit species
- *Polytelis swainsonii* (Superb Parrot).

Suitable habitat for following threatened fauna was also observed within the biodiversity study area:

- *Liopholis guthega* (Guthega Skink) – Species credit species
- *Cyclodomorphus praealtus* (Alpine Sheoak Skink) – Species credit species

- *Aprasia parapulchella* (Pink-tailed Worm-Lizard) – Species credit species
- *Myotis macropus* (Southern Myotis) – Species credit species
- *Nyctophilus corbeni* (Corben's Long-eared Bat) – Ecosystem credit species.

Six species of threatened flora species were recorded from field work in the biodiversity study area:

- *Thelymitra alpicola* (Alpine Sun-orchid) – Species credit species
- *Prasophyllum bagoense* (Bago Leek Orchid) – Species credit species
- *Prasophyllum keltonii* (Kelton's Leek Orchid) – Species credit species
- *Ammobium craspedioides* (Yass Daisy) – Species credit species
- *Leucocrysum albicans* var*. tricolor* (Hoary Sunray) – Species credit species
- *Xerochrysum palustre* (Swamp Everlasting) – Species credit species.

Desktop investigations identified three aquatic species listed as threatened under the FM Act and the EPBC Act that have the potential to occur within the biodiversity study area.

Desktop assessment identified an additional 13 migratory bird species, listed under the EPBC Act, with moderate or higher potential to occur within the study area. One species, the Rufous Fantail, was recorded during field surveys. Other important biodiversity values identified within the study area include national parks, nature reserves, protected areas, wetlands and KFH.

A BDAR will be prepared as part of the EIS for the proposal, which would further identify and clarify the potential significance of biodiversity impacts associated with the proposal. The BDAR will be prepared in accordance with BC Act and BAM. Further targeted detailed threatened species seasonal surveys will be undertaken in 2021 and 2022 to ensure compliance with the BAM along with vegetation integrity plot based native vegetation surveys. Potential measures would be identified within the EIS to avoid and minimise any adverse biodiversity effects and further design refinement would reduce the overall amount of vegetation required to be removed.

A EPBC Act Referral under the to the Commonwealth will be submitted, and a Controlled Action decision is considered highly likely. The following threatened EPBC Act listed entities are considered to likely be affected by the proposal:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC
- Alpine Sphagnum Bogs and Associated Fens TEC
- Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia TEC
- *Ammobium craspedioides*
- *Leucochrysum albicans* var*. tricolor*
- *Prasophyllum bagoense*
- *Prasophyllum keltonii*
- *Rutidosis leptorrhynchoides*
- *Xerochrysum palustre*
- Swift Parrot
- Superb Parrot
- Greater Glider

- Pink-tailed Worm Lizard
- Striped Legless Lizard
- Golden Sun Moth.

IMPORTANT NOTES

In preparing this report, ELA has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the client and/or from other sources. Except as otherwise stated in the report, ELA has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then our observations and conclusions as expressed in this report may change.

ELA derived the data in this report from information sourced from the client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the Proposal and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. ELA has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures, and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by ELA for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, the client, and is subject to, and issued in accordance with, the provisions of the contract between ELA and the client. ELA accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

6. References

Atlas of Living Australia (ALA) (2021) <https://www.ala.org.au/>

Australia and New Zealand Infrastructure Pipeline (2021), HumeLink, <https://infrastructurepipeline.org/project/humelink/>

Australian Government (2018), Bioregional Assessments: Landscape classification – Methodology, <https://www.bioregionalassessments.gov.au/assessments/23-conceptual-modelling-gloucester-subregion/2331-landscape-classification>

Australian Government Department of Agriculture, Water and the Environment (DAWE) (n.d), Directory of Important Wetlands in Australia, < https://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands>

Australian Government DAWE (2021), Species Profile and Threats Database: EPBC Act List of Threatened Ecological Communities, <https://www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl>, accessed 8 April 2021

Australian Government DAWE (2012), EPBC Act environmental offset policy, <https://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy>

BioNet Vegetation Classification, PCT Searches, <https://www.environment.nsw.gov.au/NSWVCA20PRapp/search/pctsearch.aspx>, accessed 8 April 2021

Bureau of Meteorology (2017), Groundwater Dependent Ecosystems Atlas, <http://www.bom.gov.au/water/groundwater/gde/#:~:text=The%20Groundwater%20Dependent%20Ecosystems%20Atlas,inventory%20of%20GDEs%20in%20Australia.&text=Subterranean%20ecosystems%E2%80%93this%20includes%20cave%20and%20aquifer%20ecosystems>

Eco Logical Australia (2019), Humelink Threatened Species Survey Advice, prepared for Aurecon/Transgrid

Eco Logical Australia (2019a), HumeLink Vegetation Validation – Summary Report, prepared for Aurecon/Transgrid

Eco Logical Australia (2020a), Humelink Biodiversity Survey and Assessment Strategy, prepared for Aurecon/ Transgrid

Eco Logical Australia (2020b), Humelink Microbat Survey Report January/February 2020, prepared for Aurecon/ Transgrid

Eco Logical Australia (2020c), Humelink Early Works Ecological Services: December 2019 Orchid Survey Report, prepared for Aurecon/ Transgrid

Eco Logical Australia (2021), HumeLink Ecological Survey Report Summer 2021, prepared for Aurecon/ Transgrid

Fairfull (2013), Policy and Guidelines for Fish Habitat Conservation and Management, <https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/468927/Policy-and-guidelines-for-fish-habitat.pdf>

Keith D. A. (2004) Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT. NSW Department of Environment & Conservation, Hurstville, <https://www.environment.nsw.gov.au/NSWVCA20PRapp/Static/Keith_Formation_Key.pdf>

NSW Department of Primary Industries (2021), Threatened species lists, <https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current>

NSW DPIE (2017), Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions – profile, <https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20289>

NSW DPIE (2019), Montane peatlands and swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions - endangered ecological community listing <https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2004-2007/montane-peatlands-swamps-endangered-ecological-community-listing#:~:text=1.-,Montane%20Peatlands%20and%20Swamps%20of%20the%20New%20England%20Tableland%2C%20NSW,in%20the%20headwaters%20of%20streams>

NSW DPIE (2019b). Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions - profile. <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20347>

NSW DPIE (2019c). Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion – profile. <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20346>

NSW DPIE (2019d). Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions – profile. <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20074 >

NSW DPIE (2019e). BioNet Vegetation Classification <https://www.environment.nsw.gov.au/research/Visclassification.htm>

NSW DPIE (2019f), Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar, and Brigalow Belt South Bioregions - Brigalow Belt South: Distribution and vegetation associations, <https://www.environment.nsw.gov.au/threatenedspeciesapp/profileData.aspx?id=20072&cmaName=Brigalow+Belt+South>

NSW DPIE (2020), Alpine Bogs and Fens, <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Alpine+Bogs+and+Fens#>

NSW DPIE (2020a), Alpine Herbfields, https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Alpine+Herbfields

NSW DPIE (2020b), Floodplain Transmission Woodland, <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Floodplain+Transition+Woodlands>

NSW DPIE (2020c), Inland Rocky Hill Woodlands, https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Inland+Rocky+Hill+Woodlands

NSW DPIE (2020d), Montane Wet Sclerophyll Forests https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Montane+Wet+Sclerophyll+Forests

NSW DPIE (2020e), Southern Tableland Dry Sclerophyll Forests, https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Southern+Tableland+Dry+Sclerophyll+Forests

NSW DPIE (2020f), Subalpine Woodlands, <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Subalpine+Woodlands>

NSW DPIE (2020g), Temperate Montane Grasslands, <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Temperate+Montane+Grasslands>

NSW DPIE (2020h), Tableland Clay Grassy Woodlands, <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Tableland+Clay+Grassy+Woodlands>

NSW DPIE (2020i), Upper Riverina Dry Sclerophyll Forests, <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Upper+Riverina+Dry+Sclerophyll+Forests>

NSW DPIE (2020j), Western Slopes Dry Sclerophyll Forests <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Western+Slopes+Dry+Sclerophyll+Forests>

NSW DPIE (2020k), Western Slopes Grasslands, <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Western%20Slopes%20Grasslands>

NSW DPIE (2020l), Western Slopes Grassy Woodlands <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Western+Slopes+Grassy+Woodlands>

NSW DPIE (2020m), White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – profile, <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10837>

NSW DPIE (2020n), Guideline for applying the Biodiversity Assessment Method at severely burnt sites, Biodiversity Development Assessment Report/ Biodiversity Certification Assessment Report <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/guidelineforapplyingbiodiversityassessmentmethodatseverelyburntsitesassessmentreports200104.pdf>

NSW DPIE (2021), South Western Slopes <https://www.environment.nsw.gov.au/bioregions/NSWSouthWesternSlopesBioregion.htm>

NSW Department of Primary Industries (DPI) (Fisheries) (2021), Threatened species lists, <https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current>

NSW DPI (2021a), Freshwater threatened species distribution maps, <https://www.dpi.nsw.gov.au/fishing/threatened-species/threatened-species-distributions-in-nsw/freshwater-threatened-species-distribution-maps>

NSW Government (2021), Accredited Assessor Public Register <https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor>

NSW Office of Environment & Heritage (n.d), Inland Rocky Hill Woodlands, <https://www.environment.nsw.gov.au/threatenedspeciesapp/VegClass.aspx?vegClassName=Inland%20Rocky%20Hill%20Woodlands>

NSW Office of Environment & Heritage (OEH) (2003), The Bioregions of New South Wales – their biodiversity, conservation and history, chapter 10: South western slopes <https://www.environment.nsw.gov.au/resources/nature/nswSouthWesternSlopes.pdf>

NSW OEH (2018), Biodiversity Assessment Method Operational Manual – Stage 1, <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-operational-manual-stage-1-180276.pdf>

NSW OEH (2019), BioNet Atlas user manual 2019: For all users, <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/BioNet/bionet-atlas-user-manual-2019-180504.pdf>

NSW OEH (2020), Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method, https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/surveying-threatened-plants-and-habitats-nsw-survey-guide-biodiversity-assessment-method-200146.pdf

NSW OEH (2021), Threatened Species found in Snowy Mountains IBRA sub-region, <https://www.environment.nsw.gov.au/threatenedspeciesapp/cmaSearchResults.aspx?SubCmaId=254>

Somerville M (2009) Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project volume 1. Vegetation classification technical report. Report prepared by HCCREMS / Hunter Councils Environment Division for Hunter-Central Rivers Catchment Management Authority, Tocal, NSW.

Appendix A – BioNet records

KingdomNam	ClassName	FamilyName	Scientific	CommonName	NSWStatus	CommStatus	Sensitivit	ProfileID
Fauna	Amphibia	Hylidae	Litoria booroolongensis	Booroolong Frog	E1,P	E		10484
Fauna	Amphibia	Hylidae	Litoria castanea	Yellow-spotted Tree Frog	E4A,P	E		10486
Fauna	Amphibia	Hylidae	Litoria raniformis	Southern Bell Frog	E1,P	V		10491
Fauna	Amphibia	Limnodynastidae	Heleioporus australiacus	Giant Burrowing Frog	V,P	V		10398
Fauna	Amphibia	Myobatrachidae	Pseudophryne pengilleyi	Northern Corroboree Frog	E4A,P,2	CE	2^^	10694
Fauna	Aves	Acanthizidae	Chthonicola sagittata	Speckled Warbler	V,P			10722
Fauna	Aves	Accipitridae	Circus assimilis	Spotted Harrier	V,P			20134
Fauna	Aves	Accipitridae	Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P			20322
Fauna	Aves	Accipitridae	Hieraaetus morphnoides	Little Eagle	V,P			20131
Fauna	Aves	Accipitridae	Lophoictinia isura	Square-tailed Kite	V,P,3		3	10495
Fauna	Aves	Anatidae	Oxyura australis	Blue-billed Duck	V,P			10580
Fauna	Aves	Apodidae	Apus pacificus	Fork-tailed Swift	P	C,J,K		0
Fauna	Aves	Apodidae	Hirundapus caudacutus	White-throated Needletail	P	V,C,J,K		20354
Fauna	Aves	Artamidae	Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P			20303
Fauna	Aves	Burhinidae	Burhinus grallarius	Bush Stone-curlew	E1,P			10113
Fauna	Aves	Cacatuidae	Callocephalon fimbriatum	Gang-gang Cockatoo	V,P,3		3	10975
Fauna	Aves	Cacatuidae	Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2		2^^	10140
Fauna	Aves	Climacteridae	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P			10171
Fauna	Aves	Estrildidae	Stagonopleura guttata	Diamond Firetail	V,P			10768
Fauna	Aves	Falconidae	Falco subniger	Black Falcon	V,P			20269
Fauna	Aves	Meliphagidae	Anthochaera phrygia	Regent Honeyeater	E4A,P	CE		10841
Fauna	Aves	Meliphagidae	Epthianura albifrons	White-fronted Chat	V,P			20143
Fauna	Aves	Meliphagidae	Grantiella picta	Painted Honeyeater	V,P	V		10357
Fauna	Aves	Meliphagidae	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V,P			10523
Fauna	Aves	Neosittidae	Daphoenositta chrysoptera	Varied Sittella	V,P			20135
Fauna	Aves	Pachycephalidae	Pachycephala inornata	Gilbert's Whistler	V,P			10582
Fauna	Aves	Pachycephalidae	Pachycephala olivacea	Olive Whistler	V,P			10583
Fauna	Aves	Petroicidae	Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V,P			10519
Fauna	Aves	Petroicidae	Petroica boodang	Scarlet Robin	V,P			20133
Fauna	Aves	Petroicidae	Petroica phoenicea	Flame Robin	V,P			20129
Fauna	Aves	Petroicidae	Petroica rodinogaster	Pink Robin	V,P			10607
Fauna	Aves	Pomatostomidae	Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V,P			10660
Fauna	Aves	Psittacidae	Glossopsitta pusilla	Little Lorikeet	V,P			20111
Fauna	Aves	Psittacidae	Lathamus discolor	Swift Parrot	E1,P,3	CE	3	10455
Fauna	Aves	Psittacidae	Neophema pulchella	Turquoise Parrot	V,P,3		3	10555
Fauna	Aves	Psittacidae	Polytelis swainsonii	Superb Parrot	V,P,3	V	3	10645
Fauna	Aves	Scolopacidae	Calidris acuminata	Sharp-tailed Sandpiper	P	C,J,K		0
Fauna	Aves	Scolopacidae	Gallinago hardwickii	Latham's Snipe	P	J,K		0
Fauna	Aves	Strigidae	Ninox connivens	Barking Owl	V,P,3		3	10561
Fauna	Aves	Strigidae	Ninox strenua	Powerful Owl	V,P,3		3	10562
Fauna	Aves	Tytonidae	Tyto novaehollandiae	Masked Owl	V,P,3		3	10820
Fauna	Aves	Tytonidae	Tyto tenebricosa	Sooty Owl	V,P,3		3	10821
Fauna	Insecta	Castniidae	Synemon plana	Golden Sun Moth	E1	CE		10791
Fauna	Mammalia	Burramyidae	Cercartetus nanus	Eastern Pygmy-possum	V,P			10155
Fauna	Mammalia	Dasyuridae	Dasyurus maculatus	Spotted-tailed Quoll	V,P	E		10207
Fauna	Mammalia	Emballonuridae	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P			10741
Fauna	Mammalia	Macropodidae	Petrogale penicillata	Brush-tailed Rock-wallaby	E1,P	V		10605
Fauna	Mammalia	Miniopteridae	Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P			10534
Fauna	Mammalia	Muridae	Mastacomys fuscus	Broad-toothed Rat	V,P	V		10510
Fauna	Mammalia	Muridae	Pseudomys fumeus	Smoky Mouse	E4A,P	E		10686
Fauna	Mammalia	Petauridae	Petaurus australis	Yellow-bellied Glider	E2,V,P			10601
Fauna	Mammalia	Petauridae	Petaurus norfolcensis	Squirrel Glider	E2,V,P			10602
Fauna	Mammalia	Phascolarctidae	Phascolarctos cinereus	Koala	V,P	V		10616
Fauna	Mammalia	Pseudocheiridae	Petauroides volans	Greater Glider	P	V		20306
Fauna	Mammalia	Pteropodidae	Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V		10697
Fauna	Mammalia	Vespertilionidae	Chalinolobus dwyeri	Large-eared Pied Bat	V,P	V		10157
Fauna	Mammalia	Vespertilionidae	Chalinolobus picatus	Little Pied Bat	V,P			10159
Fauna	Mammalia	Vespertilionidae	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P			10331
Fauna	Mammalia	Vespertilionidae	Myotis macropus	Southern Myotis	V,P			10549
Fauna	Mammalia	Vespertilionidae	Scoteanax rueppellii	Greater Broad-nosed Bat	V,P			10748
Fauna	Reptilia	Pygopodidae	Aprasia parapulchella	Pink-tailed Legless Lizard	V,P	V		10061
Fauna	Reptilia	Pygopodidae	Delma impar	Striped Legless Lizard	V,P	V		10211
Fauna	Reptilia	Varanidae	Varanus rosenbergi	Rosenberg's Goanna	V,P			10826
Flora	Flora	Asteraceae	Ammobium craspedioides	Yass Daisy	V	V		10043
Flora	Flora	Asteraceae	Leucochrysum albicans var. tricolor	Hoary Sunray		E		20258
Flora	Flora	Asteraceae	Senecio garlandii	Woolly Ragwort	V			10750
Flora	Flora	Fabaceae (Faboideae)	Cullen parvum	Small Scurf-pea	E1			10190
Flora	Flora	Fabaceae (Faboideae)	Pultenaea humilis	Dwarf Bush-pea	V			20095
Flora	Flora	Fabaceae (Faboideae)	Swainsona sericea	Silky Swainson-pea	V			10783
Flora	Flora	Fabaceae (Mimosoideae)	Acacia bynoeana	Bynoe's Wattle	E1	V		10006
Flora	Flora	Myrtaceae	Eucalyptus aggregata	Black Gum	V	V		20128
Flora	Flora	Orchidaceae	Caladenia concolor	Crimson Spider Orchid	E1,P,2	V	2^^	10122
Flora	Flora	Orchidaceae	Caladenia montana		V,P,2		2^^	20302
Flora	Flora	Orchidaceae	Diuris aequalis	Buttercup Doubletail	E1,P,2	V	2^^	10235
Flora	Flora	Orchidaceae	Genoplesium vernale	East Lynne Midge Orchid	V,P,2	V	2^^	10343
Flora	Flora	Orchidaceae	Prasophyllum bagoense		E4A,P,2	CE	2^^	10938
Flora	Flora	Orchidaceae	Prasophyllum innubum		E4A,P,2	CE	2^^	20084
Flora	Flora	Orchidaceae	Prasophyllum keltonii	Kelton's Leek Orchid	E4A,P,2	CE	2^^	20085
Flora	Flora	Orchidaceae	Pterostylis alpina	Alpine Greenhood	V,P,2		2^^	20305
Flora	Flora	Orchidaceae	Pterostylis foliata	Slender Greenhood	V,P,2		2^^	20321
Flora	Flora	Orchidaceae	Pterostylis oreophila	Blue-tongued Greenhood	E4A,P,2	CE	2^^	20059
Flora	Flora	Orchidaceae	Thelymitra alpicola	Alpine Sun-orchid	V,P,2		2^^	20296
Flora	Flora	Proteaceae	Grevillea iaspicula	Wee Jasper Grevillea	E4A,2	E	2^^	10366
Flora	Flora	Proteaceae	Grevillea wilkinsonii	Tumut Grevillea	E4A	E		10381
Flora	Flora	Proteaceae	Persoonia mollis subsp. revoluta		V,P			20345
Flora	Flora	Rhamnaceae	Pomaderris cotoneaster	Cotoneaster Pomaderris	E1	E		10648
Flora	Flora	Solanaceae	Solanum armourense		E1			10760
Flora	Flora	Thymelaeaceae	Pimelea bracteata		E4A			20364

Appendix B – PMST records

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

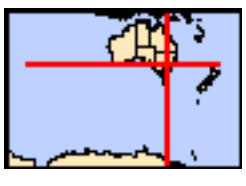
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 17/09/21 09:27:57

Coordinates

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	2
Wetlands of International Importance:	7
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	82
Listed Migratory Species:	13

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	17
Commonwealth Heritage Places:	2
Listed Marine Species:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	22
Regional Forest Agreements:	1
Invasive Species:	46
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
Australian Alps National Parks and Reserves	NSW	Listed place
Historic		
Snowy Mountains Scheme	NSW	Listed place

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	600 - 700km upstream
Barmah forest	200 - 300km upstream
Gunbower forest	300 - 400km upstream
Hattah-kulkyne lakes	400 - 500km upstream
Nsw central murray state forests	200 - 300km upstream
Riverland	500 - 600km upstream
The coorong, and lakes alexandrina and albert wetland	600 - 700km upstream

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community known to occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community likely to occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat known to occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat known to occur within area
Nannoperca australis Murray-Darling Basin lineage Southern Pygmy Perch (Murray-Darling Basin lineage) [91711]	Vulnerable	Species or species habitat known to occur within area
Frogs		
Crinia sloanei Sloane's Froglet [59151]	Endangered	Species or species habitat may occur within area
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat known to occur within area
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Litoria spenceri Spotted Tree Frog [25959]	Endangered	Species or species habitat may occur within area
Litoria verreauxii alpina Alpine Tree Frog, Verreaux's Alpine Tree Frog [66669]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Pseudophryne corroboree		
Southern Corroboree Frog [1915]	Critically Endangered	Species or species habitat may occur within area
Pseudophryne pengilleyi		
Northern Corroboree Frog [66670]	Critically Endangered	Species or species habitat known to occur within area
Insects		
Paralucia spinifera		
Bathurst Copper Butterfly, Purple Copper Butterfly, Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper [26335]	Vulnerable	Species or species habitat may occur within area
Synemon plana		
Golden Sun Moth [25234]	Critically Endangered	Species or species habitat known to occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Mastacomys fuscus mordicus		
Broad-toothed Rat (mainland), Tooarrana [87617]	Vulnerable	Species or species habitat known to occur within area
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys fumeus		
Smoky Mouse, Konoom [88]	Endangered	Species or species habitat known to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Acacia bynoeana		
Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat known to occur within area
Ammobium craspedioides		
Yass Daisy [20758]	Vulnerable	Species or species habitat known to occur within area
Amphibromus fluitans		
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Brachyscome muelleroides Mueller Daisy [15572]	Vulnerable	Species or species habitat may occur within area
Caladenia arenaria Sand-hill Spider-orchid [9275]	Endangered	Species or species habitat may occur within area
Caladenia concolor Crimson Spider-orchid, Maroon Spider-orchid [5505]	Vulnerable	Species or species habitat likely to occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat may occur within area
Calotis glandulosa Mauve Burr-daisy [7842]	Vulnerable	Species or species habitat may occur within area
Colobanthus curtisiae Curtis' Colobanth [23961]	Vulnerable	Species or species habitat likely to occur within area
Commersonia prostrata Dwarf Kerrawang [87152]	Endangered	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat may occur within area
Diuris aequalis Buttercup Doubletail [21588]	Endangered	Species or species habitat known to occur within area
Diuris ochroma Pale Golden Moths [64565]	Vulnerable	Species or species habitat may occur within area
Dodonaea procumbens Trailing Hop-bush [12149]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus aggregata Black Gum [20890]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus macarthurii Camden Woollybutt, Paddys River Box [7827]	Endangered	Species or species habitat likely to occur within area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat may occur within area
Genoplesium vernale East Lynne Midge-orchid [68379]	Vulnerable	Species or species habitat likely to occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat may occur within area
Grevillea iaspicula Wee Jasper Grevillea [22024]	Endangered	Species or species habitat known to occur within area
Grevillea raybrownii [65665]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Grevillea wilkinsonii Tumut Grevillea [56396]	Endangered	Species or species habitat known to occur within area
Helichrysum calvertianum [5702]	Vulnerable	Species or species habitat may occur within area
Kunzea cambagei [11420]	Vulnerable	Species or species habitat likely to occur within area
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat likely to occur within area
Lepidium monoplocoides Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat known to occur within area
Persoonia mollis subsp. revoluta [56094]	Vulnerable	Species or species habitat known to occur within area
Phyllota humifusa Dwarf Phyllota [10133]	Vulnerable	Species or species habitat may occur within area
Pomaderris brunnea Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat likely to occur within area
Pomaderris cotoneaster Cotoneaster Pomaderris [2043]	Endangered	Species or species habitat known to occur within area
Pomaderris pallida Pale Pomaderris [13684]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum bagoense Bago Leek-orchid [84276]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum innubum Brandy Marys Leek-orchid [83603]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum keltonii Kelton's Leek-orchid [83604]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Translocated population known to occur within area
Pterostylis oreophila Blue-tongued Orchid, Kiandra Greenhood [22903]	Critically Endangered	Species or species habitat known to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rutidosis leptorhynchoides Button Wrinklewort [67251]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area
Thelymitra kangaloonica Kangaloon Sun Orchid [81861]	Critically Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat known to occur within area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Airservices Australia
Commonwealth Land - Australian Broadcasting Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Australian Telecommunications Corporation
Commonwealth Land - Commonwealth Bank of Australia
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of War Service Homes
Commonwealth Land - Telstra Corporation Limited
Defence - BLAMEY BARRACKS - KAPOOKA
Defence - RAAF BASE WAGGA
Defence - WAGGA ARES DEPOT ; BLAMEY BKS -WAGGA WAGGA TRG DEP
Defence - WAGGA - WATER BORE SITE AP1
Defence - WAGGA - WATER BORE SITE AP2
Defence - WAGGA - WATER BORE SITE AP3

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Tumut Post Office	NSW	Listed place
Yass Post Office	NSW	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Back Arm	NSW
Bago	NSW
Bangadilly	NSW
Bango	NSW
Burrinjuck	NSW
Ellerslie	NSW
Hattons Corner	NSW
Helms	NSW
Kerrawary	NSW
Kosciuszko	NSW
Mares Forest	NSW
Minjary	NSW
Mudjarn	NSW
Mundoonen	NSW
Narrangarril	NSW
Old Jeremiah	NSW
Paddys River	NSW
Tarcutta Hills	NSW
Tarlo River	NSW
Tumut Subregion of Southern Region	NSW
Wereboldera	NSW
Wollondilly River	NSW

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Southern RFA	New South Wales

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Tomneys Plain	NSW
Tomneys Plain	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-35.798778 148.32834,-35.804658 148.308741,-35.729578 148.237732,-35.657209 148.219823,-35.634206 148.193726,-35.570983 148.177657,-35.511067 148.1961,-35.508611 148.184845,-35.432966 148.134874,-35.373904 147.928665,-35.366419 147.794017,-35.303463 147.509528,-35.281171 147.466329,-35.264181 147.458171,-35.2053 147.374655,-35.185313 147.390836,-35.252975 147.478156,-35.255912 147.499888,-35.282897 147.54867,-35.349165 147.800472,-35.356091 147.931807,-35.412336 148.128736,-35.341314 148.121837,-35.309384 148.146919,-35.254954 148.160558,-35.209775 148.209471,-35.198962 148.239659,-35.210681 148.266068,-35.158827 148.331283,-35.112977 148.338813,-34.93071 148.4052,-34.893303 148.539553,-34.873349 148.671937,-34.771656 148.878985,-34.755303 148.94069,-34.761197 148.999165,-34.732122 149.021642,-34.661467 149.217278,-34.491313 149.823041,-34.452716 149.869444,-34.42052 149.936685,-34.416636 150.027036,-34.434312 150.060779,-34.452852 150.061101,-34.455636 150.040365,-34.443501 150.041079,-34.434935 150.019664,-34.43779 149.941142,-34.50876 149.835001,-34.650707 149.346075,-34.671245 149.255866,-34.756639 149.044795,-34.779719 149.01458,-34.779719 148.919639,-34.835398 148.828982,-34.893933 148.673365,-34.945597 148.425995,-34.981735 148.417097,-35.215936 148.337337,-35.287706 148.335631,-35.35662 148.326193,-35.400044 148.308594,-35.424217 148.2139,-35.446969 148.224207,-35.470042 148.227838,-35.498487 148.216995,-35.523341 148.217098,-35.573652 148.199978,-35.625626 148.213832,-35.642307 148.239734,-35.675251 148.254953,-35.72175 148.261697,-35.798778 148.32834

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

Appendix C – Scientific licences

Department of Planning, Industry and Environment

Scientific Licence

Biodiversity Conservation Act 2016

Name and postal address of principal licensee	**Nominated premises (where appropriate)**
Alexander Pursche Eco Logical Australia Pty Ltd UNIT 29 19 BOLTON ST NEWCASTLE NSW 2300	

Your licence number is: SL100243

This licence is valid from: 01 August 2021

This licence will expire on: 31 July 2022

Additional authorisations:

Project Title: General flora and fauna survey work

This class of biodiversity conservation licence granted under Part 2 of the *Biodiversity Conservation Act 2016* authorises the following activities: Harm, by means of capture, deal in (possess) and liberate protected and threatened animals for survey purposes; Pick and deal in (possess) protected and threatened plants for identification.

This licence authorises the principal licensee and any associates named in **Attachment A** to conduct those activities authorised above, to those species, communities or materials listed in **Attachment B**, at the locations specified in **Attachment C** of this licence.

This licence also authorises the principal licensee to conduct research on National Park estate under clause 26 of the National Parks and Wildlife Regulation 2019 *(*NPW Reg*),* where this forms part of a project approved by a delegated officer of the *Biodiversity Conservation Act 2016*.

This licence is granted subject to the provisions of *Biodiversity Conservation Act 2016*, Biodiversity Conservation Regulation 2017, the general conditions listed below, any special conditions as may be notified in writing to the licensee by the Environment Agency Head of the Department of Planning, Industry and Environment (the Department) or a 'delegated officer' of the *Biodiversity Conservation Act 2016* and the Department's "Scientific Licensing Policy".

…… ……..……..

Signature of Delegated Officer **Signature of Principal Licensee***

Date: 24 August 2021 Date:..……..

* This licence is not valid unless it is signed by the principal licensee. By signing this licence, the licensee agrees that they have read, understood and agree to comply with all of the conditions listed on the licence.

LICENCE CONDITIONS

Specific

a) Please see General conditions 18 – 20 for activities undertaken on NPWS managed land.
b) The Department's hygiene guidelines must be followed at all times.
c) Animals must be handled in such a way to reduce the risk of disease transmission between animals and between humans and animals.
d) Animals must be managed in accordance with a current Animal Care and Ethics Committee approval as per the NSW *Animal Research Act 1985*.
e) Animals must be released at point of capture within 24 hours unless approved otherwise by the Animal Care and Ethics Committee approval.
f) Collection of plant specimens must not impact the viability of the individual or population and only the minimum quantity of plant material required for identification may be collected. If the viability of individuals or populations is likely to be impacted by taking specimens, photography should be used as a tool for identification.
g) The licensee is authorised to collect voucher specimens, to be held at a recognised herbarium. For mycology specimens, we recommend submission to the NSW Plant Pathology Herbarium (DAR).
h) Clean, sharp secateurs must be used to sample plants.

General

1. Only the person/s named on the licence or authorised to operate under the terms and conditions of the licence, may undertake the work. This licence is not transferable except with written confirmation from the Wildlife Team ("WT").
2. The principal licensee may vary the associated parties authorised during the term of the licence only by maintaining a signed and dated register of the associates. A copy of the register must be provided to the WT at renewal or on request by an authorised officer.
3. The licensee must carry this licence at all times whilst work is being undertaken in the field. Where multiple parties are listed, photocopies will suffice provided some other proof of identity can be provided e.g. Driver's licence.
4. The licensee must provide other parties authorised to conduct the specified activities with a copy of this licence.
5. The licensee must obtain the permission of the owner, manager or occupier of lands upon which research is conducted (for persons working on NPWS lands see also conditions 18-20).
6. Specimens or samples taken under this licence must not be sold, bartered, given, lent or promised to others without the prior written approval of the Environment Agency Head or delegate.
7. Collections or research shall, as far as is possible, be carried out away from the view of the public.
8. The licensee shall indemnify and keep indemnified, so far as the law allows, Her Majesty Queen Elizabeth II, the Minister administering the *Biodiversity Conservation Act 2016*, the Government of New South Wales, the Environment Agency Head of the Department of Planning, Industry and Environment, and the National Parks and Wildlife Service (NPWS) and its servants, agents or contractors (herein jointly and severally referred to as "the Department"), FROM AND AGAINST all lawful suits, claims, demands, proceedings, costs, (including solicitor - client costs) and expenses of any nature whatsoever which the Department may suffer or incur in connection with loss of life, personal injury or damage to property from an occurrence in connection with any land, premises, vehicle or other mode of conveyance or other item under the care, control or management of the Department, and arising either directly or indirectly from any negligent or wrongful act or omission of the licensee in the course of an operation or activities pursuant to the licence or otherwise.

Reporting requirements

9. The licensee undertaking survey, research or other biodiversity assessment works must provide a full report of the work carried out under this licence online via BioNet (previously Atlas of NSW Wildlife) using the most recent version of the Atlas data sheet available at http://www.environment.nsw.gov.au/resources/atlas/AtlasDatasheet.xls
10. The licensee must ensure that all coordinates provided as part of the data submitted to BioNet include a measurement of the accuracy of those coordinates. Coordinate accuracy should be greater than zero but no greater than **100m**.
11. The licensee must submit reports online using a secure login acquired from BioNet. Contact bionet@environment.nsw.gov.au for account details and guidelines.
12. Licensees undertaking work that cannot be supplied in the above format must provide a report to the WT specifying:
    a. Title of the project
    b. A precise description of the locality including geographic coordinates where practical

c. Results of the project

13. The licensee may also be required to complete a metadata proforma for works on NPWS estate.
14. Licensees undertaking permanent/semi-permanent marking, banding or tagging must provide marking details (e.g. tag number, date, location, species) to the WT with any renewal application.
15. The licensee must provide a copy of any final report and/or any scientific papers relating to this work to the Environment Agency Head (marked "attention Wildlife Team") when the study is completed.

Additional reporting requirements for consultants

16. Licences granted to consultants and consulting companies for survey and assessment purposes are required to provide a list of the sites where work was conducted and a list of the reports produced. A copy of these reports may be requested.
17. Reports in accordance with licence conditions 9. to 16. must be provided annually, from the "valid from" date of the licence.

Projects undertaken on NPWS managed land

18. The licensee may only undertake works in NPWS managed lands with the prior written approval of the relevant Area Manager and comply with any imposed restrictions or conditions.
19. The licensee must maintain regular contact with the NPWS Area office throughout the project as park management activities and other events may affect access to research locations. Access to reserves may be restricted during management activities or while the reserve is closed for other reasons.
20. The licensee must only use vehicles on public roads unless otherwise approved by an authorised officer.

It is an offence under the *Biodiversity Conservation Act 2016* to breach any of the conditions of this licence, issue any false receipt, make a false entry in any record, or otherwise keep a false record or provide false or misleading records or information.

Records, notifications and inquiries should be directed to:

Wildlife Team
National Parks and Wildlife Service
Locked Bag 5022
Parramatta NSW 2124

Phone: 02 9585 6406
Fax: 02 9585 6401
Email: scientific.licensing@environment.nsw.gov.au

Additional Information for licence holders

It is the licence holder's responsibility to ensure they are familiar with any other relevant statutory or regulatory provisions relevant to this licence such as the **National Parks and Wildlife Regulation 2019**, particularly with respect to activities undertaken on NPWS managed lands, the ***Firearms Act 1999,*** any local council, building and health requirements and codes of practice under the ***Prevention of Cruelty to Animals Act 1979***, as well as specific requirements under the ***Animal Research Act 1985***. On the expiration of your licence the onus is on you to renew. While NPWS forwards renewal notices to the principal licensee, it will not be responsible for the non-receipt of such a notice.

It is the licensee's responsibility to inform themselves of any likely hazards and ensure that appropriate risk management and emergency procedures are developed and in place for works undertaken on NPWS managed lands. The risk management and emergency procedures will also extend to cover the Department staff and any other third parties which may be impacted by the licensee's works. The Department accepts no responsibility for any event which results in the licensee suffering any loss. The licensee will be held liable for any damages resulting from their works which have impacted on the Department staff or any other third party.

Attachment A

Other parties

In addition to the principal licensee identified above, the following parties are also authorised under this licence:

Title	Name
Mr	Adam Bernich
Mrs	Toni Frecker
Dr	Meredith Henderson
Mr	John Norris
Miss	Julia Ryeland
Miss	Katy Wilkins

Attachment B

Licence Class

Class Name	Class Start Date
Ecological Survey/consultancy	21/07/2011

Focus of work

This project authorises the licensee to Harm, Pick, collect or otherwise interact with the following species, communities or materials as described on this licence in the listed quantities:

Species Type	Family	Genus	Species	Common Name	Target Parts	Units	Qty
FA FL Other	ALL FAUNA ALL FLORA			ALL FAUNA ALL FLORA AQUATIC MACRO INVERTEBRATES	Whole Animal Voucher specimens Individuals	Individuals Individuals Individuals	

Attachment C

Project location

This project is authorised in the following areas:

NPWS Estate

Tenure Type	Branch	Region	Area	Park
NPWS Estate				Only under NPWS contract or with Area Manager approval

Other

Tenure Type	State Forests	LLS Region	LGA	Lot Sec DP	Other Location
Other					All non-NPWS estate

NSW GOVERNMENT | Department of Primary Industries

CSB 19/2112
Secretary's ACEC Meeting 211, 3 May 2021

17 May 2021

Dr Alexander Pursche
Eco Logical Australia Pty Ltd
Suites 28 & 29, Level 7
19 Bolton Street
NEWCASTLE NSW 2300

Dear Dr Pursche

Please find enclosed your Animal Research Authority for the project title:

GENERAL WILDLIFE AND AQUATIC SURVEYS ASSOCIATED WITH CONSULTANCIES, PROJECTS, OR CONTRACT RESEARCH

The Authority is valid to **10 May 2022**. Should you wish to conduct research after this date you will need to apply to the Secretary's Animal Care and Ethics Committee for a renewal of the Animal Research Authority. **Note:** The Research Protocol will also be due for renewal at this time.

Conditions of the Approval:

1 The Secretary's Animal Care & Ethics Committee is to be informed of the specific location of each study and the procedures to be undertaken prior to work being commenced.
2 Pitfall traps must be checked twice daily in hot weather.
3 Trapping is limited to a maximum of four consecutive nights at any one site.
4 Radio tracking is limited to 5% body weight for Michrochiporan bats.

