EIS Volume 1 Chapter 11

# Flora and Fauna

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# 11. Flora and Fauna

This chapter describes the flora and fauna of the Project region and assesses how Project construction and operation will affect ecological values including vegetation communities, flora and fauna habitat, nationally listed threatened and migratory species and species protected under State legislation.

## 11.1. Key Findings

- The Project has used the mitigation hierarchy as a driving principle throughout the route selection process to minimise impacts on flora and fauna.
- ElectraNet has engaged with key stakeholders and responded to feedback and concerns in a proactive manner, including route amendments where practical, to achieve better environmental outcomes.
- Approximately 413 hectares of native vegetation will be cleared along the 205 km alignment during construction (based on upper estimates of 135 ha permanent and 278 ha temporary disturbance). This represents a very small proportion of native vegetation in the region traversed by the Project, and will be offset by achieving a 'Significant Environmental Benefit' in accordance with the *Native Vegetation Act 1991*.
- Clearance of habitat for threatened species will be minimised and is not expected to result in a significant impact to listed flora or fauna species.
- The Project is not expected to impact any listed Threatened Ecological Communities.
- The route has been selected to minimise impacts to conservation areas; vegetation clearance in these areas will be minimised and will not result in significant impact to their conservation value.
- The Project will not impact the ecological character of the Riverland Ramsar site.
- The Project follows existing infrastructure corridors and diverts around key habitat areas and will not significantly increase habitat fragmentation.
- Indirect impacts to vegetation and fauna habitats will be short term and limited in extent.
- Lighting effects at camps and other sites during construction will be short term and localised and will not have a significant impact on any species.
- Noise disturbance will be temporary and localised and will not have a significant impact on any species.
- The incidence of fauna injury or mortality will be localised and short term and will not have a significant impact on any species.
- Low numbers of birds (or bats) are expected to be impacted by collision with transmission line infrastructure, and this is not expected to have a significant impact on any species.
- Project activities and the presence of access tracks are not expected to result in an increase in the existing level of pest species present in the transmission line corridor.
- Project activities and the presence of access tracks are not expected to result in an introduction, increase or spread of weeds above the existing level present.
- Project activities and the presence of access tracks are not expected to result in an introduction or spread of pathogens.
- Uncontrolled fire has the potential for significant impact to native vegetation and fauna. The level of risk associated with fires during construction and operation can be appropriately managed with the implementation of risk treatment and mitigation measures.
- No significant or long-term impacts to listed flora or fauna are expected.

## 11.2. Setting the Context

This section provides information to explain the context within which impact assessment is undertaken. It describes:

- the relevant EIS Guidelines
- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet
- the assessment methodology used to identify baseline environmental values and to undertake impact assessment.

### 11.2.1. EIS Guidelines

The EIS guidelines require assessment of the ecological effects of Project EnergyConnect, both during construction and operation of the transmission line. The State Planning Commission (SPC) acknowledged the ecological importance of the area and the need for the investigations to cover impacts upon:

- the Murray River Basin as it includes large tracts of vegetation and provides important wildlife habitat, including breeding waterbirds
- the Riverland Biosphere Reserve, (which includes Taylorville and Calperum Stations) and contains one of the largest intact stands of old-growth mallee vegetation, and an area listed on the Commonwealth Register of Critical Habitat for the nationally endangered Black-eared Miner
- the Riverland Ramsar site, recognised as a wetland of international importance
- threatened fauna and flora species.

The EIS Guidelines relevant to flora and fauna are provided in Table 11-1.

**Table 11-1: EIS Guidelines addressed in the Flora and Fauna chapter**

| EIS Guidelines and Assessment Requirements | Assessment level | Relevant Section |
|---|---|---|
| **Effect on Conservation Values**<br>*Assessment Requirement 3*: The proposed development traverses a corridor which contains significant and extensive tracts of remnant habitat (including one of the largest stands of old-growth mallee vegetation in Australia) and has high conservation values. It is also within close proximity of the floodplain habitat of the River Murray. | | |
| 3.1: Identify the potential effects and measures to avoid and or mitigate the proposal on the local, regional, state or national conservation status of individual species and vegetation communities during both construction and maintenance (including species listed in the SA *National Parks and Wildlife Act 1972* and the Commonwealth *Environment Protection Biodiversity Conservation Act 1999*). | Critical | 11.4.1<br>11.4.7<br>11.4.8 |
| **Effect on Native Vegetation**<br>*Assessment Requirement 4:* The proposed development traverses significant stands of native vegetation. | | |
| 4.1 Describe the location, extent, condition and significance of native vegetation, including individual species and communities in the proposal's environs. Include reference to areas that have Heritage Agreements under the *Native Vegetation Act 1991*. | Critical | 11.3.1<br>11.3.2<br>11.3.3 |
| 4.2: Describe the location, extent, condition and significance of native vegetation species and communities that may need to be cleared or disturbed during both construction and maintenance. | Critical | 11.3.2<br>11.3.3<br>11.4.1 |
| 4.3: Describe the ability of communities or individual species to recover, regenerate or be rehabilitated during both construction, operation including maintenance. | Critical | 11.4.1<br>11.4.3 |

| EIS Guidelines and Assessment Requirements | Assessment level | Relevant Section |
|---|---|---|
| | | |
| 4.4: Identify the habitat value of native vegetation and the potential for habitat fragmentation during both construction and maintenance (and decommissioning), including a description of the effects of any fragmentation that may occur over the life of the transmission line. | Critical | 11.3.2<br>11.4.2 |
| 4.5: Detail any changes in biological diversity that may result at the interface between the powerline easement and existing vegetation (i.e. the "edge effect") during construction and over the life of the transmission line, including maintenance. | Critical | 11.4.3 |
| 4.6: Outline measures to mitigate effects on native vegetation by addressing the mitigation hierarchy, including any compensatory activities in already degraded areas and use of existing easements. Make reference to guidelines produced by the Native Vegetation Council and outline the effectiveness of any mitigation measures adopted during both construction and maintenance. | Critical | 11.4.1<br>11.4.9 |
| 4.7: Identify the potential impact of fire on native vegetation, and the effects of fire risk management processes during both construction and maintenance. | Critical | 11.4.6<br>11.4.1 |
| **Effect on Native Fauna**<br>*Assessment Requirement 5*: The proposed development traverses habitat that supports significant populations of native fauna | | |
| 5.1: Describe the location, extent, condition and significance of native fauna populations, including individual species and communities in the proposal's environs. | Critical | 11.3.5<br>11.3.6 |
| 5.2: Describe the location, extent, condition and significance of native fauna species and populations that may be affected during both construction and operation. | Critical | 11.3.5<br>11.3.6<br>11.4.4<br>11.4.8 |
| 5.3: Describe the ability of populations or individuals to recover during both construction and operation. | Critical | 11.4.4<br>11.4.8 |
| 5.4: Identify the effect of habitat fragmentation including, if any, the potential for any hybridisation of fauna. | Critical | 11.4.2 |
| 5.5: Detail any changes in biological diversity (i.e. hybridisation) resulting at the interface between the powerline easement and existing habitat (i.e. the "edge effect") during both construction and over the life of the transmission line, including maintenance. | Critical | 11.4.2<br>11.4.3 |
| 5.6: Outline measures to mitigate the effects on native fauna, including any compensatory activities in already degraded areas and use of existing easements. | Critical | 11.4.1 11.4.3<br>11.4.4<br>11.4.9 |
| 5.7: Identify the potential impact of fire on native fauna, and the effects of fire risk management processes during both construction and maintenance. | Critical | 11.4.6<br>11.4.1 |
| **Hazard Risk**<br>*Assessment Requirement 10*: The construction and operation of a high voltage powerline involves a range general and specific risks. | | |
| 10.8: Describe the likelihood of bird strike and the management of such a hazard. | Medium | 11.4.4 |
| **Effect on the Physical Environment**<br>*Assessment requirement 12:* The proposed development has the potential to disturb landforms and soils and to affect stormwater run-off | | |
| 12.2: Identify any risks and implications of causing or exacerbating land degradation, especially soil erosion and the impacts of dust emissions during construction and ongoing maintenance | Medium | 11.4.3 |
| **Introduction / spread of exotic plant and animal species**<br>*Assessment Requirement 13:* The proposed development has the potential to establish a corridor for the spread of introduced or nuisance plants and animals | | |

| EIS Guidelines and Assessment Requirements | Assessment level | Relevant Section |
|---|---|---|
| 13.1: Describe the extent and significance of existing exotic plant and animal species, and diseases in the proposal's environs. | Medium | 11.3.7<br>11.3.8 |
| 13.2: Identify the potential for the introduction or dispersal of new exotic plant and animal species, and the associated implications for native species, habitat and agricultural land. | Medium | 11.4.5 |
| 13.3: Identify the potential for increased distribution and abundance of existing exotic plant and animal species, and the associated implications for native species, habitat and agricultural land. | Medium | 11.4.5 |
| 13.4: Identify any risk of spread of disease (such as Phytophthora and Mundulla Yellows), and the implications of this spread. | Medium | 11.4.5 |
| 13.5: Outline mitigation measures and their effectiveness in reducing or avoiding the introduction or spread of exotic plant / animal species and diseases (e.g. decontamination of plant, equipment and materials), having regard to the effectiveness of such mitigation measures in the past. | Medium | 11.4.5 |
| **Construction, Operation and Maintenance Effects**<br>*Assessment requirement 15*: The construction and operation of the proposal would require a range of impacts to be minimised, mitigated and monitored through an environmental management plan framework | | |
| 15.1: Describe construction techniques and the timing of construction, with reference to any climatic and temporal implications for the biophysical environment. This should include reference to potential land degradation, pollution and implications for the breeding seasons of native species. | Standard | 11.4.3<br>11.4.4<br>11.4.8 |
| **Planning and Environmental Legislation and Policies**<br>*Assessment requirement 16*: A range of planning, environmental and energy related statutory requirements would need to be met for the construction and operation of the proposed development. | | |
| 16.3**:** Outline any other Commonwealth or State Government initiatives that may relate to the proposed transmission line, including greenhouse issues, principles of ecologically sustainable development, power generation, and the conservation or protection of the biological environment. Describe the proposal in terms of its consistency with these initiatives. | Standard | 11.2.2 |

Aspects of assessment requirements identified in Table 11-1 above which are not addressed in this chapter are listed in Table 11-2 together with the applicable chapter.

**Table 11-2: Aspects of assessment requirements addressed in other chapters**

| Assessment Requirement | Chapter |
|---|---|
| 12.2 Impacts of soil erosion and dust emissions during construction | Chapter 10 Physical Environment |
| 12.2 Impacts of dust emissions during construction and ongoing maintenance | Chapter 14 Air Quality |
| 13.2 Implications for agricultural land of introduction of exotic plant and animal species | Chapter 9 Land Use and Tenure |
| 15.1 Description of construction techniques and timing | Chapter 7 Project Description |
| 15.1 Potential land degradation and pollution | Chapter 10 Physical Environment |
| 16.3 Commonwealth or State Government initiatives that may relate to the proposed transmission line including power generation. | Chapter 2 Project Justification<br>Chapter 5 Legislative and Planning Framework |

### 11.2.2. Requirements in legislation and other standards

Threatened flora and fauna species and some vegetation communities (as indicated by legislatively established Conservation Status) within South Australia are protected both at the Commonwealth and State levels. Additionally, native vegetation is afforded legislative protection at a State level and some birds which are migratory or inhabit or utilise terrestrial and wetland environments are also afforded legislative protection under Commonwealth legislation that gives effect to international treaties. The applicable legislation relating to flora and fauna within South Australia is as follows:

### Commonwealth legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas. Under the environmental provisions of the EPBC Act, actions that are likely to have a 'significant impact' on a matter of national environmental significance require assessment and approval by the Commonwealth Environment Minister. There are nine matters of national environmental significance identified under the EPBC Act; of relevance to the Project are:

- wetlands of international importance (listed under Ramsar Convention)
- listed threatened species and ecological communities
- migratory species listed under international agreements.

ElectraNet submitted an EPBC Act referral for the Project in June 2019, and it was declared to be a 'controlled action' and therefore subject to assessment under the EPBC Act. The relevant matter of national environmental significance identified for the controlled action was 'Listed threatened species and communities. The Project will be assessed under the provisions of the Bilateral Agreement between the South Australian and Commonwealth governments, prior to the Commonwealth Minister making make a (separate) decision whether or not to approve the proposed action under Part 9 of the EPBC Act.

Significant impact guidelines published under the EPBC Act (DoE 2013) have been used in the assessment of impacts on threatened species and communities listed under the EPBC Act.

### South Australian Legislation

The *National Parks and Wildlife Act 1972* (Schedules 7, 8 and 9 of the Act) (NPW Act) provides for the protection of habitat and wildlife through the establishment of parks and reserves and provides for the use of wildlife through a system of permits allowing certain actions, i.e. keeping, selling, trading, harvesting, farming, hunting and the destruction of native species. This Act also assigns species to State conservation categories Endangered (Schedule 7), Vulnerable (Schedule 8) and Rare (Schedule 9).

The *Native Vegetation Act 1991* and associated *Native Vegetation Regulations 2017* outlines the controls related to the clearance of native vegetation within South Australia and provides incentives, education measures, and assistance to landowners and proponents in relation to the preservation and enhancement of native vegetation. It provides for Vegetation Heritage Agreements between the State and landowners.

Approval is required under the Act to clear native vegetation unless the clearing activity meets circumstances prescribed under the Regulations. Under Regulations 12 and 13, vegetation clearance for major developments that are approved under an EIS (that was referred to the Native Vegetation Council (NVC) for comment) is permitted, provided that it is undertaken in accordance with the development consent and an approved management plan (or a payment into the Native Vegetation Fund) which results in a significant environmental benefit (SEB). A number of guidelines and policies have been approved by the NVC under the Native Vegetation Act (NVC 2020a,b,c,d) which set out methods for vegetation assessment and calculation of a SEB. These have been used in this chapter and supporting appendices.

The *Landscape South Australia Act 2019* provides for the protection and management of the State's natural resources, including provisions relating to land management, water resource management and pest plant and animal control. Regional landscape plans and control policies are in force under the Act to guide management of water, soil and biological assets and define water affecting activities which require a permit. The western 20 km of the transmission line corridor is in the Northern and Yorke landscape management region, and the remainder is in the Murraylands and Riverland landscape management region.

The Act further legislates control requirements for 'declared' plants (specific to each region or statewide), which controls the movement of declared plants, requires landowners / managers to destroy or control infestations of certain declared plants and requires further notification of authorities when an infestation of certain declared plants is detected. A permit or notification to the relevant Landscape Board representative may be required if movement or relocation of cleared vegetation containing declared plants will be undertaken (as per sections 186 and 197 of the Act).

For further detail about the application of these Acts, refer to Chapter 5 Legislative and Planning Framework.

### 11.2.3. Views of stakeholders

ElectraNet has engaged with key stakeholders and responded to feedback and concerns in a proactive manner, including route amendments where practical, to achieve better environmental outcomes.

Consultation undertaken for the Project has highlighted concerns regarding the potential for impact to threatened mallee bird species that occur in the extensive tracts of old growth mallee on Calperum, Taylorville and Hawks Nest stations. Consultation with DEW, Australian Landscape Trust (ALT), Birdlife Australia and other key stakeholders, along with ecological surveys, has resulted in significant modification of the alignment on Calperum and Hawks Nest stations to divert southwards around areas of higher quality habitat for threatened mallee birds.

Details of stakeholder consultation are set out further in Chapter 6 Stakeholder Engagement.

### 11.2.4. Assessment method

The ecological study of the transmission line corridor involved a staged assessment of alignment options along the approximately 205 km between Robertstown substation and the border of SA and NSW. Assessment of ecological values included both desktop studies, and in-field surveys during Spring 2018, Autumn 2019, Summer 2019 and Summer 2021. Some elements of the assessment were undertaken before the final route was established to inform the route selection process and minimise potential impacts.

Sites assessed in-field (representative vegetation patches within or intersected by the transmission line corridor, including those assessed on superseded alignment options) were given a unique numerical identifier and captured in a geographic information system (GIS) data layer for future analysis. Ecological studies involved both desktop review of flora and fauna records, as well as field survey (Bushland Assessment Method, as per the Native Vegetation Council native vegetation clearance assessment requirements) to determine vegetation type and habitat condition. The results of the studies were used to inform the alignment route selection process, to determine habitat conditions and therefore appropriate significant environmental benefit (SEB) offset requirements for inclusion into native vegetation clearance applications, and to assess the potential for conservation significant flora and fauna to be present. The data was used to determine likely and potential impacts to ecological values as a result of the Project, and to develop mitigation measures to reduce ecological impacts. Brief details on these methods are provided below.

The following study focus areas were used during the ecological assessment:

- Ecological study area (ESA) – a 25 km buffer based on the alignment as at January 2021 (i.e. a 50 km wide corridor). Note that the early ecological constraints investigations and the EPBC referral used an ESA centred on the indicative alignment at the time. The alignment has subsequently been refined (as described in Chapter 4 Route Selection) and the ESA used in this EIS is based on the proposed alignment presented in this EIS.

- EPBC Protected Matters search area – a 5 km buffer on the alignment as at January 2021 (10 km wide corridor)
- transmission line corridor – a 500 m buffer on the alignment as at January 2021 (1 km wide corridor).

The proposed alignment was further refined in February 2021 to avoid Aboriginal cultural heritage sites on Hawks Nest Station (see Chapter 4 Route Selection and Chapter 12 Cultural Heritage). This alignment is discussed throughout this chapter where relevant.

### Desktop review

A desktop review was undertaken to describe the existing environment likely to be affected by the proposed alignment. The review took into account the legislative requirements and stakeholder views, and included assessment of publicly available information from the following sources:

- Department of Environment and Water (DEW) NatureMaps (2021a).
- Modelled species distributions in the EPBC Act Protected Matters Search Tool (PMST) – (25 km buffer on the alignment for baseline / constraints studies, i.e. the ESA, noting that a 5 km buffer was used for the EIS (refer Appendix I-1)).
- Historical and recent flora and fauna records from the Biological Database of South Australia (BDBSA 2020, December extract) (approx. 25 km buffer, i.e. the ESA, plus Riverland Biosphere Reserve separate study area) (Initial ESA Recordset number DEWNRBDBSA190902-2, updated 2020 Recordset number DEWNRBDBSA201201-1).
- Historical and recent flora and fauna records from the Atlas of Living Australia (ALA), where relevant and additional information was required.
- Regional spatial information (e.g. DEW State vegetation mapping, IBRA regions, DEW vegetation remnancy statistics, conservations reserves and parks locations and aerial imagery) (DEW 2021a).
- Relevant literature (refer reference lists in Appendices and Chapter 22).
- General distribution ecology texts (refer Chapter 22).
- Species specific government fact sheets (e.g. Species profiles from the Species Profiles and Threats Database (SPRAT) Department of Agriculture Water and the Environment (DAWE 2020c).
- Review of the SNI Environmental Impact Statement (EIS) (SKM 2002) and relevant working papers (e.g. Carpenter 2002).
- Published biodiversity information for the region (e.g. Bush Condition Monitoring Manual Croft, Milne and Pedler (2009), Ramsar Ecological Character Description (ECD) (Newall, Lloyd, Gell and Walker (2009)).

The EPBC Act PMST identifies protected species that may occur in the area as well as potential pests and weed species, including Weeds of National Significance (WoNS). For the EIS assessment the PMST review incorporated species within a buffer of 5 km from the centreline of the proposed transmission line corridor. Search results are discussed in more detail for a broader 25 km buffer (the original ESA) in a preliminary constraints report (which has informed reporting for the native vegetation clearance application, the EPBC referral and options refinement) and the SA EPBC Significant Impact Assessment Report (Jacobs 2019), Threatened Mallee Birds Assessment (Appendix I-4) and the Review of Potential Impacts to Wetland Birds Review (Appendix I-5) and results are summarised below in Section 11.3.

Searches of the BDBSA incorporated the entire initial alignment with buffers of approximately 25 km (the ESA) from the centreline of the initial alignment and were also reviewed specifically for the current transmission line corridor. Search results are summarised below in Section 11.3. Reference to regional records within wider search areas are made where there is a paucity of information for a particular species (e.g. Black-eared Miner).

### Likelihood of occurrence assessment

As mentioned above, in order to assess impacts to conservation significant species, initial desktop assessments, supported by field assessments were conducted to determine the actual likelihood of threatened or migratory species occurring in the ESA and ultimately the transmission line corridor to determine risk of impact and mitigation strategies.

Flora and fauna identified as potentially occurring via desktop assessments were assessed further to determine their likelihood to occur within the transmission line corridor. The likelihood of occurrence criteria were defined as:

- Present – recorded within the transmission line corridor since 1995 during Department of Environment and Heritage (DEH) Biological Surveys (to align with NVC Bushland Assessment Methodology, NVC 2020b).
- Likely – based on the presence of suitable habitat, multiple recent database records from the transmission line corridor or immediate proximity to the transmission line corridor boundary since 1995[1].
- Possible – suitable habitat for the species is present within the transmission line corridor or immediate proximity, but no or very limited recent (since 1995) database record(s) exist within the transmission line corridor or adjacent environments.
- Unlikely – there is a lack of suitable habitat within the transmission line corridor for the species (or community) and / or a lack of proximate historic (pre 1995) records which indicate previous or current occurrence.

These criteria were also used in more detailed assessments presented in this chapter (using desktop and field data) and in a review of wetland birds of the adjacent Riverland Ramsar site and their potential for bird strike (Jacobs 2021, Appendix I-5). The detailed assessments considered the likelihood of occurrence of EPBC listed and migratory species, followed by the likelihood of any impacts being significant to species that were present, likely or considered to possibly occur, in accordance with EPBC Act significant impact guidelines (DoE 2013). The avifauna review considered the likelihood of occurrence of wetland species and potential for bird collision with the transmission line based on various features (e.g. body size, wing span, flight type).

### Field survey

#### *Vegetation and habitat assessments*

Field surveys were undertaken within the ESA by Jacobs in Spring 2018, Winter and Spring 2019, and Summer 2021 as the alignment was being refined. The vegetation field surveys were undertaken to establish the environmental values present, such as vegetation type and condition, threatened ecological communities, threatened or listed flora and fauna species or suitable habitat to support such species.

The vegetation field surveys involved the following tasks:

- The transmission line corridor and adjacent areas (alternate alignment options) were surveyed between 19 – 22 November 2018, 3 – 7 June, 28 – 30 October 2019 and 6 – 8 January 2021.
- Each vegetation type within (or intersected by) the transmission line corridor, including those assessed on previous alignment options (within the ESA), was given a unique numerical identifier and captured in GIS data layer as a polygon for future analysis.

[1] Records since 1995 have been used as this aligns with the Bushland Assessment Method and NVC guidelines (2020a,b,c,d)

- Data was collected using SA Bushland Assessment Method (as per NVC 2020b) and included 94 sites within the transmission line corridor / ESA corridor (and options) (see Figure 11-1) on private land (where approval was provided by the landowners) and within vegetation along publicly accessible road corridors. Broad vegetation characterisation and condition assessment for all accessible patches was undertaken.
- Identification and inspection of potential ‘hot spots’ i.e. habitat for EPBC listed species and NPW Act listed species or Threatened Ecological Communities (e.g. Pygmy Blue-tongue Lizard, Malleefowl, Black-eared Miner, Peppermint Box Grassy Woodland of South Australia, Iron-grass Natural Temperate Grassland of South Australia). Where potentially suitable habitat was located, targeted searches were undertaken (e.g. Pygmy Blue-tongue Lizard, Malleefowl, Black-eared Miner).
- Assignment of ‘condition’ ratings for vegetation patches as a basis for avoiding important areas and determining Significant Environmental Benefit (SEB) offsets (as a requirement of the Native Vegetation Act and Regulations and the SEB Policy and Guide (NVC 2020c,d) and assessing potential regional impact (see below).

#### *Threatened mallee birds assessment*

A field survey and assessment of the potential presence of and impact to threatened mallee birds was undertaken by Nature Advisory in Spring 2019 with a focus on EPBC listed as threatened species (refer Nature Advisory 2021, Appendix I-4). It involved the following tasks:

- Survey of 56 sites within the ESA between 22 – 29 October 2019, of which 44 sites are within the transmission line corridor (12 Hawks Nest Station sites are no longer within the corridor, refer Figure 11-1).
- Targeted Survey of key mallee habitats on foot for five species of interest, including four EPBC listed species (Black-eared Miner, Malleefowl, Red-lored Whistler, Regent Parrot) and one State listed species (Mallee Striated Grasswren) (Nature Advisory 2021, Appendix I-4).
- Surveys include grid and linear transects with observers watching for birds, listening for calls and at the end of each walk using call-playback to elicit responses from the Black-eared Miner, Red-lored Whistler and Striated Grasswren.
- Review of records / distribution / biology for each targeted species and assessment of potential impacts of the Project.

### Impact assessment

The method of impact assessment has followed that set out in Chapter 8: Impact Assessment Methodology.

The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the proposed transmission line and substation.

Where there was uncertainty in the assessment of expected impacts, this was evaluated using risk assessment tools, as discussed in Chapter 8 Impact Assessment Methodology. This is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix O.

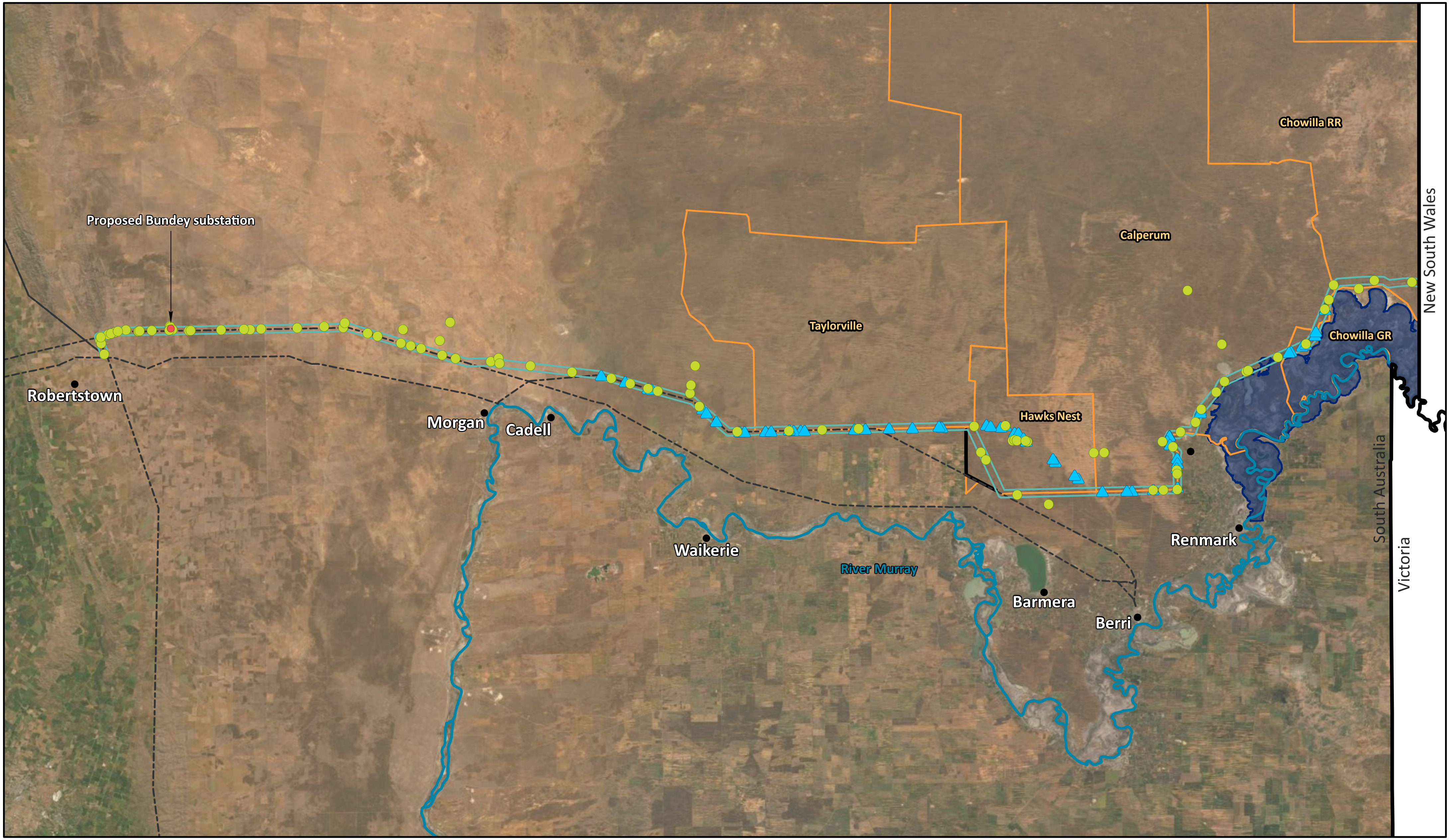





**Figure 11-1**
**Flora and fauna survey sites**

ElectraNet project energy connect JBS&G

## 11.3. Description of the Existing Environment

This section provides a summary of the condition of the existing ecological environment and the key environmental values within and in the region of the transmission line corridor, including matters of national environmental significance under the EPBC Act.

The existing environment is described in terms of the proposed alignment, transmission line corridor and the ESA as described in Section 11.2.4.

### 11.3.1. Regional context

#### Biodiversity and conservation

Remnant vegetation within the proposed alignment varies in condition, with higher value vegetation generally located along the eastern portion of the ESA, primarily within conservation areas (see 11.3.1 below), but also as discrete and isolated patches within cleared or heavily grazed private land towards the western end of the transmission line corridor.

A number of conservation areas occur within the broader ESA, including Conservation Parks and Reserves, Heritage Agreement Areas and National Parks (refer Figure 9-1 and 9-4 in Chapter 9 Land Use and Tenure). These areas are often significant from a landscape perspective in terms of providing habitat for a diverse range of flora and fauna, including threatened and protected species. A summary of conservation areas, proximity to the transmission line corridor and potential ecological constraints is provided in Table 11-3.

The ESA encompasses a number of the conservation parks / reserves that includes contiguous significant habitat that forms a part of the Riverland Biosphere Reserve (formerly the Bookmark Biosphere Reserve), which has a total reserve area of 900,000 ha. A biosphere reserve incorporates one or more protected areas and surrounding lands that are managed to combine both conservation and sustainable use of natural resources. The Riverland Biosphere Reserve is recognised by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) as providing old-growth mallee woodland and shrubland, habitat for the EPBC listed as Endangered Black-eared Miner, as well as wetlands and riverine communities within proximity to the River Murray.

Key properties within the Riverland Biosphere Reserve are listed in Table 11-3, with details relative to the transmission line corridor. The majority of these properties are avoided by the proposed alignment. Where possible, the proposed alignment parallels existing tracks and roads within the greater Riverland Biosphere Reserve including the Taylorville and Calperum southern boundary tracks (and the existing 132 kV transmission line for over half the Taylorville southern boundary), Cooltong Conservation Park (CP) northern boundary track and Wentworth-Renmark Road. These tracks / roads already fragment the landscape and include road reserves either side of the track, existing areas of disturbance (e.g. a long history of introduced herbivore grazing) and weed and pest fauna presence (refer 11.3.6 below). There are a number of other conservation areas within the ESA which also protect native vegetation and support threatened species (summarised in Table 11-3 below in relation to interaction with the transmission line corridor). The majority of these other conservation areas are avoided by the transmission line corridor.

The ESA also encompasses the Riverland Ramsar site, which is listed under the Ramsar Convention as a wetland of international importance. This 30,600 ha site contains the River Murray channel and a series of creeks, channels, lagoons, billabongs, swamps and lakes which are subject to variable regimes of inundation. As discussed in Chapter 10 Physical Environment, the transmission line corridor passes predominantly north of the Riverland site boundary and the River Murray floodplain, on higher ground on the northern side of the Wentworth-Renmark Road. It does not cross any areas that are regularly inundated, and crosses three areas of upper floodplain (totalling approximately 2 km in length) that were flooded in the 1956 flood and could be flooded in extreme flood events.

**Table 11-3: Land managed for conservation within the ESA**

| Area | Location and interaction with transmission line corridor | High level conservation values Identified |
|---|---|---|
| **Riverland Biosphere Reserve** | | |
| Taylorville Station (HA 1543) | Majority avoided by transmission line corridor. Project located along southern boundary (approximately 28 km). | Key properties of the **Riverland Biosphere Reserve**<br>A portion of this area (part of HA 1544) is in the Riverland Ramsar site.<br>Multiple records for EPBC listed fauna (Malleefowl, Regent Parrot, Black-eared Miner, Red-lored Whistler)<br>Provide extensive areas of old growth mallee habitat with a mosaic of fire scar history, which provides optimal habitat for threatened species, in particular Malleefowl. |
| Calperum Station (HA 1544) | Majority of HA avoided, intersects the alignment for approximately 43 km along southern boundary and Wentworth-Renmark Road.<br>Proposed route primarily abuts southern boundary of this station, passes through southern boundaries of HA 1544-A, HA 1544-D northern boundary of HA 1544-E and bisects southern extent of HA 1544-C (where already bisected by existing Wentworth-Renmark road, for 44 km). Proposed alignment is 50 km away from HA1544_B). | |
| Gluepot Reserve (HA 1196) | Avoided by the transmission line corridor.<br>Proposed alignment is 24 km south of boundary of this reserve. | |
| Danggali Wilderness Protection Area | Avoided by the transmission line corridor, proposed alignment is 32 km south of boundary of this reserve. | |
| Cooltong Conservation Park | Transmission line corridor occurs along existing track of northern boundary (Cooltong Boundary Track). Project occurs adjacent Cooltong boundary within Calperum Station. | Key property of the **Riverland Biosphere Reserve**<br>Threatened species records (e.g. Malleefowl, Regent Parrot, and State listed fauna) |
| Chowilla Regional Reserve | Proposed alignment is within and adjacent to the southern boundary of this reserve. Generally parallels existing unsealed road – Wentworth-Renmark Road | Key property of the **Riverland Biosphere Reserve**<br>Multiple records for EPBC-listed Regent Parrot, Southern Bell Frog. Multiple records for and State listed flora and fauna.<br>Includes boundary of the Riverland Ramsar site.<br>Records for EPBC-listed Malleefowl and State listed fauna. |
| Chowilla Game Reserve | Proposed alignment intersects approximately 5 km and 0.8 km of this reserve north of Wentworth-Renmark Road. | |
| Loch Luna Game Reserve | Avoided by the transmission line corridor, proposed alignment is ~5.5 km north of boundary of this reserve | Key property of the **Riverland Biosphere Reserve**<br>Includes boundary of Ramsar Wetland (Banrock Station Wetland Complex) |
| Moorook Game Reserve | Avoided by the transmission line corridor, proposed alignment is 11 km north to north-east of the boundary of this reserve | Part of the **Riverland Biosphere Reserve** |
| Murray River National Park (multiple sites) | Avoided by the transmission line corridor, proposed alignment is ~6.5 km west of the boundary of the northern area of this park (Renmark North) park. | Part of the **Riverland Biosphere Reserve**<br>Includes portion of Riverland Ramsar site<br>Multiple records for EPBC-listed Southern Bell Frog, Regent Parrot and State listed fauna. |

| Area | Location and interaction with transmission line corridor | High level conservation values Identified |
|---|---|---|
| **Other NPW Act Reserves** | | |
| Pooginook CP | Majority of CP avoided by transmission line corridor, northern boundary abuts. Potential use of existing park access tracks during construction (subject to approval). | Multiple records for National and State listed flora and fauna (Malleefowl, Regent Parrot, Red-lored Whistler records and habitat) |
| Hopkins Creek CP, Mimbara CP | Avoided by transmission line corridor (northwest of) | Known to contain EPBC listed / State threatened Hairy Pod Wattle *(Acacia glandulicarpa*). Multiple records for National and State fauna. |
| White Dam CP | Linear CP, the majority of which is avoided by transmission line corridor, but is intersected at both ends for approximately 2.5 km at each end. Alignment parallels existing 132 kV transmission line through the park. | Black Oak low open woodland with Bluebush. Records of State listed fauna. |
| Morgan CP, Hogwash Bend CP, Maize Island Lagoon CP | Avoided by transmission line corridor (south of) | Multiple records for EPBC-listed fauna (Regent Parrot, Southern Bell Frog) and State listed fauna and flora. |
| **Other Heritage Areas** | | |
| HA 448, 1495 and HA 1601 | Majority of HA avoided by transmission line corridor. Proposed alignment abuts northern boundaries. Along the existing Hawks Nest Station and Overland Corner Boundary Track. | Pre 1995 records for Sand Lily. No records for threatened fauna species, but would provide suitable habitat. SA Vegetation layer suggests mallee forest and mallee woodland. |
| HA 1519 (small HA adjacent 1543) | Avoided by the transmission line corridor | Habitat is contiguous with Riverland Biosphere Reserve |
| HA 280, 423 | Majority avoided by transmission line corridor, abuts corridor (south of) | |
| HA 476 | Connects to Taylorville Station, majority avoided by transmission line corridor, abuts corridor (south of) | Smaller HA are more likely to contain threatened flora and provide refuge for threatened fauna, given fragmented nature of remnant vegetation in the region. |
| HA 1386, HA 1337 | Majority avoided by transmission line corridor, abuts corridor (west and south of) | |
| HA 1520, 1294, 958, 727 | Avoided by transmission line corridor (west and north of) | |
| HA 1511 (field site 8) | Majority avoided by transmission line corridor, abuts corridor (south of) | |
| HA 1126, 314, 1340, 1198, 1570, 1120, 266, 1123 | Avoided by transmission line corridor (south of) | |

HA = Vegetation Heritage Agreement Area

### Bioregions

The ESA is located across three bioregions as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) as described in Chapter 10 Physical Environment. The majority of the transmission line corridor is within the Murray-Darling Depression (MDD) bioregion, with less than 5 linear kilometres within the Flinders Lofty Block, approximately 11 km on the boundary of the Riverina and 15 km within the Riverina IBRA bioregions (see Figure 10-4 in Chapter 10).

IBRA subregions further describe the landscape. The western end of the transmission line corridor is in the Broughton subregion, the centre of the transmission line corridor traverses the Braemer, Murray Mallee and South Olary Plain subregions and the eastern end traverses the edge of the Murray Scroll Belt subregion. Further statistics about these subregions are provided in the draft native vegetation clearance data report (Appendix I-6). High level statistics for native vegetation remnancy for IBRA subregions on the transmission line corridor are summarised below (Table 11-4), noting that NatureMaps IBRA association statistics for the majority of the subregions that the Project traverses have not been revised (DEW 2021a). Further detail about the landform, soils and vegetation within each subregion are provided in Chapter 10 Physical Environment.

Broadly, the MDD bioregion is characterised by extensive gently undulating sand and clay plain of Tertiary and Quaternary age frequently overlain by aeolian dunes with vegetation consisting of semi-arid woodlands (Black Oak / Belah, Bullock Bush / Rosewood and Acacia spp.), mallee shrublands and heathlands and savanna woodlands. The region, which extends into Victoria and NSW includes areas of wind eroded and cleared mallee, however substantial areas remain in the west aeolian dunes of South Australia. Some areas also occur in western NSW, but there has been widespread clearing in the north eastern portion of the bioregion (in NSW).

Across the bioregion, habitat fragmentation and degradation are recognised as the key threatening processes for native flora and fauna as a result of the significant clearance of native vegetation which has occurred for agriculture and grazing (DEH 2001). The remnant vegetation within the region is thus considered important for the remaining flora and fauna, particularly nationally and State listed species, but also regionally threatened and common fauna. It is acknowledged that larger blocks of vegetation are more able to withstand impacts, but small blocks are more susceptible to impacts of fragmentation, edge effects, fire, weed and pests and genetic isolation (DEH 2001, Clarke et al. 2010).

**Table 11-4: IBRA regions and subregions on the transmission line corridor**

| IBRA bioregion | IBRA subregion | IBRA subregion area in SA (ha) | Native vegetation remnancy[2] (ha) |
|---|---|---|---|
| Murray-Darling Depression (MDD) | South Olary Plain[1] | 1,219,032 | 1,182,461 (97%) |
| | Braemer[1] | 966,276 | 966,276 (100%) |
| | Murray Mallee | 2,121,127 | 445,437 ha (21%) |
| Flinders Lofty Block (FLB) | Broughton[1] | 1,032,918 | 103,292 (10%) |
| Riverina (RIV) | Murray Scroll Belt[1] | 166,462 | 93,218 (56%) |

[1] Areas not updated to IBRA version 7, as per NatureMaps (DEW 2021a)
[2] Remnancy % from Bushland Score Sheet version 2020, hectares derived from IBRA mapping layer NatureMaps 2020.

## 11.3.2. Native vegetation

### Regional vegetation community types

Whilst the IBRA provides very broad high level vegetation associations for the region, Bushland Condition Monitoring (BCM) Vegetation Communities and Associations (as described by Croft, Pedler and Milne 2009) provide richer descriptions that have been benchmarked and therefore allow more accurate assessment of condition against regional examples. The SA vegetation clearance approval and offsetting process also requires that vegetation is assessed in accordance with these regional benchmarks, which are incorporated into automated data templates (NVC 2020 a,b,c,d).

Broadly, 12 major benchmark vegetation communities are noted to occur across the Murray-Darling Basin area of South Australia (MDBSA) as defined by Croft et al. (2009). These communities are further divided into subgroups based on soil type and depth of sand. Condition characteristics are described for each subgroup and factors that cause natural variance are also taken into account. For example, seasonality, level of rainfall or a particular species presence within a vegetation community. Similar variation occurs for other 'Bush Condition' estimates such as number and threat of weed species per vegetation community in very poor to excellent condition.

### Vegetation community types

Broadly, the native vegetation of the transmission line corridor is comprised of various densities and compositions of Mallee and Chenopod shrubland, Black Oak (*Casuarina pauper*), with a small area of grassland (with emergent saltbush).

Vegetation at 94 Bushland Assessment Method (BAM) sites within the ESA was characterised following four field surveys, of which 71 sites align with the final transmission line corridor. The sites selected were representative of the broad vegetation and habitat types within the original transmission line corridor and immediate surrounds, however some associations are not present in the final transmission line corridor, related to alignment changes (refer Appendix I-2 Vegetation Assessment Summary). Site locations are shown on Figure 11-2 below.

The transmission line corridor and associated vegetation patches are presented in a series of maps in Appendix I-2. Summary information for each patch (e.g. northings and eastings, photos, dominant species and condition information) are also provided in the (Appendix I-2).

Vegetation associations encountered along the transmission line corridor can be broadly grouped in to 7 of the major MDBSA Communities (Croft et al. 2009). The distribution of these communities along the transmission line corridor is shown in Figure 11-2. These communities primarily range from overstorey of Mallee, Black Oak woodlands or Tall shrubland to understorey of Chenopod, sclerophyll shrub or Spinifex (*Triodia*), and are summarised below:

- MDBSA Community 1 – Open woodlands, shrubland and grasslands on low rainfall, limestone plains.
- MDBSA Community 2 – Open mallee and low open woodlands with a chenopod shrub understorey and chenopod open shrublands.
- MDBSA Community 3 – Mallee +/- Native Pine with open sclerophyll and chenopod shrub understorey on calcareous loams of flats or swales.
- MDBSA Community 4 – Mallee with open shrub understorey +/- Spinifex and shrublands on deep red or loamy sands.
- MDBSA Community 9 – Woodlands with an open grassy understorey and grass and matrush sedgelands.
- MDBSA Community 10 – Riparian, freshwater and brackish swamps and floodplain vegetation – River Murray Corridor and Lower Lakes.
- MDBSA Community 11 – Coastal and inland saline swamp and riparian vegetation.

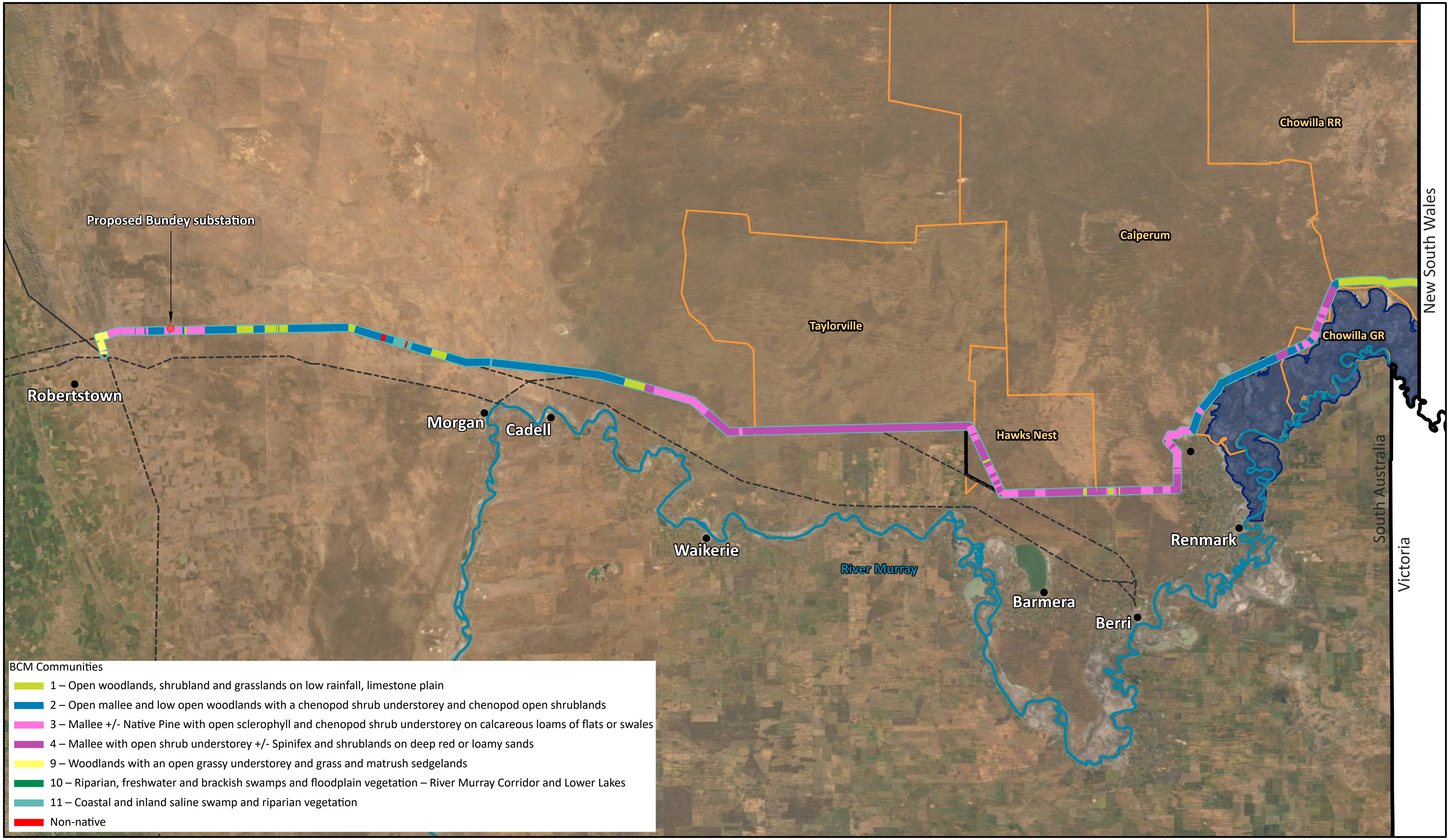
Further details regarding BCM sub-communities and vegetation associations present within the transmission line corridor are summarised in Table 11-5, with further detail for each BAM site provided in Appendix I-2. Detailed mapping of the transmission line corridor has been undertaken using the data collected in field assessments, statewide vegetation mapping and knowledge of the alignment. This mapping is used in the native vegetation clearance data report (Appendix I-6) to determine the required offset for impacts to vegetation.

**Table 11-5: BCM vegetation communities and broad vegetation associations that represent vegetation of the transmission line corridor.**

| BCM community | # of BAM sites in TLC | Summary of vegetation associations within this BCM community recorded within the transmission line corridor | Length (km) / % of TLC |
|---|---|---|---|
| MDBSA 1.1 Open Woodland with arid adapted shrubland on limestone | 4 | Black Oak (*Casuarina pauper*) Low to Open Woodland over chenopod and sclerophyll shrubs or chenopods and mixed tall shrubs<br>Red Mallee (*Eucalyptus oleosa*) Very Open Mallee over mixed shrubs<br>Black Oak / Red Mallee / Yorrell (*E. gracilis*) Open Woodland with open tall shrub understorey | 7.91 km / 3.5% |
| Degraded forms of MDBSA 1.1 | 2 | Spear Grass (*Austrostipa* sp.) Open Grassland with emergent sclerophyll and chenopod shrubs<br>Spear Grass Open Grassland / Black Bluebush (*Maireana pyramidata*) Low Open Shrubland with emergent Black Oak and / or Native Pine (*Callitris* spp.) | 14.04 km / 6.9% |
| MDBSA 1.2 Tall Shrubland with Open Arid adapted Understorey on Limestone Plains | 1 | Desert Senna (*Senna artemisioides ssp. filifolia*) Open Shrubland with emergent Yorrell. | 1.69 km / 0.8% |
| MDBSA 2.1 Open Mallee / Low Open Woodland with Chenopod shrub understorey | 14 | Red Mallee Low Mallee to Open Mallee over mid-dense chenopod shrubland or Pearl Bluebush (*Maireana sedifolia*) shrubland<br>Black Oak Very Low Woodland to Woodland over Black Bluebush Low Open to Open shrubland +/- Pearl Bluebush<br>False Sandalwood (*Myoporum platycarpum*) Very Low Open Woodland over Bluebush shrubland<br>False Sandalwood / Black Oak +/- Red Mallee Open Woodland mosaiced with Bluebush Low Open Shrubland<br>Yorrell / Red Mallee / Gilja (*E. brachycalyx*) Open Mallee over low open shrubs<br>Red Mallee / Yorrell Very Open Mallee over chenopods | 21.22 km / 10.4% |
| MDBSA 2.2 Chenopod Open Shrublands | 13 | Black Bluebush Low Very Open Shrubland (degraded)<br>Black Bluebush Low Open Shrubland to Open Shrubland<br>Bluebush Low Open to Very Open Shrubland or Open Chenopod Shrubland<br>Bluebush Very Open Shrubland with isolated trees/groves of Black Oak<br>Bluebush +/- Spiny Saltbush (*Rhagodia ulicina*) Low Open Shrubland<br>Bluebush) +/- Thorny Lawrencia (*Lawrencia squamata*) +/- Spiny Saltbush Open Shrubland | 45.54 km / 22.3% |
| MDBSA 3.1 Mallee with Very Open Sclerophyll / Chenopod Shrub understorey | 18 | Narrow-leaf Hop-bush (*Dodonaea viscosa ssp. Angustissima*) Very Open Shrubland with emergent Southern Cypress Pine (*Callitris gracilis*)<br>Yorrell Open Mallee over sparse Chenopod and Sclerophyll Shrubland<br>Narrow-leaf Red Mallee (*E. leptophylla*) +/- Gilja over tall Sclerophyll shrubs<br>Red Mallee Very Open Mallee to Mallee over open to very sparse Sclerophyll and Chenopod Shrubland<br>Red Mallee / Yorrell old growth Mallee to Open Mallee over Chenopod and Sclerophyll shrubs<br>Red Mallee Open Mallee over sparse Black Bluebush and Sclerophyll shrubs | 35.64 km / 17.5% |

| BCM community | # of BAM sites in TLC | Summary of vegetation associations within this BCM community recorded within the transmission line corridor | Length (km) / % of TLC |
|---|---|---|---|
| | | Red Mallee Open (old growth) Mallee +/- False Sandalwood over Chenopod and Sclerophyll shrubs<br>Red Mallee Open Mallee over Bitter Saltbush (*Atriplex stipitata*)<br>Red Mallee / Yorrell / Narrow-leaf Red Mallee old growth Mallee Very Open understorey<br>Mallee Box (*E. porosa*) +/- Red Mallee over Desert Senna and Chenopods<br>Beaked Red Mallee (*E.* socialis) / Yorrell Open Mallee over Desert Senna shrubland | |
| Degraded forms of MDBSA 3.1 | 7 | Spear-grass Grassland and / or Short-leaf Bluebush (*Maireana brevifolia*) Low Very Open Shrubland<br>Shrubby Twinleaf (*Roepera aurantiaca*) Low Shrubland +/- Bladder Saltbush (*Atriplex vesicaria*) with emergent shrubs<br>Short-leaf Bluebush / Ruby Saltbush (*Enchylaena tomentosa*) with scattered Mallee Box / Red Mallee<br>Bladder Saltbush Low Very Open Shrubland<br>Short-leaf Bluebush Low Open Shrubland (regrowth in cleared paddock)<br>Spear-grass Grassland (derived) with emergent shrubs including Peep-hill Hopbush (*Dodonaea subglandulifera*), and isolated mallee trees<br>Short-leaf Bluebush Low Open Shrubland +/- patches of Spear-grass | 5.98 km / 2.9% |
| 4.1 MDBSA 4.1 Mallee with open shrub understorey on tall red-sand dunes or deep sand flats | 2 | White Mallee / Ridge-fruited Mallee +/- Yorrell Low Open Mallee over Spinifex Hummock Grassland Dune Tea-tree (*Leptospermum coriaceum*) | 2.43 km / 1.2% |
| MDBSA 4.2 Mallee with understorey dominated by Triodia on moderate / low sand dunes | 19 | White Mallee (*E. dumosa*) Low Mallee to Mallee over Spinifex Hummock Grasslands<br>White Mallee +/- Narrow-leaf Red Mallee (Mallee form) or Beaked Red Mallee (Mallee form) over Spinifex Hummock Grassland<br>Yorrell Open Low Mallee over Spinifex Hummock Grassland.<br>Ridge Fruited-Mallee (*Eucalyptus incrassata*) +/- Narrow-leaf Red Mallee +/- Beaked Red Mallee over Spinifex Hummock Grassland<br>Ridge-fruited Mallee +/- Beaked Red Mallee +/- White Mallee Open Mallee over Spinifex Hummock Grassland<br>Ridge-fruited Mallee over Triodia Hummock Grassland and Dark Turpentine Bush (*Beyeria opaca)*<br>Red Mallee / White Mallee +/- Yorrell Open Mallee over an open understorey of Sclerophyll shrubs and Chenopod or over Spinifex Hummock Grassland | 57.28 km / 28.1% |
| MDBSA 4.3 Shrublands on low & / or isolated red-sand dunes | 3 | Narrow-leaf Hop-Bush Tall Open shrubland +/- Black Bluebush on red sand dune / slope<br>Black Bluebush Low Open Shrubland with emergent Narrow-leaf Hop-Bush | 6.37 km / 3.1% |
| Degraded forms of MDBSA 9.1 Woodlands with an open grassy understorey | 2 | Buckbush *(Salsola australis)* Very Open Herbland with isolated Mallee Box or with emergent Short-leaf Bluebush | 3.57 km / 1.8% |

| BCM community | # of BAM sites in TLC | Summary of vegetation associations within this BCM community recorded within the transmission line corridor | Length (km) / % of TLC |
|---|---|---|---|
| MDBSA 10.8 River Box Woodlands with Saline Tolerant chenopod Understorey | 1 | Blackbox (*E. largiflorens*) / Dryland Tea-tree (*Melaleuca lanceolata*) Low Open Woodland over Black Bluebush Low Open Shrubland (drainage line). | 0.23 km / 0.1% |
| MDBSA 10.11 Low Woodlands / Shrublands of River Terraces / Inland Drainage Lines | 1 | Turpentine Bush (*Eremophila sturtii*) Tall Open Shrubland over Black Bluebush Low Open Shrubland (run on area)<br>Spear-grass Open Grassland with emergent Bladder Saltbush (degraded form) | 0.26 km / 0.1% |
| MDBSA 11.6 semi-saline shrublands of river cliffs, floodplains, depressions and drainage lines | 4 | Australian Boxthorn *(Lycium australe)* Open Shrubland +/- Cottonbush *(Maireana aphylla)* with emergent Spine Bush (*Acacia nyssophylla*) (Possibly derived community)<br>Nitrebush *(Nitraria billardierei)* / Black Bluebush Very Open Shrubland to Nitrebush Low Open Shrubland<br>Australian Boxthorn Shrubland with emergent Black Oak / Bullock Bush (*Alectryon oleifolius)*<br>Black Oak +/- Bullock Bush (*Alectryon oleifolius*) Very Open Woodland over Australian Boxthorn shrubland | 2.5 km / 1.2% |




- Transmission line corridor
- Riverland Ramsar wetland
- Pastoral lease
- Cultural heritage avoidance alignment
- Existing ElectraNet transmission line
- River Murray
- Proposed Bundey substation

0 20
Kilometres

N

**Figure 11-2**
**Vegetation communities on the transmission line corridor**

ElectraNet project energy connect JBS&G

### Vegetation condition

Between Robertstown and Morgan, the transmission line corridor largely traverses open and semi-cleared paddocks, or grazed and drought-impacted low open chenopod shrubland or Black Oak and / or False Sandalwood Open Woodland. Prolonged drought combined with ongoing grazing have resulted in reduced plant species diversity and abundance, particularly in the chenopod dominated associations. Several patches of remnant (old regrowth) low mallee (largely Red Mallee (*Eucalyptus oleosa*)) over chenopod shrubland (including Bluebush (*Maireana sedifolia*), Bladder Saltbush (*Atriplex vesicaria*) and / or Mallee Bluebush (*M. pentatropis*)) are present, particularly at the western end of Powerline Road. A vegetation Heritage Agreement (1511) protects a portion of mallee and chenopod shrubland vegetation near the intersection of the transmission line corridor with Salford Road. The proposed corridor traverses approximately 2.2 km of White Dam Conservation Park, mapped as Bluebush and / or Black Bluebush (*M. pyramidata*) shrubland.

From Morgan to Taylorville Station, the transmission line corridor traverses two broad habitat types: open low chenopod shrubland of Black Bluebush and / or Bluebush or Australian Boxthorn (*Lycium australe*) or Low Open Woodland over a chenopod understorey (with mixed grazing pressure). North-east of Morgan, this community crosses an ecotonal transition into mixed old growth and regrowth mallee communities over sclerophyll and chenopod shrubs and / or Spinifex hummock grassland in extensive tract of low dune country. Historic fires and clearance within this broad dune country have influenced the age and current ecological value of these mallee communities. The transmission line corridor follows the Taylorville southern boundary track, which follows an existing transmission line easement along the northern boundary of Pooginook Conservation Park and continues along the southern boundary of Taylorville Station. In the eastern portion of the transmission line corridor on Taylorville Station, the alignment diverges from the existing 132 kV transmission line easement (where the 132 kV line diverts south-east) to continue east along the Taylorville southern boundary track.

At Hawks Nest Station the transmission line corridor diverts to the south-east through taller open mallee over tall shrubs in swales and sandy loam flats, and smaller mallee over Spinifex on low sandy rises. The proposed alignment (the cultural heritage avoidance alignment) through this area is located further to the west and follows the western boundary of Hawks Nest Station southwards to the existing 132 kV transmission line, which it parallels until it reaches the Overland Corner track. Vegetation along this section is similar to the transmission line corridor, however there is existing disturbance present from tracks, fencelines and the 132 kV line easement and access track.

The proposed alignment then traverses east along the northern boundary of three smaller vegetation Heritage Agreement Areas (448, 1495, 1601), then southern boundary of Calperum station and the northern boundary of Cooltong CP along the ‘Cooltong Track’ through remnant mallee. Much of the mallee along this section is regrowth from bushfires in 2006 and / or 2014.

From the north-east corner of Cooltong Conservation park, the alignment traverses north along the eastern margin of the Riverland Biosphere Reserve (also HA 1544), which is the eastern margin of an extensive tract of mallee, and adjoins a mosaic of native vegetation, exotic pastures and irrigated agriculture to the east.

North-east of Cooltong, the alignment veers east and north-eastwards again, with the vegetation transitioning from mallee to broadly Black Bluebush shrubland on loam flats, and Hopbush shrubland on dunes, as it traverses through Calperum Station. Continuing north-east through Chowilla Game Reserve, Heritage Agreement 1544 and Chowilla Regional Reserve, Black Bluebush shrublands and Hopbush shrublands continue, and additionally, there are patches of old growth mallee, Black Oak Woodland and sparsely treed areas of Native Pine.

Along the length of the alignment, vegetation condition scores ranged from 6 (Very Low) to 67 (High). Vegetation at the western end of the alignment was generally in low condition due to land use (with cleared agricultural paddocks and heavily grazed shrublands subject to prolonged drought), as was vegetation at the far eastern end (due to prolonged drought). Condition scores in the central portion of the proposed alignment were generally high. Vegetation in this central portion was dominated by extensive tracts of mallee, much of which occurs in protected areas such as conservation reserves or heritage agreement areas, and where domestic stock grazing is excluded.

Vegetation condition extent across the transmission line corridor is summarised in Table 11-6 and presented in Figure 11-3 and Plate 11-1 below. Vegetation condition was categorised at an additional 23 sites outside the transmission line corridor, and approximately 40% of these areas that were avoided were categorised as high vegetation condition. It is noted that 30.6% of the corridor is considered to comprise high condition vegetation, 35.5% has medium condition vegetation and the remainder is low to very low condition vegetation.

**Table 11-6: Summary of vegetation condition extent across the transmission line corridor**

| Condition rating[1] | Relative condition score | Number of sites within TLC | Length within TLC (km) | % of TLC |
|---|---|---|---|---|
| Very Low | <20 | 5 | 8.7 | 4.2 |
| Low | 20 – 35 | 15 | 62.4 | 30.4 |
| Medium | 36 – 55 | 32 | 71.1 | 34.7 |
| High | 56+ | 20 | 62.5 | 30.5 |
| | Totals | 72 | 205 | |

[1] Corresponds with bar graph in Electronic BAM Score Sheet for surveys sites (NVC 2020b).

### Vegetation condition examples

**Site 2b: Buckbush very open herbland, very low condition**

**Site 3c: Bladder Saltbush low very open shrubland, regrowth on past cropped land, low condition**

**Site 15a: Red Mallee over Chenopods, medium Condition**

**Site 6c: Black Bluebush shrubland, medium condition**

Site 5c: Black Oak Woodland over Black Bluebush / Bluebush, medium condition

Site 9c: Mallee over Spinifex, medium condition

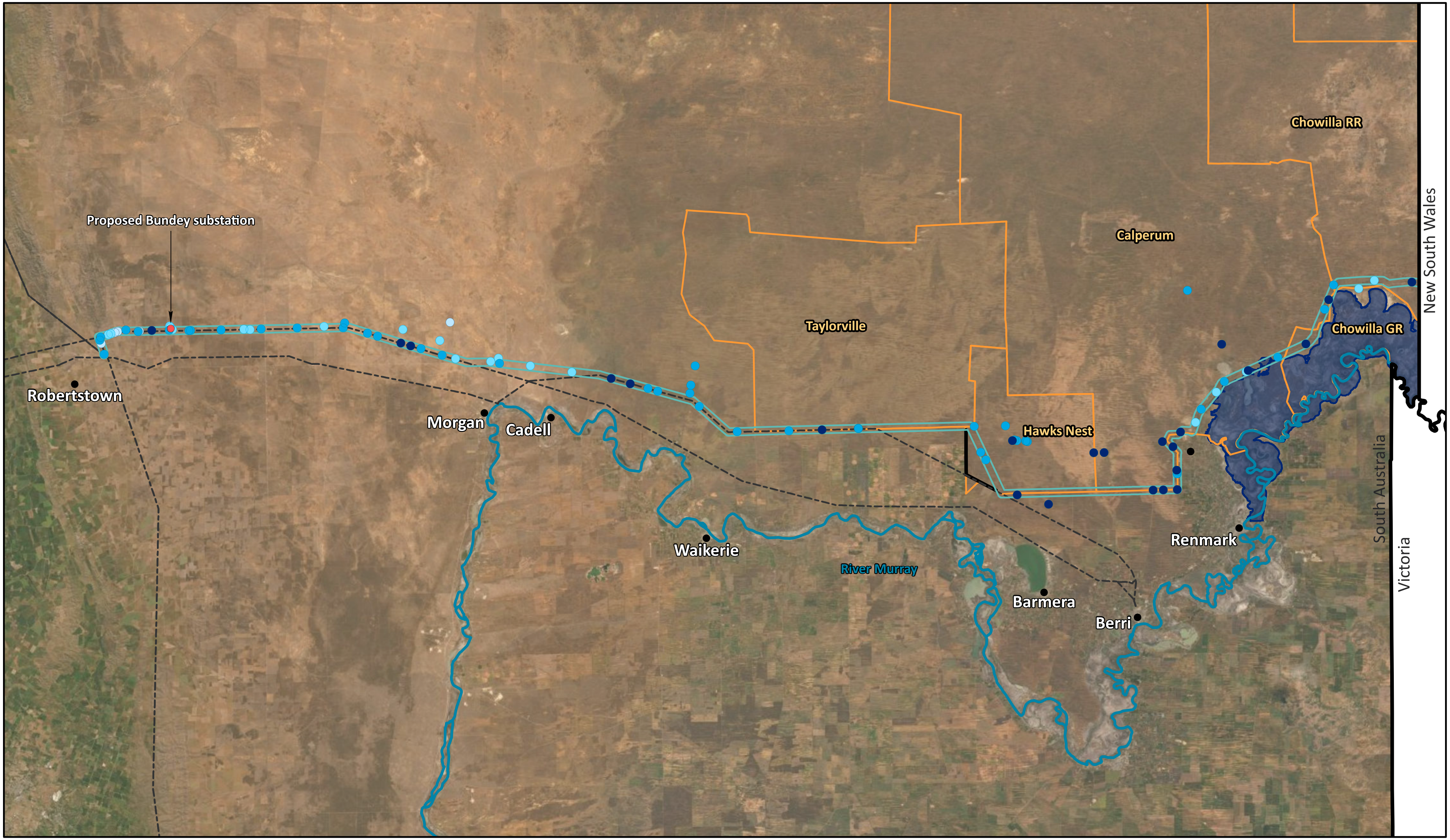
Site 18a: Mallee over Senna and Chenopods, high condition

Site 29c: Mallee over Spinifex post fire regrowth, high condition

Site 7c: Australian Boxthorn / Cottonbush, high condition (excluding bare areas in existing / tracks)

Site 6a: Mallee over chenopod, high condition

**Plate 11-1: Examples of vegetation condition at survey sites along the transmission line corridor**




Transmission line corridor
Riverland Ramsar wetland
Pastoral lease
Cultural heritage avoidance alignment
Existing ElectraNet transmission line
River Murray

Proposed Bundey substation
Vegetation condition category
High
Medium
Low
Very Low

**Figure 11-3**
**Vegetation condition at vegetation survey sites**

0 20
Kilometres

N

ElectraNet project energy connect JBS&G

### Fire history

Within the transmission line corridor, mapped fire history dates from 1972 to 2014. These fires have been mapped for the portion of the alignment traversing mallee vegetation communities, from approximately 10 km north-west of Cooltong to the Riverland Biosphere Reserve, north of Cooltong Conservation Park. All vegetation impacted by fire within the transmission line corridor (overlapping with mapped fire history) has been mapped as mallee vegetation, and the majority of this has been mapped as Mallee over Spinifex (*Triodia* sp.). The most recent fire occurred in 2014, burning an area of 697 ha within the transmission line corridor. This fire was confined to the boundary area between Cooltong CP and the Biosphere Reserve, and the southern boundary area of Hawks Nest Station. Areas that were subject to this fire correspond to vegetation survey sites with high condition scores, reflective of effective regeneration in the short duration since the fire.

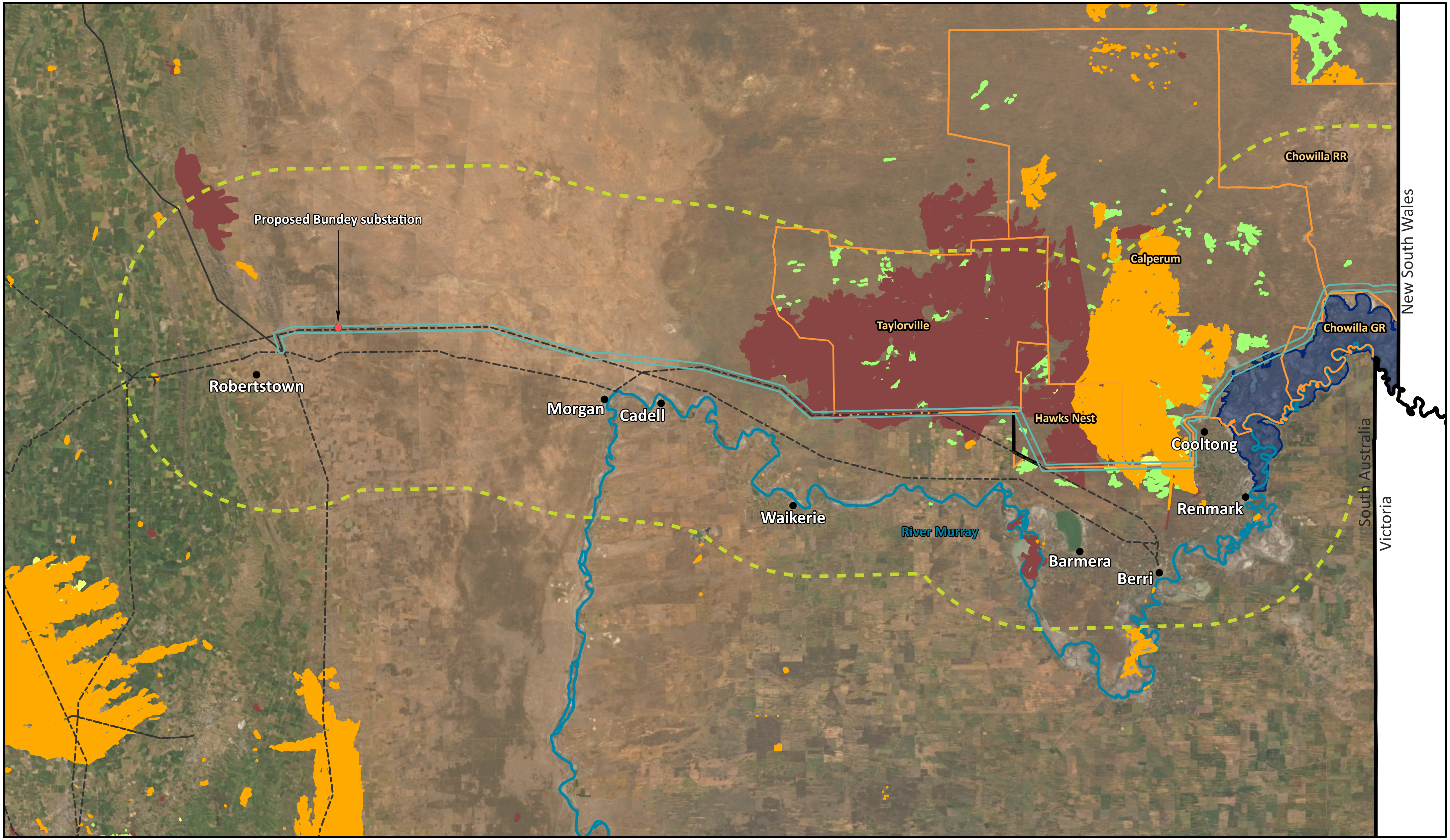
The 2006 fire covered almost 3,000 ha of the 4,670 burnt within the alignment. Within the transmission line corridor, this fire burnt discontinuously from about 10 km NW of Pooginook, along the northern boundary of Pooginook CP, southern boundary of Riverland Biosphere Reserve, and parts of the southern boundary of Hawks Nest Station. All areas burnt in this section of the transmission line corridor are also mapped as Mallee over Spinifex. These areas are also reflected by BAM (vegetation) survey sites which reported high condition scores. The relatively high condition scores for these sections of the alignment suggest that the mallee overstorey and understorey vegetation in areas affected by fire has regenerated well following the 2006 fire, with Spinifex forming a prominent groundcover.

Areas with fires pre-dating 2006 mapped within the alignment have largely been re-burnt in either 2006 or 2014, or the fires are old enough that evidence of the fire impact is not expected in the vegetation condition assessments or account for in DEW fire history data. Further detail on the fire history of vegetation within the transmission line corridor is provided in Appendix I-2 (Vegetation Assessment Summary). Years of fires and hectares burnt within the transmission line corridor are summarised in Table 11-7 below and shown in Figure 11-4.

**Table 11-7: Fire history of vegetation within the transmission line corridor**

| Year of fire | Broad habitat type[1] | Hectares burnt within TLC |
|---|---|---|
| 1972 | Predominantly Mallee over Spinifex | 450 |
| 1975 | Mallee over Spinifex | 23 |
| 1977 | Mallee over Spinifex | 9 |
| 1978 | Old growth mallee over open sclerophyll and chenopod shrub understorey | 213 |
| 1997 | Mallee over Spinifex | 152 |
| 2004 | Mallee over Spinifex | 130 |
| 2006 | Mallee over Spinifex | 2975 |
| 2010 | Old growth mallee over open sclerophyll and chenopod shrub understorey | 23 |
| 2014 | Mallee over Spinifex / Post-fire regrowth mallee over sclerophyll and chenopod shrub understorey | 697 |
| Total | | 4672 |

[1] High level estimate aligning with mapping summary in Section 11.3.4




Transmission line corridor
Ecology study area (50 km)
Riverland Ramsar wetland
Pastoral lease
Cultural heritage avoidance alignment
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Most recent fire
< 1995
1995 - 2000
2000 - 2010
2010 - 2021

**Figure 11-4**
**Fire history of the transmission line corridor and surrounds**

0 20
Kilometres
N

ElectraNet
project energy connect
JBS&G

### Flora species

Over 700 flora species have been recorded in the ESA, including several species of conservation significance which are discussed further in 11.3.3 below. Over 130 flora species have records within the transmission line corridor, including 22 exotic species of which three are declared weeds (BDBSA 2020, refer Section 11.3.7 below). Of these 130 species, one is the EPBC listed Peep-Hill Hopbush (*Dodonaea subglandulifera*) and has State and regional ratings, one only has State rating Creeping Boobialla (*Myoporum parvifolium*), and 86 have regional ratings (refer Regional flora below). Appendix I-2 provides a summary of relevant database records.

Over 165 flora species were recorded in field assessments for the EIS study, of these 154 were at BAM sites in the transmission line corridor. Fifty-four of the species were only recorded from one site. The most common native species recorded at BAM sites are provided in Table 11-8. The only threatened flora species that were recorded within the transmission line corridor was Peep-hill Hopbush. In addition, Wilga (*Geijera parviflora*), a State listed Rare species, was recorded at two sites within the ESA in mallee areas avoided by the Project (e.g. west of Taylorville Station, north of the transmission line corridor). Refer Appendix K3 for further detail.

**Table 11-8: Summary of most common flora species recorded within the transmission line corridor**

| Scientific name | Common name | No. of BAM sites from which species was recorded within the TLC |
|---|---|---|
| *Enchylaena tomentosa var. tomentosa* | Ruby Saltbush | 36 |
| *Eucalyptus oleosa ssp.* | Red Mallee | 25 |
| *Maireana sedifolia* | Bluebush | 27 |
| *Atriplex stipitata* | Bitter Saltbush | 26 |
| *Maireana pentatropis* | Erect Mallee Bluebush | 26 |
| *Maireana pyramidata* | Black Bluebush | 26 |
| *Austrostipa sp.* | Spear-grass | 24 |
| *Myoporum platycarpum ssp.* | False Sandalwood | 23 |
| *Maireana brevifolia* | Short-leaf Bluebush | 18 |
| *Alectryon oleifolius ssp. canescens* | Bullock Bush | 19 |
| *Sclerolaena patenticuspis* | Spear-fruit Bindyi | 19 |
| *Rhagodia ulicina* | Intricate Saltbush | 18 |
| *Acacia nyssophylla* | Spine Bush | 17 |
| *Dodonaea viscosa* ssp. *angustissima* | Narrow-leaf Hop-bush | 16 |
| *Rhagodia spinescens* | Spiny Saltbush | 16 |
| *Sclerolaena obliquicuspis* | Oblique-spined Bindy | 16 |

## 11.3.3. Conservation significant flora

### EPBC listed threatened ecological communities

No threatened ecological communities have been located during any of the four flora surveys within the wider ESA or the transmission line corridor (refer Appendix I-2).

Desktop assessments highlighted the potential for three EPBC listed threatened ecological communities to occur within the ESA, based on EPBC PMST outputs. A search of the BDBSA indicated that one of these threatened ecological communities did not occur within the ESA and is not relevant to the Project: Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions. The location, extent and condition of the other two threatened ecological communities within the ESA is discussed below.

***Iron-grass Natural Temperate Grassland of South Australia ecological community (EPBC Critically Endangered)***

This threatened ecological community is assumed to not be present within the transmission line corridor.

Iron-grass (*Lomandra* spp.) Natural Temperate Grassland) is mapped as potentially occurring within the far western end of the ESA, with the majority of the threatened ecological community extent (over 17,000 ha) occurring approximately 20 km or more north of the western end of the transmission line corridor.

The areas mapped as potentially comprising this threatened ecological community are generally based on interpretation of aerial photography taken in the 1990s (only six areas have a floristic survey site within them) and they are mapped at a minimum scale of 1:40 000. Mapping of this threatened ecological community within the transmission line corridor and the broader ESA is therefore considered to have low resolution and may contain errors. There are two very small patches (3.5 and 5 ha) of the threatened ecological community mapped as occurring within the transmission line corridor at the western end (refer Figure 11-5). Results of aerial imagery interpretation suggest some of these areas are cropped and have been mapped incorrectly as a threatened ecological community. There are however other unploughed areas of limited extent rolling hills habitat where *Lomandra* grasslands is considered possible within the western end of the transmission line corridor.

Given the possibility that the threatened ecological community may occur at the very western end of the proposed alignment, field surveys undertaken in the transmission line corridor and surrounds in this area targeted potential occurrences of this threatened ecological community. This threatened ecological community was not located.

***Peppermint Box (*Eucalyptus odorata*) Grassy Woodland (EPBC Critically Endangered)***

This threatened ecological community is assumed to not be present within the transmission line corridor.

Peppermint Box Grassy Woodland is mapped as potentially occurring towards the far western end of the ESA, with the majority of the threatened ecological community extent occurring north-west to south-west of the western end of the ESA.

The areas that are mapped as potentially comprising the threatened ecological community have been mapped with relatively high confidence. No areas of the threatened ecological community are mapped as occurring within the transmission line corridor (refer Figure 11-5). Whilst there are records for Peppermint Box (*Eucalyptus odorata)* within the ESA, the records are within chenopod habitat rather than grassy habitat that is representative of the threatened ecological community (DEWHA 2008b).

No areas of this threatened ecological community have been observed during any of the four flora surveys within the wider ESA, or the transmission line corridor (refer Appendix I-2).

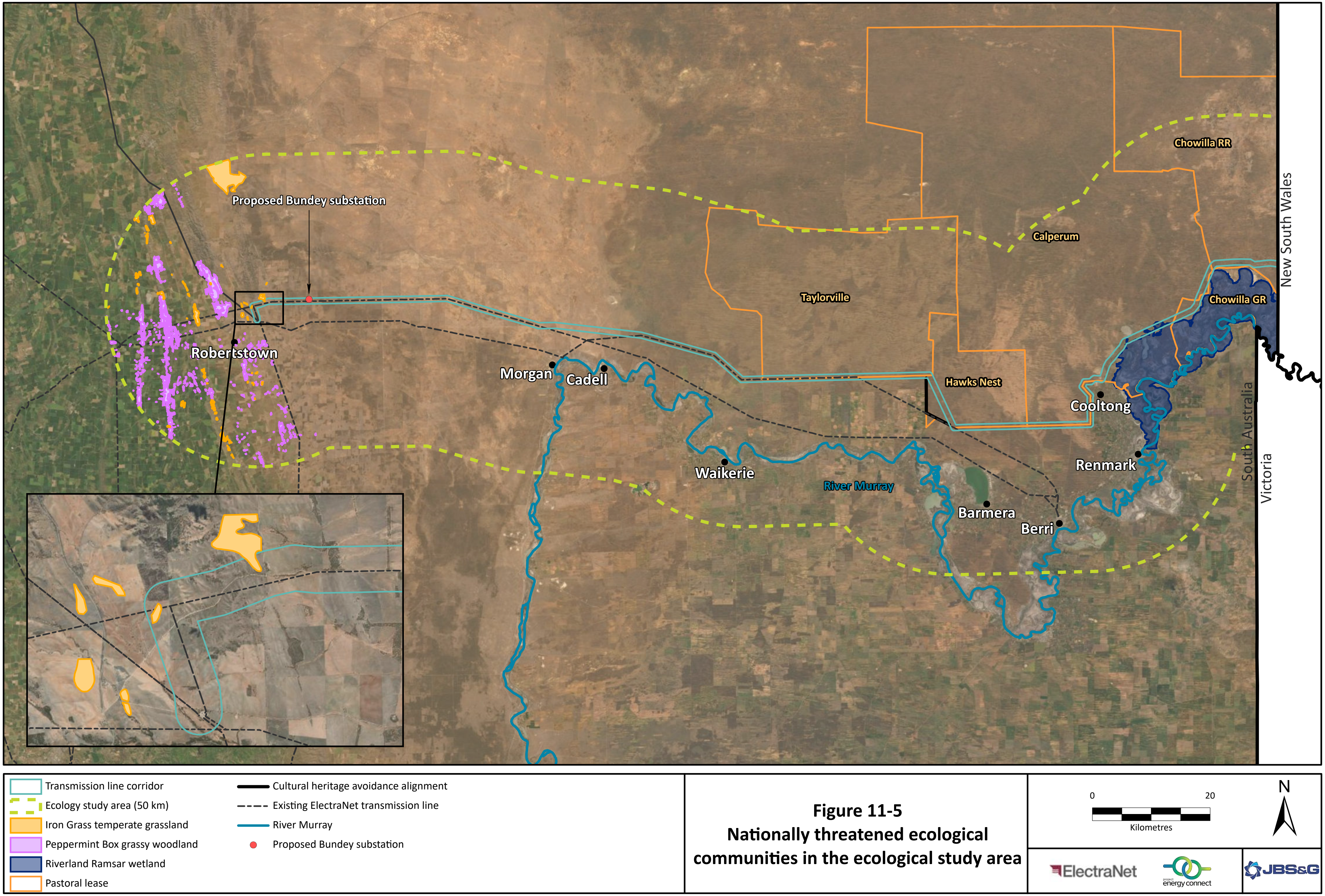



**Figure 11-5**
**Nationally threatened ecological communities in the ecological study area**

### EPBC listed threatened flora

The desktop assessment (review of EPBC Act PMST, buffer of 5 km) highlighted 10 EPBC list flora species as potentially occurring within 5 km of the alignment. BDBSA records highlighted two additional EPBC species (Refer Figure 11-6). A likelihood of occurrence assessment for whether these species actually occur within the transmission line corridor or the broader ESA considered these results as well as recent (and historical where relevant) BDBSA records, current distribution information, survey results and regional information (e.g. Robertson and Clarke 2012, DEW 2021a, South Australian Seed Conservation Centre 2020).

It was determined that of the 12 flora species, one is present (Peep Hill Hop-bush, *Dodonaea subglandulifera*) within the transmission line corridor and the wider ESA. This species has recent BDBSA records and was located during field surveys (refer Figure 11-6). Of the remaining species, two are considered to possibly be present (Silver Daisy Bush and Yellow-Swainson Pea), and nine are considered unlikely to occur within either the transmission line corridor or the broader ESA (refer Table 11-9 and Appendix I-1). The nine unlikely species include: Hairy-pod Wattle (*Acacia glandulicarpa*), Menzel's Wattle (*Acacia menzelii*), Spiller's Wattle (*Acacia spilleriana*), Flinders Ranges White Caladenia (*Caladenia xantholeuca*), Rigid Spider Orchid (*Caladenia tensa*), Slender Bell-fruit (*Codonocarpus pyramidalis*), Trailing Hop-bush (*Dodonaea procumbens*), Spalding Blown-grass (*Lachnagrostis limitanea*) and Menindee Nightshade (*Solanum karsense*).

**Table 11-9: Summary of likelihood assessment for potential EPBC listed flora species within the transmission line corridor (present and possible only)**

| Species name | Common name | Cth[1] | SA[2] | Likely to occur? | Summary of justification for likelihood of occurrence within transmission line corridor [3,4] |
|---|---|---|---|---|---|
| *Dodonaea subglandulifera* | Peep Hill Hop-bush | E | E | Present | PMST suggests known to occur. 23 recent records (2000 – 2013) within the western end of the ESA, including one within the transmission line corridor. Endemic to South Australia and occurs in the eastern Mount Lofty Ranges and on Yorke Peninsula, on low hills on loamy soils associated with rocky outcrops in open woodland (often *Callitris gracilis* and / or *Allocasuarina verticillata*), open shrubland (often Acacia) and mallee.<br>Observed as part of Robertstown substation upgrade vegetation assessments of a separate ElectraNET alignment (F1846) which runs parallel, approximately 50 m south of the proposed alignment (i.e. within the transmission line corridor. One group of three plants is known within existing this infrastructure corridor and is avoided by track maintenance / upgrades as it occurs on a rocky slope. Another group observed 800 m east of this group (50 – 100 plants, Jan 2021). These plants are all within the transmission line corridor and near known records (in similar habitat, the 'Robertstown Subpopulation') (Moritz and Bickerton 2010).<br>Given records, habitat and occurrence near Robertstown substation species is considered present within transmission line corridor, plants are spread out in proximity to each other at the western end of the transmission line corridor (refer to Figure 11-6). |

| Species name | Common name | Cth[1] | SA[2] | Likely to occur? | Summary of justification for likelihood of occurrence within transmission line corridor [3,4] |
|---|---|---|---|---|---|
| *Olearia pannosa* subsp. *pannosa* | Silver Daisy-bush | V | V | Possible | PMST suggests known to occur. Three records (2003) at the western end of the ESA near Hallelujah Hills, rocky habitats. These records are not within the transmission line corridor (> 4 km from the western end).<br>Endemic to South Australia, scattered widely in the Mt Lofty Block, localised on eastern Eyre Peninsula, upper South East, Mid North and southern Flinders. Most populations are on roadsides and include few individual plants. Occurs in heath, mallee, woodland and forest communities on a range of soils (sandy, duplex) and terrains (slopes and plains). It is a long-lived perennial, often suckering.<br>Whilst not observed during site surveys, given the wide range of landforms and soil types in which this species occurs, and records near the transmission line corridor, it is possible (but unlikely) that is occurs within the far western end of the corridor. |
| *Swainsona pyrophila* | Yellow Swainson-pea | V | R | Possible | PMST suggests likely to occur. Five historical records within the original ESA (1979, 1981). No recent records within current ESA or transmission line corridor.<br>Suitable habitat occurs within the ESA. The species is short-lived, adapted to fire and widely distributed in SA. Germination is triggered by soil disturbance or fire. Although not observed during site surveys, given suitable habitat and species characteristics it is possible the species occurs within the ESA and transmission line corridor. |

[1] *Environment Protection and Biodiversity Conservation Act 1999* Status: Critically Endangered (CE) Endangered (EN), Vulnerable (VU)
[2] *South Australian National Parks and Wildlife Act 1972* Status: Endangered (E); Vulnerable (V); Rare (R), EX (Presumed extinct)
[3] Records from Biological Database of South Australia (BDBSA 2020, November)
[4] Protected Matters Search Tool (PMST) output for 5 km buffer on the alignment as at January 2021.

#### *Peep Hill Hop-bush (*Dodonaea subglandulifera*) EPBC Endangered*

This species is endemic to South Australia and found on the east side of the Mount Lofty Ranges and on Yorke Peninsula, growing on low hills on loamy soils associated with rocky outcrops in open woodland (often *Callitris gracilis* and / or *Allocasuarina verticillata*), open shrubland (often Acacia) and mallee (SASCC 2020). All records are near, or west of the western end of the proposed transmission line.

As noted in Table 11-9 above, the Peep Hill Hop-bush is present within the transmission line corridor at the western end. Two groups of plants are known to occur in within the corridor within an existing infrastructure corridor and are currently avoided by track maintenance upgrades. Three plants were found about 20 m WSW of an existing alignment during a survey in August 2019 (Jacobs 2019), approximately 50 m south of the proposed EnergyConnect alignment, i.e. within the transmission line corridor. Another 50 – 100 plants of mixed age were also located to the west of the first group. Both locations occur within the transmission line corridor (refer Figure 11-6). These plants occur on the edge of the extent of an important known 'Robertstown' subpopulation for the species which includes over 5,000 plants at 5 locations north to northeast of Robertstown (Moritz and Bickerton 2010). Further detail about this species is provided in Appendix I-2).

No other plants have been identified within the transmission line corridor to date. As discussed in Section 11.4.1 and 11.4.7, individuals of this species can be avoided where present.

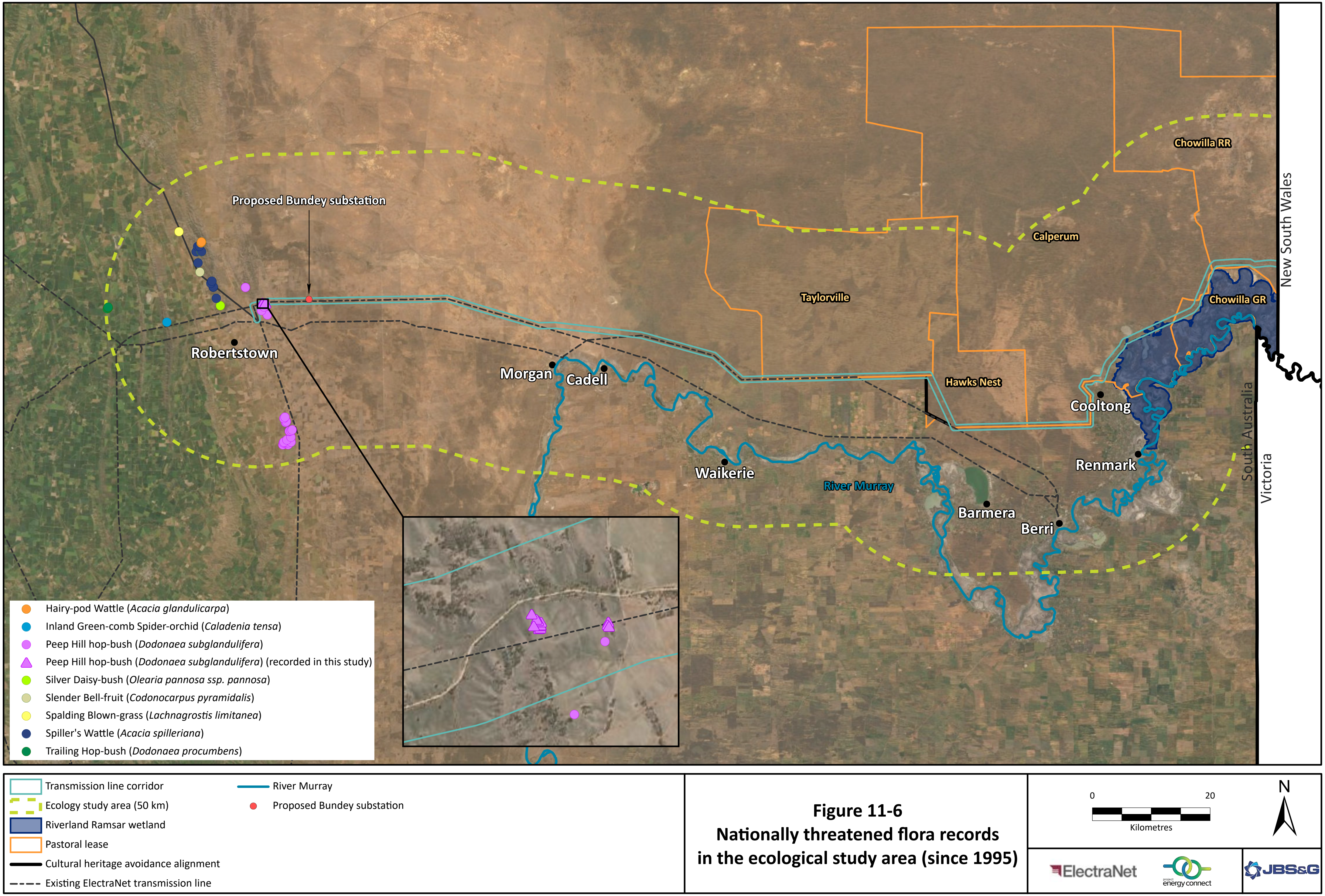



**Figure 11-6**
**Nationally threatened flora records in the ecological study area (since 1995)**

***Silver Daisy – bush (*****Olearia pannosa subsp. pannosa*****) EPBC Vulnerable***

This species is endemic to South Australia, scattered widely in the Mt Lofty Block, localised on eastern Eyre Peninsula, upper South East, Mid North and southern Flinders (DEW 2021a). Most populations are on roadsides with few individuals and the Murray-Darling Depression region is at the edge of its range (Seeds of South Australia 2020). Occurs in heath, mallee, woodland and forest communities on a range of soils (sandy, duplex) and terrains (slopes and plains). It is a long-lived perennial, often suckering (DEH 2008).

As noted in Table 11-9 above, it is possible that Silver Daisy-bush occurs within the transmission line corridor. Although the species has not been located within surveys of the transmission line corridor to date, and there are no records within the corridor, habitats where the species would occur are present.

As discussed in Section 11.4 below, this species can be avoided if present.

### State listed flora

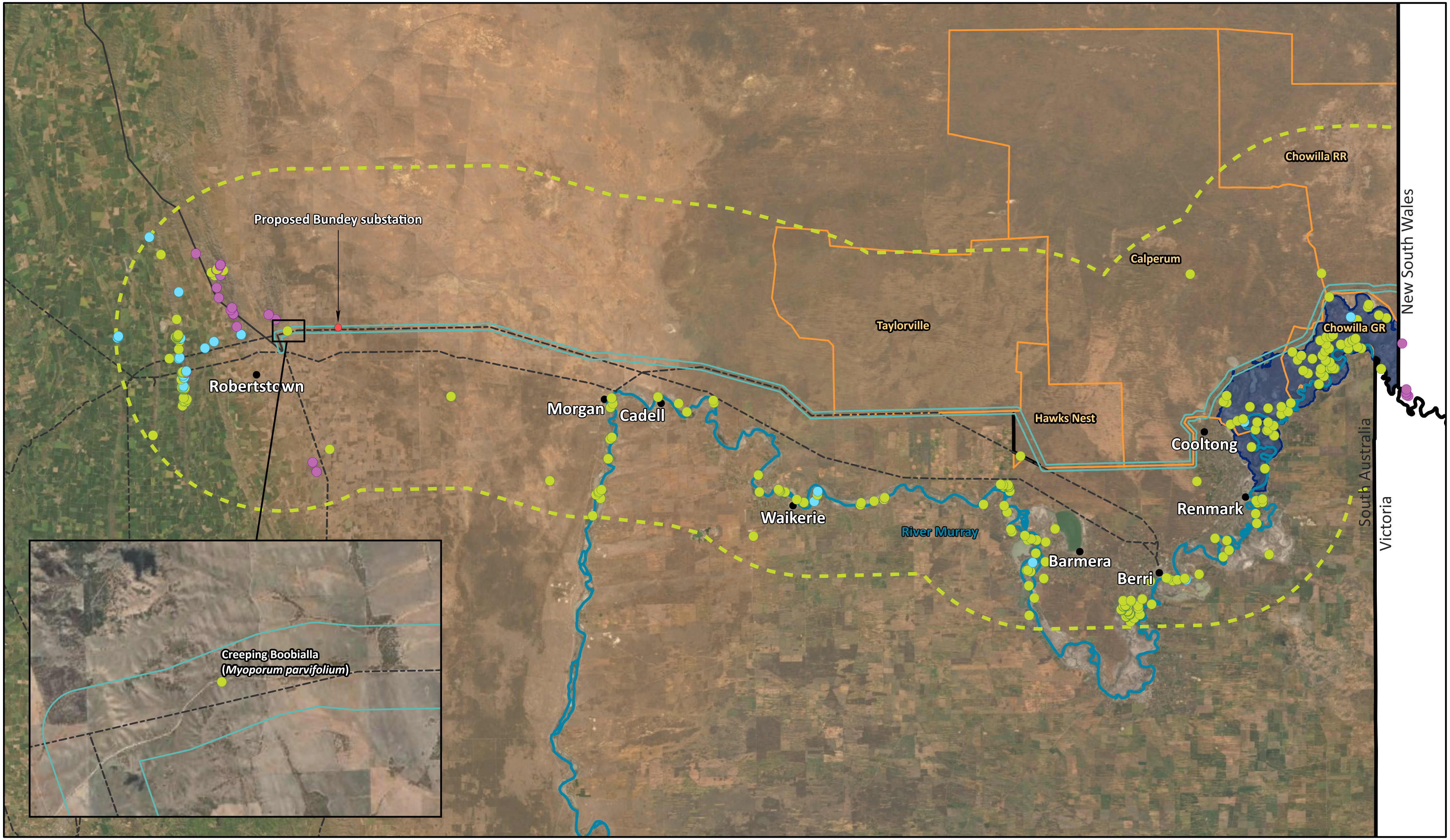
As above, in addition to Commonwealth listed species, there are records for threatened flora listed under the SA NPW Act within the ESA. There are 57 flora species with records since 1995 (excluding duplication of EPBC listed species from Table 11-9 above) (refer Table 2 in Appendix I-2 for species with no records in the transmission line corridor and considered unlikely to occur within the transmission line corridor). Note there was one record for Creeping Boobialla (*Myoporum parvifolium*) in the transmission line corridor, however this was in atypical habitat for the species, and was considered unlikely to occur (refer Table 11-10). Only one species was considered possible: Rohrlach's Bluebush (BDBSA 2020 extract), refer Figure 11-7 and Table 11-10 below. None of these species was observed during site surveys of the transmission line corridor and surrounds (refer Appendix I-2).

In addition, it should be noted that records are not an indication of abundance since flora records have originated from a variety of sources (including standard flora surveys, regional wetland surveys, regional reserve surveys, roadside vegetation surveys) which range from collecting species presence data to estimates of numbers for repeat locations for long-term or regular surveys.

**Table 11-10: State-listed threatened flora recorded in ESA / transmission line corridor from 1995 to present**

| Species | Common name | Status[1] | Records in ESA[2] | Records in TLC | Likelihood of occurrence in the transmission line corridor (TLC) |
|---|---|---|---|---|---|
| *Maireana rohrlachii* | Rohrlach's Bluebush | R | 2 | No | Possible. 3 records in the ESA > 5 km from alignment (10 – 15 km away), no records in transmission line corridor which have spatial reliability < 1 km and post 1995. Not recorded current surveys. Recorded as part of SNI surveys on rocky hills / remnant patch western end, but was avoided. Occurs on heavy soils, widespread. Records are from Cooltong CP and White's Dam CP. Given widespread and alignment runs near these CPs, considered possible, although stock can graze heavily if present. |
| *Myoporum parvifolium* | Creeping Boobialla | R | 32 | 1 | Unlikely. 32 records in the ESA > 5 km from alignment, one record in transmission line corridor, but in roadside vegetation survey, in rocky habitat, atypical for the species. Not recorded previous or current surveys. Occurs on floodplains. Habitat not in transmission line corridor. |

[1] Status as per National Parks and Wildlife Act 1972 E = Endangered, V = Vulnerable, R = Rare, R* = not evaluated, EX = Presumed Extinct
[2] BDBSA records since 1995, with < 1 km reliability unless stated otherwise. Records are from BDBSA purchased BDBSA extract Nov 2020, Regional record spread as per NatureMaps (DEW 2021a).




Transmission line corridor
Ecology study area (50 km)
Riverland Ramsar wetland
Pastoral lease
Cultural heritage avoidance alignment
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation
NPW Act Status
Endangered
Vulnerable
Rare

**Figure 11-7**
**State-listed flora records in the ecological study area (since 1995)**

0 20
Kilometres
N

ElectraNet project energy connect JBS&G

### Regionally threatened communities

Whilst there are no threatened ecosystems with official State ratings in South Australia, there is a list of threatened ecosystems of the agricultural region (DEH in progress in NVC 2020b). Blue-leaf Mallee (*Eucalyptus cyanophylla*) on loamy sand dunes (where it occurs as the overstorey dominant) is listed as a regionally Rare Ecosystem in South Australia, although this is an unofficial rating outside of any legislation. This ecosystem occurs in narrow, linear examples, primarily in Heritage Agreements, and mainly south of the River Murray. The ecosystem is considered to occur in 'unknown' extent in Cooltong CP (DEH in progress in NVC 2020b) which is traversed along its northern boundary by the transmission line corridor.

Blue-leaf Mallee was observed as present in lower numbers within White Mallee (*Eucalyptus dumosa*) / Beaked Red Mallee (*Eucalyptus socialis*) Mallee over Spinifex (*Triodia*) Hummock Grassland at flora site 16c along an existing track on the boundary of Calperum Station north of Cooltong CP. Given the vegetation at this site was not dominated by Blue-leaf Mallee, it is unlikely to qualify as the Rare ecosystem.

### Regionally listed flora

Of the over 700 flora species recorded within the wider ESA, regional conservation status is as follows: 4 Critically Endangered, 23 Endangered, 63 Vulnerable, 185 Rare, 60 Near Threatened, 349 Least Concern, 2 Regionally Extinct and the remainder are listed as Data Deficient or Not Evaluated. Most of the Critically Endangered, Endangered and Vulnerable species have been considered, given they also have State and or national conservation status. There are records for 86 of these species with regional conservation status in the transmission line corridor (2 Vulnerable, 8 Rare, remainder are Near Threatened or Least Concern). A list of these species is provided in Appendix I-1.

## 11.3.4. Habitat

Section 11.3.2 above describes native vegetation type, extent and condition within the transmission line corridor. The relative BCM communities and sub-communities have also been grouped into broad habitats which include vegetation communities of varying conditions (refer Section 11.3.2 and Appendix I-2) for further detail. These broad habitats support a range of common fauna (and flora) and have potential to support threatened fauna that potentially occur within the transmission line corridor (see Sections 11.3.5 and 11.3.6 below). Table 11-11 summarises the broad habitats in relation to BCM community and potential fauna types that are supported. Figure 11-8 shows the extent of broad habitats across the transmission line corridor.

**Table 11-11: Broad habitat type across the transmission line corridor**

| Broad Habitat Type | BCM Communities / sub communities | Habitat use and fauna support | Length in TLC (km) |
|---|---|---|---|
| Spear-grass (*Austrostipa*) and / or sparse shrub regrowth of previously cropped paddocks – western end of alignment | 1, 3, 9, 10 (Degraded 1.1, 9.1, 3.1) | Primarily very low to low condition BCM 1 and 3 where present within the corridor.<br>Provides habitat for several common bird and reptile species e.g Bluebonnet (*Northiella haematogaster*), Singing Honeyeater (*Lichenostomus virescens*), and Australasian Pipit (*Anthus novaezeelandiae*). Due to the absence of trees, low plant species diversity and abundance, lack of plant life forms and absence of litter, this habitat has limited potential for threatened fauna (e.g. potentially suitable, but limited / marginal habitat for Blue-winged parrot (*Neophema chrysostoma*), Elegant parrot (*Neophema elegans*) Australian Bustard (*Ardeotis australis*), Pygmy Bluetongue (*Tiliqua adelaidensis*) and Flinders Ranges Worm-Lizard (*Aprasia pseudopulchella*). | 17 |
| Chenopod Open Shrubland | 2, 4, 10, 11 (2.2, 4.3, 10.11, 11.6) | Primarily low condition BCM 2 where present within the corridor.<br>Provides habitat for several common bird and reptile species, e.g. Bluebonnet, Australasian Pipits. Due to the absence of trees, reduced vegetation cover and density, this habitat at the Western End of Alignment has limited potential for threatened fauna (e.g. Blue-winged parrot, Elegant parrot, Slender-billed Thornbill (*Acanthiza iredalei*), Peregrine Falcon (*Falco peregrinus macropus*), Chestnut Quailthrush (*Cinclosoma castanotum*). | 49 |
| Low Open Woodland over chenopod understorey | 1, 2, 10, 11 (2.1, 1.1, 11.6) | Primarily medium condition BCM 2 where present within the corridor.<br>In addition to those species for which chenopod open shrubland provides potentially suitable habitat, the presence of trees provides extra habitat structure for some threatened larger bird species that do not require a heavy litter layer or complex habitat structure (including dense shrub layer). At the western end of the corridor vegetation provides potentially suitable habitat for threatened fauna (e.g. Blue-winged parrot, Elegant parrot, Slender-billed Thornbill, Striped Honeyeater (*Plectorhyncha lanceolata*) and Peregrine Falcon). However, habitat at the eastern end of the corridor is more suitable for Elegant parrot, Bush Stonecurlew (*Burhinus grallarius*), Gilbert's Whistler (*Pachycephala inornata*), Striped Honeyeater, White-winged Chough (*Corcorax melanorhamphos*), Common Brushtail Possum (*Trichosorus vulpecula*) and tree roosting bat species. Regent Parrots may also utilise these areas for foraging. | 25 |
| Old growth mallee over open sclerophyll and chenopod shrub understorey | 1, 2, 3, 4 (1.1, 2.1, 3.1, 4.2, 1.2) | Comprises primarily medium to high condition BCM 3 where present within the corridor.<br>At the western end of the corridor this habitat occurs in more fragmented, smaller blocks, where there is likely higher grazing pressure. Mallee is more open and has less structural complexity. Fauna species ranges also coincide with habitat. This habitat is considered to provide potentially suitable habitat for threatened fauna, e.g. Chestnut Quailthrush, Hooded Robin (*Melanodryas cucullata cucullata*), Restless Flycatcher (*Myiagra inquieta*), Striped Honeyeater and White-winged Chough.<br>Mallee in the central and eastern end of the corridor occurs as larger blocks, with more floristic diversity and structural complexity, as well as a mosaic of fire history, providing greater opportunities for nesting and foraging. This habitat is considered to provide potentially suitable habitat for threatened fauna; e.g. Black-eared Miner (*Manoria flavigula melanotis*), Bush Stonecurlew, Chestnut Quailthrush, Gilbert's Whistler, Hooded Robin, Major Mitchell's Cockatoo (*Lophochroa leadbeateri*), Malleefowl (*Leipoa ocellata*), Regent Parrot (*Polytelis anthopeplus monarchoides*), Red-lored Whistler (*Pachycephala rufogularis*), Restless Flycatcher, Striped Honeyeater and White-winged Chough. | 47 |
| Post-fire regrowth mallee over sclerophyll | 3 (3.1) | Comprises high condition vegetation where present within the corridor. | 3 |

| Broad Habitat Type | BCM Communities / sub communities | Habitat use and fauna support | Length in TLC (km) |
|---|---|---|---|
| and chenopod shrub understorey | | Provides potentially suitable habitat for threatened fauna that require a dense shrub understorey, moderate to heavy leaf litter, and do not require hollows or large trees, e.g. Chestnut Quailthrush, Malleefowl, Red-lored Whistler (*Pachycephala rufogularis*), Restless Flycatcher, Scarlet-chested Parrot (*Neophema splendida*), Shy Heathwren (*Hylacola cauta*), and Striated Grasswren (*Amytornis striatus striatus*). State threatened raptors may also utilise this habitat for foraging and roosting (e.g. Black Falcon, *Falco subniger*, Square-tailed Kite, *Lophoictinia isura*).<br>Would also provide foraging habitat for Regent Parrot and post-fire regenerating mallee of 5 – 10 years or older may provide occasional foraging habitat for Black-eared Miner (not optimal essential habitat). | |
| Mallee over Spinifex (*Triodia*) dominated understorey | 4 (4.1, 4.2) | Primarily medium condition BCM 4 where present with the corridor.<br>Considered to provide potentially suitable habitat for threatened fauna that require a dense ground layer, and in particular dominated by Spinifex; and don't require hollows or large trees. All habitat along the transmission line is at least 7 years post fire, but ranges to old growth mallee with no recorded fire history. Even 5+ year regrowth mallee may provide foraging habitat for the following species: Black-eared Miner, Chestnut Quailthrush,Gilbert's Whistler, Malleefowl, Red-lored Whistler, Restless Flycatcher, Scarlet-chested Parrot, Shy Heathwren and Striated Grasswren. | 58 |
| Hopbush (*Dodonaea viscosa ssp angustissima*) Tall Open Shrubland – eastern half of alignment | 3, 4 (4.3) | Primarily low condition BCM 4 where present within the corridor<br>Considered to provide potentially suitable habitat for threatened fauna that require a tall open shrub structure and do not require, a moderate to heavy litter layer, hollows or large trees (e.g. Bush Stonecurlew, Lace Monitor (*Varanus varius*)). | 7 |
| Non-native vegetation | | Limited habitat for common and threatened fauna | 0.80 km |

Note: Potential fauna listed here are examples. Further assessment has been undertaken as part of the vegetation assessments required for native vegetation clearance approval.

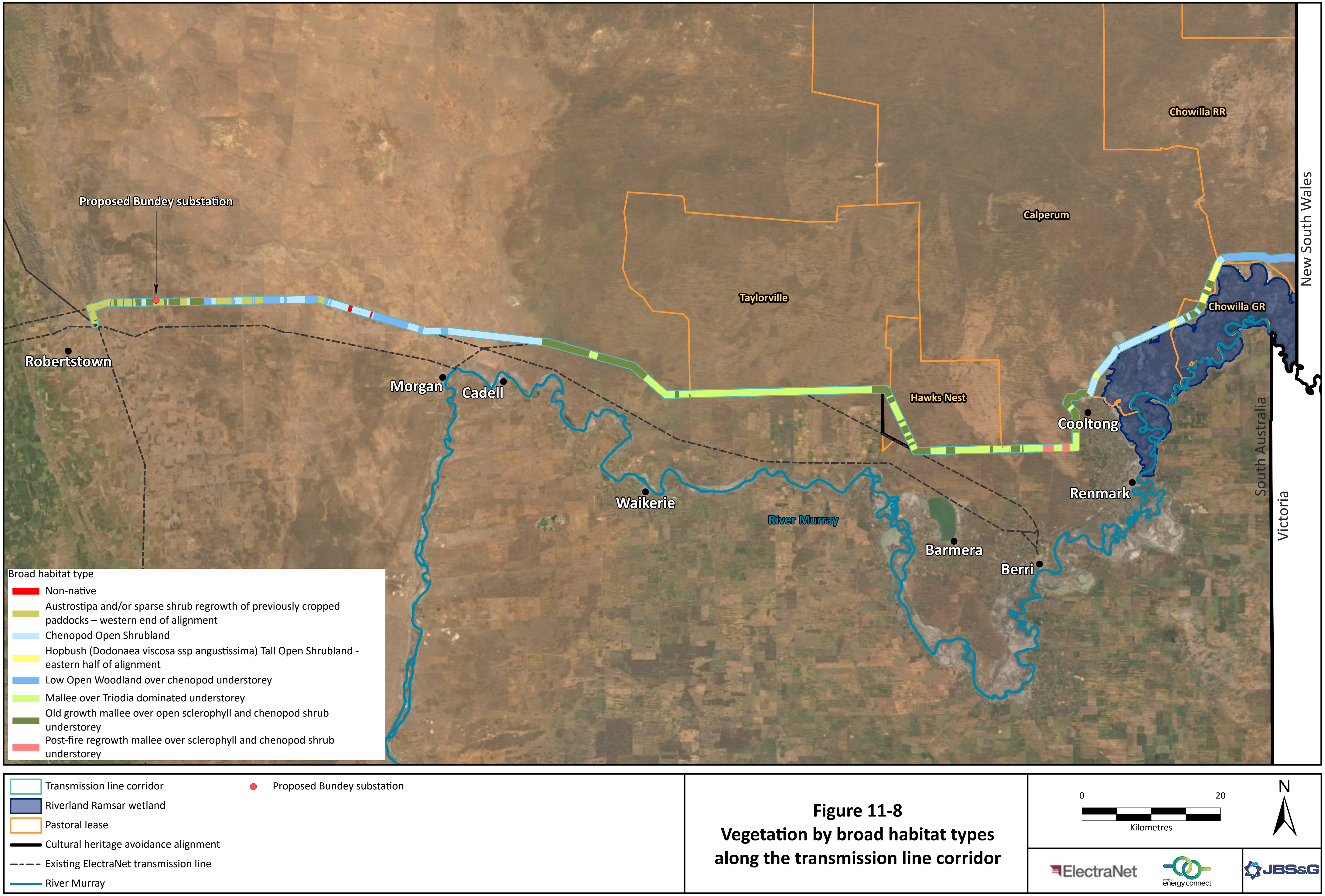



**Figure 11-8**
**Vegetation by broad habitat types along the transmission line corridor**

### 11.3.5. Native fauna

As noted previously, remnant vegetation, wetland areas, and particularly land managed for conservation within the ESA provide habitat for common and threatened fauna. Notable habitats include old growth mallee and intact mallee habitats, predominantly towards the centre and eastern end of the ESA (which are avoided or skirted by the transmission line corridor where possible). These habitats take many years to develop to a point where mallee trees support hollows and deep litter cover, and are characterised by a mosaic of fire history (refer 11.3.2). In general, they represent important habitat for native fauna species, including a number of conservation significant species discussed below. Threatened fauna are discussed further in Section 11.3.6.

Listed Critical Habitat for the Black-eared Miner (*Manorina melanotis*) is located within the Riverland Biosphere region, within Gluepot Reserve, Taylorville Station and Calperum Station. The transmission line corridor traverses the southern margin of this area, and this is discussed further below in Section 11.3.6. The wetlands of the Riverland Ramsar site are located to the south of the eastern part of the transmission line corridor (south of the Wentworth-Renmark Road) as discussed in Section 11.3.1. This area is known to support large numbers of waterbirds, including migratory species protected under the EPBC Act (see Section 11.3.6).

### 11.3.6. Conservation significant fauna

#### EPBC listed threatened fauna

***Assessment of fauna with potential to occur***

The desktop assessment (review of EPBC Act PMST with a 5 km buffer) initially highlighted 15 nationally threatened fauna species (11 birds, one frog, one mammal, two reptiles) and one threatened fauna population as potentially occurring in the transmission line corridor. Fish were excluded from the assessment, given lack of habitat that would be impacted by the Project. There was also a single BDBSA record for an additional EPBC listed species, Hooded Plover, which is considered in Table 4 of Appendix I-1. In addition, to the desktop assessment a targeted survey for mallee bird species was also undertaken (Nature Advisory 2021, provided in Appendix I-4). The targeted survey also considered an additional species, Mallee Striated Grasswren (*Amytornis striatus striatus*), which is currently State rare, but may be listed under the EPBC Act in the future (Nature Advisory 2021). This subspecies is considered with the State rated species in Section 11.3.6 below. Records for EPBC listed fauna (BDBSA and Birdlife) are shown in Figure 11-9, including recent records from the mallee birds survey (Nature Advisory 2021).

The likelihood of occurrence assessment for EPBC listed species considered desktop results as well as recent and historical BDBSA and Birdlife records, current distribution information, survey results and regional information (refer Table 11-12). It was determined that of the 17 species, three are present (Malleefowl, Black-eared Miner, Red-lored Whistler) and one is likely (Regent Parrot) within the transmission line corridor and the broader ESA. Of the remaining species, eight are considered possible (of which four are only possible in nearby water / riverine habitats, but some may fly over) and five are considered unlikely to occur within the transmission line corridor. Justification for the following species considered unlikely to occur is presented in Table 4 of Appendix I-1: Grey Falcon (*Falco hypoleucos*), Hooded Plover (*Thinornis cucullatus cucullatus*), Eastern Curlew (*Numenius madagascariensis*), Plains-wanderer (*Pedionomus torquatus*) and Night Parrot (*Pezoporus occidentalis*).

An EPBC listed Koala population (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT) was included in the PMST output, however this is not relevant to the current Project given the listed populations occur on the east coast of NSW and not in the vicinity of the Project. The Koala is not rated in SA. There are only two records for Koala within the broader ESA, one historical and one recent (scats from 2003). Given the EPBC status is not relevant for the location and considered unlikely to occur, this species is not considered further.

**Table 11-12: Summary of EPBC listed fauna species that have potential to occur within the transmission line corridor**

| Species Name | Common Name | Cth[1] | SA[2] | Likelihood | Justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| *Botaurus poiciloptilus* | Australian Bittern | E | V | Possible | EPBC PMST suggests known to occur. Widespread, but uncommon over south-eastern Australia. Shy elusive species that favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails.<br>There are 8 recent BDBSA records (2010) within the ESA (all at the same location), records are in the River corridor southwest of Berri and 7 km south of the alignment near Morgan. One Birldife record (2017) 17 km from the proposed alignment (near Berri). No records within the transmission line corridor. Possible within riverine environments south of the corridor, potential flyover. |
| *Calidris ferruginea* | Curlew Sandpiper | CE | Not rated | Possible | EPBC PMST suggests likely to occur. A common summer migrant from northern hemisphere, found in many Australian coastal sites and may also be seen inland in suitable habitats. Most common in the far southeast and northwest of Australia. Found on intertidal mudflats of estuaries, lagoons, mangroves, as well as beaches, rocky shores and around lakes, dams and floodwaters.<br>Core habitat does not occur within the ESA, but the species may be an occasional visitor to inland water habitats. Within the ESA, there is one recent BDBSA record, 22 km from alignment (2011), 4 recent BDBSA records > 25 km from the alignment and there are 3 historical records in proximity to the transmission line corridor (Lake Merreti). There are 5 Birdlife records (1999 – 2013), 13 – 17 km from the alignment. None of the records are within the transmission line corridor, but the historical records are close to the corridor. Species is considered possible in riverine environments adjacent the transmission line corridor, and flyover potential. |
| *Grantiella picta* | Painted Honeyeater | V | R | Possible | EPBC PMST suggests may occur. Endemic to mainland Australia, primarily occurring in Queensland and New South Wales and Victoria. It is also found occasionally in the Northern Territory and may be a vagrant to South Australia. It is rare throughout its range. There are few records in South Australia and these are outside of the known range. Occurs in dry open forests and woodlands, and is strongly associated with mistletoe. It may also be found along rivers, on plains with scattered trees and on farmland with remnant vegetation. It has been seen in urban parks and gardens where large eucalypts are available.<br>There are no recent BDBSA records within the ESA. There are 3 Birdlife records within the ESA (from 2000, 2011, 8 – 24 km from the alignment). There are 6 birdlife records 29-32 km north of the transmission line corridor near Gluepot Homestead in Mallee Vegetation. Given the limited records within the ESA and its status as a vagrant in South Australia, but presence of habitat its occurrence within the transmission line corridor is considered possible. |
| *Leipoa ocellata* | Malleefowl | V | V | Present | EPBC PMST suggests known to occur. Ground-dwelling species which makes large conspicuous nesting mounds. Preferred habitat is semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and / or acacias.<br>There are over well 2000 recent (1995 – 2018) BDBSA and Birldlife records in the ESA and an additional 267 BDBSA records within the transmission line corridor. Many of these records are duplicate records of regularly surveyed mound locations, and there are no recent records for active nests in the transmission line corridor. Records are widespread in mallee habitat with concentrations around CPs (e.g. Pooginook and Cooltong) and Stations within the |

| Species Name | Common Name | Cth[1] | SA[2] | Likelihood | Justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| | | | | | Biosphere Reserve. The boundaries of these CPs and Taylorville are traversed by the transmission line corridor, and a (30 km) section of the corridor runs along the southern boundary of the Biosphere Reserve and through Calperum Station north of the Murray River NP. No Malleefowl mounds / nests or Malleefowl were observed during site surveys for the Project, however Malleefowl footprints were observed during targeted survey in spring 2019 on the boundary of Calperum Station (Nature Advisory 2021). Whilst Malleefowl have not been observed in the transmission line corridor, there are numerous records and presence of habitat, therefore they are considered as present within the corridor and would occur in mallee habitats of the central transmission line corridor, but are also known to traverse along tracks and forage in cropped / stubble areas. |
| *Manorina melanotis / Manorina flavigula melanotis* | Black-eared Miner | E | E | Present | EPBC PMST suggests known to occur. Endemic to the Murray Mallee region of Victoria, South Australia and New South Wales where the majority of records are from the Riverland Biosphere Reserve, South Australia and the Murray-Sunset National Park, Victoria.<br>Preferred habitat is large tracts old-growth mallee (over Spinifex, Saltbush or Bluebush) that has not been burnt for at least 45 years, and not degraded by grazing (Clarke et al. 2005 cited in TSSC 2016b, Nature Advisory 2021). A wildfire in 2006 in the Riverland Biosphere Reserve reduced the largest remaining area of long unburnt habitat by about a third. A subsequent fire in 2014 also burnt large areas of available habitat in the southern portion of the biosphere reserve (TSSC 2016b, DEW 2021a).<br>The transmission line traverses the very southern margins of Taylorville Station and Calperum Station which are part of a block of EPBC listed Critical Habitat for the Black-eared Miner (refer below table for further discussion). The Critical Habitat area is not bisected or fragmented by the Project.<br>There has been taxonomic controversy over this species, whether considered a full species or a subspecies of Yellow-throated Miner, hence listed as either *Manorina melanotis* or *Manorina flavigula melanotis* (DAWE 2020c).<br>One Birdlife record for *Manorina flavigula melanotis* in the transmission line corridor (2000) in Taylorville Station (10 km NNW of Hawks Nest). There are approximately 200 records (BDBSA and Birdlife) within the ESA, and 800 recent records north of the ESA boundary. The majority of records in the ESA are in Calperum and Taylorville Stations as well as Gluepot Reserve. There are also 8 recent records for the common Yellow Throated Miner in the transmission line corridor, and over 400 recent records within the ESA, as well as 60 records within the ESA for hybrids (*Manorina flavigula* x *melanotis*), indicating frequent interbreeding with Yellow-throated Miners already occurs in in the ESA (refer Figure 11-10 and Figure 11-11).<br>Targeted surveys (Nature Advisory 2021) located the species (pure and hybrids) at 3 sites within / immediately adjacent the transmission line corridor (Taylorville Station and Calperum Station), therefore given numerous regional records and presence of habitat, is considered present within mallee habitats of the centre of the transmission line corridor. |
| *Pachycephala rufogularis* | Red-lored Whistler | V | R | Present | EPBC PMST suggests likely to occur. Occurs in the Murray Mallee both north and south of the Murray River, with isolated populations in central-western New South Wales, and on the Eyre Peninsula (which is likely extinct following fire in 2005). The core population occurs in the South Australia near the Victoria border. Distribution within the range is patchy as large areas are not utilised because they are not suitable (e.g. grazing, fire impacts). Whilst previously had |

| Species Name | Common Name | Cth[1] | SA[2] | Likelihood | Justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| | | | | | wide-spread occurrence in the Riverland Biosphere Reserve, landscape-scale fires have reduced numbers substantially in these areas.<br>Breeds in areas of open mallee over a fairly dense, but patchy, shrub layer. Species prefers Spinifex (*Triodia*) mallee, shrubland or mallee heath shrubland (e.g. *Melaleuca uncinata*) where canopy is sparse and shrubs at high densities (DELWP 2016, Nature Advisory 2021). It is considered to have strict habitat requirements with distribution in mallee and mallee heath, limited by presence of *Triodia scariosa*, often nesting in Spinifex hummock grasslands. Feeds mainly on the ground or in low shrubs. They have large home ranges and occur at low densities within these ranges.<br>The Riverland Biosphere Reserve population, estimated to be about 1000 birds in 2011, is considered to be one of the largest populations. In that reserve they are known to occur > 6 km from water points and associated grazing impacts and predominantly in areas of long-unburnt mallee. Landscape scale fires have caused substantial declines of populations in recent years, particularly in Billiatt and Ngarkat Conservation Parks and the Riverland Biosphere Reserve (DELWP 2016).<br>There are 6 recent BDBSA records 43 Birdlife records in the ESA (1995 – 2010), no records in the transmission line corridor). The majority of these records are north of or on the edge of areas burnt by wildfire in 2006, 2014 ~ 30 km north of the transmission line corridor. Although there are limited records in the ESA, 4 of the records were <5 km from the alignment near Pooginook CP, the species was also observed near that CP during targeted surveys (Nature Advisory 2021). Based on the above considered, present in the un-burnt / old growth mallee habitats of the transmission line corridor, however likely to occur in low abundance (Nature Advisory 2021). |
| *Polytelis anthopeplus monarchoides* | Regent Parrot | V | V | Likely | EPBC PMST suggests breeding likely to occur. Nest within River Red Gums forests. Typical nest trees are large, mature healthy trees with many hollows (though dead trees are used) and are usually located close to watercourses.<br>Principal foraging habitat is mallee woodlands, though foraging also occurs in riverine forests and woodlands. Mallee woodland within 20 kilometres of nesting sites is considered critical foraging habitat for breeding birds (Baker-gabb and Hurley 2011).<br>They may utilise cereal crops and will feed on spilt grain. Birds move between the riverine nesting habitat and foraging sites along corridors of natural vegetation. They also forage widely in mallee areas / agricultural land, but generally up to20 km from nesting habitats along the River Murray.<br>The ESA includes both breeding and foraging habitat, breeding habitat does not occur in the transmission line corridor, but rather south of the corridor in riverine environments. There are over 620 recent BDBSA records and 335 Birdlife records within the broader ESA (1995 – 2020), most along the River Murray corridor, but there are also records in mallee vegetation to the north of the ESA in Taylorville and Calperum Station and the species has been recorded in Pooginook CP, Cooltong CP, most likely associated with foraging behaviour rather than breeding. There are two recent BDBSA records (2012, 2013), and no Birdlife records in the transmission line corridor. The species was not observed during targeted surveys of the corridor. Based on the above, species is considered likely within the transmission line corridor, in mallee habitats (foraging habitat). Noting that nesting habitat does not occur in the transmission line corridor. |

| Species Name | Common Name | Cth[1] | SA[2] | Likelihood | Justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| *Rostratula australis* | Painted Snipe | E | V | Possible | EPBC PMST suggests likely to occur. Endemic to Australia, widespread over much of north and eastern Australia, and localised around Perth, but rarely observed. Prefers inland swamps and temporary water regimes, marshes with moderate cover.<br>Inhabits many different types of shallow, brackish or freshwater terrestrial wetlands, especially temporary ones which have muddy margins and small, low-lying islands. Suitable wetlands usually support a mosaic of low, patchy vegetation, as well as lignum and cane-grass.<br>Preferred habitats occur within the wider ESA and adjacent the eastern end of the transmission line corridor. There is one recent BDBSA record (2001 at Berri Sewage works) and 3 Birdlife records within the ESA. There are also 2 recent records outside the ESA near Berri and the Noora Disposal Basin, but no records in the transmission line corridor. Given limited records and preferred habitat adjacent the eastern end of the transmission line, occurrence is possible in nearby suitable habitats, with potential flyover of the transmission line corridor. |
| *Litoria raniformis* | Southern Bell Frog / Growling Grass Frog | V | V | Possible | EPBC PMST suggests known to occur. Occupies a variety of natural and artificial wetland habitats including swamps, lakes, streams, riverine floodplains, farm dams and irrigation channels. Occupied waterbodies are typically still to slow-flowing and may be permanent or ephemeral. Submergent, floating and / or emergent vegetation is often present. In South Australia, occurs along the length of the River Murray corridor, Lower Lakes, and the South East region. For populations bordering the River Murray, breeding is triggered by flooding of ephemeral waterbodies during spring or summer. In this area the frogs are concentrated in refugia prior to flooding, then disperse across the landscape during flooding / breeding events. Species is highly mobile and can move at least one km in 24 hrs. There is evidence that its persistence in many areas is dependent upon the movement of adults between particular waterbodies, and between breeding and non-breeding habitats. At least some populations may be dependent upon a small number of waterbodies in which successful breeding occurs.<br>Fences and roads may be barriers to frog movement and may compromise the viability of many populations.<br>There are 402 recent records (1995 – 2017) within the ESA, with <1 km spatial reliability, no records in the transmission line corridor and no suitable habitat. These records occur along the River Murray corridor with occasional records from nearby evaporation ponds.<br>Given the number of records, it is considered possible this species may occur in the transmission line corridor, but it is more likely to occur in the River Murray and associated wetlands that are avoided by the Project. |
| *Nyctophilus corbeni* | South-eastern Long-eared Bat | V | V[4] | Possible | EPBC PMST suggests likely to occur. Microbat previously referred to as *Nyctophilus species 2* (South-eastern long-eared Bat) (Churchill 2008). Species has scattered distribution in the Murray-Darling basin. Occurs within a wide range of inland woodland vegetation types. More commonly associated with Box, Ironbark and Cypress Pine Woodland on the western slopes and plains of inland northern NSW. Has a stronghold with core populations located in the Pilliga Scrub in NSW. Roosts in tree hollows, crevices and under loose bark. Generally roosting solitarily or in groups of 10 – 20. Slow flying, but agile and hunts for flying prey, foliage gleaning or foraging on the ground, foraging very close to vegetation.<br>In South Australia, records are all confined to mallee shrubland. Commonly recorded in extensive stands of vegetation, old-growth vegetation, and areas with a dense understorey. Bushfires are a likely threat, causing direct mortality and through loss of foraging habitat and roosting sites.<br>There is one recent record within the ESA, 20 km from the alignment (1998 Calperum Station) and no recent records |

| Species Name | Common Name | Cth[1] | SA[2] | Likelihood | Justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| | | | | | in the transmission line corridor. All records are within a large tract of intact mallee.<br>Given recent record in the ESA, aerial nature and habitat present within the ESA and transmission line corridor, it is possible this species occurs in mallee habitats within the corridor. |
| *Aprasia pseudopulchella* | Flinders-ranges Worm-lizard | V | Not rated | Possible | EPBC PMST suggests likely to occur. Endemic to South Australia, occurs in open woodland, native tussock grassland, riparian habitats and rocky isolates. Species prefers stony soils or clay soils with a stony surface and has been found sheltering in soil beneath stones and rotting stumps. All species of *Aprasia* are known to burrow freely in loose soil or litter and in root systems below shrubs. Has been recorded from the Southern Flinders, Clare Hills, rocky slopes north and south of Burra, and northern suburbs of Adelaide (Cobbler Creek Recreation Reserve), which are all west of the Project.<br>There are 5 recent records (from 2003, 15 – 24 km from alignment) within the western end of the ESA, none located within the transmission line corridor. Records were from Lomandra and / or Triodia grassland (4 sites) and Sheoak woodland (one site). The nearest record (from 2011) is ~ 10 km northwest of the transmission line corridor, but has low spatial reliability (> 1 km). Record was from 'gullies near a homestead'.<br>The western margins of the ESA are at the eastern limit of the known range. Only the far western end of the transmission line corridor may contain suitable habitat. Based on the above, the species is considered as a possible occurrence in the transmission line corridor. |
| *Tiliqua adelaidensis* | Pygmy Blue-tongue Lizard | E | E | Possible | EPBC PMST suggests known to occur. Preferred habitat is unploughed grassland, commonly Lomandra grassland (with spider holes). It has been recorded from the Mid North of South Australia with most records between Burra and Jamestown.<br>There are 2 recent records (2008) in the ESA, no records in the transmission line corridor, nearest records (>500) all from same location ~ 31 km northwest of the western end of the transmission line corridor. Records are in an un-ploughed grassland.<br>The transmission line corridor is east of all known records. Only the far western end of the study area may contain suitable habitat, however no preferred or suitable habitat observed in the corridor during site surveys to date. Based on the above occurrence in the transmission line corridor is considered possible. |

[1] *Environment Protection and Biodiversity Conservation Act 1999* Status: Critically Endangered (CE); Endangered (EN), Vulnerable (VU); Migratory Marine (MM); Migratory Terrestrial (MT); Migratory Wetland (MW)
[2] South Australian *National Parks and Wildlife Act 1972* Status: Endangered (E), Rare (R), Vulnerable (V)
[3] Records from Biological Database of South Australia (BDBSA), Purchased September 2019 extract (which includes records from multiple bird monitoring associations), Protected Matters Search Tool (PMST) (species or species habitat potential unless stated, e.g. breeding, Atlas of Living Australia
[4] Listing is for a different species name, nomenclature update
[5] See Appendix I-3 for further justification and references including Menkhorst et al. 2017, Simpson and Day 2010, Geering et al . 2008, SPRAT profile).

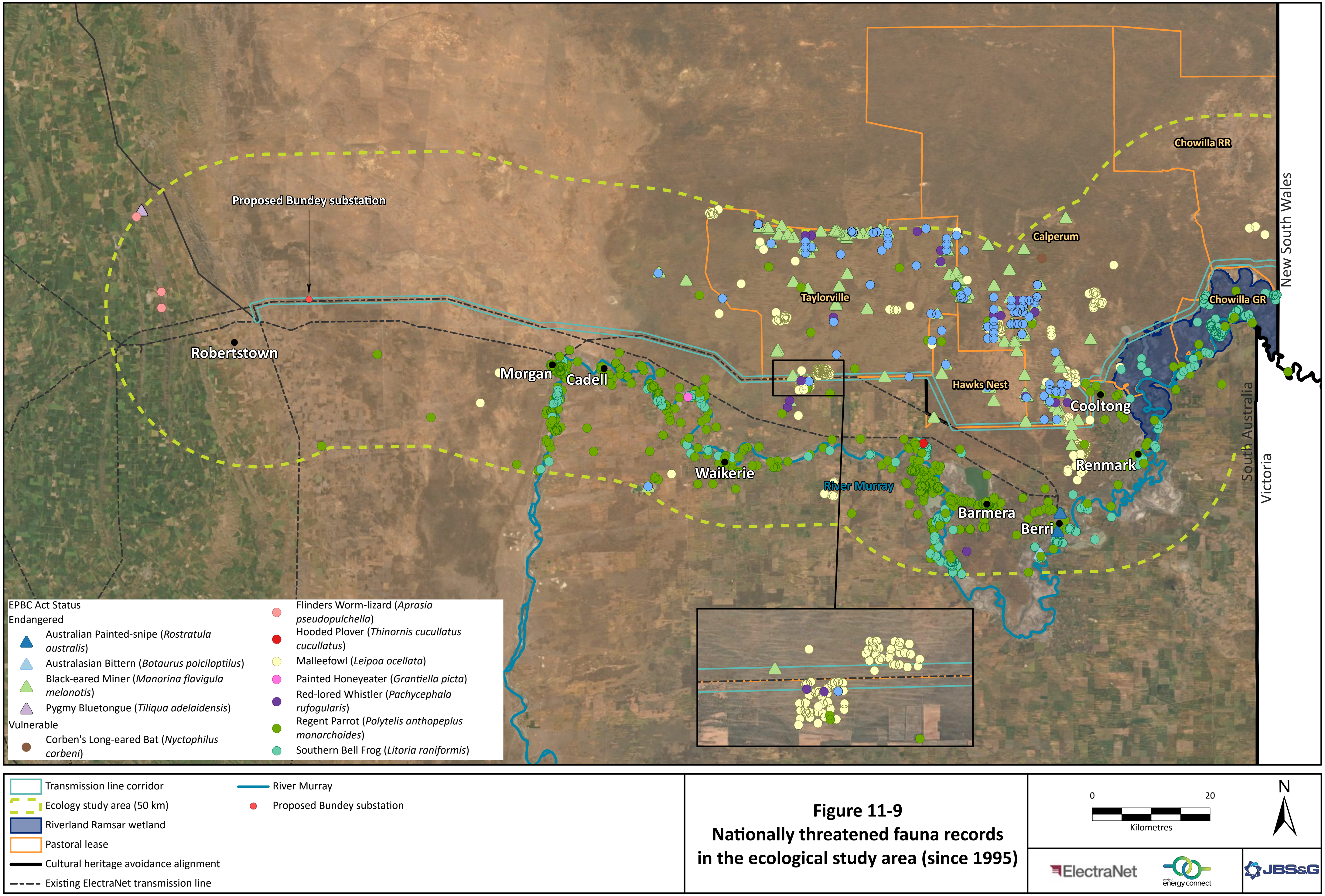



**Figure 11-9**
**Nationally threatened fauna records in the ecological study area (since 1995)**

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***Black-eared Miner* (Manorina melanotis) *EPBC Endangered***

The Black-eared Miner is a sedentary inhabitant of dense, unburnt mallee vegetation. It has hybridised extensively with the common Yellow-throated Miner *M. flavigula* in areas where the mallee has become fragmented by vegetation clearing (Carpenter 2002). Historical surveys suggested that the last remaining Black-eared Miners occur in the extensive unburnt mallee areas north of the River Murray, particularly in the Gluepot – Calperum Station area (Garnett & Crowley 2000). More recently, BDBSA and Birdlife records indicate Black-eared Miners, Yellow-throated Miners and hybrids continue to occur in the vicinity of the transmission line corridor (refer Table 11-13 and Figure 11-10). This has been confirmed by recent surveys with pure and hybrids recorded at Taylorville, Hawks Nest and Calperum Stations, the Hawks Nest records being well north of the current transmission line corridor (Nature Advisory 2021).

An interrogation of the records also shows that the majority of pure Black-eared Miners occur greater than 25 km north of the transmission line corridor and that all three bird types as well as the common Noisy Miner occur within the wider ESA (refer Figure 11-10). The majority of recent records are also concentrated within the Listed Critical Habitat area / Riverland Biosphere Reserve (refer Figure 11-11) in areas of mallee unburnt for 15 years and up to 40 years or more (DEW 2021a).

The main threats to this species are loss and modification of habitat (e.g. as a result of past vegetation clearance and disturbance, and destruction or degradation of habitat cause by fire and / or grazing pressure) and hybridisation with the Yellow-throated Miner. The survival of the Black-eared Miner population has been attributed to the presence of extensive areas of undisturbed mallee in the South Olary Plains region, of which vast areas occur within the northern half of the Listed Critical Habitat area, well north of the transmission line corridor (over 30 km north). It is noted that further clearing and disturbance of mallee in this area could be detrimental to the species (Carpenter 2002).

It is acknowledged that Black-eared Miners are present within sections of the transmission line corridor, specifically in dense mallee areas, however it is noted that the majority of the population occurs further north, over 15 to 25 km away from the transmission line corridor, all within core habitat of the Listed Critical Habitat area that will be avoided by the Project.

**Table 11-13: Summary of Miner status within and surrounding the transmission line corridor**

| Species | Cth | SA | Regional | Location | Pre 1995 records > 1 km reliability[1] | Pre 1995 records < 1 km reliability[2] | 1995 – present records < 1 km reliability[3] |
|---|---|---|---|---|---|---|---|
| Black-eared Miner *Manorina flavigula melanotis* | E | E | E | TLC | 0 | 0 | 1 (Birdlife) |
| | | | | ESA | 0 | 3 | 91 (BDBSA), 105 (Birdlife) |
| | | | | Over 25 km away | 0 | 1 | 371 (BDBSA), 427 (Birdlife) |
| Yellow-throated Miner *Manorina flavigula* | ssp | ssp | LC | TLC | 0 | 0 | 1 (BDBSA), 7 (Birdlife) |
| | | | | ESA | 59 | 22 | 133 (BDBSA), 303 (Birdlife) |
| | | | | Over 25 km away | 19 | 8 | 130 (BDBSA), 284 (Birdlife) |
| Yellow-throated x Black-eared Miner hybrid *Manorina flavigula x melanotis* | | | | TLC | 0 | 0 | 0 |
| | | | | ESA | 0 | 0 | 60 |
| | | | | Over 25 km away | 0 | 0 | 148 |

[1] Historical records (BDBSA and Birdlife) with low spatial reliability [2] Historical records with spatial reliability; [3] Recent records (post 1995) with spatial reliability as accepted by SA Department for Environment and Water for determining offsets as part of Native Vegetation Clearance Approvals process (NVC 2020a,b,c,d).

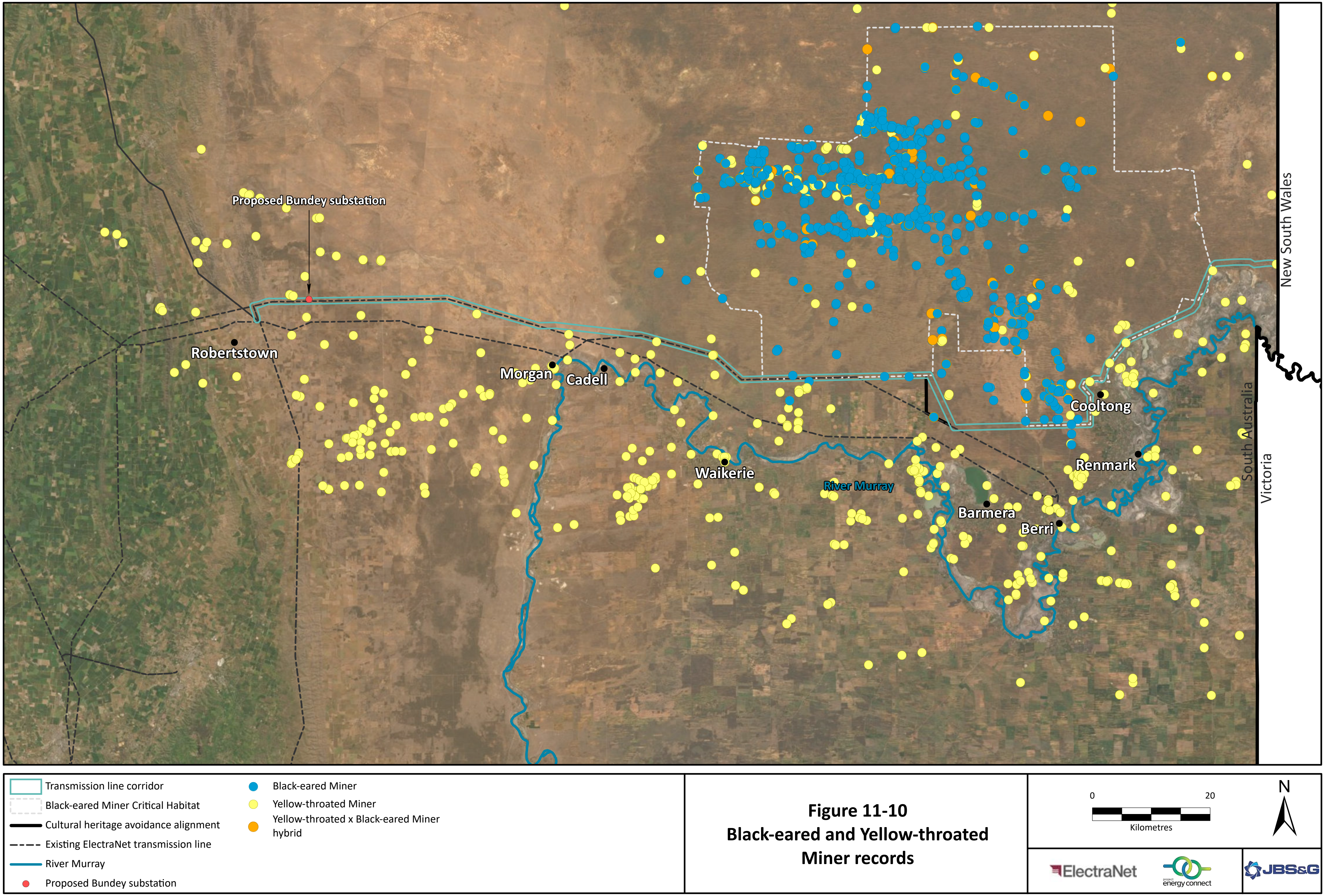


**Figure 11-10**
**Black-eared and Yellow-throated Miner records**

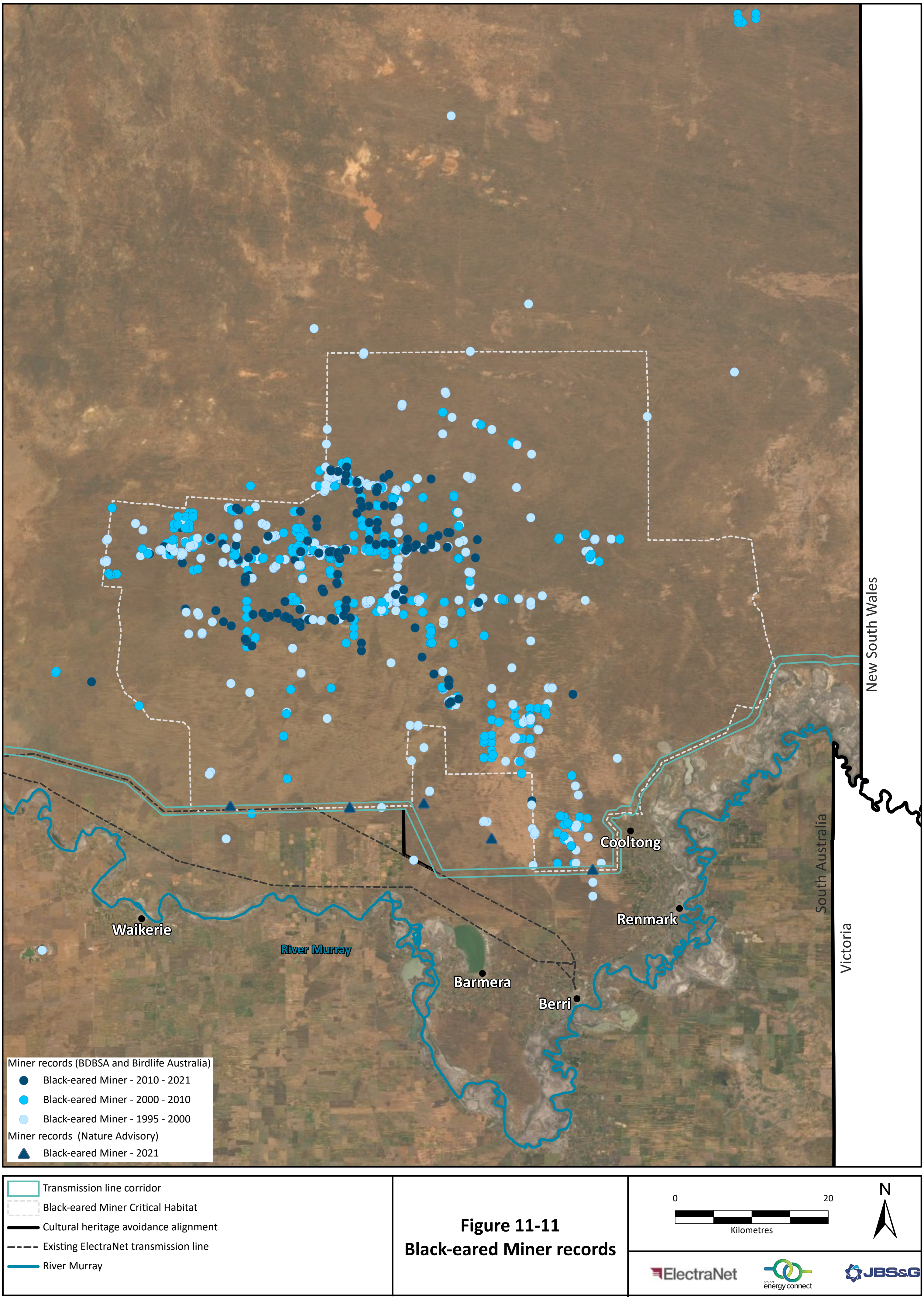


**Figure 11-11**
**Black-eared Miner records**

***Red-lored Whistler*** **(Pacycephala rufogularis)** ***EPBC Vulnerable***

The Red-lored Whistler occurs in the Murray Mallee both north and south of the Murray River, with isolated populations in central-western New South Wales. A small, isolated population in northern Eyre Peninsula appears to have become extinct (DELWP 2016).

The Red-lored Whistler is sedentary or territorial in dense mallee, Broombush (*Melaleuca uncinata*) or Cypress Pine vegetation (Menkhorst et al. 2017). The species has a very large territory of around 100 ha in Spinifex mallee and 20 ha in mallee heath with about 30% overlap with neighbouring territories. The species generally occurs solitarily, with a low population density – about one bird per 50 ha (DELWP 2016). The species mainly forages on the ground or in low shrubbery (Menkhorst et al. 2017).

In South Australia the species occurs in the upper South East, lower Murray Mallee and is widespread in and around the Riverland Biosphere Reserve in an area bounded by Calperum, Sandleton and Canegrass Stations. The population in the Biosphere Reserve was estimated to be about 1000 birds (in 2011), making this probably one of the largest populations (DELWP 2016). In the Riverland Biosphere Reserve Red-lored Whistlers occur over 6 km from water points and their associated grazing impact. However, landscape-scale fires have reduced numbers substantially in recent years in the Riverland Biosphere Reserve as well as Billiatt and Ngarkat Conservation Parks (DELWP 2016).

The majority of the current records in the Riverland Biosphere Reserve are north of or on the edge of areas burnt by wildfire in 2006 and 2014, approximately 15 – 25 km north of the transmission line corridor. However, individuals were observed at one site in Pooginook Conservation Park in recent targeted surveys (Nature Advisory 2021). They are considered to be present in the un-burnt / old growth mallee habitats of the transmission line corridor (including habitat in Taylorville Station), however likely to occur in low abundance at these sites, given the amount of mallee within the transmission line corridor that has been burnt in the last 6 – 14 years (refer Figure 11-4).

***Regent Parrot (eastern)*** **(Polytelis anthopeplus monarchoides)** ***EPBC Vulnerable***

The Regent Parrot has declined throughout the eastern mallee region of Australia over the last 100 years, due to disruption of breeding habitat in red gums along the River Murray and clearing of adjacent feeding areas (Carpenter 2002, Baker-Gabb and Hurley 2011). Threats to breeding habitats include direct clearing and disturbance of nesting sites (which can be in live or dead trees primarily River Red Gums), competition for nest hollows (e.g. cockatoo and other bird species, possums, feral bees), deliberate killing of birds (e.g. perceived as crop pests), road kill and accidental poisoning (Baker-Gabb and Hurley 2011).

This species is restricted to a single population occurring in inland south-eastern Australia, which ranges across the lower Murray-Darling basin region of South Australia, New South Wales and Victoria. Within this range the Regent Parrot occurs in riverine and mallee woodlands and forests (Baker-Gabb and Hurley 2011). There are three separate breeding areas known across the range: in Victoria (Wimmera River Drainage System), Victoria and NSW (mid Murray River between Red Cliffs and Piangil) and in South Australia (lower River Murray from Swan Reach to north-western Victoria (Lindsay Island) (Baker-Gabb and Hurley 2011).

Sub-populations of Regent Parrot in South Australia have been well surveyed and there are detailed counts of colonies and the number of active nests, with data collected two yearly for a number of years (Smith 2001, 2004, 2009 and 2011, all cited in Baker-Gabb and Hurley 2011).

In SA all known breeding colonies are located along the River Murray and feeding sites (within large blocks of intact mallee) are within 5 – 20 km (usually 5 – 10 km) of these areas. Favoured mallee includes Beaked Red Mallee (*E. socialis*) and Ridge-fruited Mallee (*E. incrassata*). Males make 2 – 3 trips per day to feed females on the nest during breeding, using corridors of vegetation (e.g. roadside vegetation) for dispersal to avoid raptors. Between Morgan and the NSW border the transmission line corridor ranges varies in distance from the River Murray (e.g. Morgan 5 km, east of Morgan 4 km, Overland Corner 6 km, Berri 17 km). Hence suitable foraging habitat occurs within the ESA and areas of the transmission line corridor towards the centre and eastern end.

These parrots are known to disperse into the mallee of the Riverland Biosphere Reserve during non-breeding periods. Large aggregations (200 – 500 birds) have previously been observed flying near Berri and Gluepot Reserve (Baker-Gabb and Hurley 2011).

There are records in Pooginook, throughout riverine environments south of the transmission line corridor and some in Gluepot Reserve in mallee habitats north of the transmission line corridor. Whilst not observed in targeted surveys of the transmission line corridor, the species has potential to occasionally forage in mallee habitats in the vicinity of the transmission line corridor (Nature Advisory 2021).

***Malleefowl*** **(Leipoa ocellata)** ***EPBC Vulnerable***

Malleefowl core habitat is semi-arid to arid zone shrublands and low woodlands dominated by mallee. Chenopod mallee is one of the least preferred Malleefowl habitats. Sandy soils and abundant leaf litter are required for breeding. Over the course of a year the birds may range over one to several square kilometres; home-ranges overlap considerably. (National Malleefowl Recovery Team 2019). The largest Malleefowl populations occur WA and SA, but they also occur in NSW and Victoria. Given the large distribution of Malleefowl across Australia, no particular populations have been described as of greater importance for the long-term survival of the species in the Malleefowl Recovery Plan, but there are declines across the range and ongoing objectives to conserve the species (Benshemesh 2007).

This species was previously widely distributed throughout the mallee areas of southern Australia, but is now restricted due to clearance, overgrazing, competition with introduced species and feral predators. Two thirds of the transmission line corridor occurs at the southern extent of the South Olary Plains IBRA bioregion. Mallee in the South Olary Plains IBRA subregion has been less fragmented than that further south. Historically, Forward & Robinson (1996) considered the region to be very important for the species. In this bioregion, Malleefowl are known to occur throughout the extensive areas of open Beaked Red Mallee and Red Mallee (SKM 2002, Carpenter 2002). Malleefowl occur throughout the Cooltong Conservation Reserve and Stony Pinch paddock of Calperum Station. A census of nesting mounds conducted in in the early 2000s suggested the area supported a robust population of Malleefowl (Carpenter 2002).

Only Malleefowl footprints were observed during targeted survey for the Project (Nature Advisory Trust 2021), however given numerous records they are considered to be present within the transmission line corridor and would persist in vast areas of habitat that are adjacent the corridor.

## EPBC listed migratory fauna

The EPBC PMST output highlighted 16 EPBC listed Migratory bird species of which two species (Eastern Curlew and Curlew Sandpiper) are also listed as threatened species and assessed in Table 11-12 above. An additional Migratory species, Caspian Tern (*Hydroprogne caspia*), was also identified as having multiple recent BDBSA records in the ESA, with records in and immediately adjacent to the transmission line corridor. BDBSA and Birdlife records for listed migratory species within transmission line corridor and ESA and are shown in Figure 11-12. Note these are records post 1995 with >1 km spatial reliability.

Table 11-14 below presents the Listed Migratory species with an assessment of the likelihood of their occurrence (or suitable habitat occurring) in or immediately adjacent the transmission line corridor (excluding the two Migratory species which are also threatened, which are covered above). Of the 12 species presented here, three are considered likely and nine are possible to occur within or immediately adjacent (e.g. potential flyover) the transmission line corridor. Further details for three unlikely species are provided in Appendix I-1 (Table 4): Grey Wagtail (*Motacilla cinerea*), Yellow Wagtail (*Motacilla flava*) and Satin Flycatcher (*Myiagra cyanoleuca*).

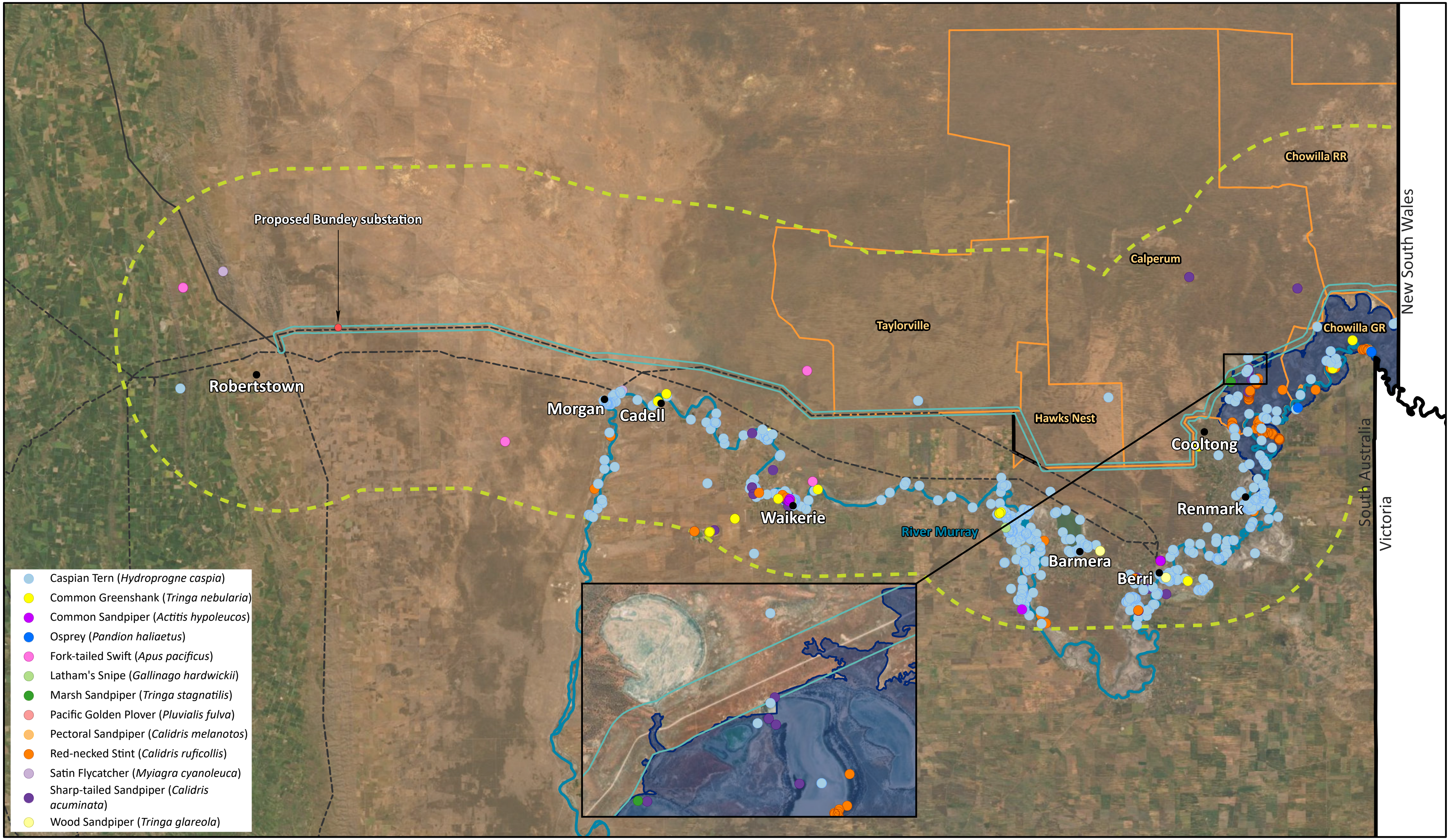


**Figure 11-12**
**EPBC-listed migratory species records in the ecological study area (since 1995)**

**Table 11-14: Likelihood assessment of EPBC listed migratory species that have potential to occur within the transmission line corridor**

| Species name | Common name | Cth[1] | SA[2] | Likelihood | Summary of justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| *Apus pacificus* | Fork-tailed Swift | MM | Not rated | Possible | EPBC PMST suggests likely to occur within area. Highly mobile, almost entirely aerial species, flying < 1 m to 1000 m above the ground – seldom recorded on the ground. Occurs above a wide range of habitats, which vary from rainforests to treeless plains. Numerous records from much of inland and coastal Australia. One recent BDBSA record (2006), 4 Birdlife records (2002, 2003, 2006) within the ESA, no recent records within transmission line corridor.<br>Species unlikely to utilise terrestrial habitat within the transmission line corridor, but may occur as an overfly visitor, given aerial nature. |
| **Migratory Terrestrial (MT)** | | | | | |
| *Actitis hypoleucos* | Common Sandpiper | MW | R | Possible | EPBC PMST suggests may occur within area. Visits Australia from late July to March, solitary or in small groups. Uses a wide variety of habitats with varying levels of salinity. Mostly found around muddy margins or rocky shores and rarely on intertidal mudflats, occurs in coastal wetlands, some inland wetlands, steep sided sewage ponds, shallow muddy edges of inland farm dams, mangrove-lined inlets. Non-core habitat exists adjacent the transmission line corridor and within water habitats of the ESA.<br>There are 4 BDBSA and 9 Birdlife records within the ESA near Waikerie and Berri (Sewage treatment works), no records from the transmission line corridor. Given suitable habitat in the Riverland wetlands and local dams within / adjacent the transmission line corridor, species is considered possible in suitable habitats and potential flyover species. |
| *Calidris acuminata* | Sharp-tailed Sandpiper | MW | Not rated | Possible | EPBC PMST suggests known to occur within area. Migratory wader / shorebird. Breeds in Siberia, migrates to New Guinea and Australia. Occurs in coastal and inland areas, but prefers non-tidal fresh or brackish wetlands. Recorded from wetlands throughout Australia. One of the most numerous migratory shorebirds to occur in fresh to saline inland wetlands, also forages in nearby damp grasslands, sometimes dams.<br>There are 18 BDBSA and 30 Birdlife records within the ESA, from the River Murray and adjoining wetlands, Lake Merretti and no records from the transmission line corridor. Given records and preferred habitat south of the eastern end of the transmission line corridor, considered likely in suitable habitats and potential flyover species. |
| *Calidris melanotos* | Pectoral Sandpiper | MW | R | Possible | EPBC PMST suggests likely to occur within area. Breeds in northern North America and Siberia, and migrates (from late June) to South America and to a lesser extent Australasia. Occurs solitary or in small flocks on freshwater wetlands, grassy or lightly vegetated coastal and inland swamps.<br>Habitat occurs south of the eastern end of the transmission line corridor in the Riverland Ramsar site.<br>Two BDBSA and one Birdlife records and three historical records (1981 and 1987) within ESA (Lake Meretti). Given records and habitat adjacent corridor, considered possible in suitable habitats and potential flyover species. |
| *Calidris ruficollis* | Red-necked Stint | MW | Not rated | Likely | EPBC PMST suggests known to occur within area. Widespread throughout Australia. Occurs on the coast, in sheltered inlets, bays, lagoons, estuaries, intertidal mudflats and protected sandy or coralline shores. Can also occur in saltworks, sewage farms, saltmarsh, shallow wetlands including lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats, flooded paddocks or damp grasslands. Often occur in dense flocks, feeding or roosting. Widespread along the coast of SA and the River Murray, including within the ESA.<br>There are 130 BDBSA and Birdlife records (1999 – 2017) within the ESA, all from the River Murray and Lake Meretti. Species is considered likely in riverine wetland environments and potential flyover species. |

| Species name | Common name | Cth[1] | SA[2] | Likelihood | Summary of justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| *Gallinago hardwickii* | Latham's Snipe | MW | R | Possible | EPBC PMST suggests likely to occur within area. Migratory wader / marsh dweller. Breeds in Japan and summer non-breeding migrant to Australia, primarily along the east coast. Prefers tussock grass and low dense sedges surrounding freshwater wetland, permanent and ephemeral wetlands. Can also occur in habitats with saline or brackish water, in any wetland vegetation (sedges, grasses, lignum, reeds and rushes), in saltmarsh and creek edges on migration and will use crops and pasture when inundated.<br>Three recent records (2006 – 2009) within the ESA, from the River and adjoining wetlands, and historical record (Lake Meretti). Given suitable habitat occurs adjacent the eastern end of the transmission line corridor and limited records, considered possible and potential flyover species. |
| *Hydroprogne caspia* | Caspian Tern | MM | Not rated | Likely | Not suggested by PMST, but multiple recent records within ESA. Migratory marine species that is widespread along Australian Coastlines and inland northern to central-eastern Australia. Occurs in sheltered coastal waters, but also uses inland water bodies, including large rivers, fresh to saline lakes, reservoirs and temporary wetlands. Forages for fish, usually patrolling 15 – 30 m above the water (Menkhorst et al. 2017).<br>Well over 700 BDBSA and Birdlife records in the ESA (1997 – 2019). No records in the transmission line corridor. Records are concentrated around riverine environments of the River Murray near Morgan, Waikerie, the Ramsar Wetland and Lake Merreti. Species is considered likely in riverine environments adjacent the transmission line corridor and potential flyover. |
| *Pandion haliaetus* | Osprey | MW | E | Possible | EPBC PMST suggests likely to occur within area. Raptor, prefers open water foraging habitat and tall woodland nesting habitat. Generally occurs on or near the coast, but also range inland along large rivers, bays, estuaries, along tidal stretches of large coastal rivers, mangrove swamps, terrestrial wetlands and coastal lands of tropical and temperate Australia and off shore islands. Nest in trees (often dead or with dead tops), rocky coastlines and on artificial structures such as telecommunication towers.<br>Preferred habitat of open water bodies, lakes, rivers for foraging are present adjacent the transmission line corridor (eastern end). Will also nest on tall manmade structures, therefore have the potential to move into the corridor once towers are constructed.<br>Majority of SA records are coastal or off-shore (3 Birdlife records (2010, 2012, 2013) within the ESA (Chowilla Game Reserve, homesteads)). Given limited records considered possible in water habitats, have the potential to nest in towers once constructed and potential flyover. |
| *Pluvialis fulva* | Pacific Golden Plover | MW | R | Possible | EPBC PMST suggests known to occur within area. Migratory shorebird. Breeds in Siberia and Alaska, migrates to a number of countries including Australia. Preferred habitat is intertidal sand and mudflat, coastal saltmarsh and rocky shores, will roost in pasture near these water habitats. Range is primarily coastal, with a small population inland, near wetland habitats. Within SA mainly coastal, but occasional inland records. One recent Birdlife record (2001) in ESA (Berri Sewage Pond), two historical records in ESA, no records in transmission line corridor. Given limited records and wetland habitats adjacent eastern end of corridor, considered possible in suitable habitats and potential flyover. |
| *Tringa glareola* | Wood Sandpiper | MW | R | Possible | EPBC PMST suggests known to occur within area. Migratory shorebird. Breeds in Europe to Siberia, migrates to Africa, southern Asia and Australia. Generally occurs in northern Australia (Aug – April). Prefers inland freshwater wetlands with emergent sedges and other small plants, with taller fringing vegetation and rarely on intertidal mudflats. Often occurs solitary or in small clusters near shorelines in mud or shallow water of wetlands. When disturbed will fly very high before wheeling and gliding back to ground.<br>The majority of SA records are from the coast off Gulf St Vincent, Spencer Gulf, and the Coorong region. However, |

| Species name | Common name | Cth[1] | SA[2] | Likelihood | Summary of justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| | | | | | there are 7 Birdlife records within ESA (near Berri / Waikerie), no records within the transmission line corridor. Given limited records and wetland habitats adjacent eastern end of corridor, considered possible in wetland habitats and potential flyover. |
| *Tringa nebularia* | Common Greenshank | MW | Not rated | Likely | EPBC PMST suggests known to occur within area. Migratory wader / shorebird. Breeds in northern hemisphere from Europe to Siberia, summer migrant to Australia, Africa and Asia. Prefers intertidal mudflats, fresh and saltwater wetlands of coast and inland.<br>Widespread in SA, including coastal and inland in estuaries and mudflats, mangrove swamps and lagoons, as well as billabongs, swamps, sewage farms and flooded crops. ESA occurs within known regularly occupied range.<br>Over 30 BDBSA and Birdlife records from the ESA. No records in the transmission line corridor. Given multiple records and habitats adjacent eastern end of corridor, considered likely in suitable habitats and potential flyover. |
| *Tringa stagnatilis* | Marsh Sandpiper, Little Greenshank | MW | Not rated | Possible | EPBC PMST suggests known to occur within area. Migratory shorebird. Breeds in Europe and Asia, migrates to Africa, Southern Asia and Australia. Preferred habitat includes coast and inland fresh or saltwater wetlands, avoids intertidal wetlands, but large numbers can occur along the northern Australian coast (Geering et al. 2008, Menkhorst et al. 2017). Study area occurs in regularly used range (Menkhorst et al. 2017).<br>Records are south of the corridor in riverine habitats. Five Birdlife records within ESA, 5 BDBSA records south of ESA (>25 km). Given limited records and habitat adjacent eastern end of corridor, considered possible in wetland habitats and potential flyover. |

[1] *Environment Protection and Biodiversity Conservation Act 1999* Status: Critically Endangered (CE); Endangered (EN), Vulnerable (VU); Migratory Marine (MM); Migratory Terrestrial (MT); Migratory Wetland (MW)

[2] South Australian *National Parks and Wildlife Act 1972* Status: Endangered (E), Rare (R), Vulnerable (V)

[3] Records from Biological Database of South Australia (BDBSA) / Birdlife Australia September 2019 / 2020 extract, Protected Matters Search Tool (PMST) (species or species habitat potential unless stated, e.g. breeding),

[4] See Appendix I-3 for further justification and references.

### EPBC listed critical habitat

The ESA includes an area listed on the Register of Critical Habitat (maintained by the Minister under the EPBC Act). This Critical Habitat is listed as '*Manorina melanotis* (Black-eared Miner) – Gluepot Reserve, Taylorville Station and Calperum Station, excluding the area of Calperum Station south and east of Main Wentworth Road' (DEH 2004a) (see Figure 11-11). This large area of habitat is over 380,000 ha and occurs within / adjacent the species area of occupancy. The criterion of for listing of this area includes: habitat meets essential life cycle requirements, habitat is used by important populations, habitat is necessary for maintaining genetic diversity (DAWE 2021a).

The transmission line corridor traverses the southern margin of the Critical Habitat area, paralleling existing disturbance corridors along the boundary (i.e. it follows the south-eastern boundary of the defined critical habitat area along Wentworth-Renmark Road and the southern boundary along the Taylorville southern boundary track and the Cooltong boundary track). A previous alignment option traversed the defined Critical Habitat area for approximately 12 km along the Stony Pinch Road north of Cooltong Conservation Park, this area has been avoided by aligning the transmission line further to the south, on the southern boundary of Calperum.

### EPBC Eastern Mallee Bird Community (nominated)

The 'Eastern Mallee Bird Community' has been nominated for Endangered conservation status under the EPBC Act. The assessment process for this community is still in progress (with advice due to the Minister for the Environment by 30 July 2021) and the community is currently not listed.

The bird assemblage associated with this community includes 52 terrestrial native birds that are identified as being dependent on, or strongly associated with, mallee habitats in south-eastern Australia. Iconic species include the Black-eared Miner, Mallee Emu-wren, Malleefowl, Red-lored Whistler and Western Whipbird. The distribution of the community is from south-west New South Wales, north-west Victoria, and from south-east South Australia to the Eyre Peninsula and includes the Murray-Darling Depression IBRA bioregion (DAWE 2021a).

It is expected that the bird community present in mallee habitats in the central and eastern part of the transmission line corridor would qualify as the Eastern Mallee Bird Community.

### State listed fauna

In addition to Commonwealth listed species, there are records for threatened fauna listed under the SA NPW Act within the ESA. Species with records within the last 25 years (excludes EPBC listed species from Table 11-10 and Table 11-12 above) are provided below in Table 11-15 below (likely and possible species) and Table 6 of Appendix I-1 (all species). It should be noted that there were records for several species of fauna that have subspecies with conservation ratings, but the known range of these subspecies is well outside the ESA. As the records are likely to be for the common subspecies, the records have not been included as a listed species (for example, Bluebonnet (Western Subspecies) (*Northiella haematogaster narethae*), rated Rare; Grey Currawong (north western subspecies) (*Strepera versicolor plumbea*) rated Endangered; Jacky Winter (south east subspecies) (*Microeca fascinans fascinans*)).

Of the 61 State listed fauna considered here, 8 are likely, 20 are considered possible and 33 are considered unlikely (of which 20 or so have potential in nearby wetland / riverine habitats). Recent records (1995 onwards) for State listed fauna with less than 1 km reliability are shown in Figure 11-13 below (note that records are concentrated in known conservation areas with higher survey intensity). In addition, it is noted that records are not an indication of abundance since fauna records have originated from a variety of sources (e.g. standard fauna surveys, bird count surveys, nest monitoring) which range from collecting species presence data to estimates of breeding or estimates of abundance, nest activity and some are in repeat locations for long-term / regular surveys).

**Table 11-15: State listed fauna that have potential to occur within the transmission line corridor**

| Species name | Common name | Cth[1] | SA[2] | Likelihood | Summary of justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| **Birds** | | | | | |
| *Ardeotis australis* | Australian Bustard | | V | Possible | Limited recent records. Occurs in open country, dry grasslands, sand plains with spinifex, pasture stubble. |
| *Falco subniger* | Black Falcon | | R | Possible | Wide-ranging. Records from Murraylands and Riverland and Northern and Yorke. |
| *Neophema chrysostoma* | Blue-winged Parrot | | V | Possible | Limited recent records in the ESA, 12 – 24 km from the transmission line corridor. Records spread across eastern SA from the north east to the South East, but records concentrated around the SE. Nests in coastal and subcoastal eucalypt forest and woodland, forages on grassland, saltmarsh, rough pasture. Post-breeding dispersal into semi-arid inland areas. |
| *Burhinus grallarius* | Bush Stonecurlew | | R | Likely | Likely in open mallee over *Atriplex* or Chenopod). Numerous records concentrated in wetland areas adjacent transmission line corridor within Chowilla Game Reserve, and HA 1544. More common in northern Australia, tropics. Occurs in pairs or singly, in grassy woodlands, open forests and grasslands pasture. |
| *Cinclosoma castanotum* | Chestnut Quailthrush | | R | Likely | Multiple records scattered throughout region in reserves and other areas. Inhabits a variety of semi-arid, scrubby habitats in the Murray Mallee, with sandy substrate (e.g. Mallee over Spinifex). Recorded in SNI surveys (SKM 2002). |
| *Neophema elegans* | Elegant Parrot | | R | Possible | Recent records in the ESA. Occurs in a variety of habitats including open woodland, grassland, saltmarsh and rough pasture. |
| *Petroica phoenicea* | Flame Robin | | | Possible | Record 22 km from the transmission line corridor. Core range is southeastern SA an eastern NSW, most of Victoria. Transmission line corridor occurence is irregular range. Habitat is present that would be used by the species; open forest woodland, farmland grasslands, burnt areas. |
| *Pachycephala inornata* | Gilbert's Whistler | | R | Likely | Multiple recent records across the ESA, concentrated mainly in reserves. Occurs in a wide range of habitats, dry scrub and woodland and open *Callitris* woodland *Acacia* thicket. |
| *Melanodryas cucullata cucullata* | Hooded Robin (SE, MM, MLR, AP, YP, MN) | | R | Likely | Records scattered from just north of western end of transmission line corridor to the South East of SA. Occurs in lightly timbered habitats. Recorded in SNI surveys (SKM 2002). |
| *Hieraaetus morphnoides* | Little Eagle | | V | Possible | Possible in transmission line corridor, possible in adjacent wetland habitats. Several records in the ESA. |
| *Lophochroa leadbeateri* | Major Mitchell | | R | Likely | Given transmission line corridor is within species range, likely in semi-arid mallee Mulga habitats. Several records in the ESA. |
| *Falco peregrinus* | Peregrine Falcon | | R | Likely | Wide-ranging, inhabits most environments, prefers cliff face for nesting. Records scattered across ESA. |
| *Lichenostomus cratitius occidentalis* | Purple-gaped Honeyeater (mainland SA) | | R | Possible | Possible, although little known, uses tall heath / mallee habitats. Records are primarily south of the transmission line corridor and concentrated in conservation areas of the Murray. |
| *Myiagra inquieta* | Restless Flycatcher | | R | Possible | Records scattered across the region from north of the transmission line corridor to the MLR, Fleurieu and South East. Widespread in open eucalypt woodland, treed farmland and mallee. Recorded in SNI surveys (SKM 2002). |
| *Petroica boodang boodang* | Scarlet Robin (SE, MLR, FR, EP) | | R | Possible | Records in the ESA are concentrated west of the transmission line corridor. Occurs in open sclerophyll forest and woodland. |

| Species name | Common name | Cth[1] | SA[2] | Likelihood | Summary of justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| *Neophema splendida* | Scarlet-chested Parrot | | R | Possible | Recent records in the ESA in habitats near the River Murray and habitats north of the transmission line corridor. Prefers arid mallee and Acacia woodland with low shrub understorey or recently burnt areas, feeds on ground in low vegetation. |
| *Calamanthus (Hylacola) cauta cauta* | Shy Heathwren (EP, MM, upper SE, YP, FR) | | R | Possible | Uncommon species that occurs in dense understory, including regrowth. Possible in Black Oak Woodland, dense mallee. Recorded in SNI surveys (SKM 2002). |
| *Acanthiza iredalei iredalei* | Slender-billed Thornbill (Western) | | ssp (R) | Possible | Llimited records, some habitat, most of SA range is Eyre Peninsula and Far west in Chenopod and Samphire habitat. Not recorded in SNI surveys or recent surveys (SKM 2002, Nature Advisory 2021). Some suitable habitat at the western end. |
| *Amytornis striatus* | Striated Grasswren | | R | Possible | Known from Murray Mallee region. ESA records are mostly concentrated around Cooltong CP and Pooginook CP, north of Old Calperum and also within HA 1543 and 1544. Occurs in spinifex and Eucalypt open scrub. Considered in recent targeted fauna surveys, given subspecies Mallee Striated Grasswren (*Amytornis striatus striatus*) has potential to be EPBC listed in the future. Species not located during targeted assessments and considered to be declining in the region, but may occur in mallee on sand dunes or mallee with dense *Beyeria opaca* with Spinifex absent (Nature Advisory 2021). |
| *Lophoictinia isura* | Square-tailed Kite | | E | Possible | Limited records, but is wide ranging and suitable habitat would occur. Alignment is in irregular occurrence range, not core range. |
| *Plectorhyncha lanceolata* | Striped Honeyeater | | R | Likely | Records in the ESA concentrated along River Murray habitats conservation areas north and south of the transmission line corridor. Inhabits tall open woodlands and open mallee. Recorded in SNI surveys (SKM 2002). |
| *Haliaeetus leucogaster* | White-bellied Sea Eagle | LM | E | Possible | Most known nesting pairs occur along the Australian coast. SA nesting sites area coastal SA (e.g. Eyre Peninsula, Kangaroo Island) (Dennis et al. 2011, Menkhorst 2017). Records in ESA are primarily from riverine environments or flying over adjacent habitats. Considered as possible to occur foraging in riverine environments and habitats adjacent the transmission line corridor. |
| *Climacteris affinis superciliosa* | White-browed Treecreeper (FR, LNE, MM) | | SP (R) | Possible | Records in northern part of ESA and beyond. Prefers semi-arid woodlands, tall shrublands, Mulga, Native Pine and Sheoak, uncommon in eucalypt woodlands. Known to occur in Blackoak Woodlands of Chowilla Station near the NSW border not recorded in SNI surveys (SKM 2002) or mallee bird report (Nature Advisory 2021). |
| *Corcorax melanorhamphos* | White-winged Chough | | R | Likely | Records spread across the ESA and in transmission line corridor. Occurs in open forest, woodland, mallee where understorey is sparse and leaf litter is productive. Recorded in SNI surveys (SKM 2002). |
| **Mammals** | | | | | |
| *Chalinolobus picatus* | Little Pied Bat | | E | Possible | Possible in Riverland Biosphere Reserve habitats. Few records in the ESA, records in SA are primarily from Riverland Biosphere Reserve (northern Calperum Station) in the Chowilla (RR), which is at the south-western extent of the range. Roosts in trees, caves, abandoned mines and buildings. Prefer hollows in large mature trees with dead limbs, or dead fallen trees with hollowed stump. Can roost in small or large colonies and have been known to travel 35 km round trip to foraging sites (Churchill 2008). Possible in *E. gracilis* to *E. oleosa* low woodland and / open woodland (SKM 2002). |

| Species name | Common name | Cth[1] | SA[2] | Likelihood | Summary of justification for likelihood of occurrence within transmission line corridor |
|---|---|---|---|---|---|
| *Saccolaimus flaviventris* | Yellow-bellied Sheath-tailed Bat | | R | Possible | Possible, but unlikely given few records in SA, one record in ESA. Wide ranging through northern WA, NT, Qld, NSW, Vic and eastern SA. Prefers tropical habitats, but also extends into temperate areas. Roosts in large tree hollows or wet and dry sclerophyll forest to open woodland, Acacia shrubland, mallee, grasslands and desert (Churchill 2008). |
| *Trichosurus vulpecula* | Common Brushtail Possum | | R | Possible | Multiple records across SA in urban built-up areas, MLR and KI, but less common in natural environments. Records concentrated along the River Murray. Utilises hollows in live and dead eucalypt trees. Records in the ESA primarily south of the transmission line corridor. |
| **Reptiles** | | | | | |
| *Morelia spilota* | Carpet Python | | R | Possible | Possible in transmission line corridor, but more likely in adjacent riverine environments. Occurs across multiple habitats from rainforest to semi-arid coastal and inland habitats. ESA records in riverine habitats along the River Murray corridor. |

Note where there are large numbers of records there is potential for duplicate BDBSA / Birdlife records, records have not been checked for duplication, hence conservative numbers are provided

[1] Environment Protection and Biodiversity Conservation Act 1999 Status: Critically Endangered (CE); Endangered (EN), Vulnerable (VU); Migratory Marine (MM); Migratory Terrestrial (MT); Migratory Wetland (MW);

[2] South Australian National Parks and Wildlife Act 1972 Status: Endangered (E), Rare (R), Vulnerable (V);

[3] Records from Biological Database of South Australia (BDBSA) and Birdlife, Recordset number DEWNRBDBSA190902-2, September 2019; Recordset number DEWNRBDBSA201201-1, November 2020, Protected Matters Search Tool (PMST) (species or species habitat potential unless stated, e.g. breeding, Atlas of Living Australia

[4] References generally from Menkhorst et al. 2017, Simpson and Day 2010, Geering et al . 2008, SPRAT profiles.