If you have any queries about your Authority or Research approval, please do not hesitate to contact Dr Liette Vandine or Colleen Henry on Email: secretary.acec@dpi.nsw.gov.au .

Yours sincerely

F. R. Doughty

DR FRANK R DOUGHTY
Chair
Secretary's Animal Care & Ethics Committee
Email: ARA Certificate
Notification (Fauna)

Chief Scientist Branch | Locked Bag 21 | Orange NSW 2800 | T: 0419 423 417
E: colleen.henry@dpi.nsw.gov.au | W: www.dpi.nsw.gov.au | ABN: 72 189 919 072

ANIMAL RESEARCH AUTHORITY

Issued by

THE SECRETARY
DEPARTMENT OF REGIONAL NSW

Principal Investigator: **Dr Alexander Pursche**
Eco Limited Australia Pty Ltd
Suites 28 & 29, Level 7
19 Bolton Street
NEWCASTLE NSW 2300

Associate Investigators:	**Loren Appleby**	**Rodney Armistead**	**Diane Campbell**
David Coombes	**Joanne Davis**	**Janene Devereux**	**Ian Dixon**
Belinda Failes	**James Garden**	**Alex Gorey**	**Peter Hancock**
Meredith Henderson	**Alan House**	**Steven Jarman**	**Tomas Kelly**
Francis Lemckert	**Jessie McCudden**	**Daniel McKenzie**	**Nicole McVicar**
Emily Messer	**May-Le Ng**	**Cheryl O'Dwyer**	**Shawn Ryan**
Alicia Scanlon	**Tobias Scheid**	**Tom Schmidt**	**Rani Sherriff**
Ryan Smithers	**Karen Spicer**	**Kirsten Velthuis**	**Claire Wheeler**
Renee Whitchurch	**Stacey Wilson**	**Danielle Woodhams**	

Other Participants:	**David Allworth**	**Adam Bernich**	**Eliza Biggs**
Emma Blacklock	**Dan Brassington**	**Bronwyn Callaghan**	**Emily Chetwin**
Lachlan Copeland	**Rebecca Croake**	**Clare Duck**	**Suzanne Eacott**
Matthew Elsley	**Toni Frecker**	**Michelle Frolich**	**Lily Gorrell**
Michael Gregor	**Timothy Henderson**	**Ronnie Hill**	**Cassandra Holt**
Robert Humphries	**Talia Jenner**	**Keagan Jones**	**Elise Keane**
Leura Kowald	**Jamica Kwani**	**James Leonard**	**Kate Maslen**
Sophie Montgomery	**Carolina Mora**	**Jeni Morris**	**Nick Neagle**
Chris Ormond	**Gordon Patrick**	**Deidre Ryder**	**Julia Ryeland**
Amanda Sales	**Liam Scanlan**	**Renee Silvester**	**Alex Taylor**
Griffin Taylor-Dalton	**Pearce Thomas**	**Daniel Watts**	
Briana Wingfield			

are authorised to conduct the following research

GENERAL WILDLIFE AND AQUATIC SURVEYS ASSOCIATED WITH CONSULTANCIES, PROJECTS, OR CONTRACT RESEARCH

Being environmental consultancy

Location: **Various locations throughout New South Wales**

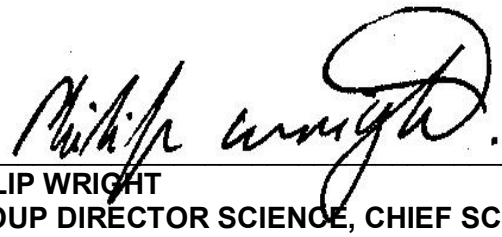
As approved by and in accordance with the
ANIMAL CARE AND ETHICS COMMITTEE OF
THE SECRETARY DEPARTMENT OF REGIONAL NSW

Being animal research carried out in accordance with the Code of Practice, for a recognised research purpose and in connection with animals (other than exempt animals) that have been obtained from the holder of an animal suppliers licence.

Approved with the following conditions:-

1 The Secretary's Animal Care & Ethics Committee is to be informed of the specific location of each study and the procedures to be undertaken prior to work being commenced.
2 Pitfall traps must be checked twice daily in hot weather.
3 Trapping is limited to a maximum of four consecutive nights at any one site.
4 Radio tracking is limited to 5% of body weight for Michrochiporan bats.

This authority remains in force from **10 May 2021** to **10 May 2022** unless suspended, cancelled, or surrendered



PHILIP WRIGHT **17 May 2021**
GROUP DIRECTOR SCIENCE, CHIEF SCIENTIST*
CHIEF SCIENTIST BRANCH
NSW Department of Primary Industries (DPI), an office the Department of Regional NSW (DRNSW)
*Delegate of the Secretary of the Department of Regional NSW (DRNSW)

NSW GOVERNMENT | Department of Primary Industries

CSB 19/2112
Secretary's ACEC Meeting 203, 11 May 2020

20 May 2020

Dr Alexander Pursche
EcoLogical Australia Pty Ltd
Suites 28 & 29, Level 7
19 Bolton Street
NEWCASTLE NSW 2300

Dear Dr Pursche

Please find enclosed your Animal Research Authority for the project title:

GENERAL WILDLIFE AND AQUATIC SURVEYS ASSOCIATED WITH CONSULTANCES, PROJECTS OR CONTRACT RESEARCH

The Authority is valid to **10 May 2021**. Should you wish to conduct research after this date you will need to apply to the Secretary's Animal Care and Ethics Committee for a renewal of the Animal Research Authority.

Conditions of the Approval:

1 The Secretary's Animal Care & Ethics Committee is to be informed of the specific location of each study and the procedures to be undertaken prior to work being commenced;
2 Pitfall traps are to be checked twice daily in hot weather;
3 Trapping is limited to four consecutive nights at any one site;
4 Transmitters are restricted to a maximum of 5% body weight of Microchiropteran bats.

If you have any queries about your Authority or Research approval, please do not hesitate to contact Dr Liette Vandine or Colleen Henry on Email: secretary.acec@dpi.nsw.gov.au .

Yours sincerely

DR FRANK R DOUGHTY
Chair
Secretary's Animal Care & Ethics Committee

Email: ARA Certificate
Notification (Fauna) and (Aquatic)

Chief Scientist Branch | Locked Bag 21 | Orange NSW 2800 | T: 02 6391 3682
E: colleen.henry@dpi.nsw.gov.au | W: www.dpi.nsw.gov.au | ABN: 72 189 919 072

ANIMAL RESEARCH AUTHORITY

Issued by

THE SECRETARY
DEPARTMENT OF REGIONAL NSW

Principal Investigator: **Dr Alexander Pursche**
EcoLogical Australia Pty Ltd
Suites 28 & 29, Level 7
19 Bolton Street
NEWCASTLE NSW 2300

Associate Investigators:	**Loren Appleby**	**Dr Rodney Armistead**
David Coombes	**Joanne Davis**	**Dr Matt Dowle**
Belinda Failes	**Dr Meredith Henderson**	**Tomas Kelly**
Mike Lowry	**Dr Francis Lenckert**	**Jessie McCudden**
Daniel McKenzie	**May-Le Ng**	**Dr Cheryl O'Dwyer**
Alicia Scanlon	**Tom Schmidt**	**Ryan Smithers**
Steven Jarman	**James Garden**	**Dr Ian Dixon**
Claire Wheeler	**Emily Messer**	**Martin Sullivan**
Dr Peter Hancock		

Other Participants:	**David Allworth**	**Elise Keane**
Emma Blacklock	**Kate Maslen**	**Dan Brassington**
Kimberly McCallum	**Kate Brodie**	**Nicole McVicar**
Liz Brown	**Carolina Mora**	**Rachel Brown**
Jeni Morris	**Bronwyn Callaghan**	**Lauren Perkins**
Diane Campbell	**Deidre Ryder**	**Jeffry Cargill**
Liam Scanlan	**Lachlan Copeland**	**Rani Sherriff**
Rebecca Croake	**Karen Spicer**	**Clare Duck**
Sarah Stevens	**Suzanne Eacott**	**Griffin Taylor-Dalton**
Matthew Elsley	**Daniel Watts**	**Michelle Frolich**
Renee Whitchurch	**Alex Gorey**	**Katy Wilkins**
Lily Gorrell	**Stacey Wilson**	**Ronnie Hill**
Briana Wingfield	**Alan House**	**Danielle Woodhams**
Talia Jenner		

are authorised to conduct the following research

GENERAL WILDLIFE AND AQUATIC SURVEYS ASSOCIATED WITH CONSULTANCIES, PROJECTS OR CONTRACT RESEARCH

Being fauna surveys for ecological impact, assessment and management planning

Location: Various locations throughout New South Wales

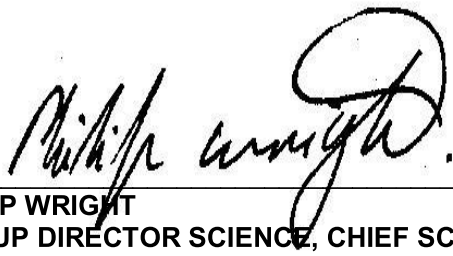
As approved by and in accordance with the
ANIMAL CARE AND ETHICS COMMITTEE OF
THE SECRETARY DEPARTMENT OF REGIONAL NSW

Being animal research carried out in accordance with the Code of Practice, for a recognised research purpose and in connection with animals (other than exempt animals) that have been obtained from the holder of an animal suppliers licence.

Approved with the following conditions:

1 The Secretary's Animal Care & Ethics Committee is to be informed of the specific location of each study and the procedures to be undertaken prior to work being commenced.
2 Pitfall traps are to be checked twice daily in hot weather;
3 Trapping is limited to four consecutive nights at any one site;
4 Transmitters are restricted to a maximum of 5% body weight of Microchiropteran bats.

This authority remains in force from **10 May 2020** to **10 May 2021** unless suspended, cancelled or surrendered



PHILIP WRIGHT **20 May 2020**
GROUP DIRECTOR SCIENCE, CHIEF SCIENTIST*
CHIEF SCIENTIST BRANCH
NSW Department of Primary Industries (DPI), an office the Department of Regional NSW (DRNSW)
*Delegate of the Secretary of the Department of Regional NSW (DRNSW)

Department of Planning, Industry and Environment

Scientific Licence

Biodiversity Conservation Act 2016

Name and postal address of principal licensee	**Nominated premises (where appropriate)**
Mr Martin Sullivan Eco Logical Australia Pty Ltd 19 Bolton Street NEWCASTLE NSW 2300	

Your licence number is: SL100243

This licence is valid from: 01 August 2020

This licence will expire on: 31 July 2021

Additional authorisations:

Project Title: General flora and fauna survey work

This class of biodiversity conservation licence granted under Part 2 of the *Biodiversity Conservation Act 2016* authorises the following activities: Harm, by means of capture, temporarily possess and liberate protected and threatened animals for survey purposes; Pick and possess protected and threatened plants for identification.

This licence authorises the principal licensee and any associates named in **Attachment A** to conduct those activities authorised above, to those species, communities or materials listed in **Attachment B**, at the locations specified in **Attachment C** of this licence.

This licence also authorises the principal licensee to conduct research on National Park estate under clause 26 of the National Parks and Wildlife Regulation 2019 *(*NPW Reg*),* where this forms part of a project approved by a delegated officer of the *Biodiversity Conservation Act 2016*.

This licence is granted subject to the provisions of *Biodiversity Conservation Act 2016*, Biodiversity Conservation Regulation 2017, the general conditions listed below, any special conditions as may be notified in writing to the licensee by the Environment Agency Head of the Department of Planning, Industry and Environment (the Department) or a 'delegated officer' of the *Biodiversity Conservation Act 2016* and the Department's "Scientific Licensing Policy".

Digitally signed by Martin Sullivan
DN: cn=Martin Sullivan, o=Eco Logical Australia, ou, email=martinsullivan@ecoaus.com.au, c=AU
Date: 2020.08.10 12:42:15 +10'00'

……	……
Signature of Delegated Officer	**Signature of Principal Licensee***
Date: 03 August 2020	Date: 10/08/20 ……..

* This licence is not valid unless it is signed by the principal licensee. By signing this licence, the licensee agrees that they have read, understood and agree to comply with all of the conditions listed on the licence.

LICENCE CONDITIONS

Specific

a) Please see General conditions 18 – 20 for activities undertaken on NPWS managed land.
b) Animals are to be managed in accordance with a current Animal Care and Ethics Committee approval and released at the point of capture.
c) The licensee is authorised to collect voucher specimens, to be held at a recognised herbarium.
d) Clean, sharp secateurs must be used to sample plants.
e) The Department's hygiene guidelines must be followed at all times.

General

1. Only the person/s named on the licence or authorised to operate under the terms and conditions of the licence, may undertake the work. This licence is not transferable except with written confirmation from the Wildlife Team ("WT").
2. The principal licensee may vary the associated parties authorised during the term of the licence only by maintaining a signed and dated register of the associates. A copy of the register must be provided to the WT at renewal or on request by an authorised officer.
3. The licensee must carry this licence at all times whilst work is being undertaken in the field. Where multiple parties are listed, photocopies will suffice provided some other proof of identity can be provided e.g. Driver's licence.
4. The licensee must provide other parties authorised to conduct the specified activities with a copy of this licence.
5. The licensee must obtain the permission of the owner, manager or occupier of lands upon which research is conducted (for persons working on NPWS lands see also conditions 18-20).
6. Specimens or samples taken under this licence must not be sold, bartered, given, lent or promised to others without the prior written approval of the Environment Agency Head or delegate.
7. Collections or research shall, as far as is possible, be carried out away from the view of the public.
8. The licensee shall indemnify and keep indemnified, so far as the law allows, Her Majesty Queen Elizabeth II, the Minister administering the *Biodiversity Conservation Act 2016*, the Government of New South Wales, the Environment Agency Head of the Department of Planning, Industry and Environment, and the National Parks and Wildlife Service (NPWS) and its servants, agents or contractors (herein jointly and severally referred to as "the Department"), FROM AND AGAINST all lawful suits, claims, demands, proceedings, costs, (including solicitor - client costs) and expenses of any nature whatsoever which the Department may suffer or incur in connection with loss of life, personal injury or damage to property from an occurrence in connection with any land, premises, vehicle or other mode of conveyance or other item under the care, control or management of the Department, and arising either directly or indirectly from any negligent or wrongful act or omission of the licensee in the course of an operation or activities pursuant to the licence or otherwise.

Reporting requirements

9. The licensee undertaking survey, research or other biodiversity assessment works must provide a full report of the work carried out under this licence online via BioNet (previously Atlas of NSW Wildlife) using the most recent version of the Atlas data sheet available at http://www.environment.nsw.gov.au/resources/atlas/AtlasDatasheet.xls
10. The licensee must ensure that all coordinates provided as part of the data submitted to BioNet include a measurement of the accuracy of those coordinates. Coordinate accuracy should be greater than zero but no greater than **100m**.
11. The licensee must submit reports online using a secure login acquired from BioNet. Contact bionet@environment.nsw.gov.au for account details and guidelines.
12. Licensees undertaking work that cannot be supplied in the above format must provide a report to the WT specifying:
    a. Title of the project
    b. A precise description of the locality including geographic coordinates where practical
    c. Results of the project
13. The licensee may also be required to complete a metadata proforma for works on NPWS estate.
14. Licensees undertaking permanent/semi-permanent marking, banding or tagging must provide marking details (e.g. tag number, date, location, species) to the WT with any renewal application.
15. The licensee must provide a copy of any final report and/or any scientific papers relating to this work to the Environment Agency Head (marked "attention Wildlife Team") when the study is completed.

Additional reporting requirements for consultants

16. Licences granted to consultants and consulting companies for survey and assessment purposes are required to provide a list of the sites where work was conducted and a list of the reports produced. A copy of these reports may be requested.
17. Reports in accordance with licence conditions 9. to 16. must be provided annually, from the "valid from" date of the licence.

Projects undertaken on NPWS managed land

18. The licensee may only undertake works in NPWS managed lands with the prior written approval of the relevant Area Manager and comply with any imposed restrictions or conditions.
19. The licensee must maintain regular contact with the NPWS Area office throughout the project as park management activities and other events may affect access to research locations. Access to reserves may be restricted during management activities or while the reserve is closed for other reasons.
20. The licensee must only use vehicles on public roads unless otherwise approved by an authorised officer.

It is an offence under the *Biodiversity Conservation Act 2016* to breach any of the conditions of this licence, issue any false receipt, make a false entry in any record, or otherwise keep a false record or provide false or misleading records or information.

Records, notifications and inquiries should be directed to:

Wildlife Team
National Parks and Wildlife Service
Locked Bag 5022
Parramatta NSW 2124

Phone: 02 9585 6406
Fax: 02 9585 6401
Email: scientific.licensing@environment.nsw.gov.au

Additional Information for licence holders

It is the licence holder's responsibility to ensure they are familiar with any other relevant statutory or regulatory provisions relevant to this licence such as the **National Parks and Wildlife Regulation 2019**, particularly with respect to activities undertaken on NPWS managed lands, the ***Firearms Act 1999,*** any local council, building and health requirements and codes of practice under the ***Prevention of Cruelty to Animals Act 1979***, as well as specific requirements under the ***Animal Research Act 1985***. On the expiration of your licence the onus is on you to renew. While NPWS forwards renewal notices to the principal licensee, it will not be responsible for the non-receipt of such a notice.

It is the licensee's responsibility to inform themselves of any likely hazards and ensure that appropriate risk management and emergency procedures are developed and in place for works undertaken on NPWS managed lands. The risk management and emergency procedures will also extend to cover the Department staff and any other third parties which may be impacted by the licensee's works. The Department accepts no responsibility for any event which results in the licensee suffering any loss. The licensee will be held liable for any damages resulting from their works which have impacted on the Department staff or any other third party.

Attachment A

Other parties

In addition to the principal licensee identified above, the following parties are also authorised under this licence:

Title	Name
Mr	Adam Bernich
Mrs	Toni Frecker
Dr	Meredith Henderson
Mr	John Norris
Miss	Julia Ryeland
Miss	Katy Wilkins

Attachment B

Licence Class

Class Name	Class Start Date
Ecological Survey/consultancy	21/07/2011

Focus of work

This project authorises the licensee to Harm, Pick, collect or otherwise interact with the following species, communities or materials as described on this licence in the listed quantities:

Species Type	Family	Genus	Species	Species Code	Common Name	Target Parts	Units	Qty
FA FL Other	ALL FAUNA ALL FLORA				ALL FAUNA ALL FLORA AQUATIC MACRO INVERTEBRATES	Individuals Plant samples Individuals		

Attachment C

Project location

This project is authorised in the following areas:

NPWS Estate

Tenure Type	Branch	Region	Area	Park
NPWS Estate				Only under NPWS contract or with Area Manager approval

Other

Tenure Type	State Forests	LLS Region	LGA	Lot Sec DP	Other Location
Other					All non-NPWS estate

Appendix D – HumeLink Biodiversity Survey and Assessment Strategy (ELA, 2020a)

Humelink Biodiversity Survey and Assessment Strategy

Aurecon on behalf of TransGrid

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

DOCUMENT TRACKING

Project Name	Humelink Biodiversity Survey and Assessment Strategy
Project Number	19SYD-13582
Project Manager	Rob Mezzatesta
Prepared by	Kirsten Velthuis; Meredith Henderson; Frank Lemckert; Alicia Scanlon; Katy Wilkins; Bronwyn Callaghan; Ian Dickson; Claire Wheeler; Peter Hancock; Robyn Stevens; James King
Reviewed by	Nathan Kearnes and Meredith Henderson
Approved by	Nathan Kearnes
Status	**Final**
Version Number	**2**
Last saved on	**3 July 2020**

This report should be cited as 'Eco Logical Australia 2020. Humelink Biodiversity Survey and Assessment Strategy. Prepared for Aurecon on behalf of TransGrid.'

Template 2.8.1

Contents

List of Tables

Abbreviations

Abbreviation	Description
AOI	Area of Interest
BAM	Biodiversity Assessment Method
BDAR	Biodiversity Development Assessment Report
BVT	BioMetric vegetation Types
DFSI	Department of Finance, Service and Innovation
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
DSF	Dry Sclerophyll Forest
EECs	Endangered Ecological Communities
EIS	Environmental Impact Statement
EOI	Expression of Interest
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
GDEs	Groundwater Dependent Ecosystems
GEEBAM	Google Earth Engine Burnt Area Map
GloVIS	USGS Global Visualisation Viewer
IBRA	Interim Biogeographic Regionalisation for Australia
MNES	Matters of National Environmental Significance
NBR	Normalized Burn Ratio
NDVI	Normalised difference vegetation index
PAs	Planning Agreements
PCT	Plant Community Type
SAII	Serious and Irreversible Impacts
SEARs	Secretary's Environmental Assessment Requirements
SELLS	South-East Local Land Services
SVM	State Vegetation Mapping
VIS	NSW Vegetation Information System

1. Executive Summary

This report presents a strategy for the survey of biodiversity matters relevant to the HumeLink project. It overviews the strategy for the survey of threatened flora and fauna species, plant community types as well as aquatic habitat and groundwater dependent ecosystems.

2. Introduction

The objective of this report is to present an overview of the strategy for the survey of biodiversity matters for the HumeLink project. It has been informed by numerous previous works and discussions and guidance from TransGrid and Aurecon since November 2018.

This report summarises the desktop assessment undertaken to develop an updated threatened species list based on the corridor dated 25 May 2020 (the survey area) and then a proposed survey and assessment strategy for the overall project.

The following sections detail some of the contextual matters that influence the recommended approaches detailed in this strategy.

2.1 Survey Area

The survey area covers the full width of the route corridor provided by Aurecon dated 25 May 2020.

2.2 Threatened Species Assessment

All NSW listed 'species credit' species and Commonwealth listed Matters of National Environmental Significance within the corridor will be targeted for survey (Appendix C).

The list of potentially relevant species consists of

- threatened species identified in the (BAM) calculator as having an association with Plant Community Types (PCTs) within the Interim Biogeographic Regionalisation for Australia (IBRA) subregions that occur within the AOI
- threatened species recorded as occurring within a 5 km radius of the AOI on the NSW Bionet
- Matters of National Environmental Significance (MNES) recorded as occurring within a 1 km radius of the AOI.
- Exclusion of marine and aquatic species from the list.

For each species, the threatened species assessment detailed the State and Commonwealth listing status and includes information on optimal survey season, suitable habitat requirements, along with indicative survey method and survey effort requirements. This was based on information contained within:

- the BAM calculator, including details on BAM credit type and information about Serious and Irreversible Impacts (SAII)
- NSW and Commonwealth threatened species profiles and recovery plans
- NSW State and Commonwealth threatened species survey guidelines for mammals, bats, birds, fish, reptiles, frogs, plants and orchids
- expert judgement within the project team.

The threatened fauna species are detailed in section 3.1 and threatened flora species in section 3.2. All species are listed in Appendix C. Survey for aquatic species are not proposed at this stage; aquatic species habitat survey is discussed in section 3.4.

2.3 Plant Community Types

An assessment of PCTs has been developed based on initial desktop assessment within the most probable route, which was then further narrowed down to the route corridor. The list of PCTs was developed based on the following data sources and assumptions:

Data sets used:

- Humelink corridor dated 25 May 2020
- Vegetation Data: a merged dataset of source data as per Table 1.

Table 1: Source data used to build vegetation dataset

	Name	Attributes	Description
(a)	RiverinaSVM_v1p2_PCT_E_4469	PCT IDs and descriptions	NSW OEH State Vegetation Mapping (SVM) dataset 4469
(b)	SELLS_AOI_Vegetation	Biometric BVT IDs and descriptions	South-East Local Land Services (SELLS) Vegetation Compilation Map with CMA biometric vegetation type (BVT) descriptions
(c)	Riverina_SELLS_Veg_20190923	PCT and BVT IDs and descriptions	The resulting dataset from a January 2019 ELA compilation study for TransGrid that used as input the two original data sets (a & b above)

Additional vegetation data used include:

- in the Western half, additional areas of RiverinaSVM_v1p2_PCT_E_4469 were used
- in the North Eastern section no PCT mapping was available but additional areas of SELLS_AOI_Vegetation were used. The biometric descriptions and IDs were matched with those in the compiled dataset (Riverina_SELLS_Veg_20190923) to get the relevant PCT.

The resulting merged PCT dataset was then clipped by the corridor and summarized based on PCT ID to identify the area of each PCT within the study area.

3. Survey Strategy

3.1 Threatened Fauna

Our recommended approach for threatened fauna survey consists of three main approaches as detailed below:

1. Thirty-kilometre-long transects (on average) within the width of the corridor that includes multiple techniques undertaken over one week. This approach starts with the placing out of camera traps, any other required traps and ultrasonic detectors along the transect and after four days of trapping using these methods. Through the week, spotlighting and call playback are conducted each night to cover nocturnal species and daytime searches are undertaken to target nests of raptors, signs of arboreal mammals, look for caves and other roosts, identify flying fox camps and to check water bodies for amphibians. Transect searches will target the survey priority area where there is suitable vegetation. This work will be completed by teams of an experienced senior ecologist and a junior ecologist as support.
2. A broadscale bird survey undertaken along the survey area to target habitats for threatened birds that can generally only be detected with diurnal surveys through calls and visual observations and take specific knowledge to effectively locate. This will be conducted by a recognised expert bird surveyor and a junior ecologist.
3. Targeted surveys for a small range of other species not covered by the above. These surveys will be completed by a recognised expert and a junior ecologist, targeting suitable habitat across the length of the corridor. This may include:
    - Birds: migratory bird survey in spring/summer (exact timing depends on when the birds arrive). Winter feeding bird survey for Swift Parrot and Regent Honeyeater
    - Small Mammal trapping survey, including for Broad Toothed Rat, Smoky Mouse, White-footed Dunnart
    - Brush-tailed Rock Wallaby survey to be confirmed with DPIE / Save Our Species coordinator for this species
    - Frogs: Sloane's Froglet in winter, other Frogs in spring-summer. Survey for Corroboree Frog to be confirmed with DPIE / Save Our Species coordinator for this species
    - Reptiles: including Guthega Skink, Alpine She-oak Skink, Striped-legless Lizard, Pink-tailed Worm Lizard, and Pale-headed Snake
    - Insects: Giant Dragonfly and Golden Sun Moth
    - Habitat survey for those species at the far north that may be present if any Triassic Sandstones occur in the study area.

Table 2, outlines a summary of the overarching proposed fauna survey effort and timing.

Table 2: Proposed fauna survey effort

Fauna class	Survey effort
Aves (diurnal)	Sixty minutes per 100 ha of suitable habitat – repeated twice
Aves (nocturnal)	5 minutes call playback for each species followed by spotlight (minimum total of 8 times per site) per 100 ha of suitable habitat. Search for signs of roosts under potential breeding trees

Fauna class	Survey effort
Amphibia	200 m transects conducting aural/visual surveys per 1 ha of suitable aquatic habitat -repeated twice
Mammalia	10/ha camera traps for four nights*; 200 m spotlight and one call playback transects per 50 ha suitable habitat
Mammalia – bats	2 X ultrasonic bat detectors for four nights per 50 ha of stratification unit within suitable habitat
Reptilia	Typically, 30 minute search of suitable habitat repeated on two separate days per 100 ha of suitable habitat. Turning minimum number of rocks and looking for active individuals

**BAM guidelines designed for smaller projects - numbers of camera traps to be feasibly and effectively used will be discussed / negotiated with EESG*

3.2 Threatened Flora

Surveys for threatened flora will be carried out where possible according to the *NSW Guide to Surveying Threatened Plants* (OEH 2016). Threatened flora survey within areas burnt in the 2019/2020 bushfires is detailed in section 3.5. The available months of survey, depends on when the species is most likely to be detected. The location for targeted threatened species surveys will be based on the presence of required habitat and proximity to known records. Locations of potential habitat within the survey area is based on existing available PCT vegetation mapping.

Surveys for threatened flora species will consist of the following methods:

- **Habitat validation**: field staff will conduct a rapid assessment of the targeted threatened species survey location to confirm that the vegetation present conforms with the PCT description and the habitat requirements for the targeted species.
- **Parallel traverses:** field staff will conduct searches for candidate species by walking a grid of parallel traverses. The minimum widths of these traverses depend on the density of the vegetation and the life form of the species being targeted and are shown in Table 3 below. Where multiple species are being searched for concurrently in an area of habitat, the width of the parallel traverse will be the smallest required for all the targeted species for that habitat. Traverses will be recorded using a GPS to be plotted on survey effort maps.
- **Data collection**: the location of any detected individuals of the targeted threatened flora species will be marked digitally to account for area calculation flora and relevant details recorded. Where the identity of the species cannot be confirmed during the field survey, a specimen will be collected and preserved for later identification.

Table 3: Vegetation class / group and required survey effort

Class / Group	Survey effort
Trees	Parallel traverses (20-40 m)
Medium shrubs 1 to 6 m	Parallel traverses (10-20 m)
Sub-shrubs (including Chenopods) (<1 m)	Parallel traverses (10-15 m)
Herbs / forbs / sedges / rushes / orchids / Epiphytes and climbers	Parallel traverses (5-10 m)

3.3 Ecological Communities

3.3.1 Plant Community Types

Floristic (vegetation integrity) plots are required within each vegetation zone of each Plant Community Type. Vegetation information including composition (diversity), structure (cover) and functional attributes will be recorded at each site consistent with BAM. Vegetation community classification will be consistent with the *NSW Vegetation Information System* (VIS) database.

The survey effort as per BAM requirements is shown in the Table 4 below. It is assumed that each PCT has two vegetation zones (i.e. good and poor condition) however, this assumption will need to be validated during detailed field survey.

Table 4: Required survey effort and timing per vegetation zone

Vegetation zone area (ha) within each PCT	Survey effort (Minimum plots)	Survey Timing
<2	1	Any time of the year, however spring/summer survey may be optimal for some PCTs where identification of species is reliant on the presence of fruit/seed (such as grassland communities).
>2-5	2	
>5-20	3	
>20-50	4	
>50-100	5	
>100-250	6	
>250-1000	7	
>1000	8	

A total of 71 PCTs have been identified within the survey area (see Appendix B). Assuming the total area (ha) of each PCT is divided equally into two vegetation zones, a total of 646 plots will be required based on the above minimum survey effort per vegetation zone (see Appendix B).

Notes:

- The list of PCTs are based on desktop assessment of existing vegetation mapping and may not be a completely accurate representation of what is found during the field survey.
- It is possible that a PCT has a different number of vegetation zones than the estimate of two, and this will change the number of plots required.

3.3.2 Groundwater Dependent Ecosystems

To assess the impacts on Groundwater Dependent Ecosystems (GDEs), a search of the Bureau of Meteorology's GDE Atlas will be used to identify any GDEs already recognised within the AOI. Additional areas of potential groundwater dependence would be identified using supplementary information such as groundwater and ecological reports and data.

In addition, GIS techniques would be used to indicate the presence of GDEs such as wetlands and terrestrial vegetation communities. The normalised difference vegetation index (NDVI) will be determined from satellite images taken from different time periods corresponding to high- and low rainfall events. Any areas identified as potential GDEs would be examined in the context of groundwater data (e.g. depth to water table, quality). Any multi-band imagery available to Aurecon / TransGrid should be provided, otherwise publicly available imagery would be sourced from the USGS Global Visualisation Viewer (GloVis) site.

To prioritise GDEs for assessment during the site survey, the ecological condition of each GDE needs to be characterised. The aim of the ecological characterisation is to identify the ecological significance of each GDE in their baseline condition. This will also allow an assessment of risk that may occur as a result of proposed works and will comply with the *Risk assessment guidelines for groundwater dependent ecosystems* (NSW Office of Water 2012).

The objectives of the desktop assessment are to identify (if possible):

- The type of GDE (spring, terrestrial vegetation etc.)
- The source aquifer (i.e. a shallow or deeper confined aquifer source)
- The potential / typical species and communities associated with the location and source aquifer
- An overall assessment of the GDE ecological functioning.

3.4 Aquatic Habitat Survey

The corridor contains waterways with threatened fish species (predicted or known) listed under the *Fisheries Management Act 1994* (FM Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Construction impacts to these species are most likely related to new waterway crossing structures and sedimentation from erosion of new access tracks or pads. Unless specifically requested by DPI Fisheries or the Commonwealth, there is no need to catch fish to assume their presence. However, this is at the discretion of those Departments once they consider the scale and type of potential impact. Therefore, consultation is recommended before including detailed aquatic surveys (i.e. catching fish).

A desktop assessment based on habitat models will be implemented to inform the impact assessment, without catching fish. Desktop and field survey would focus on classifying key fish habitat types (Table 5) and waterway classes (Table 6) using definitions developed by DPI Fisheries in their *Policy and Guidelines for Fish Habitat Conservation and Management* (Fairfull 2013).

Table 5: Key fish habitat and associated sensitivity classification scheme (Source: Fairfull, 2013)

Key fish habitat and associated sensitivity classification scheme (for assessing potential impacts of certain activities and developments on key fish habitat types)	
TYPE 1 – Highly sensitive key fish habitat: ▪ *Posidonia australis* (strapweed) ▪ *Zostera*, *Heterozostera*, *Halophila* and *Ruppia* species of seagrass beds >5 m^2 in area ▪ Coastal saltmarsh >5 m^2 in area ▪ Coral communities ▪ Coastal lakes and lagoons that have a natural opening and closing regime (i.e. are not permanently open or artificially opened or are subject to one off unauthorised openings) ▪ Marine park, an aquatic reserve or intertidal protected area ▪ SEPP 14 coastal wetlands, wetlands recognised under international agreements (e.g. Ramsar, JAMBA, CAMBA, ROKAMBA wetlands), wetlands listed in the Directory of Important Wetlands of Australia[2] ▪ Freshwater habitats that contain in-stream gravel beds, rocks greater than 500 mm in two dimensions, snags greater than 300 mm in diameter or 3 metres in length, or native aquatic plants ▪ Any known or expected protected or threatened species habitat or area of declared 'critical habitat' under the FM Act ▪ Mound springs	TYPE 2 – Moderately sensitive key fish habitat: ▪ *Zostera*, *Heterozostera, Halophila* and *Ruppia* species of seagrass beds < 5 m^2 in area ▪ Mangroves ▪ Coastal saltmarsh <5 m^2 in area ▪ Marine macroalgae such as *Ecklonia* and *Sargassum* species ▪ Estuarine and marine rocky reefs ▪ Coastal lakes and lagoons that are permanently open or subject to artificial opening via agreed management arrangements (e.g. managed in line with an entrance management plan) ▪ Aquatic habitat within 100 m of a marine park, an aquatic reserve or intertidal protected area ▪ Stable intertidal sand/mud flats, coastal and estuarine sandy beaches with large populations of in-fauna ▪ Freshwater habitats and brackish wetlands, lakes and lagoons other than those defined in TYPE 1 ▪ Weir pools and dams up to full supply level where the weir or dam is across a natural waterway
TYPE 3 – Minimally sensitive key fish habitat may include: ▪ Unstable or unvegetated sand or mud substrate, coastal and estuarine sandy beaches with minimal or no in-fauna ▪ Coastal and freshwater habitats not included in TYPES 1 or 2 ▪ Ephemeral aquatic habitat not supporting native aquatic or wetland vegetation	

Table 6: Classification of waterways for fish passage (Source: Fairfull, 2013)

Classification	Characteristics of waterway class
CLASS 1 – Major key fish habitat	Marine or estuarine waterway or permanently flowing or flooded freshwater waterway (e.g. river or major creek), habitat of a threatened or protected fish species or 'critical habitat'.
CLASS 2 – Moderate key fish habitat	Non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Freshwater aquatic vegetation is present. TYPE 1 and 2 habitats present.
CLASS 3 – Minimal key fish habitat	Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other CLASS 1-3 fish habitats.

Classification	Characteristics of waterway class
CLASS 4 – Unlikely key fish habitat	Waterway (generally unnamed) with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools post rain events (e.g. dry gullies or shallow floodplain depressions with no aquatic flora present).

The majority of this assessment would use a desktop approach using aerial imagery and modelled fish distributions. A selection of sites would then be inspected in the field to rapidly appraise aquatic and riparian features (e.g. substrate type, habitat connectiveness, bank stability, overhanging vegetation). This would validate typical types / classes and provide local site descriptions, which could be extrapolated across sites with similar appearance when viewed on aerial imagery. Field sites would be selected to represent a combination of:

- Stream order
- Fish community status
- Key fish habitat
- Threatened species
- Land use / disturbance (broadly ranked as cleared and not cleared)
- Sub-catchment.

Many threatened fish species can be assumed present where individual rivers have been modelled (Riches et al 2016), therefore detailed aquatic survey (fish catching) is not proposed. Survey may be triggered if a significant impact is determined due to removal of critical habitat or obstruction of flow. In that scenario, fish surveys may be required after consultation with DPI Fisheries and the Commonwealth.

Some threatened fish species do not have accurate modelled distributions but have broad potential or historic distribution zones. For those species, site validation would be required to confirm the presence of suitable habitat. For example, the potential area for Alpine Redspot Dragonfly covers large areas of waterways within the survey priority area, but it has extremely specific habitat requirements in that they only occur amongst rocks, logs and moss within the splash zone of waterfalls or in the nearby stream edge. It is noted that dragonflies with an aquatic larval stage are classed as fish under the FM Act. In this instance, it is not practical to walk and survey all the streams. Rather, a refined desktop approach using a digital elevation model and topographic notations would be used to predict potential habitat (waterfalls and gullies). A subset of these sites would be inspected in the field to verify the habitat type.

The proposed methods above do not involve targeted fish surveys. Based on the likely limited impact on aquatic species in the survey priority area as a result of the proposed works, we have assumed that targeted fish surveys are not required. The need for a detailed aquatic survey could be triggered if DPI Fisheries or the Commonwealth instruct so in their project Secretary's Environmental Assessment Requirements (SEARs), or if:

1. the project is on a CLASS 1 or 2 watercourse or where it has been identified that there may be a significant impact on a threatened aquatic species

2. the combination of disturbance type, ecological response, scale, uncertainty, cumulative effects and importance of the habitat result in a Level 2, 3 or 4 Investigation defined in the *Aquatic Ecology in Environmental Impact Assessment* (Dept Planning, 2013) guidelines.

The project will cross CLASS 1 and 2 watercourses (i.e. threatened species habitat) and could trigger a Level 2 Investigation, but the impacts would likely be acceptable if crossings are designed and constructed to maintain fish passage.