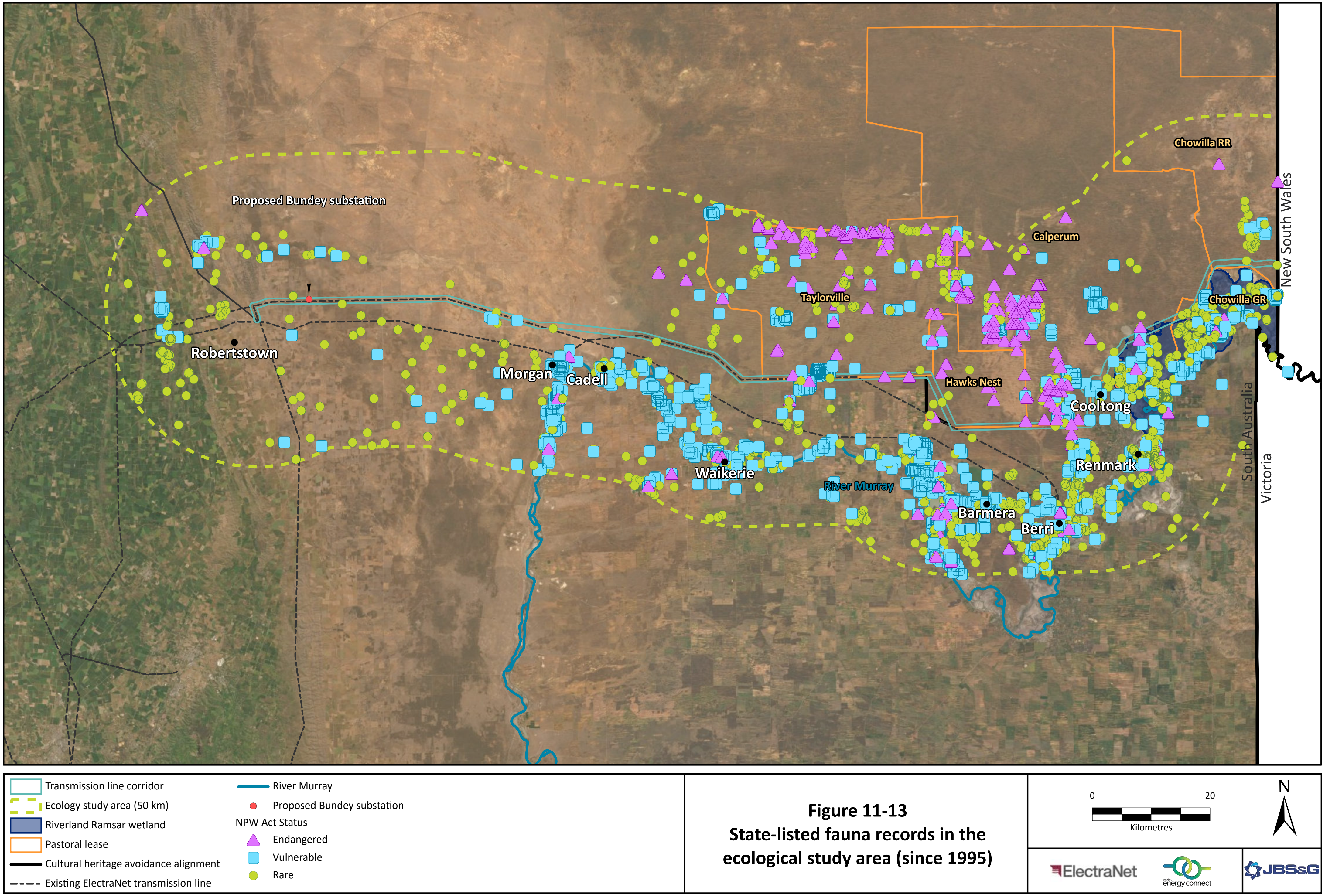


**Figure 11-13**
**State-listed fauna records in the ecological study area (since 1995)**

### Regional / local threatened species

There are records for approximately 57 species with regional conservation status in the ESA. Some of these species are also EPBC listed as threatened and / or migratory, and State conservation status under the NPW Act. This includes species with regional status as follows: 16 Critically Endangered, 10 Endangered, 4 Vulnerable, 23 Rare, 5 Near Threatened, 2 Least Concern and 3 Data Deficient. These species and their various conservation ratings are summarised in Table 7 of Appendix I-1. Where these species also have State or migratory ratings, likelihood of occurrence is considered in Table 11-14 above and Table 11-15 below, with further detail in Tables 4-6 of Appendix I-1.

### Wetland Birds

As noted earlier in Chapter 10 Physical Environment and above in Section 11.3.1, wetlands that form part of the Riverland Ramsar site are located south of the eastern extent of the transmission line corridor. Two studies have described the avifauna values of the Riverland site wetlands and considered the likelihood and consequences of potential impacts to wetland birds as a result of Project EnergyConnect (Carpenter 2002, Jacobs 2021, provided in Appendix I-5).

Of the 74 species considered most recently by Jacobs (2021), 38 species are regularly recorded during monthly count surveys within the Riverland wetlands. Bird types that occur at the wetlands include common waterbirds (ducks, swans, grebes, cormorants, pelicans, egrets and herons, ibis and spoonbills, crakes, rails and waterhens. There are also threatened waterbirds that are known to utilise wetland habitats (e.g. Nationally Endangered Australasian Bittern and Australian Painted Snipe) as well as migratory and resident shorebirds, and raptors. Wetlands can support significant numbers of waterbird species (primarily common species), depending on seasonal conditions or management conditions that alter the hydrological regime (e.g. wet and dry cycles) of the wetland resulting in preferable conditions.

Colonial nesting waterbirds (e.g. egrets, ibises, pelicans, cormorants and herons) require substantial floods or inundation to support large breeding events in floodplain wetlands. Non-colonial waterbirds (e.g. waterfowl, grebes, crakes, rails and waterhens) do not generally congregate to breed, but are still dependent on wetland habitat for foraging and nesting habitat to raise young (NSW OEH 2018).

Migratory shorebirds that disperse to non-tidal wetlands (inland systems) tend to show more dispersive behaviour than species that refuge in coastal mangrove areas during high tide (e.g. Whimbrel, Terek Sandpiper and Grey-tailed Tattler). Inland wetlands and grasslands that are important for migratory shorebirds are generally ephemeral, hence occupation varies depending on recent climate and rainfall. Some of these areas may not be used for several years, but are then very important and productive following rain (e.g. Lake Eyre in northern South Australia) (DoEE 2017).

Table 8 of Appendix I-5 summarises species, records and maximum counts at the Riverland wetlands from 2000 to 2015. This information was used to conduct a high-level risk-based assessment considering both likelihood and consequence factors for individual species.

## 11.3.7. Pest flora and fauna

### Regional weeds

Similar to other regions of South Australia, historical vegetation clearance and impacts of prolonged grazing and altered fire regimes are key threatening processes to biodiversity (e.g. flora, fauna and habitats) of the region. Weed (exotic species) further contribute to degradation processes within native habitat. The transmission line corridor spans two Landscape Management Regions: Northern and Yorke and Murraylands and Riverland. In these regions pest plants that pose a significant threat to agriculture, the natural environment and public health and safety are listed as declared plants under the under the *Landscape South Australia Act 2019,* and there are legal obligations for their control.

In the Northern and Yorke region priority weeds are outlined in factsheets and Weed Action Plans for three districts; the western end of the transmission line corridor occurs in the Southern Flinders Upper North District. Priority plants of this region include Weeds of National Significance (WoNS) (e.g. Silverleaf nightshade *Solanum elaeagnifolium*), Bridal creeper *Asparagus asparagoides*, Wheel cactus *Opuntia robusta*, African Boxthorn *Lycium ferocissimum*), Wild olives *Olea europaea*) and Declared Weeds (e.g. Buffel Grass *Cenchrus ciliaris,* Caltrop *Tribulus terrestris*, Horehound *Marrubium vulgare*, Lincoln weed *Diplotaxis tenuifolia*, Innocent weed *Cenchrus longispinus and C. incertus* and Creeping Knapweed *Rhaponticum repens* ( Landscapes South Australia 2020a).

Priority weeds in the Murraylands and Riverland region include 41 Declared Weeds, 3 State Alert Weeds (Broomrape *Orobanche spp.*, Salvinia *Salvinia molesta,* Water Hyacinth *Eichhornia crassipes*) (notify immediately if found, and one Alert Weed (Buffel Grass, to be Declared for this region within 12 months). Buffel Grass is currently controlled as soon as it is found in the region and presents a significant and ongoing risk to the region. Buffel grass is a pasture plant that forms a continuous flammable ground layer. It can carry intense and extensive fires at much shorter intervals that the native understory, altering native plant communities over time (Landscapes South Australia 2020b). Buffel Grass has not been detected during the surveys of the transmission line corridor to date.

### Transmission line corridor weeds

As mentioned earlier there are records for 22 exotic species within the transmission line corridor (BDBSA 2020). Three of the exotic species are Declared weeds: Salvation Jane (*Echium plantagineum*), African Boxthorn (*Lycium ferocissimum*) and Horehound (*Marrubium vulgare*).

Two declared weeds were observed within the transmission line corridor (African Boxthorn *Lycium ferocissimum* and Horehound *Marrubium vulgare*). African Boxthorn, which is also a Weed of National Significance (WoNS) was recorded at three sites (isolated plants at each site). These sites are all at the far western end of the transmission line corridor (road reserve adjoining the Robertstown Substation, and within a formerly cropped paddock 3 km away from the Substation). Horehound was recorded at three sites, in low densities at the western end of the alignment in paddocks that were intermittently cropped.

In addition to African Boxthorn and Horehound, another 23 weed species were recorded within the transmission line corridor (Table 11-16). The most frequently recorded weeds were Ward's Weed (*Carrichtera annua*) (17 sites) and Medic species (*Medicago spp*.) (13 sites), with Wild Sage (*Salvia verbenaca*) and Onion Weed (*Asphodelus fistulosus*) the next most frequent (9 sites and 6 sites respectively). Whilst these weeds were common and widespread weeds they are considered to be of relatively low threat to intact areas of native vegetation, and were largely associated with areas of past clearance and / or higher grazing pressures.

In general weed diversity and abundance within the transmission line corridor and adjacent areas was low. Weeds were recorded in 40 of the total 94 BAM sites surveyed and in 35 of the 72 BAM sites located within the transmission line corridor.

Weed abundance was greatest at the western end of the alignment, which traversed areas of intermittently cropped paddocks. Common weeds at the western end included the aforementioned four species of widespread weeds. Weeds confined to the far western end were typically agricultural weeds (e.g. Horehound, Wild Oats (*Avena fatua*), Brome Grass (*Bromus* sp.), Saffron Thistle (*Carthamus lanatus*) and Stemless Thistle (*Onopordum acaulon*)). These weeds are not considered to be of high threat to areas of intact native vegetation.

The middle third of the transmission line corridor contains large tracts of mallee on sandy or sandy loam soils, much of which is not grazed by domestic stock. Weeds in this section were either absent or largely confined to existing vehicle tracks and of low environmental threat, particularly Wild Sage.

The eastern third of the corridor is dominated by large areas of Blackbush (chenopod) shrubland, and Hopbush (*Dodonaea viscosa* ssp. *angustissima*) shrubland on dunes, interspersed with smaller areas of mallee, Black Oak Woodland. At the time of survey, weed diversity and abundance was generally low, primarily including Medic species and Wild Sage.

**Table 11-16: Weeds recorded from BAM sites within transmission line corridor and ESA**

| Species Name | Common Name | Number of BAM sites recorded at in TLC | Number of BAM sites recorded at in TLC / ESA | Environmental threat Rating[3] |
|---|---|---|---|---|
| *Lycium ferocissimum*[1,2] | African Boxthorn | 3 | 3 | 4 |
| *Hordeum vulgare* | Barley | 2 | 2 | 1 |
| *Hordeum* sp. | Barley-grass | 1 | 1 | 1 |
| *Bromus* sp. | Brome Grass | 0 | 1 | 2 |
| *Erodium cicutarium* | Cut-leaf Heron's-bill | 1 | 1 | 2 |
| *Erodium* spp. | Heron's-bill | 2 | 4 | 2 |
| *Marrubium vulgare*[1] | Horehound | 2 | 2 | 3 |
| *Mesembryanthemum crystallinum* | Iceplant | 1 | 1 | 2 |
| *Centaurea melitensis* | Maltese thistle | 1 | 1 | 2 |
| *Psilocaulon granulicaule* | Match-head Plant | 2 | 2 | 2 |
| *Medicago* sp. | Medic | 9 | 13 | 2 |
| *Asphodelus fistulosus* | Onion Weed | 6 | 6 | 2 |
| *Heliotropium europaeum* | Potato Weed | 3 | 3 | 1 |
| *Carthamus lanatus* | Saffron Thistle | 3 | 4 | 2 |
| *Hordeum marinum* | Sea Barley-grass | 1 | 1 | 1 |
| *Limonium* sp, including *Limonium lobatum* | Sea-lavender | 4 | 4 | 2 |
| *Medicago minima* | Small Burr-medic | 1 | 1 | 2 |
| *Hypochaeris glabra* | Smooth Cat's Ear | 1 | 1 | 2 |
| *Onopordum acaulon* | Stemless Thistle | 2 | 3 | 3 |
| *Moraea setifolia* | Thread Iris | 3 | 3 | 2 |
| *Rostraria pumila* | Tiny Bristle-grass | 5 | 5 | |
| *Nicotiana glauca* | Tree Tobacco | 2 | 2 | 2 |
| *Carrichtera annua* | Ward's Weed | 16 | 17 | 1 |
| *Sisymbrium* sp. | Wild Mustard | 4 | 4 | 1 |
| *Avena fatua* | Wild Oat | 2 | 2 | 2 |
| *Salvia verbenaca* var. | Wild Sage | 9 | 9 | 2 |
| *Brassica* sp. | Wild Turnip | 0 | 1 | 2 |

[1] Declared Weed, [2] Weed of National Significance, [3]Environmental threat rating as per Appendix 11 of NVC 2020b.

## Regional pest animals

Additional threats to the region's biodiversity include the presence of introduced animals as well as some native animals that occur in high numbers. Impacts include directly preying on native animals, displacing native animals or competition for food and habitat resources, land degradation and removal of palatable plant species (DEH2001, Foulkes and Gillen 2000). The distribution of some weed species can also be exacerbated by the activities of introduced species, further impacting the degradation of areas of native vegetation.

In the SA Murray-Darling Basin region the main introduced animals that impact biodiversity in terrestrial areas and are listed as key threatening processes include Feral Rabbit (*Oryctolagus cuniculu*), Feral Goat (*Capra hircus*), European Red Fox (*Vulpes vulpes*) and Feral Cat (*Felis catus*) (DEH 2001).

Other pest animals common in the ESA include House Mouse (*Mus musculus*), Black Rat (*Rattus rattus*), Feral Sheep (*Ovis aries*), Feral Cattle (*Bos taurus*), House Sparrow (*Passer domesticus*), Eurasian Skylark (*Alauda arvensis*), European Goldfinch (*Carduelis carduelis*), Feral Pigeon (*Columbia livia*), Spotted Dove (*Spilopelia chinensis*), Common Starling (*Sturnus vulgaris*) and Common Blackbird (*Turdus merulai*). There are also small numbers of records (i.e. less than 10 in the last 20 years) for Feral Dog / Dingo (*Canis lupus*), Fallow Deer (*Cervus dama*), European Brown Hare (*Lepus europaeus*) and Feral Pig (*Sus scrofa*) (BDBSA 2019).

Native animals that occur in large numbers in the region and impact the environment through grazing and intensive foraging include the Western Grey Kangaroo (*Macropus fuliginosus*), Galahs (*Macropus fuliginosus*) and Little Corellas (*Cacatua sanguinea*) (DEH 2001).

Pests

Evidence of rabbit presence were observed from the western and eastern portions of the transmission line corridor. At the western end, rabbit scats were recorded only in paddocks that were intermittently cropped. However, evidence of rabbit density and extent was relatively high at the eastern end of the transmission line corridor. In this area rabbits were commonly associated with red dunes supporting Blackbush (*Maireana pyramidata*), Native Pine (*Callitris gracilis*) and / or Hopbush (*Dodonaea viscosa* ssp *angustissima*). At the eastern end of the alignment rabbits were also recorded in areas of Red Mallee (*Eucalyptus oleosa*) and *E. gracilis* (Yorrell) Mallee and in Black Oak (*Casuarina pauper*) Woodland on red loams or sandy loam soils.

Goats were only observed once during surveys of the transmission line corridor, in the centre third, in a large tract of mallee. Goat scats were rarely recorded throughout the surveys. Fox scats were recorded only from the western end of the transmission line corridor in a cropping paddock. Kangaroos were present throughout the alignment with kangaroo scats being an obvious presence at all sites.

At the western and eastern end of the transmission line corridor, large areas were grazed by domestic stock, kangaroos and rabbits. The area was surveyed during a prolonged period of low rainfall, hence total grazing pressure at sites in these areas was generally high. The relative grazing impact by individual vertebrates was not assessed during the survey. In general, grazing impacts were not significant in the middle of the transmission line corridor and vertebrate pest presence was less obvious.

### 11.3.8. Pathogens

Phytophthora (‘root rot’) is a plant disease that is caused by many species of soil fungus; *Phytophthora cinnamomi* is the most destructive and common species that occurs in South Australia. There are a range of susceptible plants, particularly in higher rainfall areas (e.g. Mount Lofty Ranges, lower South East of SA). Common susceptible plants include some Eucalypts (e.g. *Eucalyptus baxteri* and *E. obliqua*), Grass-trees (*Xanthorrhoea* species), some Banksias (*Banksia* spp.) and some Wattles (*Acacia spp.*). Activities that can spread the pathogen or introduce it to an area include earthworks, movement of machinery or livestock from infected areas, recreational activities, revegetation activities and fire management activities (Landscape South Australia 2006).

There are no *Phytophthora* records within the transmission line corridor or the ESA (DEW 2021a). The nearest unconfirmed records are in the Mount Lofty Ranges in Kaiserstuhl Conservation Park. Given the average annual rainfall of the region is less than 400 mm, and the lack of records *Phytophthora,* it is unlikely to occur. The ESA occurs in an area mapped as ‘no apparent risk of infestation’ in the *Phytophthora Management Guidelines* (Phytophthora Technical Group 2006). Similarly, the ESA is also mapped as nil or very low risk in DPTI Phytophthora (Dieback) Control documentation (DPTI 2017).

Mundulla Yellows is a fatal tree disease that was first observed in the vicinity of Mundulla, South Australia in the 1970's and has now been identified in all States, including Tasmania (DAWE 2021b). The dieback disease has been observed in a range of Eucalypt species, particularly in modified landscapes, and also occurs in Sheoaks (*Allocasuarina spp.*), Banksias and Wattles. To date areas that have undergone significant disturbance such as farmland, roadsides and urban parks support vegetation with symptoms of the disease. A multi-disciplinary study on Mundulla Yellows found that it is caused by a complex interaction of soil properties (texture and parent material), nutrients, soil compaction, water availability, increased alkalinity and salinity, and the accumulation of bicarbonate in the soil solution (DEH 2004b).

Field surveys for Project EnergyConnect have not detected evidence of Mundulla Yellows. Whilst dieback is known for the Landscape Regions of the transmission line corridor, it has not currently been associated with Mundulla Yellows. For example, dieback of River Red Gums in the Northern Yorke is localised and considered to be related to lerp (insect) attack and climatic conditions (Landscapes South Australia 2016).

## 11.4. Impact Assessment

The following Project aspects have been identified as sources of ecological impacts:

- vegetation clearance and land disturbance required for construction and operation of the Project
- construction activities including vehicle and machinery movement and the presence and activity of personnel
- the presence of the transmission line within the environment following construction
- operational activities associated with the Project including inspection and maintenance activities along the easement.

The potential impact events resulting from these aspects of the Project are discussed below. Predicted impact categories and an evaluation of uncertainty of each impact event are also provided.

### 11.4.1. Clearance of vegetation and habitat

#### Vegetation clearance

**Approximately 413 hectares of native vegetation will be cleared during construction (based on upper estimates of 135 ha permanent and 278 ha temporary disturbance). This represents a very small proportion of native vegetation in the region traversed by the Project, and will be offset by achieving a 'Significant Environmental Benefit' in accordance with the *Native Vegetation Act 1991***

***Construction***

Vegetation clearance will be required for the construction of towers, the Bundey substation, new access tracks and temporary facilities (e.g. temporary laydown areas / staging sites and worker construction camps). Upper estimates for land disturbance in Chapter 7 Project Description indicate that approximately 413 ha of land may be disturbed, with 135 ha of permanent disturbance and 278 ha of temporary disturbance that will be rehabilitated following completion of construction. Vegetation clearance in vegetation communities along the transmission line has been conservatively estimated at 2 hectares per kilometre of the transmission line, using these upper estimates and based on the assumption that all land disturbed contains some native vegetation.

It is noted that this clearance estimate is likely to be higher than the final vegetation clearance required, as it uses upper estimates for all Project components, and does not take into account the preferential use (where feasible) of disturbed areas with no or poor quality native vegetation (e.g. existing access tracks and firebreaks and the Bundey substation site). Some components (e.g. temporary facilities) have greater flexibility in placement and are likely to be able to utilise disturbed areas to a large extent. Vegetation clearance for temporary facilities will only occur if there are no suitable existing cleared areas in proximity to the work areas and access tracks.

As noted in Chapter 7 Project Description, existing access tracks are present along much of the alignment (generally along fences or existing transmission lines) and will be utilised where feasible. However, the use of these existing tracks has not been assumed for estimates of permanent clearance, as there may be constraints in some locations (e.g. height clearance limitations under existing transmission lines) that restrict their use. Also, in most locations there will be a requirement to maintain suitable offset distances from adjacent transmission lines where present (to meet safety requirements) or from property boundaries (to avoid both the easement and the required electrical clearance zone around the conductors overlapping into adjacent properties). This will result in tower pads (and the centreline of the alignment) generally being offset from the existing tracks and fence lines (as shown in Figure 7-11). As these aspects will not be refined until the detailed design phase, the upper estimate of clearance has been used. Measures that will be implemented to minimise and mitigate vegetation clearance are discussed further below.

Primary access to the easement will preferentially utilise existing public and private roads and tracks on the properties traversed by the Project and adjacent properties (including the access tracks and easement used to maintain ElectraNet's existing 132 kV transmission lines) as noted in Section 7.5.5. Some of these tracks may require maintenance or upgrade (in consultation with the landholder) to facilitate construction access, however it is expected that vegetation clearance requirements will be very limited (and within the scope of clearance permitted for existing roads and tracks under the Native Vegetation Regulations).

The vegetation communities traversed by the transmission line corridor and the upper estimate of clearance in each community is summarised in Table 11-17. The impacted vegetation is representative of seven Bushland Condition Monitoring (BCM) communities. Further detail is provided in Appendix I-6 (Native Vegetation Clearance Data Report). Table 11-18 shows the estimated condition of the vegetation that would be cleared (based on field assessments using the NVC Bushland Assessment Method (BAM) (NVC 2020b)). Compared to the extent of regional remnant vegetation, the estimated clearance for the Project represents a very small proportion, as summarised in Table 11-19.

The proposed Bundey substation site will require clearance of heavily grazed low open shrubland and grassland with sparse native ground cover. The site is in relatively poor condition, with condition scores at BAM sites across the land parcel of 25.7, 33.3 and 41.4 (scores in the 'low' and lower end of 'medium' categories).

Cultural Heritage Avoidance Alignment

The proposed alignment traversing Hawks Nest Station was adjusted late in the preparation of this EIS to avoid Aboriginal cultural heritage sites, as discussed in Chapter 4 Route Selection and Chapter 12 Cultural Heritage. The new alignment traverses the same vegetation communities as the transmission line corridor, however it is slightly longer (by approximately 1.3 km). Consequently, it may result in a marginal increase in the area of land disturbance and vegetation clearance, dependent on the extent that existing access tracks can be utilised. However, as it follows existing disturbance to a greater extent (along the station boundary fence and the ElectraNet transmission line), the overall level of impact to vegetation and habitats is expected to be lower.

**Table 11-17: Estimates of clearance of vegetation communities**

| Bushland condition monitoring community | | Approx. area of clearance (ha)[1] |
|---|---|---|
| MDBSA 1.1 | Open woodland with arid adapted shrubland on limestone | 15.8 |
| MDBSA 1.1 | Degraded forms of MDBSA 1.1 (e.g. primarily present as Spear-grass Grassland with emergent shrubs / trees) | 28.0 |
| MDBSA 1.2 | Tall Shrubland with Open Arid adapted Understorey on Limestone Plains | 3.4 |
| MDBSA 2.1 | Open mallee / low open woodland with Chenopod shrub understorey | 42.4 |
| MDBSA 2.2 | Chenopod Open Shrublands | 91.1 |

| Bushland condition monitoring community | | Approx. area of clearance (ha)[1] |
|---|---|---|
| MDBSA 3.1 | Mallee with Very Open Sclerophyll / Chenopod Shrub understorey | 71.3 |
| MDBSA 3.1 | Degraded forms of MDBSA 3.1 (e.g. primarily present as Spear-grass Grassland and / or Short-leaved Bluebush Low (very) Open Shrubland | 12.0 |
| MDBSA 4.1 | Mallee with open shrub understorey on tall red-sand dunes or deep sand flats | 4.8 |
| MDBSA 4.2 | Mallee with understorey dominated by Triodia on moderate / low sand dunes | 114.6 |
| MDBSA 4.3 | Shrublands on low and / or isolated red-sand dunes | 12.7 |
| MDBSA 9.1 | Degraded forms of MDBSA 9.1 Woodlands with an open grassy understorey | 7.1 |
| MDBSA 10.8 | River Box Woodlands with Saline Tolerant chenopod Understorey | 0.5 |
| MDBSA 10.11 | Low Woodlands / Shrublands of River Terraces / Inland Drainage Lines | 0.5 |
| MDBSA 11.6 | Semi-saline shrublands of river cliffs, floodplains, depressions and drainage lines | 5.0 |

[1]Based on upper estimate land disturbance of 2 ha/km

**Table 11-18: Condition of vegetation that will require clearance**

| Condition Category | BAM Condition Score | Total length within TLC (km) | Approx. area of Clearance[1] (ha) |
|---|---|---|---|
| Very Low | <20 | 8.7 | 17.4 |
| Low | 20 – 35 | 62.4 | 124.8 |
| Medium | 36 – 55 | 71.1 | 142.2 |
| High | 56+ | 62.5 | 125 |

[1]Based on upper estimate land disturbance of 2 ha/km

**Table 11-19: Estimates of IBRA subregions that would be cleared**

| IBRA Bioregion | IBRA Subregion | Remnancy (ha)[2] | Approx. Area of Clearance (ha)[3] | Clearance % of IBRA Subregion Remnant Vegetation |
|---|---|---|---|---|
| Murray-Darling Depression (MDD) | South Olary Plain[1] | 1,182,461(97%) | 219.7 | 0.02% |
| | Braemer[1] | 966,276 (100%) | 42.8 | 0.004% |
| | Murray Mallee | 445,437 (21%) | 97.1 | 0.02% |
| Flinders Lofty Block (FLB) | Broughton[1] | 103,292 (10%) | 10.2 | 0.01% |
| Riverina (RIV) | Murray Scroll Belt[1] | 93,218 (56%) | 40 | 0.04% |

[1]Areas not updated to IBRA version 7, as per NatureMaps (DEW 2021a)
[2]Remnancy % from Bushland Score Sheet version 2020, hectares derived from IBRA mapping layer NatureMaps (DEW 2021a )
[3]Based on upper estimate land disturbance of 2 ha/km.

### *Operation*

As discussed in Section 7.8.7, vegetation management will be required during operation to maintain access to specific locations such as towers, and in areas where vegetation will encroach on the clearance zone underneath the transmission line conductors (as required under the Electricity (Principles of Vegetation Clearance) Regulations, which will need to be amended to account for 330 kV lines, as discussed in Section 7.8.7). It is planned to design the line to span across mature vegetation with minimal clearance required where feasible, however clearance or lopping of trees under the conductors may be required in some areas.

Preliminary calculations have indicated that trees up to a height of approximately 8 m may be able to be spanned without trimming. Field observations have indicated that mallee on the transmission line corridor was rarely greater than 8 – 9 m maximum height, indicating that trimming requirements may be very limited in most areas. Local topography between towers (e.g. sand dune ridges) may result in the need for some vegetation trimming mid-span. This will be confirmed when detailed line design is undertaken.

*Significance and mitigation*

The vegetation communities present on the proposed alignment are common and widespread in the region and extensively represented in areas managed for conservation. As indicated in Table 11-19, the estimated vegetation clearance represents a very small proportion of remnant vegetation in the region. As noted below, the mallee vegetation present along the central part of the transmission line corridor provides valuable habitat, particularly for threatened mallee birds, however the potential impacts are mitigated as far as practicable by the route selected as well as the very small proportion of habitat that will be impacted.

As discussed in Chapter 4 Route Selection, a comprehensive route selection process has been undertaken to ensure that technical, engineering, environmental, social, land access, and economic factors have been appropriately considered. The Project has used the mitigation hierarchy as a driving principle throughout the route selection process to minimise impacts on flora and fauna. The resulting alignment predominantly follows existing disturbance corridors and follows the boundary of the mallee habitats and the Riverland Biosphere Reserve, which will minimise potential impacts as a result of clearance and fragmentation. A range of measures will be implemented during detailed design and construction to minimise vegetation clearance, including the following:

- detailed design of the alignment will aim to avoid traversing isolated patches of vegetation where feasible (e.g. at the western end of the transmission line corridor)
- pre-clearance surveys will be undertaken to 'micro-site' tower locations and other infrastructure to avoid occurrences of threatened plants or other significant features (e.g. active Malleefowl mounds)
- areas where native vegetation is degraded or has been previously cleared will be utilised in preference to clearing vegetation wherever practicable
- existing access tracks will be used for access along the easement as far as possible
- tracks will be designed to take the shortest route (with the potential to use short spur tracks off existing roads or access tracks) and with as little impact as possible to native vegetation, existing land uses and landholders
- tracks will be restricted to the minimum width necessary to allow safe access (typically 5 m)
- temporary worker camps will be sited in disturbed / cleared areas or in areas with limited native vegetation
- other temporary facilities (e.g. temporary laydown areas / staging sites) will be sited in disturbed areas or in areas with limited native vegetation as far as practicable
- where feasible, vegetation will be rolled or trimmed rather than being completely removed
- preparation of the stringing access corridors between tower locations will typically be undertaken using a dozer with blades raised to remove larger trees while keeping shrubs, grasses and topsoil largely intact, or rolled where possible
- larger trees in the stringing access corridors may be cut off above ground level with rootstock left intact to allow regeneration rather than being removed where practicable
- removal of larger trees (e.g. trunk diameter over 30 cm) will be avoided where possible (noting that sites such as access tracks, tower locations, helicopter staging sites and some brake and winch sites will require complete removal of vegetation)
- pads for tower assembly will be restricted to the minimum size necessary
- the line will be designed to span across mature vegetation (with minimal clearance required) where feasible.

In addition, use of helicopters during construction will be considered during detailed design and may be used through sensitive areas with difficult access, such as Calperum Station and Taylorville Station, subject to health and safety, commercial and technical feasibility. It is expected that this method would reduce construction footprints and required vegetation clearance.

Following the completion of construction activities, areas of temporary disturbance will be rehabilitated. Pads used for tower construction would be reduced in size, as a much smaller cleared area (typically 25% or less) is required around towers for operation. Topsoil and subsoil would be re-spread over cleared areas with cleared vegetation, and sites allowed to naturally revegetate. The areas of mallee in the middle third of the transmission line corridor are expected to regenerate well, particularly if rootstock is left in place, based on the low levels of weeds present and level of regeneration observed in field surveys. Control of exotic vegetation (particularly grasses) may be required around towers in other areas. Habitat regeneration is site specific and would depend on the degree of disturbance and composition of seed bank at the site. For example, mallee regrowth habitats and post-fire habitats observed in field surveys exhibited regeneration of species from all strata, which varied depending on disturbance (e.g. fire history and historical clearance for access tracks and fire breaks). In contrast, sites with previous grazing disturbance exhibited less diversity in regrowth or regeneration of flora species, represented by lower plant diversity scores and presence of weed species. Ultimately vegetation restoration is an adaptive process and will depend on a combination of factors including degree of disturbance, existing seedbank, threats (e.g. native and exotic grazing), species competition, climate change and drought influences.

Clearance of native vegetation requires approval under *Native Vegetation Act 1991* and *Native Vegetation Regulations 2017.* A vegetation clearance application is being prepared for the Project and a draft Native Vegetation Clearance Data Report is contained in Appendix I-6. The Project will require a Level 4 application to be approved by the Native Vegetation Council and will need to provide a Significant Environmental Benefit offset as per the Significant Environmental Benefit Policy and Guide (NVC 2020c,d).

ElectraNet will either implement an on-ground SEB, or fulfil the SEB requirement by a payment into the Native Vegetation Fund.

A preliminary estimate of the SEB requirement is contained in the draft Native Vegetation Clearance Data Report (Appendix I-6). It is expected that a formal application under the Native Vegetation Regulations and an accompanying Data Report will be submitted following submission of the EIS. The Data Report may be updated to incorporate refinements in clearance estimates at the time (e.g. resulting from the EIS process or the progression of detailed design). As is standard for large linear infrastructure projects, it is expected that the clearance areas will remain as estimates in the application and final clearance will be confirmed following construction with in-field audits against approved clearance areas, with the SEB adjusted as necessary to reflect the final clearance.

ElectraNet will incorporate vegetation management requirements in the Construction Environmental Management Plan (CEMP), which will detail the requirements for pre-clearance micro-siting and post clearance audits, exclusion zones and NVC approved clearance areas. Monitoring will be undertaken during and following construction to ensure that vegetation management measures are effective and remediation will be undertaken if required.

The predicted impacts are in the **Minor** category, particularly when the offset provided by the SEB is taken into account. Uncertainty in the predicted impact (based on uncertainty in final definition of clearance areas and the potential for excursions outside designated clearing areas) has been evaluated in Appendix O and the level of risk is **Low**.

### Clearance of habitat for threatened species

**Clearance of habitat for threatened species will be minimised and is not expected to result in a significant impact to listed flora or fauna species**

As discussed in Section 11.3.3, conservation significant flora and fauna are known, or have the potential, to occur within the transmission line corridor. However, the corridor does not provide core habitat or the only remaining habitat for the majority of the species. Core habitat for the majority of species predominantly occurs in conservation areas across the region that have been avoided by the route, including properties in the Riverland Biosphere Reserve to the north of the transmission line corridor and the Riverland Ramsar site to the south.

The area of threatened species' habitat that will be cleared represents a very low proportion of available habitat in the region. In particular, the proportion of the area of listed Critical Habitat for Black-eared Miner that will be impacted by traversing the southern boundary of this area (i.e. Taylorville, and the section of Calperum north of Wentworth-Renmark Road) is extremely low. Estimated clearance is 143 ha, which is approximately 0.04% of the total area (over 380,000 ha) of listed Critical Habitat, along 71 km of its southern-most fringe). As it traverses the edge of this Critical Habitat area, follows existing disturbance and is not in the most important areas of mallee habitat where the vast majority of Black-eared Miners have been recorded, it is not considered that it constitutes a significant impact to the critical habitat[2].

Pre-construction surveys and micro-siting will be undertaken to 'micro-site' towers and other infrastructure to avoid occurrences of any potentially present threatened plant species and other significant features (e.g. any identified Malleefowl mounds).

Further discussion on potential impacts to threatened species is provided in Sections 11.4.7 and 11.4.8.

Decommissioning at the end of the design life of the Project (approximately 100 years as discussed in Section 7.6.9) would not be expected to result in significant impacts to fauna habitat as access tracks in place for operations would be used to access tower sites.

The predicted impacts are in the **Negligible** category for listed flora and **Minor** for listed fauna. Uncertainty in the predicted impact (based on uncertainty in species' occurrence or the potential for excursions outside designated clearing areas) has been evaluated in Appendix O and the level of risk is **Low** for listed flora and **Medium** for listed fauna.

### Impact to listed threatened ecological communities

**The Project is not expected to impact any listed Threatened Ecological Communities**

No threatened ecological communities have been located within the transmission line corridor. Two threatened ecological communities listed under the EPBC Act (Iron-grass (*Lomandra*) Natural Temperate Grassland of South Australia and Peppermint Box (*Eucalyptus odorata*) Grassy Woodland) were considered to have a low potential to occur at the western end of the corridor but have not been detected, despite multiple targeted searches during field surveys. If present, any patches are assumed to be very small, given they have not been located to date during multiple vegetation assessments along the transmission line corridor. Small patches may not meet the defined criteria for the threatened ecological community.

Micro-siting of the location of towers, pads and other infrastructure (e.g. access tracks) will be undertaken prior to construction to confirm that these communities are not present. In the unlikely event that they are detected, infrastructure would be positioned to avoid or minimise impacts from direct clearance, and weed hygiene measures in the CEMP would be implemented to prevent the

[2] The Critical Habitat listing (DAWE 2021a) states: *In general, actions are more likely to lead to significant damage if they occur within the most important areas of open mallee bushland. Actions within disturbed areas of the properties of little or no direct relevance to the survival of the species would generally be unlikely to cause significant damage to critical habitat.*

indirect introduction or spread of weeds that could impact the quality and extent of the threatened ecological communities if present. Given the implementation of proposed mitigation measures and the small relative footprint for tower foundations and access tracks, the Project is expected to have negligible impacts to these threatened ecological communities even if they are present.

The nominated Eastern Mallee Bird Community (which is not currently listed as a threatened ecological community) would not be significantly impacted as the Project will not reduce the community extent, increase fragmentation to any significant extent, adversely affect critical habitat or cause a substantial change in species composition of this or any other ecological community (refer to discussion of these aspects in Sections 11.4.2 to 11.4.8).

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in community occurrence or potential ineffective implementation of controls) has been evaluated in Appendix O and the level of risk is **Low**.

### Impact to conservation areas

**The route has been selected to minimise impacts to conservation areas; vegetation clearance in these areas will be minimised and will not result in significant impact to their conservation value**

As discussed in Section 11.3.1 and Table 11-3, the Project traverses a number of properties managed primarily for conservation. The route has been selected to minimise potential impacts to the vegetation, habitats and conservation values of these properties. In particular, it has been aligned along the southern boundary of Taylorville and Calperum stations and to follow existing disturbance corridors, including tracks, fencelines, firebreaks, existing transmission lines and the Wentworth-Renmark Road. Vegetation clearance will primarily occur adjoining existing disturbance corridors.

The area impacted by the Project generally represents a very small proportion of the total area of the properties managed for conservation that it intersects. Given the presence of existing disturbance, the Project will have a very limited impact on the vegetation, habitat or conservation value of these conservation areas.

White Dam Conservation Park is a small and linear park, and a greater proportion of its total area will be impacted by the installation of several towers. Existing tracks will be used as far as possible to minimise disturbance. The low height of the vegetation present (Bluebush Shrubland) and the presence of the existing 132 kV transmission line, towers and access track will limit the significance of impact from the Project to this area.

Additional loadings are included in SEB offset calculations to compensate for vegetation loss in any conservation areas, as per the SEB guidelines under the Native Vegetation Act (NVC 2020a,b,c,d).

The predicted impacts are in the **Negligible** to **Minor** category. Uncertainty in the predicted impact (based on uncertainty in final definition of clearance areas) has been evaluated in Appendix O and the level of risk is **Low.**

### Impact to the Riverland Ramsar site

**The Project will not impact the ecological character of the Riverland Ramsar site**

As discussed in Chapter 10 Physical Environment, the transmission line corridor passes predominantly north of the Riverland Ramsar site boundary and River Murray floodplain, on higher ground on the northern side of the Wentworth-Renmark Road. It does not cross any areas that are regularly inundated, and crosses three areas of upper floodplain (totalling approximately 2 km in length) that were flooded in the 1956 flood and could be inundated again in extreme flood events. Several towers will be constructed in these areas of upper floodplain.

The Project will not significantly impact the ecological character of the Riverland Ramsar site. It will not alter the hydrology of the wetland or result in a substantial and measurable change in the water quality, as discussed in Chapter 10 Physical Environment. It will not result in areas of the wetland being destroyed or substantially modified, the habitat or lifecycle of native species dependent on the wetland being seriously affected or in the introduction of invasive species harmful to the ecological character of the wetland being introduced or spread. In addition, impacts to wetland avifauna (an important aspect of the ecological character) are considered low risk as discussed in Section 11.4.4 below).

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on the potential for extreme weather events or ineffective implementation of erosion controls) has been evaluated in Appendix O and the level of risk is **Low**.

### 11.4.2. Habitat fragmentation

**The Project follows existing infrastructure corridors and diverts around key habitat areas and will not significantly increase habitat fragmentation.**

Remaining native vegetation in the broader region is already highly fragmented within an agricultural environment (particularly at the western end of transmission line corridor) and concentrated in areas which are usually less suited to agriculture. Small patches persist along roadsides or remain as scattered trees within farmland. Remnant vegetation which provides key habitats for threatened species (e.g. old growth mallee) is largely conserved within the reserves of the region (e.g. Pooginook Conservation Park, Cooltong Conservation Park, Taylorville and Calperum Stations and other Vegetation Heritage Agreement areas).

The size of many of the vegetation fragments that are scattered across the western end of the transmission line corridor are too small to support a number of conservation significant species and unlikely to sustain viable populations of many species in the long term. These vegetation patches are already subject to ongoing edge effects with notable impacts from weeds and pest animals, and ongoing degradation processes likely. However, it is noted that such small and narrow blocks, including road-side vegetation, can facilitate movement for small mammals and reptiles and act as ‘stepping stones’ between larger viable vegetation blocks for a range of species, particularly in environments subject to large areas of historical clearing.

The fragmented landscape along the western end of the transmission line corridor is in contrast to the large tracts of vegetation that are part of the Riverland Biosphere Reserve, primarily north of the central to eastern end of the transmission line corridor, where there are few edge effects and less fragmentation. These habitats take many years to develop where mallee trees support hollows and deep litter cover, and are characterised by a mosaic of fire history (e.g. north of the transmission line corridor the fire history ranges from long-unburnt to burnt in the last 10 – 20 years) (see Figure 11-4). These larger blocks north of the eastern end of the corridor provide higher quality unfragmented habitats for sensitive species or species with large home range requirements.

The Project avoids key habitats (refer 11.3.1) including the majority of the Riverland Biosphere Reserve and conservation areas. Where boundaries of conservation areas are intersected, they are traversed alongside existing tracks and existing infrastructure corridors. As discussed in Chapter 4 and Section 11.3.1, there has been a detailed route selection process to avoid key biodiversity areas, utilising existing cleared infrastructure corridors, roads and tracks wherever practicable to minimise further impacts and further fragmentation, rather than bisecting large tracts of vegetation.

Where the transmission line corridor meets higher quality mallee vegetation at the central / eastern portion of the alignment, the route has been diverted southwards (following engagement with Australian Landscape Trust and DEW) to avoid bisecting this vegetation as far as possible by following the southern boundary of the Biosphere Reserve (Taylorville / Calperum Stations) which is also the southern boundary of the Listed Critical Habitat area for the Black-eared Miner. The cultural heritage avoidance alignment on Hawks Nest Station also follows the station boundary and the existing transmission line in this section of the route. Existing fragmentation is present along the alignment in these areas due to the presence of roads, tracks, fence lines and the existing transmission line. This alignment reduces the risk of further increasing the existing fragmentation and hybridisation impacts that occur in the region. Mallee habitats in the eastern end of the transmission line corridor are largely avoided and existing tracks / road corridors are used where possible.

Vegetation clearance as part of the Project will marginally increase the long-term fragmentation of some vegetation blocks across the landscape. Fragmentation impacts may include increased risk of weed incursion and increased access to predators, however new or upgraded tracks in this area will also improve access for fire management and weed and pest management. The relatively narrow width of the clearance required for the transmission line corridor is not expected to hinder movement of the majority of fauna species within the landscape. Smaller patches of mallee at the western end of the transmission line corridor can generally be spanned and avoided, and there are existing tracks and infrastructure corridors that can be used to minimise vegetation clearance and habitat fragmentation.

Given the very limited increase in habitat fragmentation that is expected and the presence of existing disturbance corridors, it is not considered that vegetation clearance or disturbance in the central to eastern end of the transmission line corridor will lead to further hybridisation of the Black-eared Miner beyond the extent of hybridisation that is already known for the species. The Black-eared Miner, Yellow-throated Miner and hybrids of the two species already occur within and immediately south and north of the transmission line corridor and interbreeding is ongoing (refer Figure 11-10 and Section 11.4.9 below).

As discussed in Chapter 7, design and construction measures can be used to minimise impacts to sensitive areas and smaller areas of mallee, for example by spanning small patches where feasible and careful placement of towers. Helicopter construction techniques are being considered during detailed design, subject to health and safety, commercial and technical feasibility. If feasible, these aerial techniques are expected to reduce the amount of on-ground temporary clearance that would be required.

In addition, whilst clearance of some vegetation may have short-term impacts in the region, the commensurate offset activities (either on-ground offsets or via payment into the Native Vegetation Fund) present an opportunity to increase the quality of remaining vegetation or the quantity of vegetation under conservation agreement to support flora and fauna and provide positive long-lasting benefits to the region. The Significant Environment Benefit for the Project as required by the Native Vegetation Clearance Approval, will contribute targeted resources to the ecological values and conservation objectives of the region.

Based on the above, the impacts of habitat fragmentation associated with construction and operation of the transmission line are summarised below:

- Large portions of the alignment, particularly along the western end, traverse already highly fragmented and largely cleared / degraded agricultural landscapes.
- The proposed alignment has been selected to minimise fragmentation by utilising existing tracks and existing infrastructure corridors where present.
- Remnant vegetation of higher condition providing better quality habitat within the transmission line corridor is avoided wherever possible as part of the route design process to reduce impacts (refer Figure 11-3).
- Remnant vegetation within the transmission line corridor that will be cleared ranges in condition and does not provide a significant portion of critical habitat or resources for threatened flora and fauna species, but provides habitat for common species and fringe areas of habitat for threatened species.
- The transmission line corridor avoids the vast majority of the Black-eared Miner Listed Critical Habitat area (only traversing parts of the southern boundary following existing disturbance) (see Section 11.4.8).

It is noted that habitat values are present within and adjacent the transmission line corridor, and there are some areas of the corridor where the Project will result in some fragmentation. Any additional habitat fragmentation that occurs as part of construction and operation will result in a negative, but below measurable changes.

Decommissioning activities at the end of the design life of the Project (approximately 100 years as discussed in Section 7.6.9) would not be expected to result in additional fragmentation as access operational tracks would be used.

The predicted impacts to ecological values from fragmentation are in the **Minor** category. Uncertainty in the predicted impact (based on uncertainty in the prediction of fragmentation impacts) has been evaluated in Appendix O and the level of risk is **Low**.

### 11.4.3. Indirect effects on vegetation and fauna habitats

**Indirect impacts to vegetation and fauna habitats will be short term and limited in extent**

There is potential for vegetation and fauna habitats adjacent to construction areas to be indirectly impacted by Project activities. The potential significance of this 'edge effect' is reduced by the proposed alignment, as it predominantly follows existing disturbance corridors or follows previously cleared agricultural land. Control measures will be implemented during construction and operation to ensure that these impacts are minimised and are short term.

Dust emissions resulting from land clearing, vehicle movement and helicopter operation, that can potentially reduce vegetation health, will be managed by implementing dust control measures during construction and rehabilitating of areas of temporary disturbance, as discussed in Chapter 14 Air Quality. These impacts will be short term, as construction is temporary and maintenance vehicle movements during operations are limited, and will be localised to the vicinity of the alignment and access tracks. Rainfall is expected to remove any dust which settles on vegetation during construction and therefore dust is unlikely to result in long term reduction of vegetation health.

Erosion and sedimentation from disturbed areas or alteration of surface water flows are expected to have a very low level of impact and will be managed by a range of design measures and management controls, as discussed in Chapter 10 Physical Environment. Any impact to vegetation and habitats would be very localised and short term.

Activities that could result in reduction in soil or water quality, such as wastewater management, dewatering, dust suppression using saline water and spills that have the potential to affect vegetation and habitats are discussed in Chapter 10 Physical Environment. With the control measures outlined in Chapter 10 in place, the impact to vegetation and habitats would be localised and short term.

The introduction of, or spread of weeds, pests or pathogens can also result in impacts to biodiversity at the interface between the powerline easement and existing vegetation. These are discussed in Section 11.4.5.

Increased public access during operations via new unmanaged access tracks could also result in fauna disturbance and habitat degradation from unmanaged recreation or poor waste management (or an increase in weeds or predatory pests, as discussed in Section 11.4.5). Access to the operational easement will be restricted by locked gates where required and appropriate signage. As the transmission line corridor predominantly follows existing tracks and infrastructure corridors where the risk of increased public access already exists, the Project is not expected to result in a significant increase in public access.

The predicted impacts are in the **Negligible** to **Minor** category. Uncertainty in the predicted impact (based on uncertainty in the implementation of management measures or unplanned events) has been evaluated in Appendix O and the level of risk is **Low**.

### 11.4.4. Disturbance to fauna

#### Lighting

**Lighting effects at camps and other sites during construction will be short term and localised and will not have a significant impact on any species**

Lighting will be required at temporary worker camps during construction and emergency lighting will be installed at the Bundey substation for operations. This emergency lighting will only be utilised when operational or maintenance crews need to attend the site in the event of a fault and do not remain illuminated at night and will be designed and installed to minimise light spill outside of the substation site boundary.

Artificial lighting from temporary worker camp sites can result in localised impacts to behaviour of fauna, including displacement of some species and attraction of fauna such as insects, geckos and insectivorous microbats and potentially larger aerial nocturnal predators. Given the limited use of lighting for the Project at a small number of temporary worker construction camps, impacts to fauna associated with lighting would be localised and short-term.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in camp locations) has been evaluated in Appendix O and the level of risk is **Low**.

#### Noise

**Noise disturbance will be temporary and localised and will not have a significant impact on fauna**

Local fauna may be directly influenced by noise and vibration associated with construction, increases in traffic, operation and maintenance activities and presence of construction vehicles / plant equipment. This would also include the use of helicopters that are under consideration as a construction method.

The impact of noise on fauna can range from physiological or behavioural responses at lower noise levels to masking (interference with detection of biologically significant sound), temporary threshold shift (temporary loss of hearing) or permanent threshold shift (permanent loss of hearing) as noise levels increase. The most common behavioural response for birds is flight, as they perceive the noise as a threat. Changes to existing noise levels can potentially affect breeding behaviour, foraging behaviour and social interactions.

As discussed in Chapter 14 Noise and Vibration, the noise assessment undertaken for the Project (Appendix J) identified that the noise level at which a temporary threshold shift occurs (93 dB(A)) was a suitable criteria for evaluating noise impacts on fauna. It considered that masking is acceptable as it is unavoidable and will only occur temporarily or the Project. The noise assessment indicated that during construction, land clearing and tower construction activities would only reach 93 dB(A) within 5 m of the source. Most fauna would be unlikely to approach or remain within this distance and would avoid the noise source.

Modelling indicated that helicopter operations have the potential to reach 93 dB(A) within a 20 m radius of the noise source. However, due to the helicopter operating at heights of approximately 50 m, this is unlikely to result in a temporary threshold shift in ground-dwelling fauna. There is the potential for birds to fly within 20 m, however it is expected that birds would avoid the helicopter as a behavioural response and therefore not be impacted by a temporary threshold shift. The assessment concluded that Project noise is unlikely to result in a temporary threshold shift for fauna.

Behavioural impacts of construction noise from the Project will be localised and temporary. It may result in temporary displacement of individuals from the immediate vicinity of the construction area, however this is not expected to result in significant impacts to local populations.

During operation the main noise source would be related to annual helicopter maintenance, which will occur along the entirety of the Project alignment. There will also be ground-based visual inspections, however the noise impact from this maintenance is expected to be minimal. The other significant noise that occurs during operation occurs during rainy periods, where Corona discharge is heard as a hissing or crackling noise from the transmission lines. It is estimated that this noise reaches a maximum of 53 dB(A) (for 400 kV line at a distance of 15 m) (see Appendix J) and would not have a significant impact on fauna.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (based on uncertainty in fauna occurrence and construction methods) has been evaluated in Appendix O and the level of risk is **Low**.

### Fauna injury or mortality

**The incidence of fauna injury or mortality will be localised and short term and will not have a significant impact on any species**

Fauna injury or mortality can occur through collision with vehicles or vegetation clearance machinery or entrapment in excavations, predominantly during the construction phase. Once construction begins, larger or more mobile local fauna would move away from the local areas during disturbance, however smaller species (e.g. small reptiles) may remain. Local populations of species present within the transmission line corridor are likely to be small, particularly given the extensive use of existing disturbance corridors and the extent of habitat outside the transmission line corridor. Therefore, impacts to overall species and populations are likely to be small and at the local level. Whilst there are known threatened species in the region, core habitats and core populations are avoided by the Project (see Section 11.4.7). If there are impacts to individuals or local fauna populations, the impacts on populations are likely to be short-term.

Measures will be implemented to minimise fauna injury or mortality during construction, including:

- regular monitoring of excavations for trapped fauna and use of temporary fences where appropriate
- pre-clearance surveys in areas of key fauna habitat (e.g. for threatened mallee bird nests during the breeding season)
- use of wildlife handler where appropriate (e.g. when retrieving fauna from excavations or removing nests of threatened mallee birds in critical habitat during breeding season)
- speed limits to reduce fauna strike.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the frequency of collision / entrapment or implementation of management measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Bird strike

**Low numbers of birds (or bats) are expected to be impacted by collision with transmission line infrastructure, and this is not expected to have a significant impact on any species**

Bird strike can occur as a result of collision with vehicles (as discussed above) or the transmission line itself. Historically, the highest mortality rates occur where transmission lines pass directly through wetlands and lower rates may occur when transmission lines pass within proximity to wetlands. It is acknowledged that flight patterns and behaviours of birds that occur in the region, including waterbirds, are variable and can influence mortality rates. Waterbirds are known to move between local wetlands (e.g. between Lake Merreti and Lake Woolpolool) and some species will also fly to inland wetlands (e.g. Blackbox swamps or lakes north of Danggali Conservation Park and Darling River anabranch areas) during stopovers as part of migration routes. Similarly, Regent Parrots are known to migrate inland from riverine habitats to forage on mallee habitats. Other key factors known to impact bird strike risk include bird size and species specific behaviours such as flying in tight flocks (e.g. Australian Shoveler, Pink-eared Duck, Hardhead), recruitment events (e.g. Pink-eared Duck, Grey Teal, Red-necked Avocet, Hardhead, Coot, Black-tailed Native Hen, Freckled Duck) flying at high speeds (e.g. Hardhead) and flocks with a high proportion of juveniles present (e.g. Regent Parrot) (Willard and Willard 1978, Scott et al. 1972, Frith 1982 all cited in ALT 2002). It is noted that there are no records for deaths of these particular species that have been attributed to powerlines in Australia (see Appendix I-5).

Seventy three species with previous records of occurrence at the Riverland Ramsar site that occurs adjacent the transmission line corridor, plus an additional State-rated raptor with records of deaths attributed to powerlines, were considered in supporting assessments (Jacobs 2021, Appendix I-5). Of these species, 38 species have been regularly recorded during monthly count surveys at key lakes within the Riverland Ramsar site. These species are considered to be more likely to be at risk of collision (bird strike) with the Project as a result of their regular presence, however given there are a number of factors involved in collision risk, a high-level risk assessment was undertaken which considered the likelihood and consequences of collision to these species using a risk-based approach (refer Appendix I-5).

Factors considered to influence the likelihood of risk of collision / bird strike included body size (wingspan and weight), dispersal timing, flight type, maximum local counts within the wetland lakes and historical evidence of collision with powerlines within Australia and South Australia. Factors which influence the consequences of any collisions were also considered by species, including conservation status and population estimates (based on International Union for Conservation of Nature (IUCN) criteria). In addition to these species-specific features, further factors considered to influence the likelihood of collision include inundation frequency of wetland habitat within the site, and distance to the powerline. Infrequent inundation and larger distances to the line are considered to reduce the likelihood that birds that inhabit the wetland will be at risk of collision (refer further detail in Appendix I-5).

Species with both elevated likelihood and elevated consequence factors represent those species at an overall elevated risk of collision with powerlines. Of the threatened species that were considered to have some risk of collision with the transmission line, no threatened species were considered at high risk, two State-listed species were considered to have moderate risk (Freckled Duck and White-bellied Sea-eagle) and five threatened species were considered to have low risk (Curlew Sandpiper, Australian Bittern, Painted Snipe, Banded Stilt, Peregrine Falcon).

Consequences to individual species from the Project, particularly migratory species are not considered to be significant when overall population numbers are considered. Of the listed migratory species that were considered to have some risk of collision with the transmission line, none were considered to have high or moderate risk and four species were considered to have low risk: Curlew Sandpiper, Sharp-tailed Sandpiper, Caspian Tern, Crested Tern.

Other risk factors also relate to the distance of the species to the transmission line (which is influenced by inundation extent), inundation frequency of water habitats which influences fluctuation in bird numbers as well as regional habitat availability. Likelihood of collision has been documented to be reduced when mitigation measures are applied to transmission lines, including line markers (reflective and non-reflective), line design / configuration features and spacing of towers are implemented. A number of these mitigation measures are available to ElectraNet for Project EnergyConnect and are expected to be effective at reducing potential impacts from the line.

In addition, wetland areas closest to the alignment do not hold water in most years and therefore, waterbirds will not be present year-round, lowering the overall risk and impacts to species as a whole through reduced likelihood of collision. The majority of the wetland waterbird habitat south of the transmission line corridor is more than 1 km from the alignment. Less than 1.5 km of the alignment is within 500 m of a wetland boundary (based on the indicative 1 in 10 year inundation extent – see Appendix I-5).

As with the previous study undertaken for transmission lines in this location (Carpenter 2002), it is concluded that with the implementation of effective mitigation measures, the likelihood of collision with the transmission line is considered to be relatively low. Regardless, collision remains a possibility, given that portions of the line run within 1 km of the wetland habitat which can be expected to be inundated with reasonable frequency through managed inundation or 'natural' flows within the regulated river system. However, consequences to individual species are not considered to be significant when overall population numbers are considered. There is minimal evidence of substantial mortality directly attributed to transmission lines, rather, the data suggests a very low incidence of death. Species present within the Riverland wetland complex are generally present in relatively low numbers compared with regional, national and global populations estimates, and overall, Project EnergyConnect is not expected to significantly impact any species.

The transmission line will be designed to reduce the potential for bird strike, including installation of bird diverters in sections of the line when in close proximity to wetland habitats (e.g. within 500 m of the indicative 1 in 10 year inundation extent). Whilst there is still a low risk of bird strike to individuals, the Project is not expected to result in significant impacts to wetland avifauna, migratory bird species or threatened bird species.

The predicted impacts are in the **Negligible** to **Minor** category. Uncertainty in the predicted impact (based on uncertainty in future inundation events and bird numbers present) has been evaluated in Appendix O and the level of risk is **Low**.

### 11.4.5. Pests and weeds

#### Incursion of predators or pests

**Project activities and the presence of access tracks are not expected to result in an increase in the existing level of pest species present in the transmission line corridor.**

Project activities and presence of access tracks can result in increase in predatory pest species, particularly if waste is not managed effectively. Desktop and field assessments to date have identified an existing level of predator and pest presence in the region (see Section 11.3.7). The construction of the Project is not expected to significantly increase the access of predatory pests to habitats on the transmission line corridor, as existing tracks are present along the majority of the proposed alignment. The CEMP and OEMP will include mitigation measures to avoid introduction or increase in abundance of predators and pests.

Waste will be managed and transported appropriately (e.g. in covered bins) to avoid increasing or facilitating predators and pests in the region. Adaptive pest management, monitoring and control would be undertaken where required, particularly during construction. Management would be undertaken in consultation with Landscape Management Board staff and with consideration of regional conservation objectives.

There are some areas of the transmission line corridor where access for predator and pest maintenance and monitoring activities are limited and provision or upgrade of tracks will assist in providing increased opportunities for regional predator and pest control activities.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the implementation of management measures) has been evaluated in Appendix O and the level of risk is **Low**.

#### Introduction or spread of weeds

**Project activities and the presence of access tracks are not expected to result in an introduction, increase or spread of weeds above the existing level present in the transmission line corridor.**

As noted in Section 11.3.7 above, exotic flora species, including declared and environmental weeds occur with the ESA and within the transmission line corridor. Given poorer condition vegetation and existing cleared areas will be targeted for tower footprints and temporary construction areas (e.g. camps and laydown areas), interaction with exotic species is inevitable. Introduction of new weeds or spread of existing weeds could degrade better quality vegetation within and adjacent the transmission line corridor and enable / harbor predator pest species (e.g. foxes and cats).

During construction indirect impacts would be managed via standard practices in the CEMP. Pre-construction inspections would be undertaken to identify any areas of weed infestation requiring specific management measures. Vegetation clearance would occur in approved areas, no-go zones would be established and vegetative material containing declared weeds would not be moved from the site (unless appropriate permits are in place). Stockpiles will also be monitored for weed outbreaks. Awareness about key weed threats (e.g. Buffel Grass) would be included in induction programs.

During operation indirect impacts would be managed via standard practices in the OEMP. Adaptive weed management, monitoring and control would be undertaken where required if weeds are detected, particularly following rainfall events and disturbance events. Adaptative weed management, monitoring and control would be undertaken. Targeted management of key threat species (e.g. weeds of national significance or declared weeds including the declared / alert weed Buffel Grass) would be undertaken in consultation with Landscape Board staff and with consideration of regional conservation objectives. Buffel Grass (which is a pasture plant that can dominate plant communities and increase uncontrollable fire intensity) has not been located during the vegetation surveys to date.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the presence of weeds at the time of construction in the implementation of management measures) has been evaluated in Appendix O and the level of risk is **Medium**.

#### Pathogens

**Project activities and the presence of access tracks are not expected to result in introduction or spread of pathogens.**

The transmission line corridor occurs in an area considered as ‘no apparent risk’ for Phytophthora. Similarly, the Landscape Management Regions have not highlighted Mundulla Yellows (a tree dieback disease) as a priority concern. No evidence of either disease was observed during vegetation surveys of the transmission line corridor. While there is no evidence of these pathogens’ presence, pathogens could potentially be transported to the region from high risk areas (e.g. where rainfall is over 400 mm) via imported fill or in revegetation tube stock, if revegetation is used for screening or rehabilitation purposes.

During construction, potential impacts would be managed by standard practices in the CEMP including standard vehicle hygiene protocols and ensuring importation of clean fill (if required). Awareness about key potential threats (e.g. dieback from soil pathogens) would be included in induction programs. Extensive revegetation is not planned, hence spread of pathogens is considered low risk.

During operation indirect impacts would be managed by standard practices in the OEMP. Adaptive management would be undertaken in the unlikely event that evidence of pathogens is detected. Management would be undertaken in consultation with relevant government agencies, if required.

The predicted impacts are in the **Negligible** category and the level of certainty in this prediction is high.

### 11.4.6. Fire

**Uncontrolled fire has the potential for significant impact to native vegetation and fauna. The level of risk associated with fires during construction and operation can be appropriately managed with the implementation of risk treatment and mitigation measures.**

Bushfires are a natural occurrence in the region. They often result from lightning, especially between September to December when dry lightning storms occur frequently (DEH 2009), but bushfires can also occur as a result of other causes such as reignition or escape of prescribed burns, improperly extinguished or out of season campfires or arson.

As discussed in Chapter 18 Hazards and Risk Management, construction and operation of the transmission line involves a number of potential ignition sources. During construction, these include sparks from ‘hot works’ such as welding, ignition of dry grass by vehicle exhaust or vehicle collisions. During operation, potential sources of ignition include contact between vegetation and conductors, contact between conductors or damage to transmission lines during extreme weather events, bird strike or ageing or poorly maintained equipment.

Bushfires can have direct and immediate impacts, as well as ongoing impacts on the ecology of an area, particularly where the habitat is already fragmented through adjacent land practices such as farming. Fire can also have long-term impacts to threatened species that have a preference for long-unburnt habitats, such as Black-eared Miner, Red-lored Whistler and to a lesser extent Malleefowl.

Bushfire extent and frequency are amongst the most significant threats to mallee habitats and associated biodiversity. Periodic fires which are restricted in area create a mosaic of habitat age which is beneficial to many mallee fauna species that utilise resources in both long unburnt mallee and adjacent patches with more recent fire history. A natural mosaic of fire history also provides a mechanism for controlling fuel loads and potentially reducing the intensity of future fires across the landscape. However, if fires occur too frequently and cover large expanses, they can be deleterious to vegetation associations which contain plant species that do not have mechanisms to cope with fire, and there are implications to post fire seedling establishment, as species can die off before reaching maturity if there are too many fires in quick succession (e.g. less than 20 years) (DEH 2001). This impact on mallee vegetation in turn impacts fauna species that are reliant on the mallee habitats. The areas adjoining the 2014 fire scar (see Figure 11-4) are particularly vulnerable to impacts of a subsequent fire at this stage.

Fire intensity is also an important factor, as many mallee flora species are adapted to effectively regenerate after natural fires. Some plants are able to resprout from underground or ground level woody tissue that has been insulated from heat (such as the lignotubers of mallee Eucalypt species), and a number of plant species’ seeds are well insulated in soils or within dense woody capsules which can be released following fire. However, if fires are too hot due to excessive fuel loads or catastrophic conditions, some species will not readily regenerate. In addition to reducing flora diversity, hollows and deep litter cover which take years to develop are impacted by severe fires. Mallee fauna species that are of particular risk are threatened species which occur in lower numbers and have more stringent habitat preferences (e.g. EPBC listed Black-eared Miner, Red-lored Whistler, Malleefowl).

Transmission lines are specifically designed to reduce the risk of fire, partially to protect the asset itself, but also to protect the surrounding environment, including potential impacts upon flora and fauna from fauna. Regardless, unplanned and unmanaged activities that can lead to bushfires can include:

- Failure of management controls during construction and operation
    - Unmanaged vegetation near transmission line towers and wires
    - Inadequate protection of assets (e.g. inadequate fire break widths, water points, signage)
    - Use of equipment that produces sparks, during fire ban season when risk is higher (e.g. hot works activities, petrol vehicles close to pasture stubble or grasses)
- System failure or ageing infrastructure
- Inadequate emergency response
- External weather conditions, lightning strike, recreational activities by members of the public.

Historical fires associated with transmission lines generally originate from the lower voltage distribution network where there is much greater potential for contact with vegetation. The Victorian

Bushfire Royal Commission identified Single Wire Earth Return lines as a particular concern, which differ greatly from the proposed voltage transmission line.

A bushfire risk assessment undertaken in the Project's Fire Hazard Management Plan (Appendix S) concluded that with line design measures and fire management measures outlined in Chapter 18 Hazard and Risk Management and Appendix S in place, the residual risk is expected to be Low to Medium. Residual risk was identified as being higher during the construction stage than at the operational stage of the Project. Experience elsewhere on the ElectraNet network indicates that transmission lines similar to the design proposed have not resulted in the ignition of bushfires.

Transmission lines offer some benefit with regards to fire risk in certain landscapes. In some areas of the Project, such as the Riverland, dry thunderstorms are common and the presence of a transmission line may actually reduce the risk of fires starting as a result of lightning strike. Transmission towers can act to dissipate lightning across the landscape, thereby reducing the risk of fire staring from lightning strike. Standard lightning protection (e.g. earthwires above conductors) offer shield protection from lightning strike and every transmission structure is earthed.

In the central region of the Project, the mallee of the Riverland Biosphere Reserve is known to be an "extremely difficult environment to combat fire. The size of the area, lack of access to water, steep sandy terrain and often rapid rate of fire spread all contribute to a volatile fire environment" (DEH 2009). Access through established mallee in the absence of tracks is also very difficult. Powerline easements can assist in regional fire management by serving as physical, maintained fire breaks and assist in providing alternate access for the emergency vehicles (however it is noted that the proposed extent of clearance for the Project will not be wide enough to be considered a fire break). The transmission line corridor follows the southern edges of Taylorville and Calperum Stations on existing access tracks, but also traverses areas of Hawks Nest Station where access is poor and requires upgrade. The proposed route and associated clearance / access tracks present an opportunity to increase the balance between property protection, energy security and conservation management objectives in this area. No formal fire break clearance is proposed by the Project however it is believed that any new access tracks will be considered as part of the next review of the CFS Bookmark Bushfire Management Plan.

Transmission line design measures adopted to reduce the risk of fire to an acceptable level include:

- route selection, avoiding or spanning high fire risk vegetation (e.g. dense mallee), using existing tracks
- pre-clearance micro-siting surveys to consider both environmental values and fire risk
- lightning masts to attract lightning away from sensitive environments / substation
- design to Australian and International Standard. Use of earth wires, optical ground wires and dampers to avoid electrical faults and damage to conductors. Use of fire protection systems, and increased conductor spacing to eliminate risk of 'conductor clashing'.

ElectraNet will update and implement the Project's Fire Management Plan (refer Appendix S) in the construction and operational phases to protect people, infrastructure and the environment. This will include:

- strategies as per consultation and collaboration with regional CFS and conservation managers (ALT and DEW). It is noted that the proposed land clearance activities will assist in improving CFS access to the region, but disturbance will not be wide enough to provide fire breaks.
- fire tracks and buffers as agreed with CFS
- transmission lines in designated bushfire or high bushfire rated areas to be inspected and cleared every year (in contrast to every three years for regular transmission lines).
- weed maintenance to ensure fuel load at the base of the towers is minimised

- vegetation clearance in accordance with *Electricity (Principles of Vegetation Clearance) Regulations 2010 (SA)* (refer Chapter 7). Maintenance of vegetation clearance buffers, particularly in high fire risk areas and in accordance with voltage and design requirements
- education of workforce about local bushfire risk during site inductions
- maintain awareness of seasonal restrictions, particularly regarding hot works during fire ban season.
- emergency response protocols and equipment in place and regularly checked
- restriction of high-risk fire activities during fire ban periods.

Further detail is provided in Chapter 18 Hazard and Risk Management and Appendix S.

ElectraNet will add this new transmission line to its extensive existing network monitoring program to ensure fire management control measures are inspected, and maintained if required, prior to the fire ban season each year. The monitoring programs will be implemented during the construction phase and continue during post construction with relevant aspects adopted into the operation and environment management plant that will be developed.

There is no impact expected as a result of fire initiated by the Project. The level of risk associated with an unplanned event occurring has been assessed in the bushfire risk assessment in Appendix S. It concluded that if risk treatment and mitigation measures are not implemented, the bushfire scenarios assessed pose a significant level of inherent risk to life, property and environmental assets. Following implementation of the recommended mitigation and management measures, the residual risk is expected to be reduced to lower levels of **Low** and **Medium**.

Consequently, with the mitigation strategies outlined in the Fire Hazard Management Plan in place, the fire risk can be reduced to an acceptable and manageable level.

### 11.4.7. Summary of impacts to listed flora

**No significant or long-term impacts to listed flora are expected.**

One nationally Endangered plant species (Peep Hill Hop-bush) is present in small numbers near the eastern end of the transmission line corridor, and a small number of nationally and State listed species are considered to be possibly present, but have not been identified in field surveys. These species are summarised in Table 11-20 below. The cultural heritage avoidance alignment (see Section 11.4.1) does not increase the likelihood of presence of any listed species[3].

Threatened flora (if present) can potentially be impacted by direct clearance or indirect impacts (e.g. weeds, dust). As discussed in Section 11.4.1, pre-clearance surveys will be undertaken to 'micro-site' towers and other infrastructure and avoid impacts to individuals or populations of threatened plant species. Other plant species of conservation significance (e.g. State-listed Rare species or species of regional conservation significance), if present, would be avoided where feasible, and infrastructure would be sited to minimise impacts. Measures to minimise indirect impacts would be implemented through the Construction Environmental Management Plan, as discussed in Sections 11.4.3 and 11.4.5.

Given the low potential for threatened flora to occur within the final infrastructure footprint, the management measures that will be implemented (including micro-siting for threatened species) and the offset activities required under the Native Vegetation Regulations and Significant Environmental Benefit Offset Policy and Guide (NVC 2020c,d), it is considered that construction and operation of the proposed infrastructure corridor will result in negligible impacts to listed species.

[3] There is a record for one species listed as Rare in South Australia (Sand Lily *Corynotheca licrota*) near the cultural heritage avoidance alignment. The species was considered unlikely on the transmission line corridor due to habitat preferences and the small number of records in the ESA (see Appendix I-1). Its presence on the proposed alignment is still considered unlikely.

Significant impacts to any species listed under the EPBC Act are not expected to occur. Further detail on predicted impacts for individual species and an assessment of residual impacts against EPBC Act significant impact guidelines (DoE 2013) are provided in Table 11-20 and Appendix I-5.

**Table 11-20: Summary of impacts to listed flora**

| Species name | Cth[1] | SA[2] | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual Impact |
|---|---|---|---|---|---|---|---|
| **EPBC Act listed flora species** | | | | | | | |
| Peep Hill Hop-bush | EN | E | Present | Shrub. Occurs on eastern MLR and Eyre Peninsula, associated with rocky outcrops. BDBSA records in transmission line corridor. Two groups of plants present within existing transmission line easement on rocky slopes, one group of three plants already avoided by regular track maintenance upgrades. Second group is 50 – 100 plants of mixed age. Both groups can be avoided with micro-siting and or spanning.<br>Suitable habitat is only present at the western end of the corridor and is not critical to the species survival. | No direct impact expected. Clearance of individual plants where they occur will be avoided by micro-siting.<br>Low potential for indirect impact via weed introduction or spread or habitat degradation within EIS transmission line corridor. | Avoid known groups of plants at the western end of the transmission line corridor.<br>Micro-site to avoid impacts to other individuals (if present).<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Long-term impacts to a population are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Silver Daisy-bush | VU | V | Possible | Shrub. BDBSA records in proximity to the western end of transmission line corridor. Suitable habitat present in the western end of transmission line corridor. No records in transmission line corridor, not detected during BAM surveys.<br>The transmission line corridor is at the eastern margins of the species distribution, hence significant or populations are unlikely along the transmission line corridor. | No direct impact expected.<br>Impacts to individual plants, if they occur, can be avoided with micro-siting.<br>Unlikely key population occurs in transmission line corridor.<br>If present, low potential for indirect impact via weed introduction or spread within EIS transmission line corridor. | Micro-site to avoid impacts to individuals (if present).<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Long-term impacts to an important population are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Yellow Swainson-pea | VU | R | Possible | Small Shrub. No known populations identified within corridor, but suitable habitat occurs. Germination is triggered by soil disturbance or fire. | No direct impact expected.<br>Seeds may be present and impacted by soil | Micro-site to avoid impacts to individuals (if present). | Negligible. Long-term impacts to an important population are not expected |

| Species name | Cth[1] | SA[2] | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual Impact |
|---|---|---|---|---|---|---|---|
| | | | | | disturbance, however the area of disturbance represents a very small proportion of suitable habitat in the region.<br>Impacts to individual plants, if they occur, can be avoided with micro-siting.<br>Unlikely key population occurs in transmission line corridor.<br>If present, low potential for indirect impact via weed introduction or spread within EIS transmission line corridor. | Implement CEMP / OEMP to manage indirect impacts. | Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| **NPW Act listed flora species** | | | | | | | |
| Rohrlach's Bluebush | - | R | Possible | Small shrub. One record in transmission line corridor from White's Dam and also recorded in Cooltong CP adjacent transmission line corridor. | No direct impact expected.<br>Impacts to individual plants may occur if present. Infrastructure would be sited to minimise impacts.<br>Unlikely key populations occur in transmission line corridor.<br>If present, low potential for indirect impact via weed introduction or spread within EIS transmission line corridor. | Avoid where feasible. Locate infrastructure to minimise impacts.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Residual impacts to the species are not expected. |

| Species name | Cth[1] | SA[2] | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual Impact |
|---|---|---|---|---|---|---|---|
| **Other potential species** | | | | | | | |
| Other regionally significant species that possibly occur. | | | Possible | Preferred habitat and multiple previous records in transmission line corridor, but not observed in field to date. | No direct impact expected.<br>Impacts to individual plants may occur if present.<br>Unlikely key populations occur in transmission line corridor.<br>If present, low potential for indirect impact via weed introduction or spread within EIS transmission line corridor. | Avoid where feasible.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Residual impacts to these species are not expected. |
| EPBC Act and NPW Act species that have been assessed as unlikely to occur | | | Unlikely | Historical or limited records in transmission line corridor, but considered unlikely to occur due to current restricted range and / or lack of suitable habitat. | No direct impact expected.<br>Potential minor impacts to individual plants, if they occur, can be avoided with micro-siting.<br>Unlikely key populations occur in transmission line corridor.<br>If present, low potential for indirect impact via weed introduction or spread within EIS transmission line corridor. | Micro-site to avoid impacts to individuals (if present).<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Residual impacts to these species are not expected. |

1 Environment Protection and Biodiversity Conservation Act 1999 Status: Critically Endangered (CE) Endangered (EN), Vulnerable (VU)
2 South Australian National Parks and Wildlife Act 1972 Status: Endangered ®; Vulnerable (V); Rare ®, EX (Presumed extinct)

### 11.4.8. Summary of impacts to listed fauna

**No significant or long-term impacts to listed fauna are expected.**

Fifty two listed fauna (threatened and or migratory) with National and State conservation ratings are considered to occur, likely to occur of possibly occur within the EIS transmission line corridor (including four National listed species that are possible in water habitats / flyover), with a further 42 considered unlikely to occur (refer Table 11-12, Table 11-14 and Table 11-15 in Section 11.3 above). Of the 42 considered unlikely to occur, 20 State listed species have the potential to occur in nearby water habitats. The cultural heritage avoidance alignment (see Section 11.4.1) does not increase the likelihood of presence of (or impact on) any listed species.

Impacts to listed fauna (including threatened species and migratory species), as well as common fauna that may occur during construction and operation could are discussed in Sections 11.4.4 above, but briefly relate to direct mortality, habitat removal or alteration, increase in predation, changes to breeding regimes and sensitivities to disturbance. Increased fragmentation to suitable habitat areas could also result in increased hybridisation of the Black-eared Miner with the Yellow-throated Miner.

Most listed and protected species that occur in the broader ESA are concentrated in the adjacent reserves, are not located within the transmission line corridor and are highly mobile and will move away from an area during disturbance (e.g. as vehicles transport infrastructure to the areas for assembly / construction). If important breeding / nesting sites of listed fauna are located within the final footprint (e.g. active Malleefowl mounds, Black-eared Miner colony) they could potentially be avoided via micro-siting of tower locations. Avoidance buffers (e.g. 50 – 100 m) could potentially be applied where feasible, to minimise disturbance impacts if required.

A number of migratory species and or other fauna species may only occur as occasional visitors to the region, and occasionally. The transmission line corridor does not represent habitat and associated resources that are critical to the survival of individuals and local populations of species (see Table 11-14 above and Table 11-21 below). Impacts to Black-eared Miner the Listed Critical habitat area are not expected to be significant, as discussed in Section 11.4.1. Whilst some localised edge effects are possible (e.g. weed incursion, changes in pest levels) these would be relatively minor and would be managed by the CEMP / OEMP. Hybridisation is also a potential impact for Black-eared Miners, however Yellow-throated Miner and hybrids are already present in this area, therefore changes to the existing status (within the transmission line corridor) be minor are not considered to be significant.

As discussed above (Section 11.4.4) the eastern end of the transmission line corridor is located north of the wetlands of the Riverland Ramsar site. The majority of the transmission line corridor is located more than 1 km from wetlands in the Riverland Ramsar site, and no impacts to habitat quality of the Riverland Ramsar site are expected. Risk of bird strike from wetland bird visitors / residents is discussed in Section 11.4.4 above and in more detail in Appendix I-5.

It is acknowledged that common native fauna and fauna with regional ratings occur within the transmission line corridor and surrounds. The number of individuals and proportion of the species' populations present within the transmission line corridor are likely to be small, due to the size and condition of available habitat, noting that larger areas have been avoided, the route follows existing tracks, where available. Therefore, impacts to overall species populations are likely to be small.

Impacts to all fauna populations (including listed species) within the transmission line corridor are predicted to be low to negligible, based on the following assumptions:

- All vegetation clearance will be approved and offset in accordance with Native Vegetation Act and Regulation requirements to reduce impacts to listed and general fauna as a result of vegetation clearance.
- In key areas that support listed species (e.g. dense mallee, Listed Critical Habitat for Black-eared Miner, Riverland Biosphere Reserve), Project design and construction control measures

will ensure vegetation clearance is minimised, occurs in approved clearance areas, existing tracks and disturbed area are used as far as possible and micro-siting will occur at each tower location.

- To reduce impacts to critical habitats of listed species, access track widths and number of laydown areas will be minimised in areas of higher quality mallee habitat that require clearance. Laydown areas will be located in lower condition habitat.
- Habitat condition across the construction footprint is already degraded, resulting in reduced diversity of native fauna, particularly towards the western end and centre of the corridor where there is existing infrastructure and tracks present.
- Vegetation clearance measures are expected to ensure that, during construction and operation there is low risk of direct impacts to fauna, particularly threatened fauna.
- If there are impacts to individuals or populations, they are likely to be short-term (e.g. construction phase) as fauna will move away from the area and return when disturbance has reduced or offset habitat has been established.

Given the extensive availability of habitat near the transmission line corridor (which parallels existing, cleared access tracks and has been realigned to avoid higher quality habitats in the central part of the alignment) and the proposed control measures, Nature Advisory (2021) concluded that **the Project is unlikely to lead to unacceptable increased impacts to threatened mallee birds** (refer Appendix I-4).

Key species are discussed further below. Further detail on individual species and groups of species with a possible (or greater) likelihood of occurrence are provided in Table 11-21 below.

### Black-eared Miner

Black-eared Miner (listed as Endangered Nationally and in SA) occurs in dense, long-unburnt mallee vegetation. It has hybridised extensively with the common Yellow-throated Miner in areas where the mallee has become fragmented by vegetation clearing; this is recognised as a key threat to the species as a whole. Historically they were known to occur in extensive unburnt mallee areas north of the River Murray, particularly in the Gluepot to Calperum Station area. More recently, BDBSA and Birdlife records, as well as recent surveys indicate Black-eared Miners, Yellow-throated Miners and hybrids continue to occur in the vicinity of the transmission line corridor. Both pure Black-eared Miners and hybrids were recently recorded at Taylorville, Hawks Nest and Calperum Stations, the Hawks Nest records being well north of the current transmission line corridor (refer Appendix I-4).

Potential impacts to the species relevant to the Project are habitat removal, fragmentation and degradation of habitat, predation, disturbance during construction and operation (e.g. vehicle collision, noise, activity) and as mentioned above, hybridisation. Clearance of vegetation can facilitate hybridisation via fragmentation of habitat, which allows Yellow-throated Miners to enter and hybridise with pure Black-eared Miners.

Vegetation clearance for the Project is expected to result in a minor to moderate level of impact of habitat fragmentation or increasing existing levels of hybridisation of the Black-eared Miner. The alignment has been modified to avoid localities where the species has been recorded recently as well as avoiding impacts to Critical Habitat to the north of the alignment where the majority of the pure Black-eared Miners occur. Whilst there are expected to be individuals present, the habitat in the transmission line corridor is considered to be less suitable, and the better habitat that is within the listed Critical Habitat area is well north of the corridor. There is a possibility Yellow-throated Miners may enter new cleared areas and hybridise with Black-eared Miners but evidence indicates hybrid birds are already present in the impact area (refer Appendix I-4).

Vegetation clearance during construction will result in a low risk of reducing the value of Black-eared Miner Critical Habitat, as the alignment only traverses the southern boundary of this habitat, following areas already disturbed rather than the essential mallee habitat that is well north of the corridor. The

Project will impact approximately 0.04% (143 ha along 71 km of alignment) of the total area (over 380,000 ha) of listed Critical Habitat, along its southern margin. The proportion of available mallee habitat that will be impacted by the Project is also very small. The Project will result in clearance of approximately 201 ha of non-core / less suitable mallee habitat (along approximately 100 km of the alignment)[4]. This is 0.03% of the more than 600,000 ha of mallee habitat in the Riverland Biosphere Reserve and other properties traversed by the proposed alignment. Standard fauna protection protocols (e.g. speed limits, dust suppression, fauna awareness during inductions and prevention of unauthorised access to tracks) are expected to minimise other construction and operation impacts.

Based on the above, significant impacts as per the EPBC Significant Impact Guidelines Endangered species criteria (DoE 2013) are not expected (see Table 11-21 and Appendix I-3).

### Malleefowl

Malleefowl (listed as Vulnerable nationally and in SA) occur in semi-arid to arid zone shrublands and low woodlands dominated by mallee habitats. The largest populations occur WA and SA, but they also occur in NSW and Victoria. Given the large distribution of Malleefowl across Australia, no particular populations have been described as of greater importance for the long-term survival of the species in the Malleefowl Recovery Plan, but there are declines across the range and ongoing objectives to conserve the species (Benshemesh 2007). Preferred habitats include long-unburnt mallee on sand with deep litter and with a mosaic of fire history, for breeding and foraging. In SA, more than 600,000 ha of suitable habitat occurs north of the transmission line corridor in the Riverland Biosphere Reserve. Whilst Malleefowl have not been observed in the transmission line corridor (aside from tracks on the boundary of Calperum, Nature Advisory 2021), there are numerous records and presence of habitat, therefore they are considered as present within the corridor and would occur in mallee habitats of the central to eastern transmission line corridor, but are also known to traverse along tracks and forage in cropped / stubble areas.

Threats to the species include habitat removal, habitat degradation or fragmentation as a result of vegetation clearance or increased fire potential and weed incursion. Other potential impacts include increased predator access, collision with vehicles, particularly given ground-dwelling nature and size and disturbance during construction (noise, activity, dust) or operation. While juvenile Malleefowl are precocial (hatched in advance state) and have no post hatch parental care and can fend for themselves, they are particularly vulnerable to predation by foxes. The intent of the Project is to minimise vegetation clearance that could facilitate additional habitat fragmentation, degradation and predation and increased fire potential.