The above impacts would need to be addressed once a project footprint and detailed designs are issued and consultation with DPI Fisheries has occurred. Therefore, we reserve the right to modify the proposed survey methods and budget to suit. If a detailed aquatic survey is required following regulator liaison, an additional fee would be provided to undertake these surveys, and recommended survey techniques and seasonal requirement are shown below.

Table 7: Threatened fish species with survey requirements if negotiated post-consultation

Common Name	Scientific Name	FM Act	EPBC Act	Survey requirements (not proposed in this strategy, but could be triggered during consultation with regulator)
Flathead Galaxias	*Galaxias rostratus*	CE	CE	Electrofishing or small scoop net. Electrofishing settings 60 Hz and 2 or 4 mS, voltage generally between 200-700 V.
Macquarie Perch	*Macquaria australasica*	E	E	Recommended March to September, not to be conducted October to mid-January. Fyke nets. Electrofishing in streams <1.5 m depth. Gillnets set for 6 hours.
Murray Crayfish	*Euastacus armatus*	V	Under consideration for listing	Visual observation for burrows or exoskeleton remnants, electrofishing over 200 m section – single pass over all habitat types, minimum time of 40 minutes for streams <4 m avg width, 60 minutes >4 m avg width; trapping with box-type bait traps where <3 crayfish collected.
Silver Perch	*Bidyanus bidyanus*	V	CE	Electrofishing, gillnets set for 6 hours.
Southern Pygmy Perch	*Nannoperca australis*	E	Under consideration for listing	Backpack electrofishing, bait traps set for 30-60 minutes
Trout Cod	*Maccullochella macquariensis*	E	E	Avoid sampling in October to November. Focus on areas close to riverbank with large woody debris in deep water. Electrofishing in low turbidity, gillnets set for 6 hours, fyke nets.
Adam's Emerald Dragonfly	*Archaeophya adamsi*	E		Macroinvertebrate sampling, Spring and Autumn.
Alpine Redspot Dragonfly	*Austropetalia tonyana*	V		Macroinvertebrate sampling, Spring and Autumn.
Murray Hardyhead	*Craterocephalus fluviatilis*	CE	V	Scoop nets and small seines.
Murray Cod	*Maccullochella peelii peelii*		V	Optimal time is March to May. Electrofishing in small flowing upland waterways. Fyke nets to detect juveniles from September to January.

3.5 Survey in areas burnt during the 2019/2020 fires

Survey in areas impacted by severe or catastrophic bushfire will be undertaken in accordance with the 'Guidelines for applying Biodiversity Assessment Method at severely burnt sites' (DPIE, 2020) (*the Guidelines),* and consists of the following steps:

1. Desktop assessment
    - Review of the Fire Extent and Severity Mapping (FESM) or other DPIE approved map product to determine if native vegetation in the survey area contains any of the following FESM Severity Classes within its boundaries:
        - Extreme – Full canopy consumption
        - High - full canopy scorch/partial consumption
        - Medium – partial canopy scorch
        - Low – burnt understory with unburnt canopy - vegetation may be affected (This category captures potentially burnt grasslands)
    - For those areas meeting the above classes, the vegetation formation, land use and vegetation condition prior to bushfire are to be determined.

2. Regulator liaising
    - Liaise with the consent authority about the specific approach to use, prior to full site assessment
    - As the Guidelines do not cover Alpine or Rainforest vegetation formations, liaising with EESG is also required to agree the approach taken to assess the likely pre-fire values of vegetation likely to have been a PCT from the Rainforest or Alpine complex vegetation formations.

3. Site assessment
    - Rapid evaluation, at the vegetation formation level, of burn severity level to determine if the Guidelines apply
    - If the rapid evaluation determines that the Guidelines do apply, then a more in-depth evaluation of burn severity at the scale of the vegetation zone is required, within the site based on criteria set out in the Guidelines, or other evidence-based information.
    - If any of the native vegetation is severely burnt within a vegetation zone, the BAM and the Guidelines are to be applied:
        - Collection of Vegetation Integrity (VI) plot data in an unburnt section of vegetation zone; or
        - Collection, or use of existing VI plot data, in a surrogate plot adjacent to or within 10km from the study area; or
        - Assume benchmark conditions
    - If none of the native vegetation is severely burnt within a vegetation zone, the BAM applies and VI plot data is to be collected as per the BAM.

4. Reporting
    - Justification is required for the determination of severely burnt / not severely burnt within the BDAR

- Implementation of guidance set out in the Guidelines and application of the BAM.

An initial review of PCTs within the corridor was undertaken to identify PCTs with less than 2 ha occurring outside areas burnt as identified in the FESM. These are shown in the table 8 below.

Table 8: PCTs with less than 2 ha occurring outside of FESM burnt area

PCT ID	PCT Name	Hectares within corridor	Hectares within corridor and outside burnt areas
45	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	3.74	0.00
304	Candlebark - Apple Box - Narrow-leaved Peppermint tall open forest on granite in the Tumbarumba region of the South Eastern Highlands Bioregion and upper NSW South Western Slopes Bioregion	3.09	0.38
316	Nortons Box - Red Box - Red Stringybark +/- Nodding Flax Lily forb-grass open forest mainly on the Tumut region	2.12	0.35
335	Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	17.61	1.85
637	Alpine and sub-alpine peatlands, damp herbfields and fens, South Eastern Highlands Bioregion and Australian Alps Bioregion	72.23	0.38
939	Montane wet heath and bog of the eastern tablelands, South Eastern Highlands Bioregion	40.93	0.44
1190	Snow Gum - Candle Bark shrubby open forest in valleys of the southern ACT ranges, South Eastern Highlands Bioregion	16.09	0.84
1271	Tea-tree tall riparian shrubland, South Eastern Highlands Bioregion, South East Corner Bioregion and Australian Alps Bioregion	7.64	0.09

3.6 Approach Where Survey Cannot be Undertaken

3.6.1 Threatened Species Survey

Under the BAM, if adequate survey for a species is not or cannot be undertaken, for instance where access is not available; where survey is not possible due to emergency regulatory measures; or where the threatened species survey period cannot be met, the species will be assumed present within areas of suitable habitat. An agreed approach with EESG will be required to determine the suitability of this approach given that assumptions of presence are applied at the entire vegetation zone. This may either over- or under-estimate species' presence.

An alternative approach is to obtain an expert report for each species unable to be surveyed.

3.6.2 Vegetation Communities Survey

Under BAM, if adequate vegetation integrity plot survey is not or cannot be undertaken, for instance where access is not available or not possible due to emergency regulatory measures; the benchmark data for the PCT, available from the BAM calculator will be utilised instead. If there is existing plot data

available, it may be possible to use that data, however agreement by EESG must be sought prior to making that assumption.

An alternative approach is to undertake the survey in a reference site elsewhere - i.e. the same PCT of expected similar condition to the PCT which cannot be surveyed. Where a reference site is used for a burnt area, the condition of the reference site will need to reflect the likely condition of the site before it was burnt.

4. References

Department of Planning (2003). *Aquatic Ecology in Environmental Impact Assessment.* Available from https://pdfs.semanticscholar.org/5d91/3c9c8c862e180a71b21f5eee41c0688f3afc.pdf

Department of Planning, Industry and Environment. (2020*). Guideline for applying the Biodiversity Assessment Method at severely burnt sites*. Available from https://www.environment.nsw.gov.au/research-and-publications/publications-search/guideline-for-applying-biodiversity-assessment-method-at-severely-burnt-sites-assessment-reports

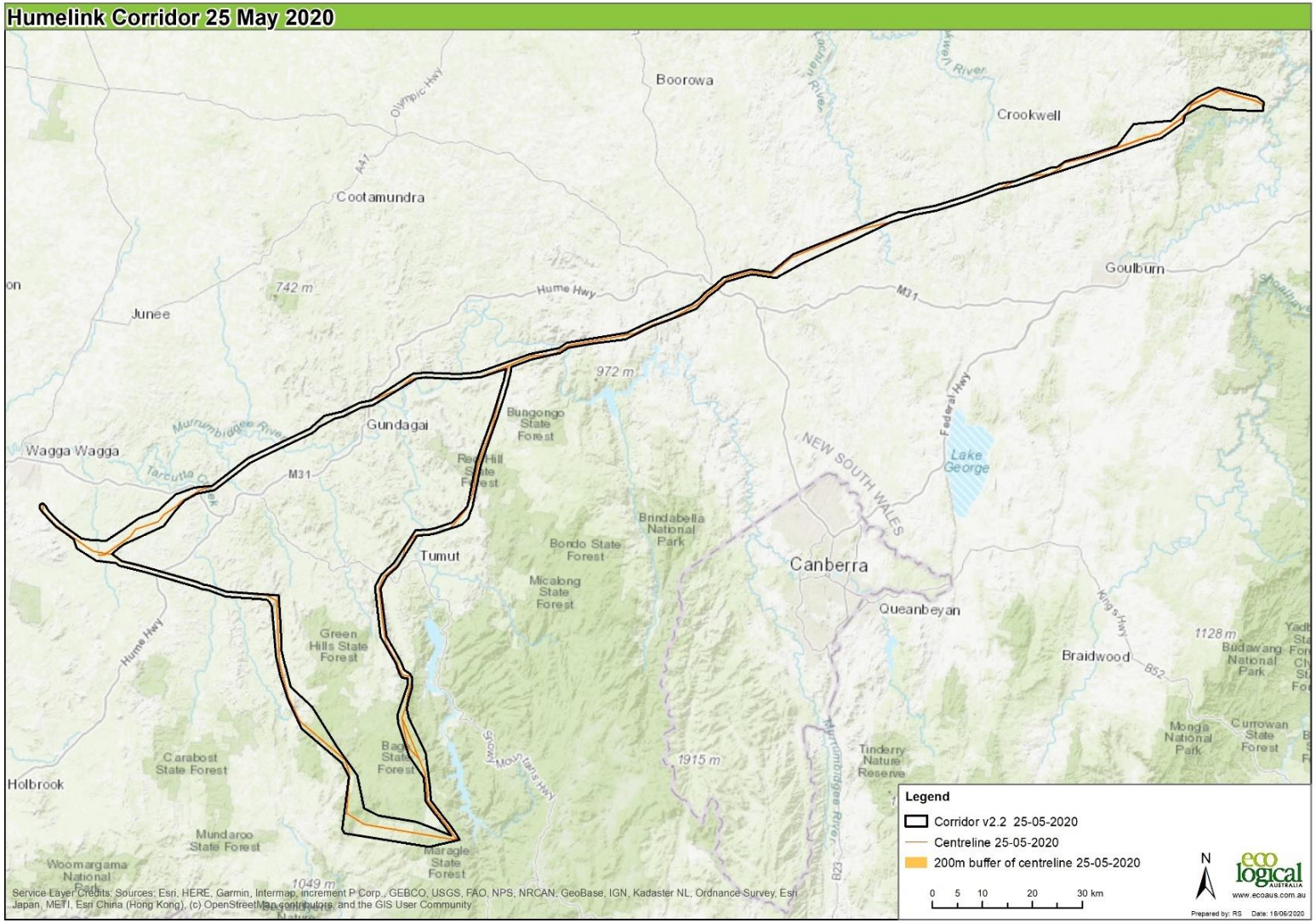
Fairfull, S. (2013). *Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 update).* Available from http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/468927/Policy-and-guidelines-for-fish-habitat.pdf

NSW Office of Water (2012). *Risk assessment guidelines for groundwater dependent ecosystems: Volume 1 – The conceptual framework.* Available from http://www.water.nsw.gov.au/__data/assets/pdf_file/0005/547682/gde_risk_assessment_guidelines_volume_1_final_accessible.pdf

Office of Environment and Heritage (2016). *NSW Guide to Surveying Threatened Plants.* Available from https://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-guide-to-surveying-threatened-plants

Riches, M., Gilligan, D., Danaher, K. and Pursey, J. (2016). *Fish Communities and Threatened Species Distributions of NSW.* Available from https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/669589/fish-communities-and-threatened-species-distributions-of-nsw.pdf

Appendix A Humelink Corridor



Appendix B Plant Community Types

Table 9: PCTs within Humelink corridor

PCT ID	PCT name	Total Area (ha)	Veg zone area based on 2 zone per PCT	Plots per veg zone	Plots per PCT (2 veg zones
5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.	20.01	10.00	3	6
45	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	3.74	1.87	1	2
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	20.14	10.07	3	6
79	River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion	249.41	124.71	6	12
85	River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion	0.35	0.17	1	2
185	Dwyers Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	13.92	6.96	3	6
266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	1112.75	556.38	7	14
267	White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion	2.45	1.23	1	2
268	White Box - Blakelys Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion	227.20	113.60	6	12

PCT ID	PCT name	Total Area (ha)	Veg zone area based on 2 zone per PCT	Plots per veg zone	Plots per PCT (2 veg zones
276	Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	11.07	5.53	3	6
277	Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	1012.86	506.43	7	14
278	Riparian Blakelys Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion	99.18	49.59	4	8
280	Red Stringybark - Blakelys Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South Western Slopes Bioregion	676.97	338.48	7	14
283	Apple Box - Blakelys Red Gum moist valley and footslopes grass-forb open forest of the NSW South Western Slopes Bioregion	49.07	24.54	4	8
285	Broad-leaved Sally grass - sedge woodland on valley flats and swamps in the NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion	450.88	225.44	6	12
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion	342.00	171.00	6	12
289	Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion	64.43	32.22	4	8
290	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion	543.07	271.53	7	14
295	Robertsons Peppermint - Broad-leaved Peppermint - Nortons Box - stringybark shrub-fern open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	343.86	171.93	6	12

PCT ID	PCT name	Total Area (ha)	Veg zone area based on 2 zone per PCT	Plots per veg zone	Plots per PCT (2 veg zones
296	Brittle Gum - peppermint open forest of the Woomargama to Tumut region, NSW South Western Slopes Bioregion	342.70	171.35	6	12
297	Broad-leaved Peppermint - Nortons Box - Red Stringybark tall open forest on red clay on hills in the southern part of the NSW South Western Slopes Bioregion	81.33	40.66	4	8
298	Apple Box - Nortons Box - Blakelys Red Gum valley flat moist grassy tall open forest in the southern NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion	44.73	22.36	4	8
299	Riparian Ribbon Gum - Robertsons Peppermint - Apple Box riverine very tall open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	376.39	188.19	6	12
300	Ribbon Gum - Narrow-leaved (Robertsons) Peppermint montane fern - grass tall open forest on deep clay loam soils in the upper NSW South Western Slopes Bioregion and western Kosciuszko escarpment	3564.69	1782.34	8	16
301	Drooping Sheoke - Ricinocarpus bowmannii - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt	23.51	11.76	3	6
304	Candlebark - Apple Box - Narrow-leaved Peppermint tall open forest on granite in the Tumbarumba region of the South Eastern Highlands Bioregion and upper NSW South Western Slopes Bioregion	3.47	1.74	1	2
305	Apple Box - Broad-leaved Peppermint - Red Stringybark shrubby hill open forest in the upper NSW South Western Slopes Bioregion and adjacent South Eastern Highlands Bioregion	111.67	55.83	5	10
306	Red Box - Red Stringybark - Nortons Box hill heath shrub - tussock grass open forest of the Tumut region	209.61	104.80	6	12

PCT ID	PCT name	Total Area (ha)	Veg zone area based on 2 zone per PCT	Plots per veg zone	Plots per PCT (2 veg zones
307	Eurabbie - Robertsons Peppermint very tall, fern open forest of gullies and sheltered hillslopes in the southern most part of the NSW South Western Slopes Bioregion	1471.18	735.59	7	14
310	Nortons Box - Red Stringybark grassy tall open forest on sheltered slopes in the Tumbarumba - Murray River region of the NSW South Western Slopes Bioregion	88.79	44.39	4	8
314	Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	379.48	189.74	6	12
316	Nortons Box - Red Box - Red Stringybark +/- Nodding Flax Lily forb-grass open forest mainly on the Tumut region	2.12	1.06	1	2
317	Currawang very tall shrubland on siliceous rocky ridges and cliffs mainly in the NSW South Western Slopes Bioregion	0.002	0.001	0	0
318	Mugga Ironbark -Tumbledown Red Gum - Red Box - Black Cypress Pine open forest on shallow stony soils on hills in the NSW South Western Slopes Bioregion	36.56	18.28	3	6
319	Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	21.58	10.79	3	6
320	Kangaroo Grass - Redleg Grass forb-rich temperate tussock grassland of the northern Monaro, ACT and upper Lachlan River regions of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	78.42	39.21	4	8
335	Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	17.61	8.81	3	6
342	Mugga Ironbark - mixed box woodland on hills in the Cowra - Boorowa - Young region of the NSW South Western Slopes Bioregion	10.17	5.09	3	6

PCT ID	PCT name	Total Area (ha)	Veg zone area based on 2 zone per PCT	Plots per veg zone	Plots per PCT (2 veg zones
343	Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamophic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	173.92	86.96	5	10
346	White Box - Blakelys Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion	6.78	3.39	2	4
347	White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	208.69	104.34	6	12
348	Red Stringybark - Long-leaved Box - Joycea pallida grassy open forest in the upper Lachlan catchment, NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	188.20	94.10	5	10
352	Red Stringybark - Blakelys Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	122.82	61.41	5	10
637	Alpine and sub-alpine peatlands, damp herbfields and fens, South Eastern Highlands Bioregion and Australian Alps Bioregion	72.23	36.12	4	8
638	Alpine Ash - Mountain Gum moist shrubby tall open forest of montane areas, southern South Eastern Highlands Bioregion and Australian Alps Bioregion	1037.71	518.85	7	14
639	Alpine Ash - Snow Gum shrubby tall open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion	1059.78	529.89	7	14
641	Alpine grassland/herbfield and open heathlands in Kosciuszko National Park, Australian Alps Bioregion	1646.38	823.19	7	14

PCT ID	PCT name	Total Area (ha)	Veg zone area based on 2 zone per PCT	Plots per veg zone	Plots per PCT (2 veg zones
644	Alpine Snow Gum - Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko NP, South Eastern Highlands Bioregion and Australian Alps Bioregion	161.84	80.92	5	10
679	Black Sallee - Snow Gum low woodland of montane valleys, South Eastern Highlands Bioregion and Australian Alps Bioregion	806.65	403.32	7	14
731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion	576.57	288.28	7	14
796	Derived grassland of the NSW South Western Slopes	3007.91	1503.95	8	16
840	Forest Red Gum - Yellow Box woodland of dry gorge slopes, southern Sydney Basin Bioregion and South Eastern Highlands Bioregion	356.78	178.39	6	12
858	Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion	488.41	244.20	6	12
877	Grey Myrtle dry rainforest of the Sydney Basin Bioregion and South East Corner Bioregion	0.13	0.06	1	2
939	Montane wet heath and bog of the eastern tablelands, South Eastern Highlands Bioregion	40.93	20.47	4	8
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges, South Eastern Highlands Bioregion and Australian Alps Bioregion	3944.42	1972.21	8	16
963	Narrow-leaved Peppermint - Mountain Gum - Brown Barrel moist open forest on high altitude ranges, northern South Eastern Highlands Bioregion	56.10	28.05	4	8
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	1706.20	853.10	7	14

PCT ID	PCT name	Total Area (ha)	Veg zone area based on 2 zone per PCT	Plots per veg zone	Plots per PCT (2 veg zones
1097	Ribbon Gum - Narrow-leaved Peppermint grassy open forest on basalt plateaux, Sydney Basin Bioregion and South Eastern Highlands Bioregion	90.63	45.32	4	8
1100	Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion	432.02	216.01	6	12
1105	River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion	22.75	11.38	3	6
1150	Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion	62.99	31.50	4	8
1155	Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion	108.37	54.19	5	10
1190	Snow Gum - Candle Bark shrubby open forest in valleys of the southern ACT ranges, South Eastern Highlands Bioregion	16.09	8.04	3	6
1191	Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	15.55	7.77	3	6
1196	Snow Gum - Mountain Gum shrubby open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion	538.69	269.35	7	14
1224	Sub-alpine dry grasslands and heathlands of valley slopes, southern South Eastern Highlands Bioregion and Australian Alps Bioregion	1862.70	931.35	7	14
1256	Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	15.29	7.64	3	6
1271	Tea-tree tall riparian shrubland, South Eastern Highlands Bioregion, South East Corner Bioregion and Australian Alps Bioregion	7.64	3.82	2	4

PCT ID	PCT name	Total Area (ha)	Veg zone area based on 2 zone per PCT	Plots per veg zone	Plots per PCT (2 veg zones
1330	Yellow Box - Blakelys Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	49.32	24.66	3	6
Total survey plots					646

Appendix C Threatened species survey period

Table 10: Survey period for threatened species with likelihood to occur within the corridor

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fauna	Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Critically Endangered	Species/Ecosystem	yes	yes	yes							yes	yes	yes
Fauna	Burhinus grallarius	Bush Stone-curlew	Endangered	Not Listed	Species	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Not Listed	Species/Ecosystem	yes									yes	yes	yes
Fauna	Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable	Not Listed	Species/Ecosystem				yes	yes	yes	yes	yes				
Fauna	Cercartetus nanus	Eastern Pygmy-possum	Vulnerable	Not Listed	Species	yes	yes	yes							yes	yes	yes
Fauna	Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable	Species	yes										yes	yes
Fauna	Crinia sloanei	Sloane's Froglet	Vulnerable	Not Listed	Species							yes	yes	yes			
Fauna	Delma impar	Striped Legless Lizard	Vulnerable	Vulnerable	Species	yes	yes	yes	yes	yes				yes	yes	yes	yes
Fauna	Eulamprus leuraensis	Blue Mountains Water Skink	Endangered	Endangered	Species	yes	yes										yes
Fauna	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not Listed	Species/Ecosystem												

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fauna	Heleioporus australiacus	Giant Burrowing Frog	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes				yes	yes	yes	yes
Fauna	Hieraaetus morphnoides	Little Eagle	Vulnerable	Not Listed	Species/Ecosystem												
Fauna	Hoplocephalus bungaroides	Broad-headed Snake	Endangered	Vulnerable	Species/Ecosystem	yes	yes								yes	yes	yes
Fauna	Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Endangered	Endangered	Species	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Lathamus discolor	Swift Parrot	Endangered	Critically Endangered	Species/Ecosystem			yes	yes	yes	yes	yes					
Fauna	Litoria aurea	Green and Golden Bell Frog	Endangered	Vulnerable	Species	yes	yes							yes	yes	yes	yes
Fauna	Litoria booroolongensis	Booroolong Frog	Endangered	Endangered	Species	yes	yes										yes
Fauna	Litoria brevipalmata	Green-thighed Frog	Vulnerable	Not Listed	Species	yes	yes	yes								yes	yes
Fauna	Litoria castanea	Yellow-spotted Tree Frog	Critically Endangered	Endangered	Species	yes	yes							yes	yes	yes	yes
Fauna	Litoria littlejohni	Littlejohn's Tree Frog	Vulnerable	Vulnerable	Species	yes	yes	yes				yes	yes	yes	yes	yes	yes
Fauna	Litoria raniformis	Southern Bell Frog	Endangered	Vulnerable	Species	yes	yes	yes							yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fauna	Litoria spenceri	Spotted Tree Frog	Critically Endangered	Endangered	Species	yes	yes	yes							yes	yes	yes
Fauna	Lophochroa leadbeateri	Major Mitchell's Cockatoo	Vulnerable	Not Listed	Species/Ecosystem									yes	yes	yes	yes
Fauna	Lophoictinia isura	Square-tailed Kite	Vulnerable	Not Listed	Species/Ecosystem	yes								yes	yes	yes	yes
Fauna	Mastacomys fuscus	Broad-toothed Rat	Vulnerable	Vulnerable	Species	yes	yes	yes	yes					yes	yes	yes	yes
Fauna	Miniopterus australis	Little Bentwing-bat	Vulnerable	Not Listed	Species/Ecosystem	yes	yes										yes
Fauna	Mixophyes balbus	Stuttering Frog	Endangered	Vulnerable	Species	yes	yes							yes	yes	yes	yes
Fauna	Mixophyes iteratus	Giant Barred Frog	Endangered	Endangered	Species	yes	yes	yes							yes	yes	yes
Fauna	Myotis macropus	Southern Myotis	Vulnerable	Not Listed	Species	yes	yes	yes							yes	yes	yes
Fauna	Ninox connivens	Barking Owl	Vulnerable	Not Listed	Species/Ecosystem					yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Ninox strenua	Powerful Owl	Vulnerable	Not Listed	Species/Ecosystem					yes	yes	yes	yes				
Fauna	Pandion cristatus	Eastern Osprey	Vulnerable	Not Listed	Species/Ecosystem				yes	yes	yes	yes	yes	yes	yes	yes	
Fauna	Paralucia spinifera	Purple Copper Butterfly, Bathurst Copper Butterfly	Endangered	Vulnerable	Species								yes	yes	yes	yes	

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fauna	Petalura gigantea	Giant Dragonfly	Endangered	Not Listed	Species	yes										yes	yes
Fauna	Petaurus australis	Yellow-bellied Glider population on the Bago Plateau	Endangered	Not Listed	Species	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Petaurus norfolcensis	Squirrel Glider	Vulnerable	Not Listed	Species	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Petaurus norfolcensis	Squirrel Glider in the Wagga Wagga Local Government Area	Vulnerable	Not Listed	Species	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Petrogale penicillata	Brush-tailed Rock-wallaby	Endangered	Vulnerable	Species	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Petroica rodinogaster	Pink Robin	Vulnerable	Not Listed	Species	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Pezoporus wallicus wallicus	Eastern Ground Parrot	Vulnerable	Not Listed	Species	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Phascogale tapoatafa	Brush-tailed Phascogale	Vulnerable	Not Listed	Species	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Phascolarctos cinereus	Koala	Vulnerable	Vulnerable	Species/Ecosystem	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Polytelis swainsonii	Superb Parrot	Vulnerable	Vulnerable	Species/Ecosystem	yes								yes	yes	yes	yes
Fauna	Pseudomys fumeus	Smoky Mouse	Critically Endangered	Endangered	Species/Ecosystem	yes	yes	yes	yes						yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fauna	Pseudophryne pengilleyi	Northern Corroboree Frog	Critically Endangered	Critically Endangered	Species	yes	yes										
Fauna	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable	Species/Ecosystem	yes	yes	yes							yes	yes	yes
Fauna	Sminthopsis leucopus	White-footed Dunnart	Vulnerable	Not Listed	Species	yes	yes	yes	yes						yes	yes	yes
Fauna	Synemon plana	Golden Sun Moth	Endangered	Critically Endangered	Species										yes	yes	yes
Fauna	Tyto novaehollandiae	Masked Owl	Vulnerable	Not Listed	Species/Ecosystem					yes	yes	yes	yes				
Fauna	Tyto tenebricosa	Sooty Owl	Vulnerable	Not Listed	Species/Ecosystem				yes	yes	yes	yes	yes				
Fauna	Calidris ferruginea	Curlew Sandpiper	Endangered	Critically Endangered	Species/Ecosystem	yes	yes	yes					yes	yes	yes	yes	yes
Fauna	Hirundapus caudacutus	White-throated Needletail	Not listed	marine, migratory	N/A	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Petauroides volans	Greater Glider	Not listed	Vulnerable	N/A	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Aprasia parapulchella	Pink-tailed Worm Lizard	Vulnerable	Vulnerable	Species	yes	yes	yes						yes	yes	yes	
Fauna	Apus pacificus	Fork-tailed Swift	Not listed	migratory	N/A	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Calidris acuminata	Sharp-tailed Sandpiper	Not listed	marine, migratory	N/A	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Gallinago hardwickii	Latham's Snipe	Not listed	marine, migratory	N/A	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fauna	Aprasia parapulchella	Pink-tailed Legless Lizard	Vulnerable	Vulnerable	Species									Yes	Yes	Yes	
Fauna	Ardeotis australis	Australian Bustard	Endangered	Not Listed	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fauna	Burramys parvus	Mountain Pygmy-possum	Endangered	Endangered	species	Yes	Yes	Yes							Yes	Yes	Yes
Fauna	Calyptorhynchus banksii samueli	Red-tailed Black-Cockatoo (inland subspecies)	Vulnerable	Not Listed	Species/Ecosystem					Yes	Yes	Yes		Yes	Yes	Yes	Yes
Fauna	Litoria verreauxii alpina	Alpine Tree Frog	Endangered	Vulnerable	Species											Yes	Yes
Fauna	Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Not Listed	Species/Ecosystem	Yes	Yes										Yes
Fauna	Pseudophryne corroboree	Southern Corroboree Frog	Critically Endangered	Critically Endangered	species	Yes											
Fauna	Cyclodomorphus praealtus	Alpine She-oak Skink	Endangered	Endangered	species	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Fauna	Liopholis guthega	Guthega Skink	Endangered	Endangered	species	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Fauna	Tympanocryptis pinguicolla	Grassland Earless Dragon	Endangered	Endangered	species	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Fauna	Calyptorhynchus lathami	Glossy Black-Cockatoo,	Endangered	Not Listed	species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		Riverina population															
Fauna	Numenius madagascariensis	Eastern Curlew	Not listed	Critically Endangered	Species/ecosystem	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fauna	Litoria verreauxii alpina	Alpine Tree Frog	Endangered	Vulnerable	species											yes	yes
Fauna	Mastacomys fuscus mordicus	Broad-toothed rat	vulnerable	vulnerable	species	yes	yes	yes	yes	yes					yes	yes	yes
Fauna	Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)	Koala	vulnerable	vulnerable	Species/Ecosystem	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Fauna	Actitis hypoleucos	Common Sandpiper	not listed	migratory	N/A	yes							yes	yes	yes	yes	yes
Fauna	Calidris melanotos	Pectoral Sandpiper	not listed	migratory	N/A	yes	yes	yes	yes	yes	yes			yes	yes	yes	yes
Fauna	Monarcha melanopsis	Black-faced Monarch	not listed	migratory	N/A	yes								yes	yes	yes	yes
Fauna	Motacilla flava	Western Yellow Wagtail	not listed	migratory	N/A	yes										yes	yes
Fauna	Myiagra cyanoleuca	Satin Flycatcher	not listed	migratory	N/A	yes	yes										yes
Fauna	Rhipidura rufifrons	Rufous Fantail	not listed	migratory	N/A	yes	yes	yes								yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Acacia ausfeldii	Ausfeld's Wattle	Vulnerable	Not Listed	Species								yes	yes			
Flora	Acacia bynoeana	Bynoe's Wattle	Endangered	Vulnerable	Species	Yes	yes	yes						yes	yes	yes	yes
Flora	Acacia clunies-rossiae	Kanangra Wattle	Vulnerable	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Acacia flocktoniae	Flockton Wattle	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Acacia meiantha	Acacia meiantha	Endangered	Endangered	Species							yes	yes	yes	yes		
Flora	Acacia phasmoides	Phantom Wattle	Vulnerable	Vulnerable	Species									yes			
Flora	Ammobium craspedioides	Yass Daisy	Vulnerable	Vulnerable	Species									yes	yes	yes	
Flora	Asterolasia buxifolia	Asterolasia buxifolia	Endangered	Not Listed	Species									yes	yes	yes	
Flora	Baloskion longipes	Dense Cord-rush	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Boronia deanei	Deane's Boronia	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Bossiaea oligosperma	Few-seeded Bossiaea	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Caladenia arenaria	Sand-hill Spider Orchid	Endangered	Endangered	Species									yes			
Flora	Caladenia concolor	Crimson Spider Orchid	Endangered	Vulnerable	Species									yes			

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Caladenia montana	Caladenia montana	Vulnerable	Not Listed	Species											yes	
Flora	Caladenia tessellata	Thick Lip Spider Orchid	Endangered	Vulnerable	Species									yes	yes		
Flora	Calotis glandulosa	Mauve Burr-daisy	Vulnerable	Vulnerable	Species	Yes	yes	yes							yes	yes	yes
Flora	Carex klaphakei	Klaphake's Sedge	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Commersonia prostrata	Dwarf Kerrawang	Endangered	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Cullen parvum	Small Scurf-pea	Endangered	Not Listed	Species	Yes											yes
Flora	Cynanchum elegans	White-flowered Wax Plant	Endangered	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Dichanthium setosum	Bluegrass	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes							yes
Flora	Dillwynia glaucula	Michelago Parrot-pea	Endangered	Not Listed	Species									yes	yes	yes	yes
Flora	Diuris aequalis	Buttercup Doubletail	Endangered	Vulnerable	Species										yes	yes	
Flora	Diuris ochroma	Pale Golden Moths	Endangered	Vulnerable	Species	Yes											yes
Flora	Diuris tricolor	Pine Donkey Orchid	Vulnerable	Not Listed	Species									yes	yes		
Flora	Dodonaea procumbens	Creeping Hop-bush	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Eleocharis obicis	Spike-Rush	Vulnerable	Vulnerable	Species										yes	yes	
Flora	Eucalyptus aggregata	Black Gum	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus alligatrix subsp. alligatrix	Eucalyptus alligatrix subsp. alligatrix	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus aquatica	Broad-leaved Sally	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus benthamii	Camden White Gum	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus cannonii	Capertee Stringybark	Vulnerable	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus canobolensis	Silver-Leaf Candlebark	Vulnerable	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus kartzoffiana	Araluen Gum	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus langleyi	Albatross Mallee	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	Endangered	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus parvula	Small-leaved Gum	Endangered	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus pulverulenta	Silver-leafed Gum	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Eucalyptus recurva	Mongarlowe Mallee	Critically Endangered	Critically Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Eucalyptus robertsonii subsp. hemisphaerica	Robertson's Peppermint	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Euphrasia arguta	Euphrasia arguta	Critically Endangered	Critically Endangered	Species	Yes	yes	yes								yes	yes
Flora	Euphrasia scabra	Rough Eyebright	Endangered	Not Listed	Species		yes	yes	yes								
Flora	Genoplesium superbum	Superb Midge Orchid	Endangered	Not Listed	Species		yes	yes									
Flora	Gentiana baeuerlenii	Baeuerlen's Gentian	Endangered	Endangered	Species			yes	yes	yes							
Flora	Gentiana bredboensis	Bredbo Gentian	Critically Endangered	Vulnerable	Species										yes	yes	
Flora	Gentiana wingecarribiensis	Wingecarribee Gentian	Critically Endangered	Endangered	Species										yes	yes	yes
Flora	Glycine latrobeana	Clover Glycine	Critically Endangered	Vulnerable	Species	yes								yes	yes	yes	yes
Flora	Grammitis stenophylla	Narrow-leaf Finger Fern	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Grevillea acanthifolia subsp. paludosa	Bog Grevillea	Endangered	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Grevillea divaricata	Grevillea divaricata	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Grevillea iaspicula	Wee Jasper Grevillea	Critically Endangered	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Grevillea renwickiana	Nerriga Grevillea	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Grevillea wilkinsonii	Tumut Grevillea	Endangered	Endangered	Species										yes		
Flora	Gyrostemon thesioides	Gyrostemon thesioides	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Hakea dohertyi	Kowmung Hakea	Endangered	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Haloragis exalata subsp. exalata	Square Raspwort	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Hibbertia puberula	Hibbertia puberula	Endangered	Not Listed	Species	Yes	yes							yes	yes	yes	yes
Flora	Irenepharsus magicus	Elusive Cress	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes							yes
Flora	Irenepharsus trypherus	Illawarra Irene	Endangered	Endangered	Species	Yes	yes	yes									yes
Flora	Kunzea cambagei	Cambage Kunzea	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Lastreopsis hispida	Bristly Shield Fern	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Lepidium hyssopifolium	Aromatic Peppercress	Endangered	Endangered	Species										yes	yes	yes
Flora	Leptospermum thompsonii	Monga Tea Tree	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Leucochrysum albicans var. tricolor	Hoary Sunray	Not Listed	Endangered	Species	Yes	yes	yes	yes					yes	yes	yes	yes
Flora	Lysimachia vulgaris var. davurica	Yellow Loosestrife	Endangered	Not Listed	Species	Yes	yes	yes									yes
Flora	Monotaxis macrophylla	Large-leafed Monotaxis	Endangered	Not Listed	Species								yes				
Flora	Monotoca rotundifolia	Trailing Monotoca	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes							
Flora	Persoonia glaucescens	Mittagong Geebung	Endangered	Vulnerable	Species	Yes	yes	yes									
Flora	Persoonia hindii	Persoonia hindii	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Persoonia hirsuta	Hairy Geebung	Endangered	Endangered	Species	Yes	yes	yes	yes	yes							yes
Flora	Persoonia marginata	Clandulla Geebung	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Phyllota humifusa	Dwarf Phyllota	Vulnerable	Vulnerable	Species	Yes										yes	yes
Flora	Pilularia novae-hollandiae	Austral Pillwort	Endangered	Not Listed	Species										yes	yes	yes
Flora	Pimelea curviflora var. curviflora	Pimelea curviflora var. curviflora	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Pomaderris brunnea	Brown Pomaderris	Endangered	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Pomaderris cotoneaster	Cotoneaster Pomaderris	Endangered	Endangered	Species										yes	yes	
Flora	Pomaderris delicata	Delicate Pomaderris	Critically Endangered	Critically Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Pomaderris pallida	Pale Pomaderris	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Prasophyllum bagoense	Bago Leek Orchid	Critically Endangered	Critically Endangered	Species												yes
Flora	Prasophyllum canaliculatum	Summer Leek Orchid	Critically Endangered	Not Listed	Species	Yes											yes
Flora	Prasophyllum fuscum	Slaty Leek Orchid	Critically Endangered	Vulnerable	Species											yes	
Flora	Prasophyllum innubum	Brandy Mary's leek orchid	Critically Endangered	Critically Endangered	Species		yes	yes									
Flora	Prasophyllum keltonii	Kelton's Leek Orchid	Critically Endangered	Critically Endangered	Species	Yes											Yes
Flora	Prasophyllum petilum	Tarengo Leek Orchid	Endangered	Endangered	Species									yes	yes	yes	yes
Flora	Prasophyllum sp. Majors Creek	Majors Creek Leek Orchid	Critically Endangered	Not Listed	Species											yes	yes
Flora	Prostanthera gilesii	Prostanthera gilesii	Critically Endangered	Not Listed	Species									yes	yes	yes	
Flora	Prostanthera stricta	Mount Vincent Mint-bush	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Pterostylis alpina	mountain greenhood Orchid	Vulnerable	Not Listed	Species								yes	yes	yes	yes	
Flora	Pterostylis foliata	Slender Greenhood	Vulnerable	Not Listed	Species										yes	yes	
Flora	Pterostylis oreophila	Blue-tongued Greenhood	Critically Endangered	Critically Endangered	Species	Yes											yes
Flora	Pterostylis ventricosa	Pterostylis ventricosa	Critically Endangered	Not Listed	Species			yes	yes	yes							
Flora	Pterostylis vernalis	Pterostylis vernalis	Critically Endangered	Critically Endangered	Species								yes	yes	yes		
Flora	Pultenaea elusa	Elusive Bush-pea	Critically Endangered	Endangered	Species										yes	yes	
Flora	Pultenaea glabra	Smooth Bush-Pea	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Pultenaea humilis	Dwarf Bush-pea	Vulnerable	Not Listed	Species										yes	yes	yes
Flora	Pultenaea parrisiae	Parris' Bush-pea	Vulnerable	Vulnerable	Species										yes	yes	
Flora	Pultenaea pedunculata	Matted Bush-pea	Endangered	Not Listed	Species									yes	yes	yes	
Flora	Rutidosis leptorrhynchoides	Button Wrinklewort	Endangered	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Senecio garlandii	Woolly Ragwort	Vulnerable	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Senna acclinis	Rainforest Cassia	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Solanum amourense	Solanum amourense	Endangered	Not Listed	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Solanum celatum	Solanum celatum	Endangered	Not Listed	Species								yes	yes	yes	yes	
Flora	Swainsona recta	Small Purple-pea	Endangered	Endangered	Species									yes	yes	yes	
Flora	Swainsona sericea	Silky Swainson-pea	Vulnerable	Not Listed	Species									yes	yes	yes	
Flora	Thelymitra alpicola	Thelymitra alpicola	Vulnerable	Not Listed	Species	Yes										yes	yes
Flora	Thelymitra atronitida	Black-hooded Sun Orchid	Critically Endangered	Not Listed	Species											yes	yes
Flora	Thelymitra kangaloonica	Kangaloon Sun Orchid	Critically Endangered	Critically Endangered	Species										yes	yes	
Flora	Thesium australe	Austral Toadflax	Vulnerable	Vulnerable	Species	Yes	yes									yes	yes
Flora	Trachymene scapigera	Mountain Trachymene	Endangered	Endangered	Species	Yes	yes	yes									yes
Flora	Tylophora linearis	Tylophora linearis	Vulnerable	Endangered	Species	Yes	yes	yes	yes	yes				yes	yes	yes	yes
Flora	Veronica blakelyi	Veronica blakelyi	Vulnerable	Not Listed	Species	Yes	yes						yes	yes	yes	yes	yes
Flora	Zieria citriodora	Lemon Zieria	Endangered	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Zieria covenyi	Coveny's Zieria	Endangered	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Zieria murphyi	Velvet Zieria	Vulnerable	Vulnerable	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Zieria obcordata	Zieria obcordata	Endangered	Endangered	Species	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Flora	Amphibromus fluitans	Floating Swamp Wallaby-grass	Vulnerable	Vulnerable	Species	Yes	yes	yes									yes
Flora	Genoplesium vernale	East Lynne Midge Orchid	Vulnerable	Vulnerable	Species											yes	yes
Flora	Austrostipa wakoolica	A spear-grass	Endangered	Endangered	Species										Yes	Yes	Yes
Flora	Brachyscome papillosa	Mossgiel Daisy	Vulnerable	Vulnerable	Species									Yes	Yes	Yes	
Flora	Brachyscome muelleroides	Claypan Daisy	Vulnerable	Vulnerable	Species									Yes	Yes	Yes	
Flora	Caesia parviflora var. minor	Small Pale Grass-lily	Endangered	Not Listed	Species	Yes	Yes								Yes	Yes	Yes
Flora	Caladenia rosella	Rosella Spider Orchid	presumed extinct	Endangered	Species												
Flora	Calotis pubescens	Max Mueller's Burr-daisy	Endangered	Not Listed	Species	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Flora	Carex archeri	Archer's Carex	Endangered	Not Listed	Species	Yes	Yes	Yes									Yes
Flora	Carex raleighii	Raleigh Sedge	Endangered	Not Listed	Species	Yes	Yes	Yes									Yes
Flora	Convolvulus tedmoorei	Bindweed	Endangered	Not Listed	Species						Yes	Yes	Yes	Yes			
Flora	Digitaria porrecta	Finger Panic Grass	Endangered	Not Listed	Species	Yes	Yes										
Flora	Discaria nitida	Leafy Anchor Plant	Vulnerable	Not Listed	Species	Yes	Yes	Yes	Yes							Yes	Yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Eucalyptus corticosa	Creswick Apple Box	Vulnerable	Not Listed	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flora	Eucalyptus saxicola	Mt Canobolas Box		Not Listed	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flora	Argyrotegium nitidulum	Shining Cudweed	Vulnerable	Vulnerable	Species	Yes	Yes	Yes	Yes								Yes
Flora	Euphrasia collina subsp. muelleri	Mueller's Eyebright	Endangered	Endangered	Species	Yes										Yes	Yes
Flora	Goodenia macbarronii	Narrow Goodenia		Not Listed	Species	Yes	Yes							Yes	Yes	Yes	Yes
Flora	Grevillea obtusiflora	Grevillea obtusiflora	Endangered	Endangered	Species								Yes	Yes	Yes		
Flora	Indigofera efoliata	Leafless Indigo	Endangered	Endangered	Species								Yes	Yes	Yes		
Flora	Lepidium aschersonii	Spiny Peppercress	Vulnerable	Vulnerable	Species	Yes	Yes	Yes	Yes							Yes	Yes
Flora	Lepidium monoplocoides	Winged Peppercress	Endangered	Endangered	Species	Yes	Yes									Yes	Yes
Flora	Leptorhynchos orientalis	Lanky Buttons	Endangered	Not Listed	Species									Yes	Yes	Yes	
Flora	Philotheca ericifolia	Philotheca ericifolia		Vulnerable	Species									Yes	Yes	Yes	Yes
Flora	Pomaderris elachophylla	Lacy Pomaderris	Endangered	Not Listed	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flora	Prasophyllum retroflexum	Kiandra Leek Orchid	Vulnerable	Vulnerable	Species	Yes											Yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Ranunculus anemoneus	Anemone Buttercup	Vulnerable	Vulnerable	Species	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Flora	Commersonia procumbens	Commersonia procumbens	Vulnerable	Vulnerable	Species	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Flora	Rutidosis leiolepis	Monaro Golden Daisy	Vulnerable	Vulnerable	Species	Yes	Yes	Yes							Yes	Yes	Yes
Flora	Swainsona murrayana	Slender Darling Pea	Vulnerable	Vulnerable	Species									Yes			
Flora	Swainsona plagiotropis	Red Darling Pea	Vulnerable	Vulnerable	Species									Yes			
Flora	Dampiera fusca	Kydra Dampiera	Endangered	Not Listed	Species	Yes										Yes	Yes
Flora	Rytidosperma vickeryae	Perisher Wallaby-grass	Endangered	Not Listed	Species		Yes	Yes									
Flora	Bossiaea fragrans	Bossiaea fragrans	Critically Endangered	Critically Endangered	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flora	Bossiaea bombayensis	Bombay Bossiaea	Vulnerable	Not Listed	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flora	Bothriochloa biloba	Lobed Bluegrass		Not Listed	Species	Yes	Yes	Yes	Yes	Yes	Yes					Yes	Yes
Flora	Prasophyllum sp. Wybong	Prasophyllum sp. Wybong		Critically Endangered	Species									Yes	Yes		
Flora	Pomaderris cocoparrana	Cocoparra Pomaderris	Endangered	Endangered	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flora	Rhodamnia rubescens	Scrub Turpentine	Critically Endangered	Not Listed	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Kingdom	Scientific Name	Common Name	NSW	Common-wealth	NSW Credit class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora	Persoonia mollis subsp. revoluta	Persoonia mollis subsp. revoluta	Vulnerable	Not Listed	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flora	Xerochrysum palustre	Swamp Everlasting		Vulnerable	Species	Yes	Yes	Yes	Yes	Yes				Yes	Yes	Yes	Yes

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

Appendix E - BAM BioNet PMST threatened species

Flora All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 16 November 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 16 November 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA project records within V9 proposal corridor	Species Credit Species SCS)/Ecosystem Credit Species (ECS)/Dual	Potential SAII	Bionet	MNES	Associated by PCT/s	Likelihood of Occurrence/Justification for survey inclusion or exclusion	Survey Required (Y/N)
Epiphytes and Climbers	*Cynanchum elegans*	White-flowered Wax Plant	0	0	0	0	SCS			TRUE		Unlikely - occurs in rainforest gullies scrub and scree slopes; from the Gloucester district to the Wollongong area and inland to Mt Dangar	No
Epiphytes and Climbers	*Tylophora linearis*	Tylophora linearis	0	0	0	0	SCS				TRUE	No BioNet records in or within 5 km of the study area. No AVH records in the study, but several N, the closest approx. 75,679 m NNW (1915, 'Temora'), and a more recent one approx. 95,137 m NNW of the study area (2008, Badgery TSR, c. 30 km NW of Young, N side of Clifton Rd, near intersection with Nockes Rd). Majority of records occur in the central western region. Records from Goonoo, Pillaga West, Pillaga East,Bibblewindi, Cumbiland Eura State Forests, Coolbaggie NR, Goobang NP and Beni SCA. Also has been recorded Hiawatha State Forest near West Wyalong in the south and there are old records as far north as Crow Mountain near Barraba and near Glenmorgan in the western Darling Downs. Distribution not in or near AOI.	No
Grass	*Amphibromus fluitans*	Float Swamp Wallaby-grass	0	0	0	0	SCS			TRUE		No Bionet recordsin or within 10km of thestudy area. Occurs in periodically inundated sites (including table drains and farm dams), notably wetlands on riverine floodplain. Grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels.	No
Grass	*Austrostipa wakoolica*	A spear-grass	0	0	0	0	SCS				TRUE	Unlikely - distribution and habitat (Murray River floodplains) outside AOI. All AVH and Atlas records to NW, W and SW of AOI - closest is 73km away. Distribution not in, or near study area.	No
Grass	*Baloskion longipes*	Dense Cord-rush	0	0	0	0	SCS				TRUE	Closest records are approx. 23,679 m S of study area (at and near Hanging Rock Swamp, Penrose SF). Others are approx. 104,637 m S-SE. Has been recorded from the Kanangra-Boyd area to the Southern Tablelands but all populations are small. Populations have been recorded in Blue Mountains National Park, Kanangra-Boyd National Park, Penrose State Forest (in Hanging Rock Swamp), Morton National Park (The Vines), the Clyde Mountain area and Ballalaba (south of Braidwood). Distribution not in, or near study area.	No
Grass	*Bothriochloa biloba*	Lobed Bluegrass	0	0	0	0	SCS				TRUE	Unlikely - distribution listed in PlantNet (NC, ?CC, NT, NWS, CWS, NWP, SWP) outside botanical divisions across which the study area crosses (SWS, ST). Although 2 AVH records in Canberra? Distribution not in, or near study area.	No
Grass	*Dichanthium setosum*	Bluegrass	0	0	0	0	SCS				TRUE	Very low / unlikely. None in survey area. One Bionet record approx 27,745 m from study area, but noted as invalid. Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extendingtonorthern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas. Distribution not in, or near study area.	No
Herbs and Forbs	*Ammobium craspedioides*	Yass Daisy	165	10	8	8	SCS		TRUE	TRUE	TRUE	ELA recorded during survey within v9 corridor	Yes
Herbs and Forbs	*Argyrotegium nitidulum*	Shining Cudweed	0	0	0	0	SCS				TRUE	No BioNet records in, or within 5 km of study area. Several AVH records, the closest being approx. 37,482 m SE of the study area (1970, Spencers Creek, 1/4 mile [0.4 km] above road bridge). In NSW Shining Cudweed is found only in the higher parts of Kosciuszko National Park. The species also occurs in Victoria and the south island of New Zealand, in similarly high mountain areas. Distribution not in, or near study area.	No
Herbs and Forbs	*Brachyscome muelleroides*	Claypan Daisy	0	0	0	0	SCS	TRUE		TRUE	TRUE	Unlikely - distribution in PlantNet says south from Wagga Wagga. Closest records (2) are 10km from AOI in Wagga from 1889. Next closest are a cluster 76 km to the south east of the western exten of the AOI (1949-1951). Distribution not in, or near study area.	No
Herbs and Forbs	*Caesia parviflora var. minor*	Small Pale Grass-lily	0	0	0	0	SCS				TRUE	No BioNet records in or within 5 km of the study area. The two closest BioNet records are approx. 20.9 km SW of the study area (16/11/1966, ca. north-east of Carabost. Determination status: det. Determiner: R.J.F. Henderson Habit / Notes: A small plant to nine inches in height, 0.5 inches in width; silvery-white flowers with yellow stamens on leafless stalks. Not widespread, occurring only in isolated instances. Grows on gravelly ridges and clay loam slopes with a westerly aspect.) and 101.6 km NE of the study area (21/12/2001, Lambeth Reserve, eastern section (3b) Specified Map No: 9030-2-S). No AVH records. Only survey for if surveying for species in the same associated PCTs in the appropriate survey months.	Yes
Herbs and Forbs	*Calotis glandulosa*	Mauve Burr-daisy	0	0	0	0	SCS	TRUE		TRUE	TRUE	Vallid records are mostly in Kosciuzko National Park, > 24,023 m from Study Area. The distribution of the Mauve Burr-daisy is centred on the Monaro and Kosciuszko regions. There are three known sites in the upper Shoalhaven catchment. There are old and possibly dubious records from near Oberon, the Dubbo area and Mt Imlay.	Yes

Flora All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 16 November 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 16 November 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA project records within V9 proposal corridor	Species Credit Species SCS)/Ecosystem Credit Species (ECS)/Dual	Potential SAII	Bionet	MNES	Associated by PCT/s	Likelihood of Occurrence/Justification for survey inclusion or exclusion	Survey Required (Y/N)
Herbs and Forbs	*Calotis pubescens*	Max Mueller's Burr-daisy	0	0	0	0	SCS				TRUE	No Bionet records in or within 5 km of the study area. Numerous AVH records within approx 45,000 m E,SE,-SE of the study area (2011, Kelly's Plain, ca. 2.7 km SSW of Tantangara Dam (wall); Kosciuszko National Park; 2016, Botherum Plain, next to access track ca 850 m S of Gungarlin River crossing, Kosciuszko National Park.). This species has been recorded from five sites in the Snowy Mountains of NSW (four of which, all in Kosciuszko National Park, are extant). It was first recorded in Victoria in the 19th Century but not seen again there until 2009 when a single large population was discovered south-east of Mt Hotham.	No
Herbs and Forbs	*Colobanthus curtisiae*	Curtis' Colobanth	0	0	0	0				TRUE		Very unlikely. and >10km from study area	
Herbs and Forbs	*Cullen parvum*	Small Scurf-pea	1	1	0	0	SCS		TRUE		TRUE	Unlikely - distribution in PlantNet is far western NSW on Darling and Murrumbidgee Rivers (NWP, SFWP, NFWP).Closest AVH record is 183km to the west on the Murrumbifgee River	No
Herbs and Forbs	*Euphrasia arguta*	Euphrasia arguta	0	0	0	0	SCS	TRUE			TRUE	Low / Unlikley. No BioNet or AVH records in or within 5 km of the study area. Distribution not in, or near study area	No
Herbs and Forbs	*Euphrasia scabra*	Rough Eyebright	0	0	0	0	SCS	TRUE			TRUE	No BioNet records in or within 5 km of the study area. No AVH records in or within 5 km of the study area, the closest being approx. 178,176 m N of the study area (1890, Rylstone). There are ten old herbarium collections of Rough Eyebright from NSW (including Port Jackson, Bathurst Plains, Lake George, Jindabyne, Yarrangobilly Caves and Tumbarumba). The species is regarded as extinct in South Australia. There is one population in Tasmania and seven in Victoria. There are three extant populations in NSW: Bondi State Forest, South East Forests National Park and near Nunnock Swamp. Total NSW population is between 250 and 500 plants.This number varies with season with few plants appearing in some years.	No
Herbs and Forbs	*Glycine latrobeana*	Clover Glycine	0	0	0	0	SCS	TRUE		TRUE	TRUE	Potentially. Seven BioNet records (2011-2019) approx. 30-34 km E-SE of study area, at Kellys Plain, Gulf Plain and near Circuits Hut. No AVH records in or within 5 km of the study area.	Yes
Herbs and Forbs	*Helichrysum calvertianum*	Helichrysum calvertianum	0	0	0	0	SCS			TRUE		Grows on or near rock outcrops and platforms (mainly Hawkesbury Sandstone) in dry sclerophyll forest and associated mallee and heath. Restricted to the Southern Highlands region between Joadja, Belanglo, Canyonleigh, Penrose, Fitzroy Falls, Mt Gibraltar (presumed extinct), and Berrima.	No
Herbs and Forbs	*Irenepharsus magicus*	Elusive Cress	0	0	0	0	SCS	TRUE			TRUE	No records in BioNet search. AVH records from 1954 approx. 51,210 m S of study area. (Upper Geehi Valley Snowy Mtns [Mountains] H.E.A. [Hydro Electric Authority]). Although the location information provided with the single NSW collection is vague, it would appear that it was made in the vicinity of Geehi Dam, which is within Kosciuszko NP. Elusive Cress has also been recorded in East Gippsland in Victoria. Distribution not in, or near study area.	No
Herbs and Forbs	*Lepidium hyssopifolium*	Aromatic Peppercress	0	0	0	0	SCS			TRUE		All Atlas records are in the Central and Southern Tablands to east of AOI. AVH has more extensive records also in Vic, SA, Tas and NZ. The nearest record is approx. 60km away. Distribution not in, or near study area.	No
Herbs and Forbs	*Lepidium monoplocoides*	Winged Peppercress	0	0	0	0	SCS			TRUE		Unlikely - PlantNet distibution says widespread in semi-arid regions and list mainly the far west NSW botanical subdivisions (NWP, SWP, NFWP, SFWP)., although SWS is listed, the only record is in the far west of this region. All AVH records are in western NSW or Victoria. The closest record is 92km to the west of the AOI	No
Herbs and Forbs	*Leucochrysum albicans var. tricolor*	Hoary Sunray	79	20	122	122	SCS	TRUE	TRUE	TRUE	TRUE	ELA recorded during survey within v9 corridor	Yes
Herbs and Forbs	*Ranunculus anemoneus*	Anemone Buttercup	0	0	0	0	SCS				TRUE	No BioNet records in or within 5 km of the study area. No AVH records in the study area. Nearby records likely have incorrect coordinates, as their location descriptions refer to Mt Kosciusko. Nearsest records are approx. 38,100 m SSE of the study area (1854, Munyang Mountains / range). The Anemone Buttercup occurs in a narrow band, only about 8km wide and 32km long, along the Great Dividing Range within Kosciuszko National Park (comprising the Main Range between Mt Kosciuszko and Mt Twynam; the Charlottes Pass resort; the Mt Perisher - Mt Blue Cow area; the Guthega - Mt Tate area; the Schlink Pass - Gungarten Pass area, the Rams Head Range and Upper parts of Thredbo, and Mt Jagungal). Species occurs at elevation ≥ 1600m , which does not occur within the study area. Restricted distribution does not extend into study area.	No
Herbs and Forbs	*Rutidosis leiolepis*	Monaro Golden Daisy	0	0	0	0	SCS				TRUE	No BioNet records in or within 5 km of the study area. No AVH records in the study area. The closest AVH record it approx. 25,512 m E (1998, Kosciuszko National Park, Yorkes Ck 400 m north-east of Long Plain Hut). Other AVH records further N , S and E of the closest record. The Monaro Golden Daisy is found in scattered populations on the Monaro, and in low subalpine plains of Kosciuszko National Park (eg. Long Plain and Happy Jacks Plain).	No
Herbs and Forbs	*Rutidosis leptorrhynchoides*	Button Wrinklewort	0	0	0	0	SCS			TRUE		No BioNet records in study area. Many AVH records, mostly 20,418 m S (around Goulbourn and >51,488 m S around Canberra. Local populations at Goulburn, the Canberra - Queanbeyan area and at Michelago.	Yes

Flora All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 16 November 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 16 November 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA project records within V9 proposal corridor	Species Credit Species SCS)/Ecosystem Credit Species (ECS)/Dual	Potential SAII	Bionet	MNES	Associated by PCT/s	Likelihood of Occurrence/Justification for survey inclusion or exclusion	Survey Required (Y/N)
Herbs and Forbs	*Senecio garlandii*	Woolly Ragwort	2	0	0	0	SCS		TRUE		TRUE	Two BioNet recordswithin the study area. Many AVH records in the region. The closest plausible record (there are a few which don't appear to have accurate coodinates) is approx. 12,776 m SW of the study area (1971, Wrigley's property adjoining 'Big Springs', c. 15 miles ESE of The Rock, at foot of range of hills called 'Bob in the box'). The most recent record is approx. 54,196 m W of the study area (2015, Ceranya, Milbrulong via Lockhart). This daisy is found between Temora, Bethungra and Albury and possibly Burrinjuck near Yass. The largest populations are at The Rock and Mt Tabletop (and surrounds). Approx. 9,265 m N of study area at Grange road off Mangoplah road, south of Wagga Wagga (lat./long. for Wagga Wagga); Approx. 27,088 m NW from study area at Ulandra Nature Reserve (gully of south-eastern slope of Mt Ulandra near summit); approx. 59,156 m SW of study area, approx 50m west of South Creek Trail, Woomargama National Park; Historic (extinct population) approx 9,413 m S of study area at Burrinjuck. potential habitat present in the study area and historic, and more recent records < 9,413 m and 54,196 m (respectively) from study area	Yes
Herbs and Forbs	*Senecio macrocarpus*	Senecio macrocarpus	0	0	0	0	SCS			TRUE		occurs in South Australia and Victoria,.	No
Herbs and Forbs	*Swainsona recta*	Small Purple-pea	0	0	0	0	SCS			TRUE	TRUE	No BioNet records in or within 5 km of the study area. No AVH records in the study area, but there are a number of records in the greater region, distributed around the study area 70,206 m SE, 56,658 m WSW, 133,166 m N 104,358 m NE, and possibly approx. 10,975 m N (coordinates unlikely to be accurate). Small Purple-pea was recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Populations still exist in the Queanbeyan and Wellington-Mudgee areas. Over 80% of the southern population grows on a railway easement. It is also known from the ACT and a single population of four plants near Chiltern in Victoria. Study area is within recorded distribution and contains potential habitat.	Yes
Herbs and Forbs	*Swainsona sericea*	Silky Swainson-pea	2	0	0	0	SCS		TRUE		TRUE	One BioNet records within 5 km of the study area. Approx. 4,343 m NW of the study area (1999, Bowning TSR (no. 36) LOCATION DETAILS: No gate on road, TSR surrounds tip; opposite recreation ground on Burley Griffin Way) and approx. 4,931 m SE of the study area (2005, Mount Parnassus: Area at top of hill surrounding lookout). Many AVH records surrounding the study area. Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Potential habitat in study area and records nearby	Yes
Herbs and Forbs	*Thesium australe*	Austral Toadflax	0	0	0	0	SCS			TRUE	TRUE	No BioNet or AVH records in or within 5 km of the study area. Many BioNet records further to the NE, E and SE, the closest being approx 8.5 km SE of the study area at Serpentine (1969). Potential habitat in study area	Yes
Herbs and Forbs	*Xerochrysum palustre*	Swamp Everlasting	0	0	6	6	SCS			TRUE	TRUE	ELA recorded during survey within v9 corridor	Yes
Orchids	*Caladenia arenaria*	Sand-hill Spider Orchid	0	0	0	0	SCS	TRUE		TRUE	TRUE	3 BioNet records however dates and location details are witheld. Location details for AVH records have been denatured, but appear consistent with the following distribution description (from BioNet): Caladenia arenaria is found mostly on the south west plains and western south west slopes. The original description is of a plant from Nangus, west of Gundagai (1865) and there is a report of the species from Adelong near Tumut. A record near Cootamundra needs verifying. The Sand-hill Spider Orchid is currently only known to occur in the Riverina between Urana and Narranderra. Distribution not in, or near study area. ELA Ecologist and orchid expert Lachland Copeland advised to exclude species from survey- based on bionet record 35km outside of study area, and on advice from orchid contacts within NPWS (G Robertson).	No

Flora All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 16 November 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 16 November 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA project records within V9 proposal corridor	Species Credit Species SCS)/Ecosystem Credit Species (ECS)/Dual	Potential SAII	Bionet	MNES	Associated by PCT/s	Likelihood of Occurrence/Justification for survey inclusion or exclusion	Survey Required (Y/N)
Orchids	*Caladenia concolor*	Crimson Spider Orchid	2	0	0	0	SCS	TRUE	TRUE	TRUE		Two BioNet record within 5 km of the study area, however the date and location details have been witheld. AVH shows 3 records in or within 5 km of the study area (near Tumut, Tumbarrumba and Burrinjuck), however the coordinates and location descriptions for these records has also been denatured. The current NSW Scientific Committee listing incorporates two populations which have each been described as separate species by D.L. Jones. One of these populations comprises a few hundred plants on private property near Bethungra and the other of about 100 plants occurs in Burrinjuck Nature reserve. The other occurrences of the Crimson Spider Orchid in NSW are from the Nail Can Hill Crown Reserve near Albury. The species also occurs at two localities in Victoria near Beechworth and Chiltern. Info based on ELA Ecologist and orchid expert Lachland Copeland advice: Changed from Sep to Oct survey. Southern occurences considered to be Caladenia orestes (same complex as C. concolor which occurs further north). C. orestes was surveyed in Red Hill State Forest in Oct 2020.	Yes
Orchids	*Caladenia montana*	Caladenia montana	2	0	0	0	SCS		TRUE		TRUE	Unlikely - distribution not in, or near, AOI as this species occurs in mainly in the east alps section of the Alpine National Park, Victoria, and possibly southern Kosciuszko National Park adjacent to Victoria	No
Orchids	*Caladenia tessellata*	Thick Lip Spider Orchid	0	0	0	0	SCS	TRUE		TRUE	TRUE	No BioNet records in or within 5 km of the study area. Several AVH records near Queanbeyan, and S and W of Tarago, however the coordinates have been denatured and the location ion descriptions have been witheld. Approx distances from the study area are likely > 70,425 m S-SE. The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border. Distribution not in or near study area	No
Orchids	*Diuris aequalis*	Buttercup Doubletail	32	0	0	0	SCS		TRUE	TRUE	TRUE	BioNet records and known distribution are much further east and north than the State Forest study area. There is only one associated PCT (1100) within the State Forest study area (Bago SF and Maragle SF), and it is really far from the Bionet records, and the distribution description doesn't support the likelihood of it occurring in Bago or Maragle SF. However, ELA Ecologist and orchid expert Lachland Copeland advises it's possible that it could be present. Surveyed in Bago and Maragle State Forests in October 2020.	Yes
Orchids	*Diuris ochroma*	Pale Golden Moths	0	0	0	0	SCS	TRUE		TRUE	TRUE	No BioNet or AVH records in or within 5 km of study area. Closest BioNet records are approx 34 km from the study area in 2019 (location descriptions witheld). In NSW, it is known to occur in the Kybeyan area, Monaro Tableland (NSW Final Determination). ELA Ecologist and orchid expert Lachland Copeland advised that the closest records of Diuris ochroma are a long way away (35km to the SE) hence why it was excluded. It flowers best in Nov and is certainly all done for this past season (summer 2020-21)	No
Orchids	*Diuris tricolor*	Pine Donkey Orchid	0	0	0	0	SCS				TRUE	Possible, survey required (advice ELA Ecologist and orchid expert Lachland Copeland)	Yes
Orchids	*Genoplesium baueri*	Bauer's Midge Orchid	0	0	0	0	SCS	TRUE		TRUE		Grows in sparse sclerophyll forest and moss gardens over sandstone; from the Hunter Valley to Nowra district. Feb- March survey period only.	No
Orchids	*Genoplesium vernale*	Eastern Lynne Midge-Orchid	3	0	0	0	SCS		TRUE	TRUE		Three records within 10km of study area, non within the study area. Generally restricted to a narrow geographic range from near Mogo to west of Ulladulla.	No
Orchids	*Prasophyllum bagoense*	Prasophyllum bagoense	399	279	63	63	SCS	TRUE	TRUE	TRUE	TRUE	"A total of 63 individuals of this species were observed during ELA survey (December 2019) (56 on McPhersons Plains and 7 on Modder Creek Plain). Considering the area searched this number appeared to be relatively low and was likely to have been severely affected by the drier than normal winter/spring/early summer leading up to the survey. Geoff Robertson and Gavin Philips (pers. comm.) both agreed that their surveys, conducted at the same time, yielded far fewer plants than in previous seasons." (Eco Logical Australia 2020. Humelink Early Works Ecological Services – December 2019 Orchid Survey. Prepared for Aurecon.)	Yes

Flora All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 16 November 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 16 November 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA project records within V9 proposal corridor	Species Credit Species SCS)/Ecosystem Credit Species (ECS)/Dual	Potential SAII	Bionet	MNES	Associated by PCT/s	Likelihood of Occurrence/Justification for survey inclusion or exclusion	Survey Required (Y/N)
Orchids	*Prasophyllum innubum*	Prasophyllum innubum	4	1	0	0	SCS	TRUE	TRUE	TRUE	TRUE	3 Bionet records from 2015, locations witheld. In New South Wales, Prasophyllum innubum is known from a single population comprising about seven small colonies, totalling about 400 individuals, from a small area about 30 km north-west of Cabramurra and about 17 km south of Talbingo, in the Tumbarumba Local Government Area. The species occurs in Bago State Forest and apparently also on adjacent Crown forestry lease and private freehold. The species is not known to occur in any conservation reserves. ELA Ecologist and orchid expert Lachland Copeland suggets habitat is unlikely. However, due to records occurring within a 10km radius and this species listing as CE and SAII surveys are required.	Yes
Orchids	*Prasophyllum keltonii*	Kelton's Leek Orchid	62	30	25	25	SCS	TRUE	TRUE	TRUE	TRUE	"A total of 25 individuals of this species were observed during ELA survey (Dec 2019) (5 on McPhersons Plains and 20 on Modder Creek Plain). As with Prasophyllum bagoense, the number of flowering plants appeared low relative to previous surveys in the same area (G. Robertson pers. comm., G. Philips pers. comm.)." (Eco Logical Australia 2020. Humelink Early Works Ecological Services – December 2019 Orchid Survey. Prepared for Aurecon.)	Yes
Orchids	*Prasophyllum petilum*	Tarengo Leek Orchid	0	0	0	0	SCS			TRUE	TRUE	No BioNet records in or within 5 km of the study area. Many AVH records, the closest being. approx. 3,127 m NWW of the study area (2000, description witheld). There are also other records further N and S of the study area. Natural populations are known from a total of five sites in NSW. These are near Boorowa, Queanbeyan area, Ilford,;Delegate and a newly recognised population c.10 km west of Muswellbrook. It also occurs at Hall in the Australian Capital Territory. This species has also been recorded at Bowning Cemetery where it was experimentally introduced, though it is not known whether this population has persisted. "there is a thriving population a bit south of Booroowa and then the type population in NW Canberra (Hall Cemetery). Given our corridor passes halfway between these two extant populations, and that the species happily grows in disturbed semi cleared environments and derived grasslands, it's quite possible it could turn up. This is the only one I really think we need to survey for. It and the Caladenia are both best in late Sept through to mid Oct". (Pers. comms. ELA Ecologist and orchid expert Lachland Copeland Jan 2020).	Yes
Orchids	*Prasophyllum retroflexum*	Kiandra Leek Orchid	0	0	0	0	SCS				TRUE	No BioNet or AVH records in or within 5 km of the study area. Ten denatured BioNet records ranging from approx. 20 km to 37 km E-SE of the study area - location notes have been witheld, but appear to relate to populations in the Long Plain, Kiandra and Tantangara area. Advice from ELA Ecologist and orchid expert Lachland Copeland' is that it is unlikely to be detected after January.	No
Orchids	*Prasophyllum sp. Wybong*	Prasophyllum sp. Wybong	0	0	0	0	SCS	TRUE			TRUE	Also refered to as Prasophyllum petalum. Potential habitat present within the study site. Refer to info for Prasophyllum petalum.	Yes
Orchids	*Pterostylis alpina*	Alpine Greenhood	3	0	0	0	SCS		TRUE		TRUE	One BioNet record within 5 km of the study area, from 2005, however location details have been denatured/witheld. Also AVH records in and within 5 km of the study area, however the location descriptions have been witheld. The record also looks likely to be in the 2019-2020 fire footprint. The Alpine greenhood grows in moist forests on foothills and ranges, extending to montane areas in New South Wales, the Australian Capital Territory and Victoria. In NSW the species occurs in the Southern Tablelands south from Bondo State Forest. Distribution not in, or near study area. Likely burnt 2019-2020. ELA Ecologist and orchid expert Lachland Copeland does not think we need to include it in these surveys.	No
Orchids	*Pterostylis foliata*	Slender Greenhood	5	1	0	0	SCS		TRUE		TRUE	BioNet records have been denatured, however closest record with 0.5 km of the State Forest study area recorded in 2004. Other records within approx 5 km of study area were recorded between 2004 and 2010. Potential habitat in Batlow area	Yes

Flora All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 16 November 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 16 November 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA project records within V9 proposal corridor	Species Credit Species SCS)/Ecosystem Credit Species (ECS)/Dual	Potential SAII	Bionet	MNES	Associated by PCT/s	Likelihood of Occurrence/Justification for survey inclusion or exclusion	Survey Required (Y/N)
Orchids	*Pterostylis oreophila*	Blue-tongued Greenhood	4	2	0	0	SCS	TRUE	TRUE	TRUE	TRUE	"No individuals located during the December 2019 surveys by ELA. Discussions with experts who have observed this species in the field suggest that it may not have been seen in NSW for over 10 years (D. Rouse pers. comm., M. Clements pers. comm., D. Jones pers. comm.). The species was badly affected by wildfires in 2003 in southern NSW and the ACT with all of the experts cited above believing it led to local extinctions of most of the known populations. The species appears to be highly habitat specific and only small areas of this suitable habitat (high altitude, boggy soils beneath teatrees) exist in the study area. The previous record for the study area, based on observations from Jim Kelton and Peter Branwhite in 2005, is relatively imprecise making it difficult to determine if the original plants still survive." (Eco Logical Australia 2020. Humelink Early Works Ecological Services – December 2019 Orchid Survey. Prepared for Aurecon.)	Yes
Orchids	*Rhizanthella slateri*	Eastern Australian Underground Orchid	0	0	0	0	SCS	TRUE		TRUE		Grows in sclerophyll forest in shallow to deep loams. Collections tend to be accidental and it is not possible to determine distribution accurately; currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed.	No
Orchids	*Thelymitra alpicola*	Alpine Sun-orchid	1	0	1	1	SCS				TRUE	"Dean Rouse and Geoff Robertson observed numerous plants of this species in two locations in the study area, plus a third locality nearby (Spencers Creek Swamp) that is still in Bago State Forest but out of the proposed footprint. This species usually flowers best in November (D. Rouse pers. comm.) though observations of other orchids during the survey suggested that all orchids appeared to be flowering much later than usual (L. Copeland pers. obs, G. Robertson pers. comm., G. Philips pers. comm.). It is therefore possible that the surveys conducted for this species on 17th and 18th December 2019 may have been too early to detect most plants. A single small population of nine plants was observed in Maragle State Forest and all plants were still in bud (a relatively well-developed bud was prised open to confirm it's identity and to rule out the similar species Thelymitra juncifola and T. simulata). A second round of surveys planned for early December 2020 may have been more productive for observing this species but was cancelled due to the summer wildfires of 2019/2020." (Eco Logical Australia 2020. Humelink Early Works Ecological Services – December 2019 Orchid Survey. Prepared for Aurecon.)	Yes
Orchids	*Thelymitra kangaloonica*	Kangaloon Sun Orchid	0	0	0	0	SCS	TRUE		TRUE		Very unlikely. Rare and >50km from study area (Advice from ELA Ecologist and orchid expert Lachland Copeland).	No
Sedge	*Carex archeri*	Archer's Carex	0	0	0	0	SCS	TRUE			TRUE	No BioNet records in or wihin 5 km of the study area. Four BioNet records, the closest being approx. 67 km S of the study area above NE shore of Blue Lake, Kosciuszko NP (2018). AVH records are around Mt Kosciuszko, approx 43,518 m S of the study area. In NSW, Archer's Carex is only known from Kosciuszko National Park (Club Lake and upper Thredbo River areas). It is also found in the high country of Victoria and Tasmania.	No
Shrubs	*Acacia ausfeldii*	Ausfeld's Wattle	0	0	0	0	SCS				TRUE	No BioNet records in or within 5 km of the biodiversity study area. Also no AVH records in or near study area. Found to the east of Dubbo in the Mudgee-Ulan-Gulgong area of the NSW South Western Slopes bioregion, with some records in the adjoining Brigalow Belt South, South Eastern Highlands and the Sydney Basin bioregions. Populations are recorded from Yarrobil National Park, Goodiman State Conservation Area and there is a 1963 record from Munghorn Gap Nature Reserve. A large population is also known from Tuckland State Forest to the northwest of Gulgong. Distribution not in, or near study area	No
Shrubs	*Acacia bynoeana*	Bynoe's Wattle	2	0	0	0	SCS		TRUE	TRUE	TRUE	2 Bionet Records, none in study area. Closest records are approx. 5,664 m S-SE ((SPJGI2650030) 1/06/1993, TARAL Vegetation Survey, Species list of Tarlo River, not exhaustive (NOTE: No location given - no field sheet discovered. Location determined to be in general location of Tarlo River NP - general location only entered during data review 24/6/10 by Greg Steenbeeke); and approx. 4,405 m S-SE (SPJGI2574666) 27/02/2002, P5MA Vegetation Survey, 4 km west of Middle Arm road and The Forest intersection southern tributaries of Wooroondooroonbidgee Creek. Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. The species is currently known from about 30 locations, with the size of the populations at most locations being very small (1-5 plants). It has recently been found in the Colymea and Parma Creek areas west of Nowra.	Yes
Shrubs	*Acacia clunies-rossiae*	Kanangra Wattle	0	0	0	0	SCS				TRUE	Unlikely - Kanangra Wattle grows in the Kowmung and Coxs River areas entirely within Kanangra-Boyd and Blue Mountains National Parks. Closest Bionet Atlas record is greater tha 35km to the north of the AOI. Distribution not in, or near study area.	No