The species is known to persist near access tracks and fragmentation of the scale proposed is not likely to be of significant consequence for this species (Nature Advisory 2021). Vegetation clearance during construction will result in very low reduction in the area or value of Malleefowl habitat, as the alignment traverses areas already disturbed and avoids the extensive mallee habitat that is north of the corridor. The Project will result in clearance of approximately 201 ha of potentially suitable habitat (i.e. mallee) along approximately 100 km of the alignment[4]. This is 0.03 % of the more than 600,000 ha of mallee habitat in the Riverland Biosphere Reserve and other properties traversed by the proposed alignment. Standard fauna protection protocols (e.g. speed limits, dust controls, waste management, fauna awareness during inductions and prevention of unauthorised access) are expected to minimise other construction and operation impacts. In addition, whilst no Malleefowl mounds have been detected to date, micro-siting prior to vegetation clearance can be used to avoid impacts to active nesting mounds and breeding pairs if present.

[4] Estimates of clearance are based on upper estimates for land disturbance of 2 ha per km. The length of potentially suitable habitat along the transmission line corridor is based on mapping of broad habitat types along the corridor (see Section 11.3.4).

Based on the above, significant impacts as per the EPBC Significant Impact Guidelines, Vulnerable species criteria (DoE 2013), are not expected (see Table 11-21 and Appendix I-3).

### Red-lored Whistler

Red-lored Whistler (listed nationally as Vulnerable and Rare in SA) is considered present in the long-unburnt / old growth mallee habitats of the transmission line corridor (including habitat in Taylorville Station), however likely to occur in low abundance at these sites, given that amount of mallee within the transmission line corridor that has been burnt in the last 6 – 14 years. The species is known from Pooginook CP (previous records and survey results) which is traversed by the transmission line corridor (along the northern boundary) and abuts Taylorville Station (refer 11.3.6 above). The species occurrence is considered limited in this area that is already fragmented by existing track and existing ElectraNet infrastructure (Nature Advisory 2021).

Threats to the species include habitat removal, habitat degradation or fragmentation as a result of vegetation clearance or increased fire potential and weed incursion. Other potential impacts includer increased predator access, collision with vehicles and disturbance during construction (noise, activity, dust) or operation. The intent of the Project is to minimise vegetation clearance that could facilitate additional habitat fragmentation, degradation and predation and increased fire potential. The known occurrence of this species within the transmission line corridor is primarily in areas with existing tracks present, i.e. already fragmented. Vegetation clearance during construction will result in a very low reduction in the area or value of Red-lored Whistler habitat, as the alignment traverses areas already disturbed and avoids essential mallee habitat that is well north of the corridor. The Project will result in clearance of approximately 201 ha of non-core / less suitable mallee habitat along approximately 100 km of the alignment[5]. This is 0.03 % of the more than 600,000 ha of mallee habitat in the Riverland Biosphere Reserve and other properties traversed by the proposed alignment. Standard fauna protection protocols (e.g. speed limits, dust suppression and noise controls, fauna awareness during inductions and prevention of unauthorised access to tracks) are expected to minimise construction and operation impacts.

Based on the above, significant impacts as per the EPBC Significant Impact Guidelines Vulnerable species criteria (DoE 2013) are not expected (see Table 11-21 and Appendix I-3).

### Regent Parrot

Regent Parrot (listed as Vulnerable nationally and in SA) is restricted to a single population occurring in inland south-eastern Australia, which ranges across the lower Murray-Darling basin region of South Australia, New South Wales and Victoria. In SA all known breeding colonies are located along the River Murray and feeding sites (within large blocks of mallee) are within 5 – 20 km (usually 5 – 10 km) of these areas. Mallee further than 20 km from the River Murray can be utilised in the non-breeding season. Favoured mallee includes Beaked Red Mallee and Ridge-fruited Mallee. Roadside vegetation corridors are often used for dispersal to avoid raptors. Suitable foraging habitat occurs within the ESA and areas of the transmission line corridor towards the centre / eastern end (e.g. between the River Murray and Morgan, Overland Corner and Berri. Historical and current survey records show occurrence along the alignment is limited.

Potential impacts to the species as a result of the Project include impacts to foraging or flight path habitat (e.g. removal, degradation, fragmentation, weed invasion), impacts associated with collision (vehicles or the transmission line itself (see below) or impacts associated with disturbance (e.g. noise, dust, activity) during construction or operation. A number of areas on the transmission line corridor are within 6 – 17 km of the River Murray and have potential to interrupt movement patterns include

[5] Estimates of clearance are based on upper estimates for land disturbance of 2 ha per km. The length of potentially suitable habitat along the transmission line corridor is based on mapping of broad habitat types along the corridor (see Section 11.3.4).

area between Stuart and Makaranka, areas near Pooginook CP, North of Lake Bonney and East from Cooltong CP to the NSW border (Nature Advisory 2021).

Major vegetation clearance along flight path corridors or in core foraging habitat is not expected. The Project would impact a very small proportion of available foraging habitat in the region. The Project will result in clearance of approximately 250 ha of potentially suitable foraging habitat (mallee / woodland) along approximately 125 km of alignment[6]. This is 0.04 % of the more than 600,000 ha of potentially suitable mallee / woodland habitat in the Riverland Biosphere Reserve and other properties traversed by the proposed alignment.

This species is also at risk of bird strike via vehicle collision and collision with transmission lines. During breeding season males are potentially at risk when foraging back and forth from nesting sites to feed females and juveniles are at risk during dispersal once they have fledged. However, as discussed in Appendix I-5 (and Section 11.4.4), likelihood of collision with the transmission line is considered to be low, given their size, small wingspan, wide spacing of conductors and flight height. There were also no deaths attributed to powerline for Regent Parrots or other parrots. Provided there is adequate gap between the canopy and the powerlines, Regent Parrots moving between the Murray River breeding and roosting sites and mallee shrubland foraging areas, which usually fly less than five metres above the tree canopy, are considered unlikely to collide with the powerlines (see Appendix I-4). Under typical operating conditions, the clearance between the conductors and the canopy would be more than 5 m, which would mean that collision with the transmission line is unlikely.  Additional protocols as part of the CEMP and OEMP such as speed limits and fauna awareness protocols would also be implemented.

Based on the above, significant impacts as per the EPBC Significant Impact Guidelines Vulnerable species criteria (DoE 2013) are not expected (see Table 11-21 and Appendix I-3).

[6] Estimates of clearance are based on upper estimates for land disturbance of 2 ha per km. The length of potentially suitable habitat along the transmission line corridor is based on mapping of broad habitat types along the corridor (see Section 11.3.4).

**Table 11-21: Impacts to listed fauna**

| Species name | Cth | SA | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual impact |
|---|---|---|---|---|---|---|---|
| **EPBC Act listed species** | | | | | | | |
| Black-eared Miner | EN | E | Present | Present / likely in long unburnt mallee habitats. Listed Critical Habitat area occurs north of the Project and its southern boundary intersects the transmission line corridor. Core populations occurs in northern half of Listed Critical Habitat.<br>Key threat to species is degradation / fragmentation / fire impacts to habitat and further hybridisation with Yellow-throated Miner (hybrids and YTM already present with the transmission line corridor, north and south of). | Clearance of very small proportion of available habitat (e.g. 0.04% of listed Critical Habitat, 201 ha clearance of non-core / less suitable mallee habitat compared to 600,000 ha in the surrounding areas).<br>Localised disturbance during construction, affecting a very small proportion of available habitat.<br>Low potential for individuals to be impacted by vehicle collision.<br>Low potential for increase in predators as line follows existing disturbance corridors.<br>Minor to moderate potential for increase in rate of hybridisation as hybrids and Yellow-throated Miners are already present. | Avoid BEM Critical Habitat Area.<br>Minimise vegetation clearance that could facilitate additional fragmentation / rate of hybridisation / increased fire potential.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible to low. Long-term impacts to the population and species as a whole are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Malleefowl | VU | V | Present | No nesting mounds identified to date within the transmission line corridor. Would move away from area if present, vast areas of suitable habitat present north of the eastern end of the transmission line corridor and in conservation areas that are avoided. Critical habitat is not limited to the transmission line corridor. Juveniles are vulnerable to fox predation. | Clearance of very small proportion of available mallee habitat (201 ha clearance of mallee habitat compared to 600,000 ha in the surrounding areas).<br>Localised disturbance during construction, affecting a very small proportion of available habitat.<br>Low potential for individuals to be impacted by vehicle | Avoid known nesting mounds.<br>Micro-site to avoid impacts to mounds / breeding pairs (if present).<br>Speed limits, awareness, predator control.<br>Minimise vegetation clearance that could facilitate additional | Negligible. Long-term impacts to an important population are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |

| Species name | Cth | SA | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual impact |
|---|---|---|---|---|---|---|---|
| | | | | Ground dwelling bird that is vulnerable to vehicle collision.<br>> 600,000 ha of more suitable habitat (mallee extent and mosaic of fire history in the Riverland Biosphere Reserve) is avoided. | collision, given relatively low densities and management controls.<br>Low potential for impacts to nesting mounds within dense mallee given lack of mounds detected to date and micro-siting.<br>Low potential for increase in predators as line follows existing disturbance corridors. | habitat fragmentation / predation.<br>Implement CEMP / OEMP to manage indirect impacts. | |
| Regent Parrot | VU | V | Likely | Present / possible foraging in mallee habitats 20 km from nesting areas, less frequently north of the transmission line corridor. Nesting habitat is well south of the transmission line corridor (along the River Murray). Juveniles and males may be prone to strike with powerlines when flying to northern mallee areas to forage. Noting that the species usually fly less than five meters above the tree canopy / use treed corridors to move between breeding and foraging localities. | Clearance of very small proportion of available mallee foraging habitat (250 ha clearance of mallee/woodland habitat compared to 600,000 ha in the surrounding areas).<br>Localised disturbance during construction, affecting a very small proportion of available foraging habitat.<br>Low potential for individuals to be impacted by vehicle collision, when flying from southern nesting habitats to northern foraging habitats.<br>Low potential for individuals to be impacted by collision with transmission line, when flying from southern nesting habitats to northern foraging habitats, particularly juveniles / males. | Speed limits, awareness.<br>Fauna awareness protocols.<br>Minimise vegetation clearance of foraging habitat and 'treed corridors' between nesting and foraging areas.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Long-term impacts to an important population are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Red-lored Whistler | VU | R | Present | Known to occur in the Riverland Biosphere Reserve, prefers long-unburnt mallee habitats. Critical habitat is not limited to the | Clearance of very small proportion of available habitat (200 ha clearance of non-core / less suitable mallee habitat | Avoid clearing preferred habitats.<br>Micro-siting to minimise vegetation clearance that | Negligible. Long-term impacts to an important population are not expected. |

| Species name | Cth | SA | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual impact |
|---|---|---|---|---|---|---|---|
| | | | | transmission line corridor, but occurs 30 km north of the transmission line corridor. Species prefers Spinifex / mallee shrubland or mallee heath shrubland where canopy is sparse and shrubs at high densities. Observed near Pooginook Conservation Park (the transmission line corridor traverses northern border which abuts Taylorville Station),where occurrence is limited. | compared to 600,000 ha in the surrounding areas).<br>Localised disturbance during construction, affecting a very small proportion of available non-critical habitat.<br>Low potential for individuals to be impacted by vehicle collision.<br>Low potential for increase in predators as line follows existing disturbance corridors. | could facilitate additional habitat fragmentation / predation.<br>Implement CEMP / OEMP to manage indirect impacts. | Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Painted Honeyeater | V | R | Possible | Nomadic mobile species that occurs at low densities throughout its range. Strongholds for the species and breeding areas occur on the inland slopes of the Great Dividing Range in NSW, Vic and Southern Queensland.<br>Occurs in dry open forests and woodlands, strongly associated with mistletoe. Few records in South Australia. | Clearance of very small proportion of vegetation in the region that the species could potentially utilise (if present).<br>Localised disturbance during construction (if present).<br>Low potential for individuals to be impacted by vehicle collision (if present). | Minimise vegetation clearance.<br>Implement CEMP / OEMP to manage indirect impacts. | Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Australian Bittern / Painted Snipe / Latham's Snipe | EN / EN / MW | V / V/ R | Possible | Possible occurrence in swampy well vegetated riverine / Ramsar wetland habitats immediately adjacent eastern end of the transmission line corridor. Limited suitable habitats occur immediately north of the transmission line corridor for these birds to move to if present, more likely to move to adjacent wetlands. | Low potential for individuals to be impacted by collision with transmission line, if flying from southern wetland habitats to northern wetland habitats. | Buffer between corridor and wetland habitats.<br>Bird reflectors on transmission line near wetlands in Ramsar site.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Long-term impacts to populations or habitats critical to species survival are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |

| Species name | Cth | SA | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual impact |
|---|---|---|---|---|---|---|---|
| Curlew Sandpiper | CE / MW | Not rated | Possible | Occurrence in riverine, wetland, artificial water habitats of or adjacent the transmission line corridor. Potential flyover species. Predominantly migratory birds that are not present all year round, breed outside of Australia. Habitats adjacent the transmission line corridor are not core habitats. | Low potential for individuals to be impacted by collision with transmission line, if flying from southern wetland habitats to northern wetland habitats. | Buffer between corridor and wetland habitats.<br>Bird reflectors on transmission line near wetlands in Ramsar site.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Long-term impacts to populations or habitats critical to migratory species survival are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Functional Group – Common Sandpiper, Sharp-tailed Sandpiper, Pectoral Sandpiper, Red-necked Stint, Pacific Golden Plover, Wood Sandpiper, Common Greenshank, Marsh Sandpiper | MW | | Possible or likely (refer Table 11-11) | | | | |
| Caspian Tern / Crested Tern | MM | Not rated | Likely | Likely / possible foraging above in riverine / wetland habitats adjacent the transmission line corridor, potential flyover species on route to and from wetland habitats. Evidence of tern deaths attributable to powerline bird strike, but mainly coastal species (Crested Tern) less likely to occur.<br>Wetland review considered the overall risk to these species as low (based on likelihood and consequence factors). | Moderate potential for low numbers of individuals to be impacted by collision with transmission line, if flying from southern wetland habitats to northern wetland habitats. | Buffer between corridor and wetland habitats.<br>Bird reflectors on transmission line near wetlands in Ramsar site.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Long-term impacts to populations or habitats critical to migratory species survival are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Osprey | MW | E | Possible | Possible foraging in riverine / wetland habitats adjacent the transmission line corridor, or nesting in towers once established. Critical habitat is not limited to the transmission line corridor. Core populations and breeding areas occur along the coastline of | Low potential for individuals to be impacted by collision with transmission line, if flying from southern wetland habitats to northern wetland habitats.<br>Low potential for individuals to be impacted by collision with | Buffer between corridor and wetland habitats.<br>Bird reflectors on transmission line near wetlands in Ramsar site. | Negligible. Long-term impacts to populations or critical habitats are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |

| Species name | Cth | SA | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual impact |
|---|---|---|---|---|---|---|---|
| | | | | Australia, greater numbers to the north of Australia. | transmission line if nesting on towers. | Regular tower monitoring for nest development / removal.<br>Implement CEMP / OEMP to manage indirect impacts. | |
| Fork-tailed Swift | MT | Not rated | Possible | Overfly species, uses aerial habitats to 1000 m. Habitat is not limited to the transmission line corridor or broader region. | Low potential for individuals to be impacted by collision with transmission line, if flocks fly near line. | Implement CEMP / OEMP to manage indirect impacts. | Negligible.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Southern Bell Frog | VU | V | Possible | Occurs in riverine / wetland habitats immediately adjacent eastern end of the transmission line corridor, but will move into adjacent areas during appropriate season / rainfall. Critical habitat is not limited to the transmission line corridor. | Low potential for individuals to be impacted by vehicle collision if present in transmission line corridor during seasonal conditions (e.g. winter, flooding events).<br>Low potential for increase in predators as line follows existing disturbance corridors. | Speed limits, awareness, predator control.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Long-term impacts to populations or critical habitats are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| South-eastern Long-eared Bat / Corben's Long-eared Bat | VU | V | Possible | Possible, but unlikely occurrence in mallee / woodland habitats. Would likely move to suitable habitat north of the transmission line corridor or to NSW if impacted by disturbance. No bat camps / roosts known to occur in the transmission line corridor. Core important population occurs in NSW (Piliga Scrub). Critical habitat is not limited to the transmission line corridor. | Low potential for individuals to be impacted by collision with transmission line, if flying near line or roosting in mallee habitat that is cleared.<br>Localised disturbance during construction, affecting a very small proportion of available non critical habitat. | Avoid clearing preferred habitats.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Long-term impacts to important population or critical habitats are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Flinders-ranges Worm-Lizard, | VU | Not rated | Possible | Possible in grassland, woodland, rocky loose soil and litter habitats toward western end of the transmission line corridor. Transmission line corridor is on the | Low potential for individuals to be impacted by ground disturbance if present in transmission line corridor. | Micro-site to avoid impacts to species (if present). | Negligible. Long-term impacts to populations or critical habitats are not expected. |

| Species name | Cth | SA | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual impact |
|---|---|---|---|---|---|---|---|
| | | | | edge / outside the known range of where the species may occur. Marginal suitable habitat (if any) occurs at the very western extent. Habitat in the transmission line corridor is not critical to the species. | Low potential for increase in predators as line follows existing disturbance corridors.<br>Low potential for temporary barriers to movement within transmission line corridor. | Implement CEMP / OEMP to manage indirect impacts. | Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Pygmy Blue-tongue Lizard | EN | E | Possible | Possible in unploughed grassland habitats toward western end of transmission line corridor, however targeted searches for habitat have not detected suitable habitat or species to date. Transmission line corridor is east of all known records. No habitat in transmission line corridor that is critical to the species or cannot be avoided by micro-siting or spanning if present. | | | |
| **NPW Act listed species and other potential species** | | | | | | | |
| Striated Grasswren | ** | R | Possible | Possible occurs in mallee habitats in the region, although not detected in targeted surveys | Clearance of very small proportion of available habitat.<br>Localised disturbance during construction, affecting a very small proportion of available habitat.<br>Low potential for individuals to be impacted by vehicle collision.<br>Low potential for increase in predators as line follows existing disturbance corridors | Minimise vegetation clearance that could facilitate additional habitat fragmentation / predation.<br>Implement CEMP / OEMP to manage indirect impacts. | Negligible. Long-term impacts to populations or critical habitats are not expected.<br>Residual impacts are not significant under EPBC significant impact guidelines (see Appendix I-3). |
| Other NPW species that possibly occur. | | | Possible | Species that possibly occur in the region (as per Appendix O, P). These are primarily highly mobile species, with limited records in or adjacent to the transmission line | Clearance of very small proportion of available habitat.<br>Localised disturbance during construction, affecting a very | Buffer between corridor and wetland habitats.<br>Minimise vegetation clearance that could | Negligible. Residual impacts to these species are not expected. |

| Species name | Cth | SA | Likelihood of occurrence | Background comments | Expected impact | Mitigation measures | Level and significance of residual impact |
|---|---|---|---|---|---|---|---|
| | | | | corridor and not considered to be directly reliant upon habitat in the transmission line corridor. If they occur, they are infrequent visitors. | small proportion of available habitat.<br>Low potential for individuals to be impacted by vehicle collision.<br>Low potential for individuals to be impacted by collision with transmission line, if flying near line.<br>Low potential for increase in predators as line follows existing disturbance corridors | facilitate additional habitat fragmentation / degradation / predation.<br>Bird reflectors on transmission line near wetlands in Ramsar site.<br>Implement CEMP / OEMP to manage indirect impacts. | |
| EPBC and NPW species that are unlikely to occur | | | Unlikely | Species that are unlikely to occur in the region (as per Appendix I-1). These are primarily highly mobile species and not considered to be directly reliant upon habitat in the transmission line corridor. If they occur, they are very infrequent visitors. | | | |
| Common Fauna | | | Likely | Locally common native reptiles, mammals and birds and exotic fauna | | | |

[1] *Environment Protection and Biodiversity Conservation Act 1999* Status: Critically Endangered (CE) Endangered (EN), Vulnerable (VU); Migratory Marine (MM); Migratory Terrestrial (MT); Migratory Wetland (MW)
[2] *South Australian National Parks and Wildlife Act 1972* Status: Endangered ®; Vulnerable (V); Rare ®, EX (Presumed extinct)
** Potential future listing as Endangered under the EPBC Act (Nature Advisory 2021).

## 11.4.9. Summary of key mitigation measures

**Table 11-22: Key mitigation measures – flora and fauna**

| Mitigation measure | Construction | Operation |
|---|---|---|
| Undertake detailed design to avoid traversing isolated patches of vegetation where possible (e.g. at the western end of the transmission line corridor) | ✓ | |
| Design the line to span across mature vegetation (with minimal clearance required) where feasible. | ✓ | ✓ |
| Minimise vegetation clearance for conductor stringing tracks where possible subject to stringing method determined during detailed design | ✓ | |
| Undertake pre-clearance surveys to 'micro-site' tower locations and other infrastructure to avoid occurrences of threatened plants or other significant features (e.g. active Malleefowl mounds) | ✓ | |
| Establish no go areas (flagged / fenced where required) to protect sensitive vegetation / habitats where appropriate | ✓ | |
| Restrict vegetation disturbance, clearance or trimming to approved areas (as per NVC approval) | ✓ | ✓ |
| Locate temporary worker camps in disturbed / cleared areas or in areas with limited native vegetation | ✓ | |
| Locate other temporary facilities (e.g. temporary laydown areas / staging sites) in disturbed areas or in areas with limited native vegetation as far as practicable, avoiding areas of habitat for Black-eared Miner | ✓ | |
| Minimise clearance of vegetation, particularly dense mallee habitats | ✓ | ✓ |
| Roll or trim vegetation where feasible rather than complete removal | ✓ | |
| Retain groundcover and rootstock where possible (e.g. for the stringing access corridors) | ✓ | |
| Avoid removal of larger trees (e.g. trunk diameter over 30 cm) where possible | ✓ | |
| Utilise areas where native vegetation is degraded or has been previously cleared in preference to clearing vegetation wherever practicable | ✓ | |
| Use existing roads, tracks, fire breaks and other existing disturbed areas to minimise habitat removal wherever possible | ✓ | |
| Restrict tracks to the minimum width necessary to allow safe access (typically 5 m) | ✓ | |
| Design tracks to take the shortest route (e.g. short spur tracks off existing roads / tracks) and with as little impact as possible to native vegetation, existing land uses and landholders including following existing boundaries where possible | ✓ | |
| Restrict pads for tower assembly to the minimum size necessary | ✓ | |
| Offset vegetation clearance with a Significant Environmental Benefit in accordance with NVC approval. | ✓ | |
| Rehabilitate or allow natural regeneration in areas of disturbance where not required after construction | ✓ | |
| Restrict vehicle movements to defined tracks and work areas. | ✓ | ✓ |
| Implement speed limits on access tracks, particularly in key areas of mallee habitat, to reduce the risk of vehicle collisions with wildlife | ✓ | |
| Restrict unauthorized public access to access tracks | ✓ | ✓ |
| Install locked gates where required and appropriate signage once construction is completed | | ✓ |
| Use dust suppression measures (e.g. water tankers) where required during construction. | ✓ | |
| Attach bird diverters to powerline conductors and / or the top-most earth / shield wire at regular intervals to increase visibility of the lines in close proximity to wetland habitats in the Riverland Ramsar site (e.g. within 500 m of the indicative 1 in 10 year inundation extent). | | ✓ |

| Mitigation measure | Construction | Operation |
|---|---|---|
| Install temporary fencing to prevent stock or large fauna entrapment in excavations that are to be left open where appropriate. | ✓ | |
| Regularly check any open excavations for trapped fauna or provide measures to allow their escape | ✓ | |
| Use wildlife handler where appropriate (e.g. when retrieving fauna from excavations or removing nests of threatened mallee birds in critical habitat during breeding season) | ✓ | |
| Place construction camps near already disturbed areas where practicable and utilise lighting type that limits illumination away from the area. | ✓ | |
| Provide inductions to all contractors to ensure understanding of local and regional flora and fauna significance and sensitivities, construction method and work area restrictions | ✓ | |
| Implement protocols for management of waste during construction to avoid attracting feral pest animals | ✓ | ✓ |
| Undertake pre-construction inspection to identify any areas of weed infestation requiring specific management measures. | ✓ | |
| Implement weed hygiene procedures such as vehicle wash-downs and inspections where appropriate | ✓ | |
| Control weeds within the works area in accordance with the Landscape South Australia Act | ✓ | ✓ |
| Conduct post construction weed survey and control program (if necessary) with particular focus on any weed infestations identified in pre-construction surveys | | ✓ |
| Appropriately dispose of any declared weeds cleared as part of the Project (with any necessary notification / permits under the Landscape South Australia Act in place for moving / relocating vegetation containing declared plants). | ✓ | ✓ |
| Undertake pest animal control if ground disturbance encourages pest animal (e.g. rabbit) activity. | ✓ | ✓ |
| Implement and maintain fire tracks and fire breaks in accordance with fire hazard management plan | ✓ | ✓ |
| Undertake weed maintenance to ensure fuel load at the base of the towers is minimised | | ✓ |
| Ensure that all equipment is fitted with appropriate firefighting equipment. | ✓ | ✓ |
| Maintain awareness of local seasonal restrictions, particularly regarding hot works during fire ban season | ✓ | ✓ |
| Restrict high risk fire activities during fire ban periods. | ✓ | ✓ |
| Maintain clearance distances between vegetation and transmission lines in accordance with the Electricity (Principles of Vegetation Clearance) Regulations | | ✓ |

## 11.5. Conclusion

ElectraNet’s key finding is that Project construction or operational activities will not lead to significant or long-term impacts to flora and fauna. Potential impacts can be readily managed with appropriate location of infrastructure and application of mitigation measures.

EIS Volume 1 Chapter 12

# Cultural Heritage

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# 12. Cultural Heritage

This chapter describes how the construction and operation of the Project may affect Aboriginal and non-Aboriginal cultural heritage values within the transmission line corridor.

Native title in the area of the Project is discussed in Chapter 9 Land Use and Tenure.

## 12.1. Key Findings

### Aboriginal cultural heritage

- Cultural heritage surveys along the entire route have identified sites of Aboriginal cultural heritage significance and the alignment has consequently been altered to avoid and limit potential impact.
- Towers will be micro-sited following detailed design and survey to further avoid and protect sites.
- Cultural Heritage Management Plan(s) will be developed and implemented to address protection for identified Aboriginal sites of significance and procedures for discovery and reporting. A draft framework for the Cultural Heritage Management Plan is included as Appendix R.
- Aboriginal Heritage Agreements between ElectraNet and the Traditional Owner groups will be entered into to ensure cultural heritage values are protected and their views are taken into consideration.

### Non-Aboriginal cultural heritage

- Impacts to non-Aboriginal cultural heritage sites due to Project construction and operation are not expected.
- There are no Commonwealth Heritage, National Heritage or Local Heritage places in the transmission line corridor.
- There is only one State Heritage listed place near the transmission line corridor which will be avoided by the alignment and construction activities.
- A Project Construction Environmental Management Plan (CEMP) will detail requirements, procedures and responsibilities for all staff and contractors around known and discovered non-Aboriginal heritage sites.

## 12.2. Setting the Context

This section provides information needed to explain the context within which impact and risk assessment occurs. It describes:

- the relevant EIS Guidelines
- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet
- the assessment methodology used to identify baseline environmental values and to undertake the impact and risk assessment.

### 12.2.1. EIS Guidelines

The EIS Guidelines require the assessment of the potential impacts of Project construction on Aboriginal or non-Aboriginal cultural heritage as set out in Table 12-1.

**Table 12-1: EIS Guidelines addressed in Cultural Heritage chapter**

| EIS Guidelines and Assessment Requirements | Assessment level |
| --- | --- |
| **Effect on Conservation Values**<br>*Assessment Requirement 3*: The proposed development traverses a corridor which contains significant and extensive tracts of remnant habitat (including one of the largest stands of old-growth Mallee vegetation in Australia) and has high conservation values. It is also within close proximity of the floodplain habitat of the River Murray. | |
| • *3.2*: Identify the potential effects and measures to avoid and or mitigate the proposal on the local, regional, state or national conservation status of sites, objects and areas of significance to Aboriginal people during both construction and maintenance. | Critical |
| **Effect on Cultural Heritage Values**<br>*Assessment Requirement 6:* The proposed development has the potential to impact on sites / locations of Indigenous or Non-indigenous heritage through disturbance during construction. | |
| • *6.1:* Identify any effects on Aboriginal sites of archaeological or anthropological significance (including but not limited to those listed in the Register of the National Estate and the SA Register of Aboriginal Sites and Objects). Indicate any consultation with local Aboriginal organisations that have an in interest in the area. | Critical |
| • *6.2:* Identify any effects on post European settlement sites of archaeological or anthropological significance (especially but not limited to those listed in the Register of the National Estate, State Heritage Register or Interim List for the State Register and lists of places of local heritage value). | Critical |
| • *6.3:* Outline measures adopted to avoid or minimise impacts on Aboriginal and European sites of archaeological or anthropological significance. | Critical |
| **Effect on Communities**<br>*Assessment Requirement 9*: The proposed development has the potential to affect the local community during construction and through the establishment of a large linear structure. | |
| • *9.2:* With reference to assessment requirement 6 above, outline potential impacts on any other use of the land by Aboriginal people, or on cultural values held by Aboriginal people that relate to the areas affected by the project. | Medium |
| **Specialist reports and details**<br>A **Cultural Heritage Management Plan** prepared by an appropriately qualified heritage expert that includes an assessment of the potential impact of the proposal on Aboriginal cultural heritage. The CHMP must outline measures to be taken before during and after the proposed development in order to manage and protect Aboriginal cultural heritage. The CHMP should include a cultural heritage survey identifying areas of Aboriginal significance. This survey should identify any archaeological, anthropological or historical sites, or sites of significance according to Aboriginal tradition. | |

Aspects of assessment requirements identified in Table 12-1 which are not addressed in this chapter are listed in Table 12-2 together with the applicable chapter.

**Table 12-2: Aspects of assessment requirements addressed in other chapters**

| Assessment requirement | Chapter |
| --- | --- |
| 6.3 Consideration of cultural heritage when selecting temporary facilities including construction camps | Chapter 9 Land Use and Tenure |

### 12.2.2. Requirements in legislation, guidelines and other standards

#### State legislation

The *Aboriginal Heritage Act 1988* provides for the protection and preservation of Aboriginal sites, objects and remains of significance and outlines the obligations of parties to disclose newly discovered sites, object and remains. No Aboriginal site, object or remains may be damaged, disturbed or interfered with unless prior approval has been obtained from the Minister for Aboriginal Affairs and Reconciliation.

The *Heritage Places Act 1993* provides for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance through listing in the South Australian Heritage Register. Records of State and local heritage places that were previously maintained by local councils and noted in the relevant Development Plans are now mapped in the State-wide Planning and design Code and State Atlas. They continue to be listed in the South Australian Heritage Register.

#### Guidelines

The *Discovery of Aboriginal Sites and Objects* fact sheet provides guidance on what to do should an Aboriginal site, object or remain be found. Information on potential Aboriginal sites (e.g. areas within close proximity to creeks, rivers, watercourses etc) and reporting guidelines are provided (e.g. stop work procedures), together with managing any areas of discovery (DPC-AAR 2021).

The *Project Planning and Aboriginal Heritage* guide assists proponents with identifying and protecting Aboriginal heritage. It provides information on how to find recorded information, who to liaise with and what actions can be taken to ensure Aboriginal heritage sites, objects or remains are not damaged, disturbed or interfered with (DPC-AAR 2021).

### 12.2.3. Views of stakeholders

#### Aboriginal cultural heritage

ElectraNet has extensively liaised with the Traditional Owners of land in the region of the Project, which comprise the First Peoples of the River Murray and Mallee (First Peoples), First Peoples of the River Murray and Mallee native title claim #2 and Ngadjuri Nation #2 (Ngadjuri), together with their respective legal representatives from SA Native Title Services (SANTS).

Liaison has occurred via meetings with each of the Traditional Owner groups, presenting an overview of the Project, route selection process and providing an opportunity to ask questions and obtain feedback, together with on-site cultural heritage surveys.

The First Peoples advised early on in the process that the eastern most section of the alignment within South Australia is particularly sensitive from a heritage perspective, with many areas of known sites recorded and a high likelihood of other significant, but as yet undiscovered, areas.

In addition to the protection of Aboriginal sites and objects of significance, the Traditional Owners have raised the following matters when meeting with ElectraNet representatives:

- compensation for impacts or potential impacts to native title land
- employment opportunities for Indigenous people
- the importance of not crossing the River Murray.

These matters have been addressed in Aboriginal Heritage Agreements negotiated between ElectraNet and each of the registered body corporates for the First Peoples, the River Murray and Mallee Aboriginal Corporation (RMMAC) and Ngadjuri Nation Aboriginal Corporation (NNAC) respectively.

The proposed alignment will not traverse the River Murray.

Further information on engagement is provided in Chapter 6 Stakeholder Engagement.

#### Non-Aboriginal heritage

Community and stakeholder consultation undertaken for the Project provided an opportunity for people to raise issues related to non-Aboriginal heritage and sites of local significance to the community.

A consistent view expressed by stakeholders was that the proposed alignment should not traverse south of the River Murray for a variety of reasons, including the potential for impacts to cultural heritage sites. The proposed alignment will generally be more than 5 km north of the main channel of the River Murray.

### 12.2.4. Assessment method

The route selection methodology used by ElectraNet to identify constraints and opportunities based on environment, social (including cultural heritage), land use and engineering aspects is discussed in Chapter 4 Route Selection.

The desktop Aboriginal heritage study area (AHSA) comprises a 10 km corridor (i.e. 5 km buffer either side of the proposed alignment).

The non-Aboriginal cultural heritage study area (HSA) for the purposes of this assessment is the transmission line corridor (i.e. 500 m buffer either side of the proposed alignment).

Information on recorded sites of Aboriginal cultural heritage significance was identified during a desktop assessment of AHSA. Sites identified by Traditional Owners during on-site cultural heritage surveys are also noted, although locations are confidential at the request of the Traditional Owners and are not provided in this EIS.

#### Aboriginal cultural heritage – desktop review

To identify relevant Traditional Owners and any Aboriginal heritage sites, objects or remains which may located in the AHSA, a desktop review of various available sources was undertaken and took into account the EIS Guidelines, legislative requirements and stakeholder views, and included an assessment of publicly available information from the following sources:

- the Central Archive, including the Register of Aboriginal Sites and Objects, maintained by DPC-AAR. This search covered the initial 10 km Project investigation corridor which was identified in the early stages of the route selection process (refer Chapter 4 Route Selection).
- Aboriginal History, Volume 40, 2016 covering the Overland Stock Route (Burke et al. 2016)
- review of the extensive works undertaken as part of the SNI project by Sinclair Knight Merz (SKM) in 2002.

***Results of the search of the Central Archive***

The Central Archive incorporates the Register of Aboriginal Sites and Objects maintained by Department of the Premier and Cabinet-Aboriginal Affairs and Reconciliation (DPC-AAR). A search of the archive provided numerous recorded and registered sites located within 20 km of the proposed alignment. The search results were fed into the route selection process and enabled the initial 10 km Project investigation area to be narrowed down to a 1 km transmission line corridor which avoided each of those registered and recorded sites (refer Chapter 4 Route Selection).

On-site cultural heritage surveys with the relevant Traditional Owners were then organised to ensure the construction and operation of the Project within the 1 km corridor would not impact on any previously undiscovered sites, objects or remains along the proposed alignment. The results of the on-site heritage surveys are discussed in Section 12.3.1.

#### *Existing Cultural Heritage information – First Peoples*

The First Peoples' preferred archaeologist / anthropologists, Dr Vivienne Wood and Craig Westell of Vivienne Wood Heritage Consultant Pty Ltd, have a long and respectful relationship with the First Peoples and were contracted by the First Peoples to undertake an on-site survey in respect of the land within with their native title consent determination area.

In preparation for the survey, Dr Wood and Mr Westell undertook a comprehensive desktop review of all available archival and documentary materials and, together with the results of previous heritage surveys, provided ElectraNet with a confidential risk assessment of the native title consent determination area. The assessment related to four distinct zones which were ranked from High to Low. Both the River Murray Valley and the River Murray Valley Margin Zones were ranked as High, the Murray High Plain Zone ranked as Low, and the Alluvial fans Zone were ranked Low to Moderate.

#### *Existing Cultural Heritage information – First Peoples #2*

Dr Wood and Mr Westell were also contracted by the First Peoples claim #2 to undertake an on-site survey in respect of the land within with their native title claim area.

In preparation for the survey, Dr Wood and Mr Westell undertook a comprehensive desktop review of all available archival and documentary materials and, together with the results of previous heritage surveys, provided ElectraNet with a confidential risk assessment of the native title claim area.

#### *Existing Cultural Heritage information – Ngadjuri Nation #2*

Ngadjuri Nation has its own website with a wealth of information about Ngadjuri country, culture and heritage. Ngadjuri country extends from Angaston and Gawler in the south to Panaramittee and Yunta in the north, and includes the Mid North, Clare Valley, Barossa Valley, Burra, Peterborough, Orroroo, Jamestown and parts of the Southern Flinders Ranges (Ngadjuri 2016). Many of the towns within the Ngadjuri area of interest have Ngaduri names which hint at their Ngadjuri heritage. These include Kapunda, Eudunda, Booleroo and Yarcowie (Ngadjuri 2016).

Ngadjuri Dreaming and Creation stories have been passed down from generation to generation for thousands of years, connecting Ngadjuri people to their ancestors. These stories teach the Ngadjuri about history, lore and traditions, and teach and maintain culture and enrich Ngadjuri understanding of history (Ngadjuri 2016).

### Aboriginal cultural heritage – on-site surveys

#### *First Peoples – Native Title Consent Determination Area*

Land use and tenure within the area of the native title consent determination area comprises:

- pastoral lease for conservation (e.g. remnant native vegetation) or primary production purposes (e.g. sheep grazing)
- Crown Record held by the Minister for Environment and Water for the Chowilla Regional Reserve in respect of tourism and conservation
- freehold land held by various parties for grazing and cropping purposes.

In preparation for on-site surveys, Dr Wood / Mr Westell reviewed information relating to previous recorded sites within 200 m of the proposed alignment which was sourced from DPC-AAR, historic and archival resources and previous heritage surveys they had undertaken in the region. During this process it was noted that the first 40 km, commencing from the eastern-most part of the consent determination area and heading west, is particularly sensitive in terms of Aboriginal heritage. This is due to the proximity of the northern margin of the River Murray floodplain in the areas of Chowilla Game Reserve and Calperum Station.

Two surveys were undertaken in October 2019 and November 2020 with the intent of traversing the proposed alignment within a 100 m wide 'preferred corridor' over the entire stretch of country within the First Peoples native title consent determination area (refer Figure 9-5 in Chapter 9 Land Use and Tenure).

*October 2019 survey*

The survey team comprised Dr Wood / Mr Westell, six First Peoples' members and two representatives from ElectraNet.

The survey included the entire first 40 km of the consent determination area and was undertaken over the course of five days. Systematic pedestrian survey was able to be conducted throughout due to the easily accessible and relatively flat terrain.

Several areas of interest to the First Peoples were identified during the survey. These areas have been recorded for the purpose of route design and to ensure avoidance by ElectraNet and its contractors during construction and maintenance. To ensure protection of these areas, a slight change was made to shift the alignment north within the Chowilla Game Reserve which was also agreed to by representatives of the Department for Environment and Water (DEW), on behalf of the Environment Minister.

A survey report has been completed by Dr Wood / Mr Westell and provided to the First Peoples and ElectraNet. Survey results are summarised in Section 12.3.1, noting that the formal survey report is confidential at the request of the First Peoples.

*November 2020 survey*

This survey commenced on 11 November 2020 and started from the point where the October 2019 survey ended. Completion was scheduled for two weeks after commencement, with the entire stretch of the consent determination area to have been covered by that time.

Good progress was made during this pedestrian survey, with approximately 50 km traversed within the first five days. Unfortunately, the survey was halted on Wednesday, 18 November 2020 due to the COVID-19 lockdown announced by the SA government. The parties were able to re-start the survey on 30 November 2020 and completed the entire stretch of land within the native title consent determination area by 6 December 2020.

A survey report has been completed with the outcomes of the November 2020 survey and provided to the First Peoples and ElectraNet. Survey results are summarised in Section 12.3.1, noting that the formal survey report is confidential at the request of the First Peoples.

*February 2021 consultation*

On 2 and 3 February 2021, ElectraNet joined RMMAC representatives and heritage advisers in a follow-up field visit to consult further on the heritage values of the transmission line corridor and arrangements to avoid impact to sites of significance. These discussions further inform the Cultural Heritage Survey Report, which is under development, pending further consultation between ElectraNet and RMMAC representatives.

***First Peoples – Native Title Claim #2***

An Aboriginal Heritage Survey was completed with First Peoples #2 representatives between 27 January 2021 and 4 February 2021 over the area within the First Peoples #2 claim (as shown in Figure 9-5 Chapter 9 Land Use and Tenure). Several areas of interest to the First Peoples were identified during the survey. These areas have been recorded for the purpose of route design and to ensure avoidance by ElectraNet and its contractors during construction and maintenance.

A Cultural Heritage Survey Report is under development, pending further consultation between ElectraNet and First Peoples #2 representatives.

The land use and tenure within this claim area is freehold land held by various parties for grazing and cropping purposes. An existing ElectraNet 132 kV transmission line traverses the area and the proposed alignment runs parallel to Powerline Road.

***Ngadjuri Nation #2***

ElectraNet have met with members of Ngadjuri Nation #2 and their legal representatives from SANTS to discuss the proposed Project. A cultural heritage survey in respect of the 7 km stretch of native title claim within the area of the Project was undertaken on 16 December 2020 and the results are discussed further in Section 12.3.1. A report detailing outcomes is being prepared for Ngjaduri Nation and ElectraNet but remains confidential at the request of the Ngadjuri.

As with the First Peoples, an Aboriginal Heritage Agreement has been entered into to ensure heritage values are protected and the views of Ngadjuri Nation are taken into consideration.

All land within the 7 km stretch is held under freehold title and utilised for grazing and cropping purposes, with the exception of the land comprising the existing Robertstown substation which is the commencement point of the proposed alignment.

#### Non-Aboriginal cultural heritage

A desktop assessment of non-Aboriginal cultural heritage was conducted, utilising a 1 km wide corridor based on the proposed alignment of the Project (the HSA).

The following steps were taken to conduct the assessment of non-Aboriginal heritage:

- a search of the following South Australian databases:
  - South Australian Heritage Places Database http://maps.sa.gov.au/heritagesearch/HeritageSearchLocation.aspx
  - Local Heritage Places as listed in a Schedule of Local Heritage Places within local Council Development Plans and the Planning and Design Code
- a search of the following national databases:
  - Commonwealth Heritage Places – searched via the Australian Heritage Database https://www.environment.gov.au/heritage/places/commonwealth-heritage-list
  - National Heritage Places –searched via the EPBC Act Protected Matters Search Tool https://www.environment.gov.au/heritage/places/national-heritage-list
- a review of heritage surveys conducted in areas overlapping or adjacent to the HSA, including the River Murray and Lower North (Department for Environment, Heritage and Aboriginal Affairs (DEHAA) 1998)
- a review of the extensive works undertaken as part of the SNI project by Sinclair Knight Merz (SKM) in 2002. Information obtained and summarised by SKM has been used during development of this chapter.

## 12.3. Description of Existing Environment

This section examines the existing environment and the cultural heritage values, both Aboriginal and non-Aboriginal, that require protection.

### 12.3.1. Aboriginal cultural heritage

As noted in Section 12.2.4, a desktop review and on-ground Aboriginal cultural heritage surveys have been conducted to determine the Aboriginal cultural heritage values across the AHSA. The results of the reviews and surveys have informed appropriate mitigation measures to ensure those values are protected during construction and maintenance activities.

The search of the Central Archive, which includes the Register of Aboriginal Sites and Objects administered by the DPC-AAR, revealed that there are both registered and recorded Aboriginal heritage sites within 20 km of the area of the Project, together with restricted areas in the general vicinity. The majority of the sites are located along the River Murray and reflect the ties to the land and water by the First Peoples over many thousands of years (together with Ngarrindjeri Nation with ties to the River Murray from the Murray Mouth and Coorong, as far north as Mannum) (DEW 2020).

#### Outcomes of on-site cultural heritage surveys

During the various surveys undertaken by Traditional Owner groups for the Project, sites of significance were located along the original proposed alignment. ElectraNet has agreed in some cases to move the alignment in order to avoid those sites and otherwise to implement a buffer to protect sites. An additional level of protection has also been agreed and is documented in the Aboriginal Heritage Agreement between the various parties.

The Aboriginal Heritage Agreements detail all requirements and obligations of both Traditional Owners and ElectraNet during the construction and maintenance phases of the Project. ElectraNet has also committed to including a cultural heritage component into its standard inductions to ensure personnel and contractors undertaking field work during the design and early works are aware of the region’s heritage values and the importance of following mitigation measures including:

- all vehicles must stay on existing vehicle tracks
- there must be no interference with any cultural heritage sites, objects or remains
- any discoveries must immediately be reported to ElectraNet and the First Peoples, with appropriate lines of communication to be identified.

Additional mitigation measures are proposed to ensure that no sites, objects or remains of significance that are not currently recorded, registered or discovered, will be impacted by the Project (refer Section 12.4).

### 12.3.2. Non-Aboriginal cultural heritage

Non-Aboriginal cultural heritage consists of places or objects with special cultural value inherited from the past, which are intended for conservation and passing on to future generations.

The area of the Project has a long history of non-Aboriginal cultural heritage. In the western region of the HSA, recorded heritage places reflect the long history of copper mining which contributed to South Australia’s early prosperity. In the eastern region, identified heritage places are largely centred around early European use of the River Murray as a medium for trade, agriculture and commerce, with the majority of heritage sites located within the boundaries of townships.

#### Regional historical overview

***Western region of the HSA***

The Mid North region was one of the first areas in South Australia settled by Europeans after colonisation, due to its suitability for farming. However, the character of the area changed with the discovery of copper near Burra Creek in 1845. By 1848 the Burra Mine was established. Burra began as a single company mining township that over time, was a set of townships owned privately, by government and by the mining company (Auhl 1986).

As the area become increasingly populated by mine workers and adjacent supporting industries, John Roberts, a Kooringa storekeeper, carted supplies to the nearby Emu Downs district. Roberts eventually established a store and house in the area from which to operate. When postal services started there, the town was gazetted as Roberts Town (DEP 1983).

After the closure of the mine, the population of the area gradually decreased, and horticulture and agriculture became more established. While these industries continue to support the region in modern times, there has also been a recent shift toward renewable energy infrastructure.

The township of Burra is recognised as a State Heritage Area because of the town's significant links with mining in the history and development of South Australia and the area is of economic and cultural heritage significance to Australian mining history (Heritage SA 2018).

#### *Eastern region of the HSA*

The first European settlement on the River Murray in South Australia was established in 1841 and by 1853 the era of steam navigation of the River Murray had begun. The river ports grew and the first irrigation settlement in Australia was established at Renmark by the Chaffey brothers. Once the possibility of creating fertile land alongside the river through irrigation was realised, more European settlers began to take up land. A network of towns soon arose throughout the region to supply the support services required by farmers (State Library SA 2010a and 2010b).

After the First and Second World Wars, the South Australian government settled returned soldiers and their families in irrigation colonies along the River Murray which resulted in the expansion of the existing areas Cobdogla, Waikerie, Renmark and Berri, as well as new settlements in Cadell and Chaffey among others. The strong community bonds of soldiers resulted in large-scale collaborative irrigation works, which eventually formed the basis of the highly productive orchard and vineyard businesses that support the region today (State Library SA 2010a and 2010b).

### Listed heritage places

#### *Commonwealth Heritage Places*

Commonwealth Heritage Places are heritage places on Commonwealth lands or waters, or under Australian Government control. A review of the Commonwealth Heritage List identified 'Murray Mallee-Calperum Station and Taylorville Station' as a Commonwealth Heritage Place within the HSA. The leases for these properties were previously held by the Commonwealth (Director National Parks (DNP)) and were transferred in perpetuity to Australian Landscape Trust (ALT) in 2013–14.

As part of Department of Agriculture Water and Environment's (DAWE) consideration of the EPBC referral prepared for the Project, the status of Calperum and Taylorville Stations as Commonwealth land was addressed. The Heritage Branch and General Counsel Branch of DAWE confirmed that, as the stations are no longer owned or leased by the DNP they are no longer Commonwealth Heritage Places despite not having been removed from the Commonwealth Heritage List. The properties were therefore not further considered by DAWE under the Commonwealth Heritage Matters of National Environmental Significance for a controlled action. Accordingly, Calperum and Taylorville Stations have not been included in this heritage assessment as Commonwealth Heritage Places.

#### *National Heritage Places*

National Heritage Places are natural, historic or Indigenous places with outstanding national heritage value to the Australian nation, outside of Commonwealth land. No National Heritage Places have been identified in the HSA. The closest identified site is the Australian Cornish Mining Site in Burra, located approximately 33 km north-west from the HSA.

#### *State Heritage Places*

State Heritage Places are places that embody important aspects of the State's history and / or are of significant cultural value. A review of the State Heritage Register identified 'Suicide Bridge' as a State Heritage Place in the HSA (refer Plate 12-1). The site is located 1.5 km south of the proposed alignment in the Chowilla Game Reserve approximately 35 km north-east of Renmark. The location of Suicide Bridge is shown in Figure 12-1 and a summary of the statement of significance is provided in Table 12-3 (Dallwitz and Marsden 1984).

A number of other State Heritage Places associated with historical pastoral, irrigation and river-based commerce activities along the River Murray were identified around Waikerie, Cadell and Morgan but are not considered further in this assessment as they are located more than 5 km outside the HAS. At the western end of the alignment, State Heritage Places such as the Lime Kiln Ruins at Bower and the Princess Royal Homestead and Station near Burra were identified but are also not considered further in this assessment due to their distance from the HSA (more than 20 km).

**Table 12-3: State Heritage Place in the HSA**

| Listed Address | LGA | Listed Name | Statement of significance |
|---|---|---|---|
| Old Coach Road to Wentworth near Border Cliffs via Renmark | Unincorporated SA | Suicide Bridge (previously Lunatic Bridge)<br>Timber Trestle and former NSW-SA Telegraph Line Posts, Chowilla Game Reserve Part of Bookmark Biosphere Reserve Buffer Zone. | The old coach route to Wentworth in NSW cut through the isolated country to the north of the Murray Valley and was in use until the early twentieth century.<br>'Suicide Bridge' is one of the few surviving structures associated with that coaching era. Its curious names probably relate to the terrifying night-time coach crossings during storms or floods.<br>This item is a highly significant vernacular structure. It is made of native pine with split eucalyptus decking.<br>Nearby, to the east, are the remains of old telegraph posts which were once part of the overland telegraph between South Australia and New South Wales.<br>To the west is an example of early timber roadside fencing. |

### *Local Heritage Places*

Local Heritage Places are structures or buildings that demonstrate important local historical attributes or contribute to the historical themes of a local area. No Local Heritage Places have been identified in the HSA.

**Plate 12-1: 'Suicide Bridge', Old Coach Road**
(Source: Exploroz **www.exploroz.com**)

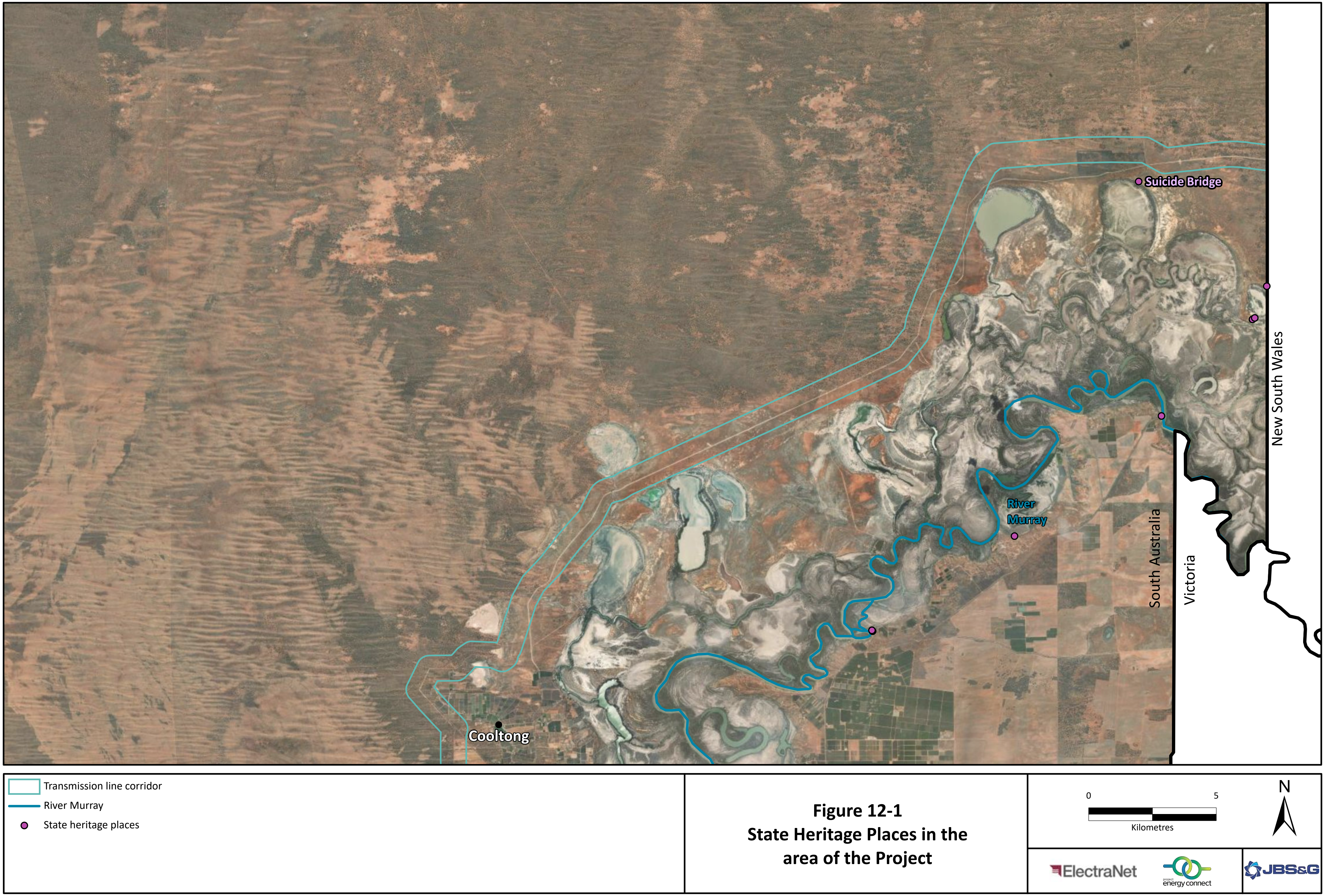


**Figure 12-1**
**State Heritage Places in the area of the Project**

## 12.4. Impact Assessment

The following aspects of the Project have been identified as sources of impacts to cultural heritage:

- location of Project infrastructure
- land disturbance from Project activities during construction, including excavations for structure foundations and erection of towers and conductors.

The potential impact events resulting from these aspects of the Project are discussed below.

### 12.4.1. Project design

#### Placing of towers and other easement infrastructure

**Cultural heritage desktop assessment and field surveys have identified sites of significance and the alignment has been moved accordingly. Towers will be micro-sited and access designed to protect those sites.**

***Aboriginal cultural heritage***

Inappropriate location of towers, staging and laydown areas, stringing corridors and access tracks has the potential to damage, disturb or interfere with sites, objects or remains of Aboriginal heritage significance.

Placement of infrastructure, location of activities and careful planning provides the greatest opportunity to reduce impacts to Aboriginal cultural heritage. ElectraNet engaged early with the relevant Traditional Owners of land within the AHSA and cultural heritage surveys were undertaken with the First Peoples in October 2019 and November 2020. These surveys covered all land along the proposed alignment from the SA / NSW border in the east, to the border with the First Peoples #2 native title claim and the Ngadjuri Nation #2 native title claim approximately 7 km from Robertstown.

The eastern end of the alignment is of particular importance to the First Peoples and the October 2019, November 2020 and February 2021 surveys identified several locations of cultural significance. This has resulted in changes to the proposed alignment traversing Hawks Nest Station in order to completely avoid sites of significance. The cultural heritage avoidance alignment on Hawks Nest Station now traverses the previously disturbed western and southern property boundaries and utilises existing access tracks and the existing ElectraNet 132 kV transmission line (refer Figure 12-2). This alignment has been fully surveyed and agreed to by the Traditional Owners and the pastoral lessee.

No additional sites were identified along the proposed alignment by either the First Peoples or Ngadjuri Nation #2 during these surveys.

In addition to avoidance by the alignment, a Cultural Heritage Management Plan (CHMP) will be prepared to ensure protection of identified sites. A draft framework for the CHMP is provided at Appendix R. The CHMP will be finalised following detailed design, micro siting surveys and further engagement with the respective Traditional Owners. An appropriate buffer sufficient to protect each site of significance will be implemented. Physical barriers may be erected around each identified site during construction activities (in consultation with the Traditional Owners). No encroachment within the buffer will be authorised without further consultation with the relevant Traditional Owners.

The Cultural Heritage Management Plan Framework (Appendix R) provides information on ElectraNet's commitment to working with Traditional Owners to protect cultural heritage values during all phases of the Project, including strategies that will be utilised to avoid sites and manage heritage generally.

A Project CEMP will detail requirements and responsibilities for all staff and contractors, including site inductions and training, prior to the commencement of construction work including protocols for site discovery and reporting. Cultural heritage awareness will be included in standard inductions to ensure personnel and contractors undertaking field work during the design and early works are aware of the region's heritage values and the importance of following management measures set out in the CHMP including remaining on existing tracks.

*Non-Aboriginal cultural heritage*

**The Project is situated at sufficient distance from the closest State Heritage Place for any impacts for Project construction or operation extremely unlikely.**

There is only one State Heritage Place identified in the vicinity of the transmission line corridor which will be avoided by construction activities. Suicide Bridge and the accompanying infrastructure lies 1.5 km south of the proposed alignment and on the southern side of the Wentworth-Renmark Road. There are no construction activities proposed in the vicinity of the heritage site.

All employees, contractors and sub-contractors will be made aware of the location of the State Heritage Place, and training and induction will be undertaken for all personnel to educate them on the importance of remaining within designated / approved areas. The requirements to avoid the site will be set out in the Project CEMP.

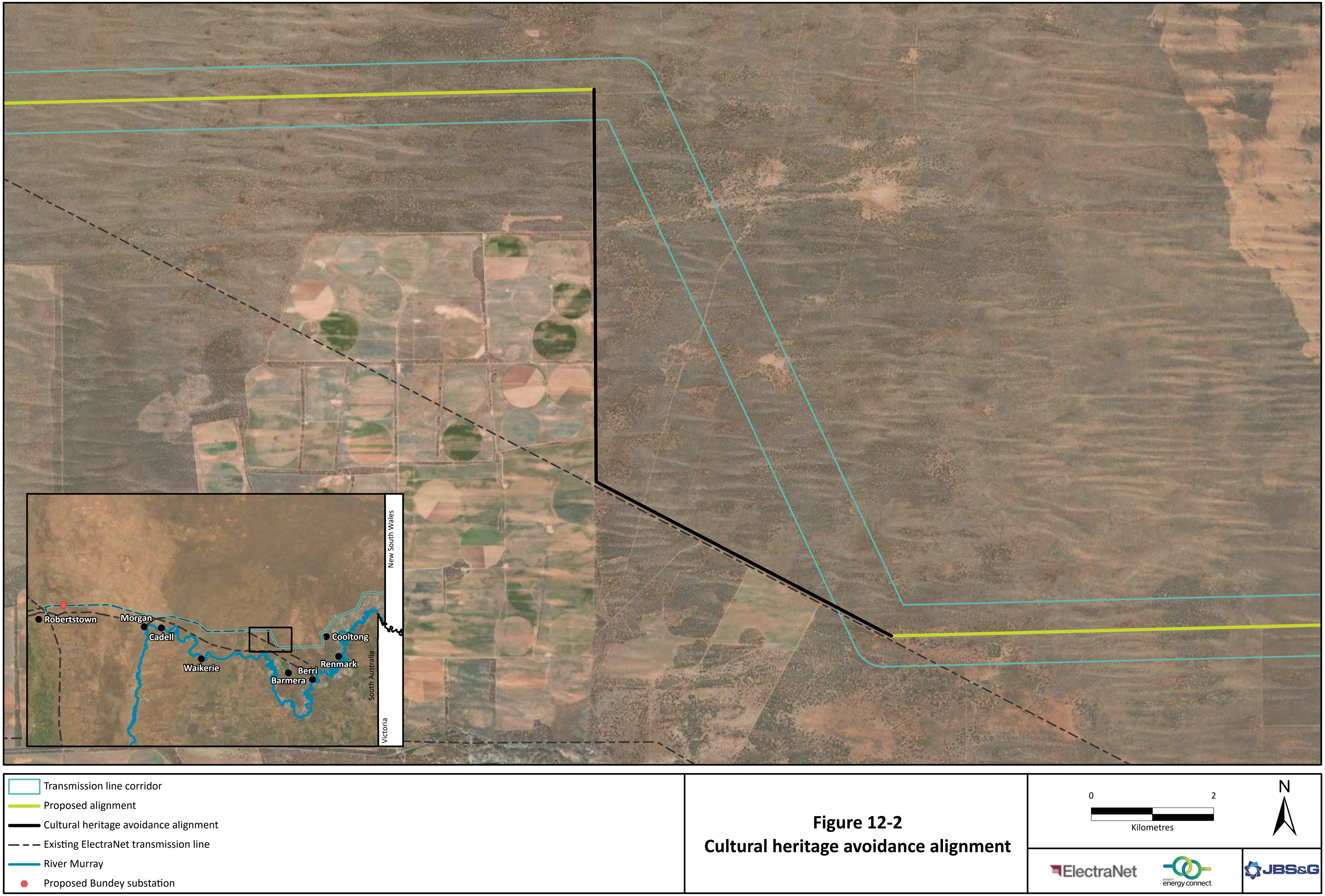


**Figure 12-2**
**Cultural heritage avoidance alignment**

### 12.4.2. Land disturbance during construction

#### Discovery of potential Aboriginal cultural heritage sites, objects or remains

**Discovery of Aboriginal sites, objects or remains will be managed in accordance with the *Aboriginal Heritage Act 1988* and in consultation with the relevant Traditional Owners.**

***Aboriginal cultural heritage***

Although the alignment has been surveyed with Traditional Owners, there is potential for previously unknown sites, objects or remains to be uncovered during construction ground disturbance and excavations.

This potential will be mitigated to some extent by utilising previously disturbed areas for tower placement, access tracks and other infrastructure wherever practicable. If any sites, objects or remains are discovered during construction activities, work will cease immediately in the vicinity and care taken not to cause further disturbance. The CHMP for the Project will set out procedures for discovery and reporting and will include a requirement that any discoveries must immediately be reported to ElectraNet and the relevant Traditional Owners. Notification of any discovery will also be made in accordance with the *Aboriginal Heritage Act 1988.*

If the alignment cannot be moved to avoid those sites, objects or remains, ElectraNet will discuss all options with the relevant Traditional Owners. ElectraNet's first and preferred option is to relocate Project infrastructure to avoid impact to heritage sites. Only after extensive consultation with the relevant Traditional Owner groups, and only where infrastructure relocation remains unfeasible, will ElectraNet consider making an application to the Minister for Aboriginal Affairs pursuant to Section 23 of the Aboriginal Heritage Act to seeking approval to damage, disturb and interfere with those sites, objects or remains.

Compliance with the Aboriginal Heritage Act and the CHMP will ensure impacts to Aboriginal sites, objects or remains discovered during constructed are minimised.

***Non-Aboriginal cultural heritage***

If potential sites or objects are discovered, procedures in the CEMP for the identification, management and protection of heritage sites will be implemented. If sites or objects cannot be avoided, the requirements of the *Heritage Places Act 1993* provide safeguards to protect heritage values. This would include obtaining a permit from the Heritage Council prior to any excavation, disturbance or removal of a potential place / object of archaeological significance.

The Project CEMP will detail requirements for all staff and contractors of their responsibilities and procedures around known and discovered non-Aboriginal heritage sites.

### 12.4.3. Operations

Once constructed, impacts to Aboriginal cultural heritage are considered to be extremely unlikely if operation of the transmission line is in accordance with Aboriginal Heritage Agreements reached with the Traditional Owners.

Impacts to non-Aboriginal cultural heritage from operation of the Project are not expected.

### 12.4.4. Summary of key mitigation measures

**Table 12-4: Key mitigation measures – cultural heritage**

| Mitigation measure | Construction | Operation |
|---|---|---|
| Cultural Heritage Management Plans which may include no-go zones, conditional access areas ground disturbance monitoring | ✓ | ✓ |
| Cultural Heritage site inductions | ✓ | |

| Mitigation measure | Construction | Operation |
|---|---|---|
| Site Discovery Procedure | ✓ | ✓ |
| Property Access requirements and GIS mapping | ✓ | ✓ |

## 12.5. Conclusion

ElectraNet have placed a high priority on the protection of cultural heritage and particularly Aboriginal cultural heritage. Early and ongoing engagement has been undertaken with the relevant Traditional Owners of land traversed by the Project and the alignment has been modified to avoid sites of significance in response to survey results.

Aboriginal Heritage Agreements between ElectraNet and the First Peoples River Murray and Mallee and Ngadjuri Nation #2 will be entered into to ensure cultural heritage values are protected and the views of the Traditional Owners are taken into consideration.

A project CHMP and CEMP will be implemented prior to the commencement of any work and detail requirements and responsibilities for all staff and contractors, including site inductions and the importance of remaining within designated and approved areas, training and protocols for site discovery and reporting.

Due to the consultation undertaken, adjustments to the Project alignment and the management measures which will be implemented, impacts to Aboriginal and Non-Aboriginal cultural heritage from Project construction or operation are not expected.

EIS Volume 1 Chapter 13

# Visual Amenity

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# 13. Visual Amenity

This chapter describes the potential effects of the construction and operation of the Project on visual amenity within the visual impact study area identified for the Project. This chapter provides an assessment of the likely effect on residents, workers and visitors within the visual impact study area and is based on the outcomes of the specialist Visual Impact Assessment, attached as Appendices L-1 and L-2.

## 13.1. Key Findings

- Visual impacts related to the Project have been mitigated through a detailed route selection process which has avoided visual receptors and visually sensitive landscapes where possible, alignment with other existing transmission infrastructure corridors and design of Project elements to reduce visual massing.
- The Project infrastructure will not be visible beyond 6.2 km (the Theoretical Zone of Visual Influence – TZVI). Modelling of Project infrastructure shows that the vast majority of the receptors within the TZVI will not have views of the transmission line and towers, while others will have limited visibility due to visual mitigation factors which reduce the level of impact such as vegetation shielding, topography and existing transmission infrastructure.
- Construction activities will not result in significant negative visual impacts as these activities are likely to be short-term involving days (rather than months) in one location before moving to the next tower location.

Table 13-1 below provides a summary of visual impact assessment for identified receptors.

**Table 13-1: Summary of visual impact on receptors**

| Receptor | Summary of visual impact assessment |
|---|---|
| **Social** | The vast majority of potential social receptors, including residential properties (towns and agricultural areas) and structures for intermittent residency are located within the Negligible Visibility zone. Eleven receptors were located within the Very Low Visibility Zone and two receptors were located within the Low Visibility Zone. One receptor was located in each of the Moderate and High Visibility zones. |
| **Town centres** | The Project will not be visible from the townships of Morgan, Cadell and Renmark as these are located outside of the TZVI.<br>Residents on the east of Robertstown may observe Project elements in the distance, but these views will not be dominated by the Project.<br>Cooltong will likely experience a higher degree of visual impact however this will be mitigated by the presence of existing electricity distribution infrastructure, and vegetation shielding in the vicinity of most properties. |
| **Tourism areas** | Views of the Project will not be possible from the River Murray, or its immediate surrounds due to topographic barriers and vegetation shielding preventing views to the north.<br>Other areas of conservation importance, such as Calperum Station and Taylorville Station, have a low number of receptors in the proximity of the proposed alignment (i.e. visitors that frequent the southern boundaries) which reduces the overall level of impact. |
| **Road users** | Views of the Project from major and minor roads within the TZVI will be possible for short sections of a journey. Impacts at the western end will be mitigated by the presence of existing transmission infrastructure and the transient and short duration of the views. |

## 13.2. Setting the Context

This section provides the context for the impact and risk assessment. It describes:

- the relevant EIS Guidelines

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the project to meet
- the assessment methodology used to identify baseline environmental values and to undertake the impact and risk assessment.

### 13.2.1. EIS Guidelines

The EIS Guidelines require an assessment of the visual effect of the constructed lattice transmission towers and wires along the alignment. This includes assessment of impacts on visual amenity of residents, road users and tourists during construction, operation, maintenance and decommissioning[1] aspects of the proposal. The EIS must also describe the likely impact and mitigation measures required to minimise the potential loss of visual amenity (refer Table 13-2).

**Table 13-2: EIS Guidelines addressed in the Visual Amenity chapter**

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| **Visual Impacts / Interface with adjacent land users**<br>*Assessment requirement 8*: The effect of large number of lattice towers (i.e. approximately 475 towers – typically 50 m in height and spaced 450 – 600 m apart) along an approximately 190 km alignment, which would represent a significant visual element in the landscape. | |
| • 8.1: Describe the effects of the proposal on the visual amenity and landscape quality for residents, visitors and tourists (especially near the River Murray Valley, major road crossings and other sensitive landscapes). Refer to construction, operation, maintenance and decommissioning aspects of the proposal, and outline the methodology adopted for classifying landscapes and assessing visual and landscape impacts. | Medium |
| • 8.2 Describe alternative measures for minimising potential loss of visual amenity (e.g. structural design and placement, screening) and detail any compensatory and site rehabilitation measures that will be undertaken to minimise visual impacts as a result of vegetation clearance. | Medium |

Aspects of assessment requirements identified in Table 13-2 which are not addressed in this chapter are listed in Table 13-3 together with the applicable chapter.

**Table 13-3: Aspects of assessment requirements addressed in other chapters**

| Assessment requirement | Chapter |
|---|---|
| 8.2 Measures to minimise visual impacts | Chapter 4 Route Selection |

### 13.2.2. Requirements in legislation and other standards

As there is no specific South Australian legislation or guidelines which regulate the assessment of impacts to visual amenity, general guidance for assessment and management of visual impacts of significant infrastructure is provided through the State's statutory planning framework.

The Planning and Design Code provides for the design and siting of structures to reduce aesthetic impacts to rural vistas, minimise impacts on the natural environment, avoid obscuring existing public views to landscape and minimise impacts from key public vantage points and scenic routes. The planning assessment (including visual impacts of the Project) against the Code is provided in Chapter 5 Legislative and Planning Framework.

[1] The design life of the Project is approximately 100 years. Decommissioning will be conducted in accordance with environmental standards and legislative requirements at that date (refer Chapter 7 Project Description). The visual impacts of decommissioning have therefore not been considered further in this chapter.

The Visual Impact Assessment (VIA) was also designed to align with 'best practice' by utilising the following documents:

- Guidance Note for Landscape and Visual Assessment (2018), Australian Institute of Landscape Architects
- Western Australia Environmental Assessment Guideline for Environmental factors and objectives (EPA WA 2018)
- Visual Landscape Planning in Western Australia (2007), A manual for evaluation, assessment, siting and design, Western Australian Planning Commission
- Swanwick, C (2013), Guidelines for Landscape and Visual Impact Assessment. 3rd ed. United Kingdom: Landscape Institute and Institute of Environmental Management and Assessment
- Lothian, A (2000), Landscape Quality Assessment of South Australia. PhD Thesis Adelaide University.

### 13.2.3. Views of stakeholders

ElectraNet has undertaken a thorough stakeholder engagement program which has included engagement with affected landholders and known social receptors in close proximity of the transmission line corridor. Feedback received from local government, landholders and local residents regarding visual amenity addressed:

- the opportunity to underground the transmission line to reduce visual impact
- impact on property values as a result of the transmission lines obstructing views
- impact to quality of lifestyle due to large structures obstructing landscape
- avoiding impact on the tourism and recreation use on the River Murray
- avoiding townships and residential areas.

### 13.2.4. Assessment Method

The method of assessment has followed that set out in Chapter 8 Impact Assessment Methodology. The Visual Impact Assessment Report is provided at Appendix L-1.

The visual impact assessment (VIA) considers the impacts that are expected to occur as part of the construction, operation and maintenance of the proposed transmission line and Bundey substation and was undertaken in two phases as shown in Figure 13-1.

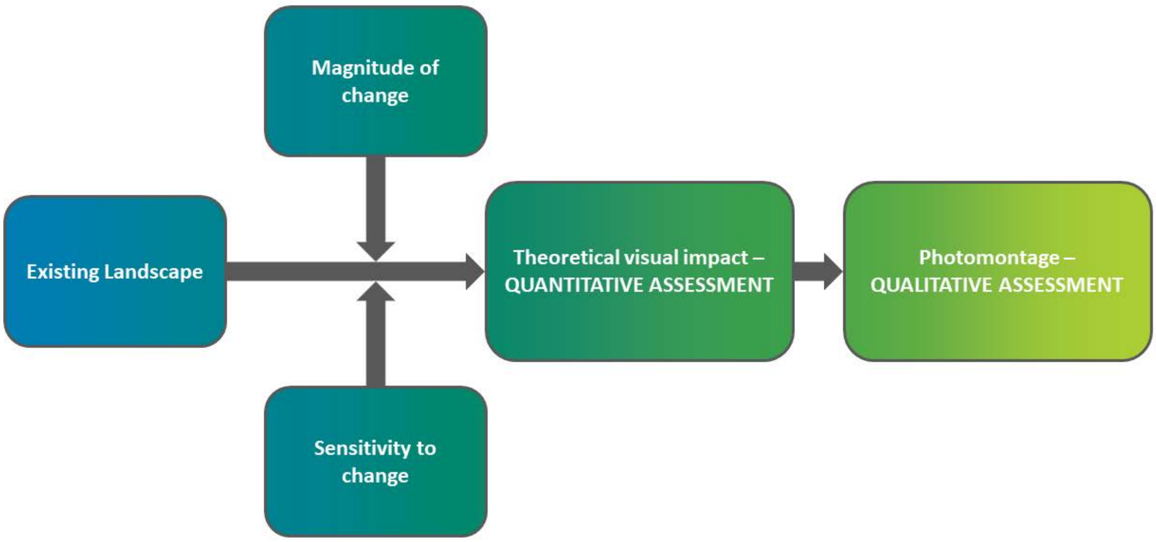



**Figure 13-1: Visual impact assessment process**

### Phase 1 – Quantitative assessment – theoretical visual impact

A quantitative desktop assessment was undertaken to determine the theoretical visual impact of the Project and included the following:

- determination of the Theoretical Zone of Visual Influence (TZVI) to assist in defining the visual impact study area[2]
- classification and description of the existing visual landscapes within the study area
- identification of potential visual receptors within the visual impact study area
- determination of the key visual elements to be modelled
- assessment of the visual impact based on the incorporation of the magnitude of change with sensitivity to change criteria.

The quantitative desktop assessment comprised the components summarised in Table 13-4 which, when combined, produce the theoretical visual impact.

**Table 13-4: Components of quantitative assessment**

| Component | Inputs | Model | Outputs |
|---|---|---|---|
| Magnitude of Change | • Proposed Project design<br>• Distance to receptor | Magnitude of Change Model | Theoretical Visual Impact |
| Sensitivity to Change | • Visual Landscape Scenic Quality and Visual Absorption Capacity<br>• Distance from existing transmission line infrastructure<br>• Vegetation height | Sensitivity to Change Calculation | |

An input table for each input component of the quantitative assessment was developed to rank each component of visual impact at different locations in the study area. The score from each input table was subjected to the following formula to calculate the visual impact rating:

- Distance of receptor from Project Infrastructure (**a**) is determined
- This number (**a**) is then multiplied by the average of the sum of the ‘sensitivity to change factors’ [Visual Landscape Scenic Quality (**b**), vegetation height (c), distance from existing transmission line infrastructure (d)] as summarised in the following formula:

*a x (average of b+c+d) = quantitative visual impact model score*

A description of the visual impact rating model scores and the corresponding degree of visual impact is presented below in Table 13-5.

**Table 13-5: Theoretical visual impact matrix**

| Model Score | Description | Modelled visual impact rating |
|---|---|---|
| 101 – 128 | Developments dominate the visual field and dramatically alter the landscape. | **High Visibility** |
| 76 – 100 | Developments are very obvious in the visual field and alter the landscape. | **Moderate Visibility** |
| 51 – 75 | Developments are obvious, but do not dominate the landscape. | **Low Visibility** |
| 26 – 50 | Developments can be seen in the visual field and alter the landscape to a small degree. | **Very Low Visibility** |

[2] For the purposes of the assessment discussed in this chapter, the ‘visual impact study area’ equates to the area described as the ‘project area’ in the Visual Impact Assessment at Appendix L

| Model Score | Description | Modelled visual impact rating |
|---|---|---|
| 1 – 25 | Limited / no visual effect on the landscape, visible as a very minor feature in some locations. | **Negligible Visibility** |
| 0 | Outside the TZVI | **Outside TZVI** |

### Theoretical Zone of Visual Influence (TZVI) and visual impact study area

The Theoretical Zone of Visual Influence (TZVI) is the area within which the components of a development are theoretically visible to a human receptor standing on the ground. The key factors in determining this are the visual capability of humans (human field of vision), the dimensions of the development, the distance (visual attenuation) of the viewpoint, and the characteristics of the surrounding topography.

Through the use of spatial data analysis and photomontages, the visual impact of the Project was modelled. The analysis concluded that the study area for the purposes of the VIA is defined as the outer limit of the TZVI of the tallest infrastructure element of the Project (i.e. a maximum radius of 6.2 km from each tower location).

### Phase 2: Qualitative assessment – Photomontage assessment

A qualitative photomontage assessment to verify and support the quantitative analysis / assessment included the following:

- Selection of viewpoint locations for the development of representative photomontages. Photomontage locations were selected to provide examples of a variety of views towards the Project infrastructure in a variety of landscape contexts.
- Photomontages were created using a combination of assessment with Global Positioning System (GPS) referencing, on-site photographic capture and computer-generated simulations. The base modelling of the development for photomontages was produced using Blender™ (3D computer graphics software tool set used for creating animated films, visual effects, art, 3D printed models, interactive 3D applications and video games). Kolor Autopano Giga Pro™ was used for stitching the individual photographs together into a panorama. Adobe Photoshop™ was used for combining the base photography with the 3D elements and for masking purposes. All three programs are commonly used within the development industry for visual assessment of infrastructure projects.
- Quantitative assessment of the photomontages to assess the level of visual impact.

## 13.3. Description of Existing Environment

The proposed Project infrastructure will be located within a variety of visual landscape types which will provide context to the perception of potential receptors of the various infrastructure elements.

A visual landscape type (VLT) is an area that can be described, assessed and classified based on distinctive visual elements and common visual characteristics. Eight VLTs have been defined for the purposes of the visual impact assessment based on the IBRA bioregions and dominant land uses in the area of the Project (refer Figure 10-3).

The vegetation and landform characteristics of the relevant IBRA bioregions are described further in Chapter 10 Physical Environment and Chapter 11 Flora and Fauna. Land uses are described further in Chapter 9 Land Use and Tenure.

VLTs in the area of the Project are shown on Figure 13-2 with examples of VLTs provided in Plate 13-1 to Plate 13-8.

**Table 13-6: Description of visual landscape types**

| Bioregion | Visual landscape type | % of total alignment length | Description |
|---|---|---|---|
| Flinders Lofty Block | Low Hills | 3.84% | Sparse low shrublands on plains between undulating hills, and Mallee woodland eucalyptus on the crest of hills. Significant clearing for agricultural purposes has confined remnant native vegetation primarily to hills, watercourses and roadsides. Used mainly for agricultural with scattered farm residences and a range of road types (refer Plate 13-1). |
| Murray Darling Depression | Degraded Agricultural Plains | 28.68% | Relatively flat terrain with no specific focal aesthetic features, and no significant waterbodies present. Highly calcareous loamy earths with yellow to grey cracking clays vegetated predominately by low-lying shrubs and is very sparsely populated (refer Plate 13-2). |
| | Dryland Agriculture | 18.09% | Matrix of cleared fields, where native mallee has been removed, and appears to be utilised primarily for grazing. Topography of the area is generally flat and featureless (refer Plate 13-3). |
| | Murray-Darling Depression Irrigated Agriculture | 7.94% | Gently undulating to flat topography with calcareous soils that have been cleared of native vegetation for intensive irrigated horticulture activities. Population density is sparse, with few residences in the area. Due to the presence of agriculture infrastructure and lack of vegetation, the VLT is highly modified (refer Plate 13-4). |
| | Mallee Dunefield | 19.54% | Second largest VLT within the area of the Project with highest density of vegetation cover. Brown calcareous soils with variable dune cover. Ephemeral waterbodies present with a number of reserves utilised for tourism, scientific and recreational purposes. Population density within this area is very low (refer Plate 13-5). |
| Riverina | Irrigated Agriculture | 3.64% | Gently undulating to flat topography hosting a mixture of irrigated agricultural activities. This VLT largely consists of vineyards and orchards with scattered native eucalyptus vegetation. Also comprises the township of Cooltong and dispersed agricultural residences (refer Plate 13-6). |
| | Eastern Riverina | 18.27% | Area includes the Riverland Ramsar site which hosts extensive flood plains, islands, lakes and wetlands. Comprises low lying shrub plains with views towards the vast low-lying wetlands of the River Murray floodplain. Landscape also comprises the township of Cooltong and the development of infrastructure has been limited (Plate 13-7). |
| | Western Riverina | 0% – alignment bypasses the VLT, but is falls within the TZVI | Western section of the Riverina hosts views of the Murray River. There is an increase in height and density of vegetation underlain by brown sands, which consists of eucalyptus woodlands and irrigated horticultural lands (fruit orchards). This landscape type hosts scattered residences along the river banks as well as a camping and recreation sites. The townships of Morgan and Cadell are located in this VLT (refer Plate 13-8). |

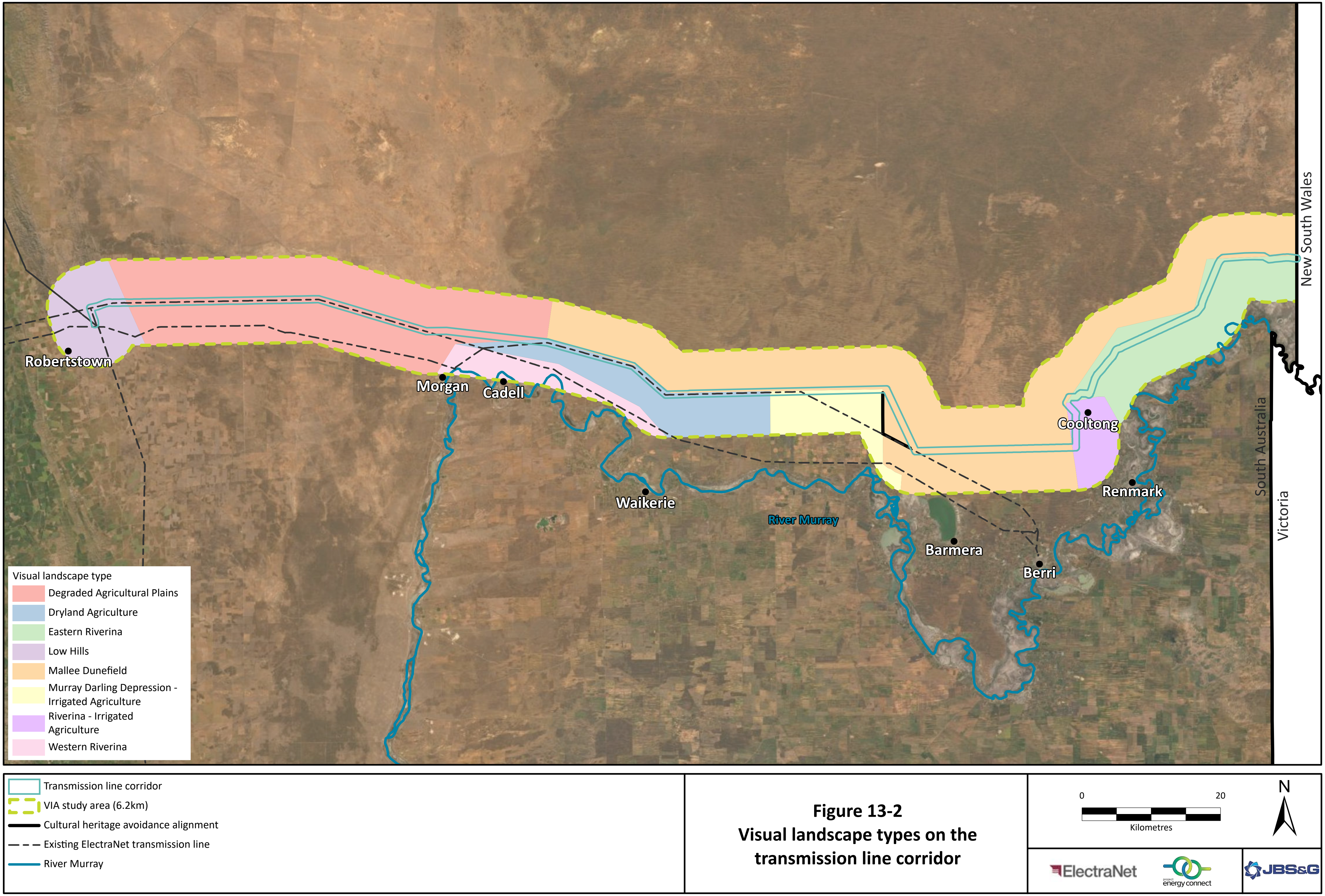



**Figure 13-2**
**Visual landscape types on the transmission line corridor**

**Plate 13-1: Example of a typical Low Hills VLT**

**Plate 13-2: Example of Degraded Agricultural Plains VLT**

**Plate 13-3: Example of Dryland Agriculture VLT**

Plate 13-4: Example of Murray-Darling Depression Irrigated Agriculture landscape

Plate 13-5: Example of Mallee Dunefield VLT

Plate 13-6: Example of Riverina Irrigated Agriculture VLT

**Plate 13-7: Example of showing Western Riverina VLT**

**Plate 13-8: Example of Eastern Riverina VLT**

## 13.4. Impact Assessment

The following aspects of the Project have been identified as sources of visual impacts on sensitive receptors:

- movement of construction vehicles, helicopters, establishment of laydown areas and construction camps
- light spill from night-time lighting at laydown areas and construction camps
- the presence of the operational towers and associated conductors in the landscape
- maintenance and other operational activities.

The potential impact events resulting from these aspects of the Project are discussed below.

### 13.4.1. Construction

#### Movement of construction vehicles, helicopters, establishment of laydown areas and temporary construction camps and clearance of native vegetation

**Impacts related to the construction phase will be limited to the short period when construction is undertaken at each tower location and will be temporary and localised.**

The construction phase will involve the presence of heavy machinery, light vehicles and potentially helicopters, temporary establishment of construction camps, laydown and staging areas and some clearance of native vegetation.

Very few visual impact receptors are located within the transmission line corridor, and these are located in the community of Cooltong. The construction camps will only be present during the construction phase of the Project and will be located close to the centre of the alignment and away from visual receptors. A high standard of 'housekeeping' at construction camps will be maintained and wastes will be appropriately stored and regularly removed from site to minimise visual impacts. The impact of construction on nearby receptors will be further mitigated as the Project will have a short construction duration at each tower location. Potentially impacted landholders will be notified in advance of construction activities.

Some short-term loss of amenity may be experienced by individual landholders in the transmission line corridor as a result of temporary changes to the visual aesthetic of the landscape. Small areas of vegetation will be cleared to facilitate the construction of the tower footings. Due to the predominance of low vegetation, limited vegetation clearing within the proposed easement is expected which will not result in a change to views unless the receptor is immediately adjacent to the clearing. Partial reinstatement of these clearings will occur post construction with operational clearances maintained for operations. Disturbed land will be re-contoured to match surrounding ground levels.

In areas of temporary clearance (e.g. laydown areas) cleared vegetation will be stockpiled and placed over returned topsoil to assist in natural regeneration. Based on the low levels of weeds present and level of regeneration observed in field surveys, areas of mallee are expected to regenerate well, particularly if rootstock is left in place. Rehabilitated areas will be actively monitored for weed species (particularly after periods of high rainfall.

Visual impacts to individual landholders from construction activities are expected to be **Negligible to Minor**.

#### Light spill from night-time lighting at laydown areas and temporary construction camps

**Impacts from light spill from construction areas will be minimised by ensuring that lighting is directed inward and downward.**

The construction camps are temporary and will only be present during the construction phase of the Project. Generally, these will be located close to the centre of the alignment and away from visual receptors. While there are very few receptors immediately adjacent to the proposed alignment, construction camps will be situated taking into consideration the shielding impact of topography and vegetation where receptors are present nearby.