Flora All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 16 November 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 16 November 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA project records within V9 proposal corridor	Species Credit Species SCS)/Ecosystem Credit Species (ECS)/Dual	Potential SAII	Bionet	MNES	Associated by PCT/s	Likelihood of Occurrence/Justification for survey inclusion or exclusion	Survey Required (Y/N)
Shrubs	*Acacia flocktoniae*	Flockton Wattle	0	0	0	0	SCS				TRUE	The Flockton Wattle is found only in the Southern Blue Mountains (at Mt Victoria, Megalong Valley and Yerranderie). Distribution not in, or near study area	No
Shrubs	*Acacia meiantha*	Acacia meiantha	0	0	0	0	SCS	TRUE			TRUE	distribution not in, or near, AOI - all know populations in Central Tablelands between Orange, Lithgow and Kandos. Distribution not in, or near study area	No
Shrubs	*Acacia phasmoides*	Phantom Wattle	0	0	0	0	SCS	TRUE			TRUE	No BioNet records in or within 5 km of the study area. Two clusters of AVH records approx 30,410 m W-SW of study area (2014, Woomargama National Park, ca 180 m N of Cockatoo fire trail) and approx 32,601 m SW of the study area (1987, Midlands/Eastern Highlands. Pine Mountain Reference Area, Pine Mountain National Park). The species is only known from one location in NSW: Woomagarma National Park in Greater Hume Shire. It is also found at Burrowa-Pine Mountain National Park in Victoria. Distribution not in, or near study area	No
Shrubs	*Boronia deanei*	Deane's Boronia	0	0	0	0	SCS				TRUE	Unlikley. Occurs in wet heath on sandstone. Two subsp: subsp. deanei is restricted to the Blue Mtns & Kanangra-Boyd area, subsp. acutifolia only known from two disjunct areas centred on Fitzroy Falls and Nalbaugh National Park	No
Shrubs	*Bossiaea fragrans*	Bossiaea fragrans	0	0	0	0	SCS	TRUE			TRUE	No Bionet records in, or within 5 km of the study area. AVH records around Abercrombe caves, the most recent being approx. 68,754 m NW of the study area (2019, Saddle above Grove Creek, approx 450m N of Abercrombie Cavern). Currently only known from the Abercrombie Karst Conservation Reserve, south of Bathurst on the NSW central tablelands. It is highly restricted, with only a small number of known populations. Distribution not in, or near study area.	No
Shrubs	*Bossiaea oligosperma*	Few-seeded Bossiaea	0	0	0	0	SCS				TRUE	Many BioNet records, but all south of Study area / footprint in Windellama and Sandy Point, closest being approx 53,378 m from study site. The Few-seeded Bossiaea is known from two disjunct areas - the lower Blue Mountains in the Warragamba area (Wollondilly, Allum, Tonalli River catchments) and the Windellama area in Goulburn Mulwaree Shire, where it is locally abundant. A 1960s record for the Araluen valley south of Braidwood is credible but has not been relocated. Distribution not in, or near study area	No
Shrubs	*Commersonia prostrata*	Dwarf Kerrawang	0	0	0	0	SCS			TRUE	TRUE	None in study area. Mostly in Rowes Lagoon, Morton NP and Wingello SF, Nerriga, Nadgigomar NR. Closest records are approx 31,555m from study area at Rowes Lagoon. Dwarf Kerrawang occurs on the Southern Highlands and Southern Tablelands (one plant at Penrose State Forest, one plant at Tallong, a small population near the Corang and about 2000 plants at Rowes Lagoon), a larger population in the Thirlmere Lakes area (particularly among the dying reeds at the edge of the water), and on the North Coast (less than 100 plants at the Tomago sandbeds north of Newcastle).	No
Shrubs	*Cullen parvum*	Small Scurf-pea	1	0	0	0	SCS		TRUE			No records within the biodiversity study area, its known distribution occurs in the north of the study area. Plants are found in grassland, River Red Gum (Eucalyptus camaldulensis) Woodland or Box-Gum Woodland, sometimes on grazed land and usually on table drains or adjacent to drainage lines or watercourses	No
Shrubs	*Dillwynia glaucula*	Michelago Parrot-pea	0	0	0	0	SCS				TRUE	No BioNet records in or within 5 km of the study area. Several AVH records approx. 76,604 m E of the study site, near Michelago (e.g. 1995, Gossoon Creek, 250 m W of confluence with Murrumbidgee River, 8.5 km S of ACT border), as well as others E of Tarago, approx. 61,680 m S-SE of the study area (e.g. 1997, Cnr of Claypit and Nerriga Rds, 8 km S of Windellama. Windellama is 39 km SE of Goulburn). Michelago Parrot-pea is recorded from five areas on the NSW Southern Tablelands: near Windellama, where the species is locally abundant, near Mongarlowe, in Nadgigomar Nature Reserve near Braidwood, north-east of Michelago and at Numeralla. There is potential habitat between the known sites. Distribution not in, or near study area.	No
Shrubs	*Discaria nitida*	Leafy Anchor Plant	0	0	0	0	SCS				TRUE	No BioNet records in or within 5 km of the study area. Many AVH records approx. 10,355 m SE, plus more scattered N and S of those records. Many of the records appear to be in the area which burnt in Dec-Jan 2020. The Leafy Anchor Plant is confined to the far south of the Southern Tablelands of NSW and the north-east highlands of Victoria. In NSW the Leafy Anchor Plant grows mostly within Kosciuszko National Park, south from the Blue Water Holes - Yarrangobilly Caves area to south-west of Jindabyne, at altitudes above 900 m. In NSW 18 sites are known with a total population of about 2,800 plants (Wright & Briggs, 2000). In Victoria the species is extremely rare with a total of only 31 plants known from two populations.	No

Flora All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 16 November 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 16 November 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA project records within V9 proposal corridor	Species Credit Species SCS)/Ecosystem Credit Species (ECS)/Dual	Potential SAII	Bionet	MNES	Associated by PCT/s	Likelihood of Occurrence/Justification for survey inclusion or exclusion	Survey Required (Y/N)
Shrubs	*Dodonaea procumbens*	Creeping Hop-bush	0	0	0	0	SCS			TRUE		Possible (refer to National Recovery Plan). None in study area. Closest record noted as invalid. Closest valid record is 52,785 m SE of study area on the edge of Lake Bathurst. Other population (records) are 83,260 m E of study area around Michelago. Found in the dry areas of the Monaro, between Michelago and Dalgety. Here it occurs mostly in Natural Temperate Grassland or Snow Gum Eucalyptus pauciflora Woodland. There is one population at Lake Bathurst (the northern-most occurrence of the species). Here it occurs in adjacent to the lake bed in grassland dominated by Corkscrew Grass Austrostipa scabra and Curly Sedge Carex bichenoviana.	Potential
Shrubs	*Grevillea iaspicula*	Wee Jasper Grevillea	15	0	0	0	SCS		TRUE	TRUE		Location notes witheld. Two clusters of records - the closest is 8,213 m S of study area (on the shores of Lake Burrinjuck near Burrinjuck village on the border of the Southern Tablelands and South Western Slopes) and other is, 21,798 m S of study area (in the Wee Jasper area).	Yes
Shrubs	*Grevillea raybrownii*	Grevillea raybrownii	0	0	0	0	SCS			TRUE		Grows in dry sclerophyll forest in sandy, gravelly loam derived from sandstone, restricted to an area bounded by Dapto, Robertson and Berrima, possibly also Bungonia.	No
Shrubs	*Grevillea wilkinsonii*	Tumut Grevillea	17	17	0	0	SCS	TRUE	TRUE	TRUE	TRUE	Potential habita occurs within study area and 17 records within a 10km Bionet search. Highly restricted distribution in the NSW South-west Slopes region. Its main occurrence is along a 6 km stretch of the Goobarragandra River approximately 20 km east of Tumut where about 1,000 plants are known. The other occurrence is a small population that straddles the boundary of two private properties at Gundagai where only eight mature plants survive. generally grows in close proximity to the water, at altitudes between 310 and 340 m. Most healthy adult plants occur in open sunny areas, and those plants found under the canopy of dense vegetation tend to be spindly and are sometimes subject to sooty mould infestations. Associated native vegetation iinclude Blakely's Red Gum (Eucalyptus blakelyi), Apple Box (E. bridgesiana), Yellow Box (E. mellliodora), and Red Stringybark (E. macrorhyncha) and with Kurrajongs (Brachychiton populneus) sometimes growing in nearby paddocks. Surveyed in Red Hill State Forest on October 2020.	Yes
Shrubs	*Haloragis exalata subsp. exalata*	Square Raspwort	0	0	0	0	SCS				TRUE	No records in BioNet search, and none of the AVH records are near the study area. Square Raspwort occurs in 4 widely scattered localities in eastern NSW. It is disjunctly distributed in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Distribution not in, or near study area.	No
Shrubs	*Indigofera efoliata*	Leafless Indigo	0	0	0	0	SCS	TRUE			TRUE	Unlikely - only known from a few collections from the Dubbo area.	No
Shrubs	*Kunzea cambagei*	Cambage Kunzea	0	0	0	0	SCS			TRUE		Potential in far east arm of AOI, east of Taralga - only search in damp heath or mallee sites	Yes
Shrubs	*Persoonia marginata*	Clandulla Geebung	0	0	0	0	SCS				TRUE	No BioNet records in or within 5 km of the study area. No AVH records within or near the study area, the closest being ~ 120,000 m N or the study area. The Clandulla Geebung occurs between Kandos and Clarence in the western Blue Mountains. Populations are largely disjunct and include Clandulla, Ben Bullen and Sunny Corner State Forests; isolated populations have also been recorded from Turon and Gardens of Stone National Parks. Distribution not in, or near study area.	No
Shrubs	*Persoonia mollis subsp. revoluta*	Persoonia mollis subsp. revoluta	11	11	0	0	SCS		TRUE			11 BioNet records within the study area. No AVH records within the study area, however many nearby, the closest being approx. 10,982 m ESE of the study area (1965, near Bungadilly [Bangadilly?], c. 11 miles [17.7 km] directly WNW of Berrima). Closest and most recent record is approx. 11,910 m SE of the study area (2016, 'Craigenbrae', Tugalong Road, Canyonleigh). Persoonia mollis subsp. revoluta is endemic to New South Wales where it is currently known to occur in seven populations, primarily in the area between Mittagong, Paddys River and High Range in the Southern Highlands with an outlying population in the Bindook Highlands. Most of the populations occur between 600 and 800m a.s.l.,and with an average annual rainfall across the range of between 700 and 900 mm.	Yes
Shrubs	*Phyllota humifusa*	Dwarf Phyllota	0	0	0	0	SCS			TRUE		Many BioNet records E and NE of the study area, the closest being approx. 12.5 km E at Paddy's River Bridge, Penrose. No BioNet or AVH records in or within 5 km of the study area.	Yes
Shrubs	*Pimelea bracteata*	Pimelea bracteata (No data in TBDC)	7	2	0	0	SCS		TRUE			5 Bionet records within 10km of the study area, none within. Found in wet heath and along creek banks at higher altitudes in the Kiandra area.	Potential
Shrubs	*Pomaderris brunnea*	Brown Pomaderris	0	0	0	0	SCS			TRUE		One Bionet record from 2016, approx 22,648 m S of study area South facing slope above Paddys River. Found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands. Distribution not in, or near study area.	No

Flora All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 16 November 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 16 November 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA project records within V9 proposal corridor	Species Credit Species SCS)/Ecosystem Credit Species (ECS)/Dual	Potential SAII	Bionet	MNES	Associated by PCT/s	Likelihood of Occurrence/Justification for survey inclusion or exclusion	Survey Required (Y/N)
Shrubs	*Pomaderris cotoneaster*	Cotoneaster Pomaderris	36	0	0	0	SCS			TRUE	TRUE	35 BioNet records within the study area, recorded in 1998 and 2016, closest being 8-10 m from the edge of the Goobarragandra River c. 1 km upstream from Rock Flat Camping area. AMG sheet 8527: 629790E 6080600N. One associated PCT (300) within State Forest Study Area (Bago). Has a very disjunct distribution, so can't rule out possibility. Recorded in a range of habitats in predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.	Yes
Shrubs	*Pomaderris pallida*	Pale Pomaderris	0	0	0	0	SCS	TRUE		TRUE		Many Bionet records S, E & SE of the study area. Closest is approx. 42,017 m S (Wallaroo Hill freehold (Murrumbidgee River riparian strip) Lot 5 end of Parkwood Road, 500m from Gininderra Gorge) and 37,258 m S-SE (Western edge of Shoalhaven River, north of Bungonia Creek confluence). Recorded from near Kydra Trig (north-west of Nimmitabel), Tinderry Nature Reserve, the Queanbeyan River (near Queanbeyan), the Shoalhaven River (between Bungonia and Warri), the Murrumbidgee River west of the ACT and the Byadbo area in Kosciuszko National Park.	Yes
Shrubs	*Pultenaea humilis*	Dwarf Bush-pea	1	1	0	0	SCS		TRUE		TRUE	Likely -Atlas and AVH records are within the study area and 15km south.	Yes
Shrubs	*Solanum armourense*	Solanum armourense	2	0	0	0	SCS	TRUE	TRUE			A Bionet record from 2019 approx. 5,443 m E of study area 1971 at Tugalong Rd, Canyonleigh (aka 'Little Forest west' to NPWS). Pending gazettal as southern extension to Wollondilly River NR2017, and another Bionet record approx. 12,785 NE of study area: Single plant on hillside at private property gate just off Wombeyan Caves Road, Bullio, two older records from same locations. Confined to a relatively small area south-west of Sydney, from Mt Armour within Blue Mountains National Park south to the Wombeyan area. Known from four locations, three of which occur within Blue Mountains National Park. Potential habitat in study area and records nearby	Yes
Shrubs	*Zieria obcordata*	Granite Zieria	0	0	0	0	SCS	TRUE			TRUE	Unlikely - No BioNet records in or within 5 km of the study area. 116,885 m N of the study area (1963, Crackerjack Rock, W of Bathurst.). Occurs at two sites with a geographic range of 105 km. These are in the Wuuluman area near Wellington, comprising of a single subpopulation over 3 sites comprising 209 plants and Crackerjack Rock/Rock Forests area NW of Bathurst, with a subpopulation comprising of14 sites, totaling to approximately 700 adults plants. Distribution not in, or near study area.	No
Trees	*Eucalyptus aggregata*	Black Gum	12	12	0	0	SCS		TRUE	TRUE	TRUE	Likely - bionet recorded in TSR within 10km study area. Possible other locations as well due to close proximatey of other records N of study area (and same veg communities/soil?). See TBDC spreadsheet for more detail. Black Gum is found in the NSW Central and Southern Tablelands, with small isolated populations in Victoria and the ACT. In NSW it occurs in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. Black Gum has a moderately narrow distribution, occurring mainly in the wetter, cooler and higher parts of the tablelands, for example in the Blayney, Crookwell, Goulburn, Braidwood and Bungendore districts.	Yes
Trees	*Eucalyptus alligatrix subsp. alligatrix*	Eucalyptus alligatrix subsp. alligatrix	0	0	0	0	SCS				TRUE	Only known from a single location south-west of Rylstone; however, the species has reportedly been widely propagated and planted in the Rylstone area. Distribution not in, or near study area	No
Trees	*Eucalyptus cannonii*	Capertee Stringybark	0	0	0	0	SCS				TRUE	Low / Unlikely. One bionet record, approx 6,532 m E of the study site. Record is quarantened and noted as invalid. The Capertee Stringybark is predominantly restricted to the central tablelands and slopes of NSW between the Golden Highway in the north, and the Mitchell Highway in the south. The species' distribution is bounded from east of Bathurst, to Wallerwang near Lithgow, north along the western edge of Wollemi National Park and north-west to Mudgee; isolated occurrences are known from a short way north of Goulburn River National Park between Dunedoo and Merriwa. Within this area the species is often locally frequent. Distribution not in, or near study area	No
Trees	*Eucalyptus macarthurii*	Paddys River Box, Camden Woollybutt	0	0	0	0	SCS			TRUE		Closest record approx. 15,176 m NE of Study Area. Other records are further away, S of the study area, ranging from 15,621 m and 26,508 m and 63,898 m. Has a moderately restricted distribution. It is currently recorded from the Moss Vale District to Kanangra Boyd National Park. In the Southern Highlands it occurs mainly on private land, often as isolated individuals in, or on the edges, of paddocks. Isolated stands occur in the north west part of the range on the Boyd Plateau. Itis not well reserved but does occur withinCecil Hoskins Nature Reserve in the Southern Highlands andKanangra Boyd National Park.	Yes
Trees	*Eucalyptus robertsonii subsp. hemisphaerica*	Robertson's Peppermint	0	0	0	0	SCS	TRUE			TRUE	Very low / unlikely. Four 1987 records quarantened and noted as being invalid, approx. 54,387 m E from the Study area. SoS also does not recognise these individuals or populations. Known only from the central tablelands of NSW, at small disjunct localities from north of Orange to Burraga. Distribution not in, or near study area.	No

Fauna All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 13 July 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 13 July 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA Project records within V9 proposal corridor	Species Credit Species SCS) /Ecosystem Credit Species (ECS)/ Dual	Potential SAII	Bionet	MNES	Associated PCTs	Likelihood of Occurrence/Justifcation for survey exlusion/inclusion	Survey Required (Y/N)
Amphibian	*Crinia sloanei*	Sloane's Froglet	0	0	0	0	SCS			TRUE	TRUE	No bionet records. Typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. Occurs within the Wagga Wagga vicinity. Potential habitat occurs.	Yes
Amphibian	*Heleioporus australiacus*	Giant Burrowing Frog	1	0	0	0	SCS		TRUE	TRUE		One Bionet record within 10km Radius. This species is distributed in south eastern NSW and Victoria, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Lack of suitable habitat (outside of distributional range).	No
Amphibian	*Litoria booroolongensis*	Booroolong Frog	77	1	0	0	SCS		TRUE	TRUE	TRUE	77 Bionet records occur within 10km of the study area and is known from the Namoi catchment. Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Suitable habitat occurs within the study area.	Yes
Amphibian	*Litoria castanea*	Yellow-spotted Tree Frog	2	0	0	0	SCS	TRUE	TRUE		TRUE	2 records occur within 10km radius of the study area. Only known population is near Yass. Require large permanent ponds or slow flowing 'chain-of-ponds' streams with abundant emergent vegetation such as bulrushes and aquatic vegetation. Potential habitat occurs.	Yes
Amphibian	*Litoria raniformis*	Southern Bell Frog	1	0	0	0	SCS		TRUE	TRUE		1 record occurs within a 10km radius. 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. Potential habitat occurs.	Yes
Amphibian	*Litoria spenceri*	Spotted Tree Frog	0	0	0	0	SCS	TRUE		TRUE	TRUE	No Bionet records occur within 10km radius of the study area. This species is extremely rare and occurs within river environments with rocky habitat. This species occurs among boulders or debris along naturally vegetated, rocky fast flowing upland streams and rivers. Historically it was known from two streams in southern NSW on the north-west side of the Great Dividing Range, however both populations appeared to have become locally extinct. One population has been re-established via a reintroduction program. Potential habitat occurs within study area.	Yes
Amphibian	*Litoria verreauxii alpina*	Alpine Tree Frog	0	0	1	1	SCS			TRUE	TRUE	ELA recorded during survey within v9 corridor	Yes
Amphibian	*Pseudophryne pengilleyi*	Northern Corroboree Frog	3	1	0	0	SCS	TRUE	TRUE	TRUE	TRUE	2 Bionet records occur within 10km radius of the study area. Occurs in forests, sub-alpine woodlands and tall heath in the Brindabella Ranges. Summer breeding habitat is pools and seepages in sphagnum bogs, wet heath, wet tussock grasslands and herbfields in low-lying depressions. Potential habitat occurs.	Yes

Fauna All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 13 July 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 13 July 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA Project records within V9 proposal corridor	Species Credit Species SCS) /Ecosystem Credit Species (ECS)/ Dual	Potential SAII	Bionet	MNES	Associated PCTs	Likelihood of Occurrence/Justifcation for survey exlusion/inclusion	Survey Required (Y/N)
Arboreal Mammals	*Cercartetus nanus*	Eastern Pygmy Possum	26	0	1	1	SCS		TRUE		TRUE	ELA recorded during survey within v9 corridor	Yes
Arboreal Mammals	*Petauroides volans*	Greater Glider	97	13	7	7	SCS		TRUE	TRUE	TRUE	ELA recorded during survey within v9 corridor	Yes
Arboreal Mammals	*Petaurus australis*	Yellow-bellied Glider	434	73	5	4	ECS		TRUE		TRUE	ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species
Arboreal Mammals	*Petaurus norfolcensis*	Squirrel Glider	297	5	5	5	SCS		TRUE		TRUE	ELA recorded during survey within v9 corridor	Yes
Arboreal Mammals	*Phascogale tapoatafa*	Brush-tailed Phascogale	0	0	0	0	SCS				TRUE	No bionet records, however this species cannot be ruled out due to broad habitat requirements. Potential habitat	Yes
Arboreal Mammals	*Phascolarctos cinereus*	Koala	387	0	0	0	Dual		TRUE	TRUE	TRUE	387 Bionet records within 10km radius & various preferred koala feed trees occur within the study area. Potential habitat	Yes
Bats	*Pteropus poliocephalus*	Grey-headed Flying-fox	39	2	0	0	Dual		TRUE	TRUE	TRUE	39 Bionet records. Potential habitat due to broad habitat requirements	Yes
Birds	*Anthochaera phrygia*	Regent Honeyeater	7	0	0	0	Dual	TRUE	TRUE	TRUE	TRUE	Not mapped on Important Areas Map as of 13-05-2021. However Box-Gum vegetation occurs within stusy area consisting of winter flowering trees.	Yes
Birds	*Apus pacificus*	Pacific Swift	14	0	0	0	N/A		TRUE			No bionet records with study area, 10 bionet records within 10 km radius	No
Birds	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	426	65	1	1	ECS		TRUE		TRUE	ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species
Birds	*Botaurus poiciloptilus*	Australasian Bittern	0	0	0	0	ECS			TRUE		potential habitat	No- Ecosystem Credit Species
Birds	*Burhinus grallarius*	Bush Stone-curlew	3	2	0	0	SCS		TRUE		TRUE	3 Bionet records occur. Potential habitat in the form of open forests and woodlands with a sparse grassy groundlayer and fallen timber occurs within the study area..	Yes
Birds	*Calidris acuminata*	Sharp-tailed Sandpiper	2	0	0	0	Dual		TRUE			The Sharp-tailed Sandpiper is a summer migrant from Arctic Siberia, being found on wetlands throughout Australia. It prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches	No

Fauna All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 13 July 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 13 July 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA Project records within V9 proposal corridor	Species Credit Species SCS) /Ecosystem Credit Species (ECS)/ Dual	Potential SAII	Bionet	MNES	Associated PCTs	Likelihood of Occurrence/Justifcation for survey exlusion/inclusion	Survey Required (Y/N)
Birds	*Calidris ferruginea*	Curlew Sandpiper	0	0	0	0	Dual	TRUE		TRUE		No Bionet records. Generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. Not usually found inland. Lack of suitbale habitat.	No
Birds	*Callocephalon fimbriatum*	Gang-gang Cockatoo	461	65	82	53	Dual		TRUE		TRUE	ELA recorded during survey within v9 corridor	Yes
Birds	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	31	0	0	0	Dual		TRUE		TRUE	Potential habitat 30 bionet records within 10km radius	Yes
Birds	*Chthonicola sagittata*	Speckled Warbler	89	8	1	1	ECS	TRUE			TRUE	ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species
Birds	*Circus assimilis*	Spotted Harrier	5	0	0	0	ECS	TRUE			TRUE	Potential habitat	No- Ecosystem Credit Species
Birds	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	1185	142	9	9	ECS	TRUE			TRUE	ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species
Birds	*Daphoenositta chrysoptera*	Varied Sitella	132	23	1	1	ECS	TRUE			TRUE	ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species
Birds	*Epthianura albifrons*	White-fronted Chat	41	5	0	0	ECS	TRUE			TRUE	Potential habitat 37 bionet records within 10km radius	No- Ecosystem Credit Species
Birds	*Falco hypoleucos*	Grey Falcon	0	0	0	0	ECS			TRUE		Potential habitat	No- Ecosystem Credit Species
Birds	*Falco subniger*	Black Falcon	20	6	0	0	ECS	TRUE			TRUE	Potential habitat	No- Ecosystem Credit Species
Birds	*Gallinago hardwickii*	Latham's Snipe	8	0	0	0	ECS	TRUE				Potential habitat	No- Ecosystem Credit Species
Birds	*Glossopsitta pusilla*	Little Lorikeet	64	1	0	0	ECS	TRUE			TRUE	Potential habitat	No- Ecosystem Credit Species
Birds	*Grantiella picta*	Painted Honeyeater	6	0	0	0	ECS	TRUE	TRUE		TRUE	Potential habitat	No- Ecosystem Credit Species
Birds	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	37	2	0	0	Dual	TRUE			TRUE	Potential habitat, 37 bionet records within 10km radius	Yes

Fauna All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 13 July 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 13 July 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA Project records within V9 proposal corridor	Species Credit Species SCS) /Ecosystem Credit Species (ECS)/ Dual	Potential SAII	Bionet	MNES	Associated PCTs	Likelihood of Occurrence/Justifcation for survey exlusion/inclusion	Survey Required (Y/N)
Birds	*Hieraaetus morphnoides*	Little Eagle	72	5	0	0	Dual		TRUE		TRUE	Potential habitat, 72 bionet records within 10km radius	Yes
Birds	*Hirundapus caudacutus*	White-throated Needletail	15	2	0	0	ECS		TRUE	TRUE	TRUE	Potential habitat	No- Ecosystem Credit Species
Birds	*Lathamus discolor*	Swift Parrot	43	0	0	0	Dual	TRUE	TRUE	TRUE	TRUE	Potential habitat, 43 bionet records within 10km radius	Yes
Birds	*Leipoa ocellata*	Malleefowl	0	0	0	0	ECS			TRUE	TRUE	Potential habitat	No- Ecosystem Credit Species
Birds	*Lophoictinia isura*	Square-tailed Kite	3	0	0	0	Dual		TRUE		TRUE	Potential habitat	Yes
Birds	*Melanodryas cucullata cucullata*	Hooded Robin	57	3	0	0	ECS		TRUE		TRUE	Potential habitat	No- Ecosystem Credit Species
Birds	*Melithreptus gularis gularis*	Black-chinned Honeyeater	93	6	0	0	ECS		TRUE		TRUE	Potential habitat, 93 bionet records within 10km radius	No- Ecosystem Credit Species
Birds	*Neophema pulchella*	Turquoise Parrot	20	0	0	0	ECS		TRUE		TRUE	Potential habitat	No- Ecosystem Credit Species
Birds	*Numenius madagascariensis*	Eastern Curlew	0	0	0	0	Dual	TRUE		TRUE		No Bionet records. Primarily coastal distribution and 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. Lack of suitable habitat in Study Area..	No
Birds	*Oxyura australis*	Blue-billed Duck	5	0	0	0	ECS	TRUE		TRUE		Potential habitat	No- Ecosystem Credit Species
Birds	*Pachycephala inornata*	Gilbert's Whistler	1	0	0	0	ECS	TRUE		TRUE		Potential habitat	No- Ecosystem Credit Species
Birds	*Pachycephala olivacea*	Olive Whistler	27	6	2	2	ECS	TRUE		TRUE		ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species
Birds	*Petroica boodang*	Scarlet Robin	310	27	15	15	ECS	TRUE		TRUE		ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species
Birds	*Petroica phoenicea*	Flame Robin	296	21	15	15	ECS	TRUE		TRUE		ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species
Birds	*Petroica rodinogaster*	Pink Robin	3	3	0	0	SCS	TRUE		TRUE		3 Bionet records. Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies. Potential habitat occurs within study area.	Yes
Birds	*Polytelis swainsonii*	Superb Parrot	272	12	1	1	Dual	TRUE	TRUE	TRUE		ELA recorded during survey within v9 corridor	Yes
Birds	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler	57	1	2	0	ECS	TRUE		TRUE		ELA recorded with 10km radius, also 31 bionet records within v9 corridor, Potential habitat	No- Ecosystem Credit Species
Birds	*Rostratula australis*	Australian Painted Snipe	0	0	0	0	ECS		TRUE	TRUE		Potential habitat	No- Ecosystem Credit Species
Birds	*Stagonopleura guttata*		226	46	2	2	ECS	TRUE		TRUE		ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species

Fauna All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 13 July 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 13 July 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA Project records within V9 proposal corridor	Species Credit Species SCS) /Ecosystem Credit Species (ECS)/ Dual	Potential SAII	Bionet	MNES	Associated PCTs	Likelihood of Occurrence/Justifcation for survey exlusion/inclusion	Survey Required (Y/N)
Forest Owls	*Ninox connivens*	Barking Owl	8	1	0	0	Dual		TRUE		TRUE	8 Bionet records within a 10km radius. 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 found on these fertile riparian soils.Potential habitat	Yes
Forest Owls	*Ninox strenua*	Powerful Owl	47	4	0	0	Dual		TRUE		TRUE	47 Bionet records within 10km radius. Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Due to the high records of Greater Glider in the locality (a primary prey)- suitbale habitat occurs within study area.	Yes
Forest Owls	*Tyto novaehollandiae*	Masked Owl	11	0	1	1	Dual		TRUE		TRUE	ELA recorded during survey within v9 corridor	Yes

Fauna All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 13 July 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 13 July 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA Project records within V9 proposal corridor	Species Credit Species SCS) /Ecosystem Credit Species (ECS)/ Dual	Potential SAII	Bionet	MNES	Associated PCTs	Likelihood of Occurrence/Justifcation for survey exlusion/inclusion	Survey Required (Y/N)
Forest Owls	*Tyto tenebricosa*	Sooty Owl	4	1	0	0	Dual	TRUE	TRUE		TRUE	4 Bionet records within a 10km radius. Potential habitat present in the form of moist eucalypt forests.	Yes
Ground Mammals	*Burramys parvus*	Mountain Pygmy-possum	0	0	0	0	SCS				TRUE	No Bionet records with a 10km radius. Lives on the ground in rocky areas where boulders have accumulated below mountain peaks; frequently associated with alpine heathland shrubs dominated by the Mountain Plum-pine (Podocarpus lawencei). Inhabits only alpine and subalpine areas on the highest mountains of Victoria and NSW. In NSW the entire range is in a 30 km by 8 km area of Kosciuszko National Park between Thredbo and Kerries Ridge, where it occupies less than four square kilometres of habitat. Lack of suitable habitat - outside distributional range	No
Ground Mammals	*Dasyurus maculatus*	Spotted-tailed Quoll	25	5	0	0	ECS		TRUE	TRUE	TRUE	Potential habitat	No- Ecosystem Credit Species
Ground Mammals	*Mastacomys fuscus*	Broad-toothed Rat	0	0	0	0	SCS		TRUE	TRUE		11 Bionet records within a 10km radius, no associated PCTs within the study area, suitable habitat occurs.	Yes
Ground Mammals	*Petrogale penicillata*	Brush-tailed Rock-wallaby	1	0	0	0	SCS	TRUE	TRUE	TRUE	TRUE	1 Bionet record. Well-known populations do not exist within study area. Suitbale habitat occurs if study area is within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines.	Yes
Ground Mammals	*Pseudomys fumeus*	Smoky Mouse	3	0	0	0	SCS		TRUE	TRUE	TRUE	3 bionet records within a 10km radius. This species prefers heath habitat on ridge tops and slopes in sclerophyll forest, heathland to sub-alpine regions of up to 1800 metres, but sometimes occurs in ferny gullies. Suitbale habitat occurs.	Yes
Ground Mammals	*Pseudomys novaehollandiae*	New Holland Mouse	0	0	0	0	ECS			TRUE	TRUE	potential habitat	No- Ecosystem Credit Species
Insecta	*Paralucia spinifera*	Purple Copper Butterfly	0	0	0	0	SCS			TRUE		No Bionet records occur within a 10km radius. Bursaria spinosa shrub is an important habitat requirement for larvae. Occurs above 850 m elevation, most known sites have a south-west to north-west aspect, usually where direct sunlight reaches the habitat, and with extremes of cold such as regular winter snowfalls or heavy frosts. The study area potentially lies outside of its distributional range.	Yes
Insecta	*Synemon plana*	Golden Sun Moth	69	5	0	0	SCS	TRUE	TRUE	TRUE	TRUE	50 Bionet records occur within a 10km radius. Wallaby grass (Rytidosperma sp), Chilean needlegrass (Nassella nessiana) or Serrated Tussock (Nassella trichotoma) are important habitat features as it feeds on the roots of these grasses. The study area lies within it's distributional range. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses Austrodanthonia spp. suitbale habitat occurs within the study area.	Yes
Microchiroptera Bats	*Chalinolobus dwyeri*	Large-eared Pied Bat	7	0	0	0	SCS	TRUE (breeding habitat only)	TRUE	TRUE	TRUE	7 Bionet records. Potential habitat for maternity roosts have not been detected during previous surveys. Potential foraging habitat occurs.	Yes

Fauna All Species from MNES and Bionet search 10km radius of proposal corridor v9 as well as PCT associations

Species Survey Group	Scientific Name	Common Name	# Bionet records in 10km radius of v9 proposal corridor (Bionet records as at 13 July 2021)	# Bionet records within V9 proposal corridor (Bionet records as at 13 July 2021)	# ELA project records in 10km radius of v9 proposal corridor	# ELA Project records within V9 proposal corridor	Species Credit Species SCS) /Ecosystem Credit Species (ECS)/ Dual	Potential SAII	Bionet	MNES	Associated PCTs	Likelihood of Occurrence/Justifcation for survey exlusion/inclusion	Survey Required (Y/N)
Microchiroptera Bats	*Chalinolobus picatus*	Little Pied Bat	0	0	0	0	ECS				TRUE	Potential foraging habitat	No- Ecosystem Credit Species
Microchiroptera Bats	*Falsistrellus tasmaniensis*	Eastern False Pipistelle	0	45	2	2	ECS		TRUE		TRUE	ELA recorded during survey within v9 corridor	No- Ecosystem Credit Species
Microchiroptera Bats	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	59	3	0	0	Dual	TRUE (breeding habitat only)	TRUE		TRUE	59 Bionet records in 10km radius. Potential habitat for maternity roosts have not been detected during previous surveys (caves, culverts etc.). Further surveys for maternity roosts in areas not previously assessed will be undertaken.	Yes
Microchiroptera Bats	*Myotis macropus*	Southern Myotis	11	0	0	0	SCS		TRUE		TRUE	11 Bionet records. Study area has hollow bearing trees within 200 m of riparian zone. Potential habitat occurs.	Yes
Microchiroptera Bats	*Nyctophilus corbeni*	Corben's Long-eared Bat	0	0	0	0	ECS			TRUE	TRUE	Potential foraging habitat	No- Ecosystem Credit Species
Microchiroptera Bats	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	2	1	0	0	ECS		TRUE		TRUE	Potential foraging habitat	No- Ecosystem Credit Species
Microchiroptera Bats	*Scoteanax rueppellii*	Greater Broad-nosed Bat	5	0	0	0	ECS		TRUE		TRUE	Potential foraging habitat	No- Ecosystem Credit Species
Reptiles	*Aprasia parapulchella*	Pink-tailed Legless Lizard	3	3	0	0	SCS		TRUE	TRUE	TRUE	3 Bionet records occur. Suitable habitat in the form of 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. Suitable habitat occurs within study area.	Yes
Reptiles	*Cyclodomorphus praealtus*	Alpine She-oak Skink	0	0	0	0	SCS				TRUE	No Bionet records. Restricted to sub-alpine and alpine grasslands. In NSW, the Alpine She-oak Skink has only been observed within Kosciuszko National Park between Smiggin Holes and Kiandra. This species prefers tree-less or very lightly treed areas that contain tussock grasses, low heath or a combination of both. Within this habitat the species shelters beneath litter, rocks, logs and other ground debris, and has been observed basking on grass tussocks. In NSW, Alpine She-oak Skinks have been observed in alpine to sub-alpine grasslands in flat to gently sloping areas. Potential habitat occurs	Yes
Reptiles	*Delma impar*	Striped Legless Lizard	8	2	0	0	SCS		TRUE	TRUE	TRUE	8 Bionet records occur and the study area crosses over its distributional extent. Suitable habitat occurs in the form of Natural Temperate Grassland.	Yes
Reptiles	*Hoplocephalus bitorquatus*	Pale-headed Snake	0	0	0	0	SCS				TRUE	No Bionet records, however this species is highly crptic, spending weeks at a time hidden in hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. Potential habitat occurs.	Yes
Reptiles	*Liopholis guthega*	Guthega Skink	0	0	0	0	SCS				TRUE	No Bionet records. Restricted to locations above 1600 m in the Australian Alps, in the vicinity of Mt Kosciuszko, NSW. Occurs between 1600 m and 2170 m – in the coldest (winter snow cover) and some of the wettest regions on mainland Australia. Preferred habitats are usually rocky or have sub-surface boulders hidden beneath soil or thick vegetation. The NSW distribution occurs where there is a granite substrate and decomposing granite soils. Individuals have been recorded in a range of vegetation types, including open Eucalyptus pauciflora (Snow Gum) woodland with grassy or shrubby understoreys, dry tussock grassland, and tall and short heath. Ptential habitat occurs.	Yes
Reptiles	*Varanus rosenbergi*	Rosenberg's Goanna	2	0	0	0	ECS		TRUE		TRUE	Potential habitat	No- Ecosystem Credit Species

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

Appendix C Preliminary Heritage Assessment

HumeLink

Preliminary Aboriginal and Non-Aboriginal Heritage Assessment

PUBLIC VERSION – Sensitive information redacted

November 2021

Navin Officer

heritage consultants Pty Ltd

acn: 092 901 605

Number 4
Kingston Warehouse
71 Leichhardt St.
Kingston ACT 2604

www.nohc.com.au

ph 02 6282 9415
fx 02 6282 9416

Document control

Project no.:	190133
Project client:	Aurecon
Project proponent	Transgrid
Document description:	Preliminary Desktop Cultural Heritage Assessment (Aboriginal & non-Aboriginal)
Project Manager:	Nicola Hayes
Authors:	Joel Mason & Nicola Hayes
Internal review:	Nicola Hayes
Document status:	Version 0 Final – For Public Display
Local Government Areas:	Yass Valley, Wagga Wagga, Snowy Valley, Cootamundra-Gundagai, Upper Lachlan Shire

Document revision status

Author	Revision number	Internal review	Date issued
Nicola Hayes	0	Final	17/11/21

EXECUTIVE SUMMARY

This report refers to HumeLink - new high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle (referred to as the proposal). The proposal would connect the existing Wagga 330 kV substation, existing Bannaby 500 kV substation, the future Maragle 500 kV substation and a new substation (Gugaa 500 kV substation) approximately 15 kilometres east of the Wagga 330 kV substation (refer to Figure 1.1). The future Maragle 500 kV substation is expected to be built subject to a separate approval (reference SSI-9717, EPBC 2018/836) for the Snowy 2.0 Transmission Connection Project, and would be located approximately 85 kilometres south of Tumut in the Snowy Mountains.