Design guidelines within the Construction Environmental Management Plan for all construction areas will ensure that lighting impacts are contained while still meeting health and safety requirements.

**No impacts** to landholders from light spill are expected.

### 13.4.2. Operation and maintenance

Presence of the operational towers and associated conductors in the landscape

**The modelling of the Project infrastructure shows that the majority of the receptors within the TZVI will not be aware of the presence of the transmission line.**

In general, the towers will be evident as artificial structures on the landscape. The steel lattice towers will contrast with the largely natural visual setting, however the design of the towers as a lattice structure will allow the receptor to 'see through' the towers to the landscape and views beyond. Given the terrain is generally flat, most views of the towers will be skyline views, with the sky forming a backdrop to the towers across the landscape. The conductors appear almost invisible beyond a couple of kilometres and are not considered to constitute a significant component of the overall visual impact.

A key driver of the Project route selection process was to mitigate potential visual impacts by siting the proposed alignment away from areas that are visually sensitive e.g. towns or scenic tourism locations. This ensured that these locations are generally either at the periphery, or outside of the TZVI.

Key potentially sensitive receptors were identified early in the Project scoping process and included towns, and tourism hotspots. This assisted the refinement of the alignment away from the River Murray and its associated wetlands, as well as avoiding towns such as Morgan, Cadell and Renmark. In addition, consideration was given to locating the alignment close to existing linear infrastructure and areas of disturbance such as roads and existing transmission infrastructure.

***Results of modelling of the TZVI area***

The percentage of the area of the total TZVI (i.e. the visual impact study area) within each impact zone was modelled. Modelling showed that, prior to consideration of receptors, over 87% of the visual impact study area falls within the Negligible Visibility zone, with 8% of the area falling within the Very Low Visibility zone. The Low and Moderate Visibility zones each covered approximately 2%, with less than 0.5% of the area falling into the High Visibility zone as shown in Table 13-7.

**Table 13-7: Visual impact matrix of TZVI Area**

| Description | Modelled visual impact rating | Percentage of area of total TZVI within each impact zone |
|---|---|---|
| Developments dominate the visual field and dramatically alter the landscape. | High Visibility | 0.3% |
| Developments are very obvious in the visual field and alter the landscape. | Moderate Visibility | 2.6% |
| Developments are obvious, but do not dominate the landscape. | Low Visibility | 1.5% |
| Developments can be seen in the visual field and alter the landscape to a small degree. | Very Low Visibility | 8.1% |
| Limited / no visual effect on the landscape, visible as a very minor feature in some locations. | Negligible Visibility | 87.4% |

Potential receptor locations within the TZVI were spatially analysed against the VIA model to determine the theoretical level of visual impact from different receptor locations as described below (and refer Appendices L-1 and L-2). Figure 13-3 to Figure 13-7 show the theoretical visual impact model outcome for the alignment and associated receptors[3].

[3] Receptors with potential for Negligible to No Visibility are not shown on the figures.

*Verification of quantitative assessment*

Photomontage locations were selected to provide examples of views towards the Project infrastructure in a variety of landscape contexts. Photomontages were produced to allow representative views of various landscape types where a number of towers could be seen across the landscape. Ten photomontages were generated and assessed (refer Appendix L) and a selection of six are listed in Table 13-8 and provided in Figure 13-8 to Figure 13-12 to demonstrate the theoretical visual impact.

Overall the photomontages were found to verify the findings of the quantitative assessment, that the visual impact of the Project infrastructure across the visual impact study area was generally Negligible (refer Appendix L for details).

**Table 13-8: Viewpoint montage locations and theoretical visual impact assessment**

| Visual analysis | View direction | Distance from infrastructure (m) | Theoretical visual impact description | Comment |
|---|---|---|---|---|
| VP04 | South-south-east | 8005 | Outside TZVI | Photomontage of viewpoints outside the TZVI were selected (e.g. VP04) to confirm the validity of the TZVI by demonstrating that the transmission infrastructure would not be visible from these points (refer Figure 13-8). |
| VP03 | North-west | 1951 | Negligible Visibility | VP03 and VP14 illustrate locations of Negligible Visibility (refer Figure 13-9 and Figure 13-10) |
| VP14 | North-east | 2140 | Negligible Visibility | |
| VP17 | North-west | 48 | Very Low Visibility | Based on the model inputs, although VP17 is rated as having Very Low Visibility, the photomontages indicate that the Project infrastructure will be theoretically visible.<br>This viewpoint could potentially be classified with a higher impact rating however it has been assessed at a lower impact level due to the presence of existing infrastructure and the low sensitivity of the visual landscape type (refer Figure 13-11). |
| VP05 | North-east | 78 | High Visibility | The location at VP05 illustrates the highest visually impacted area, adjacent to the transmission towers (refer Figure 13-12) |

## Views from towns

**The Project will only be visible from Cooltong and to a much lesser extent Robertstown. Visual impacts will be mitigated by topographic barriers, vegetation shielding and existing electricity distribution infrastructure.**

The Project will not be visible from the town centres located near the Project alignment (Morgan, Cadell and Renmark), as these centres all fall outside of the TZVI. The Project may be slightly visible from some properties located to the north of these towns, but generally local vegetation shielding will mitigate views of the distant Project infrastructure.

The settlement of Cooltong will be likely to experience higher degrees of visual impact as the Project traverses the southern boundary of Calperum Station, and north of the Cooltong Conservation Park.

Views in this area will be mitigated to some extent by the existing electricity distribution infrastructure, and a degree of vegetation shielding within the vicinity of most of the properties.

Robertstown residents on the eastern side of the settlement may observe elements of the Project in the distance, but these views will not be dominated by the Project. The Bundey substation, and connecting transmission towers are the key infrastructure elements which will be approximately 5.5 km away and will be largely shielded by topographic barriers.

### Views from social receptor locations[4]

**The highest density of residential development is located outside of the TZVI. The majority of social receptors fall within the Negligible Visibility and Very Low Visibility zones.**

Very few residences fall within the TZVI, and the highest density of residential development (in the vicinity of the settlements of Morgan, Cadell and Renmark West) is located outside of the TZVI. Residential areas on the fringes of these settlements, and agricultural residences within farming areas within the TZVI, account for the majority of the social receptors.

As shown in Table 13-9, the largest grouping of social receptors is in the Negligible Visibility and Very Low Visibility zones, representing the lowest visual impact scores. Two receptor locations are likely to have Low Visibility of the transmission line, with only one receptor located within the Moderate Visibility areas. One residential receptor was identified to fall within the area of High Visibility near Cooltong.

Figure 13-3 to Figure 13-7 show the distance from the proposed Project infrastructure and the impacted social receptors identified as experiencing Very Low Visibility to High Visibility. Receptors identified as experiencing Negligible Visibility have not been mapped.

**Table 13-9: Potential visual social receptors location impact analysis**

| Modelled visual impact rating | Social receptor numbers | Description |
|---|---|---|
| **High Visibility** | 1 | Developments dominate the visual field and dramatically alter the landscape. One social receptor at Cooltong is located within this impact zone (refer Figure 13-5 and Figure 13-6). |
| **Moderate Visibility** | 1 | Developments are very obvious in the visual field and alter the landscape. Two social receptors at Cooltong are located within this impact zone (refer Figure 13-5 and Figure 13-6). |
| **Low Visibility** | 2 | Developments are obvious, but do not dominate the landscape. Two social receptors at Cooltong are within this impact zone (refer Figure 13-5 and Figure 13-6). |
| **Very Low Visibility** | 11 | Developments can be seen in the visual field and alter the landscape to a small degree. Eleven social receptors are located within this impact zone (refer Figure 13-3, and Figure 13-6). |
| **Negligible / No Visibility** | 463 | Limited / no visual effect on the landscape, visible as a very minor feature in some locations. 463 social receptors are located within this impact zone. |

### Views from tourism areas

**There will be a minimal impact on tourist areas as views of the Project will not be possible from the River Murray, or its immediate surrounds due to topographic barriers, and vegetation shielding preventing views to the north.**

[4] Social receptors are defined as residents and transient / intermittent residents within the study area, with high frequency of exposure to the Project infrastructure.

The main tourism areas in the vicinity of the TZVI are those that are dependent on the scenic qualities of the River Murray floodplain. The Project passes more than 4 km north at its closest point on the Wentworth-Renmark Road, and the areas adjacent to the River Murray fall outside of the TZVI and therefore will not have views of the Project. The visual mitigation effect of the tall riparian vegetation, and the topographic variation within this area, assist in preventing views of the transmission infrastructure.

Limited numbers of tourists (mainly students and research-related visitors) may be visually impacted by the Project in areas of conservation importance, such as Calperum and Taylorville Stations. Although these visitors will be sensitive to changes to the visual landscape, the low frequency of views in the proximity of the proposed alignment will reduce the magnitude of the impact within the Calperum area. Views of the Project infrastructure will only be possible from the far southern extent of this area and will be mitigated by the height of the vegetation which will shield views from receptors.

#### Views from roads

**Views of Project infrastructure will be possible from some major and minor roads within the TZVI for short sections of a journey.**

Project infrastructure will be a dominant feature for transient visual receptors on the Wentworth-Renmark Road within the TZVI. The Wentworth-Renmark Road runs immediately adjacent to the transmission lines on the eastern end of the Project and direct (but fleeting) views will be experienced due to close proximity and lack of screening by vegetation and / or existing transmission infrastructure. Views from other major roads within the TZVI will be from the Goyder Highway between White Dam and Cadell. Major roads in the area of the project are detailed in Chapter 16 Traffic and Transport.

#### Maintenance

**Maintenance activities such as vehicle movements on access tracks will have a negligible impact on visual amenity compared to the presence of the transmission towers.**

Ongoing maintenance activities such as light and on occasion heavy vehicle or helicopter movements will have a negligible impact on visual amenity due to the infrequent nature and duration of these activities.

### 13.4.3. Cultural heritage avoidance alignment – Hawks Nest Station

As discussed in Chapter 4 Route Selection, the transmission line corridor assessed in the EIS was based on the proposed alignment as at January 2021. This alignment was adjusted in February 2021 following Aboriginal cultural heritage surveys on Hawks Nest Station. A review of the visual impact study area and assessment of the potential impacts to visual social receptors identified in the VIA was undertaken on the basis of the realignment and the consequent change to the TZVI (refer Appendix L-2).

A total of 21 new social receptors were identified within the study area (i.e. 6.2 km from towers located on the new alignment). These receptors are expected to largely comprise rural residences with at least two properties used for tourism purposes. There are no towns within the updated study area and transient receptors will be associated with vehicles travelling along the Goyder Highway. A small section of the River Murray at Overland Corner is within the revised TZVI.

All additional social receptors in the revised TZVI were assessed as having Negligible to No Visibility of the Project infrastructure due to topography and the presence of vegetation (refer Appendix L-2).

Modelling of views indicates that the small area of the River Murray at Overland Corner is within the Negligible Visibility impact range. Due to the presence of vegetation along the river, the river is not expected to host views of transmission infrastructure. Views from other tourism areas are not expected to change significantly from the assessment of the previous alignment.

Views of Project infrastructure from towns in the vicinity of the study area and the Goyder Highway are not expected to change as a result of the realignment.

### 13.4.4. Summary of key mitigation measures

Potential impacts to visual amenity for sensitive receptors have been mitigated as far as practicable in the route selection, alignment of the Project infrastructure and siting of towers (refer to Chapter 4 Route Selection) . The Project has been aligned away from areas with high numbers of visual receptors and adjacent to existing linear infrastructure where possible. Further mitigation measures are not proposed.

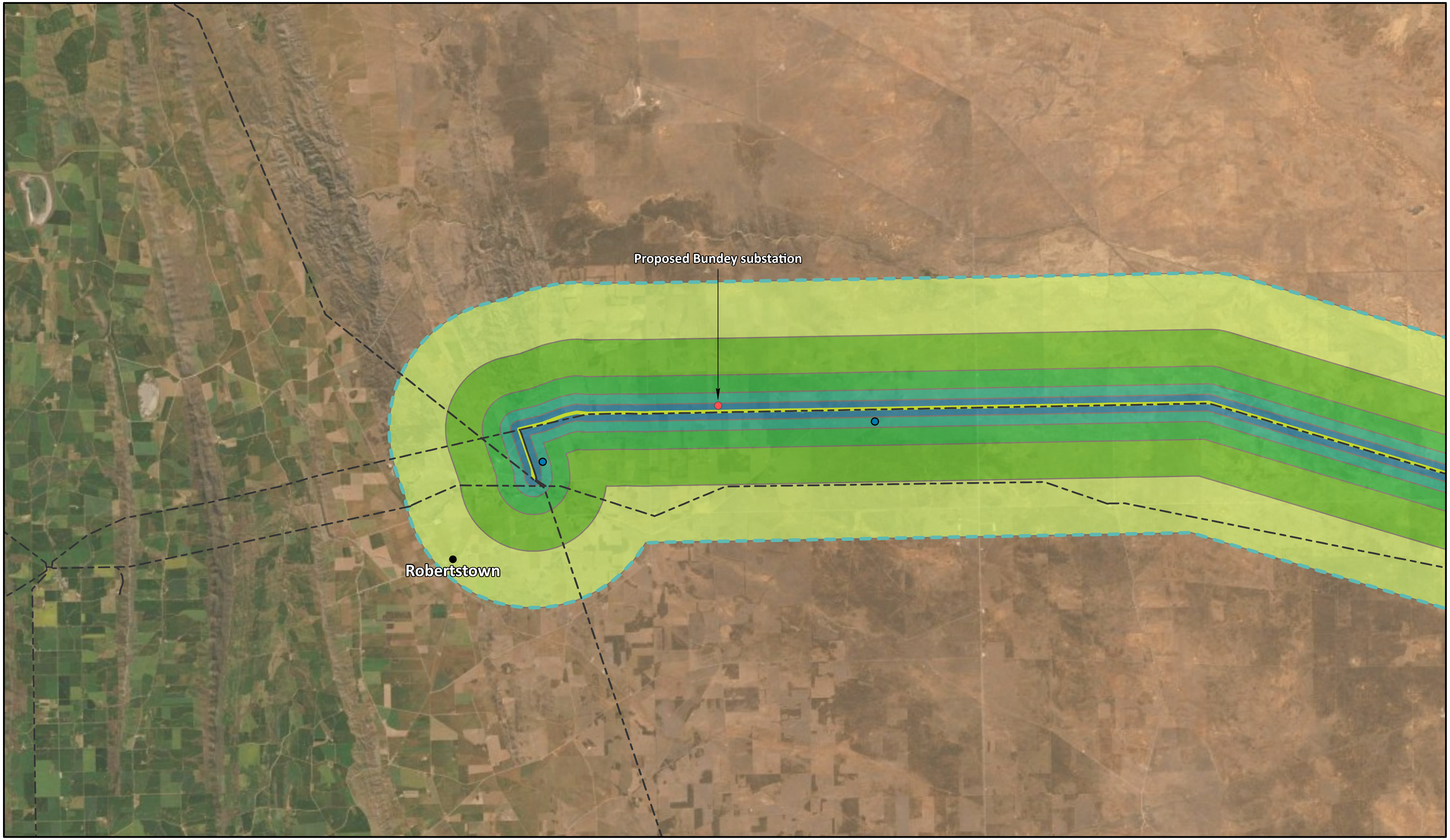
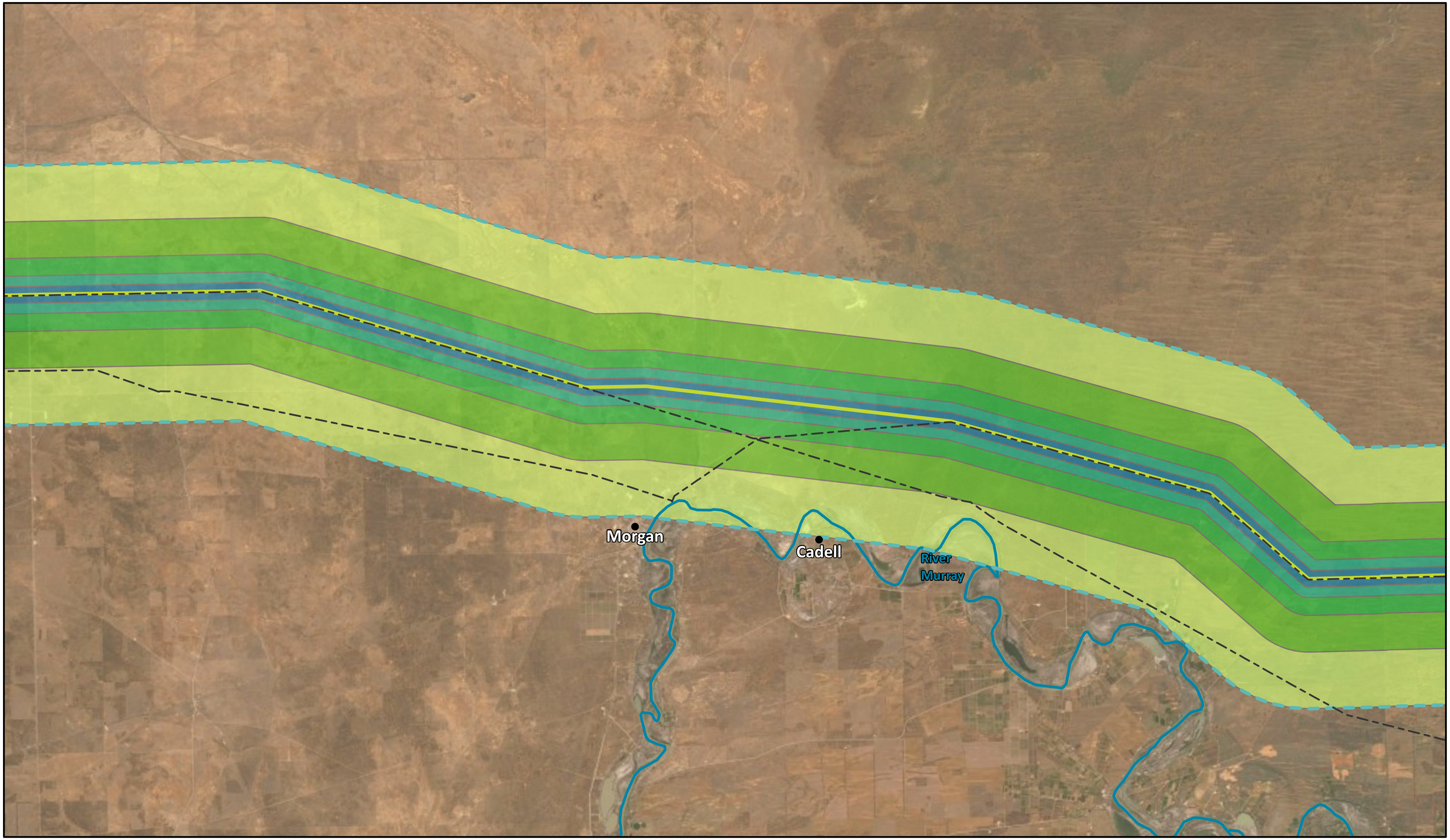





**Figure 13-3**
**Distance from proposed Project infrastructure to potential social receptors - Robertstown**




VIA study area (6.2km)
Proposed alignment
Existing ElectraNet transmission line
River Murray

Distance from proposed project infrastructure
0 - 400m
400 - 900m
900 - 1750m
1750 - 3500m
3500 - 6200m

**Figure 13-4**
**Distance from proposed Project infrastructure to potential social receptors - Morgan and Cadell**

0 5
Kilometres

N

ElectraNet
project energy connect
JBS&G

Note: no impacted social receptors identified

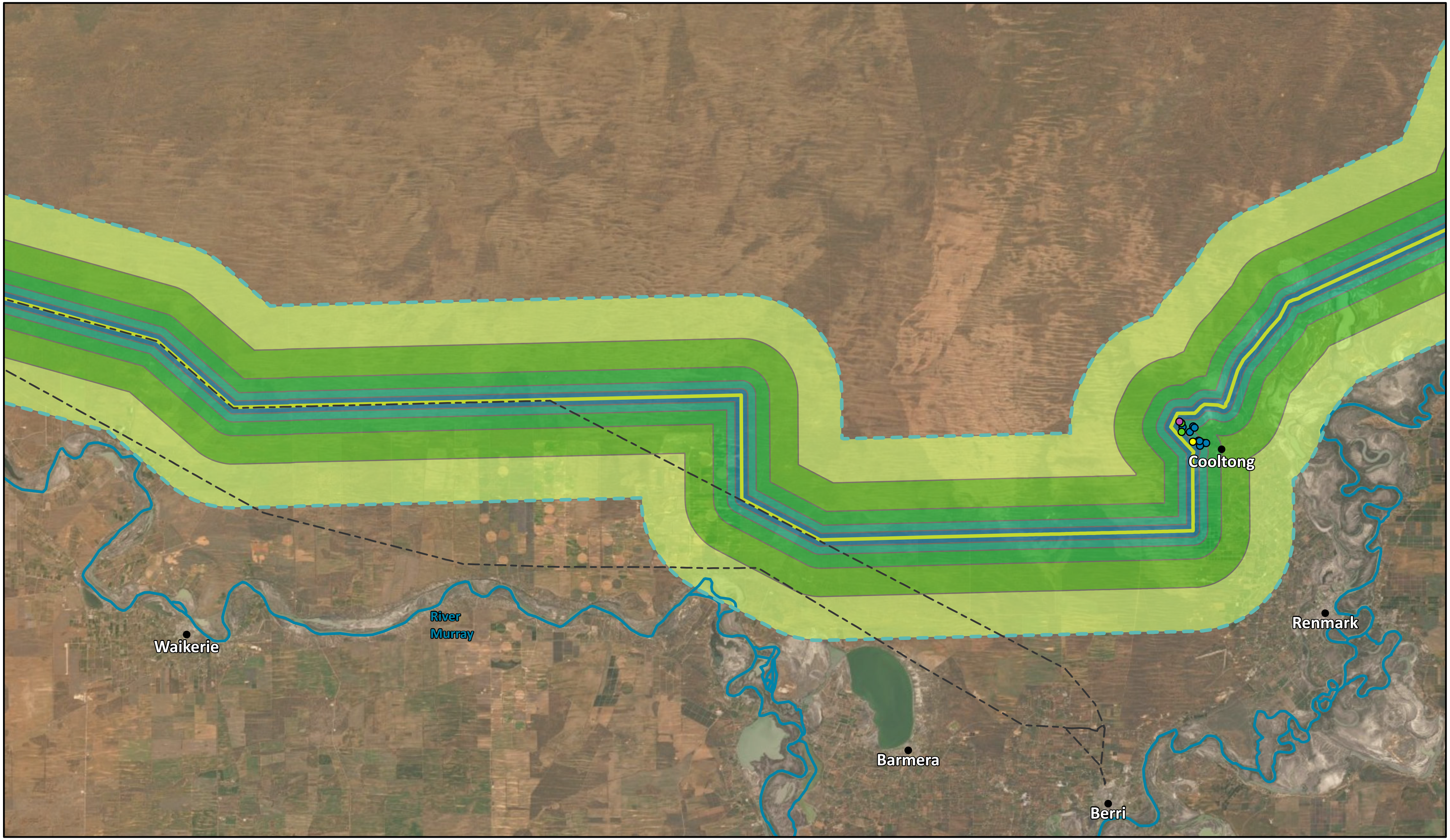
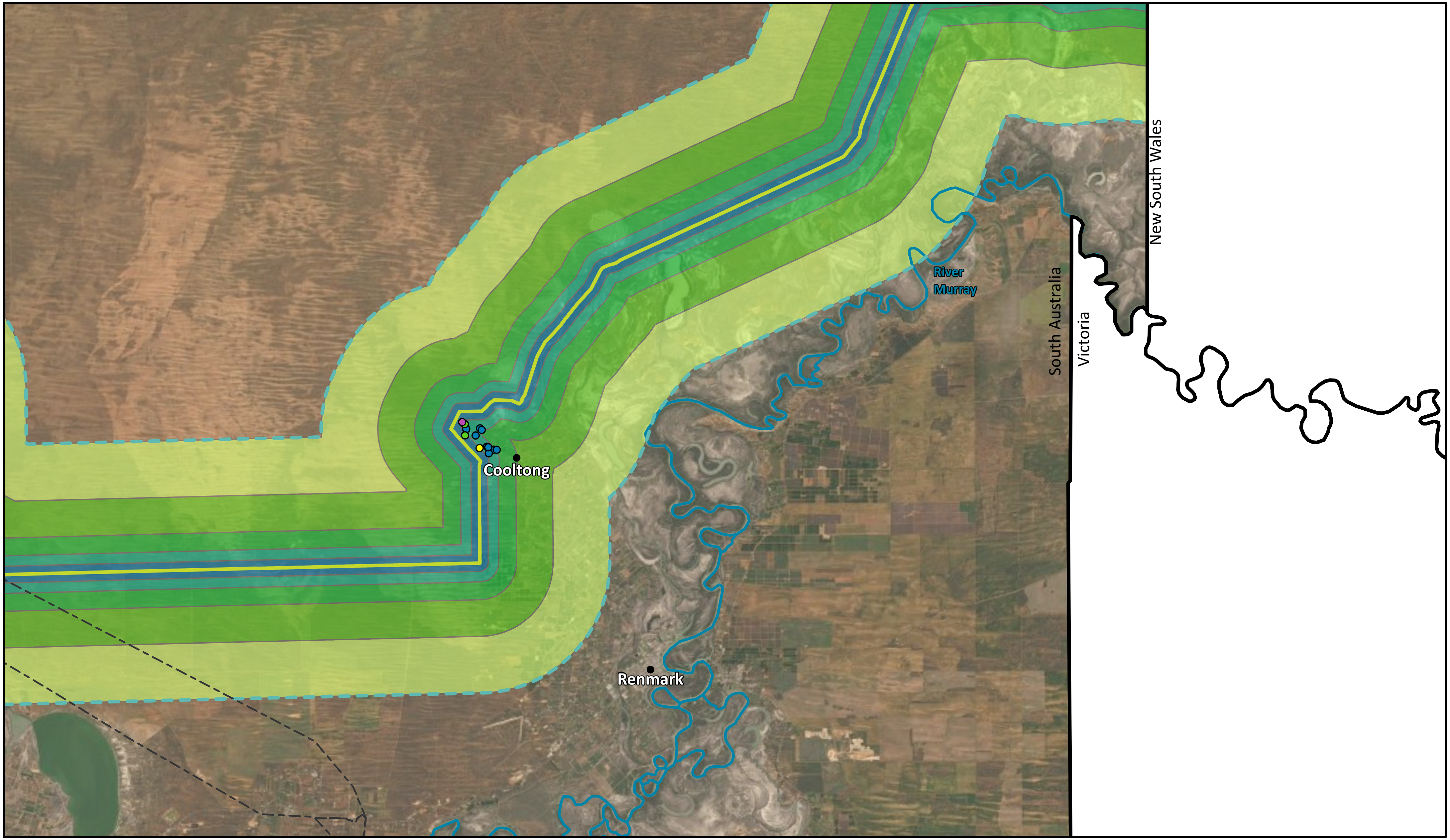



**Figure 13-5**
**Distance from proposed Project infrastructure to potential social receptors - Waikerie and Barmera**

ElectraNet

project energy connect

JBS&G




- VIA study area (6.2km)
- Proposed alignment
- Existing ElectraNet transmission line
- River Murray

Distance from proposed project infrastructure
- 0 - 400m
- 400 - 900m
- 900 - 1750m
- 1750 - 3500m
- 3500 - 6200m

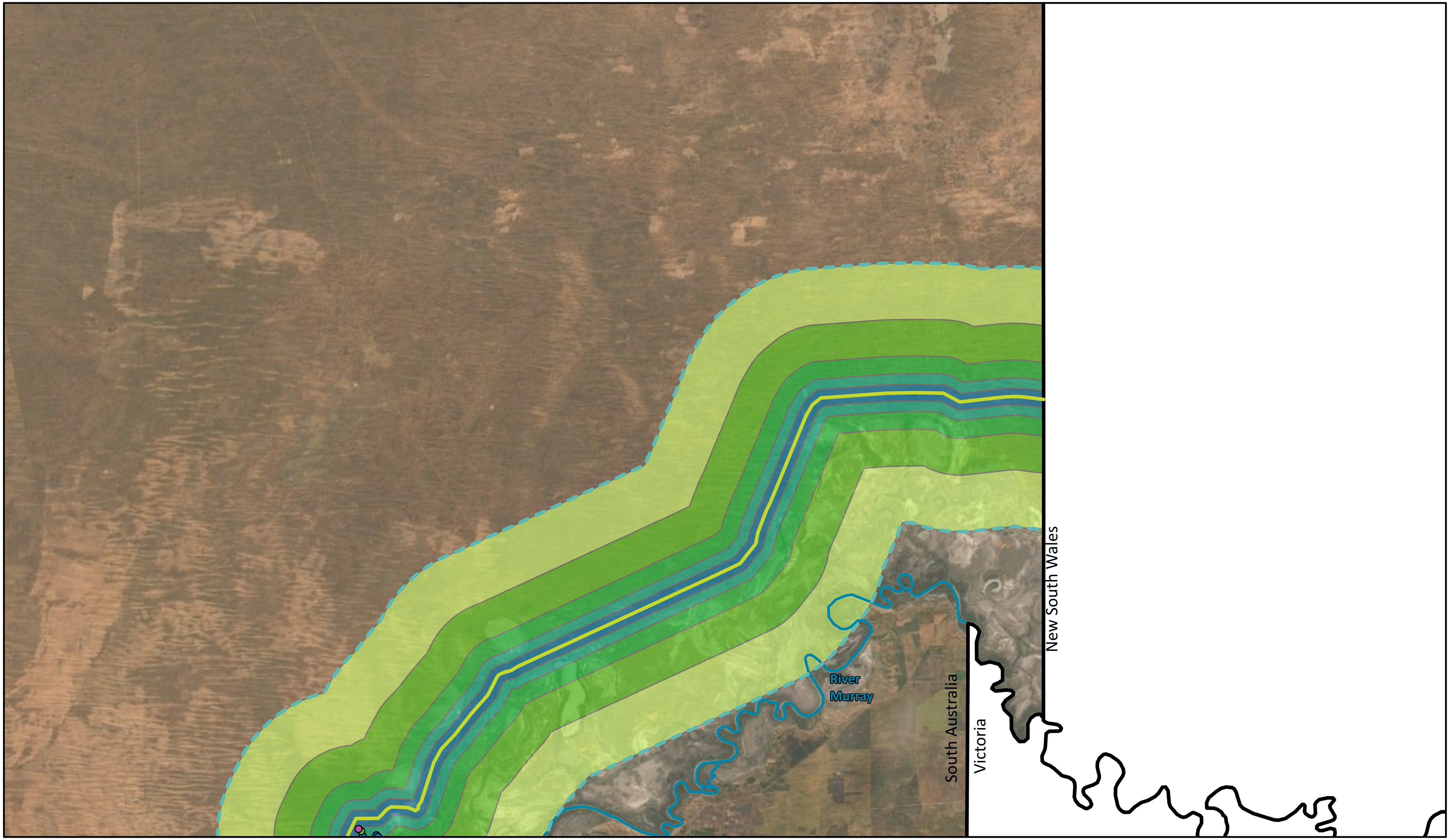
Potential social receptor visibility
- High
- Moderate
- Low
- Very Low

**Figure 13-6**
**Distance from proposed Project infrastructure to potential social receptors - Cooltong and Renmark**

0 5
Kilometres

N

ElectraNet
project energy connect
JBS&G




VIA study area (6.2km)
Proposed alignment
Existing ElectraNet transmission line
River Murray

Distance from proposed project infrastructure
- 0 - 400m
- 400 - 900m
- 900 - 1750m
- 1750 - 3500m
- 3500 - 6200m

Potential social receptor visibility
- High
- Low
- Very Low

**Figure 13-7**
**Distance from proposed Project infrastructure to potential social receptors - Wentworth-Renmark Road**

0 5
Kilometres

N

ElectraNet
project energy connect
JBS&G

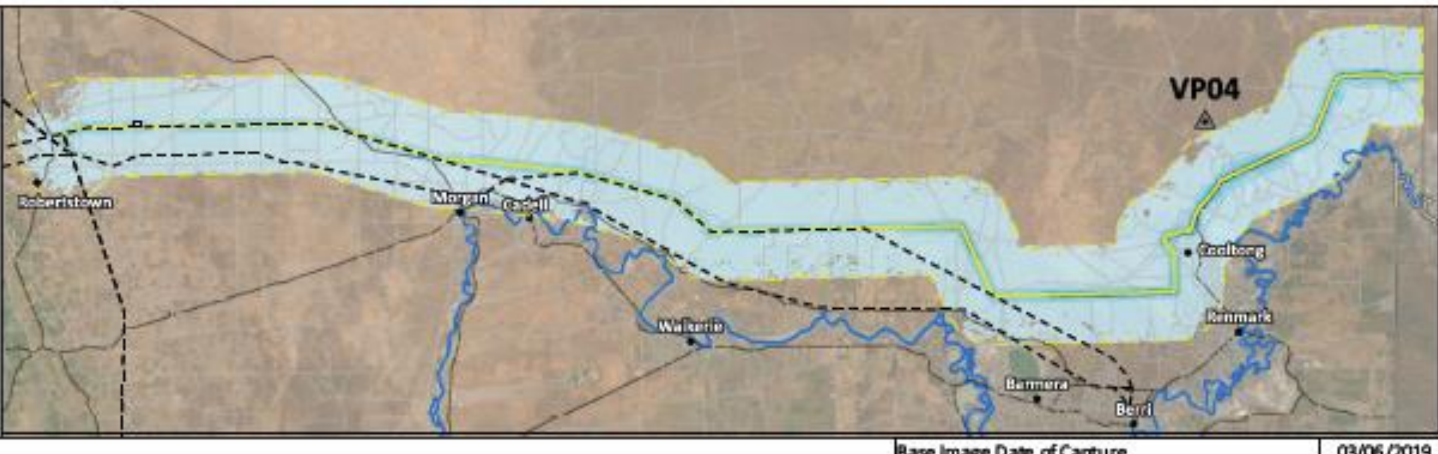
Note: no impacted social receptors identified

Current Landscape

Landscape and Project

Project Highlighted

Project Location Overview




# Figure 13-8
## Photomontage VP04

| | |
|---|---|
| Base Image Date of Capture | 03/06/2019 |
| Base Image Time of Capture | 10:38 AM |
| View Direction (compass bearing) | 160 |
| Eastings | 472,282.49 |
| Northings | 6,245,446.68 |
| Elevation (mAHD) | 43.19 |
| Horizontal Field of View (degrees) | 120 |
| Vertial Field of View (degrees) | 36 |
| Distance from Project Infrastructure (m) | 8,005.57 |
| Associated Visibility | Outside TZVI |
| Visual Landscape Type | Outside TZVI |
| Sensitivity to Change | Outside TZVI |
| Average Vegetation Height | Outside TZVI |
| Sensitivity to Change | Outside TZVI |
| Distance of receptor from Existing powerline Infrastructure | Outside TZVI |
| Sensitivity to Change | Outside TZVI |
| Theoretical Visual Impact Level | Outside TZVI |

| | |
|---|---|
| Job No: 55766 | |
| Client: ElectraNet | |
| Not to Scale at A3 | |
| Version: DRAFT_RevC | Date: 25-Nov-2020 |
| Drawn By: TB | Checked By: AT/ DB |
| Image Reference: JBS&G / Convergen | |

**Legend:**
**Project Tower Designs**
(presented in 'Projected Highlighted' image)

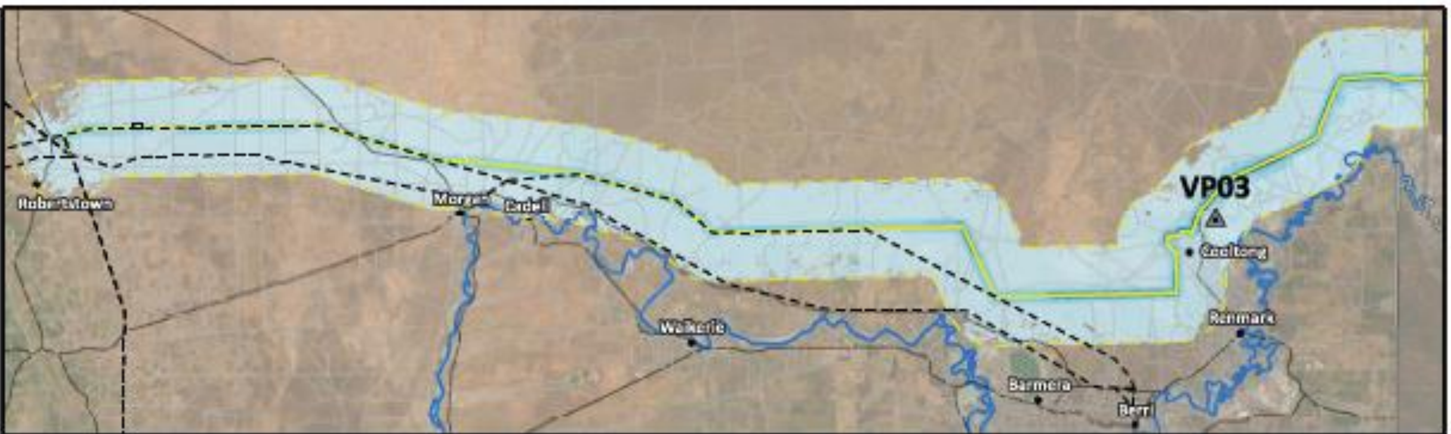
64.5m (Medium Angle Strain) Tower

Current Landscape

Landscape and Project

Project Highlighted

Project Location Overview




# Figure 13-9
# Photomontage VP03

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|---|---|
| Base Image Date of Capture | 03/06/2019 |
| Base Image Time of Capture | 11:27 AM |
| View Direction (compass bearing) | 298 |
| Eastings | 473,338.51 |
| Northings | 6,233,119.94 |
| Elevation (mAHD) | 18.31 |
| Horizontal Field of View (degrees) | 120 |
| Vertial Field of View (degrees) | 36 |
| Distance from Project Infrastructure (m) | 1,951.04 |
| Associated Visibility | Low |
| Visual Landscape Type | Eastern Riverina |
| Sensitivity to Change | High |
| Average Vegetation Height | <1m |
| Sensitivity to Change | High |
| Distance of receptor from Existing powerline Infrastructure | >3,351m |
| Sensitivity to Change | High |
| Theoretical Visual Impact Level | Negligible Visibility |

| | |
|---|---|
| Job No: 55766 | |
| Client: ElectraNet | |
| Not to Scale at A3 | |
| Version: DRAFT_RevC | Date: 25-Nov-2020 |
| Drawn By: TB | Checked By: AT/ DB |
| Image Reference: JBS&G / Convergen | |

**Legend:**
**Project Tower Designs**
(presented in 'Projected Highlighted' image)

64.5m (Medium Angle Strain) Tower

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Current Landscape

Landscape and Project

Project Highlighted

Project Location Overview


JBS&G

# Figure 13-10
# Photomontage VP14

| | |
|---|---|
| Base Image Date of Capture | 04/06/2019 |
| Base Image Time of Capture | 2:00 PM |
| View Direction (compass bearing) | 195 |
| Eastings | 358,831.66 |
| Northings | 6,246,969.31 |
| Elevation (mAHD) | 108.14 |
| Horizontal Field of View (degrees) | 120 |
| Vertial Field of View (degrees) | 36 |
| Distance from Project Infrastructure (m) | 2,139.96 |
| Associated Visibility | Low |
| Visual Landscape Type | Degraded Agricultural Plains |
| Sensitivity to Change | Low |
| Average Vegetation Height | 3 – 10m |
| Sensitivity to Change | Low |
| Distance of receptor from Existing powerline Infrastructure | 1,676 - 3,350m |
| Sensitivity to Change | Moderate - High |
| Theoretical Visual Impact Level | Negligible Visibility |

| | |
|---|---|
| Job No: 55766 | |
| Client: ElectraNet | |
| Not to Scale at A3 | |
| Version: DRAFT_RevC | Date: 25-Nov-2020 |
| Drawn By: TB | Checked By: AT/ DB |
| Image Reference: JBS&G / Convergen | |

**Legend:**
**Project Tower Designs**
(presented in 'Projected Highlighted' image)

64.5m (Medium Angle Strain) Tower

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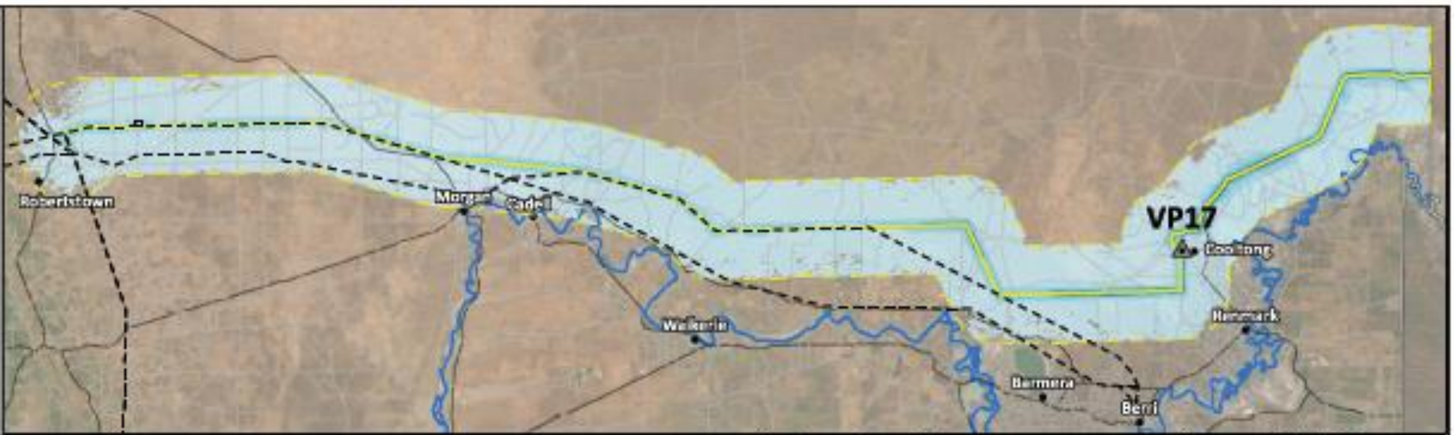
Current Landscape

Landscape and Project

Project Highlighted

Project Location Overview




JBS&G

Figure 13-11
Photomontage VP17

| | |
|---|---|
| Base Image Date of Capture | 12/10/2019 |
| Base Image Time of Capture | 10:14 AM |
| View Direction (compass bearing) | 290 |
| Eastings | 468,597.21 |
| Northings | 6,228,951.02 |
| Elevation (mAHD) | 41.67 |
| Horizontal Field of View (degrees) | 120 |
| Vertial Field of View (degrees) | 36 |
| Distance from Project Infrastructure (m) | 555.87 |
| Associated Visibility | Moderate |
| Visual Landscape Type | Riverina - Irrigated Agriculture |
| Sensitivity to Change | Low |
| Average Vegetation Height | <1m |
| Sensitivity to Change | High |
| Distance of receptor from Existing powerline Infrastructure | >3,351m |
| Sensitivity to Change | High |
| Theoretical Visual Impact Level | Very Low Visibility |

| | |
|---|---|
| Job No: 55766 | |
| Client: ElectraNet | |
| Not to Scale at A3 | |
| Version: DRAFT_RevC | Date: 25-Nov-2020 |
| Drawn By: TB | Checked By: AT/DB |
| Image Reference: JBS&G / Convergen | |

**Legend:**
**Project Tower Designs**
(presented in 'Projected Highlighted' image)

64.5m (Medium Angle Strain) Tower

Current Landscape

Landscape and Project

Project Highlighted

Project Location Overview


JBS&G

## Figure 13-12
## Photomontage VP05

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|---|---|
| Base Image Date of Capture | 03/06/2019 |
| Base Image Time of Capture | 12:51 PM |
| View Direction (compass bearing) | 22.6 |
| Eastings | 472,549.74 |
| Northings | 6,235,091.35 |
| Elevation (mAHD) | 33.96 |
| Horizontal Field of View (degrees) | 120 |
| Vertial Field of View (degrees) | 36 |
| Distance from Project Infrastructure (m) | 78.76 |
| Associated Visibility | High Visibility |
| Visual Landscape Type | Eastern Riverina |
| Sensitivity to Change | High |
| Average Vegetation Height | 1-2m |
| Sensitivity to Change | Moderate |
| Distance of receptor from Existing powerline Infrastructure | >3,351m |
| Sensitivity to Change | High |
| Theoretical Visual Impact Level | High Visibility |

| | |
|---|---|
| Job No: 55766 | |
| Client: ElectraNet | |
| Not to Scale at A3 | |
| Version: DRAFT_RevC | Date: 25-Nov-2020 |
| Drawn By: TB | Checked By: AT/ DB |
| Image Reference: JBS&G / Convergen | |

**Legend:**
**Project Tower Designs**
(presented in 'Projected Highlighted' image)

64.5m (Medium Angle Strain) Tower

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## 13.5. Conclusion

Project EnergyConnect traverses several landscape types from cleared grazing land to extensive mallee woodland with low population densities. Given these landscape types, the proposed towers will be a dominant feature. The route selection and alignment of the Project infrastructure has considered locations away from visually sensitive areas, and adjacent to existing linear infrastructure, resulting in a relatively low overall visual impact where high numbers of visual receptors have been avoided. Highly sensitive landscapes have been largely avoided, and where they are crossed (for example in the eastern sector) there are very few receptors.

The vast majority of the TZVI will not be significantly impacted by the transmission infrastructure with 87% of the area falling to the Negligible Visibility zone. Conversely, only 0.3% of the area (1,038 ha) within the TZVI falls into the High Visibility zone.

The Project infrastructure will not be visible beyond 6.2 km (the TZVI). The highest visual impact will be from areas closer to the transmission line, which decreases exponentially as the receptor moves away towards the outer edge of the TZVI. Within the TZVI, the visual impact experienced by a receptor is influenced by landscape sensitivity and receptor types, vegetation screening and other mitigation factors.

In general, the Project will have limited visual impact. There will be a few, localised areas within the TZVI, close to the alignment that will be visually affected with the Project infrastructure being visually dominant.

EIS Volume 1 Chapter 14

# Air Quality

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# 14. Air Quality

This chapter provides a summary of the existing air quality conditions and assesses the potential impact the Project may have on air quality, including greenhouse gas emissions. It is based on the outcomes of the specialist air quality assessment attached at Appendix K.

## 14.1. Key Findings

- Potential air quality impacts from construction will primarily be related to dust associated with soil disturbance due to vegetation clearance requirements for the Bundey substation, access track establishment or use, mobile concrete batching plants, tower installation and general construction activities.
- Construction vehicle and helicopter movements will not result in significant dust impacts at sensitive receptors.
- Although dust will be generated by the Project, the region is sparsely populated with only four receptors present within the transmission line corridor and only two receptors that may be impacted by dust. Construction impacts associated with dust are anticipated to be short-term and minor.
- Dust management measures will be implemented where required during construction to minimise potential impacts, particularly in the vicinity of sensitive receptors.
- Operational activities are not expected to cause any adverse public nuisance or public health impacts from dust generation.
- The greenhouse gas emissions modelling has shown that the Project will contribute negligible emissions to State and national greenhouse gas inventories. It should be noted that the Project will assist the National Electricity Market transition away from traditional fossil fuel-based electricity generation to a greater mix of renewable energy sources. This in turn will have a net positive impact to greenhouse gas emissions and assist government in meeting emissions targets.

## 14.2. Setting the Context

This section provides information needed to explain the context within which impact assessment is undertaken. It describes:

- the relevant EIS Guidelines
- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet
- the assessment methodology used to identify baseline environmental values and to undertake the impact assessment.

### 14.2.1. EIS Guidelines

The EIS Guidelines require an assessment of the effects on receptors of dust and emissions from Project construction and operation activities and measures for controlling these impacts as set out in Table 14-1.

**Table 14-1: EIS Guidelines addressed in the Air Quality chapter**

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| **Land Use and Economic Effects** | |

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| *Assessment Requirement 2*: The proposal will have an impact on the State's economy during construction and operation and may result in immediate and long term effects on land owners and surrounding uses | |
| • *2.6*: Outline any mitigation measures to alleviate or avoid impacts on landowners and land uses and refer to any compensation programmes. | Critical |
| **Effect on the physical environment**<br>*Assessment requirement 12:* The proposed development has the potential to disturb landforms and soil and to affect stormwater run-off | |
| • *12.1:* Describe the nature and condition of the physical environment in the proposal's environs, including reference to geology, geomorphology, soils, hydrology and atmosphere. | Medium |
| • *12.2:* Identify any risks and implications of causing or exacerbating land degradation, especially soil erosion and the impacts of dust emissions during construction and ongoing maintenance | Medium |
| • *12.5:* Address greenhouse gas emissions from construction, operation and maintenance of the transmission line | Medium |
| **Traffic Effects**<br>*Assessment Requirement 14:* The proposal requires access for the transportation of infrastructure and construction material to site and ongoing access for maintenance purposes. | |
| • *14.4:* Identify any potential effects of construction traffic on communities including noise and dust | Standard |
| **Construction, Operation and Maintenance Effects**<br>*Assessment Requirement 15:* The construction and operation of the proposal would require a range of impacts to be minimised, mitigated and monitored through an environmental management plan framework. | |
| • *15.3:* Describe the likely impact and measures for the control of dust, vibration, noise, emissions, drag out (i.e. onto public roads) and litter during both construction and maintenance. | Standard |
| • *15.11: Describe the locations(s) where mobile concrete batching plants would be used and the management of wastewater, dust emissions and noise from such plant.* | Standard |

Aspects of assessment requirements identified in Table 14-1 which are not addressed in this chapter are listed in Table 14-2 together with the applicable chapter.

**Table 14-2: Aspects of assessment requirements addressed in other chapters**

| Assessment requirement | Chapter |
|---|---|
| 2.6 Summary of mitigation measures to alleviate or avoid impacts to landowners | Chapter 9 Land Use and Tenure |
| 2.6 Mitigation measures for noise impacts to landowners | Chapter 14 Noise and Vibration |
| 2.6 Mitigation measures for traffic impacts to landowners | Chapter 16 Traffic and Transport |
| 12.1 Description of the nature and condition of the physical environment including geology, geomorphology, soils and hydrology | Chapter 10 Physical Environment |
| 12.2 Risks and implications of land degradation, especially soil erosion | Chapter 10 Physical Environment |
| 12.2 Risks and implications of dust emissions on flora and fauna | Chapter 11 Flora and Fauna |
| 14.4 Potential noise effects of construction traffic on communities | Chapter 15 Noise and Vibration |
| 14.4 Potential effects of construction traffic on communities | Chapter 16 Traffic and Transport |
| 15.3 Impact and measures for control of vibration and noise emissions | Chapter 15 Noise and Vibration |
| 15.3 Impact and measures for control of drag-out | Chapter 16 Traffic and Transport |
| 15.3 Impact and measures for control of litter | Chapter 19 Waste Management |
| 15.11 Location of concrete batching plants | Chapter 2 Project Description |
| 15.11 Management of wastewater from concrete batching | Chapter 10 Physical Environment |
| 15.11 Management of noise from concrete batching | Chapter 15 Noise and Vibration |

### 14.2.2. Requirements in legislation and other standards

The *National Environment Protection (Ambient Air Quality) Measure* (Ambient Air Quality NEPM) was introduced in 1998 and contains ambient air quality standards for six dominant pollutants across Australia: carbon monoxide, lead, nitrogen dioxide, particles, ozone and sulphur dioxide. The NEPM also provides a framework method for monitoring and reporting on air quality.

South Australian *Environment Protection (Air Quality) Policy 2016* (Air Quality EPP) prepared under Section 28 of the *Environment Protection Act 1993* sets out the air quality standards adopted by EPA SA. The ground level concentration standards adopted in the air quality study are from Schedule 2 of the Air EPP. The aim of the policy is to reduce the impact of smoke and other air pollutants on communities across the state.

Guidance on meeting requirements under the Air Quality EPP is provided in *Evaluation distances of effective air quality and noise management* (EPA SA 2019) prepared by EPA SA. The document provides recommended evaluation distances from polluting activities, within which potential adverse impacts on sensitive receivers need to be assessed. Although no distances are specified for construction activities, concrete batching has an evaluation distance of 200 m.

The *Air and Water Quality Guideline – Concrete Batching* (EPA SA 2017) also provides guidance on compliance with the *Environment Protection Act 1993* for management and operation of concrete batching plants.

#### Greenhouse Emissions

The National Greenhouse and Energy Reporting (NGER) Scheme is an instrument under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act). The scheme provides a national framework for understanding greenhouse gas information and provides methods for reporting on greenhouse gas emissions.

*Climate Change and Greenhouse Emissions Reduction Act 2007* sets out a number of reporting obligations for the South Australian Government and mandates a biannual assessment by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) on the extent to which the targets under the Act are being achieved. The aim of the Act is to retain accountability for climate action and promote action to meet the specified targets.

### 14.2.3. Views of stakeholders

Affected landowners have not expressed any concerns to date about air quality impacts from the Project as it is recognised that dust impacts are manageable. Stakeholders within the broader region have expressed an interest in the impacts of the Project on greenhouse gas emissions during consultation sessions.

### 14.2.4. Assessment method

The method of assessment has followed that set out in Chapter 8 Impact Assessment Methodology.

#### Air quality assessment

The assessment focusses on the 1 km wide transmission line corridor, with reference to the broader region where necessary. The assessment is based on an air quality and greenhouse gas impact assessment undertaken for the Project (Northstar Air Quality 2021), contained in Appendix K.

The construction phase impacts were assessed using a risk-based assessment procedure. The assessment used guidance on threshold screening distances for dust from construction (IAQM 2016) to derive a distance (350 m) beyond which there was considered to be a negligible risk of impact on receptors from construction activities. Impact category definitions for dust emissions were then defined based on the distance from construction activities, with impacts defined as 'Moderate' within 50 m, 'Minor' between 50 and 350 m, and 'Negligible' at distances greater than 350 m. These categories were then used to predict the level of impact at receptors identified along the transmission line corridor. A 500 m buffer around the proposed alignment and Bundey substation site was used to identify potential receptors (see Section 14.3.2) which is larger than the maximum screening distance defined by IAQM (2016).

A modelling approach was not considered appropriate or necessary due to a lack of reliable factors from construction activities on which to base predictive assessments, as well as the very low number of receptors and short-term nature of the activities (and resulting low level of risk). Emission rates would also vary significantly depending on local conditions and the construction management practices employed, which would result in a high level of uncertainty in any modelling.

### Greenhouse gas assessment

The greenhouse gas assessment was undertaken using a quantitative approach to estimate the potential greenhouse gas emissions from the Project and then comparing these to the total national and South Australian greenhouse gas emissions for context. Emission outputs were estimated by projecting the direct and indirect emission types based on the project description. The applicable activities which have the potential to result in emission of greenhouse gas were:

- combustion of diesel fuel in equipment
- land clearing
- combustion of fuel during construction for material transportation purposes.

Greenhouse gas emission levels for fuel combustion were estimated using activity data for each emission source obtained from the Transport Authorities Greenhouse Group (2013) and emission factors sourced from the National Greenhouse Accounts Factors (DISER 2020b). Emissions resulting from land clearing were assumed to be negligible based on the rehabilitation of areas of temporary disturbance and the slow rate of natural decomposition of cleared vegetation that would be left on site.

Where there was uncertainty in the assessment of expected impacts, this was evaluated using risk assessment tools, as discussed in Chapter 8 Impact Assessment Methodology. This is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix O.

## 14.3. Description of Existing Environment

The air quality in the vicinity of the transmission line corridor is generally expected to be good, typical of its setting in rural remote South Australia[1].

The principal land uses along the transmission line corridor are agriculture, pastoral / grazing and conservation (as discussed in Chapter 9 Land Use and Tenure). It is expected that the primary contribution from these land uses to local air quality are:

- dust from cultivating and harvesting activities
- dust from movement of livestock
- pesticides and fertilisers from ground and / or aerial crop spraying

[1] There are no air quality monitoring stations at nearby or representative locations. The closest stations are at Elizabeth Downs in metropolitan Adelaide (90 km to the south south-west of Robertstown) and Lake Victoria (20 km to the south-east in NSW, which monitors dust storm events but does not have data available in a format suitable for use in the assessment).

- emissions from agricultural machinery.

There are some populated areas in the broader vicinity of the transmission line corridor, towards the town of Renmark (see Figure 14-1). It would be expected that the higher frequency of vehicle movements and commercial activities within those areas would contribute to local background air quality conditions.

Due to the distance the Project covers, the air quality conditions will vary as it moves through various land uses and closer to populated areas. However, as the transmission line is still a considerable distance from the more densely populated areas, the local background pollutant levels are expected to be low, except during episodic events such as dust storms or bush fires.

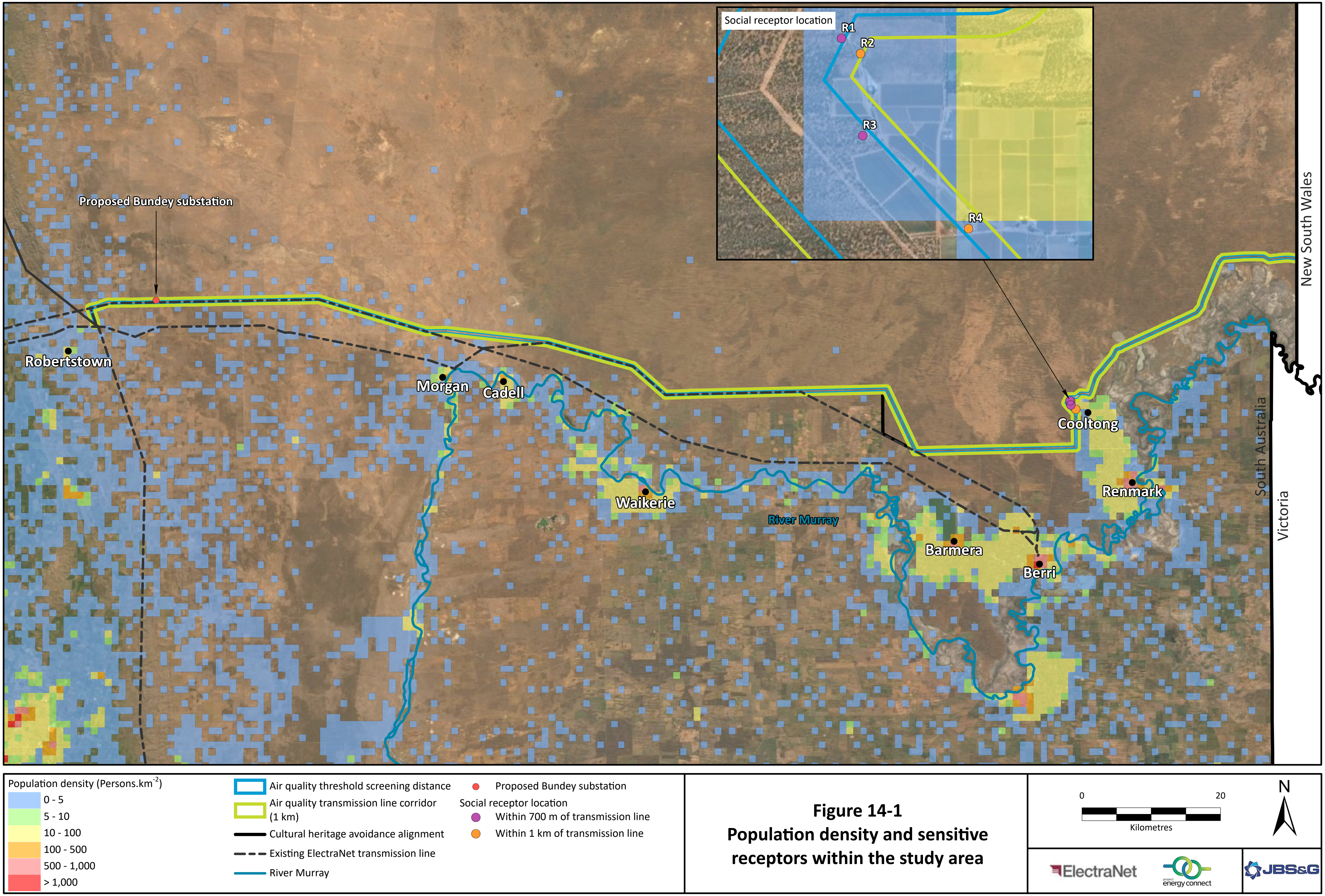


**Figure 14-1**
**Population density and sensitive receptors within the study area**

### 14.3.1. Atmospheric conditions and topography

For the purposes of the air quality impact assessment, the existing atmospheric conditions of the region were obtained from two Bureau of Meteorology Automatic Weather Station (AWS) sites located at the western (Eudunda AWS) and eastern (Renmark Aero AWS) extents of the alignment.

Annual wind roses for both locations were assumed to be representative of the westerly and easterly extremes of the transmission line corridor and indicated that south-westerly winds occur most predominantly through the area, with the highest velocities occurring during the afternoon. Wind roses for selected meteorological stations are provided in Chapter 10 Physical Environment.

There are no significant topographical features identified by the air quality assessment which could significantly influence the dispersion and transport of air pollutants between the transmission line corridor and the identified sensitive receptors discussed in Section 14.3.1.

Further detail of the physical environment of the Project region including topography is discussed in detail in Chapter 10 Physical Environment.

### 14.3.2. Sensitive receptors

The region is sparsely populated and there are very few receptors in the vicinity of Project. Four residential receptor locations near Cooltong are located within 500 m of the proposed alignment and were identified as being potentially susceptible to changes in air quality, as shown in Figure 14-1**.**

Details of the discrete sensitive receptor locations used in the air quality impact assessment are provided in Table 14-3. These locations were chosen as being indicative of sensitive receptors (residential areas).

**Table 14-3: Discrete sensitive receptor locations used in the study**

| Receptor ID | Receptor type | Generalised land use | Distance to proposed alignment (m) |
|---|---|---|---|
| R1 | Residential | Rural horticulture | 330 |
| R2 | Residential | Rural horticulture | 487 |
| R3 | Residential | Rural horticulture | 298 |
| R4 | Residential | Rural horticulture | 393 |

Greenhouse gas emissions contribute to global warming and require consideration at that level. Consequently, sensitive receptors have not been identified for greenhouse gas emissions.

## 14.4. Impact Assessment

The following aspects of the Project have been identified as potential sources of air quality impacts:

- soil disturbance during construction works for access track establishment, tower footings, excavation and stockpiling of soil
- construction vehicle and helicopter movements along the transmission line corridor that generate dust
- dust from mobile concrete batching plant operations
- combustion emissions from vehicles and equipment involved in construction and inspection and maintenance
- soil disturbance from operational activities.

The potential impact events resulting from these aspects of the Project are discussed below. Predicted impact categories and an evaluation of uncertainty are also discussed for each impact event.

Combustion emissions from vehicles and equipment involved in construction and inspection and maintenance are also a source of greenhouse gas emissions, and vegetation clearing can also result in the release of greenhouse gases. It is noted that the Project may contribute to an overall reduction in greenhouse gas emissions if renewable energy development is facilitated by the Project. The Project will also aid in moving to a low carbon economy as it will assist in the transition away from fossil fuel based generation to renewables.

Given the nature, scale and frequency of operational-phase maintenance activities, combustion emissions from this phase are considered negligible and are not assessed further. Similarly, operational greenhouse gas emissions are not considered further.

The potential impact events resulting from these aspects of the Project are discussed below. Predicted impact categories and an evaluation of uncertainty are also discussed for each impact event.

### 14.4.1. Air quality

#### Soil disturbance

**Dust generation from soil disturbance will not have a significant impact on sensitive receptors.**

Vegetation clearance, excavation and earthworks will be required for the construction of towers, the Bundey substation, new access tracks and temporary facilities (e.g. temporary lay down areas, borrow pits, staging sites and temporary worker construction camps). Dust generation can occur while soil disturbing activities are being undertaken, or during periods of high wind after the initial disturbance, due to the presence of exposed soil.

The areas of disturbance for towers along the proposed alignment have a relatively small and discrete footprint and are sparsely distributed, as discussed in Chapter 10 Physical Environment. The area of disturbance for towers and other infrastructure will be minimised and groundcover will be retained where possible (e.g. for the stringing access corridor). The most continuous soil disturbance will relate to the access track along the transmission line. Existing tracks will be utilised where possible and grading or other earthworks will be limited to what is required to provide safe access for construction.

As described in Chapter 10 Physical Environment, wind erosion potential of the soil is low to moderately low along the transmission line corridor to the west of Morgan. Areas of elevated wind erosion potential occur in the eastern part of the transmission line corridor, typically associated with the dune fields and sand plains present.

Due to the region of the Project being sparsely populated, there are very few receptors near the transmission line corridor that could potentially be impacted by dust from construction and operation activities. The air quality impact assessment (Appendix K) concluded that minor dust impacts may be experienced at up to 350 m from the construction works (which would potentially affect two residences near Cooltong which are approximately 300 m from the proposed alignment), however these impacts would be reduced to negligible with implementation of dust control measures. Moderate impacts (which could potentially occur at less than 50 m from construction works) were not predicted at any receptors as there are no receptors within this proximity.

ElectraNet’s construction contractor will develop and implement dust and air emissions measures as part of the construction environmental management plan (CEMP). This will include measures such as:

- provision of water carts to apply water or other dust suppressants as and when required on work areas close to potential sensitive receptors
- watering or stabilisation of exposed surfaces to minimise wind erosion
- planning construction activities to minimise the time that soils are exposed

- implementation of speed limits
- progressive rehabilitation of temporary construction areas
- visual monitoring of dust generation
- community liaison and mechanism for registering and resolving complaints.

These measures are described in more detail in the air quality impact assessment (Appendix K) and in the draft CEMP (refer Volume 3 Appendix P).

There is potential for an increase in dust deposition onto vegetation near construction activities. However, the impact is expected to be small scale, temporary and confined to the immediate vicinity of the disturbance footprint, and is not expected to have any significant impacts on the abundance and / or diversity of native vegetation and fauna or commercial crops. Impacts to native vegetation and fauna are discussed further in Chapter 11 Flora and Fauna.

Any impact of construction dust emissions on surrounding sensitive receptors will be limited due to the transient nature of construction along the corridor, limited scale and duration of planned earthworks at any particular site, the separation distance between construction activity and sensitive receptors.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the implementation of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Construction vehicle and helicopter movements

**Construction vehicle and helicopter movements will not result in significant dust impacts at sensitive receptors.**

Vehicle movements on access tracks and unsealed roads during construction activities and operation of helicopters during tower transport and aerial stringing can result in dust generation, which may impact nearby receptors.

As noted above, there are very few receptors in close proximity to the proposed alignment, with only two receptors located within the distance (350 m) where it is considered that impacts resulting from traffic along the alignment could potentially occur. Dust control measures in the vicinity of these receptors would be implemented to avoid any significant impact.

There will also be an increase in traffic on local roads during the construction phase, as discussed in Chapter 16 Traffic and Transport. There are very few residences adjacent to unsealed roads that are likely to be used for access to the Project during construction. Dust control measures outlined above would be implemented in the vicinity of these residences where required.

If helicopters are utilised for tower transport and aerial stringing, take-off / landing and staging sites will be required. These may be outside of the Project area and may result in the generation of particulate matter through rotor downwash and material handling activities. Care will be taken to locate these sites as far from any sensitive receptor locations as possible, and at a minimum of 350 m from those locations. This is anticipated to provide a suitable buffer for anticipated short-term (<1 hr) particulate matter emissions and to ensure that the short-term (24 hr) particulate matter criteria are achieved.

Dust generation at helicopter take-off and landing sites (particularly sites that are used frequently) would be minimised by implementation of dust control treatments such as those described above. Dust control would also be implemented at tower sites if helicopters are being used for tower assembly and dust generation is significant. Helicopters may not be used for tower assembly at sites where there are residences nearby unless granted consent by those residences for such activity.

The dust control measures outlined above are well-established for a range of construction activities and are considered standard practice. They have been used successfully by ElectraNet on other transmission line projects. They are known to be effective provided the control measures are regularly applied. As noted above, this will be a requirement in the CEMP.

Other emissions during construction (e.g. combustion emissions from vehicles or equipment) would be localised, transient and short term and would have a negligible impact on local air quality. They are not expected to have any impact air quality at the small number of receptors located in the transmission line corridor.

The predicted impacts are in the **Negligible to Minor** category. Uncertainty in the predicted impact (based on uncertainty in the implementation of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Mobile concrete batching plants

**Mobile concrete batching plants will be located and managed to avoid dust at sensitive receptors.**

Concrete for tower foundations is likely to be supplied from local concrete batching plants in Robertstown and Berri, with up to three mobile concrete batching plants proposed for various locations along the transmission line corridor. Cement, sand and aggregate materials used in concrete batching have the potential to produce dust which may adversely affect amenity values for nearby sensitive receptors.

Temporary locations for the mobile concrete batching plants will be selected to be as far from any sensitive receptor locations as possible (i.e. at least 350 m from those locations) to minimise the risk of impacts. Measures to mitigate dust emissions from mobile plants will be implemented and would include consideration of prevailing wind directions in locating the plants, shielded storage of stockpiled materials and dust suppression methods such as water sprays.

Impacts on surrounding sensitive receptors from dust emissions from mobile concrete batching plants will be limited due to the separation distance between the plants and sensitive receptors, the temporary presence of the plants, and implementation of appropriate dust suppression measures which will be set out in the CEMP.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the final location and implementation of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Rehabilitation of construction areas

**Construction areas will be rehabilitated and will not result in significant dust impacts.**

As noted above, the areas of disturbance generally have a relatively small and discrete footprint and are sparsely distributed, and there are very few receptors in close proximity. All areas of temporary disturbance (e.g. non-permanent access tracks or laydown areas) will be rehabilitated by scarifying or ripping compacted soil and replacing any previously stripped stockpiled topsoil and vegetation (or as agreed with relevant landholders). ElectraNet has experience in successfully rehabilitating construction areas for transmission lines in similar environments.

The rehabilitation of disturbed areas will be monitored to ensure success. If necessary, ElectraNet will undertake further stabilisation and / or rehabilitation works until all construction areas have achieved rehabilitation objectives.

The predicted impacts are in the **Negligible** to **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Operational vehicle movements

**Operational activities are not expected to cause any adverse public nuisance or public health impacts from dust generation.**

During standard operation the transmission line will require very little ongoing maintenance. Access tracks to the transmission line towers would be retained for inspection and maintenance activities, predominantly by light 4WD vehicles or helicopter. The maintenance program would typically involve one detailed ground inspection every three years for signs of unusual wear, structural integrity and corrosion or damage. During operational inspections and maintenance there is not expected to be any significant soil disturbance or other activities that have the potential to generate significant dust that will impact on sensitive receptors during operational activities. Flying height of helicopters during inspections will be at approximately 65 m or higher. There are also very few sensitive receptors in the vicinity of the proposed alignment who may be affected should any dust generation occur.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

## 14.4.2. Greenhouse gas

**Construction activities will not significantly contribute to global greenhouse gas emissions.**

Construction activities will result in the release of greenhouse gas emissions primarily from the use of diesel fuel for construction machinery, vehicles and generators. The combustion of fossil fuels will result in the emission of nitrogen oxides ($NO_x$), sulphur oxides ($SO_x$) and diesel particulates. The greenhouse gas emissions modelling, from vehicles and during vegetation clearing, have shown that the Project will contribute a negligible amount to the Australian greenhouse gas inventory. Direct emissions (Scope 1) from construction of the Project would contribute approximately 0.0001% of Australian total greenhouse gas emissions in 2018 and 0.0031% of SA total greenhouse gas emissions (refer Appendix K).

Summaries of the GHG emissions estimates for the construction phase are provided in Table 14-4. Note that Scope 2 emissions have not been calculated as no electricity is being purchased and consumed from an organisation on site.

**Table 14-4: Greenhouse gas emissions during construction**

| Energy Demand | Greenhouse gas emissions (t $CO_2$-e/annum) |
|---|---|
| **Scope 1** | |
| Diesel fuel for mobile plant and equipment | 758.5 |
| **Scope 3** | |
| Diesel fuel for mobile plant and equipment | 38.8 |
| Diesel fuel for material transport | 3.9 |
| Unleaded fuel for employee transport | 0.003 |
| Diesel fuel for employee transport | 0.003 |
| Aviation fuel (Avgas) for helicopter | 183.0 |
| Steel used in construction (embodied emissions) | 29,190 |
| Concrete used in construction (embodied emissions) | 17,770 |
| **Construction phase total** | **47,944** |

Scope 3 emissions related to the embodied emissions of purchased material (concrete and steel) are included in the estimates. The Project will consider opportunities to reduce embodied emissions, including potential use of materials with lower embodied energy such as fly ash cement and materials with high recycled content (such as recycled aggregate in concrete).

It should be noted that the Project will assist the National Electricity Market to transition away from traditional fossil fuel-based electricity generation to a greater mix of renewable energy sources. The Project will allow more renewable energy projects to connect to the grid as it targets renewable energy zones and allows the sharing of electricity interstate. This in turn will aid the SA and NSW governments in achieving their goal to achieve net zero emissions by 2050.

### 14.4.3. Summary of key mitigation measures

Potential impacts to air quality will be mitigated through and control measures detailed in the CEMP. Table 14-5 provides a summary of the proposed mitigation measures related to air quality.

**Table 14-5: Key mitigation measures – air quality and greenhouse gas**

| Mitigation measure | Construction | Operation |
|---|---|---|
| Provide awareness training and site-specific training (if applicable) for all workers on site on air quality issues and provide information on importance of management | ✓ | |
| Incorporate existing tracks into the design where possible to avoid construction of new access tracks, and reduce clearance footprint and associated soil disturbance | ✓ | |
| Use emissions control equipment on fixed and mobile plant and equipment | ✓ | ✓ |
| Implement dust suppression controls on unsealed roads, when required | ✓ | |
| Implement dust suppression controls on disturbed land (construction) where required | ✓ | |
| Implement dust suppression controls at mobile concrete batching plant locations, where required | ✓ | |
| Restrict the disturbance footprint to the minimum necessary to safely carry out the activities | ✓ | |
| Limit planning construction activities to minimise the time that soils are exposed | ✓ | |
| Implement maximum speed limits on access roads and work areas | ✓ | ✓ |
| Implement progressive rehabilitation of temporary construction areas | ✓ | |
| Monitor rehabilitation of disturbed areas to ensure success | ✓ | |
| Maintain equipment to ensure emissions control devices are functioning correctly | ✓ | |
| Sourcing of materials that have minimal embodied energy and environmental impact as far as practicable. | ✓ | |
| Reducing emissions through the sourcing of local materials where practicable. | ✓ | |
| Turn off vehicles/plant and machinery when not in use | ✓ | ✓ |
| Develop a complaint register and corrective action program | ✓ | ✓ |
| Undertake and ongoing community / landholder engagement process | ✓ | ✓ |
| Register any complaints in ElectraNet's IMS and implement any necessary corrective action program. | ✓ | ✓ |

## 14.5. Conclusion

ElectraNet's key finding is that Project construction or operational activities will not lead to significant air quality impacts. Most of the proposed alignment is distant from sensitive receptors and no adverse impacts are anticipated during construction or operation of the Project. Where the few receptors are in closer proximity to the alignment, the impacts will be negligible to minor, predominantly due to the transient nature of construction activities. Dust control measures will be implemented in accordance with the CEMP.

EIS Volume 1 Chapter 15

# Noise and Vibration

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# 15. Noise and Vibration

This chapter describes how the construction and operation of the Project will generate noise within the study area defined for assessment of noise impacts, and provides an assessment of the likely effect on residents and visitors within the noise study area. It is based on the outcomes of the specialist Noise Impact Assessment, attached in Appendix J.

The potential for noise disturbance to fauna is discussed further in Chapter 11 Flora and Fauna.

## 15.1. Key Findings

- Background noise levels in the Project vicinity are typical of a rural environment. The majority of the proposed transmission alignment is remote from residential receptors and is located well away from town centres such as Morgan, Cadell and Renmark. There are sensitive receptors located predominantly at the eastern end of the alignment in Cooltong, with other receptors being made up of scattered rural homesteads.
- There will be a minor short-term impact on the amenity of up to 21 receptors due to noise disturbance during land clearing and tower installation with the potential for a moderate short-term impact on up to two receptors during the construction phase.
- Helicopters may be used to assist with pre-assembled tower transport during the construction phase. Noise impacts from the use of helicopters during construction would have a very short-term minor impact on the amenity of up to 141 receptors, primarily in the Cooltong area.
- Fauna of conservation significance occur along the alignment, particularly in the eastern section. Noise impacts from construction activities, including the use of helicopters, are unlikely to cause temporary or permanent hearing damage to fauna.
- Laydown areas and construction camps will be established along the route. As these would be established in locations way from receptors (unless otherwise agreed with landholders), noise from activities at these sites is not expected to adversely affect the amenity of residential receptors.
- The noise impact on residents along transport routes from haulage of material to and from construction sites is expected to be minor and short term.
- Noise from the use of helicopters in line inspections during operation is expected to have a negligible transient impact on residential receptors or fauna.
- The operation of the Bundey substation is not expected to affect the amenity of residential receptors.
- Corona discharge events during operation of the transmission line are not expected to create noise impacts that could affect residential receptors or fauna.
- Vibration from the construction process is unlikely to present impacts on sensitive receptors given the separation distance from the proposed transmission line.

## 15.2. Setting the Context

This section provides information needed to explain the context within which impact assessment is undertaken. It describes:

- the relevant EIS Guidelines
- relevant requirements in legislation and other standards

- views of stakeholders and the environmental and social outcomes they would like the Project to meet
- the assessment methodology used to identify baseline environmental values and to undertake the impact assessment.

### 15.2.1. EIS Guidelines

The EIS Guidelines require an assessment of the likely impact of noise during construction and maintenance (including from any proposed construction camps) and measures for controlling these impacts as set out in Table 15-1.

**Table 15-1: EIS Guidelines addressed in the Noise and Vibration chapter**

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| **Land Use and Economic Effects**<br>*Assessment Requirement 2*: The proposal will have an impact on the State's economy during construction and operation and may result in immediate and long term effects on land owners and surrounding uses | |
| • 2.6 Outline any mitigation measures to alleviate or avoid impacts on landowners and land uses and refer to any compensation programmes. | Critical |
| **Effects on communities**<br>*Assessment Requirement 9*: The proposed development has the potential to affect that local community during construction and through the establishment of a large linear structure. | |
| • 9.5: Address any potential effects of electromagnetic fields, corona discharge and electric shocks on public health | Medium |
| **Traffic Effects**<br>*Assessment Requirement 14:* The proposal requires access for the transportation of infrastructure and construction material to site and ongoing access for maintenance purposes. | |
| • 14.4: Identify any potential effects of construction traffic on communities including noise and dust | Standard |
| **Construction, Operation and Maintenance Effects**<br>*Assessment Requirement 15:* The construction and operation of the proposal would require a range of impacts to be minimised, mitigated and monitored through an environmental management plan framework | |
| • 15.3: Describe the likely impact and measures for the control of dust, vibration, noise, emissions, drag out (i.e. onto public roads) and litter during both construction and maintenance | Standard |
| • 15.9: Outline the approximate size of the construction workforce including any need for any construction workers camps or accommodation. Describe the location and management of accommodation camps including sources of water and power, and the management of waste, wastewater and noise impacts. | Standard |
| • 15.11: Describe the location(s) where mobile concrete batching plants would be used and the management of wastewater, dust emissions and noise from such plant. | Standard |
| **Specialist Reports and Details**<br>A **noise assessment** prepared by a suitably experienced, professional acoustic engineering consultant to moderate external and environmental noise disturbance and amenity impacts for residents and other sensitive uses within the immediate area as a result of the proposed development (primarily during construction). | |

Aspects of assessment requirements identified in Table 15-1 above which are not addressed in this chapter are listed in Table 15-2 together with the applicable chapter.

**Table 15-2: Aspects of assessment requirements addressed in other chapters**

| Assessment Requirement | Chapter |
|---|---|
| 2.6 Summary of mitigation measures | Chapter 9 Land Use and Tenure |

| Assessment Requirement | Chapter |
|---|---|
| 2.6 Mitigation measures for air quality impacts to landowners | Chapter 14 Air Quality |
| 2.6 Mitigation measures for traffic impacts to landowners | Chapter 16 Traffic and Transport |
| 9.5 Potential effects of magnetic fields and electric shocks on public health | Chapter 18 Hazards and Risk Management |
| 14.4 Potential effects of dust from construction traffic | Chapter 14 Air Quality |
| 14.4 Potential effects of construction traffic on communities | Chapter 16 Traffic and Transport |
| 15.3 Likely impacts and measures for control of dust and emissions | Chapter 14 Air Quality |
| 15.3 Impact and measures for control of drag-out | Chapter 16 Traffic and Transport |
| 15.3 Likely impacts and measures for control of litter | Chapter 19 Waste Management |
| 15.9 Construction workforce and location and management of accommodation camps | Chapter 7 Project Description |
| 15.9 Management of soil, waste, wastewater from construction camps | Chapter 10 Physical Environment |
| 15.9 Size of the construction workforce and any need for any construction workers camps and accommodation | Chapter 17 Socio-Economic Environment |
| 15.9 Management of waste and wastewater | Chapter 19 Waste Management |
| 15.11 Location of concrete batching plants | Chapter 7 Project Description |
| 15.11 Management of wastewater from concrete batching plants | Chapter 10 Physical Environment |
| 15.11 Management of dust emissions from concrete batching plants | Chapter 14 Air Quality |

### 15.2.2. Requirements in legislation and other standards

The *Environment Protection Act 1993* (EP Act) creates a general environmental duty to take all reasonable and practical steps to prevent or minimise any resulting environmental harm. This requirement includes noise. Noise is defined as unwanted sound.

As explained in the *Guidelines for the Use of the Environment Protection (Noise) Policy 2007* (EPA SA 2009) (Noise EPP Guidelines), noise is commonly defined as unwanted sound. Sound is produced by small fluctuations in air pressure. The loudness of a sound is predominantly related to the size of the fluctuations, but is also related to their frequency i.e. the rate at which they are produced.

The loudness of sounds ranges from those which the human ear can just detect (the threshold of hearing) to those that exceed a threshold of pain. As sound is produced by changes in air pressure, the international standard unit of sound pressure is a pressure measurement, the micropascal (μPa).

The range between the faintest audible sound and the loudest sound the human ear can stand is so large when expressed in these units that measurement of sound pressure is expressed on a logarithmic scale[1], the unit of which is the more commonly known decibel (dB).

The frequency of a sound is the rate at which the fluctuations are produced per second. Practically all sounds contain a mixture of frequencies and the mix of frequencies affects the perceived loudness. A high-frequency sound (e.g. screeching or whistling) at the same acoustic pressure as a low-frequency sound (e.g. thunder) will be perceived to be louder. This is because the human ear is most sensitive to mid-range and high frequencies and is less sensitive to the lower frequencies.

To ensure measured levels approximate the human response, a weighting scale is used. It is known as the ‘A’ scale and the units are referred to as ‘A’ weighted decibels and written as dB(A). The dB(A) scale

[1] The logarithmic scale is different to a linear scale – a doubling of the sound pressure, say from 20 μPa to 40 μPa, produces an increase of 6 dB. In subjective terms, a 3 dB increase is often described as a just noticeable difference.

discriminates between sounds in much the same way as people do. References in this chapter are to dB(A) unless noted otherwise.

Some examples of typical sound levels in dB(A) are shown in Figure 15-1.

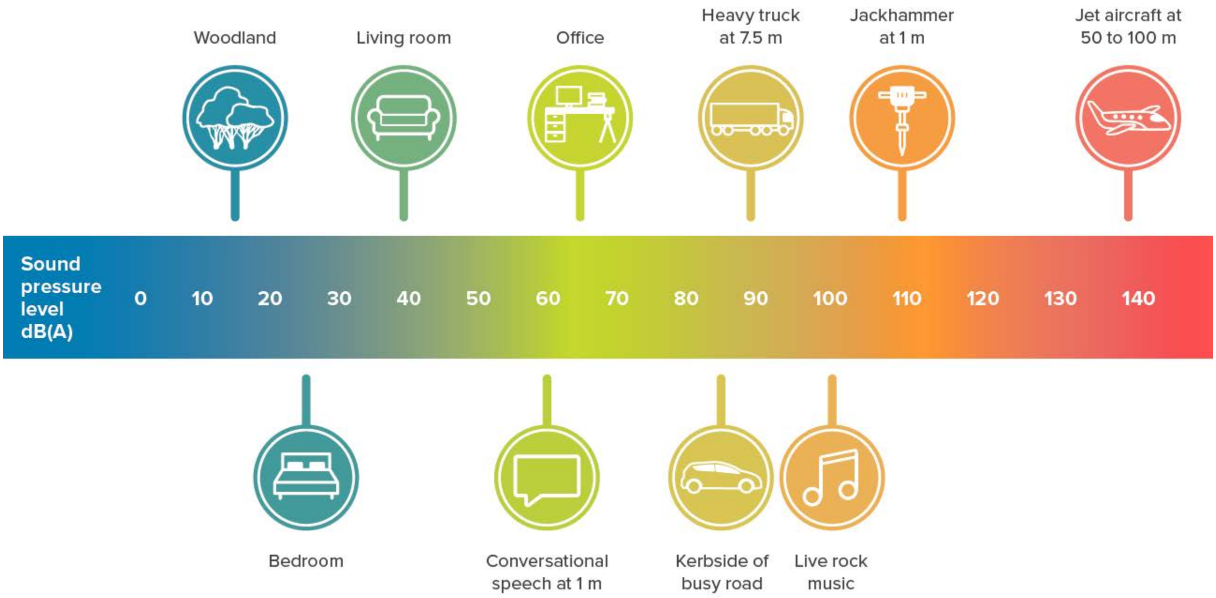



**Figure 15-1: Examples of sounds on the dB(A) scale**

## Construction Noise

The environmental noise impact assessment was completed in general accordance with the *Environment Protection (Noise) Policy 2007* (Noise EPP), which is also the most relevant guideline to address the requirements of the overarching EP Act.

The construction, demolition and related activities noise criteria are outlined in Division 1 of the Noise EPP. This division does not apply to construction activity related to public infrastructure and, consequently, does not apply to the Project. However, it has been used as a guide to establishing appropriate criteria.

Division 1 states that a construction activity resulting in noise with an adverse impact on amenity must not occur on a Sunday or other public holiday and must not occur on any other day except between 7 am and 7 pm. Exceptions are recognised when undertaking activities at a site has the potential to cause unreasonable interruption of vehicle or pedestrian traffic movements, or if other grounds exist that are determined to be sufficient by an authority or administering agency.

Construction noise that has an adverse impact on amenity is defined as that which results in a noise level greater than 45 dB(A) $L_{eq}$ (continuous noise level) or 60 dB(A) $L_{max}$ (maximum noise level) at a noise affected premises such as a residence.

Conversely, in instances where background noise levels exceed 45 dB(A) $L_{eq}$ or 60 dB(A) $L_{max}$, then construction noise is not considered an adverse impact until the background noise level is exceeded by the construction noise level (either by continuous noise level or maximum noise level or by frequency of occurrence). These guidelines are summarised below in Table 15-3.

These provisions allow for the fact that construction work is inherently noisy and often there is limited recourse for mitigation. However, given the temporary nature of construction works, it is considered acceptable, in certain situations, to exceed the Noise EPP assuming works continue to be undertaken within reasonable hours of the work day and all reasonable and practical measures are implemented to mitigate noise impacts.

It is also noted that the Noise EPP excludes aircraft noise. For the purposes of this assessment, the potential use of helicopters during construction is considered a construction activity under Part 6, Division 1 of the Noise EPP. This is due to the absence of helicopter noise guidelines in South Australia.

### Operational noise

Similar to the construction noise, the Noise EPP is the most relevant guideline to address the requirements under the EP Act for Project operational noise.

The Noise EPP identifies indicative noise levels that are based on zoning of proposed developments and the closest noise impacted premises in the relevant planning instrument. For example, where the land use category is Rural Living, the daytime (7 am – 10 pm) indicative noise level is 47 dB(A) and the night time (10 pm – 7 am) indicative noise level is 40 dB(A). In residential areas, this is marginally increased to 52 dB(A) during the day and 45 dB(A) at night.

As the Project and the sensitive receptors are located in several different land use zones along the alignment the operational noise criteria will vary. The applicable levels are summarised in Table 15-3 below.

Under Part 5, Clause 20(6) of the Noise EPP, exceedance of the recommended criteria does not necessarily mean that the works are non-compliant. Other factors, such as the amount by which the criterion is exceeded or the frequency and duration or exceedance, are to be considered when determining compliance.

### Fauna noise

In the absence of current government or other widely accepted guidelines for the specific hearing sensitivity of native fauna native, interim guidelines for potential effects from different noise sources for the average bird have been adopted from Dooling and Popper (2007).

A threshold shift is defined as a shift in the auditory threshold that may occur suddenly after exposure to a high level of noise. A ‘permanent threshold shift’ persists after a recovery period subsequent to exposure. It results in a permanent loss of hearing in fauna and impairs their ability to detect predators and communicate with other fauna. A ‘temporary threshold shift’ results in temporary hearing loss.

For the purposes of this assessment, it is considered reasonable that noise due to construction and operations does not cause any form of threshold shift in fauna. Based on Dooling and Popper (2007), the key criterion that should apply to the Project is 93 dB(A) for non-strike continuous noise at the expected location of noise sensitive fauna receivers.

**Table 15-3: Summary of adopted noise guidelines**

| **EPA SA Guidelines related to noise during construction** | | |
|---|---|---|
| Continuous noise level observed at a noise affected location, such as a residence | | 45 dB(A) Leq |
| Maximum noise level observed at a noise affected location, such as a residence | | 60 dB(A) Lmax |
| Where background noise levels exceed 45 dB(A) Leq or 60 dB(A) Lmax then construction noise is not considered an adverse impact until the background noise level is exceeded by construction noise (either by continuous noise level or maximum noise level or by frequency of occurrence). | | |
| **EPA SA Guidelines related to noise during operations** | | |
| **Land Use (in the vicinity of the Project)** | **Indicative noise factor dB(A)** | |
| | **Day (7 am to 10 pm)** | **Night (10 pm to 7 am)** |
| Rural industry | 57 | 50 |
| Light industry | 57 | 50 |
| **Adopted EIS Guidelines related to noise impacting fauna** | | |

| EPA SA Guidelines related to noise during construction | |
|---|---|
| Non-strike continuous noise at the expected location of noise sensitive fauna receivers for temporary threshold shift (TTS) | 93 dB(A) $L_{eq}$ |

### 15.2.3. Views of stakeholders

ElectraNet have undertaken a thorough stakeholder engagement program which has included engagement with all affected landholders and known social receptors in close proximity to the transmission line corridor. Noise has not been raised as a specific stakeholder concern to date.

### 15.2.4. Assessment method

The noise study area for the Project is defined as the zone within which noise might have an impact on the amenity of the environment (Figure 15-2). Collectively, the noise assessment study area includes the following:

- the entirety of the proposed transmission line alignment, comprising a length of approximately 200 km between the existing Robertstown substation, and the SA / NSW border approximately 38 km northeast of Cooltong
- the transmission line corridor is defined as a 500 m buffer around the transmission line, comprising a 1 km corridor
- an extra 2.7 km buffer around the transmission line corridor to assess the extended noise impact
- a 1 km x 1 km clearance around the proposed Bundey substation site.

Baseline noise monitoring was undertaken at locations representative of the ambient noise environment at the nearest sensitive receptors and surrounding area (Figure 15-2). Attended noise measurements were undertaken at the three locations to acquire daytime noise levels. Unattended noise measurements were undertaken over a 10-day period with noise levels averaged over the daytime and night-time periods. Equipment used for monitoring was classified as Class 1 or Class 2 measurement devices in accordance with Australian Standards AS IEC 61672.1-2004 (Plate 15-1). Devices were calibrated in accordance with manufacturer specifications. Details of the monitoring procedure are provided in the Environmental Noise Impact Assessment (Resonate 2021) (refer Appendix J).

Noise monitoring included continuous unattended noise measurements from 3 – 12 April 2019 and attended noise measurements (during daytime) on 3 April 2019.

**Plate 15-1: Noise logger installation**

Following completion of baseline monitoring, an assessment was undertaken of likely sources of noise and noise receptors during construction and operation.

Noise emissions were modelled in the SoundPLAN Environmental Software v8.0 program using the CONCAWE method. This software is widely used around the world and regarded as the leading software in developing noise propagation models. In accordance with the Noise EPP Guidelines CONCAWE weather category 5 was used for daytime noise emissions.

The noise levels of the relevant construction equipment were obtained from the *Noise database for prediction of noise on construction and open sites* (DEFRA, UK 2005). These are shown in Table 15-4.

**Table 15-4: Sound power levels of expected construction equipment for the Project**

| Stage | Plant, equipment or activity | $L_w$ total, dB(A) |
|---|---|---|
| 1: Land clearing (substation and towers) | Bulldozer | 103 |
| | Grader | 114 |
| | Front end loader | 104 |
| Total | All | 115 |
| 2: Tower installation (substation and towers) | Excavator | 106 |
| | Concrete truck | 108 |
| | Mobile concrete batching plant | 110 |
| | Semi-trailer | 111 |
| | Mobile crane | 104 |
| Total | All | 115 |
| 3: Line stringing / tower installation[1] (towers only) | Helicopter[2] | 127 |

[1] Helicopters could be used to deliver and erect the towers in some cases, but have been included separately to the land based construction as they are unlikely to occur concurrently.

[2] Different types of helicopters would be used for line stringing (Eurocopter AS350 Squirrel or similar) and tower installation (Kamov Ka-32A11BC or similar). The noise level presented is representative of the helicopter sound power level for both cases and is considered conservative.

The noise generated from Corona discharge was modelled as a line source along the transmission line corridor and was calculated at the western and eastern ends of the Project where the nearest receptors are located. At the nearest inhabited receptor, the predicted noise level is 44 dB(A) which complies with the most stringent night-time criteria.

The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the proposed transmission line and substation. The method of assessment has followed that set out in Chapter 8 Impact Assessment Methodology.

Where there was uncertainty in the assessment of expected impacts, this was evaluated using risk assessment tools, as discussed in Chapter 8 Impact Assessment Methodology. This is discussed under each impact event where relevant. The level of certainty in the assessment of noise impacts was generally high, and consequently uncertainty is only discussed for a small number of impact events (e.g. construction activity noise and traffic noise). A summary of the evaluation of uncertainty for all impact events is contained in Appendix O.

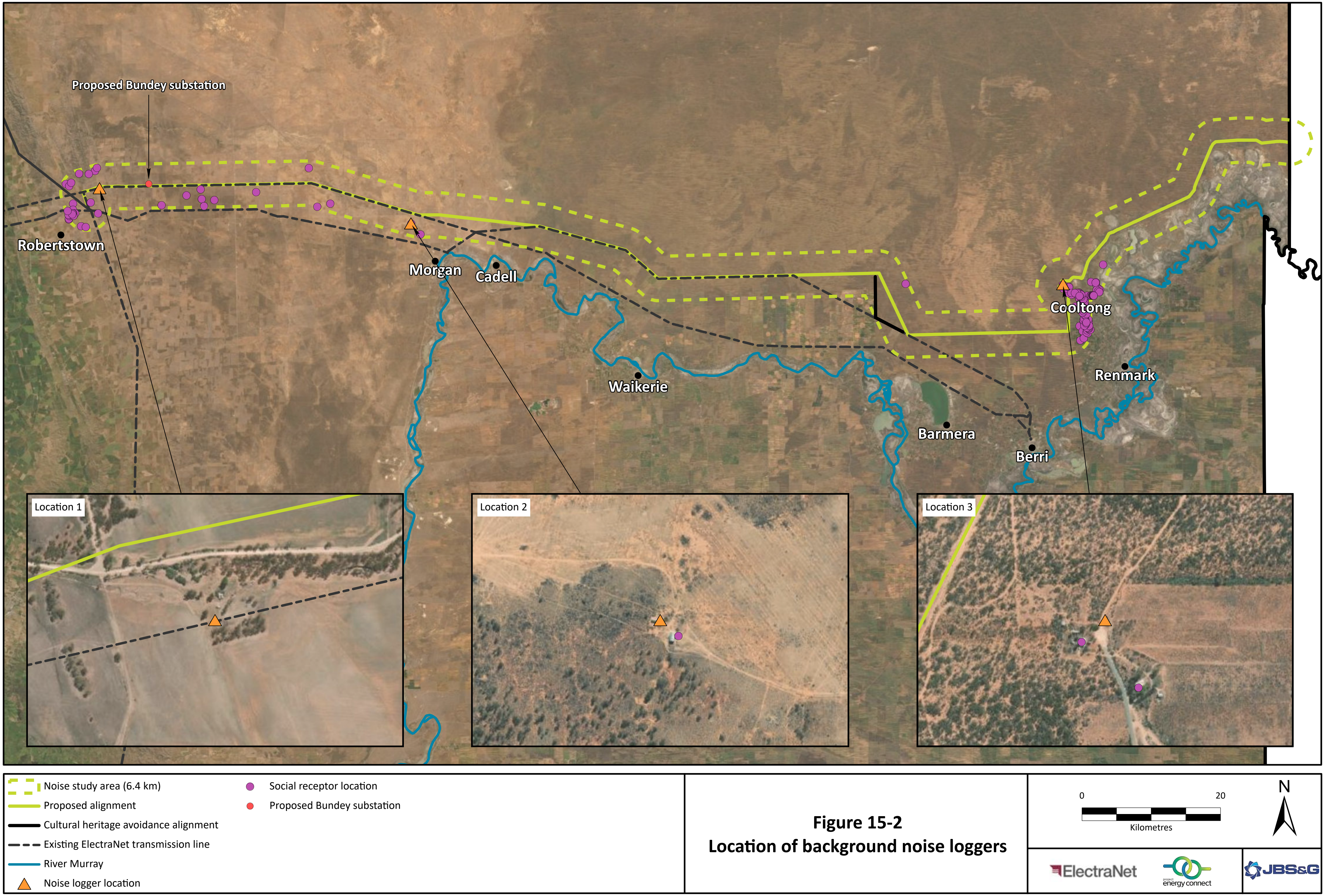



**Figure 15-2**
**Location of background noise loggers**

## 15.3. Description of Existing Environment

### 15.3.1. Sensitive noise receptors

A total of 141 verified noise sensitive receptors have been identified within the noise study area of which the majority are verified as residences.

To assess the extended noise impacts, the noise study area encompassed the transmission line corridor (500 m buffer around the transmission line) and an additional 2.7 km buffer. This was based on the area that could potentially be noise-affected. The Environmental Noise Impact Assessment (Resonate 2021) considered all properties as noise sensitive as a precautionary measure, unless a field inspection was able to confirm they were uninhabitable buildings. Consequently, it is likely that the assessment over-estimates the number of noise sensitive receptors.

The highest concentrations of receptors are located at the western end of the proposed transmission line alignment between Robertstown and Morgan, and at the eastern end at Cooltong (refer Figure 15-2). The nearest potential noise sensitive receptor is located approximately 330 m from the transmission line alignment. It is noted that the majority of the identified potential receptors are further than 1 km from the transmission line.

Fauna have also been considered as a potential sensitive receptor. The potential impact of noise on fauna has been described as including physiological and behavioural responses, permanent and temporary damage to hearing organs, interference with breeding, and the masking of vital communication. The desktop assessment of nationally threatened species[2] initially highlighted 15 nationally threatened fauna species (11 birds, one frog, one mammal, two reptiles) and one threatened fauna population as potentially occurring in the vicinity of the Project. A likelihood of occurrence assessment for EPBC Act listed species that may actually occur determined that of the 15 species indicated, three are present (Malleefowl, Black-eared Miner, Red-lored Whistler) and one is likely (Regent Parrot). Of the remaining species, seven are considered possible and four are considered unlikely to occur in the vicinity of the Project (refer Chapter 11 Flora and Fauna for further information).

### 15.3.2. Background noise environment

Baseline noise monitoring was conducted at three locations along the study area, between 3 April 2019 and 12 April 2019. The locations were selected as being representative of the ambient noise environment at the nearest noise sensitive receptor locations and surrounding areas. These locations are identified in Figure 15-2.

Where high wind speeds were determined to have an effect on background noise levels, those levels were excluded.

The results of the attended baseline monitoring are summarised in Table 15-5 below.

**Table 15-5: Attended baseline noise measurement results**

| Location | Date and Time | Measured Noise Level, dB(A) | | |
|---|---|---|---|---|
| | | $L_{max}$ | $L_{eq}$ | $L_{90}$ |
| 1 | 3 April 2019 – 9.40 am | 56 | 32 | 26 |
| 2 | 3 April 2019 – 11.07 am | 57 | 29 | 21 |
| 3 | 3 April 2019 – 2.43 pm | 52 | 31 | 23 |

[2] Desktop assessment comprised a review of the EPBC Act Protected Matters Search Tool using a 5 km buffer)

Unattended monitoring was also undertaken between the 3 April and 12 April 2019. The average results of this monitoring event are shown in Table 15-6 below.

**Table 15-6: Unattended baseline noise monitoring summary**

| Location | Time | Measured Noise Level, dB(A) – Average | | |
|---|---|---|---|---|
| | | $L_{max}$ | $L_{eq}$ | $L_{90}$ |
| 1 | Day | 76 | 34 | 26 |
| | Night | 58 | 28 | 26 |
| 2 | Day | 69 | 30 | 19 |
| | Night | 60 | 22 | 15 |
| 3 | Day | 75 | 34 | 22 |
| | Night | 57 | 20 | 17 |

Background noise levels are typical of a rural environment. Noise levels are below the construction and operational criteria for continuous noise levels in the Noise EPP.

## 15.4. Impact Assessment

The following aspects of the Project have been identified as sources of noise impacts:

- excavation equipment and general construction noise during land clearing and during the installation of the towers and substation
- use of vehicles, generators and other equipment at construction camps and laydown areas
- mobile concrete batching plant
- haulage to and from the transmission line corridor
- construction of the Bundey substation
- potential use of a helicopter during construction of towers (tower transport and stringing)
- potential use of a helicopter during maintenance of the transmission line (operation)
- operation of the substation
- corona discharge during operation of the transmission line.

The potential impact events resulting from these aspects of the Project are discussed below.

### 15.4.1. Construction noise

#### Construction noise during land clearing and towers / substation installation

**There will be a minor short-term impact on the amenity of up to 17 receptors due to noise disturbance during land clearing and tower installation with the potential for a moderate short-term impact on up to two receptors.**

Project activities will generate short term and transient noise emission effects from surface plant and mobile fleet during construction. Construction noise is not considered to have an adverse impact on the amenity of residential receptors unless it exceeds a continuous level of 45 dB(A). Modelling of the noise levels associated with land clearing and construction activities in the Environmental Noise Impact Assessment concludes this level will be achieved at a distance of 1,160 m or greater from the proposed works (refer Appendix J).

Table 15-7 shows a breakdown on the number of receptors within each noise level contour band.

Figure 15-3 shows the area around affected residential receptors within which construction activities would cause an exceedance of 45 dB(A) at that receptor.

**Table 15-7: Construction noise levels at nearest receptors**

| Construction stage | Noise level range (dB(A)) | Distance range from proposed alignment (m) | Number of receptors affected |
|---|---|---|---|
| Stages 1 and 2<br>Land clearing and tower installation | 45 – 50 | 650 – 1,160 | 9 |
| | 50 – 55 | 330 – 650 | 7 |
| | 55 – 60 | 160 – 330 | 1 |
| | 60 – 65 | 90 – 160 | 0 |
| | > 65 | 0 – 90 | 0 |
| | | **Total noise-affected receptors** | **17** |

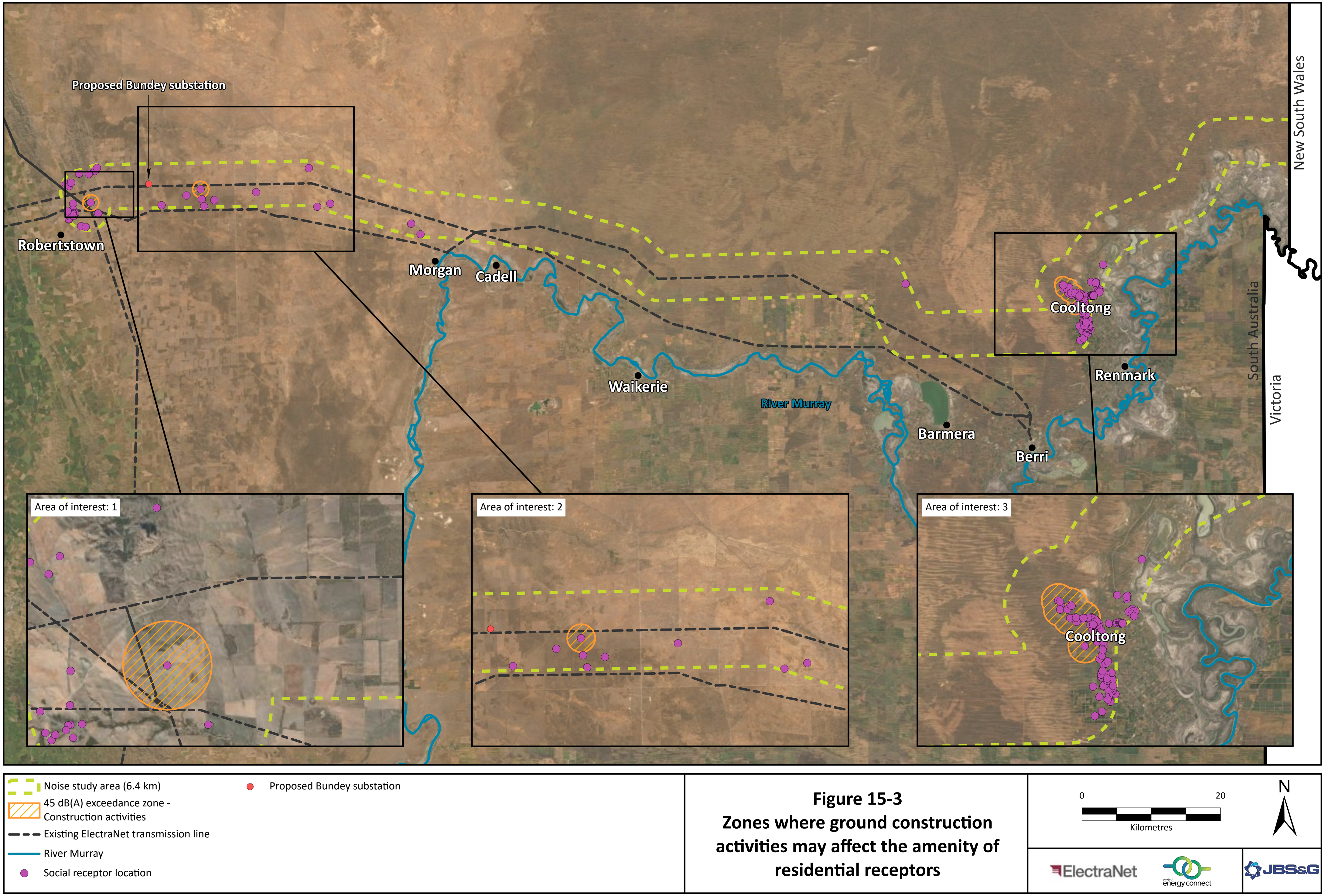



**Figure 15-3**
**Zones where ground construction activities may affect the amenity of residential receptors**

The noise level of conversational speech can vary from around 50 dB(A) – within a quiet home environment – to 60 dB(A) – within an office or restaurant environment. Noise levels above 60 dB(A) can disrupt day to day life as they can interfere with conversation or listening to the television or radio. Note, however, that an external single event noise will be attenuated by approximately 10 dB(A) by the fabric of a house with open windows (DoTaRS 2000).

Modelling indicates that:

- up to 17 receptors could be adversely affected by noise from ground construction activities
- up to eight receptors could experience noise levels above 50 dB(A) – five of those receptors are in Cooltong
- no receptors will experience noise levels above 65 dB(A).

In summary:

- no receptors will experience noise levels during ground construction activities that will affect conversation or television viewing within a house
- possibly one receptor may experience noise levels that may be regarded as an annoyance for the construction period.

These results represent a worst-case scenario. Modelling used industry-leading software with conservative assumptions. The model assumed weather conditions that were conducive to higher noise exposure at sensitive receptors (e.g. wind blowing from construction site to receptors) and represented 'worst-case' day-time conditions. It also assumed flat topography with no barriers. In reality, such wind conditions are unlikely to occur throughout the whole construction period at each site.

It should be noted that construction would typically occur in a linear manner along the proposed alignment, likely from the SA / NSW border in a westerly direction towards Robertstown, subject to access, weather conditions etc. This means construction activities at each transmission line structure location would be intermittent. It is anticipated that construction activities would progress between 8 to 12 km per month. Potential noise impacts associated with construction may thus be considered as short-term. The modelling assumed the construction period at each tower was one week. This period is unlikely to change significantly (any extension is likely to be a matter of days, rather than weeks).

The implementation of controls will further minimise the impact on affected residential receptors. Control measures to be included in the CEMP are well established and considered standard practice. These include:

- effective stakeholder communication
- planning of noisier construction works taking account of distance to receptor
- locating noisy plant, access roads and site compounds as far as practicable from receptors
- selecting processes and equipment that generate lower noise and vibration levels
- maintaining equipment and installing mufflers and silencers that meet the manufacturer's specifications where relevant
- shutting or throttling down equipment that is used intermittently when it is not in use

A full list of measures is provided in the draft CEMP in Volume 3 Appendix P.

Stakeholder communication with sensitive residential receptors will allow for early notification to those impacted parties and input to be received before works begin. This may allow works to be scheduled in a way that minimises the nuisance to receptors.

Further stakeholder engagement will also ensure that any complaints regarding noise will be quickly brought to ElectraNet's attention so that they can be investigated and noise control measures upgraded if necessary.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Vibration as a result of construction of towers / substation

**Vibration from construction equipment and activities is not expected to impact on the amenity of nearby receptors.**

Potential sources of vibration during construction of the Project will include equipment such as rollers, hydraulic hammers, pilling rigs or jackhammers. The vibration produced by the construction works will be highly dependent on the particular construction processes and equipment that is employed and also on the local geotechnical conditions encountered once construction commences. However, vibration from construction equipment has a limited distance before becoming imperceptible.

Excavations for tower foundations and footings are typically dug using drill rigs. This activity may generate vibrations but these will be infrequent, short term, localised and small-scale. The transient nature of construction activities will also move vibration emissions from drilling, being transient rather than a constant fixed-point location.

The potential for vibration impacts at sensitive receivers will be minimised through refinement of the construction methodology, such as the selection of alternative equipment if works need to occur within close proximity of receivers. As the separation distance between construction works and sensitive receivers is over 100 m and the attenuation of vibration from construction equipment occurs over short distances, it is considered that construction vibration levels will not impact on sensitive receivers.

There are no sources of vibration from the operation of the Project which may result in impacts to sensitive receivers.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Use of vehicles, generators and other equipment at construction camps and laydown areas

**Noise from temporary construction camps, laydown and staging areas is not expected to adversely affect the amenity of residential receptors.**

Temporary worker construction camps, laydown and staging areas will be required along the transmission alignment with final locations determined during the detailed design phase. ElectraNet requires that all temporary worker camps, laydowns and staging areas are sited in areas away from residences and other sensitive social receptors.

These facilities will have multiple noise sources associated with the operation of the temporary camp, workshops, generators, vehicle movements, helicopters landing etc. While the locations have not been finalised, there are sufficient areas available along, or close to the alignment that would be suitable and that are remote from any receptors. Potential noise impacts would be discussed and managed as agreed with the landholder. Consequently, the noise from temporary camps, laydowns and staging areas is not expected to affect the amenity of residential receptors.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Haulage and other large vehicle movements

**The noise impact associated with haulage and large vehicle movements is expected to be minor and short-term.**

The Project will require haulage of material to and from the transmission line corridor. Haulage routes will where practicable, be located as far as possible from residential areas. However, it is possible that some access roads will pass through residential areas on the way to major highways or other large roads better suited to haulage.

Any noise impacts associated with haulage will be short-term given length of the construction period and the transient nature of the construction work as it progresses along the alignment.

Truck movements along uneven surfaces will be restricted to minimum speeds near sensitive receptors. This will be included in the CEMP and will limit the noise impacts associated with travelling at speed on uneven surfaces.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Potential use of helicopters during construction of towers and stringing of conductors

**Noise from helicopters (if used) during construction would be transient and temporarily impact the amenity of nearby receptors.**

The Project may utilise helicopters during construction. A twin engine helicopter (such as a Kamov Ka-32A11BC or similar) may potentially be used to fly pre-assembled towers to tower pads from the laydown / staging areas during the tower assembly process. This technique may be used through ecologically sensitive areas with difficult access, such as Calperum Station, Taylorville Station and Hawks Nest Station.

A single engine helicopter (such as Eurocopter AS350 Squirrel or similar) may be utilised for aerial stringing of conductors along the entire proposed alignment.

The use of helicopters in the vicinity of the nearby residential receptors would be expected to have a localised and temporary impact on the amenity of up to 141 receptors, as shown in Table 15-8. Stringing of the conductor is usually undertaken in sections of 5 – 10 km at a time, allowing approximately 3,000 m a day pulling a draw wire, compared to 500 – 1,000 m a day using a ground stringing method. If used, it is anticipated that helicopters would be working within an area (between each tower) over a 20-day period.

The noise impact on amenity would be temporary and transient however, due to the period the helicopter would be present with an area, the impact is considered as **minor.**

**Table 15-8: Noise levels from helicopter at nearest receptors**

| Construction stage | Noise level range (dB(A)) | Distance range from proposed alignment (m) | Number of receptors affected |
|---|---|---|---|
| Stage 3<br>Line stringing / tower installation<br>(towers only) | 45 – 50 | 2,200 – 3,200 | 77 |
| | 50 – 55 | 1,400 – 2,200 | 41 |
| | 55 – 60 | 820 – 1,400 | 11 |
| | 60 – 65 | 450 – 820 | 9 |
| | > 65 | 0 – 450 | 3 |
| | | **Total noise-affected receptors** | **141** |

Impacts will be limited to those areas where sensitive receptors are located primarily at Robertstown, between Robertstown and Morgan, and at Cooltong. Tower transport via helicopter would primarily be utilised in Taylorville and Hawks Nest Stations (for access reasons) and will not occur near Cooltong. This represents only a small portion of the entire transmission line alignment. Figure 15-4 shows the area around affected residential receptors within which helicopter activities would cause an exceedance of 45 dB(A) at that receptor.

The implementation of controls will minimise amenity impacts on identified sensitive residential receptors. The following control measures will be included in the CEMP:

- effective stakeholder communication with sensitive residential receptors
- consideration of nearest receptor during planning / timing of construction works
- maintain planned works in daytime hours to minimise disruption to amenity.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Medium**.

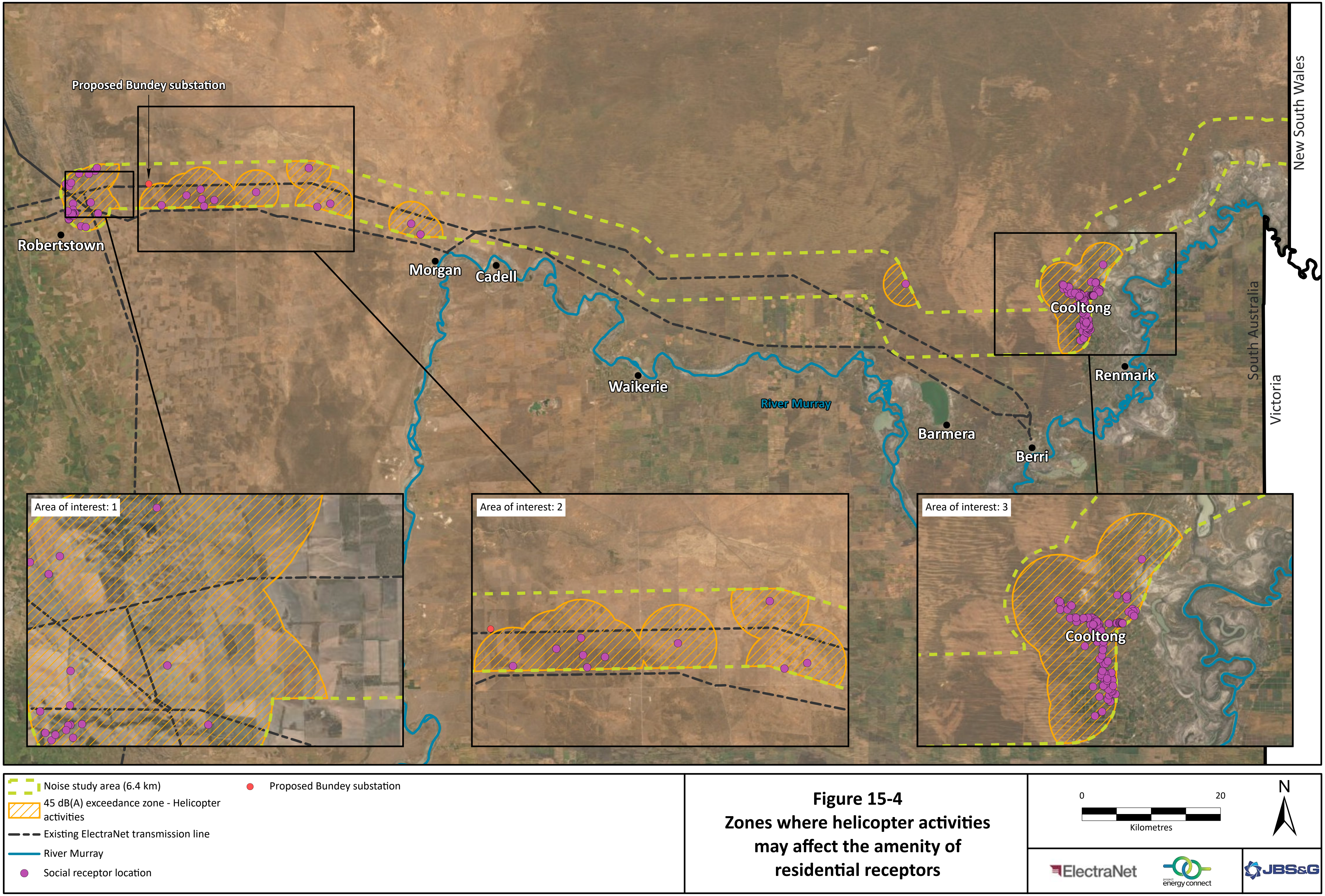
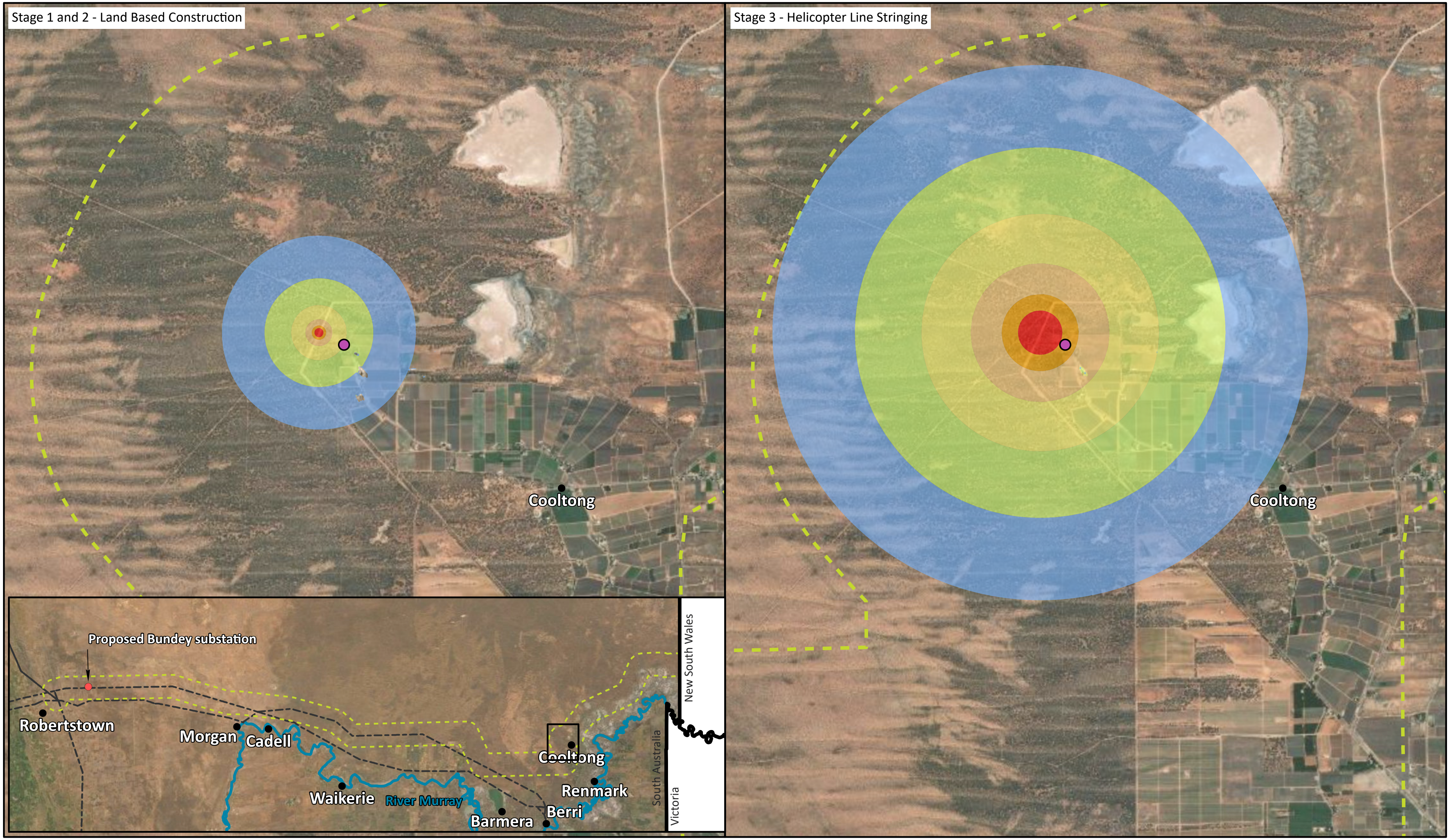



**Figure 15-4**
**Zones where helicopter activities may affect the amenity of residential receptors**




Predicted noise levels (CONCAWE Cat 5)

- 45 - 50 dB(A)
- 50 - 55 dB(A)
- 55 - 60 dB(A)
- 60 - 65 dB(A)
- 65 - 70 dB(A)
- > 70 dB(A)

- Noise study area (6.4 km)
- Existing ElectraNet transmission line
- Nearest identified receptor
- Proposed Bundey substation

**Figure 15-5**
**Noise contours for all stages of a single tower installation (includes helicopter stringing)**

0 2
Kilometres

N

### Local fauna

**Noise impacts are unlikely to result in a threshold shift for fauna in the areas surrounding the Project works.**

It is expected that for most if not all fauna, noise will be a deterrent and they are unlikely to approach the construction area at a distance that will result in threshold shift. Noise modelling has indicated that during construction, the land clearing and tower installation activities will exceed the fauna criteria at the source of the noise. However, these exceedances only persist at distances up to 5 m from ground construction activities. Most fauna are unlikely to approach within this distance and will avoid the noise source.

Modelling indicates that helicopter operations have the potential to cause temporary threshold shift in some fauna within a 20 m radius of the noise source. However, due to the helicopter operating at heights of approximately 50 m, this is unlikely to have an impact on ground fauna. There is the potential for bird flybys to come within the exceedance distance, however it is expected that the noise will cause avifaunal species to avoid the helicopter as a behavioural response.

The exceedance distances for the criteria for threshold shift in fauna may turn out to be greater than that modelled due to modelling inaccuracies or incorrect assumptions regarding equipment noise levels. However, modelling is conservative and it can be expected that fauna will avoid any loud noise source.

Noise mitigation measures within the CEMP will be implemented to minimise any potential impact experienced by fauna. The implementation of noise mitigation and management controls in the CEMP, as discussed above, will also reduce the potential for impacts on fauna.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

## 15.4.2. Operational noise

### Transmission line maintenance using helicopters

**Noise associated with the use of helicopters to inspect and maintain the transmission line is expected to have a negligible impact on the amenity of receptors.**

The use of helicopters will be infrequent and of short duration. Helicopters will be used during annual maintenance operations to check on the transmission line. The helicopters will fly over the transmission line alignment and will only linger in a specific area (for a matter of minutes) if a problem is noted. Any impacts on the amenity of receptors would be correspondingly brief and negligible.

The predicted impacts are in the **Negligible** category and the level of certainty in this prediction is high.

**Helicopter noise impacts are not expected to result in a threshold shift to fauna in the areas surrounding the Project works.**

During operational inspections and maintenance, the use of helicopters in the vicinity of fauna has the potential to have some impact on those receptors. However, the minimum distance of the helicopters from the ground surface will be at least 50 m, which is sufficient to reduce the noise level to below criteria for threshold shift.

There is the potential that birds and other fauna could approach within 20 m of the helicopter or transmission line, and therefore experience a threshold shift. However, their innate behavioural response will be to avoid such disturbance.

The predicted impacts are in the **Negligible** category and the level of certainty in this prediction is high.

### Operation of the Bundey substation

**The operation of the Bundey substation is not expected to affect the amenity of residential receptors.**

The noise generated by the substation was modelled based on the following assumptions:

- two 330 kV transformers each with a sound power level of 99 dB(A)
- six reactors each with a sound power level of 85 dB(A)
- the addition of a 5 dB character penalty to account for tonal noise
- conventional construction (i.e. no specific mitigation)

Noise modelling (Resonate 2021) indicates compliance with the most stringent night time criteria at receptor distances greater than 500 m from the location of the transformers within the substation. There are no receptors within 500 m of the substation site and, consequently, the operation of the substation is not expected to affect the amenity of receptors. The substation site measures approximately 80 ha and this will provide an additional buffer.

There are no sources of vibration from the operation of the Project which may result in impacts to sensitive receivers.

The predicted impacts are in the **Negligible** category and the level of certainty in this prediction is high.

### Corona discharge events

**Corona Discharge events are not expected to create noise impacts that could affect receptors.**

Transmission lines can produce spontaneous, pulse-like corona discharges which become apparent as a crackling noise. Corona discharge can be heard during rainy periods as a hissing or cracking sound caused by the implosion of ionised water droplets in the air. Wszolek (2006) found that the maximum noise that a transmission line will produce due to Corona discharge is 53 dB(A) at a distance of 15 m. Noise modelling (Resonate 2021) indicates the noise level associated with a Corona discharge at the nearest receptor (located in Cooltong in Figure 15-4) is expected to be 44 dB(A), which is below the relevant noise criteria. Given these results, there is no credible risk that a Corona discharge could cause an exceedance of noise criteria at a sensitive receptor.

The predicted impacts are in the **Negligible** category and the level of certainty in this prediction is high.

**Noise associated with Corona discharges is not expected to impact on any potential sensitive fauna species.**

Modelling indicates that the noise level associated with a Corona discharge within 1 m of the noise source is expected to be 69 dB(A), which is well below the fauna noise criteria of 93 dB. There is no credible risk that Corona discharge could cause an exceedance of fauna criteria.

The predicted impacts are in the **Negligible** category and the level of certainty in this prediction is high.

## 15.4.3. Summary of key mitigation measures

Potential impacts to amenity due to noise for sensitive receptors have largely been mitigated through the location of the proposed infrastructure and associated work areas. Further mitigation and control measures will be included in the CEMP. Table 15-9 provides a summary of the proposed mitigation measures related to noise.

**Table 15-9: Key mitigation measures – noise and vibration**

| Mitigation measure | Construction | Operation |
|---|---|---|
| Complaints register and corrective action program | | |
| Community consultation process, particularly with landholders | ✓ | ✓ |

| Mitigation measure | Construction | Operation |
|---|---|---|
| Planning of noisier construction works taking account of distance to receptor | ✓ | |
| Consult with landowners if noise generating activities in the vicinity of residences are planned outside normal construction hours. | ✓ | |
| Locating noisy plant, access roads and site compounds as far as practicable from receptors | ✓ | |
| Selecting processes and equipment that generate lower noise levels | ✓ | |
| Regular maintenance of equipment | ✓ | |
| Shutting or throttling down equipment that is used intermittently when it is not in use | ✓ | |
| Construction of stand-alone accommodation camps away from existing receptors, unless otherwise agreed | ✓ | |
| Truck movements limited to designated routes | ✓ | |
| Truck movements along uneven surfaces will be restricted to minimum speeds near sensitive receptors and built into the traffic management plan | ✓ | |
| Affected receptors along haulage routes to be consulted in advance of works | ✓ | |
| Maintain planned works in daytime hours to minimise disruption to amenity | ✓ | |
| Restrict maintenance activities to standard working hours where feasible | | ✓ |
| Maintain minimum distance of the helicopters from the ground surface to at least 50 m, where practical | ✓ | ✓ |
| Register any complaints in ElectraNet's IMS and implement any necessary corrective action program. | ✓ | ✓ |

## 15.5. Conclusion

The key finding is that Project construction or operational activities will not lead to significant noise impacts. Most of the proposed alignment is adequately distant from sensitive receivers that no adverse impacts are anticipated during construction or operation of the Project. Where the few receivers are in proximity to the alignment, the impacts will be negligible to minor predominantly due to the transient and temporary nature of construction activities. Relevant landholders will be consulted, and impacts mitigated where practicable.

EIS Volume 1 Chapter 16

# Traffic and Transport

JBS&G

project energy connect

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# 16. Traffic and Transport

This chapter describes how the construction and operation of the Project will generate traffic and provides an assessment of the likely effect on residents and visitors within the existing transport network of the Riverland and Murraylands areas. It is based on the outcomes of the specialist Traffic and Transport Impact Assessment, attached in Appendix M.

## 16.1. Key Findings

- It is expected that the highest volume of traffic will be experienced during the construction phase, where tower components, construction materials and workers will need to be transported to the site.
- All planned construction and operational phase traffic impacts are comfortably within the capacity of the existing road network. There is ample spare capacity at all affected intersections during the construction of the Project.
- Delays induced from Project construction traffic will be negligible. Delays from oversize loads delivered to site will be small and infrequent.
- An additional access track / road will be required to access the Project corridor via the Goyder Highway near Overland Corner. This is to reduce the concentration of construction traffic utilising the access track along the corridor.
- Oversize deliveries will be scheduled where possible to arrive outside peak hours and avoid potential conflict times with harvest seasons.
- Project traffic will be restricted to specific routes minimising the extent of possible wear on local roads.
- A Traffic Management Plan will be implemented for the construction and operation phases to mitigate the impacts of increased traffic required for the Project.

## 16.2. Setting the Context

This section provides information needed to explain the context within which impact and risk assessment occurs. It describes:

- relevant EIS Guidelines
- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the project to meet
- the assessment methodology used to identify baseline environmental values and to undertake the impact and risk assessment.

### 16.2.1. EIS Guidelines

The EIS Guidelines require an assessment of the likely impact of traffic and transport during Project construction and maintenance and measures for controlling these impacts as set out in Table 16-1.

**Table 16-1: EIS Guidelines addressed in the Traffic and Transport chapter**

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| **Land Use and Economic Effects** | |
| *Assessment Requirement 2*: The proposal will have an impact on the State's economy during construction and operation and may result in immediate and long term effects on land owners and surrounding uses. | |

<table>
<tr><th>EIS Guidelines and Assessment Requirements</th><th>Assessment level</th></tr>
<tr><td>• 2.6 Outline any mitigation measures to alleviate or avoid impacts on landowners and land uses and refer to any compensation programmes.</td><td>Critical</td></tr>
<tr><td colspan="2">Traffic Effects<br>Assessment Requirement 14: The proposal requires access for the transportation of infrastructure and construction material to site and ongoing access for maintenance purposes.</td></tr>
<tr><td>• 14.1 Describe all components of transport and storage of infrastructure (including towers and substation kit) and construction materials to site. Include reference to anticipating timing, sources of materials, routes, number and methods of transport (e.g. by shipping, vehicle and / or helicopter).</td><td>Standard</td></tr>
<tr><td>• 14.2 Describe all traffic increases during construction and operational phases and traffic management measures.</td><td>Standard</td></tr>
<tr><td>• 14.3 Describe any construction, operational and maintenance traffic requirements that are outside of the current gazetted heavy vehicle movements.</td><td>Standard</td></tr>
<tr><td>• 14.4: Identify any potential effects of construction traffic on communities including noise and dust</td><td>Standard</td></tr>
<tr><td>• 14.5 Describe any requirements where traffic infrastructure requires temporary or permanent modifications and access requirements that may be required on arterial and /or local roads to enable / facilitate construction and ongoing associated traffic and vehicles.</td><td>Standard</td></tr>
<tr><td colspan="2">Construction, Operation and Maintenance Effects<br>Assessment Requirement 15: The construction and operation of the proposal would require a range of impacts to be minimised, mitigated and monitored through an environmental management plan framework</td></tr>
<tr><td>• 15.3 Describe the likely impact and measures for the control of dust, vibration, noise, emissions, drag-out (i.e. onto the public roads) and litter during both construction and maintenance.</td><td>Standard</td></tr>
<tr><td colspan="2">Specialist Reports and Details<br>A transport and access impact assessment prepared by a suitably qualified traffic and access planner/engineer. The assessment should evaluate current and proposed access arrangements including the effect on the arterial road network and car parking, as well as vehicle interface with the local road network. Any assessment must include the traffic and access impact for the construction period as well as any ongoing operations and maintenance including details of the traffic/transport vehicle sizes/movements outside of normal gazetted heavy vehicles.</td></tr>
</table>

Aspects of assessment requirements identified in Table 16-1 above which are not addressed in this chapter are listed in Table 16-2 together with the applicable chapter.

**Table 16-2: Assessment requirements addressed in other chapters**

| Assessment Requirement | Chapter |
|---|---|
| 2.6 Summary of mitigation measures | Chapter 9 Land Use and Tenure |
| 2.6 Mitigation measures for air quality impacts to landowners | Chapter 14 Air Quality |
| 2.6 Mitigation measures for noise impacts to landowners | Chapter 15 Noise and Vibration |
| 14.4 Potential effects of dust from construction traffic | Chapter 14 Air Quality |
| 14.4 Potential noise effects of construction traffic on communities | Chapter 15 Noise and Vibration |
| 15.3 Dust and emissions impacts during construction and maintenance | Chapter 14 Air Quality |
| 15.3 Noise and vibration impacts during construction | Chapter 15 Noise and Vibration |
| 15.3 Control of litter | Chapter 19 Waste Management |

### 16.2.2. Requirements in legislation and other standards

The key relevant legislation and standards as applicable to traffic and transport in the area of the Project includes the

- Murray and Mallee Region Plan (2011)
- Mid North Region Plan
- AUSTROADS Guide to Road Design
- AUSTROADS Guide to Traffic Management
- Highway Capacity Manual Volume 2 (HCM)

The Heavy Vehicle National Law (HVNL), which came into effect on 10 February 2014, applies to all heavy vehicles over 4.5 tonnes. This law and its associated regulations operate in Queensland, New South Wales, Victoria, Tasmania, South Australia and the Australian Capital Territory. The law covers vehicle standards, mass, dimensions and loadings, fatigue management, the Intelligent Access Program (a national program developed in partnership with all Australian road agencies), heavy vehicle accreditation and on-road enforcement.

The objectives of the HVNL are:

- to promote public safety
- manage the impact of heavy vehicles on the environment, road infrastructure and public amenity
- promote industry productivity and efficiency in the road transport of goods and passengers by heavy vehicles
- encourage and promote productive, efficient, innovative and safe business practices.

The national regulations prescribe mandatory standards for heavy vehicles using public roads.

### 16.2.3. Views of stakeholders

During stakeholder consultation, concerns were raised regarding potential for increased traffic movement from the Project, impacts on road quality and who would be responsible for the costs of upgrading / maintaining the roads during construction activities.

### 16.2.4. Assessment method

The Traffic and Transport Impact Assessment was undertaken using the risk-based assessment procedure set out in Chapter 8 Impact Assessment Methodology. The assessment considers the impacts that are expected to occur as part of the construction and operation of the transmission line (refer Appendix M).

The traffic study area (TSA) focussed on the alignment of the transmission line centred within the preferred corridor with a 500 m buffer zone and an overall buffer of 5 km as shown in Figure 16-1. The westernmost extent of the assessment area is Bright, 10 km north-east of Robertstown, and the easternmost extent was the border between SA and NSW. Access to the full extent of the transmission line corridor was assessed.

To compare construction and operation impacts to existing conditions, baseline traffic and transport conditions for the TSA were determined as follows:

- existing roadway level of service was calculated using the HCM, Chapter 15 Methods for Analysis of Two-Lane Highways (TRB 2010)

- existing road safety was assessed by calculation of crash rates from historical crash records and site inspection
- existing roadway asset road conditions and transport accessibility was assessed by site inspection and information available via Location SA.

Construction stage activities impacting the road network were quantified by calculating the number of material delivery loads based on the number of towers required along the alignment. Incidental material deliveries were estimated based on an assumed number of deliveries per day.

Operations stage activities impacting the road network are considered to be negligible based on the operations and maintenance requirements of the Project.

Having determined both the baseline and Project case conditions, the severity of impacts to the road network within the TSA due to the proposed development were assessed as follows:

- Level of service degradation due to Project traffic generation was calculated according to the US Highway Capacity Manual (HCM) methodology for two lane highways (as referenced in Austroads Guide to Traffic Management).
- Any potential road safety and accessibility concerns were identified by assessing likely traffic generation volumes of different vehicle types against the observed existing road geometry and condition data (sight distances, pavement condition and road widths).

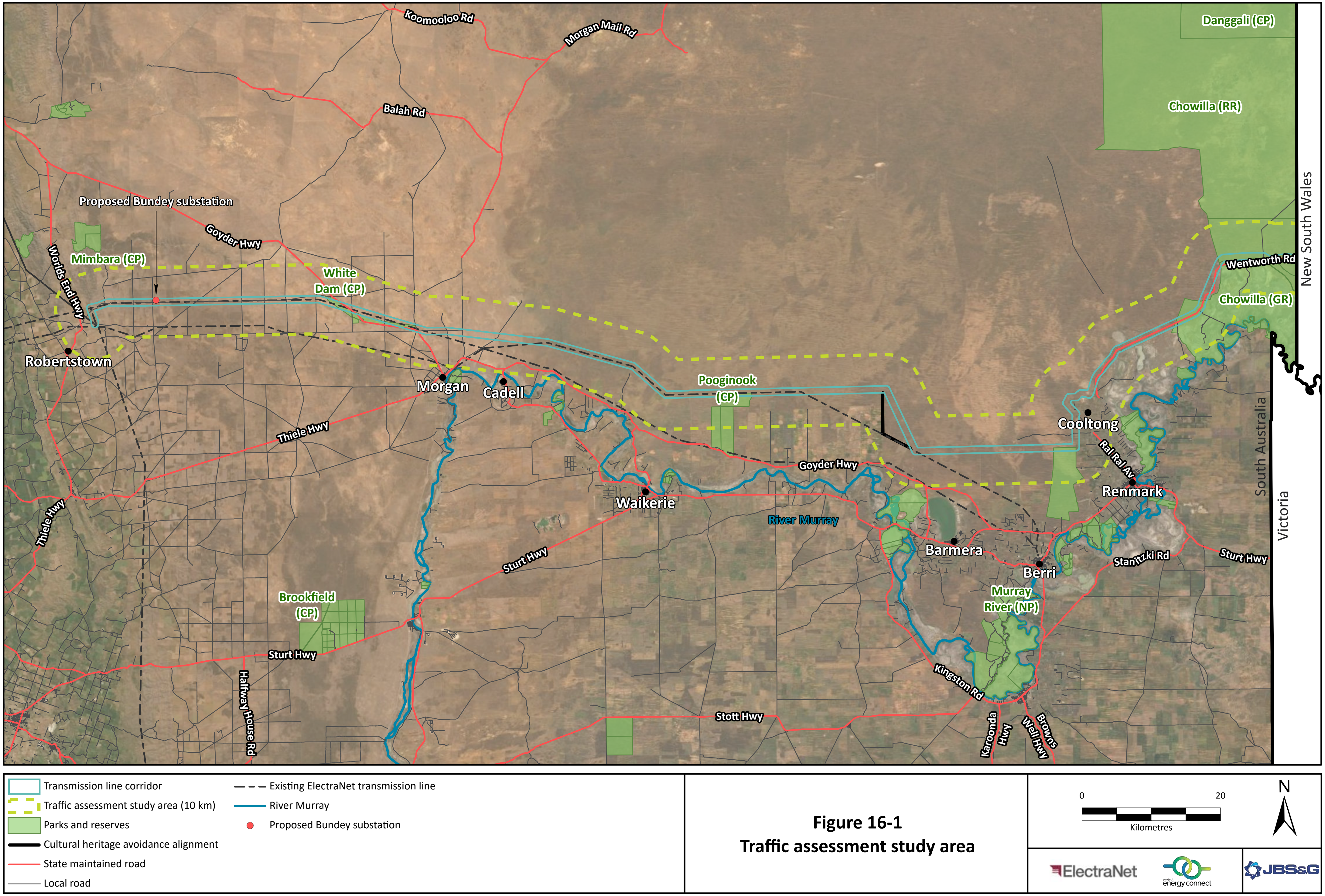


**Figure 16-1**
**Traffic assessment study area**

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## 16.3. Description of Existing Environment

Transport within the TSA is generally limited to road or air. No passenger rail services operate in the TSA, however there are passenger bus services connecting from Adelaide to Renmark and from Loxton to Adelaide. The bulk of rural movements are for freight transport and commuter travel. The area has a low population density and as such traffic volumes, even on some rural highways in the TSA, are low and well below road capacity thresholds. The exception to this is the Sturt Highway, with some sections approaching 12,000 vehicles per day in Renmark. This is still below road capacity thresholds.

The detailed traffic assessment included the State road network, local road network and bus transport within the TSA.

### 16.3.1. State road network

There are seven State-maintained roads across the TSA that may be utilised by Project personnel commuting to and from work or for Project-related materials being delivered to site (Figure 7-20). Details of each of these roads are provided in Table 16-3.

### 16.3.2. Local road network

There are 17 locally maintained roads across the TSA that may be utilised by Project personnel commuting to and from work or Project-related materials being delivered to site. Details of each of these roads are provided in Table 16-4 and shown in Figure 7-20.

The proposed interconnector alignment will largely be accessed directly from the local roads as the final leg of the journey. Once the alignment is accessed, where required a track 5 – 6 m wide will be constructed along the alignment to facilitate access by construction vehicles.

**Table 16-3: Overview of State-maintained roads within the traffic study area**

| Road Name | Class | Description | Typical Form | Photo |
|---|---|---|---|---|
| Goyder Highway | B64 | • Provides east-west connectivity from Crystal Brook through the Mid North region, right through to the Riverland. | • Sealed single carriageway with one lane in each direction. |  |
| Sturt Highway | A20 | • Forms part of the Australian National Highway Network, linking Adelaide to Sydney. Nearest the Traffic Study Area, it provides connectivity between a number of towns, including Barmera, Waikerie and Renmark.<br>• A number of overtaking lanes are provided at regular intervals. | • Sealed single carriageway with one lane in each direction |  |

| Road Name | Class | Description | Typical Form | Photo |
|---|---|---|---|---|
| Renmark Avenue | - | • Provides a link between the Sturt Highway and Ral Ral Avenue in the town centre of Renmark.<br>• Provides access to a number of commercial businesses fronting the road. | • Sealed, dual carriageway separated by a wide landscaped median with two lanes in each direction.<br>• Angled parking is provided on both carriageways |  |
| Ral Ral Avenue | - | • Provides a link between the town centre of Renmark and the north-eastern portion of the study area. | • Predominantly consists of a sealed single carriageway with one lane in each direction.<br>• A short section within the town centre of Renmark consists of sealed, dual carriageway separated by a wide landscaped median with two lanes in each direction. |  |

| Road Name | Class | Description | Typical Form | Photo |
|---|---|---|---|---|
| Wentworth-Renmark Road | - | • The State maintained section of the Wentworth-Renmark Road provides a link between the northern outskirts of Renmark and the SA / NSW border.<br>• Runs along the centre of the alignment for the far eastern portion of the TSA.<br>• Provides access to several pastoral stations and conservation / reserve areas. | • Unsealed formed and sheeted, two-way single carriageway, 10 m wide. |  |
| World's End Highway | - | • Provides north-south connectivity between the town of Eudunda and the intersection of Goyder Highway. | • Sealed single carriageway with one lane in each direction. |  |

| Road Name | Class | Description | Typical Form | Photo |
|---|---|---|---|---|
| Thiele Highway | B81 | • Provides a link between the Horrocks Highway and a number of regional towns including Freeling, Kapunda, Eudunda, terminating at Morgan. | • Sealed single carriageway with one lane in each direction. |  |

**Table 16-4: Proposed entry and exit points on local access roads**

| Road link to access | Location | Description | Typical Form and width | Photo |
|---|---|---|---|---|
| Powerline Road | Between Worlds End Highway and Goyder Highway | • Forms an east-west link between the Worlds End Highway and Goyder Highway.<br>• Generally follows the alignment of the western portion of the TSA for approximately 35 km.<br>• Western portion is maintained by Goyder Regional Council and the eastern portion by Mid Murray Council.<br>• Provides direct access to approximately 42 km of the Project corridor and the proposed Bundey substation. | • Unsealed, formed and sheeted, two-way single carriageway.<br>• Generally in good condition, with some isolated sections of minor corrugations.<br>• 6 – 8 m wide. |  |
| Lower Bright Road | 500 m from Worlds End Highway | • Local access road off Powerline Road providing access to the existing substation at the western most section of the TSA.<br>• Maintained by Goyder Regional Council.<br>• Will provide direct access to the start of the alignment at the western end and existing substation at Robertstown. | • Unsealed, formed and sheeted, two-way single carriageway.<br>• Generally in good condition.<br>• 6 – 8 m wide. |  |

| Road link to access | Location | Description | Typical Form and width | Photo |
|---|---|---|---|---|
| Schomburgk Road | Secondary access | • Local access road running perpendicular to Powerline Road.<br>• Will primarily provide access from Powerline Road to part of the alignment within the TSA.<br>• Maintained by the Mid Murray Council. | • Unsealed, formed and sheeted, two-way single carriageway.<br>• Generally in good condition.<br>• 5 – 6 m wide. |  |
| Old Redcliffe Road | Secondary access | • Local access road off Goyder Highway.<br>• Will primarily provide access from Goyder Highway to part of the alignment within the TSA.<br>• Maintained by the Mid Murray Council. | • Unsealed, formed and sheeted, two-way single carriageway.<br>• Generally in good condition.<br>• 6 m wide. |  |

| Road link to access | Location | Description | Typical Form and width | Photo |
|---|---|---|---|---|
| Lindley Cemetery Road | Secondary access | • Local access road off Goyder Highway.<br>• Will primarily provide access from Goyder Highway to part of the alignment within the TSA.<br>• Maintained by the Mid Murray Council. | • Unsealed, formed and sheeted, two-way single carriageway.<br>• Generally in good condition.<br>• 6 m wide. |  |
| Samsons Well Road | Secondary access | • Local access road off Goyder Highway.<br>• Will primarily provide access from Goyder Highway to part of the alignment within the TSA.<br>• Maintained by the Mid Murray Council. | • Unsealed, formed and sheeted, two-way single carriageway.<br>• Generally in good condition.<br>• 8 – 10 m wide. |  |

| Road link to access | Location | Description | Typical Form and width | Photo |
|---|---|---|---|---|
| Controversial Road | Secondary access | • Local access road off Goyder Highway linking Goyder Highway to Bungunnia Road.<br>• Will primarily provide access from Goyder Highway to part of the alignment within the TSA.<br>• Maintained by the Mid Murray Council. | • Unsealed, formed and sheeted, two-way single carriageway.<br>• Generally in good condition.<br>• 6 – 8 m wide. |  |
| Go-Kart Road | Secondary access | • Local access road off Controversial Road.<br>• Will primarily provide access from Controversial Road to part of the alignment within the TSA.<br>• Maintained by the Mid Murray Council. | • Unsealed, unformed two–way single carriageway.<br>• Generally in okay condition.<br>• 6 m wide. |  |

| Road link to access | Location | Description | Typical Form and width | Photo |
|---|---|---|---|---|
| Bungunnia Road | Secondary access | • Provides a north-south link from the Goyder Highway to several pastoral stations in the north.<br>• Will primarily provide access from Goyder Highway to part of the alignment within the TSA.<br>• Maintained by the Mid Murray Council. | • Unsealed, formed and sheeted, two-way single carriageway.<br>• Generally in good condition.<br>• 10 m wide. |  |
| Woods and Forest Road | Approximately 4 km from Morgan | • Provides a link from Goyder Highway to an existing sub-station and pastoral properties to the north.<br>• Will primarily provide access from Goyder Highway to part of the alignment within the TSA.<br>• Maintained by the Mid Murray Council.<br>• Provides access to the existing substation off Goyder Highway. | • Unsealed, formed and sheeted single carriageway.<br>• Generally in good condition with some minor corrugations.<br>• 10 m wide. |  |

| Road link to access | Location | Description | Typical Form and width | Photo |
|---|---|---|---|---|
| Lunn Road | Approximately 30 km from Morgan, 60 km from Sturt Highway / Goyder Highway intersection. | • Local access road from Goyder Highway which provides access to a number of adjoining properties.<br>• Will primarily provide access from Goyder Highway to part of the alignment within the TSA where it intersects the alignment.<br>• Maintained by the District Council of Loxton Waikerie. | • Unsealed, formed and sheeted single carriageway.<br>• Portion is unformed and unsheeted.<br>• Condition varies from good to poor.<br>• 6 – 8 m wide formed and sheetd road. Narrows to 3 – 4 m track on private property. |  |
| Loffler Road | Secondary access | • Local access road from Goyder Highway.<br>• Primarily provides access to several adjoining properties. It potentially could provide access from Goyder Highway to part of the alignment within the TSA; however, it does not quite intersect it.<br>• Maintained by the District Council of Loxton Waikerie. | • Unsealed, formed and sheeted two-way single carriageway.<br>• Portion is unformed and unsheeted.<br>• Condition varies from good to poor.<br>• 4 – 6 m wide. |  |

| Road link to access | Location | Description | Typical Form and width | Photo |
|---|---|---|---|---|
| Cooltong Avenue | Secondary access | • Local road providing access to several irrigated properties.<br>• Can be accessed via Ral Ral Avenue to the northwest.<br>• Potentially could provide access from Ral Ral Avenue to part of the alignment within the TSA.<br>• Maintained by the Renmark Paringa Council. | • Sealed, single carriageway with one lane in each direction.<br>• Considered to be in good condition.<br>• 6.2 m wide. |  |
| Old Cooltong Road | Secondary access | • Local road providing access to several irrigated properties.<br>• Can be accessed via Ral Ral Avenue to the north and Government Road to the south. It may be used to access part of the alignment within the TSA.<br>• Maintained by Renmark Paringa Council. | • Sealed, single carriageway which is currently not line marked. |  |

| Road link to access | Location | Description | Typical Form and width | Photo |
|---|---|---|---|---|
| Cooltong Boundary Track | Secondary access | • Aaccess and fire track for the Cooltong Conservation Park.<br>• Can be accessed via a number of different locations in the Renmark area. | • Unsealed track which is unlikely to be all weather access.<br>• ~3 – 4 m wide. |  |
| Stoney Pinch Road | Secondary access | • Local road providing access to several irrigated properties.<br>• Can be only be accessed via Old Cooltong Road. | • Unsealed, single carriageway<br>• 4 – 5 m wide. |  |

| Road link to access | Location | Description | Typical Form and width | Photo |
| --- | --- | --- | --- | --- |
| Ral Ral Avenue | Secondary access | • Local road providing access to several irrigated properties.<br>• This section of Ral Ral Avenue is the continuation of the State Maintained section of Ral Ral Avenue. | • A small section of Ral Ral Avenue consists of a sealed, single carriageway with one lane in each direction. The remaining section is narrow and unsealed.<br>• 4 – 7 m wide. |  |
| Wentworth-Renmark Road | Starts at Ral Ral Avenue in Renmark. Furthest point (SA-NSW border) approx. 45 km from Ral Ral Avenue. | • Provides a link between Ral Ral Avenue and the State-maintained section of Wentworth-Renmark Road.<br>• Will primarily provide access to the northeastern part of the alignment.<br>• Maintained by the Renmark Paringa Council. | • Sealed, single carriageway with one lane in each direction.<br>• Sealed section of Wentworth-Renmark Road considered to be in good condition.<br>• 6.5 – 7.2 m wide. |  |

### 16.3.3. Road traffic volumes

Traffic volumes are estimated from Annual Average Daily Traffic Estimates (AADT) 24-hour, two-way flows (Location SA 2019). The AADT of each of the highways within the TSA varies over segments between towns and intersections. Existing AADT varies between approximately 60 along the Story Avenue to SA-NSW border segment (on Wentworth-Renmark Road) to 12,200 at the Nineteenth Street to Eighteenth Street (on Sturt Highway) segment.

Heavy vehicle data indicates that heavy vehicles generally account for approximately 2.5 % – 32.5% of all vehicle traffic (Location SA 2019).

Traffic volumes of local roads expected to be used as part of the haulage routes are not readily available due to the fact they are owned and maintained by the local Councils. However, as they only provide access to a finite number of properties, volumes are expected to be between 100 to 300 vehicles per day or less. The gazetted vehicles for each of the highways in the TSA are detailed in Appendix M.

### 16.3.4. Road conditions

Assessment of the existing road asset conditions for the State-maintained roads indicates that the roads are in reasonable condition relative to traffic volumes (Table 16-3). The exception to this is the Wentworth-Renmark Road (currently unsealed) which has large areas of failed pavement contributing to a high roughness.

Local road asset conditions vary significantly. All sealed local roads are in reasonable condition. Most unsealed roads have variable conditions due to their nature, with some isolated areas of roughness (e.g. corrugations).

### 16.3.5. Road users

Apart from general road users, the major users of roads within the TSA include:

- Farm and rural residences: In many locations, access to farms and rural residences to roads within the Project Area is via private driveways. In some cases, sight distances at these junctions do not comply with road standards.
- School bus routes: School buses are operated by various schools within the Traffic Study Area, including several schools in Renmark, Barmera, Waikerie, Morgan and other surrounding areas. School bus routes are generally revised annually depending on the requirements of the school population.
- Public Transport: Public transport within the Traffic Study Area is limited. Stateliner operates regular bus services between Adelaide and regional centres including:
  - a service between Adelaide and Loxton with six buses each way per week. Buses leave Adelaide and Loxton Sunday to Friday
  - a service between Adelaide and Renmark with 13 buses each way per week. Buses leave Adelaide and Renmark seven days a week with two services a day (each way) Sunday to Friday, and one service a day (each way) on Saturdays.
- Local industry: As most of these roads exist within primary production areas (e.g. agriculture, horticulture and livestock areas), there is likely to be some seasonal variation in traffic volumes along the local road networks. There is likely to be higher volumes of heavy vehicles associated with vintage during late summer / early autumn and increased heavy vehicle activity associated with harvest associated with agriculture land use. This is heavier within some areas of the Riverland and nearest the western portion of the Traffic Study Area.

- Vulnerable road users: Proposed routes will have to negotiate town centres. Some of these roads exist where there is higher pedestrian activity. This occurs when the route forms part of the main street though the town. Travel through these town centres is often unavoidable, as the route forms part of approved and gazetted roads for heavy vehicle movements. Within the Traffic Study Area, town centres where this will apply include Renmark (on Sturt Highway / Renmark Avenue and Ral Ral Avenue) and, to a lesser extent, Morgan, Eudunda and Robertstown.

### 16.3.6. Road safety

Crash data obtained from DataSA (2019) was mapped and compared with traffic volumes to determine the number of crashes per vehicle kilometre travelled.

Roads with a crash rate under 50 crashes per 100 million vehicle kilometres travelled are considered to have an average or better crash history. The roads with the highest crash rates per 100 million vehicle kilometres travelled are:

- Goyder Highway – Morgan to Taylorville Road
- Wentworth-Renmark Road - End of seal to SA-NSW border.

The higher crash rates per vehicle kilometre on the above sections of road can be attributed to the low background traffic volumes. The Wentworth-Renmark Road is currently unsealed from the Renmark Paringa Council boundary all the way to the SA-NSW boundary with traffic volumes in the order of 60 vehicles per day.

These roads will provide the main access to the eastern portion of the proposed transmission line and therefore their use by construction traffic is unavoidable.

Crash types were also assessed for the various roads within the Traffic Study Area. The most commonly reported types of crashes that occur are 'hit fixed object', 'right angle', 'roll over' and 'hit animal'.

Given that the Traffic Study Area is located within a regional area with predominately high-speed rural roads, this is considered consistent with the type of crashes expected. A high proportion of the 'right-angle' crashes occurred within the built-up areas of the Sturt Highway near Barmera and Renmark. A high proportion of the 'hit animal' crashes occurred at night.

## 16.4. Impact Assessment

The following aspects of the Project have been identified as sources of traffic and transport impacts on the local traffic and road infrastructure:

- movements and volume of construction traffic
- heavy vehicle movements during construction.

The potential impact events resulting from these aspects of the Project are discussed below. Predicted impact categories and an evaluation of uncertainty are also discussed for each impact event.

### 16.4.1. Impacts on existing transport network

#### Traffic movements and volume during construction and operation

**Traffic movement and increased volumes is not expected to affect the existing transport network.**

The expected increase in traffic movements on local roads during the construction phase has the potential to disrupt local traffic networks and normal community activities.

Construction of the substation, towers and transmission lines is expected to occur within an 18 – 24 month timeframe. As a worst-case scenario, it has been assumed that construction will occur over an

18-month timeframe, this representing the greatest concentration of traffic on the road network. Construction is expected to occur in a linear fashion along the length of the alignment, with work occurring concurrently on several fronts.

Construction traffic volumes of heavy vehicles (HV) will increase during peak construction with between 13% – 53% of HVs travelling on the Wentworth-Renmark Road and sections of the World's End Highway (see Table 5-6 in Appendix M). This can be attributed to the already low traffic volumes of these roads. There is also expected to be construction traffic added to the various local roads identified in the study area. The Sturt Highway, from Truro to Eighteenth Street Renmark, will experience the most increase in HV movements within the area of the Project.

During the construction period, the highest number of HV movements per hour is estimated to be 157 along the Old Sturt Highway (Renmark Avenue) to Twenty Third Street, which includes both Project and existing traffic. This equates to a minor increase from current average of 151 HV movements per hour. The greatest difference from current HV numbers is expected along Story Avenue to the SA-NSW border (Wentworth-Renmark Road) where the estimate is for an increase to 6 HVs per hour during construction from the current base of 1 HV per hour. The road sections with the highest potential HV movement increases described are shown in Figure 16-2.

Load deliveries to the site for large volumes are assumed to occur in the most economic vehicle type legally permitted to undertake the journey on the relevant road. For most deliveries this will be on 19 m semi-trailers. Where the quantity to be transported is much smaller than the load capacity of a semi-trailer, smaller rigid trucks or light commercial vehicles (LCV) will be used. It is also expected there will be oversize loads required for the delivery of materials for the substation primary plant and control buildings at Bundey, near Robertstown.

Over-dimensional loads may impact on road capacity during construction. These loads however are expected to be minimal and will be managed via permit.

The following construction vehicles are expected to generate traffic movements as detailed in Table 16-5.

**Table 16-5: Estimated traffic to be generated during construction**

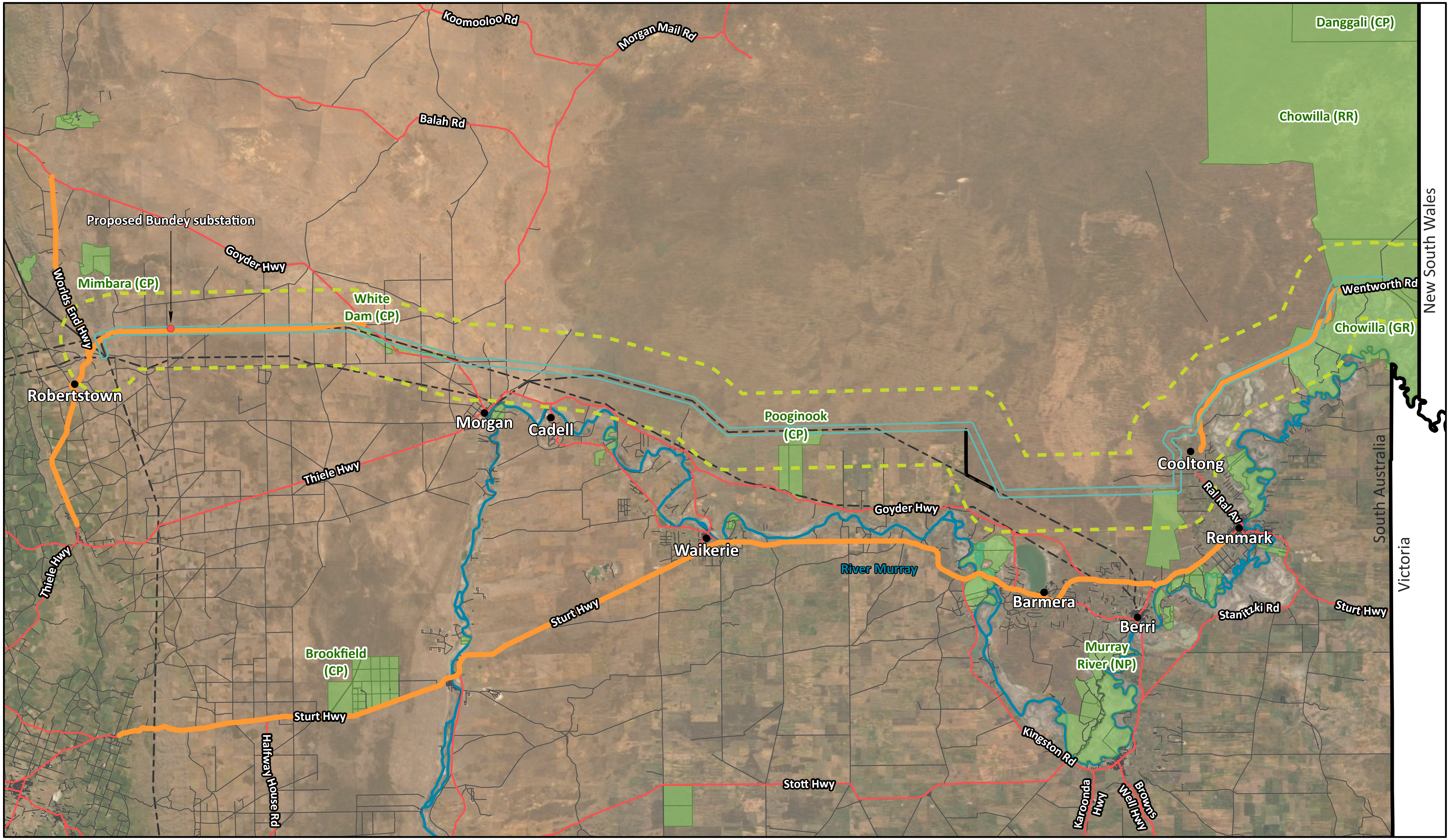
| Vehicle type | Total number of loads during construction phase (18-month duration) | Expected number of movements per day on the road network |
|---|---|---|
| Semi-trailer | 990 | Up to 20 (i.e. 10 trips / day) |
| Crane | - | Minimal – cranes will largely move about within the construction areas and along the access track between tower sites |
| Concrete truck | 2780 (based on a total of 450 towers, 6 trucks per tower and 80 trucks for the sub-station) | 16 |
| General rigid trucks | Approximately 10 vehicles per day | 20 |
| Dozers, graders, excavators | Movements occur within the site only; these vehicles to be transferred to and from site via semi-trailer | Nil |
| Light vehicles | 20 – 40 per day | 40 – 60 |

The use of a large twin-engine helicopter or sky crane for the transportation of preassembled towers will be investigated during detailed design as an alternative for tower assembly and erection. Should a helicopter be utilised, it is anticipated that it will transport small sections of towers to tower locations on Taylorville Station, Hawks Nest Station and Calperum Station. Other sections of the alignment may also be considered for helicopter use during detailed design. Preassembly and helicopter transport of towers, rather than constructing towers at each tower location will significantly reduce traffic volumes at each tower pad out along the proposed alignment.

Delays induced from Project construction traffic including oversize loads will be negligible and infrequent. The implementation of controls will further minimise the impact of increased traffic on the existing road network. Management measures may include:

- scheduling of oversize deliveries to arrive outside peak hours and potential conflict times with harvest seasons
- avoiding peak traffic periods to minimise traffic delay to the public if required
- liaising with local schools to discuss any impacts to bus routes due to traffic movements. Where possible, construction traffic to be timed to avoid school bus services.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.




- Transmission line corridor
- Traffic assessment study area (10 km)
- Parks and reserves
- Cultural heritage avoidance alignment
- Increased proportion of heavy vehicles
- State maintained road
- Local road
- Existing ElectraNet transmission line
- River Murray
- Proposed Bundey substation

**Figure 16-2**
**Increased proportion of heavy vehicles during peak construction on State roads**

0 20
Kilometres

N

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### Condition of the existing transport network

**Construction traffic may result in some damage to road pavement and road furniture, however, damage will be remediated to pre-construction condition where required.**

The increase in traffic and in particular heavy vehicle movements has the potential to damage road pavements, and require road upgrades and / or repairs.

Estimated Project traffic will be forecast for construction, operations, decommissioning and rehabilitation. ElectraNet will develop and implement a Traffic Management Plan (TMP). This will include:

- the expected traffic outcomes for each phase of the Project and potential management measures
- forecasting road traffic volumes to ensure that the potential impact of road traffic on the Level of Service (LoS), capacity, road safety and road condition can be assessed prior to each project phase.

***Impact of heavy vehicles on local roads***

The heavy vehicles proposed for use during the construction phase may result in incidental damage to the road pavement and / or road furniture, in particular on unsealed roads. The Project will develop a construction phase pavement management plan to manage these impacts. This will involve undertaking a condition survey (also known as a dilapidation survey) of the local roads intended to be used by construction traffic prior to construction. The survey would document and identify the different types of road and pavement damage and a strategy for inspection frequencies, intervention levels and required treatments will also be developed. At completion of the Project, a post construction condition survey will be undertaken to determine the level of impact to existing local road pavements has occurred and any required remediation to restore to pre-construction condition where required.

The extent by which the Project will increase average daily traffic during the construction period varies however most increases are from a very small base traffic volume and the quantum of daily traffic increase would not be more than 126 vehicles per day. The estimated increase in daily axle loadings from heavy commercial vehicles on the haul route pavements also varies from a very small base over the same period. The impact of this additional loading on pavement condition is unknown and will depend on the existing condition and remaining life of the pavement.

Project traffic will be restricted to specific routes minimising the extent of possible wear on local roads. Restricting construction traffic to specified routes will allow consideration for aspects such as, but not limited to sensitive ecological areas, areas of higher resident density, upgrade requirements, and journey time.

ElectraNet have standard environmental operating requirements for all its operations, including the environmental aspects of moving vehicles. Project traffic will control drag out onto public roads by ensuring all vehicles, plant and earthmoving equipment are inspected and clear of significant soil / vegetative matter etc. prior to site mobilisation and moving between properties.

Road restrictions are currently in place on roads in the Murraylands and Riverland for certain vehicles, restricting total length of vehicle and width of vehicles on certain routes, however this is not expected to be an issue for delivery of Project materials.

***Road Upgrades***

Upgrades may be required to the recommended route to suit restricted access vehicles, and intersections may also need to be upgraded to meet the requirements of the design vehicle. Road and intersection upgrades for safe access will be undertaken in consultation with DIT and in accordance with DIT standards.

Construction of an additional access track / road to access the Project corridor via the Goyder Highway near Overland Corner is proposed. This will reduce the concentration of construction traffic utilising the access track along the corridor and provide additional emergency access/egress. The Traffic Management Plan will address vehicle movements and any road treatments in this location following further consultation with DIT.

Operation traffic will be minimal. During the operational phase passenger and truck movements to the site will be negligible therefore no additional traffic or pavement management measures are expected to be required. Due to the very low traffic volumes likely to be generated during the operations phase of the Project, the traffic impact on the existing road network is considered to be negligible.

Monitoring and remediation measures will be implemented to reduce the risk of deterioration of the existing transport network. Modelling has shown that construction traffic is within the capacity of the existing road network. Consequently, the risk of deterioration of the existing transport network during construction or operation of the Project is considered **Low**.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### Road network safety and efficiency

**The increase in construction traffic is expected to have a minimal impact on the safety and efficiency of the local road network.**

The increase in both traffic volume and the nature of the heavy vehicles which will be utilised has the potential for negative impacts to the safety of both community and Project road users.

Traffic impact assessment concludes expected traffic volumes will not affect level of service or safety for any roads used by the Project. Additional traffic generated during the construction period would include a core range of vehicle types, dependent on the type of load being carried. This includes delivery of construction materials, workers transportation and, heavy machinery transport to the site. An assessment of traffic capacity was measured using level of service (LoS). The analysis demonstrated that with the Project construction traffic added, most roads in the study area remain operating at LOS for single lane roads.

The exception is some sections of the Sturt Highway which already have high volumes of traffic (e.g. up to 9,000 vehicles a day on two lane sections and up to 12,200 vehicles a day on the four lane sections). The increase in daily traffic on these sections represents an increase of only 1 – 2% of existing traffic volumes and is unlikely to change the existing LoS.

#### *Over-dimensional loads*

Over-dimensional loads may impact on road capacity during construction. Locations being considered include Port Adelaide and Port Melbourne. These loads however are expected to be minimal and will be managed via permit. Management of the movement of these loads will ensure opportunity is provided for traffic to pass at suitable intervals and locations along the haul route.

Traffic management measures including improved delineation and lowering speed limits may be considered to improve safety and awareness of changes in traffic during the construction period.

Oversize deliveries will be scheduled where possible to arrive outside peak hours and avoid potential conflict times with harvest seasons. There will be instances where oversized deliveries will be necessary, especially in and around the township of Robertstown. It has been estimated that the percentage of heavy vehicles during peak construction travelling on the Wentworth-Renmark Road and section of the World’s End Highway will vary between 13% – 53% (equates to 6 – 17 heavy vehicles per hour).

As oversized movements can cause disruptions to the existing traffic, it will be necessary for these movements to occur during the off-peak hours where traffic volumes are typically at their minimum. In addition, notification would be given to the road authority and local community prior to oversize vehicle movements occurring. The required permits will be sought on rotes which are currently not designated as oversize approved routes in addition to piloting requirements and discussions with DIT and relevant councils.

Peak traffic periods will be avoided, as far as practicable, to minimise traffic delay to the public if required. Delivery of materials during peak hours may cause slight delay to existing traffic travelling on roads (although level of service expected to remain the same). Modelling indicates that peak traffic generation for the Project will occur within the 3 to 12-month stage of the construction phase.

To minimise the potential effects of any major sources of delay, any works which would significantly reduce the performance of the road network in the project area would be scheduled for periods of typically lower traffic volumes where possible. The TMP will include guidelines, general requirements and procedures to be used when construction activities would have a potential impact on existing traffic arrangements.

***Driver safety***

Driver fatigue will be managed and incorporated into the Safety and Health Management System. ElectraNet will develop and implement the TMP. This will include:

- driver fatigue management plan and policies
- objectives to increase work, health and safety understanding in relation to fatigue, vehicle operation in public areas and obligation to the general public
- operating standards for work and rest.

Safety measures will be in place within the Project traffic network so that vehicle movements are conducted in a safe manner, minimising risk to workers and the community.

Consequently, the risk of reduced road network safety and efficiency is considered **Medium.**

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix O and the level of risk is **Low**.

### 16.4.2. Summary of key mitigation measures

**Table 16-6: Key mitigation measures – traffic and transport**

| Mitigation measure | Construction | Operation |
|---|---|---|
| Design and construction of transmission line at crossings of DIT roads in accordance with DIT requirements | ✓ | |
| Intersections with the Goyder Highway constructed to appropriate standards established in consultation with DIT | ✓ | |
| BAR and BAL treatments (if required) will be designed as per *The Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings* | ✓ | |
| Development of a Traffic Management Plan prior to construction. including designated speed limits and routes, appropriate constraints on travel at dawn and dusk, vehicles restricted to tracks, and effective signage where potential ecological constraints exist to raise awareness and further control speeds in these areas | ✓ | |
| Upgrade required routes to suit restricted access vehicles, and intersections to meet the requirements of the design vehicle. | ✓ | |
| Implement area-specific and site inductions and training | ✓ | |
| Consult prior to construction with the appropriate roads authority regarding works which may affect roads or traffic | ✓ | |

| Mitigation measure | Construction | Operation |
|---|---|---|
| Consult with ElectraNet and relevant Council during development of the Traffic Management Plan | ✓ | |
| Undertake road pre-condition surveys on construction haulage routes prior to the commencement of construction in consultation with relevant councils and road owners. This will include identification of existing conditions and mechanisms to repair damage to the road network caused by construction vehicles associated with the proposal. | ✓ | |
| Implement procedures for oversize loads including:<br>• scheduling of oversize deliveries to arrive outside peak hours and potential conflict times with harvest seasons<br>• avoiding peak traffic periods to minimise traffic delay to the public if required<br>• liaising with local schools to discuss any impacts to bus routes due to traffic movements. Where possible, construction traffic to be timed to avoid school bus services. | ✓ | |
| Obtain permits from the National Heavy Vehicle Regulator (NHVR) where required to provide oversized and overmass vehicles access during construction. | ✓ | |
| Ensure all vehicles, plant and earthmoving equipment are inspected and clear of significant soil / vegetative matter etc. prior to site mobilisation and moving between properties | ✓ | |
| Provide access to properties for emergency vehicles at all times. | ✓ | ✓ |
| Maintain access to properties or consult alternative arrangements with landholders. | ✓ | ✓ |
| Following completion of construction, undertake condition surveys. Any damage as a result of Project construction vehicles would be repaired following the completion of construction (and as needed through the construction period to maintain safe road conditions). | | ✓ |

## 16.5. Conclusion

ElectraNet's key finding is that Project construction or operational activities will not lead to significant traffic impacts. Most of the proposed alignment is adequately distant from sensitive receivers that no adverse impacts are anticipated during construction or operation of the Project. Where the few receivers are in proximity to the alignment, the impacts will be negligible to minor predominantly due to the transient nature of construction activities. Relevant landholders will be consulted, and impacts mitigated where practicable. Traffic and transport measures will be implemented in accordance with the CEMP.

EIS Volume 1 Chapter 17

# Socio-Economic Environment


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# 17. Socio-Economic Environment

This chapter describes the expected social and economic environment impacts of construction and operation of the Project on the landholders and communities in proximity to the transmission line corridor, both positively and negatively. Management strategies which will be utilised to prevent or reduce negative impacts are also detailed.

## 17.1. Key Findings

- The Project is expected to have major positive impacts for electricity consumers in South Australia. The multiplier effect of a reduction in electricity prices and increased security of supply on regional and SA economies is expected to have major, positive impacts.
- The Project will enable greater market access for renewable energy generation in the region, leading to economic stimulus and further benefit to the population in the study area.
- The Project is located well away from the tourism region of the River Murray and the presence of Project infrastructure is not expected to affect visitation or viability of local tourism operations.
- Construction, installation and production phases of the Project will require securing a range of locally sourced goods and services, benefitting the local economy.
- Negative impacts to the viability of local and regional industries are not expected as a result of employment of local labour by ElectraNet.
- Negative impacts to affordability or availability of housing, amenities, services or general cost of living due to the Project activities are expected to be negligible.
- There will be no compromise to community cohesion, safety or wellbeing as a result of the Project.

## 17.2. Setting the Context

This section provides information required to explain the context within which the impact assessment was undertaken. It describes:

- the relevant EIS Guidelines
- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet
- the assessment methodology used to identify baseline environmental values and to undertake the impact assessment.

### 17.2.1. EIS guidelines

The EIS Guidelines require an assessment of the likely impact of the economic and social effects of the Project on the communities, land uses, industries and businesses in the region of the Project, as set out in Table 17-1.

**Table 17-1: EIS Guidelines relating the socio-economic environment**

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| **Land Use and Economic Effects**<br>*Assessment Requirement 2*: The proposal will have an impact on the State's economy during construction and operation and may result in immediate and long-term effects on landowners and surrounding uses. | |
| • 2.8: Provide a full economic analysis of the proposal including details on the economic effects of the proposal in terms of provision of an additional 'interconnection' and the local and | Critical |

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| broader employment generation from construction activities of the proposed development, including the 'multiplier effect'. | |
| • 2.9: Describe the potential positive and negative economic effects on household, business and industrial energy consumers in the State. | Critical |
| • 2.10: Describe potential employment opportunities and the expected impacts on communities. | Critical |
| • 2.11: Identify any potential economic effects on tourism and recreation. | Critical |
| • 2.12: Identify any secondary economic effects, including the potential to attract new industries (such as renewable energy generation) and commercial ventures in areas benefiting from increased power supply. Describe any positive and negative effects of this, including current generation assets. | Critical |
| **Effect on Communities**<br>*Assessment Requirement 9*: The proposed development has the potential to affect the local community during construction and through the establishment of a large linear structure. | |
| • 9.1: Describe the proximity of the proposed transmission line to townships and dwellings, and describe any potential impacts of the proposal on quality of lifestyle. | Medium |
| • 9.4: Describe the impact of the increase in workforce during and post construction on the nearby towns and the region as a whole. In particular the impact on local business and also effects on accommodation supply and demand. | Medium |
| **Construction, Operation and Maintenance Effects**<br>*Assessment Requirement 15:* The construction and operation of the proposal would require a range of impacts to be minimised, mitigated and monitored through an environmental management plan framework. | |
| • 15.9: Outline the approximate size of the construction workforce including any need for any construction workers camps or accommodation. Describe the location and management of accommodation camps including sources of water and power, and the management of waste, wastewater and noise impacts | Standard |

It should be noted that the economic implications for the State if the Project does not proceed (Assessment requirement 2.13) are addressed in Section 2.8 of Chapter 2 Justification.