This report documents the results of a preliminary desktop cultural heritage assessment of Aboriginal and non-Aboriginal heritage. The report was commissioned by Aurecon on behalf of Transgrid to inform the HumeLink Scoping Report.

A total of two hundred and ninety-one (291) Aboriginal heritage items/recordings are included on the Department of Premier and Cabinet Aboriginal Heritage Information Management System (AHIMS) within the heritage study area (one kilometre wide corridor from either side of the proposal corridor) (searched 03/09/2021). Of these, one hundred and three (103) Aboriginal heritage items/recordings are within the proposal corridor (refer to Figures 3.1 to 3.5). All 291 AHIMS sites are listed in Appendix 1. The known Aboriginal sites within the heritage study area encompass the following archaeological site types/features:

- Aboriginal ceremony and dreaming (2)
- Aboriginal resource and gathering (4)
- Artefacts (both isolated finds and artefact scatters) (204)
- Ceremonial ring (1)
- Hearth (1)
- Modified trees (32)
- Stone arrangement (2)
- Potential archaeological deposits (45)

The Aboriginal site clustering evident across the heritage study area is more a consequence of the areas previously surveyed rather than any true indication of the use of the area by Aboriginal people in the past or regional site patterning. Therefore, gaps in data likely show absence of archaeological survey rather than areas that are void of Aboriginal sites (refer to Figure 3.5).

There are 18 non-Aboriginal heritage listed items within the heritage study area. Of these, there are 12 heritage listed items that have curtilages that are located entirely or partially within the proposal corridor. These sites include sites listed on the National Heritage List (2), the NSW State Heritage Register (SHR) (1), and Local Environmental Plans (LEP) (7). Some sites are listed across multiple lists. Two sites are listed as indicative on the Register of the National Estate (RNE) and are not listed on any other register.

The two sites listed on the National Heritage List are considered Matters of National Environmental Significance under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). They are the Snowy Mountains Scheme and Australian Alps National Parks and Reserves. The Australian Alps National Parks and Reserves has been listed for both natural and cultural values and the Snowy Mountains Scheme for its cultural values.

The following investigations are required for the Environmental Impact Statement (EIS) in support of the application for planning approval for the proposal:

Aboriginal heritage

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

2. Continue to conduct a program of Aboriginal consultation in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010). The consultation has commenced and Aboriginal parties have registered their interest in the proposal.

3. Conduct archaeological field survey of the proposal corridor, including re-inspection of known sites to clarify their location and condition. Survey to be conducted with the participation of Aboriginal stakeholder representatives.

4. Determine if a targeted program of archaeological test excavation based on the predictive modelling could be used to:

    - characterise and assess the potential for subsurface archaeological remains/artefacts along the proposed route

    - identify where alternate tower, construction pad, or access track locations may be required

5. Compile an Aboriginal Cultural Heritage Assessment Report (ACHAR) in accordance with Heritage NSW guidelines to be included in the EIS for the proposal. The ACHAR would include an assessment of the impact to Aboriginal cultural heritage including Aboriginal sites, areas of archaeological sensitivity and areas of cultural importance. The report would include an assessment of the cumulative impacts from the proposal.

6. The following policies are relevant:

    a) Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010)

    b) Guide to investigating, assessing and report on Aboriginal cultural heritage in NSW (Office of Environment Heritage (OEH) 2011)

Non-Aboriginal heritage

7. Conduct a review of early aerial photography and recent high resolution imagery, parish maps and portion plans to assist in the identification of potential archaeological sites and surviving built structures or other previously unidentified features.

8. Conduct archaeological field survey of the proposal corridor.

9. Compile a non-Aboriginal heritage assessment report in accordance with Heritage NSW guidelines to be included in the EIS for the proposal. The report would include an assessment of the impact to non-Aboriginal cultural heritage including built heritage items, ruins and archaeological sites. If the assessment finds that non-Aboriginal heritage would be impacted by the proposal, then this report would comply with Heritage NSW requirements for a Statement of Heritage Impact.

10. The non-Aboriginal heritage assessment will include consideration of whether the proposal is likely or not to have a significant impact on the values for which the Australian Alps National Parks and Reserves and Snowy Mountains Scheme are listed (see Appendix 2). To do this, the assessment will examine the landscape through which the proposed route would pass and if this would affect any features within the listed item that are integral to the national values of that place. There is potential that upgrades to existing access tracks within the Australian Alps National Parks and Reserves may be required for construction of the proposal. However, the transmission line easement is unlikely to be within the national park. The ACHAR will include assessment of the impact of the proposal on moth feasting, which is one of the identified

elements of significance in the listing of the Australian Alps National Parks and Reserves, and will consider the location of any potential rock shelter sites.

11. The following policies and guiding documents apply:

- Statements of Heritage Impact (NSW Heritage Office 2002)
- Assessing heritage significance (NSW Heritage Office 2001)
- Assessing Significance for Historical Archaeological Sites and 'Relics' (Heritage Branch, Department of Planning, 2009)
- Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (Department of the Environment 2013)

~ o0o ~

TABLE OF CONTENTS

Figures

1. INTRODUCTION

1.1 Project Description

This report refers to HumeLink - new high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle (referred to as the proposal). The proposal would connect the existing Wagga 330 kV substation, existing Bannaby 500 kV substation, future Maragle 500 kV substation and a new substation (Gugaa 500 kV substation) approximately 15 kilometres east of the Wagga 330 kV substation (refer to Figure 1.1). The future Maragle 500 kV substation is expected to be built subject to a separate approval (reference SSI-9717, EPBC 2018/836) for the Snowy 2.0 Transmission Connection Project, and would be located approximately 85 kilometres south of Tumut in the Snowy Mountains.

The primary purpose of HumeLink is to expand the capacity of the electricity network in southern NSW. It would increase electricity transfer to customers in NSW and the Australian Capital Territory (ACT).

This section provides an overview of the HumeLink proposal corridor, concept design, construction and operational activities and delivery timing. The proposal corridor extends across the lands of the Wiradjuri, Ngunnawal, Ngarigo and Gundungurra people. It is located within five local government areas: Wagga Wagga, Snowy Valleys, Cootamundra-Gundagai, Yass Valley, and Upper Lachlan Shire.

The proposal corridor traverses primarily rural areas with a range of land uses including cropping, grazing, horticulture, forestry, and renewable power generation (hydroelectric, solar, and wind). Other land uses within and surrounding the proposal corridor include residences, farm buildings and infrastructure, roads and road reserves, drainage channels for irrigation, broad acre rural residential development, recreation, and existing transmission line easements.

The key components of HumeLink are:

- Substation works:
  - A new substation (Gugaa 500/330 kV (Gugaa 500 kV)) located approximately 15 km east of the existing Wagga 330/132 kV substation (Wagga 330 kV)
  - Augmentation of the existing Wagga 330 kV and Bannaby 500/330 kV (Bannaby 500 kV) substations
  - Augmentation of the future Maragle 500/330 kV (Maragle 500 kV) substation including line connections to Bannaby and Gugaa substations and installation of transformers and other equipment (construction of the future Maragle 500 kV switching station would be completed under the Snowy 2.0 Transmission Connection Project, which is subject to separate planning approval (reference SS1-9717, EPBC 2018/836))
- New transmission lines between:
  - Maragle 500 kV substation and Bannaby 500 kV substation
  - Maragle 500 kV substation and Gugaa 500 kV substation
  - Gugaa 500 kV substation and Bannaby 500 kV substation
  - Wagga 330 kV substation and Gugaa 500 kV substation
- Ancillary development:
  - Two telecommunication huts along the transmission lines
  - New and upgraded temporary and permanent access tracks and roads
  - Temporary facilities required for construction of the proposal e.g. laydown and staging areas, stockpiling areas, concrete batching plants, brake/winch sites, site offices, parking areas and accommodation camps

1.2 Study Purpose and Aims

This report documents the results of a preliminary desktop cultural heritage assessment of Aboriginal and non-Aboriginal heritage. The report was commissioned by Aurecon on behalf of Transgrid to inform the HumeLink Scoping Report.

This assessment aims to identify available heritage information and provide a brief analysis of gaps in the existing site data, as well as identify future steps in the assessment of Aboriginal and non-Aboriginal heritage for the HumeLink Environmental Impact Statement.

1.3 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 3.4;
- 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.

No information in this report has been classified as confidential.

1.4 Glossary and Definitions

Aboriginal object	means an object associated with Aboriginal people because of Aboriginal tradition.
Aboriginal place	means a place associated with Aboriginal people because of Aboriginal tradition.
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.
DAWE	Commonwealth Department of Agriculture Water and the Environment.
Heritage study area	The study area for this report was defined by applying a one kilometre wide buffer to either side of the proposal corridor (refer to Figure 1.1).
HumeLink	new high-voltage transmission lines and associated infrastructure between substations at Wagga Wagga, Bannaby and Maragle.
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.
Proposal:	the project components of HumeLink
Proposal corridor:	corridor within which the project components may be placed.
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 easements for the 330 kV transmission lines are likely to be 60 metres wide, while the easements for the 500 kV transmission lines are likely to be between 70 and 80 metres wide.

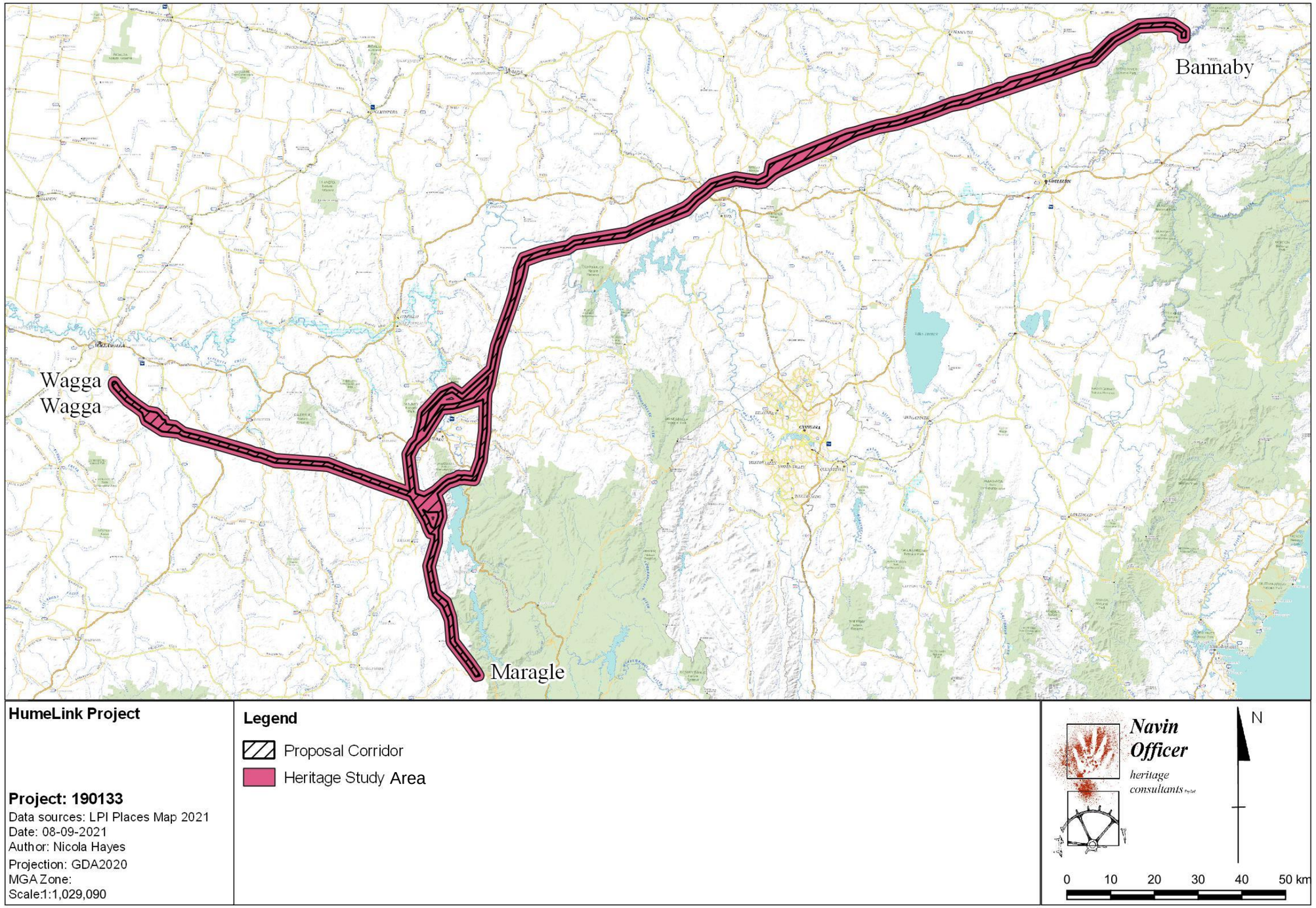


Figure 1.1 Overview of the proposal corridor and heritage study area

2 STUDY METHODOLOGY

2.1 Contributors

This report was prepared by Nicola Hayes and Joel Mason. Nicola has a Bachelor of Arts and Science, as well as a Graduate Diploma in Archaeology from the ANU. Joel has a Masters in Archaeological Science from the ANU.

2.2 Literature and Database Review

A range of archaeological and historical data was reviewed for the proposal corridor and its surrounds. This literature and data review was used to determine if known Aboriginal and historic/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 Department of Premier and Cabinet and associated files and catalogues 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:
  - AHIMS (NSW Dept Premier and Cabinet);
  - Atlas of Aboriginal Places (Heritage NSW);
  - World Heritage List (DAWE);
  - The National Heritage List (DAWE);
  - The Commonwealth Heritage List (DAWE);
  - The State Heritage Register (maintained by the Department of Premier and Cabinet, NSW on behalf of the Heritage Council of NSW);
  - Section 170 Heritage and Conservation Register(s) within the State Heritage Inventory (NSW Heritage); and
  - Heritage Schedules from the Local Environmental Plans for Yass Valley, Wagga Wagga, Snowy Valley, Upper Lachlan Shire and Cootamundra-Gundagai.
- Non-Statutory Listings:
  - Register of the National Estate (RNE) (Australian Heritage Council).

3 ABORIGINAL HERITAGE

3.1 Aboriginal Consultation

The Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010) is being followed for this proposal. 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. The consultation has been started and Aboriginal parties are beginning to register their interest in the proposal.

3.2 Aboriginal Heritage Recordings in the proposal corridor

A total of two hundred and ninety-one (291) Aboriginal heritage items/recordings are included on the Department of Premier and Cabinet's Aboriginal Heritage Information Management System (AHIMS) within the heritage study area (one kilometre from either side of the proposal corridor) (searched 03/09/2021). Of these, one hundred and three (103) Aboriginal heritage items/recordings are within the proposal corridor (refer to Figures 3.1 to 3.5). All 291 AHIMS sites are listed in Appendix 1. The known Aboriginal sites within heritage study area encompass the following archaeological site types/features:

- Aboriginal ceremony and dreaming (2)
- Aboriginal resource and gathering (4)
- Artefacts (both isolated finds and artefact scatters) (204)
- Ceremonial ring (1)
- Hearth (1)
- Modified trees (32)
- Stone arrangement (2)
- Potential archaeological deposits (45)

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.

The following site types are likely to occur in the heritage study area:

Artefact Scatters

Open artefact scatters are likely to be the most common site type encountered. They may occur almost anywhere that Aboriginal people 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 proposal, 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 heritage study area 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 problematic. The potential for scarred trees to survive within the heritage study area 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. Within the heritage study area scarred trees may occur anywhere mature native trees have survived.

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 60 metres 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.

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. PADs are generally landscape based and like artefact scatters are most likely to be identified in well drained elevated contexts within riparian zones, flood plains and adjacent to water sources, where the soil depth is assessed to be deep enough to retain an archaeological deposit.

Other Site Types More fragile/rare sites such as burials, hearths, ceremonial sites and bora rings, stone arrangements, habitation structures, and carved trees may also be present in the heritage study area, as evidenced by these site types being present within five kilometres of the proposal at very low densities. Based on the cleared status of most of the heritage study area, 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 heritage study area are artefact scatters, isolated finds and modified/scarred trees. Other site types which may occur are rock shelters, stone arrangements and grinding grooves. The most archaeologically sensitive topographic contexts in the heritage study area are elevated ground adjacent to water sources, and river and creek terraces.

3.4 Gaps in Aboriginal Sites Data

The Aboriginal site clustering evident across the heritage study area is more a consequence of the areas previously surveyed rather than any true indication of the use of the area by Aboriginal people in the past or regional site patterning. Therefore, gaps in data likely show absence of archaeological survey rather than areas that are void of Aboriginal sites. Heritage NSW provides data on the areas archaeologically surveyed; this is presented in Figure 3.5 below in relation to the proposal corridor. This data shows that the area around Adjungbilly has not been previously surveyed (see Figure 3.5) and is likely to contain many Aboriginal sites due to the many water courses and potential resource zones in that area. AHIMS are also be recorded outside of heritage surveys, ie opportunistically when encountered, and will not always be located within surveyed areas.

Figure Removed due to sensitivity of information

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

Figure Removed due to sensitivity of information

Figure 3.2 AHIMS listed Aboriginal Sites in relation to the proposal corridor and heritage study area - Bannaby

Figure Removed due to sensitivity of information

Figure 3.3 AHIMS listed Aboriginal Sites in relation to the proposal corridor and heritage study area – Centre

Figure Removed due to sensitivity of information

Figure 3.4 AHIMS listed Aboriginal Sites in relation to the proposal corridor and heritage study area – Wagga Wagga and Maragle

Figure Removed due to sensitivity of information

Figure 3.5 AHIMS listed Aboriginal Sites in relation to the proposal corridor and heritage study area and completed Archaeological surveys

4 NON-ABORIGINAL HERITAGE

4.1 Heritage Listed Items

There are 18 non-Aboriginal heritage listed items within the heritage study area, of there are 11 heritage listed items that have curtilages that are located entirely or partially within the proposal corridor. The data was obtained in June 2020 and databases re-checked in April, June and September 2021 (see Section 2.2 for a list of databases accessed). Table 4.1 lists heritage items and Figures 4.1 to 4.8 shows an overview of the heritage study area and heritage listed items.

These sites include two sites listed on the National Heritage List, one site listed on the NSW State Heritage Register (SHR), 15 sites listed and Local Environmental Plans (LEP), some sites are listed across multiple lists. The two sites listed on the National Heritage List are considered Matters of National Environmental Significance under the EPBC Act, they are the Snowy Mountains Scheme and Australian Alps National Parks and Reserves. The Australian Alps National Parks and Reserves has been listed for both natural and cultural values and the Snowy Mountains Scheme for its cultural values.

There is potential that upgrades to existing access tracks within the Australian Alps National Parks and Reserves may be required for construction of the proposal. However, the transmission line easement is unlikely to be within the national park.

Two sites are listed as indicative on the Register of the National Estate (RNE) and are not listed on any other register. The RNE was closed in 2007 and is no longer a statutory list. All references to the RNE were removed from the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 19 February 2012. The expiration or repeal of parts of the EPBC Act and the *Australian Heritage Council Act 2003* relating to the RNE does not diminish protection of Commonwealth heritage places. The RNE is now an archive of information rather than a statutory list.

Table 4.1 Heritage listed items within the proposal corridor and heritage study area (those shaded are in the heritage study area only)

Site Name	Item ID	Category	Significance	LGA	List
Snowy Mountains Scheme	1058	Historic	National	Snowy-Valley	National Heritage List, MNES under EPBC Act, RNE
Australian Alps National Parks and Reserves	28	Natural	National	Snowy-Valley	National Heritage List, MNES under EPBC Act
Hillas Farm Homestead and Outbuildings	I1	Historic	State	Upper Lachlan	SHR, LEP
Bunnaby Homestead	I2	Historic	Local	Upper Lachlan	LEP
Bannaby Shearing Shed c. 1886	I3	Historic	Local	Upper Lachlan	LEP
Flour Mill	I121	Historic	Local	Upper Lachlan	LEP
St Stephen's Anglican Church	I124	Historic	Local	Upper Lachlan	LEP
Pejar Creek Underbridge	I43	Historic	Local	Upper Lachlan	LEP
Tarlo River National Park	I160	Natural	Local	Upper Lachlan	LEP
Coolalie limestone kilns and quarry	A297	Historic	Local	Yass Valley	LEP
Derringullen Creek fossil area	A299	Natural	Local	Yass Valley	LEP, RNE
Ivydale	I72	Historic	Local	Wagga Wagga	LEP
Ivydale Woolshed	I73	Historic	Local	Wagga Wagga	LEP
Stone ruin	I71	Historic	Local	Wagga Wagga	LEP
Tennis Courts	I190	Historic	Local	Wagga Wagga	LEP

Site Name	Item ID	Category	Significance	LGA	List
Elizabeth Nugent grave on "College Creek"	I202	Historic	Local	Wagga Wagga	LEP
Kileys Run	16005	Historic/ Intangible	Indicative on the RNE	Cootamundra-Gundagai	RNE
Kosciuszko National Park (1981 boundary)	659	Natural	National	Snowy-Valley	RNE

4.2 Predictive Historical Archaeology Statement

Unrecorded historic sites and features of heritage significance that may occur within the proposal corridor include:

- Old historic non-Aboriginal graves
- Old fence lines, such as post and rail fencing; these may occur along road easement boundaries and farms;
- 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.

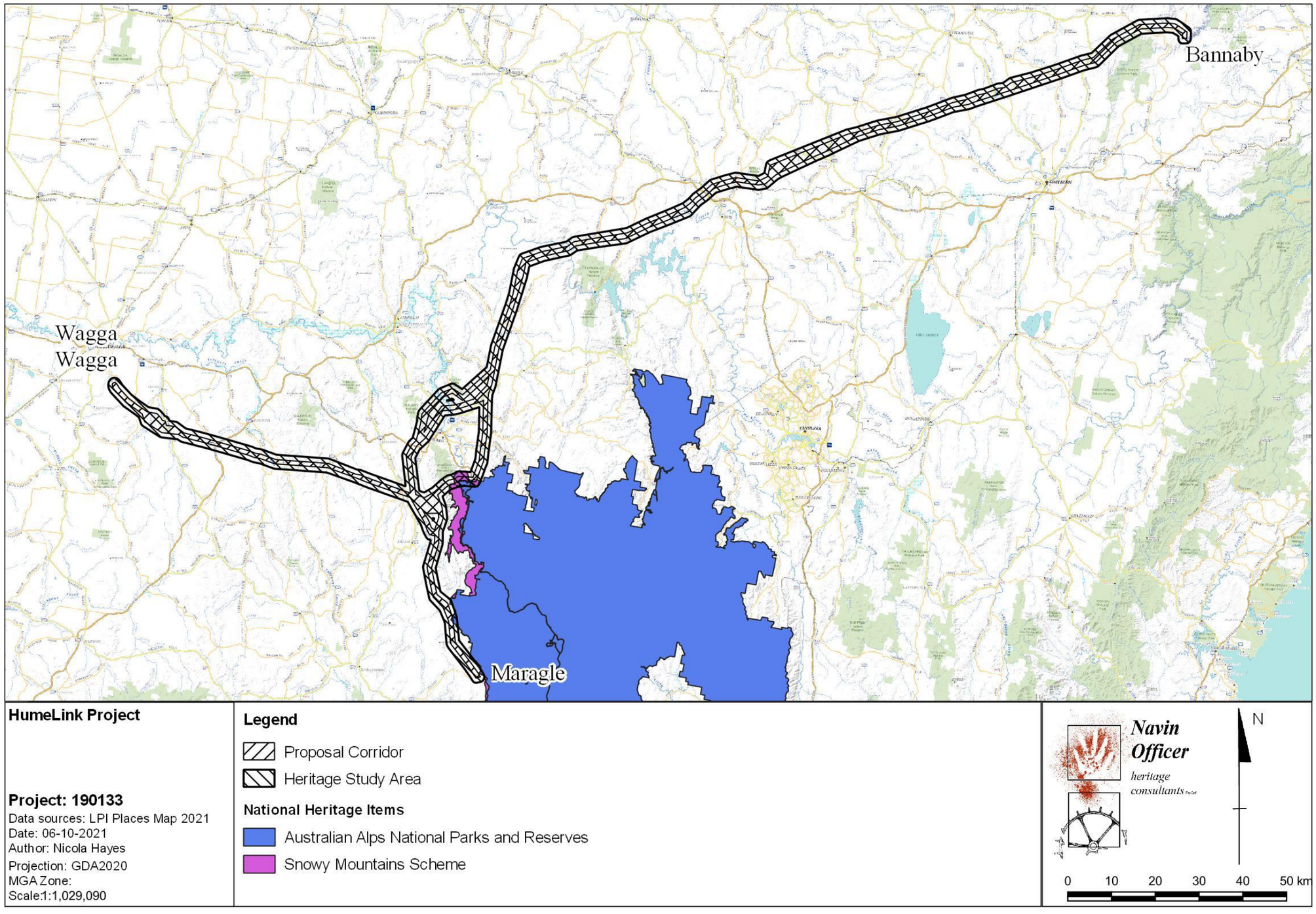


Figure 4.1 Overview of Nationally Listed heritage items relative to the proposal corridor and heritage study area

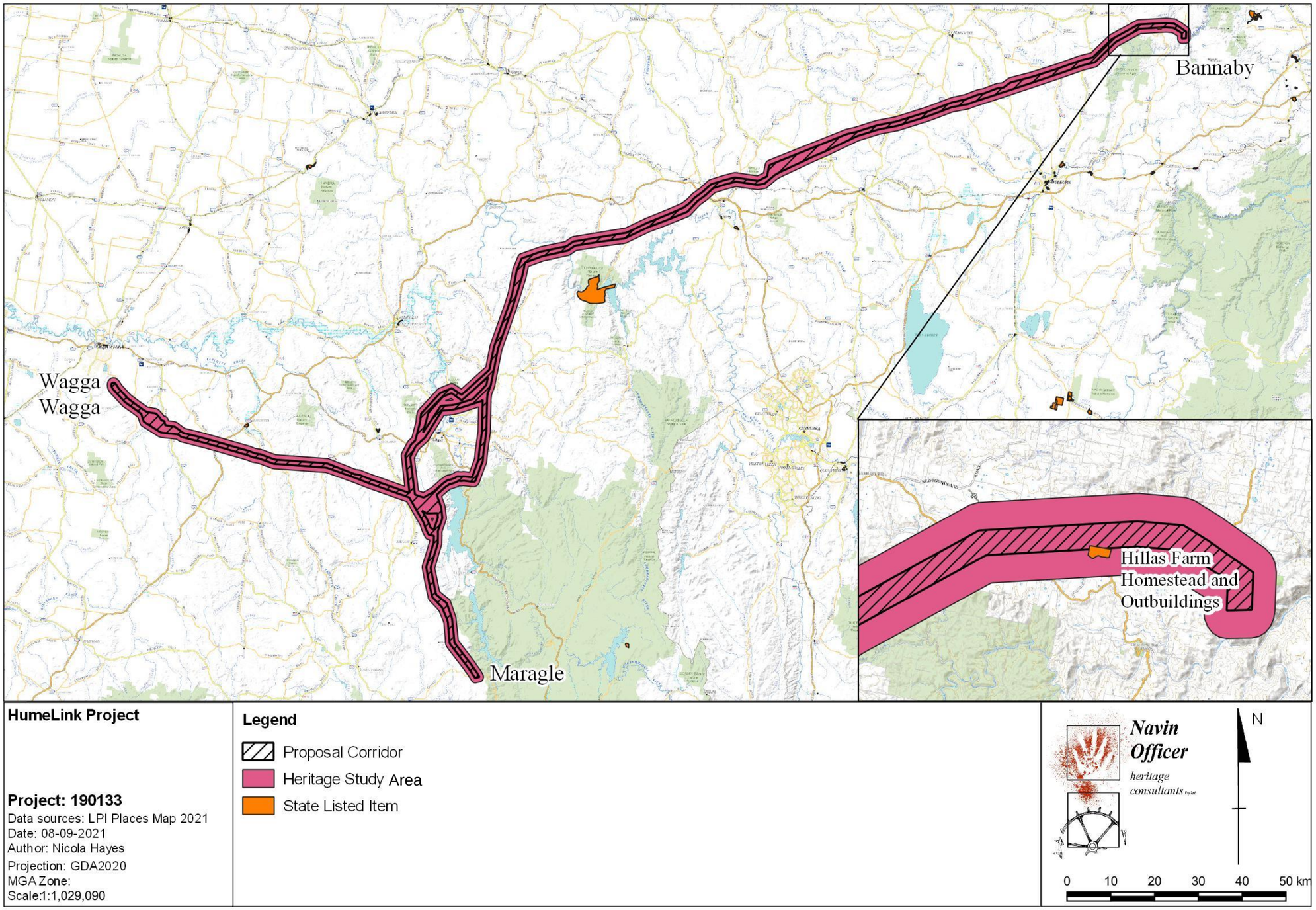


Figure 4.2 Overview of NSW State listed heritage items relative to the proposal corridor and heritage study area

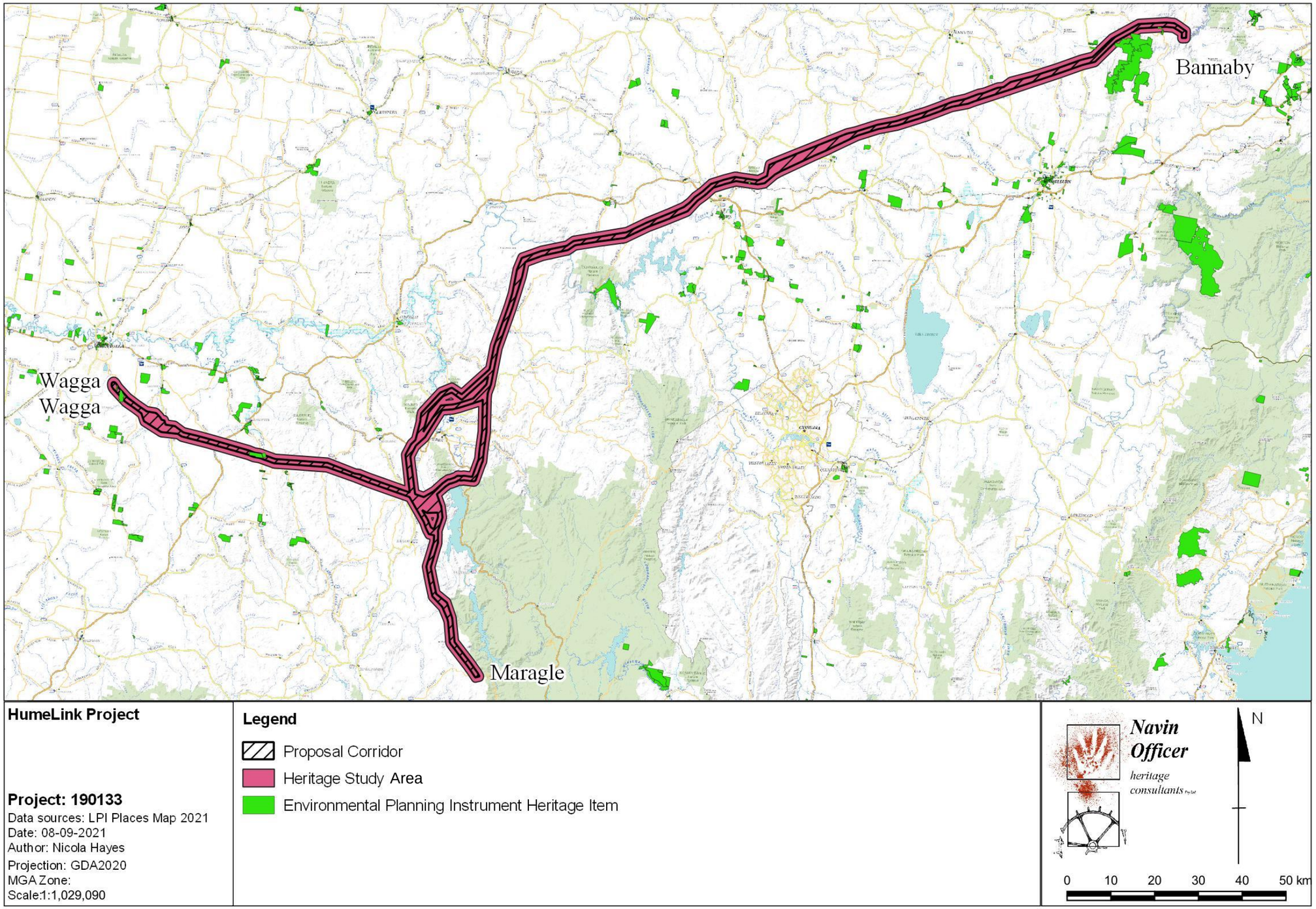


Figure 4.3 Overview of LEP listed heritage items relative to the proposal corridor and heritage study area

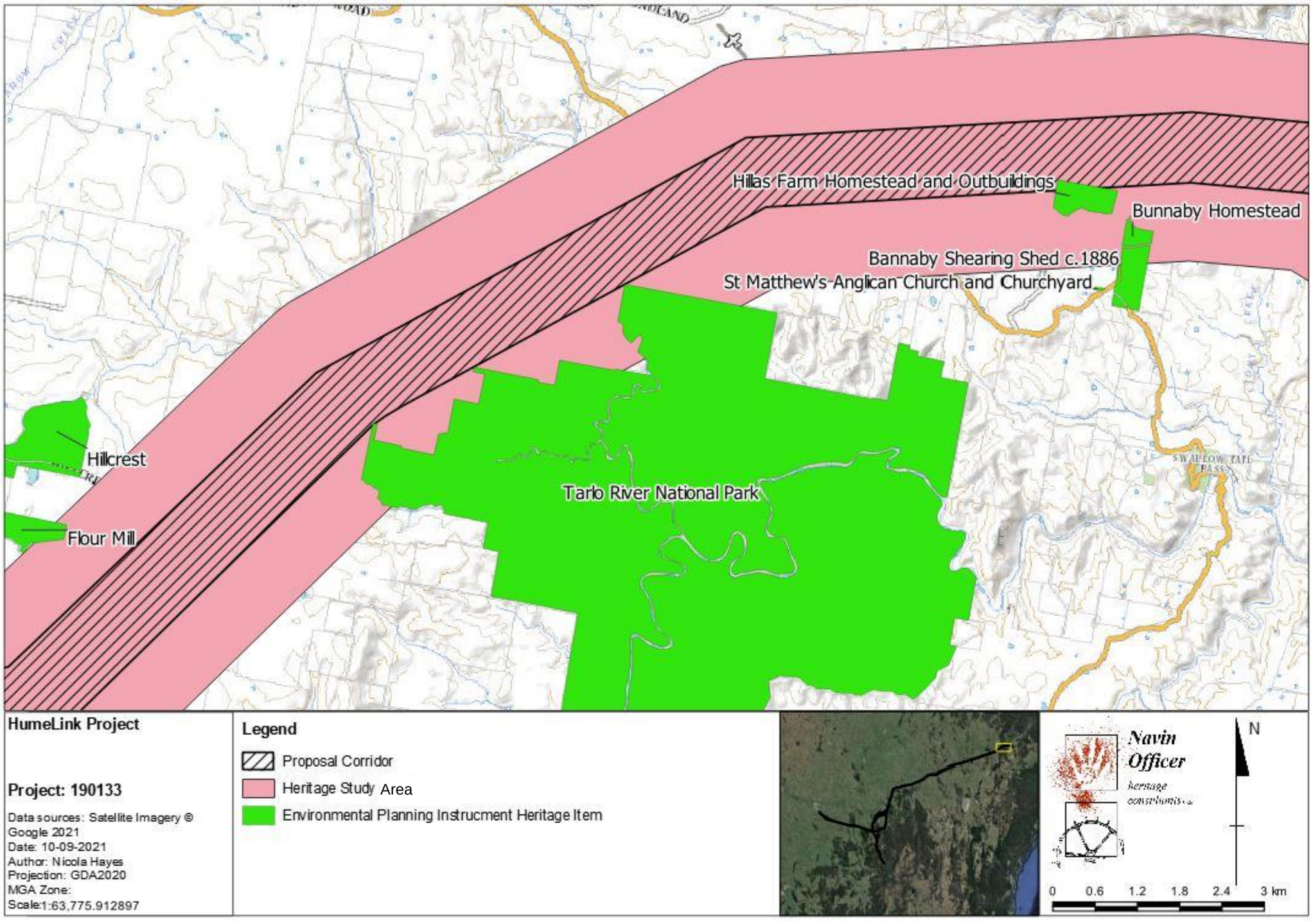


Figure 4.4 LEP listed heritage items relative to the proposal corridor and heritage study area – Upper Lachlan