Aspects of assessment requirements identified in Table 17-1 which are not addressed in this chapter are listed in Table 17-2 together with the applicable chapter.

**Table 17-2: Aspects of assessment requirements addressed in other chapters**

| Assessment requirement | Chapter |
|---|---|
| 15.9 Construction workforce size and location and management of accommodation camps | Chapter 7 Project Description<br>Chapter 9 Land Use and Tenure<br>Chapter 10 Physical Environment<br>Chapter 15 Noise and Vibration |

### 17.2.2. Requirements in legislation and other standards

#### Standards

The methodology for this socio-economic impact assessment was guided by both international impact assessment principles and methods as set out by Vanclay et. al. (2015)[1] and endorsed by the International Association for Impact Assessment (IAIA), as well as other industry standards such as the Planning Institute of Australia Social Impact Assessment Position Statement (2010) and New South Wales Social Impact Assessment Guidelines (2017).

[1] *Social Impact Assessment: Guidance for assessing and managing the social impacts of projects* (Vanclay et al. 2015)

There are no social impact assessment guidelines issued by the South Australian Government.

A general explanation of legislation governing the Project can be found in Chapter 5 Legislative Framework and Planning.

### 17.2.3. Views of stakeholders

Stakeholder engagement was undertaken by ElectraNet as part of baseline data gathering, route selection and refinement and included local councils, the general public, affected landholders and known social receptors within and adjacent to the transmission line corridor (refer Chapter 6 Stakeholder Engagement).

Stakeholders largely recognised and supported the economic benefits of the Project including supply of reliable power, aiding the transition from fossil fuels, the potential for future renewables investment in the region, in-region employment and flow-on economic benefits, including the use of local businesses and suppliers. Engagement did not identify any significant level of concern regarding social impacts.

Some concerns were raised in relation to potential negative economic impacts and included impacts to ecotourism from a change in amenity and resulting in damage to the local economy, and impacts to property values of agricultural land and investment value in environmental reserves, resulting from the presence of electrical infrastructure.

### 17.2.4. Assessment method

The method for undertaking the socio-economic impact assessment was consistent with the approach used throughout this EIS, and is described in Chapter 8 Impact Assessment Methodology.

#### Identifying the socio-economic study area

An independent socio-economic impact assessment was undertaken for the Project (BDO EconSearch 2020, provided at Appendix N-2). While the area of influence of the Project in terms of socio-economic values potentially occurs at different scales (i.e. local, regional, State and national), the assessment in this chapter focuses on the local context in proximity to the proposed alignment, with reference to the broader region and the State where relevant (refer Figure 17-1).

The study area is generally based on geographical boundaries used by the Australian Bureau of Statistics (ABS) and includes local government areas (LGAs), urban centres and localities (UCL)[2] and State Suburbs (SSC)[3]. Where relevant the assessment also draws comparisons with regional South Australia and South Australia as a whole.

The study area is defined as the following LGAs:

- Regional Council of Goyder
- Mid Murray Council
- District Council of Loxton Waikerie
- Berri Barmera Council
- Renmark Paringa Council.

Within the study area, the assessment examined the local Project context using a 5 km buffer either side of the proposed alignment, and considering the four communities closest to the alignment –

[2] Urban Centre and Localities (UCL) represent areas of concentrated urban development and has been used for larger townships in the study area.
[3] State Suburbs (SSC) are an ABS approximation of localities and have been used where required for smaller communities in the study area.

Robertstown, Morgan, Cadell and Cooltong. The townships of Waikerie, Barmera, Berri and Renmark were also considered, however this was done in a regional context due to their distance from the proposed alignment.

It should be noted that the Project also intersects the Unincorporated Area of South Australia. As the Unincorporated Area does not have any major population centres within 100 km proximity of the Project it has not been included in this assessment.

Baseline information for the broader region and South Australia was also included where relevant for comparative purposes.

### Desktop review

A desktop review was undertaken to characterise the existing socio-economic environment of the study area and support the identification and assessment of impacts. The data used for this review was primarily sourced from:

- ABS 2016 Census and additional data releases
- Department of Education, Skills and Employment (DESE)
- Tourism Research Australia (TRA)
- Other publicly available information such as community reports, agency plans and planning documents.

The desktop assessment was further supported by information received during consultation with local landowners, the community, service providers and local and State government representatives (refer Chapter 6 Stakeholder Engagement)

### Economic effects assessment and modelling

The broader economic effects of the Project were modelled by ACIL Allen (ACIL Allen 2019) using Computable general equilibrium (CGE) modelling and analysis. The assessment methodology for the modelling is set out in the report which is provided at Appendix N-1. It is noted that this modelling was undertaken using data and information from 2018–19, however it is considered that the findings remain generally valid for the Project.

The independent socio-economic assessment undertaken by BDO EconSearch used the impact assessment methodology developed for the Project and described in Chapter 8 Impact Assessment Methodology. The socio-economic assessment and details of modelling used in the assessment is provided at Appendix N-2.

The key findings of the Regulatory Investment Test for Transmission (RIT-T) completed for the Project has also informed the discussion of broader economic benefits of the Project (refer Chapter 2 Justification).

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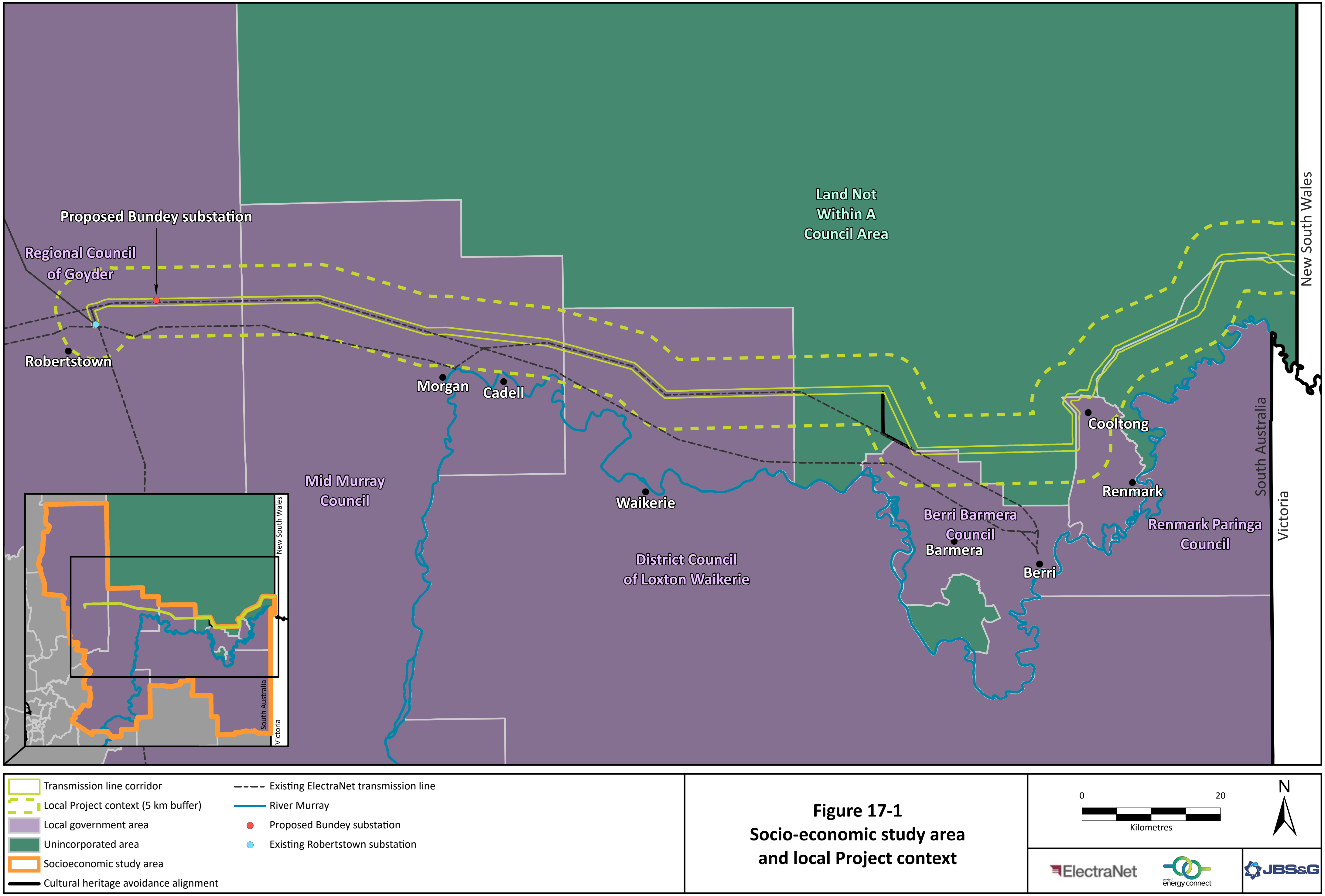



**Figure 17-1**
**Socio-economic study area and local Project context**

## 17.3. Description of Existing Environment

This section describes the existing socio-economic environment across the study area, with a focus on local communities, to inform the impact assessment in Section 17.4.

### 17.3.1. Overview of the study area

#### Local government areas and relevant townships

***Goyder LGA***

The Goyder LGA was historically economically supported by the mining industry, however agriculture (grazing and to some extent cropping) has become the primary industry, with viticulture interests also increasing in the region. The area is also increasingly becoming the focus of wind and solar renewable energy projects.

Robertstown is located on the Worlds End Highway between Eudunda and Burra and was originally a service centre for surrounding mining and agricultural activities. The Robertstown substation at the beginning of the proposed alignment is located approximately 5 km northeast of the township (refer Figure 17-2).

Burra is the largest town in the region and the council seat. It is the primary service provider for the surrounding agricultural communities and is also a significant tourist destination, featuring many historic buildings, mining history and the flooded remains of the open cut mine. Burra is located 33 km from the western end of the proposed alignment.

***Mid Murray LGA***

The Mid Murray Council encompasses 220 km of the River Murray and stretches between the major townships of Morgan and Mannum.

Morgan was one of the busiest river ports in the area following the opening of a railway line from Adelaide, until the expansion of road transport during the 20th century. Tourism in Morgan is based around its history as a river port, houseboat moorings and the waterfront marina. Morgan is located approximately 7 km south of the proposed alignment (refer Figure 17-3).

Cadell is a small citrus and winegrowing township located 8.5 km east of Morgan which provides most of the major services. A low security prison for men is also located there. Cadell is approximately 6 km south of the proposed alignment (refer Figure 17-3).

Mannum is located more than 100 km from the Project and was established to service paddle steamer and riverboat shipbuilding operations in 1840. Mannum has continued to support a tourism industry focussed around houseboat and temporary accommodation hire.

***Loxton Waikerie LGA***

Waikerie supports extensive agricultural, horticultural and viticultural developments as well as fruit processing plants. The area also has a strong ecotourism industry centred around the birdlife of the nearby lagoons and wetlands associated with the River Murray. Waikerie is located approximately 14 km south of the proposed alignment (refer Figure 17-3).

Loxton is the largest settlement in the LGA and serves as the council seat. Loxton is known for its citrus fruit industry, and also features large dryland cropping operations. Tourism in the area is largely centred around the River Murray. Loxton is located approximately 35 km south of the proposed alignment.

***Berri Barmera LGA***

Berri is the council seat and serves as the regional service centre for surrounding River Murray irrigated horticulture districts. The town is surrounded by substantial acreage of irrigated vineyards and orchards and significant wine production facilities. Berri is located approximately 16 km south of the proposed alignment (refer Figure 17-4).

Barmera is located on the shore of Lake Bonney, a large freshwater lake fed via the River Murray. The town supports irrigated agriculture and viticulture industries and recreational and water-based tourism on Lake Bonney and the River Murray. Barmera is located approximately 12 km south of the proposed alignment (refer Figure 17-4).

***Renmark Paringa LGA***

Renmark is the largest town in the LGA, and the study area. Similar to other towns in the Riverland the primary industries are wine grape production with substantial nut, citrus and stone fruit plantations. Culinary tourism is an important part of the local economy, with Renmark's location on the River Murray making it a popular destination for fishing and water sports. Renmark is located approximately 10 km south-east of the proposed alignment.

The community of Cooltong is located approximately 10 km north-west of Renmark and is predominantly comprised of irrigated grape, citrus and other fruit blocks. The community is bordered to the south-west by the Cooltong Conservation Park and by Calperum Station to the west and north. Cooltong is located within 2 km of the proposed alignment.

Paringa is a township in its own right, largely acting as a satellite town for the much larger Renmark.

### Transmission line corridor

Twenty-one individual landholders hold fifty-nine individual land parcels within the transmission line corridor with cropping, grazing and irrigated horticulture the primary land uses on these properties. Seven pastoral leases are located along the eastern end of the transmission line corridor which includes Calperum, Taylorville and Hawks Nest Stations. These properties are largely utilised for conservation and nature-based tourism purposes. Further information on land tenure and land uses on the transmission line corridor is provided in Chapter 9 Land Use and Tenure.

Figure 17-2 to Figure 17-5 show the locations of the closest townships in relation to the transmission line corridor. The Figures are arranged in terms of the four corridor sections described in Section 9.3.2 and in Chapter 4 Route Selection.

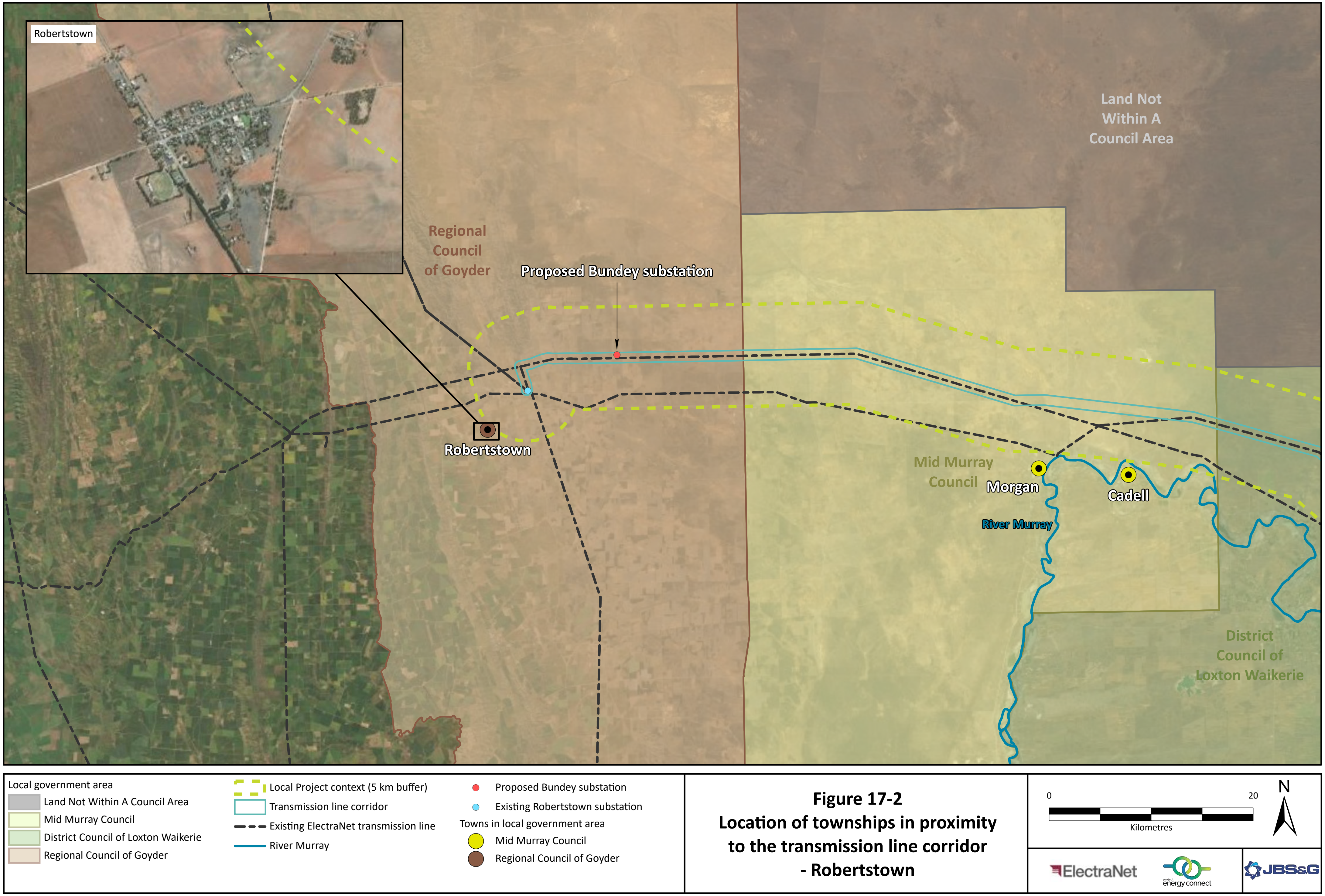



**Figure 17-2**
**Location of townships in proximity to the transmission line corridor - Robertstown**

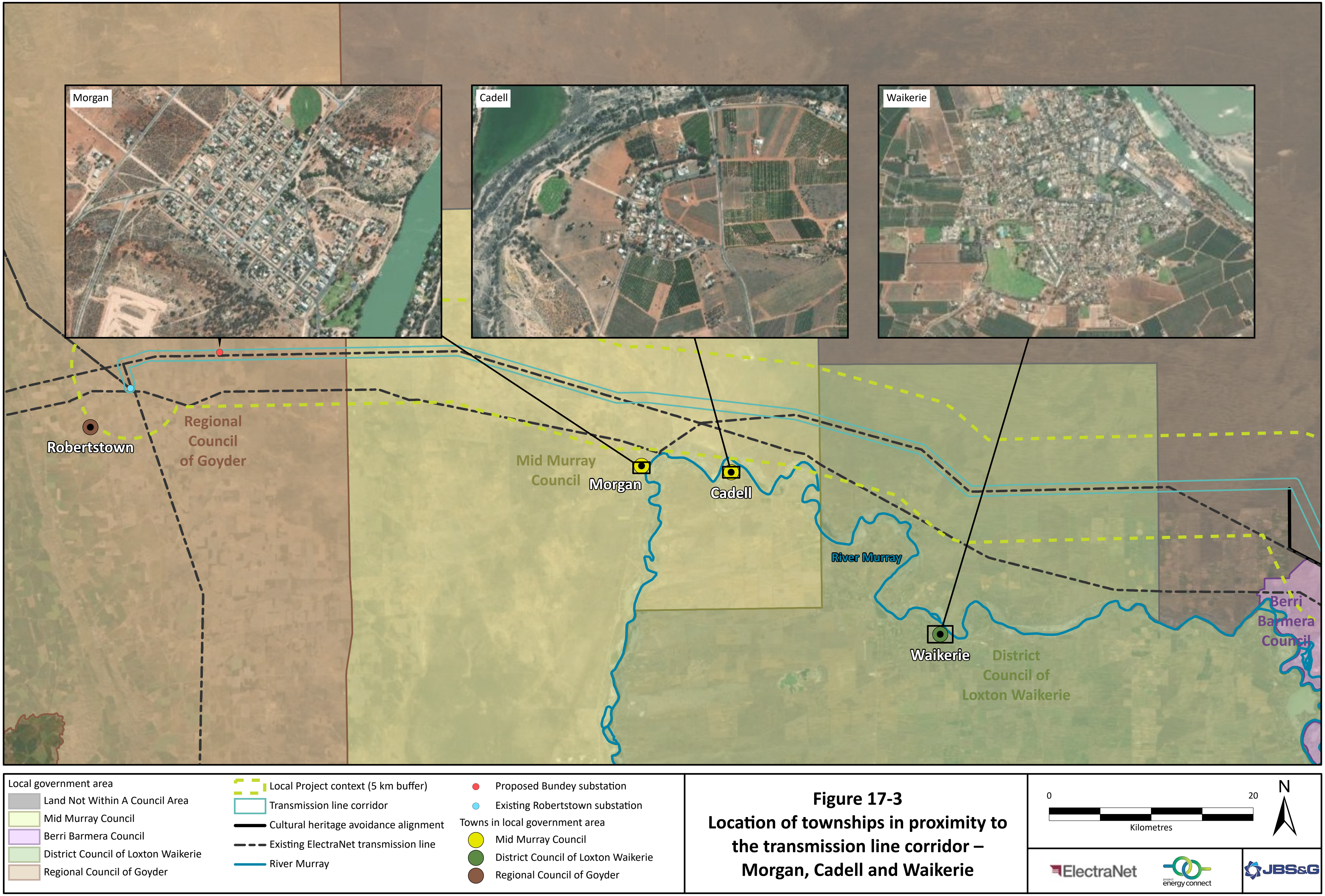
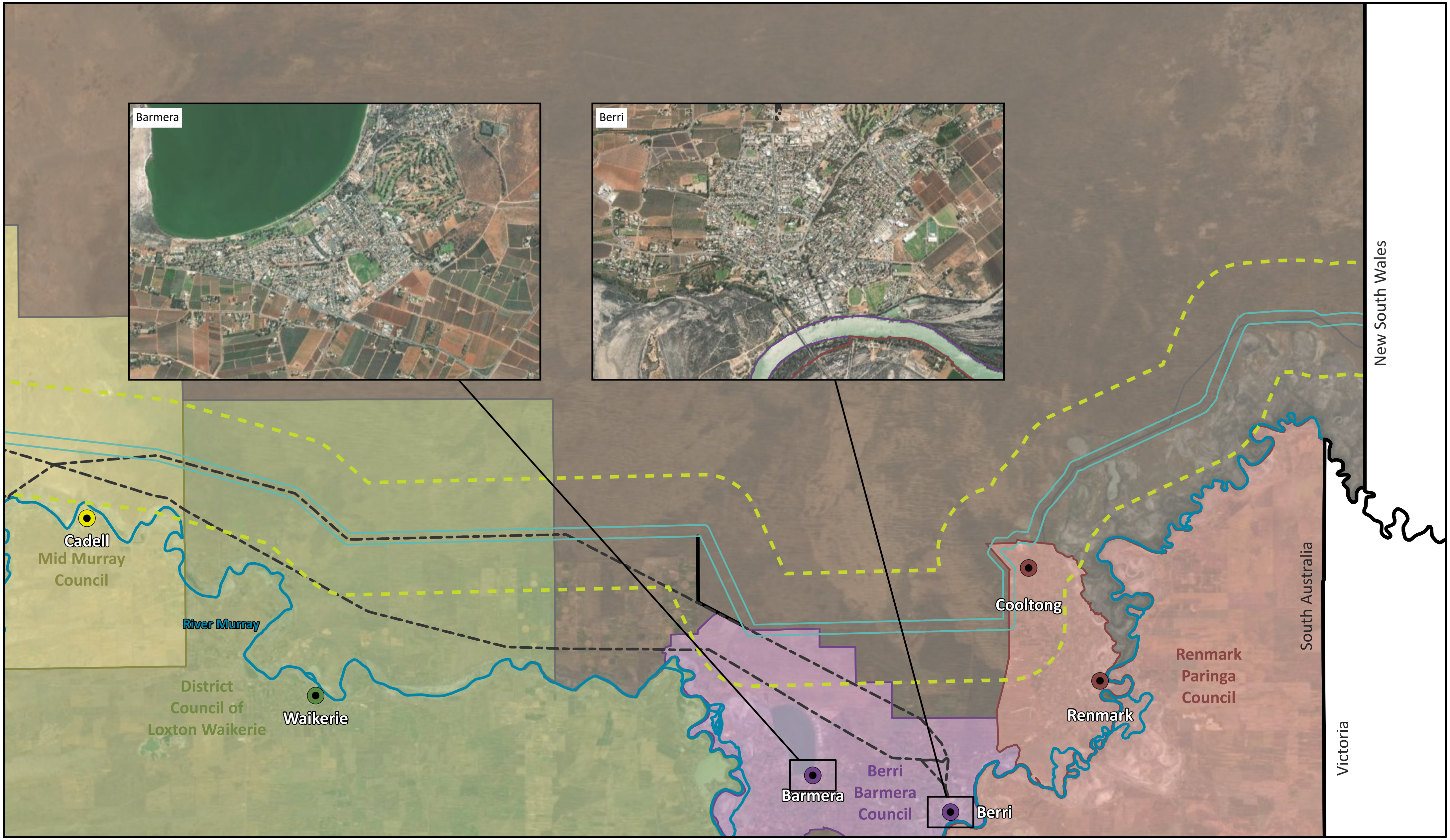



**Figure 17-3**
**Location of townships in proximity to the transmission line corridor – Morgan, Cadell and Waikerie**




Local government area
- Land Not Within A Council Area
- Mid Murray Council
- Renmark Paringa Council
- Berri Barmera Council
- District Council of Loxton Waikerie

- Local Project context (5 km buffer)
- Transmission line corridor
- Cultural heritage avoidance alignment
- Existing ElectraNet transmission line
- River Murray

Towns in local government area
- Mid Murray Council
- Renmark Paringa Council
- Berri Barmera Council
- District Council of Loxton Waikerie

0 20
Kilometres
N

**Figure 17-4**
**Location of townships in proximity to the transmission line corridor – Barmera and Berri**

ElectraNet project energy connect JBS&G

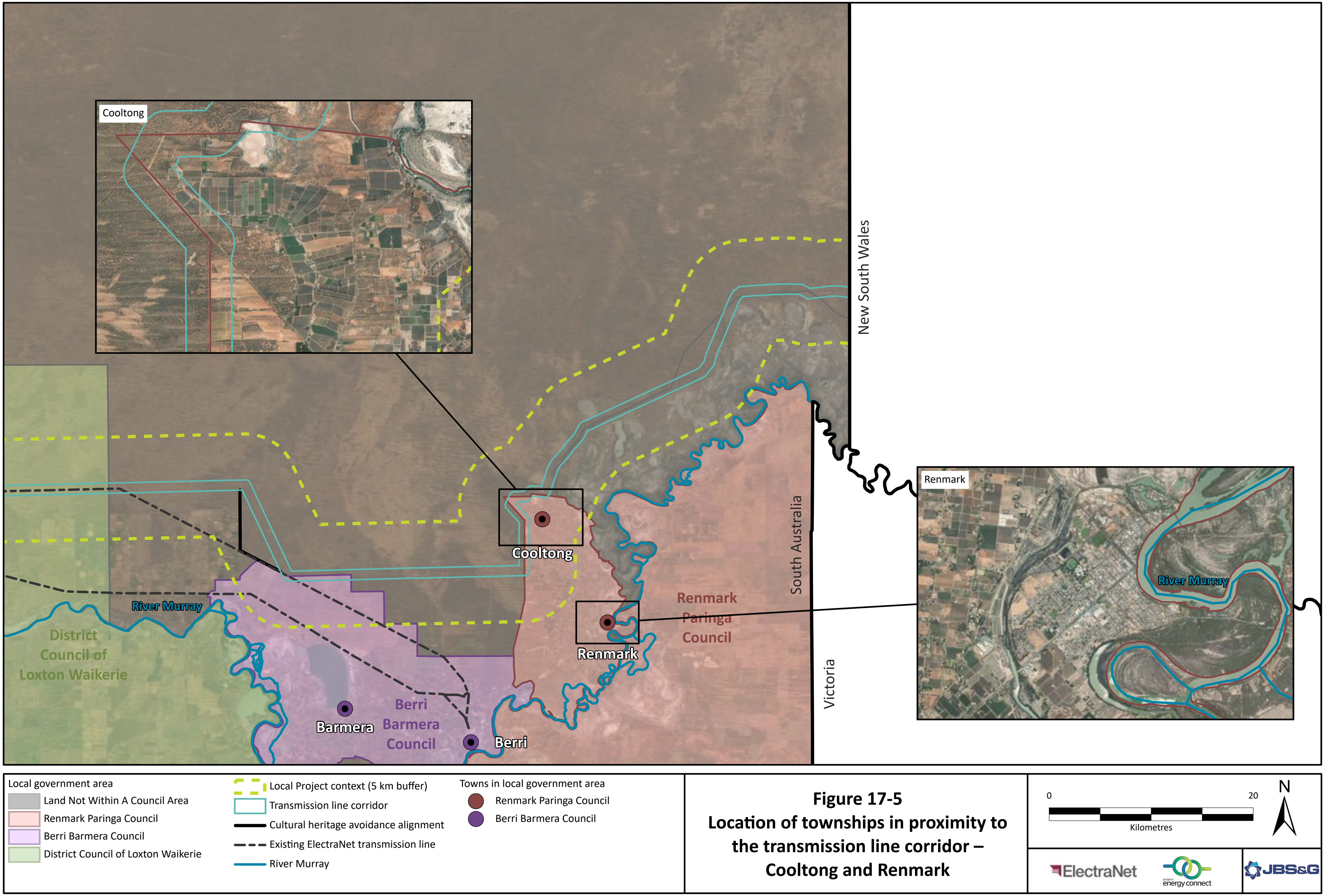



**Figure 17-5**
**Location of townships in proximity to the transmission line corridor – Cooltong and Renmark**

ElectraNet
project energy connect
JBS&G

### 17.3.2. Baseline socio-economic environment

The baseline environment is described for the following key social and economic indicators:

- population and demography
- households and families
- housing and accommodation
- employment, income and industry
- economic profile
- social services and facilities
- social character, health and wellbeing.

The different aspects of the baseline environment in the study area are discussed in detail below and summarised in Table 17-3. A snapshot of key characteristics is provided in Figure 17-6.

**Table 17-3: Summary of study area baseline environment**

| Key social and economic aspect | Summary description of the study area |
|---|---|
| **Population and demography** | The population in the study area is characterised by low population density, generally slow population increase, with population decrease in some LGAs and local townships. The population is generally older, on an ageing trend, with a lower proportion of younger people compared to the State, and a generally balanced gender ratio.<br>Educational attainment for the region is lower than the State average.<br>A higher proportion of households speak only English at home when compared to the State.<br>These characteristics are also expected to be reflected in the local Project context due to the rural nature of the social environment. |
| **Households and families** | The study area has a higher proportion of single person households and couples without children, a lower proportion of couples with children and a lower than State average number of people per household. |
| **Housing and accommodation** | Median house prices have increased in all LGAs apart from small decreases in Goyder and Mid Murray. Median weekly rent increases are generally consistent with or lower than State average. Vacancy rates in the study area are very low (0.5%), indicating a potential undersupply of housing.<br>Tourism accommodation room occupancy during peak seasons is generally 50% across the Riverland tourism region. |
| **Employment, income and industry** | The labour force participation rate is lower in comparison to the rest of the State, and the unemployment rate has also generally been lower relative to the State. Weekly individual and household incomes are generally lower than the State average.<br>Agriculture is the largest employer of people with 21% of employees in the sector (3,527 employed persons from a total of 16,531 employed persons in the study area). This is followed by health and social assistance, manufacturing and construction. |
| **Economic profile** | The Riverland LGAs are characterised by a primary production economy which includes fruits, nuts, vegetables, grains and wine grapes particularly in areas along the River Murray. River-based tourism also contributes to the Riverland economy.<br>Renewable energy generation is an emerging industry particularly at the western end of the proposed alignment in the Goyder LGA, with other projects proposed for the Riverland LGAs in the study area.<br>As the land closer to the alignment is unsuitable for cropping, the local economy is based on dryland grazing (e.g. sheep and cattle), along with some nature-based tourism.<br>Agriculture dominates the contribution to gross regional product (GRP) in the study area, contributing 31% ($753 million) of a regional total of $2.4 billion. Overall |

| Key social and economic aspect | Summary description of the study area |
| --- | --- |
| | tourism contribution to the GRP of the study area is only a small portion ($5.3 million) compared to the value of agriculture. |
| **Social services and facilities** | A range of health, education, and emergency services are available across the study area, particularly in the larger townships. The majority of the LGAs had a high level of residents able to get support outside their household in times of crisis. |
| **Social character and wellbeing** | Health indicators show that the rate of avoidable deaths is higher in the study area than the State, and the age of death is lower. The incidence of disabled residents is higher in all of the LGAs than the State incidence.<br>Indices used to measure relative advantage and disadvantage indicate that no LGA in the study area came within the top 50% of LGAs on any of the four indices, in either South Australia or Australia (refer Section 17.3.10). |

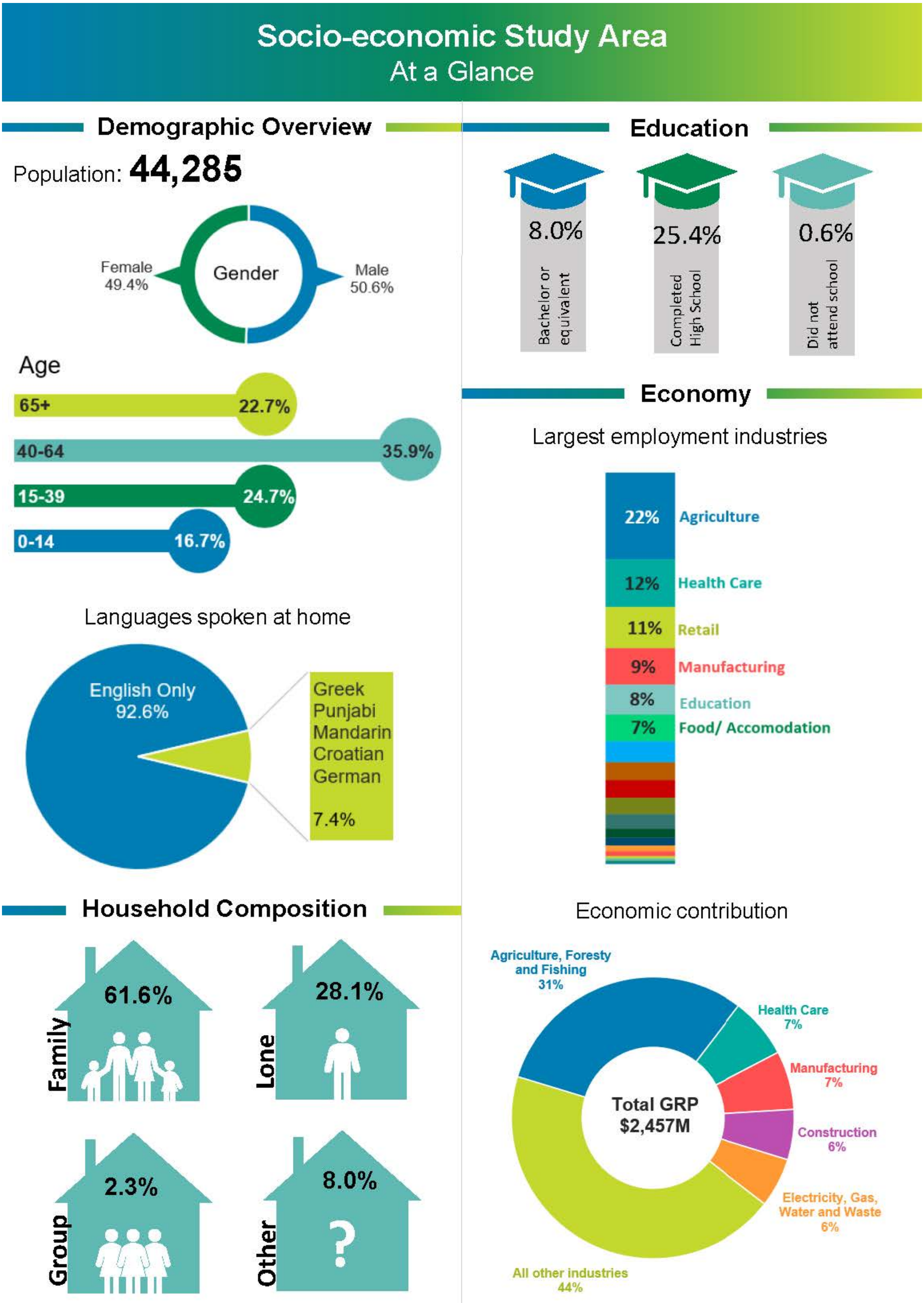



Figure 17-6: Socio-economic study area at a glance

### 17.3.3. Population and demography

Five key indicators inform the population and demography character of the study area – population, age, gender, language spoken at home, and education. The specific data for each LGA in the study area is provided in Appendix N and is summarised here[4].

#### Population trends

The total population across the study area is approximately 44,300 and there has been no significant change between 2006 and 2016, increasing only 0.2% over that period, compared to the state-wide increase of 11%. Populations by LGA have decreased in Goyder, Loxton Waikerie and Berri Barmera, remained stable in Renmark Paringa, and grown in Mid Murray. Loxton Waikerie, Berri Barmera and Renmark Paringa all experienced population decreases between 2006 and 2011 but had recovered slightly by 2016 (refer Figure 17-7).

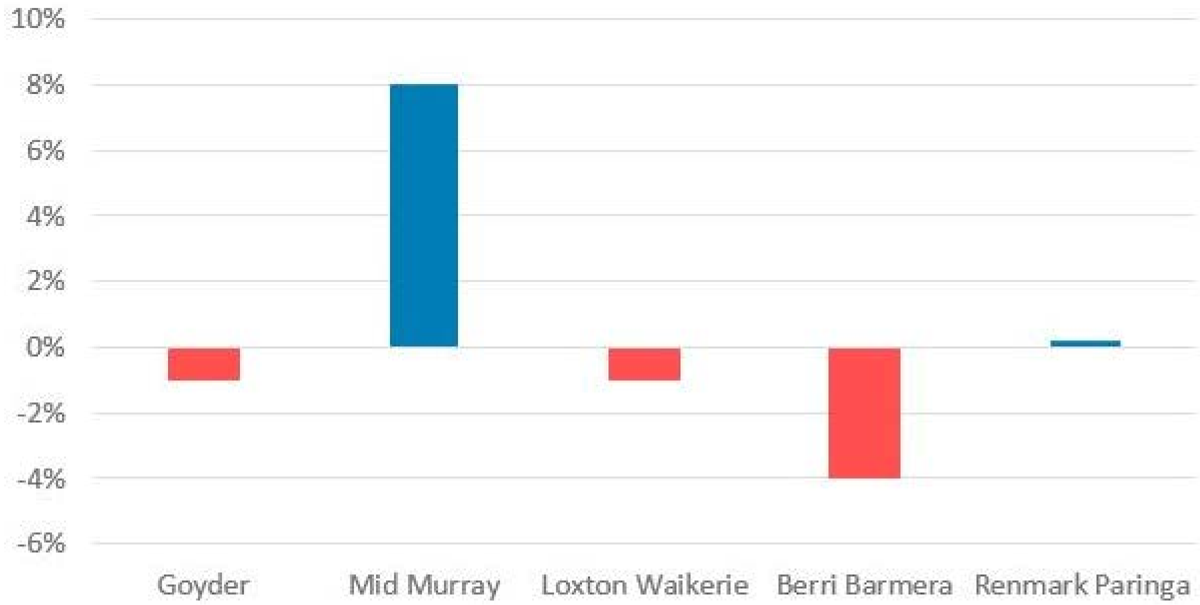



**Figure 17-7: LGA population change 2006 – 2016**
Source: ABS 2017a

Similarly mixed trends are apparent at the local level between 2011 and 2016, as shown in Table 17-4, with small population increases in the townships of Renmark, Morgan and Barmera, a small decrease in Berri and no change in Waikerie. Robertstown experienced a population decline in the period, while Cooltong and Cadell had population increases.

While there is limited information available to explain these population trends at the local scale, slow growth and population decline in the Riverland has been attributed to the outward migration of residents due to limited opportunities and a decline in irrigation (SA CES, 2012).

**Table 17-4: Population change in townships 2011 to 2016**

| Township / community | LGA | Census year population | | Population change |
|---|---|---|---|---|
| | | 2011 | 2016 | |
| Robertstown[1] | Goyder | 336 | 248 | -26% |
| Morgan[2] | Mid Murray | 323 | 339 | +5% |
| Cadell[1] | Mid Murray | 441 | 548 | +24%[3] |

[4] The data presented is representative of the broader regional area. The local Project context is expected to be more representative of a rural population and demographic.

| Township / community | LGA | Census year population 2011 | Census year population 2016 | Population change |
|---|---|---|---|---|
| Waikerie[2] | Loxton Waikerie | 1,633 | 1,632 | 0% |
| Barmera[2] | Berri Barmera | 1,914 | 1,939 | +1.3% |
| Berri[2] | Berri Barmera | 4,103 | 4,088 | -2.3% |
| Renmark[2] | Renmark Paringa | 4,387 | 4,634 | +5.6% |
| Cooltong[1] | Renmark Paringa | 317 | 333 | +5% |

[1] SSC
[2] UCL
[3] The increase shown is likely to be exaggerated due to an increase in the SSC area between 2011 and 2016

### Age and gender trends

All LGAs in the study area have older populations with a lower proportion of people in the 25 to 39 year age bracket compared to South Australia as a whole. Mid Murray has the oldest population with the lowest number of young people and children (0 – 24 years) (refer Figure 17-8). The population change in the study area among age groups between 2011 and 2016 also reflects an ageing population demographic with four of the five LGAs experiencing an increase in the 65 years and over age group greater than the State as a whole (refer Figure 17-9).

The likely explanation for the age distribution in the study area is a reflection of wider trends across regional Australia, as young people seek educational and employment opportunities in larger regional and metropolitan centres, and older urban populations migrate into rural landscapes and small regional towns (Luck *et al*. 2010, URS and URPS 2013).

The gender ratio across the study area was generally equal, with a slightly higher proportion of males in the populations in Goyder and Mid Murray, even distribution in Loxton Waikerie and Berri Barmera, and a slightly greater proportion of females in Renmark Paringa.

The gender ratio varies between communities in the local context with Robertstown, Waikerie, Barmera, Berri and Renmark having higher proportions of females, and Morgan, Cadell and Cooltong having higher proportions of males. The proportion of males in the community of Cadell is significantly higher than females (73 % to 27 %) which reflects small population size and the data influence of the Cadell Training Centre which accommodates male low security prisoners.

### Population density

Assessing the population density of townships and LGAs for the region is complicated by the various geographical boundaries for Census statistical areas. Figure 17-10 shows the available data (ABS 2017a) to provide the broad context of population density in the Riverland region.

Higher density population centres are in the LGAs of Renmark Paringa and Berri Barmera. As noted previously, the alignment does not traverse any population centres, and is distant from most local communities and townships, except for the irrigated horticulture area of Cooltong. Figure 17-2 to Figure 17-5 provide aerial representations of the density of housing and road infrastructure within townships closest to the transmission line corridor.

Due to the rural and conservation land uses along the proposed alignment, population density in the local area proximate to the alignment is very low.

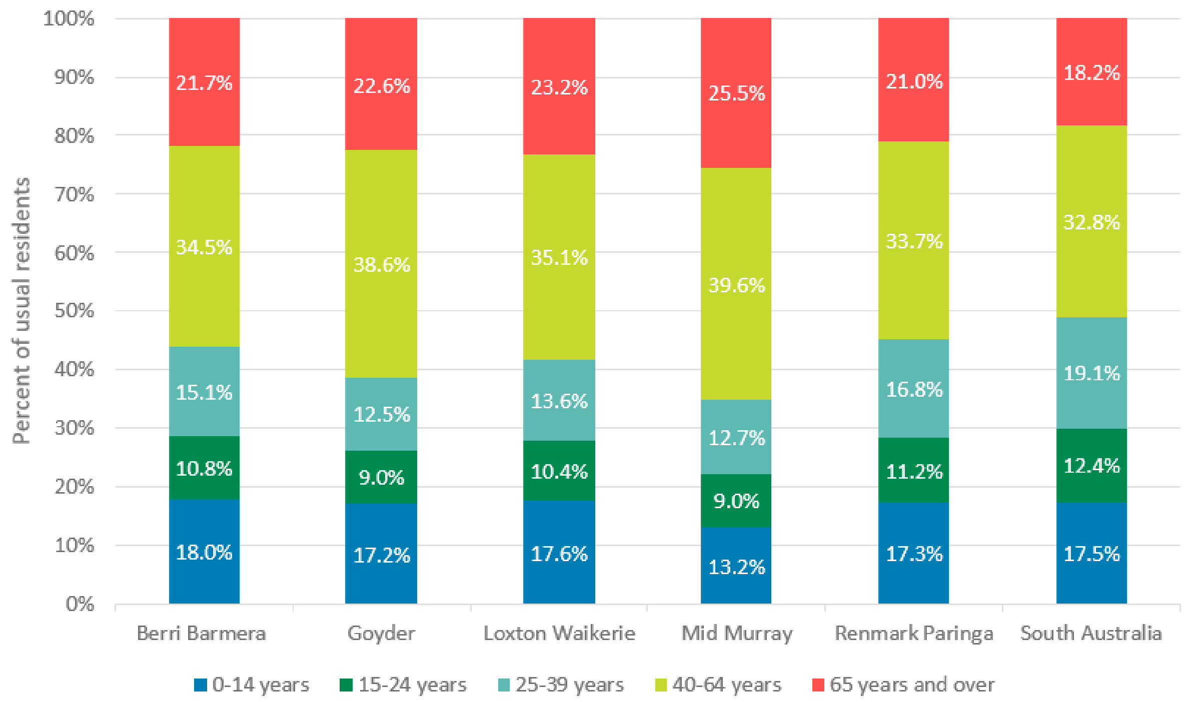



**Figure 17-8: Age group profiles in study area and South Australia**

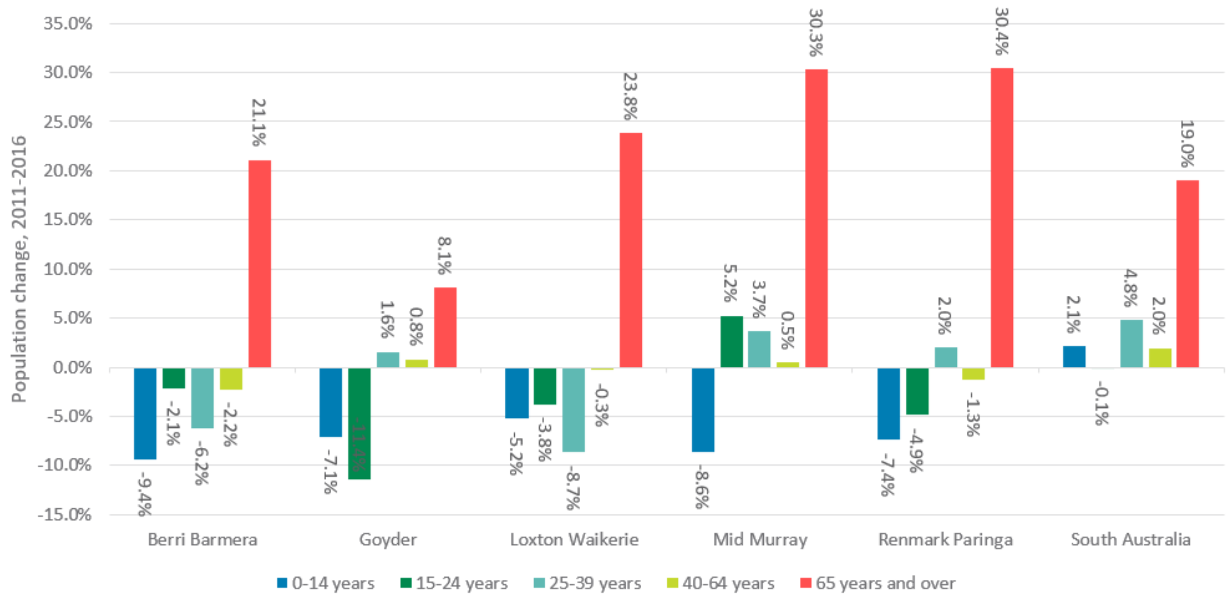



**Figure 17-9: Population change among age groups in the study area and South Australia (2011–2016)**

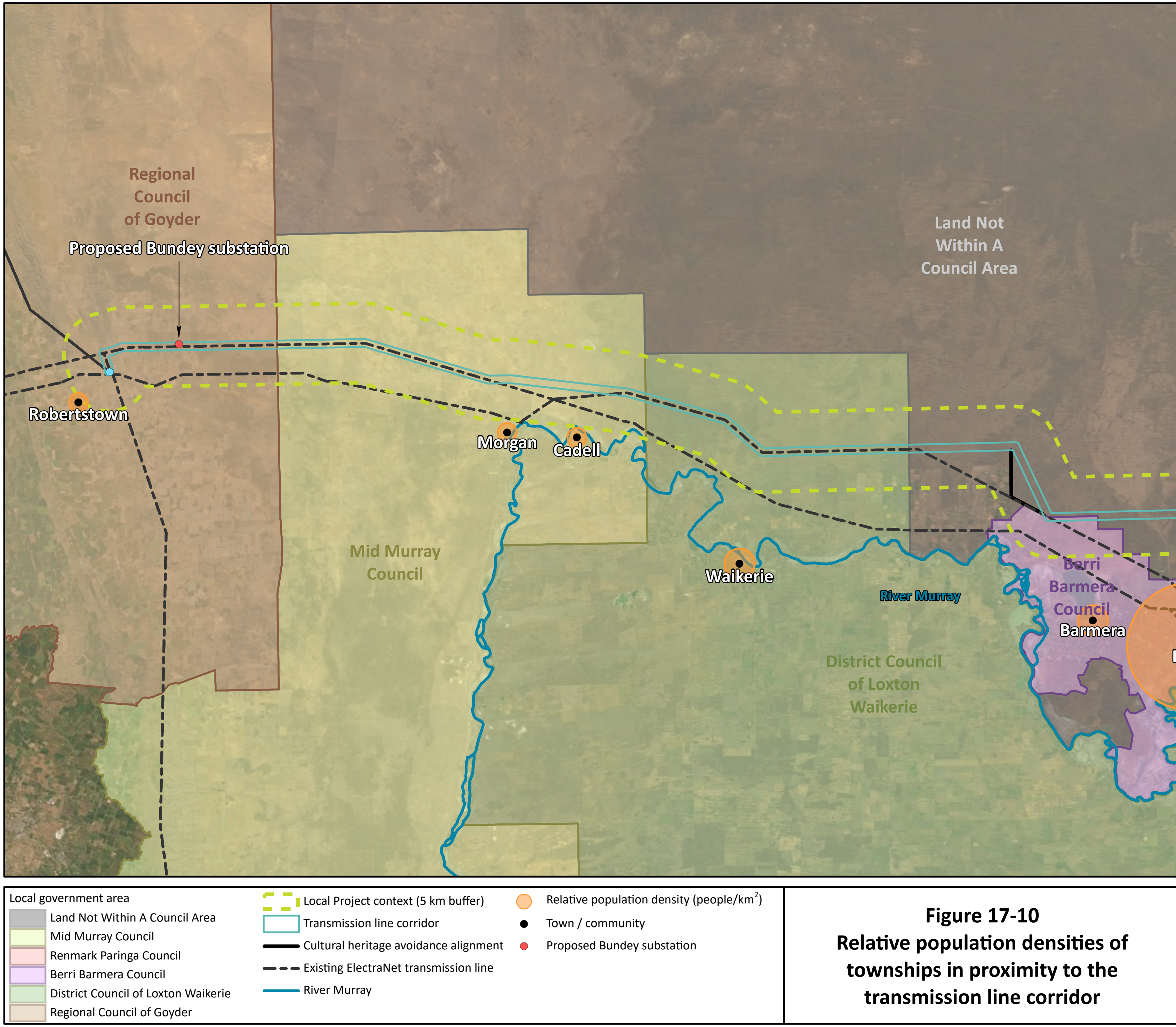



**Figure 17-10**
**Relative population densities of townships in proximity to the transmission line corridor**

### Language and education trends

Across the study area, the proportion of the population speaking English as a main language is approximately 93%, which remained relatively stable between 2006 and 2016. At the local scale, the change in the percentage of people who speak English at home over that period varies between no change in Barmera to a 4% decrease in Berri and Waikerie indicating that the broader region is diversifying albeit at a slower rate than the rest of South Australia.

The proportion of the study area population with at least year 12 or equivalent level education has increased between 2006 and 2016 from 20 % to 26 %, with an increase in every LGA and local township. This increasing trend is comparable to the increase across South Australia, but remains a lower level of attainment than the State level of 40 % in 2016.

This level of educational attainment is generally consistent with rural populations across the State when compared to metropolitan centres and may reflect that many of the important industries in the study area (e.g. agriculture, horticulture, viticulture and animal husbandry are often multi-generational family businesses and do not necessarily require formal qualifications (James 2000). There is also a broad trend in the State of rural out-migration, with individuals seeking education and further formal qualifications in larger centres.

## 17.3.4. Households and families

Household and family data provide context for characterising the role and function of a population centre within the broader region, insight into population and settlement patterns, and act as an indicator of current and future demand for services. Figure 17-11 shows the types of households present throughout the LGAs in the study area, and those in all of South Australia.

While LGAs in the study area are broadly similar in household composition to the broader South Australian community, there are higher-than-average proportions of single person households and couples without children, and lower proportions of couples with children. This trend is likely due to the higher than average percentage of older couples in the area who have relocated for retirement or whose adult children have moved out of the family home.

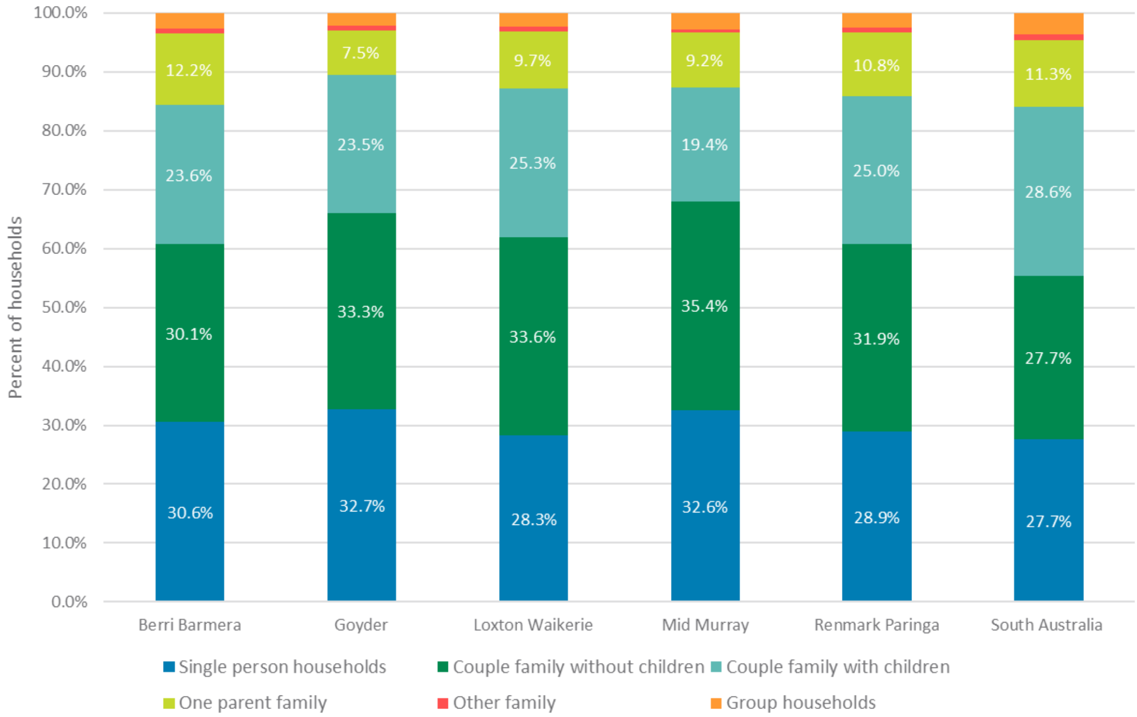



**Figure 17-11: Household types in LGAs and South Australia 2016**
Source: ABS 2017a

### 17.3.5. Housing and accommodation

The higher proportion of single-person households described in Section 17.3.4 corresponds to a lower than the State average number of people per household, particularly in the township of Morgan, which has an average of 1.9 people per household, compared to the State average of 2.4. Although population density is low in Cooltong, the proportion of people per household is higher than the State average, with an average of 2.6 people per household, and is the highest in the study area.

Across the study area residential property has become more expensive to rent and buy, mirroring trends across rural South Australia. There are regional differences in the number of residential vacancies across the study area but median weekly rent increases are comparable to the average increases across South Australia.

Table 17-5 provides a summary of housing types, occupancy rates, tenure and affordability in the LGAs in the study area.

**Table 17-5: Housing types, occupancy rates and tenure in study area LGAs, 2016**

| | Berri Barmera | Goyder | Loxton Waikerie | Mid Murray | Renmark Paringa | South Australia |
|---|---|---|---|---|---|---|
| **All private dwellings** | | | | | | |
| Total (number) | 5106 | 2203 | 5604 | **6754[1]** | 4506 | 765,786 |
| Occupied (%) | **88.5** | 80.3 | 84.8 | **54.6** | 87.2 | 87.4 |
| Unoccupied (%)[2] | **10.7** | 18.5 | 14.4 | **43** | 12 | 12 |
| **Dwelling structure (%)** | | | | | | |
| Separate house | **86.4** | 94.5 | 89.4 | **95.2** | 88.2 | 77.8 |
| Semi-detached, townhouse | **7.1** | 2.6 | 6.0 | **1.1** | 3.9 | 14.8 |
| Unit or apartment | 5.0 | **0.0** | 2.9 | 0.2 | **5.4** | 6.6 |
| Other dwelling | **0.8** | 1.6 | 1.1 | **2.6** | 1.6 | 0.5 |
| **Tenure (as %)** | | | | | | |
| Owned outright | **33.6** | 46.0 | 40.0 | **45.0** | 34.1 | 31.0 |
| Owned with a mortgage | 30.7 | **28.8** | 30.1 | **32.1** | 31.8 | 34.5 |
| Rented | **30.6** | 21.0 | 24.9 | **19.2** | 29.4 | 30.9 |
| Other / Not stated | **5.2** | 4.2 | 4.9 | **3.8** | 4.7 | 3.7 |
| **Affordability** | | | | | | |
| Median weekly rent ($) | **180** | **150** | 175 | 175 | 175 | 260 |
| Households where rent payments are less than 30% of household income (%) | **91.2** | **95.3** | 94.0 | 94.3 | 92.8 | 89.8 |
| Median monthly mortgage repayment ($) | **1083** | **867** | 1040 | 1000 | **1083** | 1491 |
| Households where mortgage repayments are less than 30% of household income (%) | 95.3 | **95.7** | 94.9 | **93.0** | 94.5 | 93.4 |

Source: ABS 2017a

[1] Bolded values indicate data extremes (e.g. highest and lowest values across the study area)

[2] Unoccupied dwellings includes holiday rental homes

#### Housing occupancy

Each LGA has a higher proportion of standalone houses than the State average, which is indicative of rural, less densely populated areas. Four of the five LGAs have similar occupancy rates to the State average; the exception being Mid Murray, which had the lowest occupancy rate. The Mid Murray LGA includes a 220 km stretch of the River Murray, and as such contains a significant number of holiday rental homes which do not experience full-time tenancy.

### Housing availability

The vacancy rate provides an indication of the availability of rental housing and the capacity of the housing rental market to absorb increased demand, with a vacancy rate of three percent generally accepted as the market being in balance (OnProperty 2020). Across the broader region, vacancy rates at the time of the assessment are very low at 0.5 %, after a recent peak of 1.5 % in April 2020 (SQM Research 2021). A low vacancy rate indicates there is a potential undersupply of housing.

The number of residential vacancies within the study area has generally declined between 2014 and 2019 with a mixed picture at the LGA level[5]. Loxton Waikerie and Renmark Paringa have experienced an increase (albeit off a low base in 2014) while Goyder, Mid Murray and Berri Barmera all experienced declines. Goyder has the lowest number of vacancies. Further detail is provided in Appendix N.

### Housing affordability

Similar to wider rural South Australia, median house prices in Loxton Waikerie, Berri Barmera and Renmark Paringa increased between 2014 and 2019. In particular the increases in Berri Barmera and Renmark Paringa were around six times the State average, suggesting a spike in demand that is not being met by supply. As discussed, the demographic trends show an increasing proportion of older residents in these LGAs between 2011 and 2016, suggesting more older people are seeing these regional areas as favourable to live in. Median house prices decreased marginally between 2014 and 2018 in Goyder and Mid Murray.

Despite the increases in Berri Barmera and Loxton Waikerie, the proportion of households where mortgage repayments are over 30% of household income (a general measure of financial difficulty; ABS 2017a) is still generally lower than the South Australian average.

Across the study area, the median weekly rent paid by households increased from $115 per week to $184 per week (+60%) between 2006 and 2016. By comparison, in South Australia as a whole the median weekly rent has increased from $150 per week to $260 per week (+73%) over the same period. The lowest median weekly rents are paid in Goyder and the highest median weekly rents are paid in Berri Barmera.

### Visitor accommodation

A range of visitor and short-term accommodation options are available across the study area, and specifically in the Riverland townships along the River Murray to the south of the transmission line corridor.

The Riverland region receives 1.35 million visitor nights per annum, with 85% comprising domestic visitors (i.e. intrastate / interstate) (SATC 2020a). The holiday sector generates nearly 60% of visitor nights, with other significant generators being visiting friends and relatives and visitors for business. Accommodation types most utilised by domestic visitors are caravan parks and camping grounds (40%), friends or relatives (27%) and hotels / motels and other commercial accommodation (19%).

The peak for accommodation occupancy (hotels, motels and serviced apartments) is in May and October with occupancy rates of 49%, and is lowest December (under 40%). As occupancy at riverfront caravan parks and houseboats is generally considered to peak during the summer school holiday period, overall the winter months would be expected to experience the lowest seasonal visitor accommodation occupancy (SATC 2015).

[5] This data is reliant on publicly listed residential vacancies, and may exclude privately available vacant properties, or those targeted more narrowly (listed on social media, or offline on community notice boards, etc).

### 17.3.6. Employment, income and industry

#### Labour force participation

Labour force participation data within the study area presented in Table 17-6 shows a lower participation rate compared to South Australia. The lowest participation was experienced in the Mid Murray LGA, which correlates to the older demographic (see Section 17.3.2) with the lowest number of young people and children as compared to the other LGAs.

Labour force trends across the study area show lower rates of unemployment than the State average, lower overall labour force participation and a higher proportion of the labour force away for work.

**Table 17-6: Labour force participation in the study area and South Australia, 2016**

| Labour force participation (%) | Berri Barmera | Goyder | Loxton Waikerie | Mid Murray | Renmark Paringa | South Australia |
|---|---|---|---|---|---|---|
| **Worked full-time** | 55.6 | 52.8 | 55.8 | 52.7 | 54.9 | **53.9** |
| **Worked part-time** | 32.5 | 34.2 | 33.5 | 35.1 | 32.4 | **33.5** |
| **Away from work** | 5.1 | 6.8 | 5.9 | 5.7 | 5.7 | **5** |
| **Unemployed** | 6.8 | 6.3 | 4.7 | 6.5 | 6.9 | **7.5** |
| **Total labour force participation (number)** | 4,630 | 1,818 | 5,244 | 3,514 | 4,369 | **806,589** |
| **Total labour force participation (% of total population)** | 43.91 | 43.96 | 45.65 | 40.66 | 46.11 | **48.11** |

Source: ABS 2017a

#### Unemployment trends

The unemployment rate has increased in the study area between 2006 and 2018 from 4.9% to 5.6%. In comparison, the unemployment rates in South Australia as a whole were 5.2% and 5.7% respectively. The unemployment rate has generally been lower in the study area relative to the State, with the exception of 2011 when the agriculture-dominated economy in the study area was recovering from the millennium drought and subsequent drought-breaking weather events (DEW 2021b). Between 2006 and 2018, the unemployment rate increased in all study area LGAs with the exception of Mid Murray, where the unemployment rate decreased from 5.8% in 2006 to 5.4% in 2018. This lower unemployment rate, along with the lower overall labour force participation, is likely indicative of the older population discussed in Section 17.3.2.

#### Income trends

Table 17-7 summarises personal, family and household incomes for each LGA in the study area and South Australia in 2016. Each income measure is lower in all of the LGAs compared to the South Australian average, suggesting a general employment outlook offering lower incomes within the study area. The general trend in income growth is also lower throughout the study area, with the exception of Goyder and Mid Murray, which may be explained by increases in higher-paying industries such as mining and construction.

**Table 17-7: Median weekly incomes in the study area and South Australia, 2016**

| | Berri Barmera | Goyder | Loxton Waikerie | Mid Murray | Renmark Paringa | South Australia |
|---|---|---|---|---|---|---|
| **Personal ($)** | 533 | 481 | 552 | 473 | 550 | 600 |
| **Family ($)** | 1,252 | 1,184 | 1,286 | 1,096 | 1,256 | 1,510 |
| **Household ($)** | 976 | 891 | 1,005 | 839 | 1,016 | 1,206 |

Source: ABS 2017a

Across the LGAs in the study area, the proportion of the population earning over $104,000 per year has increased from around 1% to 2.4% between 2006 and 2016, which is a much lower rate of increase than South Australia (1.8% to 4.6%). At the local level, the largest increase (2.7%) occurred in Morgan, where in 2011 none of the population were regarded as high income earners. Small increases were also seen in Renmark, Barmera, Berri and Waikerie.

The trends towards lower weekly incomes and lower proportion of high income earners may also be the result of a larger demographic relying on residual or fixed incomes, such as retirees.

#### Industry of employment

Agriculture is the largest employer of people within the study area, with 21% of employees occupied in the agriculture, forestry and fishing sector. This is followed by health care and social assistance, retail trade, manufacturing, education and training and accommodation and food services[6]. These six sectors account for 66% of the employed persons in the study area and overall, employee numbers have increased by 3% between 2006 and 2016.

Growth trends in employee numbers in the study area between 2006 and 2016 have been in health care and social assistance, education and training and accommodation and food services. While agriculture has traditionally been the most prominent industry, it is in decline as far as total jobs available (BDO EconSearch 2020). This is likely due to technological advancements in agricultural practices potentially superseding roles, and employment of an increasingly casualised seasonal workforce (e.g. vintage / fruit picking) in the region. The rise in health care and social assistance work is likely a market response to the aging population amongst the LGAs. Manufacturing and retail have also declined over the studied period.

Although data is not available for the local Project context, the desktop assessment indicates that the key industry of employment for people within and in proximity to the majority of the transmission line corridor is also likely to be agriculture, given the identified land uses and the greater distance to townships which might preclude involvement in other industries of employment.

### 17.3.7. Economic profile

#### Gross Regional Product

Gross regional product (GRP) is a measure of the net contribution of an activity to the regional economy and is measured as value of output less the cost of goods and services (including imports) used in producing the output.

GRP is valued in the study area is valued at $2.4 billion of which agriculture makes up 31% ($753 million). This is followed by health and social assistance ($171 million, 7% of GRP), manufacturing ($165 million, 7%) of GRP), construction ($142 million, 6% of GRP) and electricity, gas, water and waste ($139 million, 6% of GRP). In aggregate, these sectors contribute $1,370 million to GRP in the study area (56%). GRP estimates by industry sector in the study area in 2017–18[7] are presented in Figure 17-12.

[6] It should be noted that Tourism is not a single industry sector, but is an activity that draws upon a number of industries such as Accommodation and Food Services, Retail Trade, Transport. Accordingly it is not discussed as a separate industry of employment.

[7] The estimates are derived from the economic model developed for the Study Area and are not available for smaller geographies, e.g. LGAs, townships or communities in the Study Area.

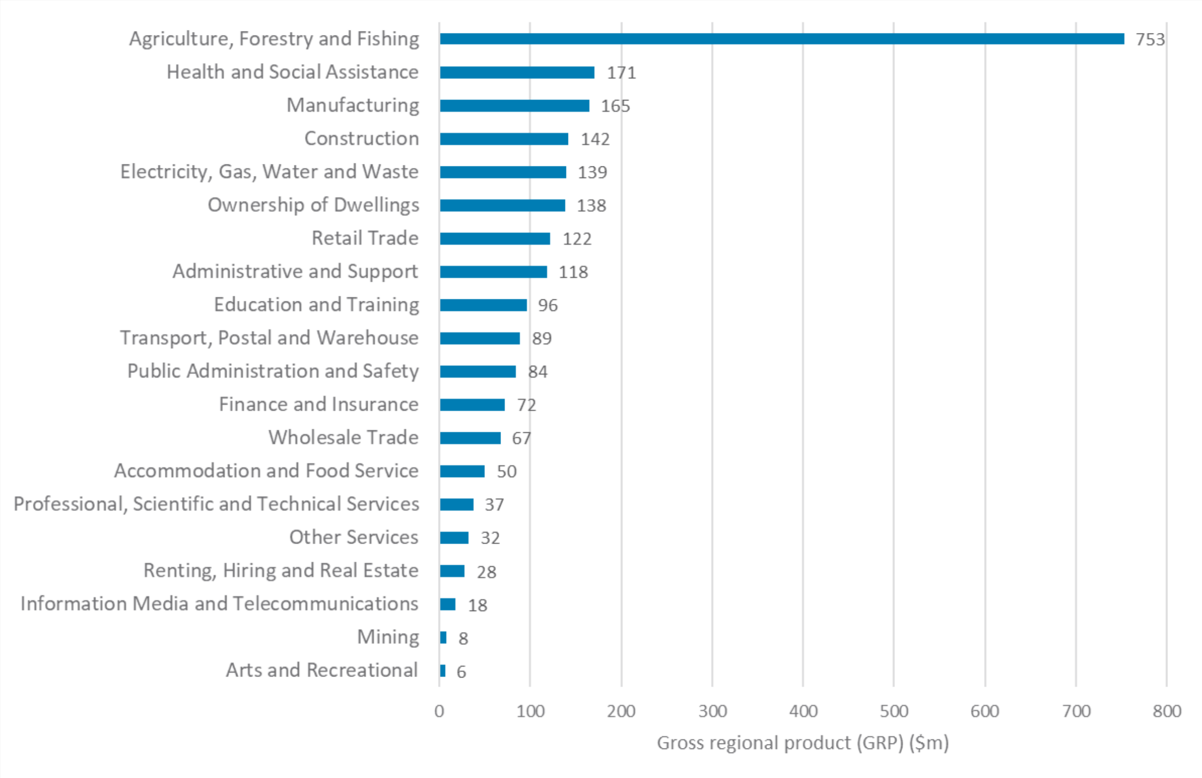



**Figure 17-12: Gross Regional Product by industry in the study area ($m), 2017–2018**
Source: BDO EconSearch analysis (Appendix N)

## Agriculture

Data from the 2015 – 2016 Agricultural Census (ABS 2017b) indicated that the total value of agricultural output in the Riverland region[8]was $93 million. The largest contributors to agricultural output were grapes (29%) and citrus fruit (23.2%).

The Riverland region also produces 97.3% of the citrus fruit and 95.1% of the nuts produced in South Australia as a whole by produce value (ABS 2017b). Figure 17-13 shows the value of agricultural production by commodity type in the Riverland region.

Agricultural produce was also the largest industry in terms of total exports by industry sector for the region, accounting for 48.1% of the total region exports, at a value of approximately $752 million (ABS 2017b).

Agriculture (primarily grazing of marginal agricultural land at the western end of the alignment) is the primary land use within the transmission line corridor (refer Chapter 9 Land Use and Tenure). Although economic data is not available at this local scale, it is expected to be the largest industry in the local context in terms of GRP and employment.

[8] Note: to present a more accurate profile of the economy of the region and communities proximate to the Project with regard to agriculture, the data presented here focuses on the four LGAs which make up the Riverland region and excludes data from the Goyder LGA.

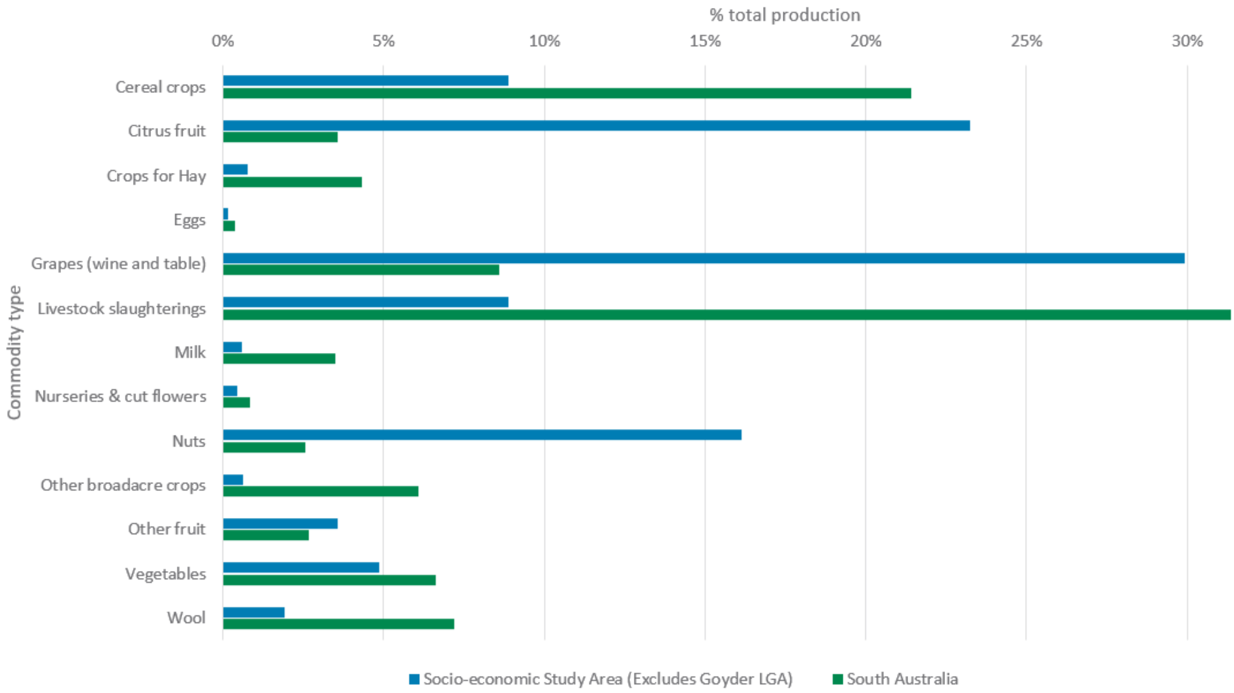



**Figure 17-13: Value of agricultural production in the Riverland region 2015–2016**
Source: ABS 2017b

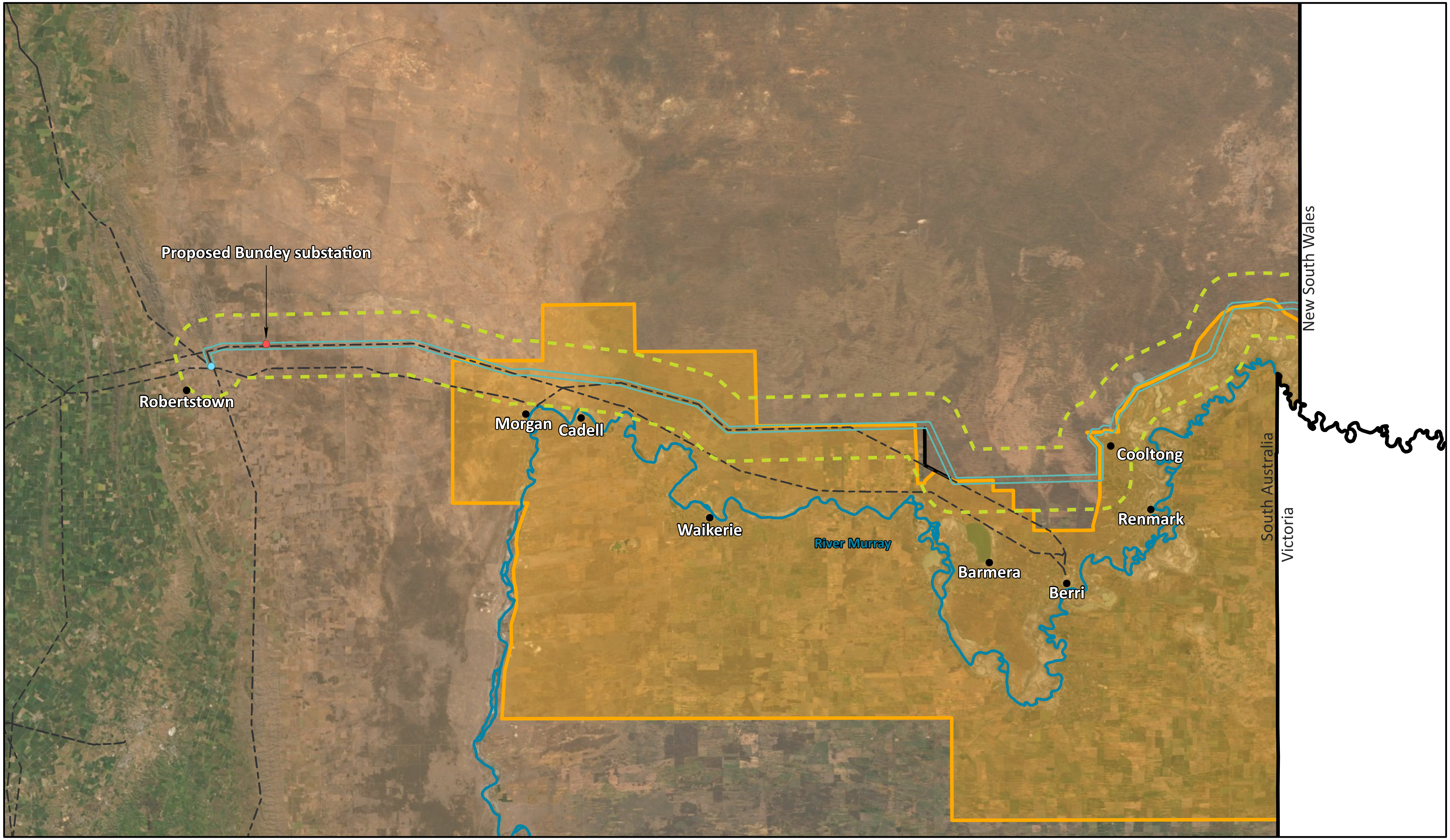
## Tourism

### *Regional*

A large part of the study area encompasses the Riverland region (refer Figure 17-14) with many of the tourism activities in the region centred on the River Murray. Recreational activities include houseboating, water skiing, kayaking / canoeing and fishing. Ecotourism is also popular in the region with stargazing, birdwatching, camping, hiking and sunrise / sunset experiences promoted as key ecotourism activities. River Murray history, Riverland produce, beverages and local community events also bring visitors to the region. A range of activities are available in many of the local townships, particularly those in proximity to the river, and are described in Appendix N.

As the tourism activities which focus on local townships along the River Murray are not in proximity to the transmission line corridor they are not described further here.

The economic contribution of tourism in the study area is driven by expenditure and can be quantified in terms of GRP and employment generated by tourism activity and associated flow-on effects. Although important locally, tourism does not play a large role in terms of economic contribution to GRP across the study area. Visitors to the study area spend around $8.1 million each year which generates around 55 fulltime equivalent jobs (including 16 from flow-on effects) and $5.3 million in GRP (including $1.9 million from flow-on effects) compared with Agriculture, which contributes approximately $753 million to GRP in the study area (see Appendix N).




- Transmission line corridor
- Local Project context (5 km buffer)
- Indicative Riverland region
- Cultural heritage avoidance alignment
- Existing ElectraNet transmission line
- River Murray
- Proposed Bundey substation
- Existing Robertstown substation

0 20
Kilometres

N

**Figure 17-14**
**Indicative Riverland region**

ElectraNet | project energy connect | JBS&G

*Local Project context*

Calperum Station and Taylorville Station are pastoral leases situated along the central and eastern section of the transmission line corridor (Plate 17-1). The properties are important locally, nationally and internationally because of their intact mallee vegetation which provides habitat for populations of threatened bird species, and wetlands and related species. Both stations provide opportunities for scientific research, educational (including schools) and training programs, and recreational activities including camping, picnicking, bush walking, canoeing and bird watching (DAWE 2020b).

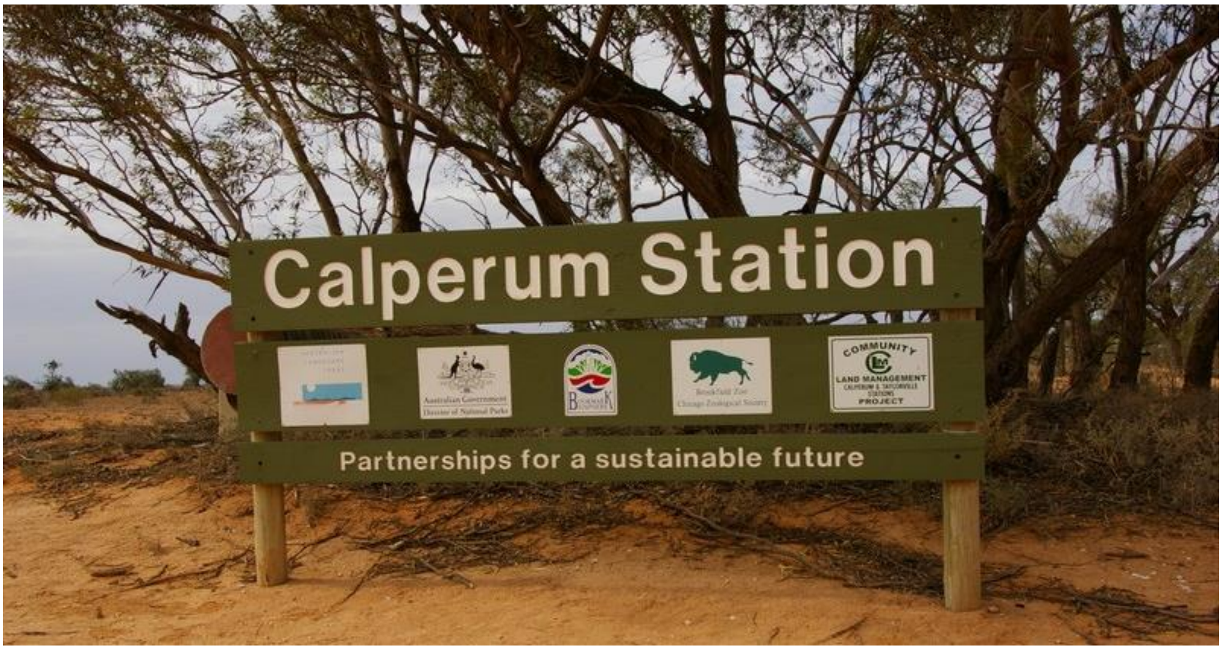



**Plate 17-1: Entrance to Calperum Station**

Chowilla Game Reserve and Regional Reserve which is situated 50 km north of Renmark comprises mallee, floodplain and wetland regions along the River Murray, and forms part of the Riverland Biosphere Reserve (Plate 17-2). Activities offered include camping, bush walking trails, canoeing and fishing (SATC 2020b).

**Plate 17-2: Creekside campsite – Chowilla Game Reserve**
Source: National Parks and Wildlife Service, South Australia

#### Renewable energy projects

There are a number of renewable energy projects in construction or due to start soon in proximity to the study area which are largely being driven by the establishment of the Mid North and Riverland Renewable Energy Zones and the proposed construction of the interconnector (refer Figure 2-5 and Chapter 2 Justification).

The Solar River Project Phase 1 and 2 is located 30 km from Robertstown, Stage 1 is expected to commence in late 2021 while Stage 2 will commence beyond 2022. The Robertstown Solar project, located 5 km north-east of Robertstown, is expected to commence beyond 2022.

The start date of a number of other significant renewable energy projects remains unclear, including the Riverland Solar Farm and Storage project located east of Morgan and the proposed Goyder renewable energy hub, comprising 1,200 MW of wind energy, 600 MW of solar PV, and 900 MW of battery storage.

Incorporation of these REZs was central to the transmission line corridor studies, assessment of alternatives to the Project and the route evaluation process. These projects would be reliant on the approval and construction of the interconnector.

Further discussion of renewable energy and the REZs is provided in Chapter 2 Project Justification and Chapter 9 Land Use and Tenure.

### 17.3.8. Social services and facilities

#### Health facilities

The Riverland General Hospital and Loxton Hospital Complex are the two most significant primary care health facilities in the region, as well as those most directly servicing the study area. All of the major townships in the study area have dental surgery facilities and general practitioners, and at least one optometrist services each LGA. The Study Area is covered by the mental health services of Country Health SA, and the Rural and Remote Distance Consultation and Emergency Triage and Liaison Service.

#### Education and childcare

Childcare, preschool, primary school, and secondary school facilities are widely available with 34 primary schools and eight secondary schools within the study area.

The overall student-to-teacher ratio in the study area is 11.2 students per teacher, which is moderately better than the 2018 South Australian average of 13.7 students per teacher. The vast majority of students in the region are enrolled in government schools (86.1%) when compared to the South Australian average (65%). Gender ratios in students are approximately equal (49.8% female) as the South Australian average (49.0% female).

#### General services and facilities

A range of general services and facilities are available in the townships and communities within the study area.

The bigger townships of Waikerie, Barmera, Berri and Renmark provide a wide range of services and facilities due to their larger populations and function as River Murray tourism centres. Renmark in particular provides for the wider range of medical services associated with the local hospital, as well as major supermarket chains, emergency services and police, post office, recreation and sporting facilities and education facilities.

Of the centres closer to the transmission line corridor, Morgan provides a range of shopping supplies, recreational areas and facilities and includes a medical centre, chemist, hardware, post office, police station, Country Fire Service station, and ambulance station. The smaller townships and of

Robertstown, Cadell and Cooltong have limited facilities due to the low density of housing in these communities, lower levels of tourism visitation and proximity to larger centres in the region.

### 17.3.9. Social character, health and wellbeing

#### Crime and safety

Raw crime statistics are compiled and reported on a financial year basis by the South Australia Police (SAPOL). These have been translated into a ratio of offences per 1,000 residents to allow comparisons between the study area and South Australia. In addition, the Public Health Information Development Unit (PHIDU) tracks 'feelings of safety' indicators (e.g. feeling safe walking alone after dark), which are also presented.

The lowest overall crime rate per 1,000 residents was in Goyder (16.68). The highest was in Renmark Paringa (57.20), which was also the only study area that fell above State average (53.31). Goyder and Mid Murray fell well below State average, likely due to being more remote and sparsely populated, and less convenient as targets for criminal activity (BCSR 2001). Conversely, Renmark Paringa and Berri Barmera reported relatively high crime statistics, but also contain the largest concentrated population centres in the region.

#### Health

General health indicators sourced from the PHIDU (PHIDU 2019) have been used to summarise the general health characteristics of the study area. These include fertility rate, chronic disease and chronic disease risk factors, age of death and avoidable deaths, and incidence of disability.

- All of the LGAs were above the South Australia birth rate of 1.9%.
- Renmark Paringa had the highest prevalence of diabetes (7.7 per 100), while Goyder had the highest prevalence of high cholesterol, and Berri Barmera had the highest prevalence of mental and behavioural disorders. Each of the areas were reasonably similar for other chronic diseases.
- All of the LGAs generally had higher levels of risk factors for chronic disease such as smoking, high risk alcohol use or obesity than the State as a whole.
- The mean age at death was similar across the LGAs but up to 3 years lower than the State-wide average (82). The LGAs also had higher rates of avoidable deaths than the State (120.7 per 100 000 deaths).
- Incidence of disabled residents across all of the LGAs is higher than the state incidence (6.3%).

The aging population may account for the increased rates of disability, whilst the relative remoteness of the study area is likely to be an influence in median age at death and avoidable death. For example, speed of emergency response may be compromised by distance, particularly in rural areas with sparsely distributed populations. The proportion of the population living or working alone can also affect emergency response. There is also a documented discrepancy between the rate of harmful lifestyle choices such as smoking and high-risk alcohol use in urban as compared to rural areas. The National Rural Health Alliance (NRHA) has discussed a range of factors contributing to this, including a lack of recreation venues, stoic attitudes regarding help-seeking, as well as economic and employment disadvantages (NRHA 2014 and 2016).

#### Community support

To understand levels of community support, the LGAs were compared on voluntary work and the ease of obtaining support from outside their household, as well as an overview of the community support structures such as community groups. Goyder had the highest levels of residents undertaking voluntary work (34.3%), while Renmark Paringa had the lowest (21.3%), which was in line with the

State-wide average (21.4%). The highest rates of volunteer work were among the smaller population areas.

The majority of the LGAs had high level of residents able to get support outside their household in times of crisis, ranging from 93.0% to 94.5% which was in line with the State figure of 93.9%. This reinforces that although the region may be sparsely populated and relatively remote, this has not affected the availability of interpersonal support structures to residents.

### 17.3.10. Advantage and disadvantage indicators

The ABS Socio-Economic Indexes for Areas (SEIFA) comprises indexes that summarise different aspects of socio-economic conditions and relative advantage and disadvantage of people living in an area in terms of their access to material and social resources, and their ability to participate in society (ABS 2018). This assessment is discussed below and shown in Figure 17-15.

- Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD) is derived from census variables related to both advantage and disadvantage. An area with a high score on this index has a relatively high incidence of advantage, and a relatively low incidence of disadvantage.
- Index of Relative Socio-Economic Disadvantage (ISRD) focuses primarily on disadvantage and is derived from census variables such as low income, low educational attainment, unemployment and dwellings without motor vehicles. A low score on this index indicates a high proportion of relatively disadvantaged people in an area.
- Index of Economic Resources (IER) focuses on financial aspects of advantage and disadvantage, and is derived from census variables relating to residents' incomes, housing expenditure and assets. Areas with higher scores have relatively greater access to economic resources than areas with lower scores.
- Index of Education and Occupation (IEO) includes census variables relating to educational attainment, employment and vocational skills. A low score indicates that an area has a high proportion of people without qualifications, without jobs, and / or with low skilled jobs. A high score indicates many people with high qualifications and / or highly skilled jobs.