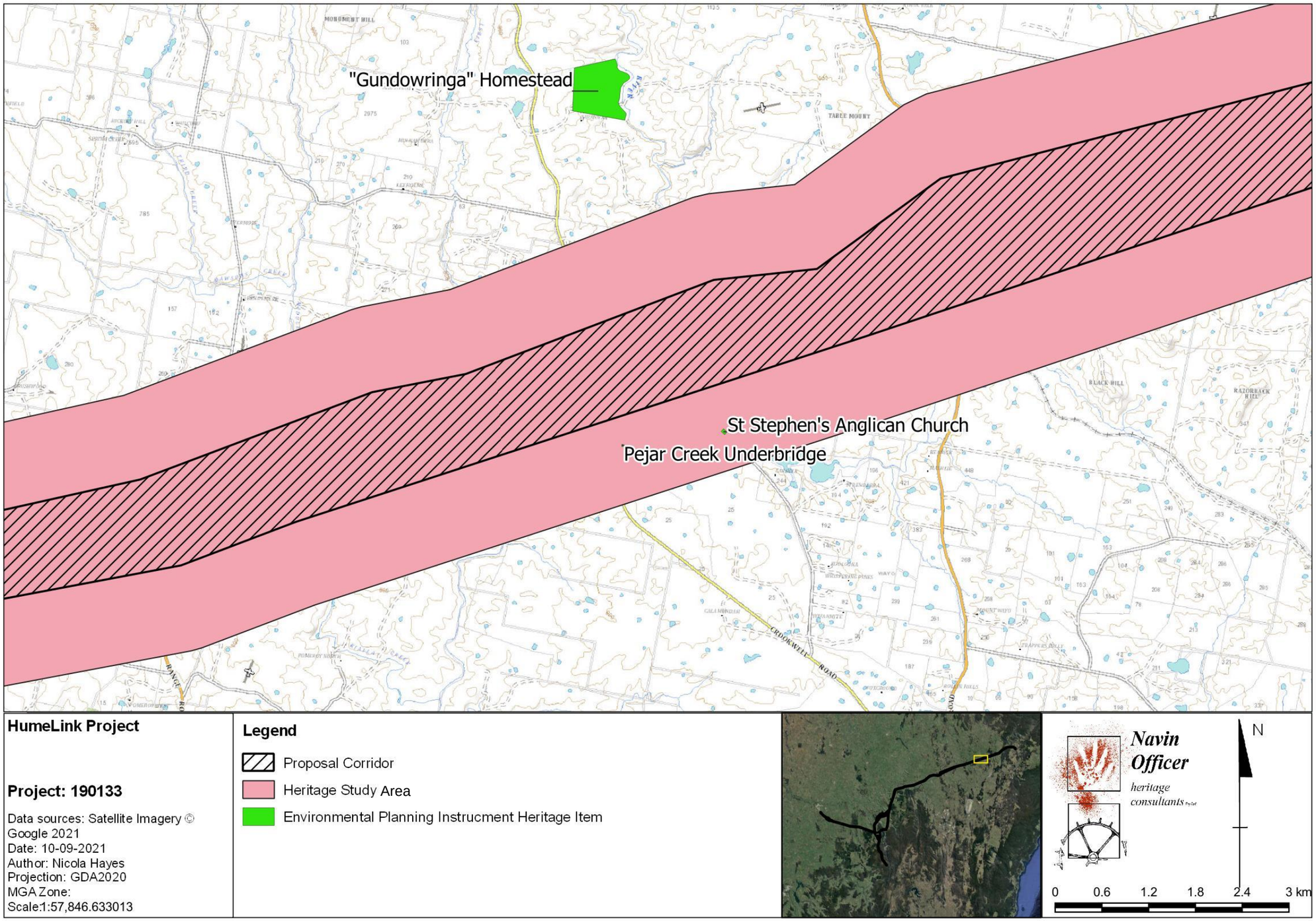


Figure 4.5 LEP listed heritage items relative to the proposal corridor and heritage study area – Upper Lachlan

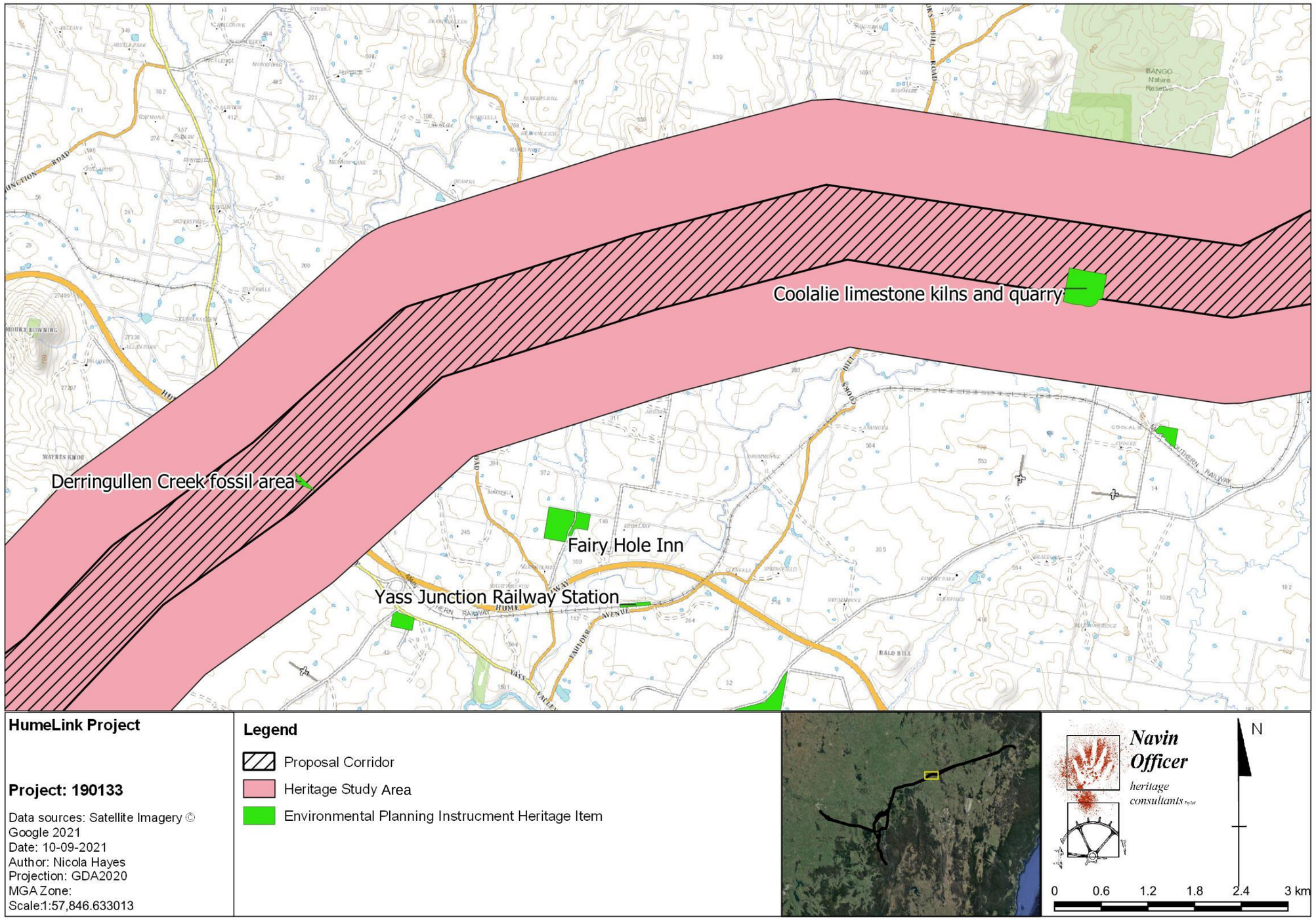


Figure 4.6 LEP listed heritage items relative to the proposal corridor and heritage study area – Yass Valley

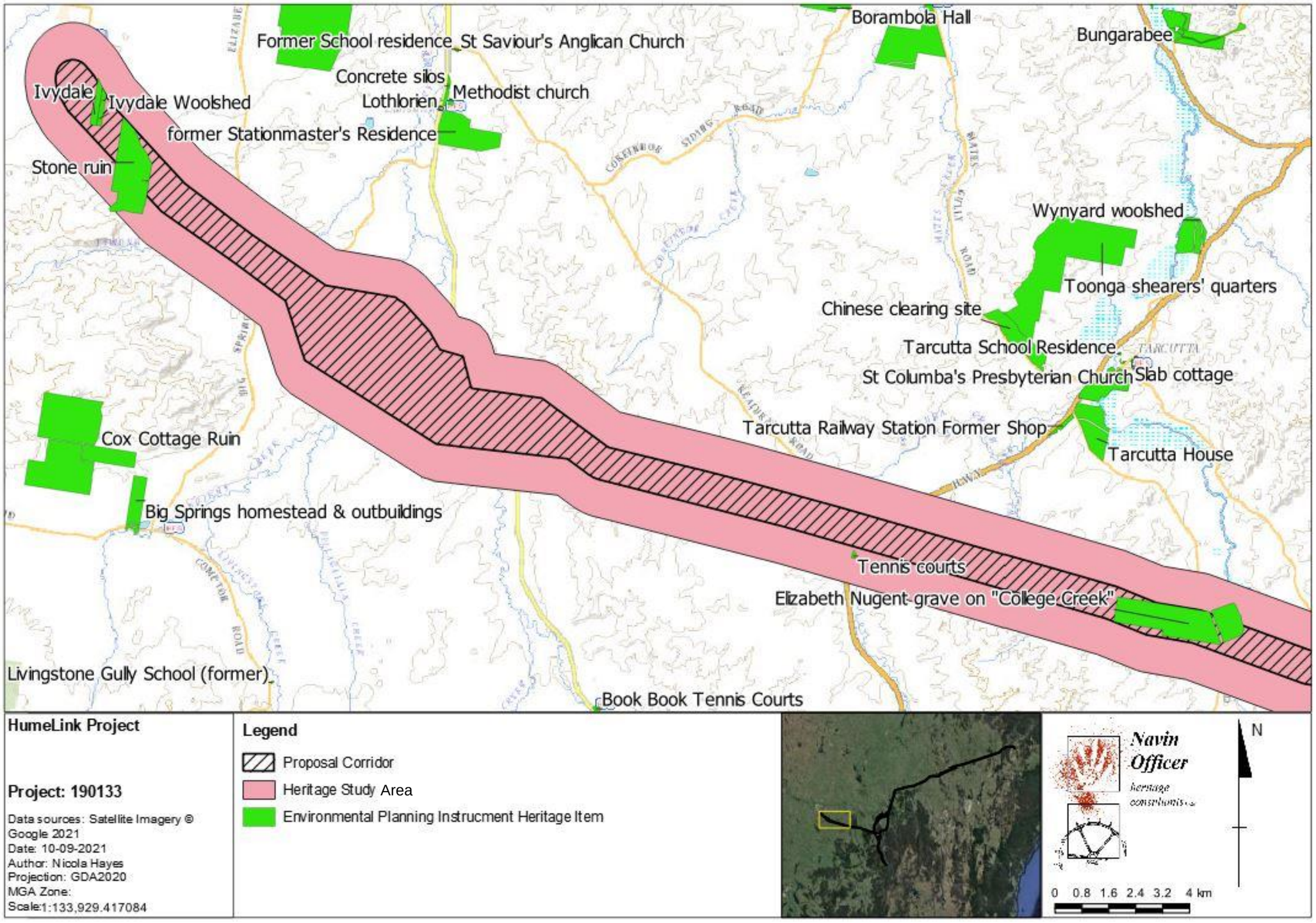
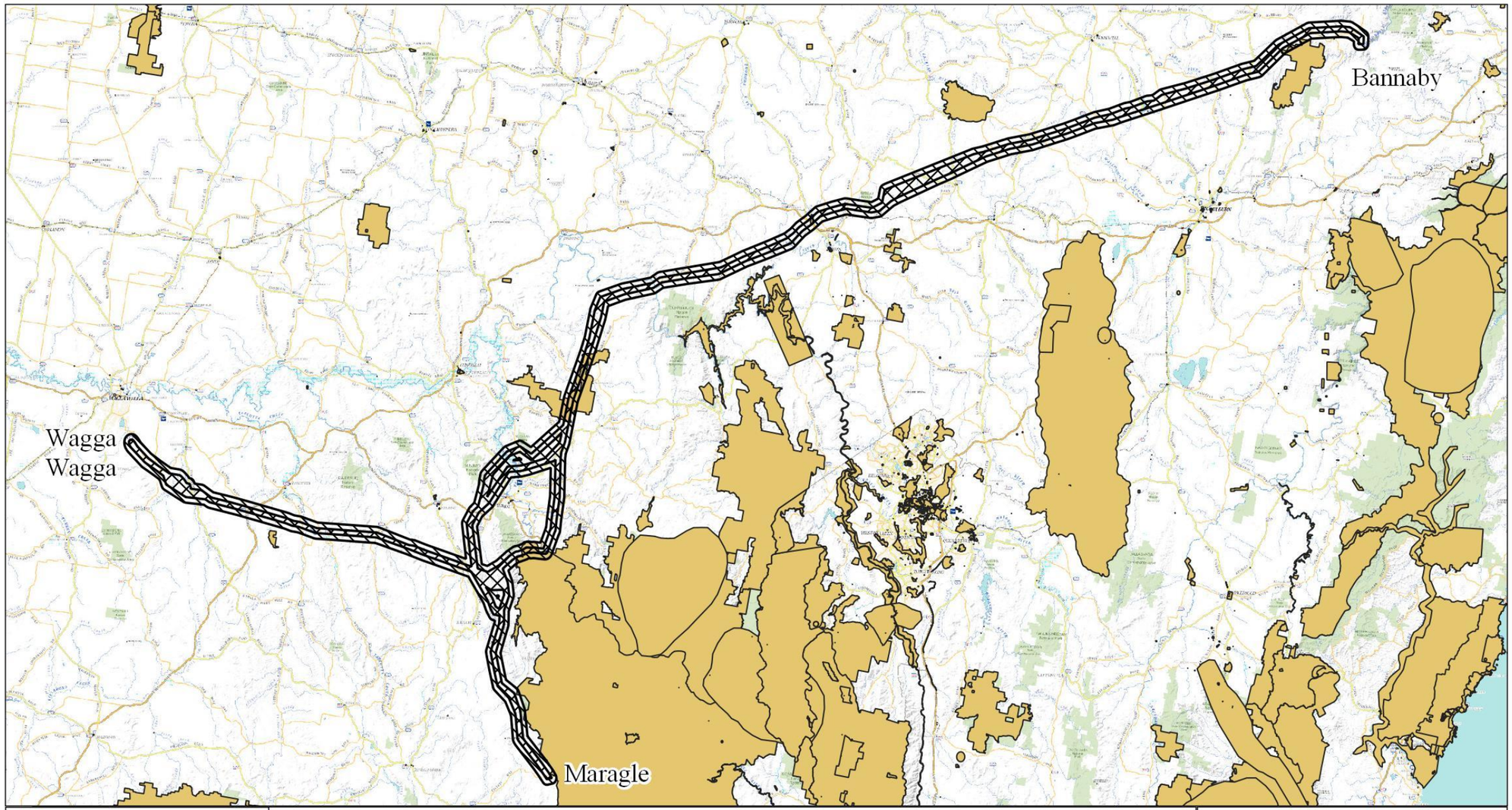


Figure 4.7 LEP listed heritage items relative to the proposal corridor and heritage study area –Wagga Wagga



HumeLink Project

Project: 190133
Data sources: LPI Places Map 2021
Date: 08-09-2021
Author: Nicola Hayes
Projection: GDA2020
MGA Zone:
Scale:1:1,029,090

Legend

- Proposal Corridor
- Heritage Study Area
- RNE Listed Item

Navin Officer heritage consultants Pty Ltd

N

0 10 20 30 40 50 km

Figure 4.8 Overview of RNE listed heritage items relative to the proposal corridor and heritage study area

5 NATIVE TITLE

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 affect 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 the guidelines provide 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” (NSW Office of Environment and Heritage 2010).

There are no native title claims in the heritage study area. There is an ILUA is in place at the eastern extent of the heritage study area , including the existing Bannaby 500 kV substation. The Gundungurra Area Agreement (NI2014/001) was registered on 27 February 2015.

6 CONSTRAINTS AND KEY ISSUES

The major constraint for the proposal in its current form is the patchiness of previous heritage surveys, both Aboriginal and non-Aboriginal, over the proposal corridor. This is broadly the result of low levels of infrastructure development in the region.

Current data on the condition and status of previously identified Aboriginal sites within the heritage study area is required, and there is also a key need to identify any previously unrecorded Aboriginal sites. Early identification of Aboriginal sites, especially those of high archaeological significance and/or Aboriginal Cultural Values, would enable the implementation of better mitigation measures, that would in turn result in improved heritage outcomes for the proposal, 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:

- Analysis of high -resolution aerial imagery, updated topographic and contour mapping (when available), Parish maps and portion plans to further inform the development of the predictive model for Aboriginal and non-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 in order to address constraints arising from tangible and intangible cultural values; and
- Assessing the need to conduct a program of subsurface archaeological investigation (test excavation) to inform the Aboriginal cultural heritage assessment for the EIS. Test excavation can be costly and time consuming and not necessarily needed for the assessment of proposal where design can change, where 100% impact within the corridor is not required and sites can be avoided. 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 heritage study area has been the subject to sporadic archaeological survey. As a consequence, sites have mostly been identified as a result of a small number of past development proposals. The location and distribution of known Aboriginal sites therefore provides an unreliable baseline for the assessment of potential transmission line alignments, substation locations and other ancillary work.

- The location of previously conducted surface surveys and subsurface excavations has not tested a representative sample of all landform types or zones of likely sensitivity within the heritage study area. A predictive model can, however, be developed with the input of the information described in Section 6 above that may be able to go some ways in filling that knowledge gap.

- Aboriginal sites in and around the heritage 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 heritage 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 heritage 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 heritage study area has been the subject to sporadic archaeological survey. As a consequence, sites have mostly been identified as a result 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 heritage study area which have been placed on heritage schedules. The range and type of listed sites may not reflect the range of non-Aboriginal sites potentially occurring within the heritage 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 non-residential or industrial locales.

- Little assessment or identification of ‘heritage landscape’ values has been conducted within the heritage 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 proposal alignment options.

8.1 Aboriginal heritage

1. Develop, refine and map 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. Continue to conduct the program of Aboriginal consultation in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010). The consultation has been started and Aboriginal parties are beginning to register their interest in the proposal.

3. Conduct archaeological field survey of proposal corridor, including re-inspection of known sites to clarify their location and condition. Survey to be conducted with the participation of Aboriginal stakeholder representatives.

4. Determine if a targeted program of archaeological test excavation based on the predictive modelling could be used to:

    - characterise and assess the potential for subsurface archaeological remains/artefacts along the proposed route

    - identify where alternate tower, construction pad, or access track locations may be required

5. Compile an Aboriginal Cultural Heritage Assessment report (ACHAR) in accordance with Heritage NSW guidelines to be included in the EIS assessment for the proposal. The ACHAR would include an assessment of the impact to Aboriginal cultural heritage including Aboriginal sites, areas of archaeological sensitivity and areas of cultural importance. The report would include an assessment of the cumulative impacts from the proposal.

6. The following policies are relevant:

    a) Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010)

    b) Guide to investigating, assessing and report on Aboriginal cultural heritage in NSW (OEH 2011)

8.2 Non-Aboriginal heritage

7. Conduct a review of early aerial photography and recent high resolution imagery, parish maps and portion plans, to assist in the identification of potential archaeological sites and surviving built structures or other previously unidentified features.

8. Conduct archaeological field survey of the proposal corridor.

9. Compile a non-Aboriginal heritage assessment report in accordance with Heritage NSW guidelines to be included in the EIS assessment for the proposal. The report would include an assessment of the impact to non-Aboriginal cultural heritage including built heritage items, ruins and archaeological sites. If the assessment finds that non-Aboriginal heritage would be impacted by the proposal, then this report would comply with Heritage NSW requirements for a Statement of Heritage Impact.

10. The non-Aboriginal heritage assessment will include consideration of whether the proposal is likely or not to have a significant impact on the values for which the Australian Alps National Parks and Reserves and Snowy Mountains Scheme are listed (see Appendix 2). To do this the assessment would examine the landscape through which the proposed route would pass and if this will affect any features within the listed item that are integral to the national values of that place. There is potential that upgrades to existing access tracks within the Australian Alps National Parks and Reserves may be required for construction of the proposal. However, the transmission line easement is unlikely to be within the national park. The ACHAR will include assessment of the impact of the proposal on moth feasting which is one of the identified elements of significance in the listing of the Australian Alps National Parks and Reserves and will consider the location of any potential rock shelter sites.

11. The following policies and guiding documents apply:

    a. Statements of Heritage Impact (NSW Heritage Office 2002)

    b. Assessing heritage significance (NSW Heritage Office 2001)

    c. Assessing Significance for Historical Archaeological Sites and 'Relics' (Heritage Branch, Dept of Planning, 2009)

    d. Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (Department of the Environment 2013)

9 REFERENCES

Department of Environment, Climate Change and Water NSW (DECCW) 2010 *Aboriginal Cultural Heritage Consultation Requirements for Proponents* Department of Environment, Climate Change and Water

Department of the Environment 2013 *Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*

Heritage Branch, Dept of Planning, 2009 *Assessing Significance for Historical Archaeological Sites and 'Relics'*

NSW Heritage Office 2001 *Assessing heritage significance*

NSW Heritage Office 2002 *Statements of Heritage Impact*

Office of Environment and Heritage (OEH) 2011 *Guide to investigating, assessing and report on Aboriginal cultural heritage in NSW*

~ o0o

APPENDIX 1

AHIMS RECORDINGS WITHIN HERITAGE STUDY AREA

Sensitive information redacted

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
51-3-0023	TWF OS5	Artefact	Contributes to Primary Importance
51-3-0028	TME-IF1	Artefact	Contributes to Primary Importance
51-3-0045	TME-OS8	Potential Archaeological Deposit (PAD)	Not Determined
51-4-0016	BY1, Bowning-Yass	Artefact	Not Determined
51-4-0017	BY2, Bowning-Yass	Artefact	Not Determined
51-4-0018	BY3, Bowning-Yass	Modified Tree (Carved or Scarred)	Not Determined
51-4-0048	BH - OS- 1	Artefact	Not Determined
51-4-0094	Conroys Gap Survey Unit 30/Locale 1	Artefact	Not Determined
51-4-0097	WYTL-OS1	Potential Archaeological Deposit (PAD)	Not Determined
51-4-0099	WYTL-OS3	Potential Archaeological Deposit (PAD)	Not Determined
51-4-0100	WYTL-OS4	Artefact	Not Determined
51-4-0101	wytl-os1 with pad	Artefact	Not Determined
51-4-0284	Rye Park SU4/Locale 1	Artefact	Contributes to Primary Importance
51-4-0290	YVWFTL SU1/L1 (Yass Valley Wind Farm)	Artefact	Contributes to Primary Importance
51-4-0326	YTB-2	Artefact	Contributes to Primary Importance
51-4-0329	YTB-15	Artefact	Contributes to Primary Importance
51-4-0380	Yass PAD 6	Potential Archaeological Deposit (PAD)	Not Determined
51-4-0389	Limestone Creek-OS1	Artefact	Not Determined
51-5-0009	Mount Pleasant 1	Artefact	Not Determined
51-5-0010	Mount Pleasant 2	Artefact	Not Determined
51-5-0125	Pomeroy Survey Unit 1/Locale 10	Artefact	Not Determined
51-5-0140	Pomeroy Survey Unit 16/Locale 1	Artefact	Not Determined
51-5-0141	Pomeroy Survey Unit 16/Locale 2	Artefact	Not Determined
51-5-0199	DALTON 6	Artefact	Not Determined
51-5-0200	DALTON GAS PIPELINE 7	Artefact	Not Determined
51-5-0201	DALTON 8	Artefact	Not Determined
51-5-0202	Dalton 7	Artefact	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
51-5-0203	Rye Park SU3/Locale 1	Artefact	Contributes to Primary Importance
51-5-0204	Rye Park SU6/Locale 1	Artefact	Contributes to Primary Importance
51-5-0205	Rye Park SU7/Locale 1	Artefact	Contributes to Primary Importance
51-5-0207	Rye Park SU3/Locale 2	Artefact	Contributes to Primary Importance
51-5-0238	GullenSolarFarm-Alt site 1	Artefact	Contributes to Primary Importance
51-5-0239	GullenSolarFarm-Alt site 2	Artefact	Contributes to Primary Importance
51-5-0240	GullenSolarFarm-Alt site 3	Artefact	Contributes to Primary Importance
51-5-0241	GullenSolarFarm-Alt site 4	Artefact	Contributes to Primary Importance
51-5-0242	GullenSolarFarm-Alt site 5	Artefact	Contributes to Primary Importance
51-5-0243	GullenSolarFarm-Alt site 6	Artefact	Contributes to Primary Importance
51-5-0244	GullenSolarFarm-Alt site 7	Artefact	Contributes to Primary Importance
51-5-0245	GullenSolarFarm-Alt site 8	Artefact	Contributes to Primary Importance
51-5-0250	Gullen Solar Farm 9	Artefact	Contributes to Primary Importance
51-5-0251	Gullen Solar Farm 10	Artefact	Contributes to Primary Importance
51-5-0252	Gullen Solar Farm 11	Artefact	Contributes to Primary Importance
51-5-0253	Gullen Solar Farm 12	Artefact	Contributes to Primary Importance
51-5-0254	Gullen Solar Farm 13	Artefact	Contributes to Primary Importance
51-5-0255	Gullen Solar Farm 14	Aboriginal Resource and Gathering	Not Determined
51-5-0255	Gullen Solar Farm 14	Potential Archaeological Deposit (PAD)	Not Determined
51-5-0256	Gullen Solar Farm 15	Artefact	Contributes to Primary Importance
51-5-0257	Gullen Solar Farm 16	Aboriginal Resource and Gathering	Contributes to Primary Importance
51-5-0257	Gullen Solar Farm 16	Artefact	Contributes to Primary Importance
51-5-0257	Gullen Solar Farm 16	Potential Archaeological Deposit (PAD)	Not Determined
51-5-0258	Gullen Solar Farm 17	Artefact	Contributes to Primary Importance
51-5-0259	Gullen Solar Farm 18	Artefact	Contributes to Primary Importance
51-5-0260	Gullen Solar Farm 19	Artefact	Contributes to Primary Importance
51-5-0261	Gullen Solar Farm 20	Artefact	Contributes to Primary Importance
51-5-0262	Gullen Solar Farm 21	Artefact	Contributes to Primary Importance
51-5-0330	RPWF IF 2	Artefact	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
51-5-0332	RPWF AFT 1	Artefact	Not Determined
51-5-0335	RPWF AFT 1 + PAD	Artefact	Not Determined
51-5-0339	RPWF IF18	Artefact	Not Determined
51-5-0340	RPWF IF17	Artefact	Not Determined
51-6-0210	PJ02	Artefact	Contributes to Primary Importance
51-6-0714	Hillview Park	Artefact	Not Determined
51-6-0715	Hillview Park 2	Artefact	Not Determined
51-6-0716	Hillview Park 3	Artefact	Not Determined
51-6-0717	Hillview Park 5	Artefact	Not Determined
51-6-0718	Hillview Park 4	Artefact	Not Determined
51-6-0722	Wollondilly Farm	Artefact	Not Determined
51-6-0723	Wollondilly Farm 9	Artefact	Not Determined
51-6-0810	PJ56	Artefact	Not Determined
51-6-0810	PJ56	Potential Archaeological Deposit (PAD)	Not Determined
51-6-0811	PJ58	Artefact	Not Determined
51-6-0813	PJ60	Artefact	Not Determined
51-6-0813	PJ60	Potential Archaeological Deposit (PAD)	Not Determined
51-6-0821	PJ57	Artefact	Not Determined
51-6-0842	PJ76	Artefact	Not Determined
51-6-0873	Crookwell WF5	Artefact	Not Determined
51-6-0874	Crookwell WF4	Artefact	Not Determined
51-6-0875	Crookwell WF16	Artefact	Not Determined
51-6-0876	Crookwell WF15	Artefact	Not Determined
51-6-0877	Crookwell WF14	Artefact	Not Determined
51-6-0878	Crookwell WF13	Artefact	Not Determined
51-6-0879	Crookwell WF12	Artefact	Not Determined
51-6-0882	Crookwell WF 3	Artefact	Not Determined
51-6-0883	Crookwell WF 2	Artefact	Not Determined
51-6-0884	Crookwell WF 1	Artefact	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
51-6-0885	Crookwell WF PAD 3	Potential Archaeological Deposit (PAD)	Not Determined
51-6-0886	Crookwell WF PAD 2	Potential Archaeological Deposit (PAD)	Not Determined
51-6-0887	Crookwell WF PAD 1	Potential Archaeological Deposit (PAD)	Not Determined
52-1-0152	Bannaby 1	Artefact	Not Determined
52-1-0272	BA1 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0273	BA2 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0274	BA3 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0275	BA4 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0276	BA5 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0277	BA6 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0278	BA7 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0279	BA8 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0280	BA9 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0281	BA10 (Bannaby Substation)	Artefact	Contributes to Primary Importance
52-1-0282	BA11 (Bannaby Substation)	Artefact	Contributes to Primary Importance
56-1-0035	Wagga Tip 1;	Modified Tree (Carved or Scarred)	Not Determined
56-1-0036	Wagga Tip 2;	Modified Tree (Carved or Scarred)	Not Determined
56-1-0038	Wagga Tip 4;	Modified Tree (Carved or Scarred)	Not Determined
56-1-0493	Big Springs Gregardoo TSR 1	Modified Tree (Carved or Scarred)	Not Determined
56-1-0494	Big Springs Gregardoo TSR 2	Modified Tree (Carved or Scarred)	Not Determined
56-1-0497	Simpson TSR 1	Modified Tree (Carved or Scarred)	Not Determined
56-1-0527	Gregadoo SF 463	Artefact	Not Determined
56-1-0528	Gregadoo SF 619	Artefact	Not Determined
56-1-0529	Gregadoo SF 393	Artefact	Not Determined
56-1-0530	Gregadoo SF 360	Artefact	Not Determined
56-1-0531	Gregadoo SF 645	Modified Tree (Carved or Scarred)	Not Determined
56-1-0539	Gregadoo Solar IF3	Artefact	Not Determined
56-1-0540	Gregadoo Solar IF1	Artefact	Not Determined
56-1-0541	Gregadoo SF IF2	Artefact	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
56-1-0622	Gregadoo SF Reburial 1	Artefact	Not Determined
56-1-0623	Gregadoo SF IF4	Artefact	Not Determined
56-1-0671	Gregadoo SF IF 5	Artefact	Not Determined
56-2-0008	Burkinshaw lane 1	Artefact	Not Determined
56-2-0009	Coreinbob 1	Artefact	Not Determined
56-2-0010	Comatawa 1	Artefact	Not Determined
56-3-0012	A2 Gadara Plains 4	Artefact	Not Determined
56-3-0015	A5 Gadara Plains 3	Modified Tree (Carved or Scarred)	Not Determined
56-3-0020	A10 Isolated Find 5	Artefact	Not Determined
56-3-0021	A11 Isolated Fid 6	Artefact	Not Determined
56-3-0023	A13 Isolated Find 8	Artefact	Not Determined
56-3-0028	Illabo-Tumut pipeline site IT8 (location need to be checked)	Aboriginal Ceremony and Dreaming	Not Determined
56-3-0028	Illabo-Tumut pipeline site IT8(location need to be checked)	Artefact	Not Determined
56-3-0029	IF1/51(wondalga adj wilson creek)	Artefact	Not Determined
56-3-0036	Meadow Creek 1	Modified Tree (Carved or Scarred)	Not Determined
56-3-0037	Meadow Creek 2	Modified Tree (Carved or Scarred)	Not Determined
56-3-0038	Meadow Creek 3	Artefact	Not Determined
56-3-0043	Brungle Scarred Tree 1	Modified Tree (Carved or Scarred)	Not Determined
56-3-0054	Minjary Nature Reserve 10	Artefact	Not Determined
56-3-0068	MA3	Artefact	Not Determined
56-3-0069	MA4	Stone arrangement; Artefact	Not Determined
56-3-0102	Gocup Road PAD 01	Potential Archaeological Deposit (PAD)	Not Determined
56-3-0110	Willaway canoe tree 1	Modified Tree (Carved or Scarred)	Not Determined
56-3-0137	The Dip TSR Scar Tree 2	Modified Tree (Carved or Scarred)	Not Determined
56-3-0139	The Dip TSR Scar Tree 1	Modified Tree (Carved or Scarred)	Not Determined
56-3-0182	Beehive TSR Rock Scatter 1	Artefact	Not Determined
56-3-0183	Beehive TSR Scar Tree 4	Modified Tree (Carved or Scarred)	Not Determined
56-3-0184	Beehive TSR Scar Tree 5	Modified Tree (Carved or Scarred)	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
56-3-0185	Beehive TSR Scar Tree 6	Modified Tree (Carved or Scarred)	Not Determined
56-3-0186	Beehive TSR Scar Tree 7	Modified Tree (Carved or Scarred)	Not Determined
56-3-0187	Beehive TSR Scar Tree 8	Modified Tree (Carved or Scarred)	Not Determined
56-3-0188	Beehive TSR Scar Tree 9	Modified Tree (Carved or Scarred)	Not Determined
56-3-0189	Beehive TSR Scar Tree 3	Modified Tree (Carved or Scarred)	Not Determined
56-3-0190	Beehive TSR Scar Tree 2	Modified Tree (Carved or Scarred)	Not Determined
56-3-0191	Beehive TSR Scar Tree 10	Modified Tree (Carved or Scarred)	Not Determined
56-3-0196	Beehive TSR Scar Tree 1	Modified Tree (Carved or Scarred)	Not Determined
56-3-0204	Hallorans TSR Scar Tree 1	Modified Tree (Carved or Scarred)	Not Determined
56-3-0205	Hallorans TSR Scar Tree 2	Modified Tree (Carved or Scarred)	Not Determined
56-3-0206	Hallorans TSR Scar Tree 3	Modified Tree (Carved or Scarred)	Not Determined
56-3-0210	Wyangle Quarry AS1	Artefact	Not Determined
56-6-0059	YC1 Yorkers Creek;	Artefact	Not Determined
56-6-0063	YC-OS-3 Bago State	Artefact	Not Determined
56-6-0064	YC-ST-2 Yorker Creek	Artefact	Not Determined
56-6-0067	YC-ST-2	Aboriginal Resource and Gathering	Not Determined
56-6-0068	YC-05-3	Aboriginal Resource and Gathering	Not Determined
56-6-0121	PC-IF-3	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0122	PC-05-2	Artefact	Not Determined
56-6-0123	PC-IR-1	Artefact	Not Determined
56-6-0125	PC-OS-4	Artefact	Not Determined
56-6-0126	BR-OS-4	Artefact	Not Determined
56-6-0127	PC-IF-2	Artefact	Not Determined
56-6-0128	PC-OS-3	Artefact	Not Determined
56-6-0131	LC-ST-2	Modified Tree (Carved or Scarred)	Not Determined
56-6-0143	BM-OS-1	Artefact	Not Determined
56-6-0145	PC-OS-6	Artefact	Not Determined
56-6-0146	PC-OS-5	Artefact	Not Determined
56-6-0147	LC/OS/4	Artefact	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
56-6-0148	LC/OS/3	Artefact	Not Determined
56-6-0149	Nurenmerenmong Boraground	Aboriginal Ceremony and Dreaming	Contributes to Primary Importance
56-6-0151	BSF-OS J67	Artefact	Not Determined
56-6-0152	BSF-OS J68	Artefact	Not Determined
56-6-0153	BSF-OS-2 J26	Artefact	Not Determined
56-6-0154	BSF-IF J69	Artefact	Not Determined
56-6-0155	BSF-PAD J70	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0158	HY-IF-2 J58	Artefact	Not Determined
56-6-0159	HY-IF-1 J59	Artefact	Not Determined
56-6-0163	HY-OS J53	Artefact	Not Determined
56-6-0165	LTC-OS-1 J65	Artefact	Not Determined
56-6-0165	LTC-OS-1 J65	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0167	LTC-OS-2 J64	Artefact	Not Determined
56-6-0168	LTC-IF-1 J63	Artefact	Not Determined
56-6-0170	PC-OS-11 J71	Artefact	Not Determined
56-6-0171	PC-PAD/OS/II J72	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0172	PC-IF-8 J73	Artefact	Not Determined
56-6-0173	BSF-OS-10 J74	Artefact	Not Determined
56-6-0174	PC-OS-12 J75	Artefact	Not Determined
56-6-0176	Logridge Ck - 1F-2 - J42	Artefact	Not Determined
56-6-0177	Logbridge creek - 1F-1 - J43	Artefact	Not Determined
56-6-0178	Logbridge Ck-05-1- J44	Artefact	Not Determined
56-6-0179	BSF-05-3- J45	Artefact	Not Determined
56-6-0180	Logbridge Ck-1F-3 - J46	Artefact	Not Determined
56-6-0181	BSF-OS-1	Artefact	Not Determined
56-6-0183	LC-1F-3 - J 48	Artefact	Not Determined
56-6-0184	BM-ST-1-J49	Artefact	Not Determined
56-6-0185	BSF-IF-9 J76	Artefact	Not Determined
56-6-0186	PC-PAD-1	Potential Archaeological Deposit (PAD)	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
56-6-0187	RGT-OS-5 J78	Artefact	Not Determined
56-6-0188	RGT-PAD-4 J79	Artefact	Not Determined
56-6-0188	RGT-PAD-4 J79	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0189	RGT-OS-4 J80	Artefact	Not Determined
56-6-0190	RGT-OS-1 J81	Artefact	Not Determined
56-6-0191	RG-PAD-1 J82	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0192	RGT-PAD-2	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0193	RGT-OS-2 J84	Artefact	Not Determined
56-6-0194	RGT-PAD-3 J85	Artefact	Not Determined
56-6-0194	RGT-PAD-3 J85	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0195	LC-PAD-1 J86	Artefact	Not Determined
56-6-0195	LC-PAD-1 J86	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0196	RGT-OS-3 J87	Artefact	Not Determined
56-6-0197	RGT-IF-1 J88	Artefact	Not Determined
56-6-0198	RGT-OS (Reynolds)-1 J89	Artefact	Not Determined
56-6-0199	Reynolds-PAD-1	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0202	P-OS-1 PAD	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0203	P-OS-1	Artefact	Not Determined
56-6-0204	BSF-OS-3 PAD	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0206	LC-1F-12	Artefact	Not Determined
56-6-0207	LC-IF-12 PAD	Artefact	Not Determined
56-6-0222	LTC-OS-1 - J107	Artefact	Not Determined
56-6-0223	LTC-IF-1 J108	Artefact	Not Determined
56-6-0224	BM-OS-8 J109	Artefact	Not Determined
56-6-0225	LTC-IF-1 PAD J110	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0226	PC-OS-9 J52	Artefact	Not Determined
56-6-0227	PC-OS-10 J51	Artefact	Not Determined
56-6-0228	PC-OS-8 J50	Artefact	Not Determined
56-6-0229	BM-BORA-PAD-2 J117	Potential Archaeological Deposit (PAD)	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
56-6-0230	BM-BORA PAD-1 J118	Ceremonial Ring (Stone or Earth)	Not Determined
56-6-0230	BM-BORA PAD-1 J118	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0233	Cros Track PAD - J121	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0235	PC-1F-17 PAD	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0236	PC-1F-17	Artefact	Not Determined
56-6-0237	PC-1F-16	Artefact	Not Determined
56-6-0238	PC-1f_16/PAD	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0239	YBG/PC-PAD	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0240	PC-1F-15(+(PAD)	Artefact	Not Determined
56-6-0241	TLCT-ST-1/J129	Modified Tree (Carved or Scarred)	Not Determined
56-6-0247	PC-EAST-PAD J142	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0249	TLCT-ST-1/PAD/J131	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0258	Muddy Spring-1	Artefact	Not Determined
56-6-0260	Clear Waters - 1	Artefact	Not Determined
56-6-0262	BSF-05-46/PAD (J195)	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0263	BSF-05-46 (J193)	Artefact	Not Determined
56-6-0266	BSF-OS-29 J167	Artefact	Not Determined
56-6-0267	BSF-OS-30 J168	Artefact	Not Determined
56-6-0268	BSF-OS-31 J169	Artefact	Not Determined
56-6-0269	BSF-IF-32 J170	Artefact	Not Determined
56-6-0270	BSF-OS/HS-1 J171	Artefact	Not Determined
56-6-0270	BSF-OS/HS-1 J171	Hearth	Not Determined
56-6-0271	BSF-IF-33 J172	Artefact	Not Determined
56-6-0272	BSF-IF-34 J173	Artefact	Not Determined
56-6-0273	BSF-IF-34/PAD J174	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0274	Clearwaters - 2	Artefact	Not Determined
56-6-0284	Artefact 1 - State Forests	Artefact	Not Determined
56-6-0285	Artefact 2 - State Forests	Artefact	Not Determined
56-6-0286	Artefact 3 - State Forests	Artefact	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
56-6-0287	Artefact 4 - State Forests	Artefact	Not Determined
56-6-0288	Artefact 5 - State Forests	Artefact	Not Determined
56-6-0289	Bago 118 - PAD	Artefact	Not Determined
56-6-0294	YC-ST-1	Modified Tree (Carved or Scarred)	Not Determined
56-6-0295	BM-OS-2	Artefact	Not Determined
56-6-0296	BM-IF-1	Artefact	Not Determined
56-6-0297	PC/25/0S/ST-1 (J156)	Artefact	Not Determined
56-6-0298	PC-OS-27	Artefact	Not Determined
56-6-0298	PC-OS-27	Modified Tree (Carved or Scarred)	Not Determined
56-6-0299	PC-OS-27/PAD (J197)	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0300	LBC-IF-11/PAD (J191)	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0301	LBC-IF-11 (J190)	Artefact	Not Determined
56-6-0302	LBC-IF-10 (J189)	Artefact	Not Determined
56-6-0303	LBC-OS-3/PAD (J188)	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0304	LBC-OS-3 (J187)	Artefact	Not Determined
56-6-0305	LC-OS-30/PAD (J186)	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0306	BM-OS-30 (J185)	Artefact	Not Determined
56-6-0308	YC-IF-8 (J183)	Artefact	Not Determined
56-6-0309	YC-IF-7/PAD (J182)	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0310	YC-OS-8 J179	Artefact	Contributes to Primary Importance
56-6-0311	YC-OS-10 PAD J178	Potential Archaeological Deposit (PAD)	Contributes to Primary Importance
56-6-0312	YC-IF-7 (J181)	Artefact	Not Determined
56-6-0313	YC-OS-10 J177	Artefact	Contributes to Primary Importance
56-6-0314	YC-OS-03 PAD J176	Potential Archaeological Deposit (PAD)	Contributes to Primary Importance
56-6-0315	YC-OS-03 J175	Potential Archaeological Deposit (PAD)	Contributes to Primary Importance
56-6-0316	YC-OS-8/PAD (J180)	Potential Archaeological Deposit (PAD)	Not Determined
56-6-0322	Cross Track-IF-1	Artefact	Not Determined
56-6-0323	PC-OS-5 Brandy Marys	Artefact	Not Determined
56-6-0326	BM/Bora-OS(J206)	Stone Arrangement	Not Determined

SITE ID	SITE NAME	FEATURE TYPE	IMPORTANCE
56-6-0361	BM/BORA-OS J219	Artefact	Not Determined
56-6-0385	TC-IF-1 The Tops	Artefact	Not Determined
56-6-0386	TP-OS-1 The Tops	Artefact	Not Determined
56-6-0387	TP-OS-2 The Tops	Artefact	Not Determined

APPENDIX 2

LISTINGS OF ITEMS OF NATIONAL HERITAGE SIGNIFICANCE

Commonwealth of Australia

Gazette

Published by the Commonwealth of Australia

GOVERNMENT NOTICES

Environment Protection and Biodiversity Conservation Act 1999

INCLUSION OF A PLACE IN THE NATIONAL HERITAGE LIST

SNOWY MOUNTAINS SCHEME

I, Josh Frydenberg, Minister for the Environment and Energy, having considered in relation to the place and the National Heritage values described in the Schedule of this instrument:

(a) the Australian Heritage Council's assessment whether the place meets any of the National Heritage criteria; and

(b) the comments given to the Council under sections 324JG and 324JH of the *Environment Protection and Biodiversity Conservation Act 1999*; and

being satisfied that the place described in the Schedule has the National Heritage values specified in the Schedule, pursuant to section 324JJ of the *Environment Protection and Biodiversity Conservation Act 1999*, include the place and the specified National Heritage values in the National Heritage List.