#### Advantage and disadvantage assessment:

- Among the study area LGAs Goyder and Loxton Waikerie had the highest relative scores ranking them at 24 and 22 respectively out of the 70 State LGAs. The lowest relative score within the study area was for Berri Barmera with a rank of 10 out of 70 (indicating there are only 9 other LGAs within SA that have a lower score).
- Loxton Waikerie had the highest relative score for ISRD and a rank of 23 out of 70, while Berri Barmera had the lowest with a rank of 10 out of 70.
- As with the overall score, Goyder and Loxton Waikerie LGAs had the highest relative ranking for IER (31 and 29 respectively out of 70) and the study area LGA with the lowest relative score was for Berri Barmera with a rank of 14 out of 70.
- Goyder also had the highest relative score and a rank of 35 out of 70, while Renmark Paringa had the lowest relative score and a rank of 7 out of 70.

***Summary***

- All LGAs in the study area were in the bottom 50% of LGAs in South Australia on the four indices assessed.
- The most common index decile showed the study area in the bottom 20% of LGAs in South Australia.

These rankings indicate that the Project region is generally lagging behind the rest of South Australia in terms of advantage opportunities, economic resources, and educational and occupational skills.

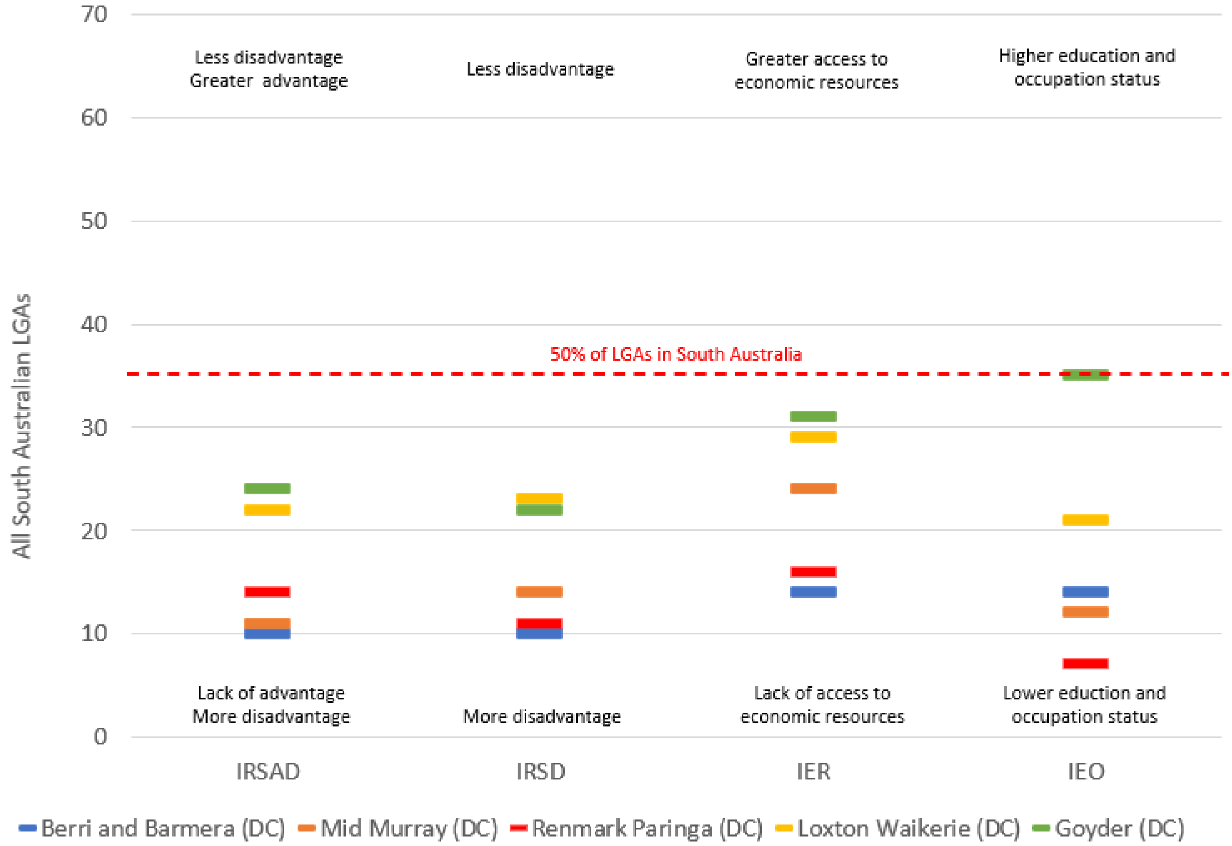



**Figure 17-15: Advantage and disadvantage indicators: study area LGAs against all South Australian LGAs**

## 17.4. Impact Assessment

The following aspects of the Project have been identified as sources of positive and negative impacts to the socio-economic environment:

### Construction

- requirement for workers and contractors
- accommodation of construction workers
- in-migration of workers during the construction period
- presence of construction crews, vehicles and equipment.

### Operation

- introduction of the interconnector to the region and the State
- permanent presence of transmission line and easement.

The potential impact events resulting from these aspects of the Project are discussed below.

### 17.4.1. Construction

#### Employment of local and other workers during construction

**Project construction activities are not expected to negatively impact the availability of labour for existing local businesses, increase wage costs or cause specific skill shortages.**

In addition to the direct jobs generated on construction sites, the construction and installation, and operation phases will require a range of locally sourced goods and services. Production of these inputs is expected to lead to an increase in the demand for labour across the South Australian economy. Project employment opportunities in the study area during Project construction have the potential to reduce the availability of labour for existing businesses, which could lead to a short-term increase in wage costs, or shortage of specific skills

The Project workforce engaged at any particular time is expected to vary throughout the course of the construction period, and may be as low as 20 during the early pre-construction phase, increasing to approximately 160 during the later stages of pre-construction and up to 250 during peak construction. Preference will be given to local labour where appropriate but this is largely dependent on the availability of the significant number of highly skilled workers that will be required to fill many of the positions.

A range of inputs were considered in assessing the impacts of the Project on local labour markets including availability of labour, the unemployment rate, low and high worker migration cases, the source of workers and a worst-case peak labour requirement of up to 250 workers. For the purposes of this assessment, it was assumed that around 90% of the construction labour requirement will be in highly specialised skill areas and would therefore likely to be sourced from outside of the study area (refer Appendix N).

As the number of employees which may be sourced from within the study area for Project construction is likely to be small, this is expected to have a temporary and **negligible** effect on the labour market, and associated labour market competition. Positions for workers from within the study area are also expected to be created which will have a **positive** impact on local employment during construction of the Project.

The operations of the interconnector are highly capital intensive rather than labour intensive when compared to other industries and therefore impacts to the local labour market are not expected during operation.

#### Accommodation of construction workers in local communities

**Temporary construction camps are likely to be used to accommodate the majority of construction workers.**

Accommodation of the significant number of Project construction workers who will be sourced from outside the region has the potential to put pressure on local rental accommodation markets (making housing less available and affordable to existing residents) and the visitor accommodation market (e.g. motels and caravan parks) during peak season.

To address these issues, the establishment of up to four temporary worker camps is proposed in locations already disturbed by development or in areas with limited native vegetation. These camps would be likely to accommodate the majority of the construction workforce. Impacts from the construction of the temporary construction camps and liaison with affected landholders are discussed further in Section 9.4.1.

As the distribution and progressive movement of the construction workforce along the proposed alignment, use of private rental accommodation in local communities on a short-term basis is not proposed or regarded as feasible. Travel times from local townships to locations on the proposed alignment will also place limits on the distance of accommodation from the alignment and may introduce road and other safety risks to Project workers and the local community.

Short-term use of visitor accommodation is also being considered in some circumstances during the construction period. Most local townships would have sufficient visitor accommodation vacancies to provide some of the construction worker accommodation requirements of the Project, however they are unlikely to have the capacity to accommodate the peak workforce of 200 – 250 personnel. If accommodation is required in local townships, this would most likely be in visitor accommodation in Morgan and Renmark. As noted previously, temporary and short-term visitor accommodation occupancy in the region is around 50% providing capacity to accommodate some of the construction workforce. In this case, engagement with local councils and potential accommodation providers will be undertaken by the construction contractors.

Due to the existing visitor vacancies in each LGA, the predicted impacts to visitor accommodation (if utilised) are expected to be in the **negligible** category. **No impact** on local housing and rental accommodation availability or affordability is expected during construction or operation as no use of local housing by workers from outside the study area is expected. Uncertainty in the predicted impact (based on uncertainty in the use of visitor accommodation) has been evaluated in Appendix O and the level of risk is **Low**.

### Presence of construction workforce in the community

**The accommodation of the construction workforce in the study area will be short term and temporary and impacts to social cohesion of local communities are not expected.**

The presence of the construction workforce in the region (up to 250 people in the peak construction period) has the potential to disrupt social cohesion in the communities where workers may be present, particularly as the majority of the construction workforce is likely to have been sourced from outside the region. The construction workforce would typically be largely male which is consistent with the gender composition of the existing population in the study area, and also have a younger age profile.

Any interactions with the local community are likely to be sporadic as the construction work roster would typically be undertaken in 12-hour shifts, seven days per week from 7am to 7pm. If required some workers may be accommodated in visitor accommodation in the Morgan and Renmark communities and may have occasional contact with the community while travelling to and from transmission line construction sites. The number of workers accommodated in this manner is likely to be small as a proportion of the overall construction workforce and would only be present in the community between shifts and for the limited duration of the construction works on the nearby sections of the alignment.

While on work rosters workers will have limited free time and would be likely to spend time between shifts in the temporary construction camp. During rostered time-off it is expected that workers would return to their usual place of residence. There may be opportunities for workers to visit or travel through communities on an ad hoc basis outside of work shifts but such visits are likely to be short-term, transient and infrequent. The frequency of interactions in a particular area will diminish and eventually cease over time, as the focus of construction activity moves along the length of the alignment.

Police resources are available in several centres (including Morgan Waikerie, Barmera, Berri and Renmark) along the length of the Project in the event that the presence of the construction workforce requires police attendance.

All ElectraNet employees, contractors and visitors who interact with members of the local community are expected to adhere to ElectraNet policies requiring respect for the cultural environments of the communities in which ElectraNet operates[9] (ElectraNet 2019b).

Accommodation of construction workers in temporary construction camps and / or visitor accommodation in the study area is expected to have a **negligible** effect on social cohesion in local communities. **No impacts** are expected during operation.

Positive attitudes of the community to the Project (as evidenced through feedback from community consultation and support of local Councils) will also mitigate any potential impacts to social cohesion. This impact is expected to be **negligible** during construction, and **no impact** is expected during operation. Uncertainty in the predicted impact (based on uncertainty in the use of visitor accommodation) has been evaluated in Appendix O and the level of risk is **Low**.

**Project construction activities will bring opportunities for business expansion and will not negatively impact provision of local social services.**

The presence of the construction workforce has the potential to place pressure on local services (e.g. social and medical services) and businesses, reducing availability to existing residents or shortages of business services to these communities (e.g. retail and recreation).

Any demand on local services by the construction workforce is expected to be occasional and ad hoc e.g. requirements for emergency services. Basic services for construction workers would be expected to be provided at their workforce accommodation e.g. dining, laundry and first aid / medical services. Other regular services would be accessed at their usual place of residence i.e. outside the region. No additional demands on education, childcare and family services are expected during the construction phase.

Similarly, local demand for business services by construction workers is expected to be minimal and it is expected that these services would be consumed primarily at their place of usual residence outside the region. Negative impacts on local services and business is expected to be **negligible** during construction. **No impact** is expected during operation.

The relatively highly paid construction workforce will generally reside within the temporary construction camps and their presence in the region will be short term and transient in locations along the alignment. The resulting change in the proportion of high income earners in the region is expected to be marginal These workers are assumed to primarily consume at their usual place of residence outside the region and **negligible** impact on local price inflation is expected in the study area under the worst-case assumptions (e.g. highest range of jobs to be filled locally).

The presence of the construction workforce (including a relatively highly paid workforce) and new consumption expenditure in the region associated with construction activities and locally employed Project workers may bring opportunities for expansion of local business / services. Local business opportunities would change over the various stages of the Project but businesses with the potential for benefit would be likely to include fuel supplies, transport and logistics (e.g. workforce transport if required) engineering and construction services (e.g. light earthworks, road and track maintenance) and supply of services, goods or consumables to camp accommodation.

Due to declining populations in the study area, it is anticipated that businesses and services would experience a benefit from a minor increase in demand. This impact is expected to be **minor** and **positive**. **No impact** is expected during operation.

[9] The ElectraNet Project Community Commitment Guideline outlines the key design and planning principles to be observed when developing potential strategies to mitigate minimise and redress impacts the impacts of a project on affected community-based stakeholders where possible, practical and reasonable.

### 17.4.2. Operations

Introduction of the interconnector to the State and regional economies

**Introduction of the interconnector will result in direct and indirect positive impacts to regional and South Australian economies through lower electricity prices and increased reliability of supply.**

Greater interconnection between electricity suppliers as a result of the Project will increase reliability of electricity supply and supply competition leading to greater reliability and downward pressure on electricity wholesale prices (refer Chapter 2 Project Justification for further discussion of broad Project benefits).

Projections of the broader economic effects on the region which hosts the transmission line and South Australia (with and without the Project), were modelled to provide a forecast of the total economic impacts of the Project (ACIL Allen 2019; Appendix N-1). The modelling found that the Project would result in a major positive economic impact, including benefits from increases in real economic output, real income and employment for the State and region.

***Real economic output***

Real economic output is the sum of the value added by all producers in the region / State plus any product taxes (minus subsidies) not included in output. At the State level this is referred to as gross state product (GSP). The Project is predicted to result in the following benefits for real economic output:

- Increase in real economic output equating to $2.1 billion (net present value) in the State over the period 2021 – 2040
- $120 million of this will occur in the SA host region[10] over the period
- $45 million of this will occur during the construction phase
- An average annual benefit of $4 million to the region is projected during the operations phase due to significantly lower SA electricity process.

***Real income***

The real income indicator is a measure of the ability to purchase of goods and services, adjusted for inflation. A change in real income from a development is a measure of the change in welfare of an economy. The Project is predicted to result in the following benefits for real income:

- Increase in real income equating to $2.4 billion (net present value) in the State over the period 2021 – 2040
- $163 million of this will occur in the SA host region over the period
- $82 million of this will occur during the construction phase
- Average annual benefit of $4 million to the region is projected during the operations phase.

***Employment***

The Project will generate jobs during the construction phase of the project as well as creating some ongoing employment in the South Australian economy. The Project is projected to lead to an increase in employment of approximately 250 full-time equivalent (FTE) ongoing jobs over the period 2021 – 2040. These jobs will mostly be mostly created during the construction phase in the region (approximately 200 job) and in the rest of the State during the operations phase.

The additional construction activity associated with the Project will have a noticeable effect on the regional economy in the construction years due to a movement of economic activity into the area.

[10] For the purposes of the modelling these are the areas of the Sate which will ‘host’ the interconnector

The region will also experience ongoing benefits once the interconnector is in operation due to the impact of projected savings in electricity prices on these local economies.

It should be noted that the analysis undertaken by ACIL Allen focussed on the direct economic impacts of the interconnector and did not consider benefits that might be expected to flow to the region through construction and operation of any new renewable generation projects in the region resulting from the presence of the interconnector.

It is expected that the Project will have **major, positive** impacts for electricity consumers within South Australia; and the multiplier effects of electricity prices on regional and SA economies are expected to have **major, positive** impacts.

### New regional investment

**The Project will enable greater market access to renewable energy generation in the region, resulting in further economic benefits to the communities in the study area.**

The RIT-T for the Project identified a potential benefit of the interconnector to be greater market access to renewable energy generation along the route. Support for solar and wind power regional investments was also identified as a strategic priority of Regional Development Australia Murraylands and Riverland. The Riverland REZ in particular was identified by AEMO in the 2018 and 2020 ISPs as one of the potential opportunities for development of renewable energy projects in conjunction with the transmission investment options (e.g. interconnection).

The economic effect on communities resulting from regional investment which will be enabled by the Project will be driven by the type, scale and location of likely investments as well as their likely operating employment and expenditure requirements. Investment in renewable projects in the target Renewable Energy Zones as a result of the presence of the interconnector may have a positive effect on the current low level of population growth by stimulating economic activity in the area, by influencing people to remain in the region or attract more to the region. Depending on the scale and location of such projects, the resulting generation of jobs and income would also be expected to provide a minor increase in the local standard of living.

Renewable energy generation projects currently proposed in the study area are in the Mid North and Riverland REZs in the vicinity of Robertstown, Morgan, Berri, Monash and Loxton. These investments can be expected to provide employment opportunities to local workers and contractors during construction and operation, increasing economic activity and retaining population in the study area.

Planned investments in the study area can be expected to have a **positive** impact on population size and standard of living in the study area. The size of the impact cannot be verified as the scale and detail of these projects is not yet fully known.

### Tourist amenity and economic impacts to regional and local tourism

**The presence of Project infrastructure is not expected to affect visitation for regional and local tourism activities.**

The transmission line will be evident as an artificial structure in the landscape as discussed in Chapter 13 Visual Amenity.

Engagement with local communities during the route selection process strongly indicated that prominent tourism areas should be avoided by the alignment, that the transmission line should not be located south of the River Murray or traverse the river in any way and that environmentally sensitive areas, and places of cultural heritage significance should not be impacted. Mitigating the potential impacts to visually sensitive areas such as towns, scenic locations or other sites of value to the tourism economy was a key part of the route and alignment selection process.

The proposed alignment ensures that views of the Project will not be possible from the River Murray, or its immediate surrounds due to topographic barriers and vegetation shielding which prevents views to the north. **No impact** to tourism activities or tourism service providers based in local townships and along the River Murray, associated with visual impacts of the Project is expected.

For the majority of the proposed alignment, the Project will be constructed alongside an existing transmission line, minimising the effect on wilderness and visual amenity values that draw some visitors to the area. Potential impacts to visitation activities from reduction in visual amenity were raised during landholder consultation, particularly on Taylorville Station and Calperum Stations, and Chowilla Game Reserve (refer Section 17.3.7). Potential impacts have been assessed as follows:

- School groups are not expected to be impacted by the Project as, while it will be visible from the road on approach, it will not be visible from the dorm accommodation or the river.
- Researchers visiting the SuperSite on Calperum Station are not expected to be impacted by the Project as, while it may be visible from the SuperSite, it is not expected to affect the environmental values that attract researchers to the site (i.e. the values are not affected by visual amenity).
- Researchers visiting the Australian National University bird Study Area may be affected by the Project as the 500 m corridor crosses the Study Area. However, the Project will run along the existing track in the area to prevent any impact on the researchers. The number of researchers visiting the site is very small and negligible in comparison to the estimated 10,000 visitors to the townships within the Study Area each year.

Visitation to Chowilla Game Reserve focuses primarily on camping next to the river and duck hunting. The transmission line is proposed to follow roads that run inside the boundary of the reserve, away from the camping sites and river so is not expected to affect the visual amenity value that attracts visitors to the reserve. The limited number of tourists to Calperum and Taylorville Stations are likely to be sensitive to changes to the landscape, however the low frequency of views to the transmission line reduces the magnitude of impact.

There is no impact expected on visitor activity in the Study Area resulting from construction and operation of the Project and the economic impact is expected to be **negligible**.

### 17.4.3. Summary of key mitigation measures

**Table 17-8: Key mitigation measures – socio-economic environment**

| Mitigation measure | Construction | Operation |
|---|---|---|
| ElectraNet employees, contractors and visitors at ElectraNet workplaces and any other locations where activities are undertaken by ElectraNet representatives or on behalf of ElectraNet are subject to the ElectraNet Health, Safety, Environment & Sustainability Policy. An aim of this internal policy is to ‘protect and respect the natural and cultural environment in the communities in which [ElectraNet operates]’ (ElectraNet 2019b). | ✓ | ✓ |
| A portion of the workforce will be required to temporarily relocate to construction camps as construction progresses along the transmission line. | ✓ | |

## 17.5. Conclusion

ElectraNet’s key finding is that overall the Project will deliver positive economic outcomes at both the regional and State level. Project construction and operational activities are not expected to have any permanent negative impacts to the social amenity or economic environment of local communities. The potential for short term negative impacts will be managed through consultation with affected landholders, appropriate location of infrastructure and application of standard management measures.

EIS Volume 1 Chapter 18

# Hazards and Risk Management

# Contents



## List of Tables



## List of Figures

# 18. Hazards and Risk Management

This chapter provides an overview of hazards and risk management for the Project. It evaluates a range of potential and perceived hazards and outlines the Project's risk management framework.

## 18.1. Key Findings

- The level of risk associated with fires during construction and operation can be appropriately managed with the implementation of risk treatment and mitigation measures.
- The transmission line will be designed and operated in accordance with Australian and International Standards to minimise the risk to electricity supply and infrastructure from lightning, flooding, winds and sabotage.
- The Project is not in an area of elevated seismic hazard and will be designed in accordance with Australian and International Standards to ensure seismic hazard is appropriately addressed.
- Electric and magnetic field levels directly below the transmission line will be within established exposure limits. There are no receptors in close proximity to the alignment.
- The transmission line will be designed and operated in accordance with Australian and International Standards to protect the public against the risk of electric shock.
- Suitable buffer distances will be implemented between towers and associated infrastructure adjacent public roads to maintain public and road safety.
- Consultation with landholders and detailed design will address safety considerations for landholder activities.
- ElectraNet's Health, Safety and Environment (HSE) Management System and Emergency Response Procedure, along with specific plans and procedures developed for the Project, will provide a robust framework for effective risk management and emergency response.

## 18.2. Setting the Context

This section provides information to explain the context within which the assessment is undertaken. It describes:

- relevant EIS Guidelines
- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet
- the assessment methodology used to assess potential or perceived hazards.

### 18.2.1. EIS Guidelines

The EIS Guidelines (Assessment Requirement 10) require evaluation of 'a range of general and specific risks' as listed in Table 18-1.

This chapter deals with the risks identified by this assessment requirement, with the exception of requirement 10.3 (hazardous material storage, use, handling and disposal) which is addressed in Chapters 7 Project Description and 10 Physical Environment; requirement 10.4 (risks to farming and horticultural practices) which is addressed in Chapter 9 Land Use and Tenure; and requirement 10.8 (bird strike management) which is addressed in Chapter 11 Flora and Fauna.

**Table 18-1: EIS Guidelines addressed in the Hazards and Risk Management Chapter**

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| **Hazard Risk**<br>*Assessment Requirement 10*: The construction and operation of a high voltage powerline involves a range general and specific risks. | |
| • 10.1: Evaluate the fire risk of power line and construction / maintenance equipment / vehicles and timing of maintenance to avoid fire danger season. | Medium |
| • 10.2: Evaluate the risk to electricity supply and infrastructure from fires, lightning, flooding, winds, sabotage etc. | Medium |
| • 10.5: Examine presence of towers and associated infrastructure adjacent public roads to investigate potential impacts on public and road safety. | Medium |
| • 10.6: Identify any safety risk associated with the use or transport of farming machinery and other equipment in the vicinity of towers, guy wires and power lines. | Medium |
| • 10.7: Describe risk minimisation, management and response requirements. | Medium |
| **Effect on Communities**:<br>*Assessment Requirement 9*: the proposed development has the potential to affect the local community during construction and through the establishment of a large linear structure. | |
| • 9.5: Address any potential effects of electromagnetic fields, corona discharge and electric shocks on public health. | Medium |
| **Construction, Operation and Maintenance Effects**<br>*Assessment Requirement 15*: The construction and operation of the proposal would require a range of impacts to be minimised, mitigated and monitored through an environmental management plan framework. | |
| • 15.8: Address the implications of seismicity in the area in relation to both the construction and operation of the transmission line. | Standard |
| **Specialist reports and details**<br>A fire hazard management plan that considers requirements both during the construction and operational phases – including measures to minimise fire risk at and to / from the site, resources and training required, sources of water to fight fires (and how this water will be accessed), options to utilise and coordinate with other operations in the region / area, and cost recovery. | |

Aspects of assessment requirements identified in Table 18-1 above which are not addressed in this chapter are listed in Table 18-2 together with the applicable chapter.

**Table 18-2: Aspects of assessment requirements addressed in other chapters**

| Assessment Requirement | Chapter |
|---|---|
| 10.1 Fire risk of power line and construction / maintenance equipment / vehicles and timing of maintenance to avoid fire danger season in relation to flora and fauna. | Chapter 11 Flora and Fauna |
| 9.5 Effects of corona discharge on public health. | Chapter 15 Noise and Vibration |

### 18.2.2. Requirements in legislation and other standards

The *Fire and Emergency Services Act 2005* provides for the prevention, control and suppression of fires and for the handling of certain emergency situations. It includes a duty to prevent or inhibit the outbreak of fire on land, create and maintain firebreaks and trim vegetation. Permits may be required under the Act in relation to fire bans and undertaking hot works (e.g. welding on days of total fire ban).

The *Electricity (Principles of Vegetation Clearance) Regulations 2010* aims to minimise the risk of bushfires, damage to power lines and electrical shocks without imposing excessive vegetation clearance. They set out vegetation clearance standards in accordance with Part 5 of the *Electricity Act 1996*.

Other relevant standards and guidelines that are relevant to management of hazard and risks include:

- State Bushfire Management Plan (SBCC 2021)
- Murray Mallee and Flinders Mid North Yorke Bushfire Management Area Plans (GoSA 2017)
- Bookmark Mallee Bushfire Management Plan (DEH 2009)
- South Australian Firebreaks, Fire Access Tracks and Sign Standards Guidelines (CFS 2018)
- Code of Practice for Fire Management on Public Land in South Australia (GoSA 2018)
- National Electricity Network Safety Code
- relevant Australian Standards including:
  - AS 3959 *Construction of buildings in bushfire prone areas*
  - AS/NZS 1170.2 *Structural design actions – Wind actions*
- Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz – 100 kHz) (ICNIRP 2010).

### 18.2.3. Views of stakeholders

Stakeholder and community engagement for the Project commenced in late 2018 and continued throughout 2019 and early 2020. Matters raised relating to hazards included the question of whether there were impacts on human health arising from powerlines, and the perception that transmission lines attract lightning strikes and may cause a bushfire.

Details of community consultation are set out further in Chapter 6 Stakeholder Engagement.

### 18.2.4. Assessment method

The potential and perceived hazards associated with the construction and operational phases of the Project were evaluated with consideration of the existing environment and the anticipated type of activities that would take place within the vicinity of the easement. The evaluation of fire risk is based on the assessment undertaken in Appendix S (Fire Hazard Management Plan).

## 18.3. Evaluation of Hazards

### 18.3.1. Bushfire

**The level of risk associated with fires during construction and operation can be appropriately managed with the implementation of risk treatment and mitigation measures.**

Bushfires are a natural occurrence in the region, as discussed in Chapter 11 Flora and Fauna. They often result from lightning, especially between September to December when dry lightning storms occur frequently (DEH 2009), but bushfires can also occur as a result of other causes such as reignition or escape of prescribed burns, improperly extinguished or out of season campfires or arson.

Construction and operation of the transmission line involves a number of potential ignition sources. During construction, these include sparks from ‘hot works’ such as welding, ignition of dry grass by vehicle exhaust or vehicle collisions. During operation, potential sources of ignition include contact between vegetation and conductors, contact between conductors or damage to transmission lines during extreme weather events, bird strike or ageing or poorly maintained equipment.

In landscapes such as the Riverland region where dry thunderstorms are common, the presence of a transmission line may actually assist in reducing lightning fire start risks. Being the tallest structures in the landscape, transmission towers can attract and dissipate lightning strikes thereby reducing fire start potential. Transmission lines are designed with high levels of lightning protection with earthwires located above the conductors offering shielding from lightning strike, and every transmission structure is earthed.

### Risk reduction measures

ElectraNet undertakes a range of risk reduction measures in the design, maintenance and operation of its transmission network in accordance with the ElectraNet Bushfire Risk Management Guideline, which would be implemented for the Project. These measures include:

- design of transmission lines to Australian and International Standards with particular attention to minimising the risk of fire start
- use of earth wires, optical ground wires and dampers to avoid electrical faults and damage to conductors, and increased conductor spacing to eliminate risk of 'conductor clashing'
- use of fire protection systems which will cut off the supply in the event of a fault
- vegetation management to maintain appropriate clearance in accordance with the Electricity (Principles of Vegetation Clearance) Regulations
- asset inspection and maintenance via routine maintenance tasks
- scheduling of maintenance activities with elevated fire risk to avoid days of high fire danger where possible
- operation of the transmission system to lower the fire start risk
- monitoring network performance and investigating fault events to determine root cause.

Experience elsewhere on the ElectraNet network indicates that transmission lines similar to the design proposed have not resulted in the ignition of bushfires.

### Bushfire risk assessment – Fire Hazard Management Plan

The Fire Hazard Management Plan (FHMP) (Appendix S) provides overarching guidance to manage and mitigate potential bushfire impacts to life, property and environment assets during both construction and operation of the Project.

The FHMP that has been prepared for the Project evaluates a range of bushfire scenarios including the potential impact on the Project of a bushfire occurring within the wider area, and the potential impact of a bushfire ignited by construction and / or operational activities on the Project or on surrounding life, property and environmental assets. It undertakes bushfire risk assessment using methodology based on Australian and New Zealand Standard AS/NZS ISO 31000:2018 *Risk Management – Principles and Guidelines* that has been tailored towards assessing and mitigating bushfire risk.

The bushfire risk assessment in the FHMP concluded that if risk treatment and mitigation measures are not implemented, the bushfire scenarios assessed pose a significant level of inherent risk to life, property and environmental assets (i.e. without the implementation of risk treatment and mitigation measures, the levels of risk were identified as Extreme and High). Following implementation of the recommended mitigation and management measures, the residual risk is expected to be reduced to lower levels of Low and Medium. Inherent and residual risk was identified as being higher during the construction stage, where construction activities have a greater potential to ignite a fire, than at the operational stage of the Project.

Mitigation strategies that will be implemented to manage bushfire risk associated with construction and operation of the Project include:

- vegetation management adjacent to property and life assets
- adoption of bushfire construction standards for habitable buildings
- asset inspections and maintenance
- restrictions on activities during Total Fire Bans
- portable water supplies and firefighting equipment at construction sites

- pre-emptive de-energisation of the power network (in consultation with the Australian Energy Market Operator (AEMO)) where appropriate
- promotion of public awareness
- suitable access
- development of bushfire emergency evacuation, bushfire monitoring and communication procedures
- training of personnel
- pre-bushfire season audits
- direct firefighting response and continual review of bushfire risk management measures in place.

These strategies are outlined in more detail in the FHMP. Site and stage specific plans will be prepared at the relevant stages of Project in consideration of the principles and mitigation measures documented within the plan.

With the mitigation strategies outlined in the FHMP in place, the fire risk can be reduced to an acceptable and manageable level.

### 18.3.2. Weather events

**The transmission line will be designed and operated in accordance with Australian and International Standards to minimise risks to electricity supply and infrastructure from lightning, flooding and winds.**

The transmission line will be designed to Australian and International Standards, including AS/NZS 1170.2 *Structural design actions – Wind actions.* Lightning protection will include an earth wire to offer shield protection and earthing of all structures. As discussed in Chapter 10 Physical Environment, towers will not be located in areas where they could alter surface water flows or be damaged by flooding (e.g. in close proximity to the Burra Creek channel). Disruption of power supply is not anticipated to occur, except during exceptional events.

Physical systems that will limit interruptions to electricity supply will be installed, for example systems such as a reactive maintenance system where failures of infrastructure are immediately rectified and fitting conductors with automatic reclose functions that allow line function to only be disrupted for a short period of time.

### 18.3.3. Sabotage

**The transmission line will be designed and operated to minimise the risk to electricity supply and infrastructure from sabotage.**

Public access to the relevant infrastructure will be restricted along the transmission line alignment, and on tower structures through incorporation of anti-climb barriers, which will minimise the risk associated with sabotage. Security fencing will be installed around the Bundey Substation. Monitoring and appropriate fault management along the transmission line alignment will be implemented, together with passive surveillance by landholders and general public.

The Emergency Response Management Plan will include procedures relevant to sabotage events including coverage of interruption and re-initiating of power supply while the damaged area is isolated.

### 18.3.4. Seismicity

**The Project is not in an area of elevated seismic hazard and will be designed in accordance with Australian and International Standards to ensure seismic hazard is appropriately addressed**

National Seismic Hazard Assessment mapping (Geoscience Australia 2018) indicates that the Project is not in an area of elevated seismic hazard (see Figure 18-1). Seismic hazard is equivalent to or below levels for the Adelaide region. Seismic hazard during construction is not a significant concern.

The design of structures in Australia is governed by Australian Standard, AS 1170.4 *Structural design actions, Part 4: Earthquake actions in Australia*. The Project will be designed in accordance with the requirements of AS 1170.4 to ensure that seismic hazard is appropriately addressed.

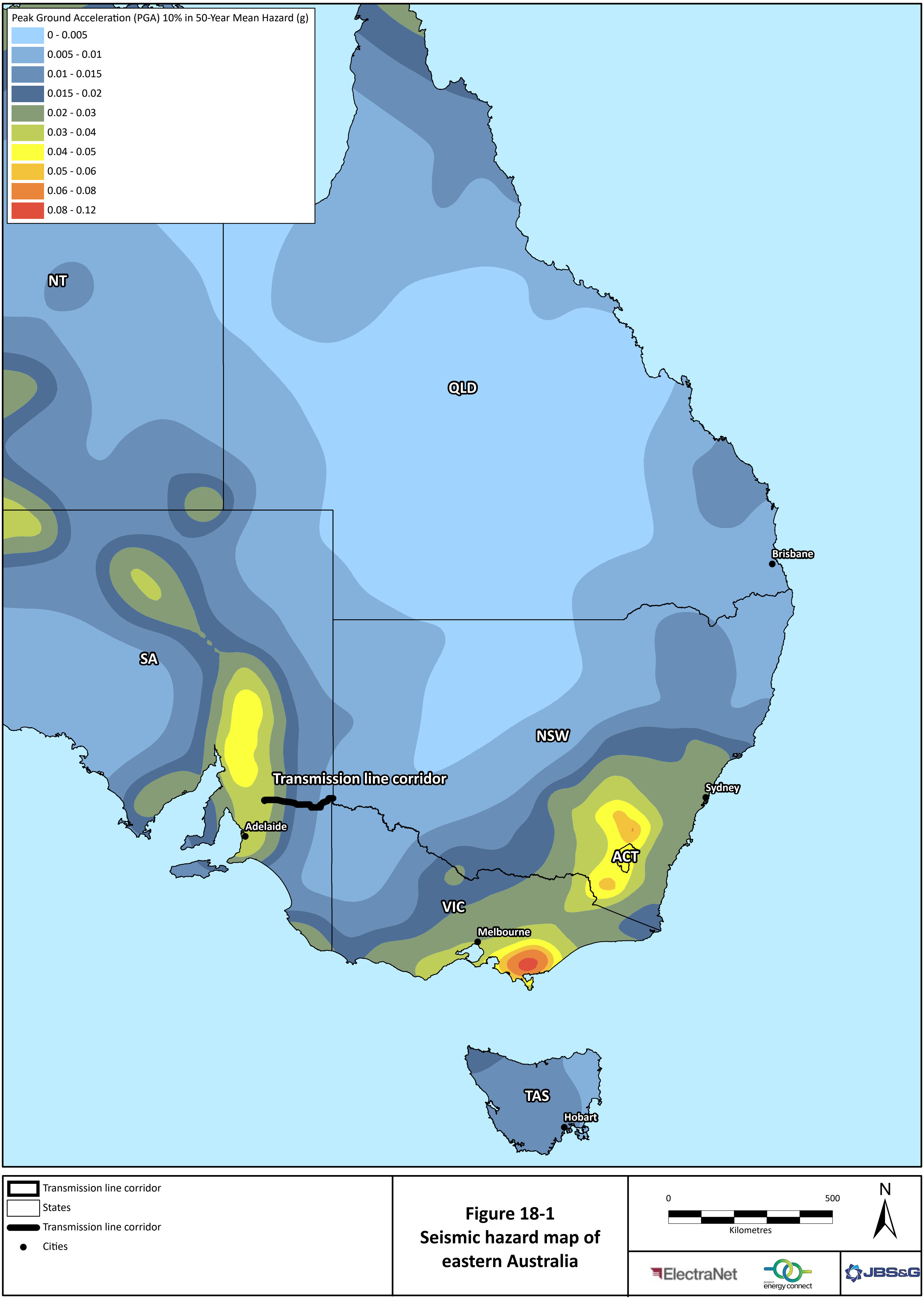



**Figure 18-1**
**Seismic hazard map of eastern Australia**

### 18.3.5. Electromagnetic fields and electric shocks

**Electric and magnetic field levels directly below the transmission line will be within established exposure limits and there are also no receptors in close proximity to the alignment**

Electric and magnetic fields (EMF) exist wherever electricity is generated, transmitted or distributed in power lines or cables, or used in electrical appliances. EMF reduce rapidly with distance from their source. For transmission lines, electric and magnetic fields are between approximately four to eight times lower for every doubling of distance from a line.

EMF induce internal electric fields and currents in the body. If the external fields are strong enough, these induced electric fields can interfere with the body's nervous system causing nerve and muscle stimulation and changes in nerve cell excitability in the central nervous system. These effects occur at field strengths well above field strengths found below a transmission line.

Exposure limit guidelines for EMF have been developed by International Commission for Non-Ionizing Radiation Protection (ICNIRP). These guidelines are recommended for use by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), which is the Commonwealth Government agency charged with the responsibility for protecting the health and safety of people, and the environment, from EMF. The limiting thresholds for the general public set by the ICNIRP guideline are widely accepted as providing complete protection against all known adverse health effects of electric and magnetic fields (BECA 2020).

Detailed modelling was undertaken to assess the EMF for the western NSW section of EnergyConnect (BECA 2020), which encompasses the proposed 330 kV transmission line connecting the Project at the SA-NSW border to the Buronga Substation in NSW. The design of the Project will be very similar to the western NSW section.

Magnetic field levels directly under the proposed lines were shown to be well below the ICNIRP general public exposure reference limit of 2,000 milligauss (mG) in all cases, including during the contingency case of one circuit in service with increased load and the other circuit out of service.

The electric field levels directly under the proposed lined lines were also shown to meet the ICNIRP general public basic restriction of 0.02 kV, based on the minimum ground clearance for the proposed lines. The minimum clearance typically occurs at the middle of the span between towers where the conductor is at its lowest, and the majority of the line is well above this clearance.

In addition, it is noted that there are no receptors (e.g. residences) in close proximity to the proposed alignment, and very few areas where the public will be able to access the easement, resulting in a very low likelihood of any public exposure to EMF generated by the Project.

Detailed design will ensure that the Project satisfies ICNIRP guideline limits for magnetic and electric fields.

**The transmission line will be designed and operated in accordance with Australian and International Standards to protect the public against the risk of electric shock**

The transmission line will be designed and operated in accordance with Australian and International Standards to protect the public against the risk of electric shock. The height of the towers and conductors and the protection systems that will be in place will ensure that this does not occur.

### 18.3.6. Infrastructure adjacent to public roads

**Suitable buffer distances will be implemented between towers and associated infrastructure adjacent public roads to maintain public and road safety**

The proposed alignment is predominantly isolated from public roads, with very few road crossings, particularly in the central section of the proposed alignment. At the western end, it parallels Powerline Road for approximately 27 km (with three crossings) and crosses Goyder Highway and several unsealed roads. In the east, it parallels Wentworth-Renmark Road for approximately 35 km. With the exception of Goyder Highway, these roads carry relatively low volumes of traffic, as discussed in Chapter 16 Traffic and Transport.

The design and construction of the transmission line at crossings of public roads (including offset distances for structures and conductor heights) will be undertaken in accordance with Department for Infrastructure and Transport or local council requirements. Suitable offsets will be implemented between towers and associated infrastructure where paralleling public roads (in consultation with Department for Infrastructure and Transport and local councils). This will ensure that public and road safety is appropriately protected.

### 18.3.7. Transport of farming machinery and other equipment near the transmission line

**Consultation with landholders and detailed design will address safety considerations for landholder activities**

As discussed in Chapter 9 Land Use and Tenure, farming machinery and vehicles which would potentially be subject to height restrictions related to transmission lines include trucks carrying baled hay, two deck cattle trailers and cropping machinery moving across a property. Due to the anticipated height of the transmission line towers and conductors it is considered extremely unlikely that mandatory height restrictions relating to clearance will be relevant.

Many properties at the western end of the transmission line corridor already safely accommodate the presence of the smaller 132 kV transmission line which will be paralleled by the Project, and will therefore be unaffected by clearance heights for the new transmission infrastructure.

The process of determining the location of the easement and the micro-siting of the towers will be undertaken in consultation with landholders and will take into consideration safety and landholder activities, such as vehicle access and movements across the property.

## 18.4. Risk Minimisation, Management and Emergency Response

Hazards and risks will be managed in accordance with ElectraNet’s HSE Management System (HSEMS), policies and guidelines. This will seek to avoid, to the greatest extent possible, risks to public safety and achieve the desired outcomes in relation to the hazards identified in this chapter.

### 18.4.1. ElectraNet’s HSE Management System Framework

ElectraNet’s HSEMS Framework establishes the commitments and expectations for decisions, activities and behaviours concerning the management of health, safety, environment and sustainability (as discussed in Chapter 20 Environmental Management Framework). The HSE Management Framework documents systems and processes for identifying and managing hazards and risks during planning, construction and operation activities.

It describes ElectraNet’s suite of procedures, policies and frameworks in place to ensure activities are managed safely, protect the environment and comply with applicable legislation, regulations and standards. These include a Safety in Design Procedure, which must be applied throughout the project lifecycle to prevent injury to people and damage to assets and the environment, and a Hazard Management Procedure, outlining the processes and responsibilities for the prevention, identification, assessment, control and reporting of hazards on ElectraNet sites. Specific identified hazard control procedures related to hazardous chemicals, driving, site attendance, site inspection, substation and asset inspection are also described.

ElectraNet’s approach to risk management is detailed in the HSEMS Framework. The approach includes four key steps; identifying hazards, assessing risks, controlling risks and reviewing control measures. Risk management is further detailed in ElectraNet’s Risk Management Policy which describes the requirements of all workers in relation to the management of risk. ElectraNet's approach to risk assessment is then detailed in the Risk Assessment and Treatment Guidelines. This guideline provides a general approach for the assessment and treatment of all types of risk, for all situations, projects and activities, across all areas, with medium to high severity consequences.

### 18.4.2. Safety and sustainability standards

ElectraNet's Safety and Sustainability Standards (S&S Standards) details minimum safety and sustainability requirements for contractors and sub-contractors undertaking construction works and asset maintenance at their sites in Australia.

The S&S Standards outline the information that ElectraNet must provide to contractors and sub-contractors relating to known or potential environmental aspects (hazards) and risks associated with the project.

It also describes the documents, including the Construction Environment Management Plan (CEMP) and Asset Maintenance Environmental Management Plan (AMEMP) and information that must be developed, implemented and maintained by the contractor.

An Aspect and Impact Register / Construction Risk Register (CRR) Development is required as part of the CEMP / AMEMP, with details including compliance obligations, a risk assessment of environmental aspects, applicable environmental operating requirements and associated actions and other control measures as instituted by the Contractor.

Chapter 20 Environmental Management Framework provides further details on ElectraNet's S&S Standards, the CEMP and AMEMP[1].

### 18.4.3. Bushfire management

As discussed in Section 18.3.1, a detailed Fire Hazard Management Plan (or Bushfire Management Plan) will be developed and implemented for each stage of the Project. This will be aligned with and used in conjunction with ElectraNet's Bushfire Risk Management Guideline. Contractors are required to mitigate bushfire start and manage the bushfire impact of the construction to the environment and its workforce in accordance with these documents.

### 18.4.4. Emergency preparedness and response

ElectraNet has an established emergency response system in place to effectively respond to any foreseeable emergency, and that in the event of an emergency, plans and capabilities are in place for dealing with such situations.

Emergency planning and response is carried out so that priorities in emergency situations are:

1. Safety and welfare of people
2. Protection of the environment
3. Preservation of the organisation's operations and reputation.

Emergency management procedures are in place to support ElectraNet personnel to manage emergency situations that have the potential to negatively impact on the operation of the transmission network or business activities.

[1] As noted in Chapter 20 Environmental Management Framework, the AMEMP performs the same function as the Operations Environmental Management Plan (OEMP) referred to in the EIS Guidelines. For consistency with the EIS Guidelines, the discussion in Chapter 20 of the plan addressing operational environmental management is referred to as the OEMP.

The processes and plans for responding to potential or actual emergency situations are documented in ElectraNet's Emergency Response Procedure (ERP). The ERP identifies a comprehensive set of instructions and activities which are aimed to achieve a prudent level of response in the event of an incident with community impact or a situation that has the potential to cause damage or risk to people, the environment and / or business operations.

The purpose of the ERP is to:

- provide instructions for managing emergency situations
- act as a resource in managing an emergency incident
- ensure emergency response instructions and personal contact details are reviewed and updated on a regular basis.

Training sessions and role playing scenarios are regularly deployed. These scenarios simulate an emergency and test overall response capabilities and the effectiveness of the controls in place. It also provides an opportunity to identify gaps that may exist between business requirements and current capability and to determine the best course of action to remediate such gaps. Usually, at least two training sessions are held per year, one for bushfire response and another to test corporate or network situations. Bushfire tests are performed annually.

A complete review of the ERP is undertaken bi-annually, or earlier if an emergency situation, incident or accident occurs, to maintain accuracy of the procedure and to ensure emergency communication details are up-to-date and relevant personnel are informed and competently understand their responsibilities as outlined.

ElectraNet's Emergency Response Procedure would provide the overarching framework for emergency response during construction and operation. Specific emergency response plans will also be developed for construction of the Project.

## 18.5. Conclusion

The range of potential and perceived hazards and risks associated with the Project will be adequately managed under the Project's risk management framework.

EIS Volume 1 Chapter 19

# Waste Management

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# 19. Waste Management

This chapter describes the legislative context of waste management in South Australia, provides a description of the assessment of anticipated waste sources likely to be generated during construction and operation of the Project and options for waste management.

## 19.1. Key Findings

- The Project will comply with State legislation and guidelines for waste management and follow the waste management hierarchy as far as is practicable, with any waste materials to be reused or recycled where possible.
- On-site construction waste will be minimal as the tower sections will be largely preassembled and specified quantities of construction materials will be ordered and delivered.
- Waste streams will be separated to maximise opportunities for reuse and recycling, and stored and labelled to ensure each type of waste is handled in the most appropriate and efficient way.
- Where recycling is not feasible, waste will be collected and stored in designated waste storage areas for collection by an authorised contractor for off-site disposal at a licenced waste facility.
- Waste will be managed in accordance with a Waste Management and Minimisation Plan to be prepared for Project construction and operations.

## 19.2. Setting the Context

This section provides context for waste management for the Project. It describes:

- the relevant EIS Guidelines
- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet
- Assessment methodology for waste management.

### 19.2.1. EIS Guidelines

The EIS Guidelines require a description of potential waste sources generated from the construction and operation of the Project, with details of waste disposal methods, including possibilities for reuse and recycling and interim and final waste disposal locations as set out in Table 19-1. The EIS Guidelines also require preparation of a waste management and minimisation plan for construction and operations.

**Table 19-1: EIS Guidelines addressed in the Waste Management chapter**

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| **Construction, Operation and Maintenance Effects**<br>*Assessment Requirement 15:* The construction and operation of the proposal would require a range of impacts to be minimised, mitigated and monitored through an environmental management plan framework. | |
| • 15.2: Outline the sources of waste and methods of disposing waste material, including reference to management of vegetation removed, indication of temporary and final locations for spoil and other waste and the possibilities for reuse or recycling of all waste streams. Provide details of a waste management plan. | Standard |
| • 15.3: Describe the likely impact and measures for the control of dust, vibration, noise, emissions, drag-out (i.e. onto the public roads) and litter during both construction and maintenance. | Standard |

| EIS Guidelines and Assessment Requirements | Assessment level |
|---|---|
| • 15.9: Outline the approximate size of the construction workforce including any need for any construction workers camps or accommodation. Describe the location and management of accommodation camps including sources of water and power, and the management of waste, wastewater and noise impacts. | Standard |
| **Specialist reports and details**<br>A **waste management and minimisation plan** (for construction and operation) detailing the sources of waste including spoil and removed vegetation, the location of waste management storage areas (including the separation of waste streams, such as recyclables, hard waste and e-waste) and disposal facilities located on site or within laydown areas and provide details of how these facilities will be serviced.<br>Details of any proposed **wastewater management**, including segregation, collection, treatment, storage, reuse and disposal of wastewater | |

Assessment requirements identified in Table 19-1 which are not addressed in this chapter are listed in Table 19-2 together with the applicable chapter.

**Table 19-2: Assessment requirements addressed in other chapters**

| Assessment Requirement | Chapter |
|---|---|
| 15.2 Management of removed vegetation | Chapter 7 Project Description |
| 15.2 Management of soil during vegetation removal | Chapter 10 Physical Environment |
| 15.3 Dust and emissions impacts during construction and maintenance | Chapter 14 Air Quality |
| 15.3 Noise and vibration impacts during construction | Chapter 15 Noise and Vibration |
| 15.3 Impacts and control of drag-out onto public roads | Chapter 16 Traffic and Transport |
| 15.9 Noise impacts from construction camps | Chapter 15 Noise and Vibration |
| 15.9 Construction workforce size and location and management of accommodation camps | Chapter 7 Project Description<br>Chapter 9 Land Use and Tenure<br>Chapter 10 Physical Environment<br>Chapter 17 Socio-Economic Environment |
| 15.9 Management of wastewater disposal | Chapter 10 Physical Environment |

### 19.2.2. Requirements in legislation and other standards

The *Environment Protection Act 1993* (EP Act) sets out the general environmental duty to take all reasonable and practical steps to prevent or minimise any resulting environmental harm. This requirement includes the management of waste.

The EP Act prescribes the waste mangement hierarchy (refer Figure 19-1) in the order of priority as follows:

a) avoidance of the production of waste
b) minimisation of the production of waste
c) reuse of waste
d) recycling of waste
e) recovery of energy and other resources from waste
f) treatment of waste to reduce potentially degrading impacts
g) disposal of waste in an environmentally sound manner.

The EP Act also provides listed wastes which have specific requirements due to their potentially contaminating nature.

The *Environment Protection (Waste to Resources) Policy 2010* (Waste to Resources EPP) prescribes the general waste management obligations. The primary objective of the Waste to Resources EPP is to achieve sustainable waste management by applying the waste management hierarchy consistently with the principles of ecologically sustainable development. In order to meet the Waste to Resources EPP waste management objective, waste management should:

- promote best practice and accountable waste management
- include effective recording, monitoring and reporting systems for the treatment, transportation and disposal of waste and other matter
- promote environmental responsibility and involvement in waste avoidance, waste minimisation and waste management within the community.

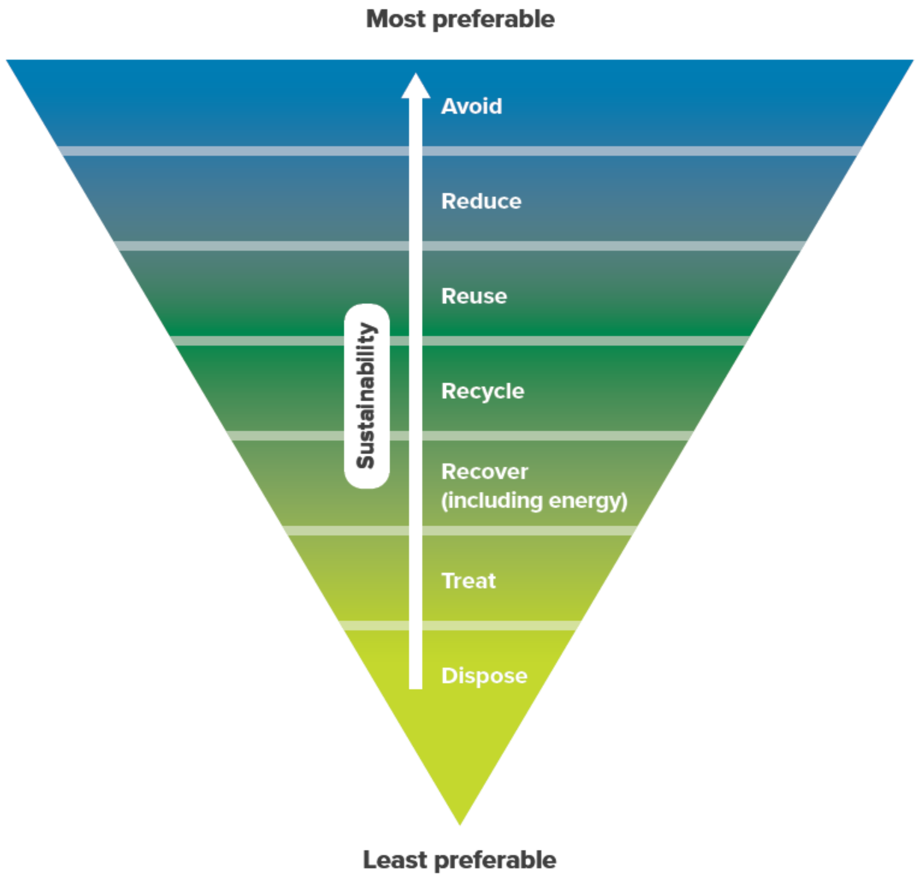


**Figure 19-1: Waste management hierarchy**

The *Environment Protection (Water Quality) Policy 2015* (Water Quality EPP) also established under the EP Act aims to achieve the sustainable management of waters, by protecting or enhancing water quality while allowing economic and social development.

### SA Waste Strategy

The current SA Waste Strategy 2015 – 2020 supports maximising the reuse, recycling and recovery of materials. Its mission is to achieve a resource efficient South Australia, by minimising South Australia's demand on primary resources, and maximising the reuse, recycling and recovery of materials, using the framework of the waste management hierarchy and the principles of ecologically sustainable development. A new waste strategy supporting the principle of circular economy is currently under development by the State government.

### 19.2.3. Views of stakeholders

Waste generation and subsequent management have not been specifically raised during community engagement for the Project. Details of community consultation are set out further in Chapter 6 Stakeholder Engagement.

### 19.2.4. Assessment method

The assessment for management of Project waste involved:

- reviewing the regulatory framework for waste management
- identifying waste generating activities and waste sources
- identifying the likely classification of waste in accordance with relevant legislation and guidelines
- identifying waste disposal options
- identifying waste management options and strategies.

## 19.3. Potential Waste Sources and Impacts

Potential sources of waste generated during construction and operation of the Project are described in Table 19-3.

**Table 19-3: Potential sources of waste from the Project**

| Potential sources of waste | Project element and or activity | Construction | Operation |
|---|---|---|---|
| General construction | • Tower footings, land clearance for access and stringing tracks, substation and ancillary infrastructure, laydown areas, construction camp | ✓ | |
| Spoil | • Spoil from excavation materials | ✓ | |
| Potentially contaminated soil | • Tower footings, land clearance for access and stringing tracks, substation and ancillary infrastructure, laydown areas, construction camp | ✓ | |
| Clean fill material | • Tower footings, land clearance for access and stringing tracks, substation and ancillary infrastructure, laydown areas, construction camp | ✓ | |
| Vegetation and organic material | • Tower footings, land clearance for access and stringing tracks, substation and ancillary infrastructure, laydown areas, construction camp | ✓ | ✓ |
| Wastewater | • Construction camp<br>• Concrete batching | ✓ | |
| Waste concrete | • Tower footings, substation and ancillary infrastructure | ✓ | |
| Waste concrete | • Tower components, substation and ancillary infrastructure | ✓ | |
| Conductor drums | • Tower components, substation and ancillary infrastructure | ✓ | |
| Electrical conductors, insulators | • Tower components, substation and ancillary infrastructure | ✓ | ✓ |
| Steel | • Tower components, tower footings, substation and ancillary infrastructure | ✓ | |

| Potential sources of waste | Project element and or activity | Construction | Operation |
|---|---|---|---|
| Domestic waste | • Construction camp waste (i.e. kitchen waste, paper, cardboard, plastics glass) | ✓ | ✓ |
| Timber | • Tower footings, land clearance for access tracks and stringing tracks, substation and ancillary infrastructure, laydown areas, construction camp | ✓ | |
| Hazardous materials and chemicals | • Tower footings, land clearance for access and stringing tracks, substation and ancillary infrastructure, laydown areas, construction camp | ✓ | ✓ |

Potential sources of impacts from Project generated waste sources include:

- procurement planning / ordering errors resulting in excess quantities of construction materials
- stockpiled cleared vegetation and spoil
- unsegregated stockpiling of waste
- incorrect disposal or reuse of soils as result of improper soil classification
- incorrect management of packaging resulting in the dispersal of plastic, paper, laminated wood and cardboard, leading to littering of the surrounding local environment
- incorrect waste management associated with domestic waste resulting in windblown rubbish and littering of the local environment
- incorrect management of wastewater resulting in contamination of the surrounding environment
- incorrect management of hazardous materials (such as fuels and oils) resulting in the contamination of the surrounding environment.

Potential impacts from waste generating activities on soils (stockpiling and contamination), water sourcing and use and wastewater disposal are assessed in Chapter 10 Physical Environment.

Strategies and options for the management of waste sources generated from the Project are described below in Section 19.4 and will be further detailed in the Waste Management and Minimisation Plan (refer Section 19.5). With appropriate and effective waste management measures in place to manage Project generated waste, waste related impacts to the local or surrounding environment from Project activities are not expected.

## 19.4. Waste Management

Waste management for the Project will be undertaken in accordance with the waste management hierarchy which underpins the objectives of the Waste to Resources EPP and in line with the South Australian Waste Strategy (EPA SA 2015). The waste management hierarchy (refer Figure 19-1) demonstrates the preferred approaches to waste management to ensure sustainable development and reuse of resources during construction and operation of the Project. Under the hierarchy, avoiding waste generation is most preferable and disposal of waste least preferable.

### 19.4.1. Avoidance and reduction of waste

The Project will be required to avoid waste generation and endeavour to reuse waste where practicable. Waste will be avoided through strategic selection of materials during design and purchasing which take into account options which may reduce waste generation for the Project. Careful planning for procurement of the specific types and quantities of materials required for construction activities, including the temporary construction camp will further minimise waste generation.

Measures to achieve avoidance and reduction of waste may include:

- development of a procurement policy which considers waste avoidance measures such as:
  - ordering site specific or prefabricated items where practicable to minimise surplus material
  - consideration of packaging material provided by suppliers during purchasing and reduce this requirement where possible, or consider returnable packaging
  - consideration of recycled items when selecting materials
  - consideration of reusable materials for meal packaging at accommodation camps
- refinement of waste stream estimates to ensure adequate on-site storage and waste segregation to facilitate recycling
- refinement of estimated volumes of materials for construction.

### 19.4.2. Reuse and recycling

Measures to separate waste streams will be implemented to maximise opportunities for reuse of waste materials on site. This includes segregation of wastes into appropriate dedicated bins or areas on site, or transportation to a designated recycling facility. The Project will reuse or recycle waste material where possible including concrete, timber, plastic, and metals (refer Table 19-4).

**Table 19-4: Construction waste recycling and reuse**

| Waste source | Recycling options |
|---|---|
| Waste concrete | • Transport to another Project site for use.<br>• Where this is not possible, waste concrete will be collected in washout bays, solidified and transported to a licensed facility for reuse or disposal. |
| Excess steel | • Recycle at other sites where applicable, or collect during and after construction and recycle via scrap metal recyclers. |
| Timber e.g. formwork, pallets etc. | • Reuse where applicable or return to supplier for reuse.<br>• If not accepted by supplier, separate and dispose of at waste facility for mulching where applicable. |
| Conductor drums | • Return to supplier for reuse. |
| Electrical (HV and LV), conductors, insulators | • Return to supplier for reuse. |
| Vegetation and organic material | • Stockpile for use in rehabilitation where required. |
| Spoil from excavation materials | • Reuse in areas that require capping / rehabilitation.<br>• If not required, remove from site using appropriate waste contractor. |

### 19.4.3. Treatment and disposal

If waste materials cannot be reused on site, they will be collected by appropriately licensed contractors for offsite reuse, reprocessing, recycling or final disposal. Final disposal of wastes will be to a licensed waste facility that is suitable for the type and quantity of waste. Waste tracking forms will be provided to the waste facility upon arrival.

Measures to manage the treatment and disposal of waste materials during construction and operation include:

- ensuring wastes which cannot be reused or recycled and require disposal are clearly segregated from those which have the potential to be reused
- providing segregated bins for subcontractors to dispose of construction waste (i.e., metal, plastics and cardboard)

- inducting contractors and staff into site waste management practices
- disposing of hazardous materials in accordance with the handling and disposal requirements of the *Work Health and Safety Regulations 2012*
- disposing of general wastes in accordance with local council requirements
- ensuring camp ablutions facilities are installed in accordance with the On-site Wastewater Systems Code and the *South Australian Public Health (Wastewater) Regulations 2013.*

Only appropriately licensed transport contractors will be engaged to transport waste material off site. The contractors appointed to transport waste will be required to demonstrate and ensure that:

- they are licensed to transport the type of waste they are contracted to receive / handle
- waste is transported to a licensed facility capable of receiving the type of waste and quantity they are carrying
- waste is adequately covered during transport
- waste data forms are provided to the waste facility upon arrival.

### 19.4.4. Management of waste sources

In addition to the waste management measures for the Project aligned to the waste management hierarchy, specific waste source management options will be implemented across the Project site to ensure appropriate waste handling and to ensure waste-related impacts to the local and surrounding environment are minimised. Waste source management will be updated based on refinement of Project design and detailed in the Waste Management and Minimisation Plan (See Section 19.5).

Key waste sources anticipated during Project construction and operation and associated management options are described in Table 19-5.

**Table 19-5: Waste sources and management options during Project construction and operation**

| Waste source | Management options | Construction | Operation |
|---|---|---|---|
| **General construction** | • Manage general construction waste in accordance with EP Act waste management hierarchy.<br>• Classify all waste in accordance with the EPA SA 842/19 waste definitions guideline and separated into waste streams.<br>• Classify construction waste material in accordance with the EPA SA 842/19 waste definitions guideline and separate into waste streams for reuse or recycling potential and stockpiled on site.<br>• Clearly label waste in a secure storage area that ensures waste is contained and managed in the most appropriate and efficient manner i.e. reuse, recycled, disposed.<br>• Store electrical waste for collection by an authorised contractor for recycling offsite, where feasible, or dispose at an appropriately licenced facility.<br>• Where offsite disposal is required, dispose to a suitable licensed facility by an appropriately licensed transport contractor in line with EPA SA requirements. | ✓ | |
| **Spoil from excavation materials** | • Use spoil material from excavation works on site where appropriate (e.g. for capping of access roads, spread between tower footings).<br>• Where not suitable for on-site use, use spoil for other purposes such as capping offsite, or classify and take offsite to a licenced waste management facility that is permitted to accept that waste for reuse, recycling or disposal. | ✓ | |

| Waste source | Management options | Construction | Operation |
|---|---|---|---|
| **Contaminated soil** | • Classify soil by an appropriately qualified environmental practitioner in line with best practice and in accordance with the CEMP.<br>• In the unlikely event that contaminated soils are encountered, segregate soils from the surrounding environment to prevent cross contamination and remove from site for remediation or disposal according to the nature of contamination. | ✓ | |
| **Stockpiled soils / clean fill material** | • Locate temporary topsoil stockpiles in areas clear of vegetation as far as practicable and away from defined watercourses to reduce the potential for surface water erosion impacts to creek lines.<br>• Re-spread stockpiled topsoil following completion of construction activities (as far as practicable and subject to suitability) and leave sites to naturally revegetate.<br>• Manage soil stockpiles in accordance with the EPA SA Guideline for stockpile management. Size of stockpiles typically below 2 m in height (to be determined by material quantity requirements, space availability, stockpile stability and safety). | ✓ | |
| **Vegetation and organic material** | • Stockpile cleared vegetation for use in rehabilitation where required.<br>• Place cleared vegetation stockpiled during access and clearing over returned topsoil to assist in natural regeneration.<br>• Dispose of noxious weeds in accordance with relevant guidelines / requirements. | ✓ | ✓ |
| **Wastewater** | • Manage camp wastewater in accordance with health regulations and relevant EPA SA requirements.<br>• Alternatively treat sewage for irrigation over a pre-approved disposal area.<br>• Use licensed contractors where wastewater is removed for offsite treatment or disposal. | ✓ | |
| **Waste concrete** | • Transport waste concrete to other sites for use.<br>• Where this is not possible, waste concrete will be collected in washout bays, solidified and transported to a licensed facility for re-use or disposal. | ✓ | |
| **Conductor drums** | • Return conductor drums to supplier for reuse. | ✓ | |
| **Electrical (HV and LV), conductors, insulators** | • Return all waste electrical material to supplier for reuse. | ✓ | ✓ |
| **Steel** | • Recycle steel components at other sites where applicable or collect during and after construction for recycling via authorised scrap metal recyclers. | ✓ | |
| **Domestic waste** | • Store waste containing food appropriately (covered), and regularly remove from site for disposal to reduce the likelihood of attracting pests and vermin (including birds) and to prevent the occurrence of windblown rubbish.<br>• Store recyclable materials such as paper, cardboard, plastics, glass, ferrous, and non-ferrous containers at recycling bins for collection by an authorised contractor and recycling off site.<br>• Where recycling is not feasible, collect waste and store in designated waste storage areas for collection by an | ✓ | ✓ |

| Waste source | Management options | Construction | Operation |
|---|---|---|---|
| | authorised contractor for off-site disposal at a licenced waste facility. | | |
| **Timber (e.g. formwork, pallets etc)** | • Re-use excess and / or waste timber material where applicable or return to the supplier for reuse.<br>• If timber is not accepted by the supplier, separate timber and dispose of at waste facility for mulching where applicable. | ✓ | |
| **Hazardous materials and chemicals** | • Dispose of all waste hazardous substances to a suitably licensed facility by an appropriately licensed transport contractor, in line with state legislation and EPA SA requirements.<br>• Collect waste from construction vehicle and plant maintenance activities and store in designated waste storage areas for collection by an authorised contractor for off site disposal.<br>• Store containers holding oil, grease and lubricants separately for recycling / return to supplier or disposal as hazardous waste<br>• Store waste oil and oil filters stored in recycling bins for collection by an authorised contractor and recycled off site (where feasible).<br>• Handle fuels in accordance with relevant standards and guidelines.<br>• Bund diesel fuel storages at laydown areas.<br>• Store chemicals and fuels in appropriate containers suitable for purpose.<br>• Separate hazardous materials and store in accordance with relevant legislation and regulations.<br>• Clean up any spills in accordance with relevant guidelines. | ✓ | ✓ |

## 19.5. Waste Management and Minimisation Plan

A Waste Management and Minimisation Plan will be prepared for the Project and will detail the sources of waste from Project construction and operation and the measures to be implemented to manage, reuse, recycle and safely dispose of the identified waste.

The Waste Management and Minimisation Plan will describe measures to minimise mismanagement of construction waste, unnecessary loss of vegetation, cross contamination of soil and release of hazardous chemicals to the environment and windblown rubbish. The plan will detail appropriate management and mitigation controls that will be implemented to avoid and or minimise potential impacts associated with waste generation from the Project.

As part of the Waste Minimisation and Management Plan, a monitoring program will be developed to ensure the measures put in place to manage waste (e.g. collection and storage areas, licensed contractors) are inspected / reviewed, maintained and updated if required. The monitoring programs will be implemented during the construction phase and will continue during the operational phase of the Project.

EIS Volume 1 Chapter 20

# Environmental Management Framework

# Contents



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# 20. Environmental Management Framework

This chapter describes the environmental management framework that will be applied during construction and operation for the Project. It describes ElectraNet's Health, Safety and Environment Management System (HSEMS) and Safety and Sustainability Standards and sets out the framework for the development and implementation for a range of environmental management plans, including those required by the EIS guidelines.

## 20.1. EIS Guidelines

The EIS Guidelines in relation to the environmental management framework are set out in Table 20-1.

**Table 20-1: EIS Guidelines related to the environmental management framework**

| EIS Guidelines related to the environmental management framework | Assessment level |
|---|---|
| **Construction, Operation and Maintenance Effects**<br>*Assessment requirement 15:* The construction and operation of the proposal would require a range of impacts to be minimised, mitigated and monitored through an environmental management plan framework | |
| 15.13: Outline the proposed environmental management measures that would be adopted to deal with the identified construction, operational and maintenance effects. Include reference to any baseline studies, monitoring and training programmes, and reporting mechanisms (internally and to public authorities). Outline the effectiveness of mitigation measures for perceived and recognised impacts. Include consideration of previously demonstrated best practice or approaches which may have been used for similar works in similar habitats, which may be of benefit and / or have been endorsed for their proven low impact effects. Equally, innovative or new approaches should also be included. | Standard |
| **Specialist Reports and Details**<br>**A Construction Environmental Management Plan (CEMP)** that describes how construction will be managed to mitigate negative environmental impacts to the environment, and public health and the amenity, and how those environmental management requirements will be implemented. Any CEMP should include consideration of a soil erosion and drainage management plan such as details of proposed stormwater management, including any opportunities for retention and reuse.<br>**An Operations Environmental Management Plan (OEMP)** that describes how operations, in particular maintenance regimes, will be managed to mitigate negative impacts to the environment, and public health and the amenity, and how any ongoing environmental management requirements will be implemented. Any OEMP should include risk management plan which includes consideration of minimising maintenance works during fire danger season. | |

In addition to the CEMP and the OEMP, the EIS Guidelines identify a number of other management plans which will be required for the Project to manage predicted environmental impacts. These are listed in Table 20-2 together with the chapter which contains further discussion on the plans.

**Table 20-2: Project management plans addressed in other chapters**

| Management plan | Chapter |
|---|---|
| Native Vegetation Clearance Data Report | Chapter 12 Flora and Fauna |
| Cultural Heritage Management Plan | Chapter 18 Cultural Heritage |
| Waste Management and Minimisation Plan | Chapter 19 Waste Management |
| Fire Hazard Management Plan | Chapter 18 Hazards and Risk Management |

The general requirement in EIS Guideline 15.13 to outline the proposed environmental management measures which will be adopted, is specifically addressed in the chapters which discuss environmental aspects and is not detailed further in this chapter. These chapters set out the details of the predicted impacts of construction, operation and maintenance activities on that aspect and the environmental management measures which will be put in place to mitigate impacts. These management measures (which may include baseline studies, monitoring and training and reporting mechanisms where relevant) are also set out in the Draft Construction Environmental Management Plan and the Draft Operations Environmental Management Plan which are provided in Appendices P and Q and discussed further in Section 20.3.

Identification of management measures has taken into account the specific requirements for delivery of the Project, the nature of the habitats and land uses traversed by the transmission line and protection of the amenity of the local community. Discussion of the expected effectiveness of the identified management measures in addressing impacts and the consideration of proven or new approaches is provided in the context of the environmental aspect addressed in each chapter.

More generally Chapter 7 Project Description describes the techniques and technologies that are proposed for construction of the Project including how use of alternative transmission technologies, structure types and construction techniques (e.g. the use of helicopters) to minimise environmental impacts have been considered in the Project design.

## 20.2. ElectraNet Environmental Management System

An Environmental Management System (EMS) provides the framework by which environmental risks associated with an organisation's activities, products and services can be identified, managed and monitored. These systems focus on continuous improvement of environmental performance, prevention of environmental damage and resource management. An EMS can also assist by providing the means of demonstrating of ongoing environmental regulatory compliance.

The ElectraNet Health, Safety and Environmental Management System (HSEMS) is outlined below.

### 20.2.1. ElectraNet Health, Safety, Environment and Sustainability Management

#### Health, Safety, Environment and Sustainability Policy

All ElectraNet operations are undertaken in accordance with the overarching Health, Safety, Environmental and Sustainability Policy which provides the basis for ElectraNet's operating policies and procedures for this area. The stated policy commitments are:

- 'to keeping our people safe from harm every day, to provide a safe and healthy workplace for workers, contractors and visitors and to protect and respect the natural and cultural environment in the communities in which we operate'; and
- 'to conducting a balanced approach to its business activities incorporating environmental and social responsibility to ensure our activities are sustainable for the benefit of current and future generations'.

#### Environmental Management Policy

ElectraNet's the Environmental Management Policy outlines the company's commitment to developing and maintaining an EMS that delivers improved environmental performance in accordance with the *Environment Protection Act 1993* (SA) and other relevant legislation, regulations, standards and codes of practice. The policy addresses:

- developing and maintaining of an EMS

- assessing activities and assets regularly to identify environmental aspects and impacts, and developing objectives and targets to prevent pollution
- developing, documenting and maintaining robust standards and procedures
- establishing and maintaining key performance indicators and measuring effectiveness through regular environmental inspections, audits and management reviews
- providing all employees and contractors with appropriate induction and training
- proactively communicating and transparently reporting environmental performance and responding to stakeholder information requests
- incorporating climate change and sustainability principles into the EMS and reducing greenhouse gas emissions.

### Health, Safety and Environment Management System (HSEMS)

Implementation of ElectraNet HSE policies and principles noted above is through the Health, Safety and Environment Management System (HSEMS) which is described in the HSE Management System Framework. This HSEMS framework document defines the structure for management of HSE across ElectraNet, and the elements and expectations by which the health and safety of workers, the public, and the environment in which they work and live, are protected during conduct of ElectraNet operations.

The HSEMS has been developed in alignment with international standard *ISO 45001:2018 Safety Management Systems* requirements and *14001:2015 Environmental Management System* requirements and is certified to *AS 4801: 2001 Occupational health and safety management systems - Requirements* and *ISO 14001:2004 Environmental management systems – Requirements*.

The framework sets out expectations and guidance in relation to roles and responsibilities, assessment of HSE opportunities and risks, communication and documentation, operational planning, emergency preparedness, performance evaluation and continuous improvement.

The HSEMS is subject to ongoing review using the plan-do-check-act approach for continuous improvement.

### Safety and Sustainability Standards

The HSEMS framework identifies ElectraNet's Safety and Sustainability Standards (S&S Standards) for contractors undertaking construction works and providing asset maintenance services as part of a sustainable procurement approach. The S&S Standards are an integral part of the ElectraNet HSEMS and outline the minimum safety and sustainability requirements for ElectraNet contractors and subcontractors.

The S&S Standards detail the environmental management plans which are required to manage environmental risks and impacts associated with projects and which include:

- **Construction Environment Management Plans (CEMP).** Contractors are required to prepare, submit, implement and maintain a project specific CEMP in accordance with their environmental management system, ElectraNet requirements and regulatory obligations.
- **Asset Maintenance Environmental Management Plans (AMEMP).** Maintenance service providers are similarly required to prepare and submit an AMEMP to manage environmental aspects associated with asset maintenance.

It should be noted that the Operations Environmental Management Plan (OEMP) referred to in the EIS Guidelines and the AMEMP perform the same function, however for consistency with the EIS Guidelines and the purposes of this chapter, the plan addressing operations environmental management is referred to as the OEMP.

The S&S Standards set out the actions which must be undertaken by ElectraNet in the preparation of the CEMP and OEMP (e.g. provision of information on land access agreements, site contamination, significant flora and fauna) and the Contractor (e.g. undertaking site inspections, risk assessments). Other actions covering requirements for matters such as training and site induction, inspections and audit schedules, vegetation protection and rehabilitation and cultural heritage site management are also set out in the S&S Standards.

#### Legal and other requirements

ElectraNet must also comply with a range of legislation, policies and requirements as set out in the Chapter 5 Legislative and Planning Framework. The CEMP and OEMP will provide the framework for achieving compliance with regulatory requirements (including the general environmental duty), environment protection policies, standards, guidelines and codes of practice.

## 20.3. Environmental Management Framework for the Project

### 20.3.1. Preparation of CEMP and OEMP

Project specific plans for environmental management of construction, operations and maintenance are required by both the ElectraNet S&S Standards and EIS guidelines. These will be developed and implemented in line with ElectraNet's overarching approach to environmental and social sustainability, and in compliance with relevant legislation and other regulatory requirements.

A draft CEMP and OEMP have been developed to support the EIS submission. These draft EMPs will be updated by the relevant contractors following the approvals process and submitted to relevant government regulators for approval prior to commencement of Project construction or operation activities. The Draft CEMP is at Appendix P and Draft OEMP is at Appendix Q.

As a general guide it is expected that the structure of the CEMP and OEMP will include the following:

- an introductory overview of the key issues requiring management
- key legislation, policies, standards and other requirements that apply to the environmental aspect.
- relevant environmental values that require protection
- identification and analysis of potential environmental impacts, including environmental hazards and risks
- performance goals the EMP is seeking to achieve in order to avoid or mitigate impacts
- an overview of the management measures that will be utilised to meet the objectives and their timing. Where required, specific plans will be developed for aspects requiring further detail
- specification of the required level of performance to meet environmental/legislative or Project-specific standards
- procedures to monitor, measure and record performance (e.g. inspections and auditing)

- reporting requirements to regulators, the community and other stakeholders for the environmental aspect and the responsible parties.
- procedures to be undertaken if performance indicators are not met.

The CEMP for the Project will be based on the draft CEMP prepared for the EIS and will address management of environmental aspects identified and discussed in the EIS (refer Table 20-3). The CEMP will also include information as advised in the Construction Environment Management Plan Guideline (EPA 1095/19) (EPA SA 2018). The OEMP will similarly be structured around the environmental aspects identified in the EIS for the Project and based on the draft OEMP prepared for the EIS.

Some specific issues will be addressed through more detailed sub-plans within the CEMP to provide appropriate guidance to contractors and other personnel on site. These could include a Rehabilitation Management Plan, Weed, Pest and Disease Management Plan, Sedimentation, Erosion and Drainage Management Plan and Traffic Management Plan

Other environmental management plans are specifically required to be prepared by the EIS Guidelines and will be additional to the CEMP and OEMP (refer Table 20-4).

All plans will require approval from ElectraNet and the appropriate regulators before construction, operations or maintenance activities commence.

**Table 20-3: Management measures to be addressed in the CEMP and OEMP**

| Issue | CEMP | OEMP | Chapter |
|---|---|---|---|
| Sedimentation, soil erosion and drainage | ✓ | | Chapter 10 Physical Environment |
| Spills, incidents and emergency response | ✓ | | Chapter 10 Physical Environment<br>Chapter 18 Hazards and Risk Management |
| Acid sulphate soils | ✓ | | Chapter 10 Physical Environment |
| Soil or groundwater contamination | ✓ | | Chapter 10 Physical Environment<br>Chapter 19 Waste Management |
| Wastewater | ✓ | | Chapter 10 Physical Environment |
| Vegetation management | ✓ | ✓ | Chapter 11 Flora and Fauna |
| Pest, diseases and weeds | ✓ | ✓ | Chapter 11 Flora and Fauna |
| Fire | ✓ | ✓ | Chapter 11 Flora and Fauna |
| Interactions with fauna | ✓ | ✓ | Chapter 11 Flora and Fauna |
| Cultural heritage | ✓ | ✓ | Chapter 12 Cultural Heritage |
| Dust and air emissions | ✓ | | Chapter 14 Air Quality |
| Noise and vibration | ✓ | | Chapter 15 Noise |
| Traffic | ✓ | | Chapter 15 Noise<br>Chapter 16 Traffic and Transport |
| Landholder notification and access arrangements | ✓ | ✓ | Chapter 9 Land use and Tenure |
| Addressing community concerns | ✓ | | Chapter 15 Noise |
| Rehabilitation and reinstatement. | ✓ | ✓ | Chapter 9 Land use and Tenure<br>Chapter 11 Flora and Fauna |

**Table 20-4: Environmental management plans required by the EIS**

| Plan | Appendix | Chapter |
|---|---|---|
| Cultural Heritage Management Plan | Appendix R | Chapter 12 Cultural Heritage |
| Fire hazard management plan | Appendix S | Chapter 18 Hazard and Risk Management |
| Waste management and minimisation plan (for construction and operation) | Appendix T | Chapter 19 Waste Management |

### 20.3.2. Environmental monitoring

Monitoring of construction, operations and maintenance activities will be undertaken to determine whether environmental risks are being managed, minimised or where reasonably possible, eliminated. Monitoring requirements in the CEMP and OEMP will address aspects such as compliance with regulatory requirements, control of weeds and pests and vegetation regeneration.

### 20.3.3. Emergency response

ElectraNet has an emergency response system in place as part of the overarching HSEMS, with processes and plans for responding to potential or actual or emergency situations documented in an Emergency Response Procedure which is regularly reviewed and updated.

Specific emergency response plans for Project construction activities will also be developed. Emergency preparedness and response is discussed in further detail in Chapter 18 Hazards and Risk Management.

### 20.3.4. Stakeholder engagement and complaint management

Consultation and communication between ElectraNet and affected landholders will be ongoing during construction. Land access protocols will be established with each landholder where construction activities are planned and appropriate access arrangements will be agreed provided to all contractors and construction crews together with standard ElectraNet operating procedures.

All ElectraNet employees, contractors and visitors who interact with members of the local community are expected to adhere to ElectraNet policies requiring respect for the cultural environments of the communities in which ElectraNet operates.

A community feedback and complaints process will be set out in the CEMP and OEMP to ensure that all feedback and complaints are appropriately recorded and addressed.

### 20.3.5. Training and induction

All Project personnel involved in construction activities will be required to undergo training in environmental management and safety requirements as part of their induction on to the site and prior to commencement of construction or operational activities. Job-specific training relevant to roles will also be undertaken and records maintained of induction and attendees.

Specific training and induction requirements will be set out in the CEMP.

### 20.3.6. Reporting and compliance

The HSEMS provides for processes for recording, reporting and tracking corrective actions for incidents and hazards, allowing analysis of incidents to identify areas requiring improvement. Internal and external reporting procedures will be implemented to ensure that environmental issues and / or incidents are appropriately responded to. A key component of the internal reporting will be Contractors' progress and incident reports to ElecraNet. External reporting (e.g. incidents, annual reports) will be carried out in accordance with regulatory requirements.

Contractors are responsible for reporting all Safety and Sustainability Events (including any notice received from a government agency) to the ElectraNet Project / Program Manager (or their representative) within one hour of the incident occurring, or if not reasonably practicable, as soon as possible. The relevant notification entry is made into the ElectraNet Incident Management System (IMS) within 24 hours.

The HSEMS also requires that an audit schedule is prepared that details the type and number of audits and inspections to be conducted and their timing. This is followed up with a procedure specific to Non-Conformance and Corrective Actions, which sets out the process, rules and responsibilities that apply to raising non-conformances or opportunities for improvement.

Chapter 18 Hazards and Risk Management provides further details on ElectraNet's risk and hazard management processes under the HSEMS.

### 20.3.7. Roles and responsibilities

All personnel involved in the Project, including ElectraNet employees, advisors, contractors and subcontractors are required to undertake work in accordance with the CEMP, OEMP and the HSEMS. Key roles and responsibilities for the implementation of the EMS during Project construction are presented in Table 20-5.

**Table 20-5: HSEMS roles and responsibilities during Project construction**

| Role | Responsibilities |
|---|---|
| Safety and Sustainability Business Partners | • Lead the development of a positive and collaborative relationship with the Contractor's team<br>• Provide strategy, general and technical health, safety and environmental advice to the ElectraNet teams<br>• Provide the Contractor with or access to a copy of the ElectraNet S&S Standards, ElectraNet SMP and EMP review checklists upon works award<br>• Liaise with all appropriate stakeholders on HPI incident investigations<br>• Liaise and provide procedural advice to the Contractor's Health Safety and Environmental Manager(s)<br>• Attend and participate in project or works leadership meetings as and if required<br>• Complete contractor performance quarterly reporting, liaising with the Team Leader - Field. |
| ElectraNet Land Management Cultural Heritage Advisor | • Liaise with appropriate Traditional Owner stakeholders and organise surveys/monitoring activities as appropriate<br>• Participate in ICAM investigations alongside the Contractor's representatives as required<br>• Liaise with on-site ElectraNet cultural heritage representatives as appropriate<br>• Escalate any issues not resolved on site to the ElectraNet Project / Programme Managers and the Land Manager. |
| ElectraNet Land Management Landowner Liaison Co-Ordinator | • Manage landowner relationships, property access notifications and special requirements including with the Department of Environment and Water<br>• Maintain ElectraNet connect land access database for ElectraNet and Contractor information<br>• Escalate any issues not resolved on site to the ElectraNet Project/Programme Managers and the Land Manager. |
| ElectraNet Team Leader Field | • Liaise with all appropriate stakeholders on HSE systems and HSE pre-qualification audits<br>• Address and resolve with any escalated items as notified by the HSE Advisors with the ElectraNet Project/Programme Managers |

| Role | Responsibilities |
|---|---|
| | • Review and approve HS & E Advisor project and works reports<br>• Hold to account the Contractor's adherence to the requirements of the ElectraNet Safety and Sustainability Standards<br>• Manage all non HPI contractor incidents and near misses in conjunction with the ElectraNet teams |
| Health Safety and Environmental Advisors | • Review contractor health safety and environmental documentation in accordance with business procedures and provide written feedback to the contractor via the ElectraNet Project / Programme Manager<br>• Attend all Safety in Design and Construction Risk related review meetings and workshops<br>• Hold to account the Contractor's adherence to the requirements of the ElectraNet Safety and Sustainability Standards<br>• Attend site work fronts, independently observe activities and conduct HSE systems audits and inspections throughout all phases of the works<br>• Liaise with the Contractor's HS & E Advisors for ground level opportunities for improvement<br>• Escalate any issues not resolved on site to the ElectraNet Project / Programme Managers and ElectraNet Team Leader - Field<br>• Provide holistic commentary on the Contractor's health safety and environmental performance<br>• Participate in and contribute to the Contractor's health safety and environmental initiatives<br>• Participate in incident cause analysis method (ICAM) investigations alongside the Contractor's representatives as required<br>• Provide formal reports to the ElectraNet Team Leader- Field for ElectraNet promulgation<br>• Attend and participate in project and works team meetings as and if required. |
| Project / Programme / Design Managers | • Collaborate with and seek advice on health, safety and environmental aspects from the HSE discipline at all stages of the project or works<br>• Hold accountable project and works team members to contribute in an ongoing manner to health safety and environmental performance on the project or works<br>• Notify incidents and near misses to relevant stakeholders<br>• Liaise with the ElectraNet Team Leader - Field to resolve any escalated site issues<br>• Liaise with the ElectraNet Team Leader Field regarding any inspection, or HSE system audit findings and non-conformances |

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# Conclusion

# 21. Conclusion

The National Electricity Market (NEM) is currently undergoing a significant period of transition from a largely centralised fossil-fuel generation fleet to a more variable, dispersed energy mix characterised by increased penetration of renewable energy generation, storage technology, wide-scale behind the meter applications and emerging technologies.

To support this transition, new investment into the transmission infrastructure that supports the NEM in connecting electricity generators and transmitting energy to consumers is required. Project EnergyConnect is proposed in response to this need, to achieve the objective of improving the affordability, reliability and sustainability of electricity supply in the NEM through increased electricity transmission between states.

If approved, Project EnergyConnect would deliver a range of direct benefits for consumers in SA and NSW. In SA these would include:

- **Lower power prices**
  - Typical residential electricity bills are estimated to be reduced annually by $100 in SA.
  - Businesses can expect higher savings, proportional to their energy use.
- **Improved energy security**
  - A greater mix of renewable energy generators will be enabled to connect into the network.
  - Reliability and confidence in electricity supply will be increased.
- **Increased economic activity**
  - Approximately 200 jobs will be created in SA during construction.
  - The development of new renewable projects at connection points will be enabled, facilitating the growth of associated industries.
  - Approximately 250 ongoing jobs will be created in SA.

The Project has been designed, to the greatest extent possible, to avoid and minimise environmental and social impacts, and to respond to the issues raised by stakeholders and the community. The detailed design and construction phase for the Project will continue to be developed with the objective of further avoiding and minimising potential negative impacts on the environment and local communities and maximising positive benefits.

Assessments have been based on the current indicative design and construction methodology for the Project, and some uncertainties remain. A conservative approach to assessment has been adopted to this stage of the Project’s development which indicates that, while no unacceptable impacts are anticipated (and despite efforts to avoid and minimise impacts through design), some residual impacts would remain. These impacts would be addressed through implementation of the proposed mitigation measures, supported by ElectraNet’s demonstrated capability and strong corporate governance and management systems. The potential residual impacts of the Project are therefore considered manageable.

ElectraNet is committed to open and transparent engagement with stakeholders and community members throughout the EIS process and beyond and will continue to engage face to face with landholders, traditional owners, government and the wider community as construction of the Project progresses. Ongoing updates via the Project website, virtual engagement room and social media platforms developed for the Project will also continue to be provided.

Overall, the Project is a critical component in delivering long term benefits to SA and NSW electricity consumers, providing security to the NEM and facilitating the transition to a lower carbon emissions future.

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# 22. References

## A


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