Dated 10/10/2016

[signed by]

Josh Frydenberg
Minister for the Environment and Energy

SCHEDULE

STATE / TERRITORY
Local Government
Name
Location / Boundary
Criteria / Values

NEW SOUTH WALES

Snowy River Shire Council; Tumbarumba Shire Council; Tumut Council

Snowy Mountains Scheme:

Approximately 460,000ha, Cabramurra, being an area enclosed by a line commencing at the intersection of the Kosciuszko National Park boundary with the south western corner of Lot 13 DP755862 (approximate MGA point Zone 55 596622mE 5977800mN),

- then westerly and southerly via the national park boundary to its intersection with MGA northing 5955860mN (approximate MGA point 601475mE 5955860mN),
- then easterly directly to MGA point 611612mE 5955384mN,
- then south easterly directly to a corner on the boundary of the Kosciuszko National Park at approximate MGA point 626108mE 5952790mN,
- then south easterly via the national park boundary to its intersection with the western boundary of Lot 62 DP756699 (approximate MGA point 627888mE 5952455mN),
- then northerly via the western boundary of Lot 62 to its intersection with the Kosciuszko National Park boundary (approximate MGA point 628051mE 5952951mN),
- then north westerly, generally northerly and generally easterly via the national park boundary to its intersection with the western boundary of Lot 46 DP756725 (approximate MGA point 630994mE 5958893mN),
- then northerly via the western boundary of Lot 46, including crossing the unnamed road reserve between approximate MGA points 630997mE 5958913mN and 631001mE 5958934mN, and northerly and easterly via the western and northern boundaries of Lot 47 DP756725 to the intersection with the southern alignment of the western boundary of Lot 53 DP756725 (approximate MGA point 631938mE 5960633mN),
- then northerly via the southern alignment of the western boundary of Lot 53 and northerly via the western boundaries of Lots 53 & 52 DP756725 to the intersection with the Kosciuszko National Park boundary (approximate MGA point 632069mE 5961243mN),
- then northerly, north westerly and northerly via the national park boundary, including crossing the road reserve of the Alpine Way between approximate MGA points 629572mE 5965053mN and 629573mE 5965101mN, to its intersection with the south eastern bank of the Thredbo River (approximate MGA point 629359mE 5966663mN),
- then north easterly via the south eastern bank of the river and easterly, south westerly, south easterly and generally northerly via the Full Supply Level (FSL) of the Lake Jindabyne shoreline, and including the whole of the Lake Jindabyne dam wall, to its intersection with MGA northing 5980080mN (approximate MGA point 646015mE 5980080mN),
- then westerly directly to the intersection of the Kosciuszko National Park boundary with MGA northing 5980115mN (approximate MGA point 645717mE 5980115mN),
- then northerly and generally north westerly via the national park boundary to its intersection with the southern boundary of Lot 36 DP756696 (approximate MGA point 631007mE 5996564mN),
- then westerly and northerly via the southern and western boundaries of Lot 36, including crossing the two unnamed road reserves between approximate MGA points 1) 630055mE 5997143mN and 630080mE 5997153mN and 2) 631346mE 5999079mN and 631331mE 5999094mN, to the

intersection with the most northerly point of the land parcel (approximate MGA point 631187mE 6000009mN),
- then via the following MGA points consecutively: 631184mE 6000196mN, 631154mE 6000338mN, 631148mE 6000453mN, 631154mE 6000482mN, 631149mE 6000592mN, 631173mE 6000647mN, 631194mE 6000737mN, 631196mE 6000857mN, 631190mE 6001012mN, 631190mE 6001214mN, 631170mE 6001511mN, 631176mE 6001687mN, 631250mE 6001840mN, 631337mE 6001947mN, 631390mE 6001947mN, 631616mE 6001854mN, 631830mE 6001867mN, 631963mE 6001907mN, 632280mE 6002069mN,
- then north easterly directly to the intersection of the western boundary of Lot 27 DP756696 with MGA northing 6002161mN (approximate MGA point 632546mE 6002161mN),
- then southerly via the western boundary of Lot 27 to its intersection with the Kosciuszko National Park boundary (approximate MGA point 632320mE 6001659mN),
- then easterly, generally northerly, south easterly and generally northerly via the national park boundary, including twice crossing the road reserve of an unnamed track between approximate MGA points 1) 633070mE 6001525mN and 633092mE 6001521mN and 2) 633663mE 6003075mN and 633640mE 6003079mN, to its intersection with MGA northing 5999916mN (approximate MGA point 644390mE 5999916mN),
- then via grid east to its intersection with the FSL of the southern shoreline of Lake Eucumbene (approximate MGA point 644400mE 5999916mN),
- then generally north easterly, generally southerly and generally north westerly via the FSL of the southern and eastern shoreline of Lake Eucumbene, and including the whole of the Lake Eucumbene dam wall, to its intersection with MGA northing 6019003mN (approximate MGA point 648334mE 6019003mN),
- then via grid north to its intersection with the Kosciuszko National Park boundary (approximate MGA point 648334mE 6019094mN),
- then easterly and generally north easterly via the national park boundary, including crossing the road reserve of the Snowy Mountains Highway between approximate MGA points 650008mE 6021972mN and 650020mE 6022043mN and the road reserve of Circuits Trail between approximate MGA points 654897mE 6024348mN and 654923mE 6024344mN, to its intersection with the most southerly point of Lot 7001 DP96275 (approximate MGA point 658578mE 6027652mN),
- then north westerly via the south western boundary of Lot 7001 to its intersection with the Kosciuszko National Park boundary (approximate MGA point 656184mE 6030089mN),
- then northerly via the national park boundary to its intersection with the most westerly point of Lot 45 DP756692 (approximate MGA point 656412mE 6037856mN),
- then north easterly and northerly via the western boundary of Lot 45 and northerly via the northern alignment of the western boundary of Lot 45 to its intersection with the southern bank of the Murrumbidgee River (approximate MGA point 657263mE 6039107mN),
- then generally westerly and northerly via the southern and western bank of the river to its intersection with MGA northing 6040179mN (approximate MGA point 655969mE 6040179mN),
- then easterly directly to a corner on the boundary of the Kosciuszko National Park at approximate MGA point 656107mE 6040145mN,
- then easterly via the national park boundary to its intersection with the northern boundary of Lot 70 DP751837 (approximate MGA point 656591mE 6040100mN),
- then north easterly and south easterly via the northern boundary of Lot 70 to its intersection with the Kosciuszko National Park boundary (approximate MGA point 659022mE 6040362mN),
- then north easterly and northerly via the national park boundary to its intersection with the Australian Capital Territory (ACT) border (approximate MGA point 664343mE 6045681mN),
- then westerly and generally northerly via the ACT border to its intersection with the Snowy Mountains Authority Proclaimed Boundary (SMAPB) (approximate MGA point 661210mE 6055296mN),

- then westerly, southerly and generally north westerly via the SMAPB to its intersection with MGA easting 614628mE (approximate MGA point 614628mE 6084904mN),
- then via grid west to its intersection with the western bank of the Tumut River (approximate MGA point 614397mE 6084904mN),
- then south westerly and southerly via the western bank of the river, and including the Blowering Power Station and water channel connecting the station to the Tumut River, to its intersection with the northern alignment of the eastern side of the Blowering Dam Spillway (approximate MGA point 613575mE 6081962mN),
- then southerly via that alignment and southerly via the eastern side of the spillway to its intersection with the FSL of the eastern shoreline of the Blowering Reservoir (approximate MGA point 613715mE 6081643mN),
- then generally southerly via the FSL of the eastern shoreline to its intersection with MGA easting 618243mE (approximate MGA point 618243mE 6063993mN),
- then southerly directly to MGA point 618279mE 6063666mN,
- then southerly directly to the top of the southern end of the Jounama Pondage dam wall (approximate MGA point 618325mE 6063462mN),
- then via grid east to its intersection with the FSL of the western shoreline of the Jounama Pondage (approximate MGA point 618398mE 6063462mN),
- then generally southerly via the FSL of the western shoreline to its intersection with the north western edge of the Tumut 3 Power Station (approximate MGA point 616920mE 6058385mN),
- then south westerly and south easterly around the edge of the power station to its south western corner (approximate MGA point 616927mE 6058354mN),
- then south easterly directly to the top of the western edge of the pressure pipes inlet structure on the headrace channel of the Talbingo Reservoir (approximate MGA point 617180mE 6057945mN),
- then generally southerly via the FSL of the western shoreline of the headrace channel and the Talbingo Reservoir to its intersection with MGA easting 617405mE on the northern boundary of Lot 50 DP1089353 (approximate MGA point 617405mE 6056987mN),
- then westerly and southerly via the northern and western boundaries of Lot 50 to its intersection with the Kosciuszko National Park boundary (approximate MGA point 616867mE 6056262mN),
- then generally westerly, generally southerly and south westerly via the national park boundary to its intersection with a 330kv powerline easement (approximate MGA point 617632mE 6022689mN),
- then south westerly via the powerline easement to its intersection with the Kosciuszko National Park boundary (approximate MGA point 615259mE 6020575mN),
- then easterly, southerly and generally south westerly via the national park boundary to its intersection with MGA easting 604878mE on the middle thread of the Tooma River (approximate MGA point 604878mE 6015855mN),
- then generally westerly via the middle thread of the river to its intersection with the Kosciuszko National Park boundary (approximate MGA point 601721mE 6015711mN),
- then southerly, north westerly and generally southerly via the national park boundary to its intersection with the eastern boundary of Lot 60 DP1197563 (approximate MGA point 598943mE 6001185mN),
- then southerly via the eastern boundary of Lot 60 to its intersection with the Kosciuszko National Park boundary (approximate MGA point 598853mE 6000665mN),
- then southerly, generally easterly and generally southerly via the national park boundary to its intersection with MGA northing 5992526mN (approximate MGA point 602293mE 5992526mN),
- then via grid west to its intersection with the western bank of the Swampy Plain River (approximate MGA point 599074mE 5992526mN),
- then south easterly via the western bank of the Swampy Plain River and the western edge of the Khancoban Pondage spillway, and generally southerly via the FSL of the western shoreline of the Khancoban Pondage and the western bank of the Swampy Plain River to its intersection with MGA northing 5981826mN (approximate MGA point 600912mE 5981826mN),

- then north easterly directly to the corner of the northern and western boundaries of Lot A DP402588 at approximate MGA point 600920mE 5981833mN,
- then north easterly, easterly, southerly and westerly via the northern, eastern and southern boundaries of Lot A and westerly via the western alignment of the southern boundary of Lot A to its intersection with the western bank of the Swampy Plain River (approximate MGA point 600858mE 5981124mN),
- then generally southerly via the western bank of the river to its intersection with MGA northing 5977188mN (approximate MGA point 601074mE 5977188mN),
- then westerly directly to the intersection of the south eastern boundary of Lot 7001 DP94170 with MGA northing 5977226mN (approximate MGA point 599952mE 5977226mN),
- then southerly and westerly via the south eastern and southern boundaries of Lot 7001 and westerly via the southern boundary of Lot 13 DP755862 to the commencement point.

Note: The national park and land parcel boundaries mentioned in this description were current as at 30/08/2016, and the Snowy Mountains Authority Proclaimed Boundary mentioned in this description was current as at 24/09/2002.

Criterion	**Values**
(a) the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history.	The Snowy Mountains Scheme is an unprecedented civil engineering project stimulated by the will of the post-World War II Commonwealth Government to build a strong Australian economy. The scheme is the most significant project to be undertaken as part of the Post-war Reconstruction program and has become an enduring symbol of Australia's identity as a multicultural, independent, and resourceful country. The Snowy Mountains Scheme was a major impetus in the development of Australia's engineering expertise and industrial relations environment in the post-war period. The Scheme resulted in the development of innovative engineering technology and features that have been adopted as standard practices world-wide, such as the use of rock bolting to strengthen tunnel roofs. In the post-World War II period Australia was asked by the United Nations to accept 100,000 displaced Europeans. The Snowy Mountains Scheme was central to this process with over 100,000 people employed from thirty different countries, including approximately 60,000 European Displaced Persons and migrants employed directly by the Snowy Mountains Authority. The vast workforce that was required to build the Snowy Mountains Scheme required new management practices and the mechanisms implemented by Sir William Hudson permanently changed the nature of industrial relations and workplace conditions in Australia. The Scheme was hailed as a model of multicultural co-operation and integration and provided the opportunity for thousands of migrants to start a new life after the impacts of the war. The majority of those who came to build the Scheme stayed, becoming Australian citizens. These so called New Australians, with their energy and enterprise, would change Australia's social and cultural skyline forever. The Snowy Mountains Scheme is a symbol of Australian achievement and is significant to the nation as the most important single development project related to the Commonwealth's post-war reconstruction program and the effort to build a new and strong nation.
(b) the place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.	The Snowy Mountains Scheme is a rare example of an engineering program of enormous complexity and scale. Apart from the sheer scale of the site, the Snowy Mountains Scheme also has rare engineering features, such as underground power stations, very large earth-filled dams, and two examples of pumped storage capacity, using off-peak power to top-up supply reservoirs, which are the only known examples of their type in Australia

(d)	the place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of: (i) a class of Australia's natural or cultural places; or (ii) a class of Australia's natural or cultural environments.	The Snowy Mountains Scheme is an exemplar as a currently operating, intact hydro-electric scheme that is the largest and most complex example of such schemes in Australia. The Scheme is comprised of significant and well maintained components such as dams, power stations, aqueducts and an extensive tunnel system. The Snowy Mountains Scheme retains all the characteristics of a complex hydro-electric and irrigation scheme with a very high degree of integrity. The technology and features that were used to construct the Snowy Mountains Scheme demonstrate the principal characteristics of a dual hydro-electric and irrigation scheme, with each component an excellent and representative example of its particular type.
(f)	the place has outstanding heritage value to the nation because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period.	The Snowy Mountains Scheme is widely regarded as one of the engineering wonders of the world. The Scheme is a major engineering feat that is recognised for its technical excellence and innovation. Because many techniques, including some that were developed specifically for the Scheme, had not been used in Australia before, the project had enormous impact on the development in Australia of surveying, hydrology, electrical and civil engineering and construction techniques
(g)	the place has outstanding heritage value to the nation because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.	The Snowy Mountains Scheme is strongly symbolic for large parts of the Australian community, and is held in special regard, especially by the thousands of former Snowy workers and their families who lived and worked there.
(h)	the place has outstanding heritage value to the nation because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.	The Scheme is significant for the association with Sir William Hudson and Olav Olsen. Hudson, the 'Father of the Snowy', was Commissioner of the Snowy Mountains Authority from 1949-67 and was instrumental in the success of the Scheme as well as the introduction of revolutionary work practices in Australia. Olsen was originally on the Hydro-electric Sub-committee of the Commonwealth-States Technical Committee and was then employed as the Chief Investigating Engineer for the Snowy Mountain Authority. Olsen is credited for the design of many of the innovative practices in engineering that were developed during for the scheme, as well as the general conception of the Snowy Mountains Scheme as a dual irrigation and hydro-electric facility.

Commonwealth of Australia Gazette

No. S237, Friday, 7 November 2008

Published by the Commonwealth of Australia

SPECIAL

Environment Protection and Biodiversity Conservation Act 1999

INCLUSION OF A PLACE IN THE NATIONAL HERITAGE LIST

I, Peter Robert Garrett, Minister for the Environment, Heritage and the Arts having considered, in relation to the place specified in the Schedule of this instrument -

(a) the Australian Heritage Council's assessment whether the place meets any of the National Heritage criteria; and

(b) the comments given to the Council under sections 324JG and 324JH of the *Environment Protection and Biodiversity Conservation Act 1999*; and

being satisfied that the place described in the Schedule has the National Heritage values specified in the Schedule, pursuant to section 324JJ of the *Environment Protection and Biodiversity Conservation Act 1999*, include it in the National Heritage List.

Dated 4/11/2008

[Signed]

Peter Robert Garrett AM
Minister for the Environment,
Heritage and the Arts

Cat. No. S23708
ISSN 1032-2345

SCHEDULE

STATE / TERRITORY
Local Government
Name
Location / Boundary
Criteria / Values

NEW SOUTH WALES
Bombala Shire, Cooma-Monara, Snowy River Shire, Tumburumba, Tumut, Yass Valley

AUSTRALIAN CAPITAL TERRITORY
Australian Capital Territory

VICTORIA
Alpine Shire, East Gippsland Shire, Mansfield Shire, Towong Shire, Wellington Shire

Australian Alps National Parks and Reserves:
About 1,653,180ha, comprising the following national parks and reserves located in the Australian Alps:
Brindabella National Park, about 12050ha, 35km south-south-west of Yass, NSW;
Namadgi National Park, about 105900ha, 35km south-west of Canberra, ACT;
Tidbinbilla Nature Reserve, about 5500ha, 25km south-west of Canberra, ACT;
Bimberi Nature Reserve, about 7100ha, 55km east-south-east of Tumut, NSW;
Scabby Range Nature Reserve, about 3400ha, 25km north of Adaminaby, NSW;
Kosciuszko National Park, about 690000ha, 10km west of Jindabyne, NSW;
Alpine National Park, about 646000ha, 5km south-east of Mount Beauty, VIC;
Snowy River National Park, about 98700ha, 25km north-north-west of Orbost, VIC;
Avon Wilderness Park, about 40000ha, 30km north-north-west of Maffra, VIC.
Mount Buffalo National Park, about 31000ha, Mount Buffalo Road, Mount Buffalo, VIC; and
Baw Baw National Park , about 13530ha, 5km north of Erica, VIC.

Criterion	Values
(a) the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history.	The Australian Alps National Parks and Reserves (AANP) are part of a unique Australian mountainous region. Human interaction with the region has been distinctive in its response to the challenges and opportunities presented by this unique environment. ***Glacial and Periglacial Features*** The assemblage of glacial deposits and features in the AANP includes five alpine lakes, thirteen cirques and associated moraines, ice-grooved and polished pavements and erratic boulders. Periglacial features, both fossil and modern, include block streams, permafrost and solifluction deposits. These features are the material expression of the cold-climate, high-altitude history of the AANP, unique in the low-latitude, low-altitude Australian continent. The glacial and periglacial features contribute uniquely to our understanding of the nature of landscape response to climate during the ice ages of the late Quaternary and into the present and therefore has outstanding heritage value to the nation for its importance in the pattern of Australia's natural history (Percival 1985; Galloway 1989; Yeates 2001a; ISC 2004; AALC 2006).

Fossils

The Mt Howitt fish fossil site demonstrates remarkable fossil species diversity and preserves fish fossils across a wide range of life stages from larvae to mature fish, over tens of millions of years. The site contributes an important narrative about the evolution of fish across a number of different marine and freshwater environments, and the development of features that enabled vertebrates to leave the water to exploit terrestrial environments for the first time. Fossils revealed at the site have outstanding heritage value to the nation for their place in vertebrate evolution during the so-called 'Age of Fish' (Vickers-Rich and Rich 1993; Cook ed. 2007).

Karst

The Yarrangobilly karst area contains an outstanding collection of surface karst features including gorges, arches, blind valleys, springs and pinnacle fields. It also contains several hundred caves including six show caves with many intricate cave decorations, open for public viewing (ISC 2004). Yarrangobilly has yielded valuable information on the long-term dynamics of landscape formation. The thick flowstone sequences in Jersey Cave span half a million years and provide the longest continuous fire history record from a single site in Australia (DEH 2006b). Yarrangobilly has outstanding value to the nation for its features and karst processes evident in the limestone karst landscape.

Biological Heritage

The Alps are one of eleven sites recognised in Australia by the IUCN as a major world centre of plant diversity. During the late Quaternary and into the present, the high-altitude, cold-climate environment has provided refuge for species in an increasingly arid climate. Containing most of the contiguous montane to alpine environments in Australia, the AANP supports a rich and unique assemblage of cold-climate specialist species that have evolved unique physiological characteristics, enabling them to survive in an environment subject to extreme climate variation. Outstandingly rich flora taxa in the AANP include the daisies (Asteraceae), willow-herbs (Onagraceae), starworts and cushion-plants (Caryophyllaceae), southern heaths (*Epacris*), bottlebrushes (*Callistemon*), orchids (*Pterostylis, Prasophyllum* and *Dipodium*) and pimeleas (Thymaelaeaceae). Cold-climate adapted and endemic fauna species include the mountain pygmy-possum (*Burramys parvus*), the alpine she-oak skink (*Cyclodomorphus praealtus*), Snowy Mountains rock skink (*Egernia guthega*), Baw Baw frog (*Philoria frosti*), southern corroboree frog (*Pseudophryne corroboree*), and the northern corroboree frog (*P. pengilleyi*). Species of a great many invertebrate taxa are endemic to the Alps. These include stoneflies, caddisflies, mayflies, grasshoppers, and earthworms. Many display cold-climate adaptations, such as the mountain grasshopper (*Acripeza reticulata*), mountain spotted grasshopper (*Monistria concinna*) and alpine thermocolour grasshopper (*Kosciuscola tristis*). The Bogong moth undertakes regular migration in Australia and an essential part of its lifecycle occurs within the AANP. The AANP is a vital refuge for alpine and sub-alpine flora and fauna species, with a high level of richness and endemism across a wide range of taxa, and therefore has outstanding value to the nation for encompassing a significant and unique component of Australia's biological heritage (Nankin 1983; Costin 1989; Strahan 1995; Good 1995; Boden and Given 1995; WWF and IUCN 1995; Cogger 1996; Crabb 2003 Good 2003; ISC 2004; DSE 2005; AALC 2005; DEC 2006; McDougall & Walsh 2007, ANHAT 2007).

Moth Feasting

The use of an adult insect – the Bogong moth – as the basis for past large-scale annual gatherings of different Aboriginal groups for ceremonies sets the gatherings in the AANP apart from other Aboriginal ceremonial gatherings and has captured the Australian imagination, making it exceptional in Australia (White 2006). Therefore the AANP has outstanding heritage value to the nation because of the importance of Aboriginal social gatherings based on moth feasting in the course, or pattern, of Australia's cultural history.

Transhumant Grazing

The AANP has outstanding heritage value for its association with historic transhumant grazing that commenced in the 1830s. The practice of using alpine high plains to graze stock during the summer months was a significant pastoral activity of the nineteenth and twentieth centuries and was continuously practised for a period of over 150 years; making a considerable contribution to the early pastoral industry of south-east Australia. Transhumant grazing created and sustained a distinctive way of life that is valued as an important part of Australia's pioneering history and culture. Evidence of transhumant grazing includes huts, the former grazing landscapes, stock yards, and stock routes.

Scientific Research

The AANP has outstanding heritage value for the scientific research that has taken place since the 1830s, demonstrated by the density and continuity of scientific endeavour. Research sites within the AANP include those relating to botanical surveys, soil conservation exclosures, karst research, fauna research, meteorology, fire ecology plots, arboreta and glacial research sites. Space tracking undertaken in the ACT with Honeysuckle Creek Tracking Station having played a significant role in the Apollo 11 moon landing mission.

Water Harvesting

Water harvesting in the AANP has outstanding heritage value to the nation for its contribution to the social and economic development of Australia. Water harvested from headwaters in the AANP contributes to the water needs of Canberra and Melbourne. The Snowy Mountains Hydro-electric Scheme and the Kiewa Valley Hydro-electric Scheme also contributes to the electricity needs of south-eastern Australia. Both schemes were major post-war reconstruction projects, encouraging migration to Australia and employing over 60,000 displaced persons from post war Europe. Evidence of water harvesting in the AANP for power and irrigation includes the major pondages along with the numerous tunnels, aqueducts, power stations, huts, roads and former settlements, town and work camp sites.

Recreation

The AANP has outstanding heritage value for the longevity and diversity of its recreational use. Snow sports commenced in Kiandra in 1861 with the establishment of the Kiandra Snowshoe Club and expanded from an ad hoc activity by enthusiasts to a multi-million dollar snow sport and tourism industry characterised by the groomed ski slopes, ski lift infrastructure and substantial village resorts. The chalets supported by government were major features of the expanding activity and were established in scenic locations in the early twentieth century when mountain retreats were highly regarded for good health. These include the Mount Buffalo Chalet, the Yarrangobilly Caves House Precinct, the Chalet at Charlottes Pass, and the former Hotel Kosciusko and Mount Franklin Chalets.

(b) the place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.

Landscape and Topography
The high altitudes of the plateaus and peaks in the AANP are prominent in a continent with an average elevation of only 330 metres above sea level. The AANP includes most of continental Australia's peaks over 1,700 metres and all of those over 1,900 metres. These high peaks and plateaus contain the vast majority of alpine and sub-alpine environments in Australia. The AANP experiences extensive snow coverage on a seasonal basis, and its glacial lakes are the only wetlands on the Australian mainland covered by ice sheets in winter. The high-altitude landscape of the AANP has outstanding heritage value to the nation for its topographic heights, uncommon alpine and sub-alpine ecosystems and glacial lakes. (AALC 2005; DEC 2006; Geoscience Australia 2007).

Glacial and Periglacial Features
Continental Australia and its southern territorial islands have experienced periods of historic glaciation, with current snow and ice coverage limited to the highest peaks and altitudes. On mainland Australia, the AANP preserves a concentration of glacial and periglacial features without comparison from the ice ages of the late Quaternary Period. The Kosciuszko Plateau is unique in mainland Australia as the only place irrefutably exhibiting landforms shaped by Late Pleistocene glaciers during a series of glacier advances known as the Late Kosciuszko Glaciation. The active and fossil periglacial landforms of the AANP include blockstreams and solifluction features (solifluction is the gradual movement of waterlogged soil down a slope, especially where percolation is prevented by a frozen substrate). They are the most striking and extensive in mainland Australia and demonstrate the widespread effects of cold climate in the Quaternary, mild climate in the Holocene and the absence of intensive Pleistocene ice modification of the elevated landscape of the Victorian and ACT Alps. Therefore the AANP has outstanding heritage value to the nation for containing uncommon glacial and periglacial features (Percival 1985; Yeates 2001; Barrows et al. 2001).

Fossils
The Mt Howitt fish fossil site is globally rare because it preserves a diverse array of fossil fish in uncommon detail at all stages of their lives. It is unique nationally in providing a snapshot of a complete freshwater vertebrate community from the past, and for yielding fossils from all stages of growth of a species, from tiny fish larvae to adult fish, and therefore has outstanding heritage value to the nation because of its preservation of an uncommon aspect of Australia's natural history (Long 2002; Cook ed. 2007).

Alpine and Sub-alpine Ecosystems
The AANP has outstanding heritage significance to the nation for possessing extremely uncommon aspects of Australia's natural history. Alpine and sub-alpine ecosystems are uncommon in the generally arid and warm climate of Australia. The distribution of cold-climate species on the mainland retreated to the higher altitudes of the Alps in the Late Pleistocene as conditions began to warm up. The AANP contains most of the alpine and sub-alpine ecosystems on mainland Australia, supporting flora and fauna species that have evolved to the harsh conditions of the high altitudes. Many of these species are endemic to the Alps and are found nowhere else in Australia. The bog and fen groundwater communities are supported by organic soils and contain exceptional water retention properties. These communities play an integral role in ecosystem function by regulating the slow release of water from saturated peatbeds to the surrounding alpine humus soils, streams and other alpine communities (Good 1995; AALC 2006b).

Eucalypt Flora Community

The AANP provides an outstanding example of the adaptability of a plant genus, the genus Eucalyptus, along a steep topographical transect. The eucalypts dominate the AANP vegetation from the lowlands to as high as the alpine region, where the snow gum (E. pauciflora) defines the treeline. Much of the highest land in Australia occurs within the AANP, which also demonstrates very large topographical variations, which in turn is reflected in the high diversity of eucalypt species replacing each other along the altitudinal and climatic gradient (Costin 1988; Kirkpatrick 1994; ISC 2004; ANHAT 2007).

(d) the place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of: (i) a class of Australia's natural or cultural places; or (ii) a class of Australia's natural or cultural environments.

North-East Kosciuszko Pastoral Landscape

The landscape is outstanding for demonstrating the use of mountain resources, namely the summer grasses and herbfields. As a relict landscape of past grazing leases it conveys the principal characteristics of transhumance and permanent pastoralism in a remote environment, these being large areas of open grassy landscapes between timbered ridges and hills, stockman's huts, homestead complexes, stockyards and stock routes. The grasslands with swathes of pioneer shrubs include the Kiandra landscape, Boggy Plain, Nungar Plain, Gulf Plain, Wild Horse Plain, Tantangara Plain, Dairymans Plain, Currango Plain, Long Plain, Cooleman Plain, Kellys Plain, Blanket Plain, Peppercorn and Pockets Saddle (KHA 2008). Homestead buildings include Cooinbil and Old Currango and the modest homestead complexes of Currango and Coolamine with additional features including exotic plantings, sheds, barns, and workers' accommodation. Former stock routes, now fire trails, include the Port Philip Fire and Murrays Gap Fire Trails. Located in the former grazing leases are stockman's huts, Bill Jones Hut, Circuits Hut, Gavels Hut, Hains Hut, Hainsworth Hut, Millers Hut, Oldfields Hut, Pedens Hut, Pockets Hut, Townsends Lodge, Gavels Hut, Long Plain Hut, Gooandra Hut, Schofields Hut, and Witzes Hut (KHA 2008), which in their use and re-use of available materials typify a lifestyle and vernacular bush building technology using hand tools. The array of characteristics relate to over a century of alpine grazing.

(e) the place has outstanding heritage value to the nation because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.

The AANP is a powerful, spectacular and distinctive landscape highly valued by the Australian community. The mountain vistas, including distinctive range-upon-range panoramas, snow covered crests, slopes and valleys, alpine streams and rivers, natural and artificial lakes, the snow-clad eucalypts and the high plain grasslands, summer alpine wildflowers, forests and natural sounds evoke strong aesthetic responses. Much of the terrain of the AANP is highly valued for its remoteness, and naturalness, including views to and from the region that capture snow clad ranges and mountain silhouettes against clear skies as well as expansive views of natural landscapes from the high points of the Alps.

The upper Snowy River and Snowy Gorge, Mount Buffalo, the Kosciuszko Main Range, Lake Tali Karng, Dandongadale Falls the peaks and ridges between and including Mt Cobbler, Mt Howitt and the Bluff and other high peaks, ridgelines, granite outcrops and escarpments are examples of dramatic awe-inspiring landscapes. Recreational pursuits in these landscapes are enhanced by aesthetic appreciation of their wild and natural quality.

Snow-covered eucalypts, huts in mountain settings and mountain landscapes are distinctive Australian images captured by numerous artists and photographers. The mountain landscapes have inspired poets, painters, writers, musicians and film makers.

(g) the place has outstanding heritage value to the nation because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.

The Australian Alps have a special association with the Australian community because of their unique landscapes, the possibility of experiencing remoteness and as the only opportunity for broad-scale snow recreation in Australia. The AANP is widely recognised by Australians as the 'high country' and many community groups have a special association with the AANP for social and cultural reasons.

Mount Kosciuszko is an iconic feature for all Australians and visited by over 100,000 people each year. It was named by the explorer Paul Edmund Strzelecki after the Polish freedom fighter, General Tadeusz Kosciuszko, in appreciation of freedom and a free people, an association that is highly valued by Australia's Polish community.

The pioneering history of the high country is valued as an important part of the construction of the Australian identity featuring in myths, legends and literature. The ballad "The Man from Snowy River" epitomises horsemanship undertaken historically in the rugged landscape. The stories, legends and myths of the mountains and mountain lifestyles have been romanticised in books, films, songs, and television series and many such as the Elyne Mitchell's Silver Brumby novels are part of Australia's national identity.

The mountain huts of the AANP constructed for grazing, mining and recreation are valued by communities as a physical expression of the cultural history of the region. They have special associations with many groups, such as mountain cattlemen, skiers and bushwalkers but particularly with huts associations that have been maintaining mountain huts and associated vernacular building skills for over 30 years.

(h) the place has outstanding heritage value to the nation because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.

Baron Ferdinand von Mueller is highly recognised nationally and internationally for his contribution to Australian botany, particularly his extensive and thorough botanical collections of the Australian Alps undertaken in several botanical collecting trips on horseback, each of several weeks' or months' duration (Costin et al. 1979).

Eugen von Guerard was a significant nineteenth century artist producing a prolific record of Australian landscapes. His 1863 painting the "North-east view from the northern top of Mount Kosciusko" is regarded as one of his finest artistically and is in Australia's national collection.

Through his ballad "The Man from Snowy River", Andrew Barton 'Banjo' Paterson captured the imagination of the Australian people, stimulating a passion for the High Country and the way of life associated with the mountains. His iconic ballad has had a lasting influence on Australians.

The writer Elyne Mitchell and poet David Campbell lived near the mountains and their strong association with the place is expressed in much of their nationally important literary works.

For a description of any references quoted above, and more information on each of the places please search the Australian Heritage Database at http://www.environment.gov.au/cgi-bin/ahdb/search.pl using the name of the place.